Wisconsin Department of Safety and Professional Services
Division of Policy Development
4822 Madison Yards Way
PO Box 8366
Madison WI 53708-8366

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Tony Evers, Governor
Dan Hereth, Secretary

VIRTUAL/TELECONFERENCE
CONTROLLED SUBSTANCES BOARD
Virtual, 4822 Madison Yards Way, Madison
Contact: Adam Barr (608) 266-2112
January 13, 2023

The following agenda describes the issues that the Board plans to consider at the meeting. At the time of the meeting, items may be removed from the agenda. Please consult the meeting minutes for a description of the actions and deliberations of the Board. Be advised that board members may attend meetings designated as "Hybrid" in-person or virtually.

AGENDA

9:30 A.M.

OPEN SESSION – CALL TO ORDER – ROLL CALL

A. Adoption of Agenda (1-3)

B. Approval of Minutes November 11, 2022 (4-5)

C. Reminders: Conflicts of Interests, Scheduling Concerns

D. Introductions, Announcements and Recognition

E. Administrative Matters – Discussion and Consideration

1) Department, Staff, and Board Updates
2) 2023 Meeting Dates **(6)**
3) Annual Policy Review **(7-10)**
4) Election of Officers, Appointment of Liaisons and Alternates, Delegation of Authorities **(11-14)**
5) Board Members – Term Expiration Dates
   a. Alton, Troy
   b. Barman, Subhadeep – 5/1/2019
   c. Bellay, Yvonne
   d. Bloom, Alan – 5/1/2020
   e. Englebert, Doug
   f. Ferguson, Kris
   g. Koresch, Sandy
   h. Weinman, Robert
   i. Weitekamp, John
6) Alternate Members
   a. Bistan, Matthew
   b. McFarland, Rosalyn
   c. Parish, Michael
   d. Zentz, Emily

F. Legislature Agenda Request: Status of Kratom – Discussion and Consideration (15-387)

G. Administrative Rule Matters – Discussion and Consideration (388)

1) Preliminary Rule Draft
    a. CSB 2.92, Relating to Scheduling 38 Anabolic Steroids **(389-393)**
    b. CSB 2.93, Relating to Scheduling Daridorexant **(394-396)**
    c. CSB 2.94, Relating to Scheduling 7 Synthetic Benzimidazole-Opioids **(397-400)**
    d. CSB 2.95, Relating to Scheduling Ganaxolone **(401-403)**
2) Affirmative Action Order
    a. CSB 2.96, Relating to Scheduling Amineptine **(404)**
    b. CSB 2.97, Relating to Scheduling Zipeprol **(405)**
    c. CSB 2.98, Relating to Scheduling Excluding [^{18}F] FP-CIT **(406)**
    d. CSB 2.99, Relating to Scheduling Mesocarb **(407)**
    e. CSB 2, Relating to Scheduling Methipropamine **(408)**
3) Drafting Proposals
    a. CSB 4, Relating to National Provider Identifier Requirements **(409-417)**
4) Pending and Possible Rulemaking Projects
    a. Rule Projects Chart **(418-419)**

H. Prescription Drug Monitoring Program (PDMP) Updates – Discussion and Consideration (420)

1) WI ePDMP Operations
    a. Recent and Upcoming Releases **(421-422)**
    b. Status of Grant Projects:
        a. FY 2020 Harold Rogers Prescription Drug Monitoring Program
        b. FY 2021 Harold Rogers Prescription Drug Monitoring Program
        c. FY 2022 Harold Rogers Prescription Drug Monitoring Program
    c. Interstate Data Sharing **(423-424)**
    d. EHR Integration Status

I. Board Member Reports – Discussion and Consideration

1) Medical Examining Board
2) Dentistry Examining Board
3) Board of Nursing
4) Pharmacy Examining Board

J. Liaison Reports

K. Report from the Referral Criteria Work Group – Discussion and Consideration

L. COVID-19 – Discussion and Consideration

M. Deliberation on Special Use Authorizations – Discussion and Consideration

N. Discussion and Consideration of Items Received After Preparation of the Agenda

1) Introductions, Announcements, and Recognition
2) Administrative Matters
3) Election of Officers

4) Appointment of Liaisons and Alternates
5) Delegation of Authorities
6) Informational Items
7) Division of Legal Services and Compliance (DLSC) Matters
8) Education and Examination Matters
9) Credentialing Matters
10) Practice Matters
11) Legislative and Administrative Rule Matters
12) Liaison Reports
13) Appearances from Requests Received or Renewed
14) Speaking Engagements, Travel, or Public Relations Requests, and Reports
15) Consulting with Legal Counsel

O. Public Comments

CONVENE TO CLOSED SESSION to deliberate on cases following hearing (s. 19.85(1)(a), Stats.); to consider licensure or certification of individuals (s. 19.85(1)(b), Stats.); to consider individual histories or disciplinary data (s. 19.85(1)(f), Stats.); and to confer with legal counsel (s. 19.85(1)(g), Stats.).

P. Deliberation on Special Use Authorizations – Discussion and Consideration

Q. Consulting with Legal Counsel

RECONVENE TO OPEN SESSION IMMEDIATELY FOLLOWING CLOSED SESSION

R. Vote on Items Considered or Deliberated Upon in Closed Session if Voting is Appropriate

S. Open Session Items Noticed Above Not Completed in the Initial Open Session

ADJOURNMENT

NEXT MEETING: MARCH 10, 2023

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MEETINGS AND HEARINGS ARE OPEN TO THE PUBLIC, AND MAY BE CANCELLED WITHOUT NOTICE.

Times listed for meeting items are approximate and depend on the length of discussion and voting. All meetings are held virtually unless otherwise indicated. In-person meetings are typically conducted at 4822 Madison Yards Way, Madison, Wisconsin, unless an alternative location is listed on the meeting notice. In order to confirm a meeting or to request a complete copy of the board's agenda, please visit the Department website at https:\\dsps.wi.gov. The board may also consider materials or items filed after the transmission of this notice. Times listed for the commencement of disciplinary hearings may be changed by the examiner for the convenience of the parties. Requests for interpreters for the hard of hearing, or other accommodations, are considered upon request by contacting the Affirmative Action Officer at 608-266-2112, or the Meeting Staff at 608-266-5439.

HYBRID (IN-PERSON/VIRTUAL)
CONTROLLED SUBSTANCES BOARD
MEETING MINUTES
NOVEMBER 11, 2022

PRESENT: Troy Alton, Subhadeep Barman *(via Zoom) (excused at 10:52 a.m.)*, Yvonne Bellay, Alan Bloom, Doug Englebert, Sandy Koresch, Michael Parish *(via Zoom)*, Robert Weinman *(via Zoom) (arrived at 9:36 a.m., excused at 9:40 a.m.)*, John Weitekamp

EXCUSED: Kris Ferguson

STAFF: Adam Barr, Executive Director; Jameson Whitney, Legal Counsel; Katlin Schwartz, Bureau Assistant; Dialah Azam, Bureau Assistant; and other DSPS Staff

(Michael Parish served as the Medical Examining Board Representative at this meeting.)

CALL TO ORDER

Doug Englebert, Chairperson, called the meeting to order at 9:35 a.m. A quorum was confirmed with eight (8) members present.

(Robert Weinman arrived at 9:36 a.m.)

ADOPTION OF AGENDA

MOTION: Alan Bloom moved, seconded by Yvonne Bellay, to adopt the Agenda as published. Motion carried unanimously.

(Robert Weinman was excused at 9:40 a.m.)

ANNUAL HEARING WITH LAW ENFORCEMENT LEADERS, AGENCIES, AND PROSECUTORS

Discussion Regarding Drug Trends

Open Discussion

MOTION: Yvonne Bellay moved, seconded by John Weitekamp, to acknowledge and thank the following individuals for their presentations to the Controlled Substances Board:

- Dan Hereth, Secretary, Department of Safety & Professional Services
- Jennifer Naugle, Division of Forensic Sciences, Deputy Administrator, Wisconsin Department of Justice
- John G. D. McGarry, Assistant Special Agent in Charge, United States Drug Enforcement Administration, Milwaukee District Office
- Jameson Whitney, Department of Safety & Professional Services
- Sandy Koresch, Wisconsin State Crime Lab Bureau

Motion carried unanimously.

APPROVAL OF MINUTES OF SEPTEMBER 9, 2022

MOTION: Alan Bloom moved, seconded by Sandy Koresch, to adopt the Minutes of September 9, 2022 as published. Motion carried unanimously.

ADMINISTRATIVE MATTERS

Department, Staff, and Board Updates

MOTION: John Weitekamp moved, seconded by Yvonne Bellay, to recognize and thank Kimberly Wood for her years of dedicated service to the State of Wisconsin. Motion carried unanimously.

(Subhadeep Barman was excused at 10:52 a.m.)

LEGISLATURE AGENDA REQUEST: STATUS OF KRATOM

Dr. Chris Cunningham, Associate Professor of Pharmaceutical Sciences, Concordia University Wisconsin School of Pharmacy

MOTION: Troy Alton moved, seconded by Alan Bloom, to acknowledge and thank Dr. Chris Cunningham, Associate Professor of Pharmaceutical Sciences, Concordia University, Wisconsin School of Pharmacy for his appearance and presentation to the Board. Motion carried unanimously.

Mac Haddow, American Kratom Association

MOTION: Troy Alton moved, seconded by Alan Bloom, to acknowledge and thank Mac Haddow and Jack Henningfield from the American Kratom Association, for their appearance and presentation to the Board. Motion carried unanimously.

REPORT FROM THE REFERRAL CRITERIA WORK GROUP

MOTION: John Weitekamp moved, seconded by Troy Alton, to accept the recommendations of the Referral Criteria Work Group and refer the specified providers to the appropriate examining boards for further proceedings. Motion carried unanimously.

ADJOURNMENT

MOTION: Alan Bloom moved, seconded by Sandy Koresch, to adjourn the meeting. Motion carried unanimously.

The meeting adjourned at 12:01 p.m.

DRAFT

State of Wisconsin
Department of Safety & Professional Services

AGENDA REQUEST FORM

1) Name and title of person submitting the request: Katlin Schwartz, Bureau Assistant		**2) Date when request submitted:** 12/14/2022 **Items will be considered late if submitted after 12:00 p.m. on the deadline date which is 8 business days before the meeting**	
3) Name of Board, Committee, Council, Sections: Controlled Substances Board			
4) Meeting Date: 1/13/2023	**5) Attachments:** ☐ Yes ☒ No	**6) How should the item be titled on the agenda page?** 2023 Meeting Dates	
7) Place Item in: ☒ Open Session ☐ Closed Session	**8) Is an appearance before the Board being scheduled?** ☐ Yes ☒ No	**9) Name of Case Advisor(s), if applicable:** N/A	

10) Describe the issue and action that should be addressed:

The Board will review and potentially make a motion to approve the following 2023 meeting dates:

- Friday, January 13, 2023 → Virtual
- Friday, March 10, 2023 →DSPS
- Friday, May 12, 2023 → Virtual
- Friday, July 14, 2023 → Virtual
- Friday, September 8, 2023 → Virtual
- Friday, November 10, 2023 → DSPS

11) Authorization

Katlin Schwartz	12/14/2022
Signature of person making this request	**Date**
Supervisor (Only required for post agenda deadline items)	**Date**
Executive Director signature (Indicates approval for post agenda deadline items)	**Date**

Directions for including supporting documents:

1. This form should be saved with any other documents submitted to the Agenda Items folders.
2. Post Agenda Deadline items must be authorized by a Supervisor and the Policy Development Executive Director.
3. If necessary, provide original documents needing Board Chairperson signature to the Bureau Assistant prior to the start of a meeting.

State of Wisconsin
Department of Safety & Professional Services

AGENDA REQUEST FORM

1) Name and title of person submitting the request:	2) Date when request submitted:
Katlin Schwartz, Bureau Assistant on behalf of Division of Policy Development Executive Directors	12/14/2022 Items will be considered late if submitted after 12:00 p.m. on the deadline date which is 8 business days before the meeting

3) Name of Board, Committee, Council, Sections:

All Boards

4) Meeting Date: First Meeting of 2023	5) Attachments:	6) How should the item be titled on the agenda page?
	☒ Yes ☐ No	Annual Policy Review

7) Place Item in:	8) Is an appearance before the Board being scheduled?	9) Name of Case Advisor(s), if applicable:
☒ Open Session ☐ Closed Session	☐ Yes ☒ No	N/A

10) Describe the issue and action that should be addressed:

Please be advised of the following Annual Policy Review items:

1. In-Person Meeting Policy: Depending on the frequency of Board meetings, a Board may be allowed a certain number of in-person meetings.
   - 4-5 Meetings per year = 1 in-person opportunity
   - 6-8 Meetings per year =2 in-person opportunities
   - 12 Meetings per year = 4 in-person opportunities
2. Attendance/Quorum: Thank you for your service and for your commitment to meeting attendance. If you cannot attend a meeting or if you have scheduling conflicts impacting your attendance, please let us know ASAP. Timely notification is appreciated as quorum is required for our Boards, Sections and Councils to meet pursuant to Open Meetings Law.
3. Walking Quorum: Board/Section/Council members must not collectively discuss the body's business outside of a properly noticed meeting. Should several members of a body do so, the members could be violating the open meetings law.
4. Mandatory Training: All Board Members must complete their annual Public Records and Ethics Trainings, if not complete, the training will be done at the next meeting.
5. Agenda Deadlines: Please communicate agenda topics to your Executive Director before the agenda submission deadline which is at 12:00 pm, 8 business days prior to a meeting. (Attachment: Timeline of a Meeting)
6. Travel Voucher and Per Diem Submissions: Please submit all Per Diem and Reimbursement claims to DSPS within 30 days of the close of each month in which expenses are incurred. (Attachments: Per Diem Example, Travel Voucher Example)
7. Lodging Accommodations/Hotel Cancellation Policy: Lodging accommodations are available to eligible members. Standard eligibility: member must leave home before 6:00 a.m. to attend a meeting by the scheduled start time.
   - If a member cannot attend a meeting it is their responsibility to cancel their reservation within the applicable cancellation timeframe. If a meeting is changed to occur remotely or is cancelled or rescheduled DSPS staff will cancel or modify reservations as appropriate.
8. Inclement Weather Policy: In the event of inclement weather the agency may change a meeting from an in-person venue to on that is executive remotely.

11) Authorization

Katlin Schwartz	12/14/2022
Signature of person making this request	Date
Supervisor (Only required for post agenda deadline items)	Date
Executive Director signature (Indicates approval for post agenda deadline items)	Date

Directions for including supporting documents:

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3. If necessary, provide original documents needing Board Chairperson signature to the Bureau Assistant prior to the start of a meeting.

Timeline of a Meeting

8 business days prior to the meeting: All agenda materials are due to the Department by 12:00 pm, 8 business days prior to the meeting date.

7 business days prior to the meeting: The draft agenda page is due to the Executive Director. The Executive Director transmits to the Chair for review and approval.

5 business days prior to the meeting: The approved agenda is returned to the Bureau Assistant for agenda packet production and compilation.

4 business days prior to the meeting: Agenda packets are posted on the DSPS Board SharePoint site and on the Department website.

Agenda Item Examples:

- Approval of the Agenda and Minutes (from the last meeting)
- Open Session Items
  - Public Hearings (on Admin Rules)
  - Administrative Matters
  - Legislation and Policy Matters
  - Administrative Rules Matters
  - Credentialing Matters
  - Education and Exam Issues
  - Public Agenda Requests
  - Current Issues Affecting the Profession
  - Public Comments
- Closed Session items
  - Deliberations on Proposed Disciplinary Actions
    - Stipulations
    - Administrative Warnings
    - Case Closings
    - Monitoring Matters
    - Professional Assistance Procedure (PAP) Issues
  - Proposed Final Decisions and Orders
  - Orders Fixing Costs/Matters Relating to Costs
  - Credentialing Matters
  - Education and Exam Issues

Thursday of the Week Prior to the Meeting: Agendas are published for public notice on the Public Notices and Meeting Minutes website: **publicmeetings.wi.gov**.

1 business day after the Meeting: "Action" lists are distributed by staff detailing board actions on closed session business.

5 business days after the Meeting: "To Do" lists are distributed to staff to ensure that board decisions are acted on and/or implemented within the appropriate divisions in the Department. Minutes approved by the board are published on the the Public Notices and Meeting Minutes website: **publicmeetings.wi.gov**.

Department of Safety and Professional Services

PER DIEM REPORT

INSTRUCTIONS: Claimant records board-related activities by entering the date of an activity, the duration of time spent in that activity, the relevant purpose code (see purpose code descriptions below), where the activity is conducted, and the type of activity performed. Only one (1) $25.00 per diem payment can be issued on any given calendar day.

Purpose Codes:

A. **Official meetings including video/teleconference calls** (automatic day of per diem)**:** i.e., board, committee, board training or screening panels; **Hearings,** i.e., Senate Confirmation, legislative, disciplinary or informal settlement conferences; **Examinations and Test Development Sessions,** i.e., test administration, test review or analysis events, national testing events, tour of test facilities, etc.)

B. **Other** (One (1) per diem will be issued for every five (5) hours spent in category B, per calendar month): i.e., review of disciplinary cases, consultation on cases, review of meeting materials, board liaison work e.g., contacts regarding Monitoring, Professional Assistance Procedure, Credentialing, Education and Examinations

NAME OF EXAMINING BOARD OR COUNCIL	BOARD OR COUNCIL MEMBER'S NAME
EXAMPLE EXAMINING BOARD	**MARY SUNSHINE**

Activity Date **MM/DD/YY**	Duration of Activity **Hours/Minutes**	Purpose Code **A or B**	Where Performed **City/Location (Home, Work, DSPS)**	Activity **Describe Activity Performed (see purpose codes)**
12/2/20	**2 hrs**	**B**	**Pleasant Prairie/Home**	**Review of screening panel materials**
12/3/20	**2 hr / 30 mins**	**B**	**Pleasant Prairie/Home**	**Review of screening panel materials**
12/10/20	1 hr	A	Pleasant Prairie/Home	Screening Panel Meeting - Teleconference
12/12/20	**1 hr / 30 mins**	**B**	**Pleasant Prairie/Home**	**Case consultation**
12/13/20	**1 hr**	**B**	**Pleasant Prairie/Home**	**Liaison: Application Review**
12/16/20	6 hrs	A	Madison/DSPS	Board Member Training

The 5-hour rule applies to "B" code activities. Add the 'B' codes within the calendar month and then divide by five (5) hours to calculate your per diem payment. In this case the total is seven (7) hours which equals one (1) day of per diem.

Each 'A' code is an automatic day of per diem regardless of time spent in that activity. Ms. Sunshine is eligible for two (2) additional days of payment.

Department staff completes the fields titled "Total Days Claimed".

CLAIMANT'S CERTIFICATION

The undersigned certifies, in accordance with § 16.53, Wis. Stats., that this account for per diem, is just and correct; and that this claim is for service necessarily incurred in the performance of duties required by the State, as authorized by law.

Comments:

Mary Sunshine 1/4/2021

Claimant's Signature Date

Supervisor Date

EMPL ID: 100012345-0

To be completed by Department staff: **TOTAL DAYS CLAIMED:** 3 @ $25.00 = 75.00

State of Wisconsin

Travel Voucher

DOCUMENT NUMBER TL

For Agency Use Only

Staple Receipts Face Up On Backside

Safety & Professional Services

Department/ Division Example Examining Board

State Officer/Employee Name Mary Sunshine

Mo/Yr **From/To:**

Emp ID 100012345 **Z**

Address 2424 Happy Road

City Pleasant Prairie **State** WI **Zip-Code** 53158

FY	FUND	BUSINESS UNIT	DEPART	APPR CLASS	OBJECT	PROJECT			BALANCE SHEET ACCT	REPORTING CATEGORY	PROJECT NUMBER	AMOUNT DEBIT	AMOUNT CREDIT
2021	10000	16500	1651300200	12100	7340000	16500P1<BRD ID>							
				12800		16500P2<TRD ID>							
				22100									
											TOTALS		

Official Business		Travel Points		HDQS-TIME		Personal Vehicle		Meals, including tips			Other Allowable Expenses		Total Allowable Expenses	
Date	Purpose of Trip	From	To	Depart	Return	Miles	Lodging	Morning	Noon	Evening	Item	Amount	Taxable	Non-Taxable
Use	Board Meeting	Home base	Madison	Report times you left		Miles	P-card	$8.00	$10.00	$20.00			Report	Report
separate		Madison	Home base	and returned home if		must be		Maximum in-state amounts					meal cost	meal cost
lines for	You must identify			meals are claimed		split.	Enter		or				here if there	here if there
each leg	the purpose of					Cannot	"P-card"	$10.00	$15.00	$25.00			is **NO**	**IS** an
of your	your trip.					place	when hotel	Maximum out-of-state amounts					overnight	overnight
trip.						roundtrip	is provided						stay.	stay.
						total on	by DSPS	Must leave	Must leave	Must return				
						one line.		home	home	home after				
								before	before	7:00 p.m.				
								6:00 a.m.	10:30 a.m.					
									and return					
									home after					
	LEGEND:	**Staff can fill in these areas.**							2:30 p.m.					
		Board Member MUST fill in these areas												
	*Item billed directly to the state agency			**Sub-Totals**										

			Mileage Costs
	Miles at	**0.510 cents/mile**	**Totals**
			Total Expenditure
			Less Travel Advance
			Net Amount Due

Claimant's Statement § 16.53 Wisconsin Statutes

I declare, under penalties, that all claimed travel expenses are true and correct and are in conformity with Wisconsin statute 16.53 and related agreements. This claim represents reasonable and actual expenses necessarily incurred by me personally in the performance of official duties and no portion was previously reimbursed to me by the State or any other source.

Date _____ **Claimant's Signature** _____

I certify that this travel claim is reasonable, proper, and in conformity with applicable statutes, travel schedule amounts, and/or collective bargaining agreements.

Date _____ **Supervisor's Signature** _____

I certify that all expenses on this voucher conform to statutory, departmental or applicable collective bargaining provisions, and were necessary in the official performance of duties required by the State Expenditures are determined to be reasonable and proper, and that sufficient funds are available to pay this claim.

_____

Agency Head or Authorized Representative

Audited in accordance with S. 16.53 Wisconsin Statutes and allowed by the provisions of chapter 20.

State of Wisconsin
Department of Safety & Professional Services

AGENDA REQUEST FORM

1) Name and title of person submitting the request: Katlin Schwartz, Bureau Assistant		**2) Date when request submitted:** 12/14/2022 **Items will be considered late if submitted after 12:00 p.m. on the deadline date which is 8 business days before the meeting**	
3) Name of Board, Committee, Council, Sections: Controlled Substances Board			
4) Meeting Date: 1/13/2023	**5) Attachments:** ☒ Yes ☐ No	**6) How should the item be titled on the agenda page?** Administrative Matters • Election of Officers, Appointment of Liaisons and Alternates, Delegation of Authorities	
7) Place Item in: ☒ Open Session ☐ Closed Session	**8) Is an appearance before the Board being scheduled?** ☐ Yes ☒ No	**9) Name of Case Advisor(s), if applicable:** N/A	
10) Describe the issue and action that should be addressed: 1) The Board, Council or Section should conduct Election Officers: Chairperson, Vice Chairperson & Secretary 2) The newly elected Chairperson should review and appoint/reappoint Liaisons and Alternates as appropriate 3) The Board should review and then consider its existing delegated authorities including any modification of these delegations and any proposals for additional delegations.			
11) Authorization Katlin Schwartz — 12/14/2022 **Signature of person making this request** — **Date**			
Supervisor (Only required for post agenda deadline items) — **Date**			
Executive Director signature (Indicates approval for post agenda deadline items) — **Date**			
Directions for including supporting documents: 1. This form should be saved with any other documents submitted to the Agenda Items folders. 2. Post Agenda Deadline items must be authorized by a Supervisor and the Policy Development Executive Director. 3. If necessary, provide original documents needing Board Chairperson signature to the Bureau Assistant prior to the start of a meeting.			

CONTROLLED SUBSTANCES BOARD

2022 Elections and Liaison Appointments

ELECTION RESULTS	
Chairperson	Doug Englebert
Vice Chairperson	Alan Bloom
Secretary	Yvonne Bellay

Appointment of Liaison and Alternates

LIAISON APPOINTMENTS	
Special Use Authorization (SUA) Liaison(s)	Alan Bloom, Yvonne Bellay *Alternate:* Doug Englebert
PDMP Liaison(s)	Subhadeep Barman *Alternates:* Kris Ferguson, John Weitekamp-Pharmacy Issues, Doug Englebert
Legislative Liaison(s)	Doug Englebert *Alternates:* John Weitekamp
SCAODA Representative	Subhadeep Barman *Alternate:* Kris Ferguson
Referral Criteria Workgroup	Doug Englebert, John Weitekamp, Subhadeep Barman, Robert Weinman

Delegation of Authorities

Document Signature Delegations

MOTION: Alan Bloom moved, seconded by Yvonne Bellay, to delegate authority to the Chairperson (or in absence of the Chairperson, the highest-ranking officer or longest serving board member in that succession) to sign documents on behalf of the Board in order to carry out its duties. Motion carried unanimously.

MOTION: Rosemary Dolatowski moved, seconded by Sandy Koresch, in order to carry out duties of the Board, the Chairperson (or in absence of the Chairperson, the highest-ranking officer or longest serving board member in that succession) has the ability to delegate signature authority for purposes of facilitating the completion of assignments during or between meetings. The members of the Board hereby delegate to the Executive Director or DPD Division Administrator, the authority to sign on behalf of a board member as necessary. Motion carried unanimously.

Delegated Authority for Urgent Matters

MOTION: John Weitekamp moved, seconded by Yvonne Bellay, that in order to facilitate the completion of urgent matters between meetings, the Board delegates its authority to the Chairperson (or, in the absence of the Chairperson, the highest-ranking officer or longest serving board member in that succession), to appoint liaisons to the Department to act in urgent matters. Motion carried unanimously.

Special Use Authorization Liaison(s) Delegation

MOTION: Sandy Koresch moved, seconded by John Weitekamp, to authorize the SUA Liaison(s) to review and make approval decisions regarding SUA applications and approve required training or credentialing on behalf of the Board. Furthermore, the Board authorizes DSPS staff to sign SUA permits on behalf of the Board. Motion carried unanimously.

MOTION: Sandy Koresch moved, seconded by John Weitekamp, to authorize the SUA Liaison(s) to make all decisions related to Special Use Authorizations. Motion carried unanimously.

Authorization for DSPS to Provide Board Member Contact Information to National Regulatory Related Bodies

MOTION: Alan Bloom moved, seconded by Yvonne Bellay, to authorize the Department staff to provide national regulatory related bodies with all board member contact information that the Department retains on file. Motion carried unanimously.

Legislative Liaison Delegation

MOTION: Sandy Koresch moved, seconded by Subhadeep Barman, to delegate authority to the Legislative Liaisons to speak on behalf of the Board regarding legislative matters. Motion carried unanimously.

SCAODA Representative Delegation

MOTION: Yvonne Bellay moved, seconded by Alan Bloom, to authorize the SCAODA representative to vote on behalf of the Board at the State

Council on Alcohol and Other Drug Abuse meetings. Motion carried unanimously.

PDMP Liaison(s) Delegation

MOTION: John Weitekamp moved, seconded by Sandy Koresch, to authorize PDMP Liaison(s) to make individual decisions on behalf of the Board when waiting for a Board meeting would unreasonably delay the development, testing, deployment, or operation of the PDMP. The Board also grants the PDMP liaison the authority to suspend access to the PDMP pursuant to CSB § 4.09(3). Motion carried unanimously.

Referral Criteria Workgroup Membership Delegation

MOTION: Alan Bloom moved, seconded by Troy Alton, that in order to facilitate the completion of its duties between meetings, the Board delegates authority to the Chairperson (or, in the absence of the Chairperson, the highest-ranking officer or longest serving board member in that succession) to appoint members to the Referral Criteria Workgroup between meetings as necessary. Motion carried unanimously.

State of Wisconsin
Department of Safety & Professional Services

AGENDA REQUEST FORM

1) Name and title of person submitting the request:	2) Date when request submitted:
Adam Barr, Executive Director	1/5/2023
	Items will be considered late if submitted after 12:00 p.m. on the deadline date which is 8 business days before the meeting

3) Name of Board, Committee, Council, Sections:

Controlled Substances Board

4) Meeting Date:	5) Attachments:	6) How should the item be titled on the agenda page?
1/13/2023	☒ Yes ☐ No	Legislature Agenda Request: Status of Kratom – Discussion and Consideration

7) Place Item in:	8) Is an appearance before the Board being scheduled? *(If yes, please complete Appearance Request for Non-DSPS Staff)*	9) Name of Case Advisor(s), if applicable:
☒ Open Session ☐ Closed Session	☐ Yes ☒ No	

10) Describe the issue and action that should be addressed:

Members of the legislature have requested that the Controlled Substances Board conduct an impartial review of existing research and provide the legislature with guidance or act unilaterally if appropriate. Specifically, the board was asked to determine whether kratom in its natural form should continue to be scheduled in Wisconsin. The board passed a motion at the July 15, 2022 meeting calling on members to conduct an eight-factor review and return their analysis to the board at its January 2023 meeting.

Attachments:
First Request from Wisconsin Legislators: Pages 1-2
Second Request from Wisconsin Legislators: Pages 3-6
HHS Letter Rescinding Recommendation to Schedule Kratom: Pages 7-10
HHS Letter to Representative Pocan: Pages 11-12
Request from Representative Pocan: Pages 13-15
Legislators Letter to AMA Opposing a Ban on Kratom: Pages 16-28
AMA Response to Legislators Regarding Withdrawn Proposal: Page 29
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Research Article on the Abuse Potential of Kratom (Submitted by American Kratom Association): Pages 59-128
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Submissions from Sandy Koresch, Controlled Substances Board Member: Pages 205-228
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NEW – Eight Factor Analysis of Kratom, Dr. Christopher Cunningham et al: Pages 362-371
NEW – November 2022 CSB Board Meeting Presentation Materials

11) Authorization

Adam Barr — 1/5/2023

Signature of person making this request — Date

Supervisor (Only required for post agenda deadline items) — Date

Executive Director signature (Indicates approval for post agenda deadline items) — Date

Revised 03/2021

State of Wisconsin
Department of Safety & Professional Services

Directions for including supporting documents:

1. **This form should be saved with any other documents submitted to the Agenda Items folders.**
2. **Post Agenda Deadline items must be authorized by a Supervisor and the Policy Development Executive Director.**
3. **If necessary, provide original documents needing Board Chairperson signature to the Bureau Assistant prior to the start of a meeting.**

WISCONSIN LEGISLATURE
P.O. BOX 8952 • MADISON, WI 53708

April 28, 2022

Wisconsin Controlled Substances Board
DSPS
PO Box 8366
Madison, WI 53708-8366

Dear Chairperson Engelbart and Members:

The kratom tree is a member of the coffee family and native to Southeast Asia. The kratom leaf in its pure, natural form has been used for centuries for pain relief, alertness, and general well-being in that part of the world. More recently, it has been used as a natural alternative to prescription drugs used for pain relief and anxiety and has been shown to be especially helpful to individuals who experience adverse reactions to prescription medications. The crisis in drug overdoses in the United States has stimulated research into the uses of kratom and other alternative pain management options. This research has shown kratom to have lower addiction and abuse profiles, while showing promising results for users. Unfortunately, nearly a decade ago, kratom was made illegal to possess or use in Wisconsin due to a provision that was included in a bill intended to address the synthetic drug problem. We believe this was done without adequate research and understanding of kratom in its natural form. Therefore, we ask the Board to review the research and provide guidance as to whether natural kratom merits scheduling.

For background, 2013 Wisconsin Act 351 changed the concept of scheduling an analog of a synthetic drug and replaced it with an actual description of the chemical structure of prohibited substances. Two chemical structures included in the long list were mitragynine (MG) and 7-hydroxymitragynine (7H-MG). MG and 7H-MG are alkaloids that are found naturally in the kratom leaf and have acceptable safety profiles in that form. Unfortunately, the change in law made ***any substance*** with MG or 7H-MG in it illegal, and as a result made natural kratom illegal also. We do not believe it was the intent of the Legislature to ban natural kratom; rather the inclusion of these particular alkaloids was intended to address concerns related to synthesized and adulterated products ***marketed*** as kratom. We agree that substances that are synthesized or adulterated with MG or 7H-MG are dangerous and should be scheduled. Kratom, however, in its natural form should not be treated in the same manner.

Since 2013, there has been significant research and discussion on natural kratom and the scientific basis for the decision to schedule kratom here and in the few states where it was indirectly banned, as well as at the federal level. Hundreds of peer-reviewed studies have now been conducted by researchers worldwide, including research sponsored by the National Institute on Drug Abuse (NIDA). These studies confirm that natural kratom is not like opioids in its safety and addiction profile and is actually a harm reduction tool that can enhance public health.

In 2015 and 2018, the Controlled Substances Board had discussions in open session regarding the issue of kratom's scheduling in Wisconsin, but no further action was taken. In August 2018, the US Department of Health and Human Services (HHS) rescinded its recommendation that FDA and DEA begin the process of scheduling MG and 7H-MG, due to insufficient evidence as well as emerging research

suggesting that ***scheduling*** kratom could actually create ***"an unknown and potentially substantial risk to public health"***[1] because it would no longer be available to the millions of Americans that use it**.** Most recently, 2021 Assembly Bill 599 and Senate Bill 958 were introduced in the Wisconsin Legislature which would legalize and regulate the use and sale of natural kratom while keeping synthesized and adulterated kratom products scheduled. AB 599 was given a public hearing and was approved by the standing committee with a bipartisan 9-2 vote.

As a result of the recent evidence, research, and public interest regarding kratom that has been made public since the enactment of 2013 Act 351, we believe it is appropriate for the Board to conduct its own impartial review of existing research and provide the legislature with guidance or act unilaterally if appropriate. We ask the following:

1) That the CSB use its authority under Wis. Stats. Ch. 961.11 to make a determination using the criteria provided in Wis. Stats. Ch. 961(1m) and (1r) as to whether or not kratom in its natural form should be scheduled in Wisconsin; and
2) If natural kratom does not meet the criteria under Wis. Stats. Ch. 961(1m), that the CSB promulgate a rule that would differentiate MG and 7H-MG found in natural kratom from MG and/or 7H-MG contained in other substances so that natural kratom would not violate Wis. Stats. Ch. 961.17(7)(mk) and (ml) of the Wisconsin Controlled Substances Act.

Thank you for your consideration of these requests. We request that the Board please let us know how it intends to proceed.

Sincerely,

Rep. Dave Murphy
56th Assembly District

Sen. Mary Felzkowski
12th Senate District

Speaker Robin Vos
63rd Assembly District

Sen. Jon Erpenbach
27th Senate District

Rep. Rob Brooks
60th Assembly District

Rep. Jonathan Brostoff
19th Assembly District

Rep. Dora Drake
11th Assembly District

Rep. Dan Knodl
24th Assembly District

Rep. John Macco
88th Assembly District

Rep. Michael Schraa
53rd Assembly District

Rep. Christine Sinicki
20th Assembly District

[1] https://www.kratomscience.com/wp-content/uploads/2021/01/dhillon-8.16.2018-response-letter-from-ash-radm-giroir4.pdf

June 24, 2022

Wisconsin Controlled Substances Board
Department of Safety and Professional Services
P.O. Box 8366
Madison, WI 53708-8366

Dear Chairperson Englebert and Honored Board Members,

We write to address the response from the Controlled Substances Board (CSB) to our request that a review be conducted on whether the alkaloid constituents of the kratom plant meet the statutory criteria for scheduling under 961.11 (1m) (a-h). As you are aware, 2013 SB 325, signed by the Governor on April 23, 2014, added kratom's alkaloids, mitragynine (MG) and 7-hydroxymitragynine (7-HMG), to Schedule I. As we clearly stated in our April 28, 2022 letter to the CSB, we believe the characterization in 2013 SB 325 to name chemical structures inappropriately included the natural alkaloids of the kratom plant. The inclusion of kratom's alkaloids in this legislation, however poorly framed, was an action prompted by the various pronouncements by the U.S. Food and Drug Administration (FDA) that federal scheduling of these alkaloids was imminent. The CSB recognized this in its March 15, 2016 Motion that the evidence did not exist to change the schedule for kratom at that time. In the intervening eight years, no such scheduling action has been taken at the federal level and much more research has been conducted. More importantly, based on our review of publicly available documents on kratom, the U.S. Secretary of Health and Human Services (HHS) has determined there is insufficient evidence to propose any federal scheduling of kratom.

The request we made of the CSB was clear—we requested that the Board "conduct its own impartial review of existing research and **provide the legislature with guidance** or **act unilaterally if appropriate**." Instead, the CSB chose to ignore our request to conduct a scientific review of the new research and approved a motion that stated, "the Legislature has scheduled…(kratom alkaloids)…and any change in scheduling should occur at the Legislative level." We consider this response inadequate as this vote did not address the question of the CSB conducting a scientific review.

Additionally, as we reviewed the record, it was perplexing to see that there was discussion by some members of the CSB about the various positions of the medical community and law enforcement entities that were already clearly presented to the legislature in committee hearings and have no basis in the scientific research that is now available. The political views of members of the CSB representing policy positions of groups with whom they are affiliated or purported to speak for raise troubling conflicts, and the proper forum for advocating for such policy positions is before the legislature, not at the CSB. We hope that moving forward, the Board will consider the request not based on policy considerations, but instead on a review of the science that the CSB is **statutorily obligated** to consider in its decision-making.

To clarify our initial request: our question is whether the scientific evidence currently available in 2022 supports the scheduling of kratom under the eight factors set forth in our statutes. We made the request that the CSB review the existing evidence and science to determine if natural kratom meets the criteria to be scheduled under Wisconsin law. The CSB is the only entity in Wisconsin State Government that has the diverse expertise and the statutory responsibility to review scientific data in an impartial manner and provide policymakers with the guidance they need to make good decisions about scheduling substances.

Two separate reviews on this issue at the federal level determined there was insufficient evidence to support the scheduling of kratom. The Wisconsin statute mirrors the same criteria the federal government reviewed, hence our interest in having the CSB re-visit the actions taken by our state in 2014. Additionally, we take note of the fact that the Expert Committee on Drug Dependence (ECDD), at the request of the UN Commission on Narcotic Drugs, conducted an extensive review of all the current science on kratom to determine if kratom should be scheduled internationally. On December 1, 2021, the ECDD voted 11-1 that there was insufficient evidence to recommend scheduling kratom. As members of the health care community, you all know better than we do that science in medicine evolves, and as we gather more evidence and data, it is proper for the state to re-visit old decisions in light of new information.

We restate our specific request that CSB conduct a scientific review and:

1) the CSB provide guidance on whether kratom's alkaloids meet the specific criteria provided in Wis. Stats. Ch. 961 (1m) and (1r) as to whether kratom in its natural form should be scheduled in Wisconsin. We ask that the assessment be made on the science, not the policy views of individual CSB members or organizations they represent; or
2) if the CSB determines natural kratom does not meet the criteria under Wis. Stats. Ch. 961(1m), the CSB promulgate a rule that differentiates natural MG and 7-HMG from any kratom products containing synthesized or chemically altered alkaloids so that natural kratom would not violate Wis. Stats. Ch. 961.17(7)(mk) and (ml) of the Wisconsin Controlled Substances Act.

We once again present our request that the CSB review this same data in an unbiased manner and provide us with your assessment as to whether natural kratom meets the 8-factors necessary for a substance to be scheduled under Wisconsin state law.

We have included several documents that address the scientific reviews conducted at the federal and international levels:

1) *Pinney Associates 8 Factor Analysis of Abuse Potential of Kratom* (The initial analysis was provided to FDA in 2018 prior to their decision to rescind the recommendation to schedule kratom. It has since been updated in August 2021 to include over 100 new peer reviewed published studies).

2) *Department of Health and Human Services Letter to Drug Enforcement Agency 2018* (Rescinding the recommendation to schedule)
3) *HHS Letter to Pocan/Lee* (Describes emerging science and confirms no intent to schedule)

The Controlled Substances Board was created to advise the Legislature, and we are here, asking you, as the experts, for your advice. We hope this second letter clarifies our request to the Board. Please let us know, at your earliest convenience, in writing, how you intend to proceed and feel free to reach out to our Legislative offices with any questions.

Sincerely,

Senator Mary Felzkowski
12th Senate District

Representative Dave Murphy
56th Assembly District

Speaker Robin Vos
63rd Assembly District

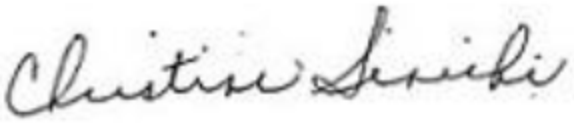
Representative Brostoff
19th Assembly District

Representative John Macco
88th Assembly District

Representative Dora Drake
11th Assembly District

Representative Dan Knodl
24th Assembly District

Representative Rob Brooks
60th Assembly District



Representative Christine Sinicki
20th Assembly District

AUG 16 2018

The Honorable Uttam Dhillon
Acting Administrator
Drug Enforcement Administration
U.S. Department of Justice
8701 Morrissette Drive
Springfield, VA 22152

Dear Mr. Dhillon:

Pursuant to the Controlled Substances Act (CSA), 21 U.S.C. § 811, I am rescinding our prior recommendation dated October 17, 2017, that the substances mitragynine and 7-hydroxymitragynine be permanently controlled in Schedule I of the CSA. HHS is instead recommending that mitragynine and 7-hydroxymitragynine not be controlled at this time, either temporarily or permanently, until scientific research can sufficiently support such an action. Mitragynine and 7-OH-mitragynine are two of the constituents of the plant *Mitragyna speciosa* (*M. speciosa*), commonly referred to as *kratom*. This decision is based on many factors, in part on new data, and in part on the relative lack of evidence, combined with an unknown and potentially substantial risk to public health if these chemicals were scheduled at this time. Further research, which I am proposing be undertaken, should provide additional data to better inform any subsequent scheduling decision.

Procedural History

On August 31, 2016, the Drug Enforcement Administration (DEA) issued a Notice of Intent to temporarily schedule the chemicals mitragynine and 7-hydroxymitragynine into Schedule I pursuant to the temporary scheduling provisions of the CSA, 21 U.S.C. § 811(h). *See,* 81 Fed. Reg. 59,929 (Aug. 31, 2016). In response to the Notice of Intent, the DEA received numerous comments from the public on mitragynine and 7-hydroxymitragynine, including comments offering their opinions regarding the pharmacological effects of these substances. To allow consideration of these comments, as well as others received on or before December 1, 2016, the DEA issued a Withdrawal of Notice of Intent and Solicitation of Comments on October 31, 2016.

On October 17, 2017, the then-Acting Assistant Secretary for Health of HHS wrote to then-Acting Administrator of the DEA to indicate that HHS was recommending that the substances mitragynine and 7-OH-mitragynine be permanently controlled in Schedule I of the Controlled

Substances Act. Recently, I became aware of DEA's intent to schedule mitragynine and 7-OH-mitragynine - into Schedule I.

Analysis

The Controlled Substances Act ("CSA") provides in pertinent part that the Attorney General may by rule add to Schedule I any drug or other substance if the Attorney General makes the findings prescribed by subsection (b) of section 812 of the CSA for Schedule I. *See,* 21 U.S.C. § 811(a). Such findings are:

1. The drug or other substance has a high potential for abuse.
2. The drug or other substance has no currently accepted medical use in treatment in the United States.
3. There is a lack of accepted safety or use of the drug or other substance under medical supervision.

The CSA requires that "[i]n making any finding under subsection (a) of this section or under subsection (b) of section 812 of this title, the Attorney General shall consider the following factors with respect to each drug or other substance proposed to be controlled or removed from the schedules:

(1) Its actual or relative potential for abuse.
(2) Scientific evidence of its pharmacological effect, if known.
(3) The state of current scientific knowledge regarding the drug or other substance.
(4) Its history and current pattern of abuse.
(5) The scope, duration, and significance of abuse.
(6) What, if any, risk there is to the public health.
(7) Its psychic or physiological dependence liability.
(8) Whether the substance is an immediate precursor of a substance already controlled under this subchapter."

21 U.S.C. § 811(c).

Before scheduling a substance, though, the Attorney General must "request from the Secretary (of HHS) a scientific and medical evaluation, and his recommendation, as to whether such drug or other substance should be so controlled or removed as a controlled substance." *Id.* at § 811(b). The Secretary's evaluation should be based on factors (2), (3), (6), (7), and (8), noted above, and the scientific and medical considerations involved in factors (1), (4), and (5). Moreover, the "recommendation of the Secretary to the Attorney General shall be binding on the Attorney General as to such scientific and medical matters, and if the Secretary recommends that a drug or other substance not be controlled, the Attorney General shall not control the drug or other substance." *Id.*

The Secretary has delegated to the Assistant Secretary for Health, in consultation with the National Institute on Drug Abuse and the Food and Drug Administration, the responsibility to make a recommendation under the CSA to the Attorney General. On October 17, 2017, my

predecessor, the Acting Assistant Secretary for Health, forwarded to you his recommendation that mitragynine and 7-hydroxymitragynine be permanently controlled in Schedule I of the CSA. The recommendation included a scientific and medical evaluation prepared by the FDA of the eight factors determinative of control under the CSA. The FDA evaluation also recommended in favor of the three findings that are required for DEA to place a substance in Schedule I.

I have reviewed the Acting Assistant Secretary's earlier recommendation as well as previous and new scientific data. In light of this review, combined with concerns for unintended public health consequences, I now conclude that while mitragynine and 7-hydroxymitragynine have many properties of an opioid, scheduling these chemicals at this time in light of the underdeveloped state of the science would be premature. For example, one recently published peer reviewed animal study indicated that mitragynine does not have abuse potential and actually reduced morphine intake. As such, these new data suggest that mitragynine does not satisfy the first of the three statutory requisites for Schedule I, irrespective of broader considerations of public health. While a single study is rarely dispositive, it strongly suggests that further evaluation is warranted.

Although there remains cause for concern for 7-hydroxymitragynine and potentially mitragynine, the level of scientific data and analysis presented by the FDA and available in the literature do not meet the criteria for inclusion of *kratom* or its chemical components in Schedule I of the CSA at this time. There is still debate among reputable scientists over whether *kratom* by itself is associated with fatal overdoses. Further analysis and public input regarding *kratom* and its chemical components are needed before any scheduling should be undertaken. It is important that we have additional information to justify scheduling, such as:[1]

- A scientific assessment of how many Americans utilize *kratom*, and an understanding of the geographic and demographic distribution of these users (Factors 4, 5);
- A scientific assessment of the actual scale and degree of dependence and/or addiction of Americans utilizing *kratom* (Factors 1, 5, 7);
- A scientific determination based on data whether *kratom* actually serves as a gateway drug that promotes further use of more dangerous opioids (Factors 1, 4, 5);
- A valid prediction of how many *kratom* users will suffer adverse consequences if *kratom* is no longer available, including:
    - Intractable pain, psychological distress, risk for suicide;
    - Transition to proven deadly opioids such as prescription opioids, heroin, or fentanyl; and
    - Transition to other potent or harmful drugs (Factor 6);
- A scientifically valid assessment of causality in the current few deaths in which *kratom* was co-utilized with known lethal drugs such as fentanyl (Factors 1, 2, 3, 5 & 6).

Furthermore, there is a significant risk of immediate adverse public health consequences for potentially millions of users if *kratom* or its components are included in Schedule I, such as:

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[1] I am also concerned about the impact of scheduling *kratom* on our ability to conduct research, especially survey research and our currently inability to routinely test for *kratom* in those brought into an emergency room as a result of a possible overdose.

- Suffering with intractable pain;
- *Kratom* users switching to highly lethal opioids, including potent and deadly prescription opioids, heroin, and/or fentanyl, risking thousands of deaths from overdoses and infectious diseases associated with IV drug use;
- Inhibition of patients discussing *kratom* use with their primary care physicians leading to more harm, and enhancement of stigma thereby decreasing desire for treatment, because of individual users now being guilty of a crime by virtue of their possession or use of *kratom*
- The stifling effect of classification in Schedule I on critical research needed on the complex and potentially useful chemistry of components of *kratom*.

Therefore, I conclude at the current time, available evidence does not support mitragynine and 7-hydroxymitragynine being controlled in Schedule I of the Controlled Substances Act. This assessment supersedes the previous recommendation letter from Acting Assistant Secretary Wright dated October 17, 2017. In the meantime, it is recognized that *kratom* may potentially have harmful effects, especially in specific circumstances and/or when used with potent prescription or illicit drugs.

Finally, it is entirely possible that new data and evidence could support scheduling of chemicals in *kratom* at some future time. *Kratom* may have harmful effects, particularly when used with other drugs. As such, I encourage continued enforcement by the FDA against unproven claims by *kratom* manufacturers. I also support enhanced public awareness that *kratom* contains molecules that may potentially be dangerous. I also plan to work expeditiously with colleagues throughout the U.S. government to seek transparent public and scientific input, and to collect data on the critical public health considerations outlined above.

Should you have any questions regarding this recommendation, please contact my office at (202) 690-7694.

Sincerely yours,

Brett P. Giroir, M.D.
ADM, U.S. Public Health Service
Assistant Secretary for Health
Senior Advisor for Opioid Policy

THE SECRETARY OF HEALTH AND HUMAN SERVICES
WASHINGTON, D.C. 20201

March 16, 2022

The Honorable Michael S. Lee
United States Senate
Washington, DC 20510

The Honorable Mark Pocan
U.S. House of Representatives
Washington, DC 20515

Dear Senator Lee and Representative Pocan:

Thank you for your letter about the substance *Mitragyna speciosa*, commonly known as kratom. As your letter notes, efforts to schedule kratom within the United States have not moved forward, and the World Health Organization (WHO) Expert Committee on Drug Dependence concluded that there was insufficient evidence to recommend a critical review of kratom. This means that WHO will take no further action to control kratom under the 1961 or 1971 Conventions at this time.

Your letter also noted that there is emerging science suggesting kratom may have therapeutic health benefits. The Department of Health and Human Services (HHS) is also aware of the emerging research and recent reports indicating that many individuals may be using kratom to self-treat serious health conditions, including, but not limited to, self-medication for managing pain, mental illness, and a substance use disorder. Additionally, there are reports that kratom is used for recreational purposes. Based on the Substance Abuse and Mental Health Services Administration's National Survey on Drug Use and Health, it is estimated that over 2 million Americans 12 years and older used kratom in 2020. However, the prevalence of kratom use is difficult to estimate, and the reason for this prevalence remains unclear.

To that end, HHS and its component agencies are working to address knowledge gaps through research. Both the National Institutes of Health and the Food and Drug Administration (FDA) are supporting studies on the pharmacology of kratom's constituents, their toxicity and addictive liability, as well as their potential therapeutic benefits for pain and substance use disorder. While there are no FDA-approved uses for kratom, the Agency has a proven drug review process involving the evaluation of scientific research and data from rigorous controlled clinical trials to assess the risks and benefits of drugs. This includes a well-developed process for evaluating therapeutic uses of botanical drug products. FDA has also issued guidance on the proper

development of botanical drug products[1] and has a team of medical reviewers who can provide scientific expertise on botanical issues for researchers developing drugs made from plants.

To your final point regarding kratom safety and consumer protections, I agree with your concerns. Indeed, FDA continues to receive concerning reports describing safety concerns associated with kratom, including death. Many kratom-involved overdose deaths have occurred after use of adulterated kratom products or taking kratom with other substances.

While options for scheduling have been discussed, we believe that additional data and information are needed to understand the public health impact of kratom in terms of therapeutic benefits as well as safety risk. Discussions continue within HHS on mitigating actions to best address the various public health concerns presented, including potential unintended consequences that may arise from transitioning to riskier alternatives (for example fentanyl) if kratom were to be scheduled.

Thank you again for contacting me regarding this matter. Should you have further questions, please have your staff contact the Office of the Assistant Secretary for Legislation at (202) 690-7627

Sincerely,

Xavier Becerra

Cc:

Hon. Linda Thomas-Greenfield, United States Ambassador to the United Nations

[1] https://www.fda.gov/files/drugs/published/Botanical-Drug-Development--Guidance-for-Industry.pdf

MARK POCAN
2ND DISTRICT, WISCONSIN
COMMITTEE ON APPROPRIATIONS
COMMITTEE ON EDUCATION & LABOR
JOINT ECONOMIC COMMITTEE
SENIOR WHIP

UNITED STATES
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10 EAST DOTY STREET, SUITE 405
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(608) 258-9800

1727 LONGWORTH HOUSE OFFICE BUILDING
WASHINGTON, DC 20515
(202) 225-2906

POCAN.HOUSE.GOV

May 10, 2022

Wisconsin Controlled Substances Board
Department of Safety and Professional Services
PO Box 8366
Madison, WI 53708

Dear Chairperson Engelbart and Members:

As a long-time supporter of legalizing the manufacture, distribution, delivery, and possession of kratom, I write to request your review of research pertaining to kratom and guidance as to whether or not it merits scheduling.

As a Member of Congress, I have worked with federal representatives in both parties to continue the research and legal use of kratom due to its promising help in a number of health conditions as well as its ability to help many people overcome addiction. I've been moved by the many, many personal stories of the benefits of kratom from people across the nation.

According to the Wisconsin Legislative Reference Bureau: "Under current law, kratom is classified as a Schedule I controlled substance and if a person manufactures, distributes, or delivers kratom, [they are] guilty of a misdemeanor."[1] Last legislative session, AB 599 attempted to reverse this unfounded restriction by removing kratom from the schedule of controlled substances while legalizing the manufacture, distribution, delivery, and possession of kratom, subject to certain limitations. This legislative outcome would have been consistent with the emerging view in Washington, D.C. where kratom is now supported on a bipartisan basis, it will be receiving millions of dollars in new research funding, and its benefits have been recognized by the Director of the National Institute on Drug Abuse (NIDA) within the National Institutes of Health (NIH).

In a recent letter addressed to both the U.S. Ambassador to the United Nations and the Secretary of the U.S. Department of Health and Human Services[2], Senator Mike Lee – a Republican from Utah – and I wrote "to ask that the United States oppose any effort to add kratom and its alkaloids to the 1971 U.N. Convention on psychotropic substances as a banned substance." Additionally, we noted that "In 2016, 145,906 Americans including consumers, scientists, and state and federal lawmakers raised their voices in opposition to the Department of Health and Human Services' (HHS) proposal to schedule kratom as a controlled substance."

[1] https://docs.legis.wisconsin.gov/2021/related/proposals/ab599
[2] https://www.americankratom.org/mediak/news/bi-partisan-letter.html

Similar to this strong support for kratom from Members of the U.S. House of Representatives and the U.S. Senate – across party lines – the Fiscal Year 2022 Labor, Health and Human Services, Education, and Related Agencies Subcommittee appropriation legislation in the House of Representatives contained the following[3]:

> "Kratom.—The [Appropriations] Committee recognizes that NIDA-funded research has contributed to the continued understanding of the health impacts of kratom, including its constituent compounds, mitragynine and 7-hydroxymitragynine. The Committee is aware of the potential promising results of kratom for acute and chronic pain patients who seek safer alternatives to sometimes dangerously addictive and potentially deadly prescription opioids and of research investigating the use of kratom's constituent compounds for opioid use disorder. The Committee directs NIDA to continue to invest in this important research, especially considering the increase in overdose deaths during the COVID–19 pandemic." (p. 135)

> "Kratom.—The [Appropriations] Committee directs the Secretary to maintain current Agency policy to not recommend that the substances mitragynine and 7-hydroxymitragynine, known as kratom, be permanently controlled in Schedule I of the Controlled Substances Act, either temporarily or permanently […] The Committee encourages AHRQ to continue to fund research on natural products that are used by many to treat pain in place of opioids, including kratom […] The Committee recommends an additional $3,000,000 for this research and directs AHRQ to make center-based grants to address research which will lead to clinical trials in geographic regions which are among the hardest hit by the opioid crisis." (p.189)

While testifying before the Appropriations Committee in the U.S. House of Representatives on May 25, 2021, Dr. Nora Volkow, the Director of NIDA, stated: "Kratom, most notably mitragynine, has many interesting properties that could be of value potentially as a medication for pain. Also, interestingly, they could hold value as treatment for addiction […] it is so important to actually do research on this substance."[4] HHS Secretary Becerra went one step further in a letter responding to Senator Lee and me in which he stated: "Discussions continue within HHS on mitigating actions to best address the various public health concerns presented, including potential unintended consequences that may arise from transitioning to riskier alternatives (for example fentanyl) if kratom were to be scheduled."[5]

Clearly, Wisconsin is out of sync with the nation when it comes to kratom, and the results can be devasting. You, however, can contribute to addressing this disparity, and publish guidance that will place Wisconsin one step closer to joining the 44 states that do not restrict kratom in the way

[3] https://www.congress.gov/117/crpt/hrpt96/CRPT-117hrpt96.pdf
[4] https://appropriations.house.gov/events/hearings/fy-2022-budget-request-for-the-national-institutes-of-health
[5] https://www.politico.com/newsletters/prescription-pulse/2022/04/12/fda-combatting-field-mice-at-white-oak-campus-00024563

our state currently does. I hope you will look favorably upon this request.

Sincerely,

Mark Pocan
Member of Congress

June 10, 2022

Gerald E. Harmon, MD
President, American Medical Association (AMA)
AMA Plaza
330 N. Wabash Ave., Suite 39300
Chicago, IL 60611-5885

SENT VIA EMAIL TO: Gerald.Harmon@ama-assn.org

Dr. Harmon:

The undersigned members of state legislatures from 6 states (26 states where legislators supported kratom consumer protections) write to register our strong objection to the consideration of Resolution "Late 1001 (A-22)" submitted by the Mississippi Medical Association at the upcoming AMA House of Delegates meeting in Chicago on June 10-15 entitled: "Banning the Sale of Kratom and Other Related Addictive Substances."

Collectively we represent the eight state legislatures who have passed appropriate regulatory requirements for the sale of kratom products to protect consumers, 18 states that are currently actively considering the Kratom Consumer Protection Act (KCPA). We deem the content of the referenced resolution to present distorted, inaccurate, and in many cases absolutely false information about the current body of science on kratom and its current regulatory status both at the federal and state level.

At the outset, what the proposed Resolution fails to disclose is that the FDA has failed in two separate scheduling recommendations to present evidence that conforms to the requirements for such scheduling under the 8 factors required by the federal Controlled Substances Act (CSA). In the first instance, on October 13, 2016, the Drug Enforcement Administration formally withdrew the Notice of Scheduling submitted by the FDA with the following explanation:

> "In response to the notice of intent, DEA received numerous comments from the public on mitragynine and 7-hydroxymitragynine, including comments offering their opinions regarding the pharmacological effects of these substances. To allow consideration of these comments, as well as others received on or before December 1, 2016, DEA has decided to withdraw the August 31, 2016 notice of intent published at 81 FR 59929. DEA has also requested that the FDA expedite its scientific and medical evaluation and scheduling recommendation for these substances, which DEA previously requested in accordance with 21 U.S.C. 811(b)."[1]

[1] https://www.federalregister.gov/documents/2016/10/13/2016-24659/withdrawal-of-notice-of-intent-to-temporarily-place-mitragynine-and-7-hydroxymitragynine-into

The FDA failed to meet the DEA deadline for submission of the 8-Factor Analysis by December 1, 2016, but independent scientists did submit an 8-Factor Analysis and more that 23,000 public comments were received, with more than 99% opposing the scheduling of kratom. The FDA finally did submit its second scheduling proposal for kratom on October 17, 2017, but that recommendation was summarily withdrawn on August 16, 2018,[2] by the HHS Assistant Secretary of Health, Brett Giroir, M.D., who offered numerous objections to the FDA's proposed scheduling of kratom, including:

> "Pursuant to the Controlled Substances Act (CSA), 21 U.S.C. § 811,1 am rescinding our prior recommendation dated October 17, 2017, that the substances mitragynine and 7-hydroxymitragynine be permanently controlled in Schedule I of the CSA. HHS is instead recommending that mitragynine and 7-hydroxymitragynine not be controlled at this time, either temporarily or permanently, until scientific research can sufficiently support such an action. Mitragynine and 7-OH-mitragynine are two of the constituents of the plant Mitragyna speciosa (M. speciosa), commonly referred to as kratom. This decision is based on many factors, in part on new data, and in part on the relative lack of evidence, combined with an unknown and potentially substantial risk to public health if these chemicals were scheduled at this time. Further research, which I am proposing be undertaken, should provide additional data to better inform any subsequent scheduling decision."

We strongly recommend that every member of the AMA House of Delegates read Dr. Giroir's letter in full to see how badly the FDA has missed the mark on its evaluation of kratom, and the importance of the context of the potential harm reduction kratom offers in our collective efforts to reduce the number of drug overdoses that we believe the average AMA member shares our views.

The proposed Resolution also excludes reference to the review of kratom by the Expert Committee on Drug Dependence (ECDD) pursuant to a charge from the UN Commission on Narcotic Drugs to do an exhaustive analysis of current science on kratom and whether it should be scheduled internationally. Following that comprehensive review, the 12-member ECDD released its findings on kratom, on an 11-1 vote, on December 1, 2021[3]:

> "The Committee concluded that there is insufficient evidence to recommend a critical review of kratom. With respect to mitragynine and 7-hydroxymitragynine,

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[2] https://static1.squarespace.com/static/54d50ceee4b05797b34869cf/t/6014 5eab6df59e7e36a7cfc1/1611947693695/dhillon-8.16.2018-response-letter-from-ash-radm-giroir.pdf

[3] https://cdn.who.int/media/docs/default-source/controlled-substances/44ecdd_unsg_annex1.pdf?sfvrsn=9c380ac2_5

> the Committee, except for one member, also concluded that there is insufficient evidence to recommend a critical review at this time."

We ask you to consider two additional points that we believe directly address the credibility of the proposed Mississippi Resolution as it is currently drafted. First, HHS Secretary Xavier Becerra responded to inquiries from Congressman Mark Pocan (D-WI) and Senator Mike Lee (R-UT) on the status of the position of HHS on kratom, and Secretary Becerra responded in a letter on March 16, 2022[4] as follows:

> "To your final point regarding kratom safety and consumer protections, I agree with your concerns. Indeed, FDA continues to receive concerning reports describing safety concerns associated with kratom, including death. **Many kratom-involved overdose deaths have occurred after use of adulterated kratom products or taking kratom with other substances.** While options for scheduling have been discussed, **we believe that additional data and information are needed to understand the public health impact of kratom in terms of therapeutic benefits as well as safety risk**. Discussions continue within HHS on mitigating actions to best address the various public health concerns presented, **including potential unintended consequences that may arise from transitioning to riskier alternatives (for example fentanyl) if kratom were to be scheduled** [emphasis added]."

Second, we ask that you consider the response by the Director of the National Institutes on Drug Abuse (NIDA), Nora Volkow, M.D., to U.S. Senator Patty Murray's (D-WA) question during the May 17, 2022, Senate Labor HHS Appropriations Subcommittee on what overdose mitigation strategies NIDA and HHS hope to roll out in the next few months:

> **"**. . . There's also interest in the community to test other products that may serve as harm reduction. For example, the use of kratom which is sold as tea and that contains a drug/molecule that has effects that are similar to a dose of buprenorphine but could be utilized also for decreasing withdrawal or depression. So, these are more novel and we don't have sufficient data, but those are things that are being discussed."

If the Mississippi Resolution on scheduling kratom were to be adopted by the AMA House of Delegates, and a subsequent federal Schedule I classification of kratom were adopted, it would

[4] https://www.dropbox.com/s/m7c87cu47667ec3/TAB%2014%20HHS%20Becerra%20Letter%20Lee%20and%20Pocan.pdf?dl=0

literally halt all research on the harm reduction potential of kratom. Such an action would directly contradict your own statement on the overdose epidemic[5]:

> "To make meaningful progress towards ending this epidemic, a broad-based public health approach is required. This approach must balance patients' needs for comprehensive pain management services, including access to non-opioid pain care as well as opioid analgesics when clinically appropriate, with efforts to promote appropriate prescribing, reduce diversion and misuse, promote an understanding that substance use disorders are chronic conditions that respond well to evidence-based treatment, and expand access to treatment for individuals with substance use disorders."

The potential value of kratom as a harm reduction tool as referenced by Dr. Girior and Dr. Volkow, and that you recognized as a needed resource, is highlighted in a survey conducted by researchers at Johns Hopkins University that concluded their "findings underscore the need for research and regulation, but not on outright ban on sales [on kratom]."[6] The survey revealed that 87% of adult kratom users who self-treated for opioid dependence reported relief from withdrawal symptoms, and 35% were free from opioids within >1 year.

NIDA-funded research on a kratom tea as a therapeutic option for opioid dependence revealed the following:

> **Results:** Oral administration of LKT resulted in dose-dependent antinociception (≥1 g/kg, p.o.) absent in mice lacking the mu-opioid receptor (MOR) and reduced in mice lacking the kappa-opioid receptor. These doses of LKT did not alter coordinated locomotion or induce conditioned place preference, and only briefly reduced respiration. Repeated administration of LKT did not produce physical dependence, but significantly decreased naloxone-precipitated withdrawal in morphine dependent mice.
>
> **Conclusions:** The present study confirms the MOR agonist activity and therapeutic effect of LKT for the treatment of pain and opioid physical dependence.[7]

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[5] https://www.ama-assn.org/delivering-care/overdose-epidemic/physicians-progress-toward-ending-nation-s-drug-overdose-epidemic

[6] https://www.hopkinsmedicine.org/news/newsroom/news-releases/natural-herb-kratom-may-have-therapeutic-effects-and-relatively-low-potential-for-abuse-or-harm-according-to-a-user-survey

[7] Wilson LL, Harris HM, Eans SO, Brice-Tutt AC, Cirino TJ, Stacy HM, Simons CA, León F, Sharma A, Boyer EW, Avery BA, McLaughlin JP, McCurdy CR. Lyophilized Kratom Tea as a Therapeutic Option for Opioid Dependence. Drug Alcohol Depend. 2020 Nov 1;216:108310. doi: 10.1016/j.drugalcdep.2020.108310. Epub 2020 Sep 22. PMID: 33017752. https://pubmed.ncbi.nlm.nih.gov/33017752/

For the record, we ask you to consider the following statements on the content of the Mississippi Resolution that are factually incorrect:

MISSISSIPPI RESOLUTION: Whereas, The US Food and Drug Administration (FDA) is warning consumers not to use Mitragyna speciosa, commonly known as Kratom and is concerned that Kratom, which affects the same opioid brain receptors as morphine, appears to have properties that expose users to the risks of addiction, abuse, and dependence; and

RESPONSE: NIDA concurrently funded two independent studies on the addiction liability of kratom's alkaloids that were published in June and July 2018, and those conclusions directly address why kratom is not scheduled today by the DEA because it does not meet the scheduling criteria in the CSA:

- Abuse liability and therapeutic potential of the Mitragyna speciosa (kratom) alkaloids mitragynine and 7-hydroxymitragynine, Hemby, et. al., that concluded "present findings indicate that MG does not have abuse potential and reduces morphine intake, desired characteristics of candidate pharmacotherapies for opiate addiction and withdrawal . . . "[8]

- Abuse liability of mitragynine assessed with a self-administration procedure in rats, Yue, et. al., that concluded "these results suggest a limited abuse liability of mitragynine and potential for mitragynine treatment to specifically reduce opioid abuse. With the current prevalence of opioid abuse and misuse, it appears currently that mitragynine is deserving of more extensive exploration for its development or that of an analog as a medical treatment for opioid abuse.[9]

MISSISSIPPI RESOLUTION: Whereas, The following jurisdictions have already banned the sale of Kratom: Alabama, Arkansas, Indiana, Tennessee, Vermont, Wisconsin, Rhode Island, Vermont, New Jersey and the District of Columbia as well as the communities of Union County, Mississippi, Sarasota, Florida, San Diego, CA, Denver, CO and at least four cities in the state of Illinois, and various other restrictions pending or being considered around the country; and

RESPONSE: Alabama, Arkansas, Indiana, Vermont [referenced twice], Wisconsin, Rhode Island, and Vermont – and most of the local

[8] https://onlinelibrary.wiley.com/doi/abs/10.1111/adb.12639
[9] https://pubmed.ncbi.nlm.nih.gov/30039246/

jurisdictions -- all enacted bans following the requests by the FDA when the agency initially filed its first scheduling recommendation on kratom in 2016. No state has banned kratom since Rhode Island in 2017. The KCPA has passed in Utah (2019), Georgia (2019), Arizona (2019), Nevada (2019), Oklahoma (2021), Oregon (2022), Colorado, (2022), and Missouri (2022). In addition, the KCPA has been filed in Vermont, Wisconsin, and Rhode Island to overturn the current bans and replace them with the KCPA.

There is no ban in effect in New Jersey, and the KCPA has been filed there. Tennessee enacted a ban on synthetic kratom, not the natural plant, and a full ban proposal was defeated in 2022.

MISSISSIPPI RESOLUTION: Whereas, There are efforts in Kentucky to add Kratom to the list of controlled substances that are unlawful to traffic and additionally to add it to the list of controlled substances that are unlawful for a person to possess; and

RESPONSE: The bill to ban kratom in the 2022 session was withdrawn by the sponsor and replaced with the KCPA, and the bill was subsequently referred for interim study.

MISSISSIPPI RESOLUTION: Whereas, This year, Washington State is attempting to designate Kratom as a controlled substance; and

RESPONSE: The bill to ban kratom in the 2022 session in Washington was withdrawn and the sponsor replaced with the KCPA, and the bill was subsequently referred for interim study.

MISSISSIPPI RESOLUTION: Whereas, The Ohio Board of Pharmacy recently recommended that Kratom be classified as a Schedule 1 controlled substance, and this follows on the heels of the FDA research, which has been considering similar measures, and refers to Kratom as having a “high potential for abuse”, “no accepted medical use”, and lacking “accepted safety for use in treatment under medical supervision”; and

RESPONSE: The proposed recommendation by the Ohio Board of Pharmacy to classify kratom as a Schedule I controlled substance was withdrawn in 2020, and the issue was deferred to the Ohio Legislature for action. The Ohio House of Representatives passed the KCPA earlier this year on a vote of 82-10 and the KCPA has had the first of three hearings in the Ohio Senate.

It is interesting to note that the Mississippi Resolution fails to disclose that a kratom ban was proposed in the 2022 legislation session in Mississippi but failed to be enacted. The Resolution also fails to disclose that the Nevada Board of Pharmacy also opened a review of kratom whether it should be scheduled and formally ended that review by removing the recommendation from their April 14, 2022, agenda.

The reason these Boards of Pharmacy have removed scheduling of kratom from their reviews, why the Mississippi and numerous other state ban bills have failed, and the reason the FDA has failed in its efforts to schedule kratom at both the national in international levels, is that the science on kratom clearly demonstrates it simply does not meet the criteria for scheduling. Without appropriate regulations, bad-actors adulterate kratom products with dangerous substances, including fentanyl, heroin, and morphine. The AMA House of Delegates would better protect the public by endorsing our efforts to pass the KCPA to protect consumers.

Any decision on whether kratom or its principal alkaloids, mitragynine or 7-hydroxymitragynine, should be banned should be based on current science. We recommend that every member of the AMA House of Delegate review the 8-Factor Analysis[10] published in January 2022 the addresses the more than 100 research articles on kratom that have been published since Dr. Girioir's August 16, 2018 letter withdrawing kratom from consideration for scheduling.

Here is a list of state legislators who have sponsored consumer protections for kratom consumers in their individual states:

Senator Sonny Borelli
Arizona Senate

Representative Leo Biasiucci
Arizona House of Representatives

Representative John Kavanagh
Arizona House of Representatives

Representative Walt Blackman
Arizona House of Representatives

Representative Kevin Payne
Arizona House of Representatives

Representative Tony Rivera (former)
Arizona House of Representatives

Senator Joann Ginal
Colorado Senate

Senator Don Coram
Colorado Senate

[10] Henningfield JE, Wang DW, Huestis MA. Kratom Abuse Potential 2021: An Updated Eight Factor Analysis. *Front Pharmacol*. 2022;12:775073. Published 2022 Jan 28. doi:10.3389/fphar.2021.775073

Representative Tom Sullivan
Colorado House of Representatives

Representative Quentin Phipps
Connecticut House of Representatives

Representative Travis Simms
Connecticut House of Representatives

Representative Ken Gucker
Connecticut House of Representatives

Senator Bobby Powell
Florida Senate

Representative Alex Andrade
Florida House of Representatives

Senator Joe Gruters
Florida Senate

Speaker Scott Saiki
Hawaii House of Representatives

Senator Ron Kouchi
President, Hawaii Senate

Senator Elgie Sims
Illinois Senate

Representative Marcus Evans
Illinois House of Representatives

Senator Adrienne Southworth
Kentucky Senate

Representative Josh Calloway
Kentucky House of Representatives

Representative Daniel Elliott
Kentucky House of Representatives

Representative Derrick Graham
Kentucky House of Representatives

Representative Lori Stone
Michigan House of Representatives

Representative Keven Hertel
Michigan House of Representatives

Representative Padma Kuppa
Michigan House of Representatives

Representative Rich Steenland
Michigan House of Representatives

Representative John Cherry
Michigan House of Representatives

Representative Julie Brixie
Michigan House of Representatives

Representative Regina Weiss
Michigan House of Representatives

Representative Jim Headsma
Michigan House of Representatives

Representative Donna Lasinski
Michigan House of Representatives

Representative Brenda Carter
Michigan House of Representatives

Representative Sue Allor
Michigan House of Representatives

Representative Abraham Alyash
Michigan House of Representatives

Representative Rachel Hood
Michigan House of Representatives

Representative Bill Sowerby
Michigan House of Representatives

Representative Aisha Gomez
Minnesota House of Representatives

Representative Nolan West
Minnesota House of Representatives

Representative Ron Roberson
Mississippi House of Representatives

Senator Joey Fillingame
Mississippi Senate

Senator Jeff Tate
Mississippi Senate

Representative Phil Christofanelli
Missouri House of Representatives

Representative Dru McDaniel
Missouri House of Representatives

Senator Holly Rehder
Missouri Senate

Representative Hershel Nunez
New Hampshire House of Representatives

Representative Aidan Ankarberg
New Hampshire House of Representatives

Assemblywoman Carol Murphy
New Jersey Assembly

Senator Leroy Comrie
New York Senate

Representative Donna Lupardo
New York Assembly

Representative Mark Fraizer
Ohio House of Representatives

Representative Scott Lipps
Ohio House of Representatives

Representative Gary Click
Ohio House of Representatives

Representative David Leland
Ohio House of Representatives

Representative Michele Lepore-Hagen
Ohio House of Representatives

Representative Mary Lightbody
Ohio House of Representatives

Representative Beth Liston
Ohio House of Representatives

Representative Bill Seitz
Ohio House of Representatives

Representative Monique Smith
Ohio House of Representatives

Representative Daniel Pae
Oklahoma House of Representatives

Representative Lonnie Paxton
Oklahoma House of Representatives

Representative Bill Post (former)
Oregon House of Representatives

Representative John Lively
Oregon House of Representatives

Representative David Brock Smith
Oregon House of Representatives

Representative Chelly Boshart Davis
Oregon House of Representatives

Representative Vikki Breese-Iverson
Oregon House of Representatives

Representative Maxine Dexter
Oregon House of Representatives

Representative Paul Evans
Oregon House of Representatives

Representative Cedric Hayden
Oregon House of Representatives

Representative Gary Leff
Oregon House of Representatives

Representative Bobby Levy
Oregon House of Representatives

Representative Raquel Moore-Green
Oregon House of Representatives

Representative Ron Noble
Oregon House of Representatives

Representative Mark Owens
Oregon House of Representatives

Representative Rachel Prusak
Oregon House of Representatives

Representative Eric Werner-Reschke
Oregon House of Representatives

Representative Tawna Sanchez
Oregon House of Representatives

Representative Greg Smith
Oregon House of Representatives

Representative Tim Knopp
Oregon House of Representatives

Representative Tracy Pennycuick
Pennsylvania House of Representatives

Representative Christina Sappey
Pennsylvania House of Representatives

Representative Susan C. Helm
Pennsylvania House of Representatives

Representative Jennifer M. O'Mara
Pennsylvania House of Representatives

Representative Timm Hennessey
Pennsylvania House of Representatives

Representative Mike Schlossberg
Pennsylvania House of Representatives

Representative Doyle Heffley
Pennsylvania House of Representatives

Representative Chris Quinn
Pennsylvania House of Representatives

Representative Tina Davis
Pennsylvania House of Representatives

Representative Brian Patrick Kennedy
Rhode Island House of Representatives

Representative Jay Edwards
Rhode Island House of Representatives

Representative Grace Diaz
Rhode Island House of Representatives

Representative Sam Azzinaro
Rhode Island House of Representatives

Representative Joe Towns
Tennessee House of Representatives

Senator Sara Kyle
Tennessee Senate

Senate Judith Zaffrini
Texas Senate

Representative J.M. Lozano
Texas House of Representatives

Representative Brad Daw (former)
Utah House of Representatives

Senator Curt Bramble
Utah Senate

Representative Brian Cina
Vermont House of Representatives

Representative Kate Donnally
Vermont House of Representatives

Representative Heather Surprenant
Vermont House of Representatives

Representative Tristan D. Toleno
Vermont House of Representatives

Representative Buddy Fowler
Virginia General Assembly

Senator Jim Honeyford
Washington Senate

Speaker Robin Vos
Wisconsin House of Representatives

Representative Dave Murphy
Wisconsin House of Representatives

Representative Rachael Cabral-Guevara
Wisconsin House of Representatives

Representative Christine Sinicki
Wisconsin House of Representatives

Representative Chuck Wichgers
Wisconsin House of Representatives

Representative Dora Drake
Wisconsin House of Representatives

Representative Jonathan Brostoff
Wisconsin House of Representatives

Senator Mary Felzkowski
Wisconsin Senate

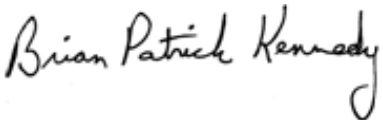
Senator Lena Taylor
Wisconsin Senate

We look forward to engaging in positive discussions on this topic with a focus on science, and request that the AMA House of Delegates defer any action on the proposed Mississippi Resolution until the science supports such an action. We would welcome the invitation for one or more of us to formally present our case for the KCPA at your upcoming House of Delegates meeting in Chicago when the Mississippi Resolution is discussed.

Respectfully submitted,

Senator Curt Bramble
Utah State Senate
Former President of the
National Conference of
State Legislatures

Speaker Robin Vos
Wisconsin House of
Representatives
Former President of the
National Conference of
State Legislatures



Representative Brian Patrick
Kennedy
Speaker Pro-Tempore
Rhode Island House of
Representatives
Vice President of the
National Conference of
State Legislatures

Representative Nolan West
Minnesota House of Representatives

Representative Tracy Pennycuick
Pennsylvania House of
Representatives

Assemblywoman Carol Murphy
New Jersey General Assembly
Majority Whip

June 11, 2022

Utah State Senator Curt Bramble
Rhode Island State Representative Brian Patrick Kennedy
Wisconsin State Assembly Speaker Robin Vos
Minnesota State Representative Nolan West
Pennsylvania State Representative Tracy Pennycuick
New Jersey Assemblywoman Carol A. Murphy

Dear Mr. Bramble, Mr. Kennedy, Mr. Vos. Mr. West, Ms. Pennycuick and Ms. Murphy:

Thank you for your letter regarding a proposed resolution submitted to the American Medical Association House of Delegates regarding kratom, and its potential inclusion as a Schedule 1 substance under the Controlled Substances Act.

This resolution was submitted by the Mississippi State Medical Association and it has withdrawn it from consideration at the AMA House of Delegates, which opened June 10 in Chicago and will continue through June 15, 2022. I want to personally thank you for taking the time to share your views on this matter with us. You can rest assured that, should this issue come before us in the future, your input will be given full consideration.

Thank you for contacting us.

Sincerely,

Gerald E. Harmon
President, American Medical Association

DAVE MURPHY

State Representative • 56th Assembly District

Assembly Committee on State Affairs

Public Hearing, December 8, 2021

Assembly Bill 599

Testimony of State Representative Dave Murphy

Mr. Chair and members of the committee, thank you for hearing Assembly Bill 599 today.

Kratom is a plant and member of the coffee family native to Southeast Asia. As an herbal supplement it has been cultivated and used in that part of world for centuries for pain relief, alertness, and general well-being. Studies have shown kratom to be an effective natural alternative to opioids, providing Americans with a safer way to address unmanageable pain and alleviate opioid dependency.

The ability for individuals to legally utilize kratom to alleviate their opioid dependency is a critical next step for the Wisconsin HOPE agenda.

In 2013, Wisconsin enacted SB 325, a model bill intended to address the national synthetic drug problem by identifying and scheduling hundreds of specific chemical compounds. Included on the list of state scheduled compounds was mitragynine and 7-hydroxymitragynine, both found naturally in the kratom leaf, effectively making natural kratom illegal to possess. Model legislation with this unintended consequence was adopted in only Wisconsin and five other states. Since that time, no other states have banned the sale or use of kratom. Initial concerns raised regarding the danger of these chemical compounds have since been attributed to another chemical compound not found naturally in kratom.

The U.S. Drug Enforcement Agency has rejected multiple attempts to federally schedule the chemical compounds of kratom and as of 2018 the Federal Drug Administration has rescinded their recommendation to schedule kratom stating, "This decision is based on

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many factors, in part on new data, and in part on the relative lack of evidence, combined with an unknown and potentially substantial risk to public health if these chemicals were scheduled at this time."

Just this October, the World Health Organization Executive Committee on Drug Dependency issued a report stating, "The Committee concluded that there is insufficient evidence to recommend a critical review of kratom."

Our bill proposes Wisconsin de-schedule mitragynine and 7-hydroxymitragynine and replace this prohibition with the Kratom Consumer Protection Act (KCPA). Instead of making kratom unavailable to those that benefit from it, the KCPA would regulate kratom products to ensure that kratom processors are registered with DATCP, products are pure kratom and not adulterated with a controlled substance or any ingredient that may cause injury, and prohibit the sale of the kratom products to anyone under 21 years of age.

MARK POCAN
2ND DISTRICT, WISCONSIN
COMMITTEE ON APPROPRIATIONS
COMMITTEE ON EDUCATION & LABOR
JOINT ECONOMIC COMMITTEE
SENIOR WHIP

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POCAN.HOUSE.GOV

December 6, 2021

The Hon. Rob Swearingen
Chair
Assembly Committee on State Affairs
Wisconsin State Legislature

Dear Chair Swearingen:

I write in support of Assembly Bill 599 (AB 599), a bill to legalize the manufacture, distribution, delivery, and possession of kratom, being considered during Wednesday's public hearing in the Committee on State Affairs.

As a Member of Congress, I have worked with federal representatives in both parties to continue the research and legal use of kratom due to its promising help in a number of health conditions as well as its ability to help many people overcome addiction. I've been moved by the many, many personal stories of the benefits of kratom from people across the nation.

According to the Wisconsin Legislative Reference Bureau: "Under current law, kratom is classified as a Schedule I controlled substance and if a person manufactures, distributes, or delivers kratom, [they are] guilty of a misdemeanor. [AB 599] removes kratom from the schedule of controlled substances and legalizes the manufacture, distribution, delivery, and possession of kratom, subject to certain limitations."[1] This legislative outcome is consistent with the emerging view in Washington, D.C. where kratom is now supported on a bipartisan basis, it will be receiving millions of dollars in new research funding, and its benefits have been recognized by the Director of the National Institute on Drug Abuse (NIDA) within the National Institutes of Health (NIH).

In a recent letter addressed to both the U.S. Ambassador to the United Nations and the Secretary of the U.S. Department of Health and Human Services[2], Senator Mike Lee – a Republican from Utah – and I wrote "to ask that the United States oppose any effort to add kratom and its alkaloids to the 1971 U.N. Convention on psychotropic substances as a banned substance." Additionally, we noted that "In 2016, 145,906 Americans including consumers, scientists, and state and federal lawmakers raised their voices in opposition to the Department of Health and Human Services' (HHS) proposal to schedule kratom as a controlled substance."

Similar to this strong support for kratom from Members of the U.S. House of Representatives and the U.S. Senate – across party lines – the Fiscal Year 2022 Labor, Health and Human Services,

[1] https://docs.legis.wisconsin.gov/2021/related/proposals/ab599
[2] https://www.americankratom.org/mediak/news/bi-partisan-letter.html

Education, and Related Agencies Subcommittee appropriation legislation in the House of Representatives contains the following[3]:

> "Kratom.—The [Appropriations] Committee recognizes that NIDA-funded research has contributed to the continued understanding of the health impacts of kratom, including its constituent compounds, mitragynine and 7-hydroxymitragynine. The Committee is aware of the potential promising results of kratom for acute and chronic pain patients who seek safer alternatives to sometimes dangerously addictive and potentially deadly prescription opioids and of research investigating the use of kratom's constituent compounds for opioid use disorder. The Committee directs NIDA to continue to invest in this important research, especially considering the increase in overdose deaths during the COVID–19 pandemic." (p. 135)

> "Kratom.—The [Appropriations] Committee directs the Secretary to maintain current Agency policy to not recommend that the substances mitragynine and 7-hydroxymitragynine, known as kratom, be permanently controlled in Schedule I of the Controlled Substances Act, either temporarily or permanently [...] The Committee encourages AHRQ to continue to fund research on natural products that are used by many to treat pain in place of opioids, including kratom [...] The Committee recommends an additional $3,000,000 for this research and directs AHRQ to make center-based grants to address research which will lead to clinical trials in geographic regions which are among the hardest hit by the opioid crisis." (p.189)

And, finally, while testifying before the Appropriations Committee in the U.S. House of Representatives on May 25th of this year, Dr. Nora Volkow, the Director of NIDA, stated: "Kratom, most notably mitragynine, has many interesting properties that could be of value potentially as a medication for pain. Also, interestingly, they could hold value as treatment for addiction [...] it is so important to actually do research on this substance."[4]

Clearly, Wisconsin is out of sync with the nation when it comes to kratom, however this legislation would rectify that and put us with the other 44 states that do not restrict kratom in the way our state currently does. I commend the authors of this bill for their work, and this Committee for including AB 599 as part of Wednesday's public hearing. I hope you will look at this bill favorably.

Sincerely,

Mark Pocan
Member of Congress

[3] https://www.congress.gov/117/crpt/hrpt96/CRPT-117hrpt96.pdf
[4] https://appropriations.house.gov/events/hearings/fy-2022-budget-request-for-the-national-institutes-of-health

To:	Members, Assembly Committee on State Affairs
From:	Badger State Sheriffs' Association (BSSA) Wisconsin Sheriffs and Deputy Sheriffs Association (WS&DSA)
Date:	December 9, 2021
RE:	**Testimony in Opposition to Assembly Bill 599: Kratom Legalization**

Good afternoon, Chairmen Swearingen, and committee members. My name is Dale Schmidt, and I am the Dodge County Sheriff as well as the 1st Vice President and Legislative Chair for the Badger State Sheriffs. Together with the Wisconsin Sheriffs and Deputy Sheriffs Association, our organizations represent all of Wisconsin's 72 Sheriffs and over 1,000 deputies and jail officers.

Our organizations oppose AB 599, which would legalize the manufacture, distribution, delivery, and possession of kratom in Wisconsin. As law enforcement officers representing small and larger Wisconsin communities, we are concerned about efforts to legalize a substance that the Drug Enforcement Administration has identified as a "drug of concern:" *Kratom is a tropical tree native to Southeast Asia. Consumption of its leaves produces both stimulant effects (in low doses) and sedative effects (in high doses), and can lead to psychotic symptoms, and psychological and physiological dependence. The psychoactive ingredient is found in the leaves from the kratom tree. These leaves are subsequently crushed and then smoked, brewed with tea, or placed into gel capsules.*[1]

Currently, there are no recognized medical uses for kratom; indeed, the Food and Drug Administration (FDA) has warned consumers not to use any product containing kratom or the psychoactive compounds derived from the plant. At the FDA's direction, U.S. Marshals have seized large shipments of raw and processed kratom across the country, including a 2016 shipment of kratom dietary supplements worth more than $400,000 in South Beloit, Illinois, just over the border from our state.[2]

Kratom use has been linked to psychotic episodes, overdose deaths, and the abuse of other drugs. According to the Centers for Disease Control and Prevention, many victims of kratom-involved and kratom-positive overdose deaths also tested positive for fentanyl, heroin, or prescription opioids.[3] The FDA has noted that kratom "affects the same opioid brain receptors as morphine, appears to have properties that expose users to the risks of addiction, abuse, and dependence."[4]

At a time when so many Wisconsin communities are dealing with the devastating effects of opioid abuse, why would we legalize a dangerous substance, with links to opioid addiction and death, that lacks any FDA-approved uses? Legalizing Kratom would be detrimental to the public health of Wisconsin, not to mention the rippling effects through OWI and other areas. **Because of the health and safety risks to our communities, we urge you to oppose efforts to legalize kratom in Wisconsin.**

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[1] U.S. Drug Enforcement Administration, "Drugs of Abuse: A DEA Resource Guide," 2017 Edition, https://www.dea.gov/sites/default/files/2018-06/drug_of_abuse.pdf.
[2] U.S. Food and Drug Administration, "FDA and Kratom," 11 September 2019, https://www.fda.gov/news-events/public-health-focus/fda-and-kratom.
[3] Centers for Disease Control and Prevention, "Notes from the Field: Unintentional Drug Overdose Deaths with Kratom Detected," April 12, 2019, https://www.cdc.gov/mmwr/volumes/68/wr/mm6814a2.htm?s_cid=mm6814a2_w.
[4] U.S. Food and Drug Administration, "FDA and Kratom."

Written Comment by Professor Dr. Dr. (h.c.) Marilyn A. Huestis

Thomas Jefferson University, and President, Huestis & Smith Toxicology, LLC

To The
Wisconsin Committee on State Affairs Hearing on AB 599
8 December 2021

I am a forensic toxicologist and former Chief of Chemistry and Drug Metabolism, National Institute on Drug Abuse (NIDA), NIH for more than 23 years. Since my recent retirement, I remain highly active in the field as a collaborator with many other researchers, as a Professor, Thomas Jefferson University, Honorary Professor, Queen Mary University of London, England, President of Huestis & Smith Toxicology, LLC, on the World Antidoping Agency's Prohibited Drug List Committee and consultant to diagnostic and pharmaceutical companies, and state and federal governments. As a Senior Science and Policy Advisor with Pinney Associates, I worked with the American Kratom Association and its research supporting affiliate, the Center for Plant Science and Health. I am the author of 535 manuscripts and book chapters and Past President of The International Association of Forensic Toxicologists, the Society of Forensic Toxicologists and Past Chair of the Toxicology Section of the American Academy of Forensic Sciences.

I am writing about designating kratom's primary active constituent mitragynine as cause of death in postmortem investigations. Currently, there is no consensus on a lethal mitragynine concentration. There is a substantial overlap between non-toxic, therapeutic, and lethal mitragynine blood concentrations. The possibility that kratom exposure alone is the primary contributor to death in some cases cannot be ruled out but most investigations of kratom-associated deaths describe the presence of other potentially lethal drug concentrations, deaths due to trauma, and/or limited toxicology testing. The National Institute on Drug Abuse stated, "There have been multiple reports of deaths in people who had ingested kratom, but most have involved other substances." The FDA website description of "Mentions of Kratom in Overdose Deaths in the US" https://www.drugpolicyfacts.org/node/3978) was not updated with information from more recent and thorough investigations that clearly documented all three of these factors in the presented death cases. As the CDC stressed in its report (Olsen et. al., 2019), in the few cases where only mitragynine was identified, toxicology testing was limited and did not include screening for many other potentially lethal drugs. Also, the FDA described one kratom-associated death of "particular concern" because the Agency had not found evidence of other drug use; however, the US DHHS later determined that the death was due to trauma in a motor vehicle crash.

The US Assistant Secretary of Health rescinded the FDA's recommendation for scheduling kratom in 2018 stating there is "still debate among reputable scientists over whether kratom by itself is associated with fatal overdoses." In almost all cases, other potent drugs were also identified, making it difficult to define the contribution of mitragynine. I personally reviewed all the published kratom reported deaths world-wide and reached the same conclusion as the CDC that lack of comprehensive toxicological testing precludes assigning causation to mitragynine. Mitragynine concentrations ranged from 3.5 to 3500 ng/mL and in most of these, the authors state that there was limited toxicological testing to rule out the presence of other

drugs. Mitragynine alone was reported in only seven cases; however, in four cases there was sufficient blood for expanded toxicology testing. Other drugs that could have contributed to the death were identified in all four cases.

Novel synthetic opioids, a NPS subclass, are agonists at opioid receptors producing analgesia, sedation, and respiratory depression, contributing greatly to the North American opioid epidemic. In my review of published kratom-associated deaths, frequently fentanyl, NPS fentanyl analogs, heroin and other NPS opioids were identified. NPS are not routinely included in toxicological testing and may be taken unknowingly as adulterants in the unregulated drug supply, especially in drugs purchased online. In addition, researchers found multiple packaged commercial kratom products with artificially elevated concentrations of 7-hydroxy-mitragynine, presumably due to intentional adulteration to make the product more potent (Lydecker et. al., 2016). We agree with other kratom experts (e.g., Prozialeck et. al., 2019) that marketed kratom products should be regulated to prevent boosting 7-hydroxy-mitragynine concentrations or per serving content above those naturally present, due to the greater safety risks of 7-hydroxy-mitragynine at supranatural concentrations. Dr. Abhisheak Sharma and his University of Florida colleagues, analyzed thousands of fresh kratom samples and always found less than 0.01% 7-hydroxy-mitragynine, the limit of quantification of the method. However, controlling 7-hydroxy-mitragynine concentrations by scheduling effectively bans naturally occurring kratom products for consumer use. Scheduling kratom, mitragynine or 7-hydroxy-mitragynine would lead to an unregulated illicit kratom market and could exacerbate the concern of fortifying kratom or mitragynine products with 7-hydroxy-mitragynine.

Another example included in the FDA report of mitragynine-associated deaths was a case report of nine Swedish deaths (Kronstrand et. al., 2011). The authors concluded that the kratom powdered leaf product purchased online was laced with a toxic dose of O-desmethyltramadol and the nine cases should not have been characterized as kratom caused deaths. The complexities of making conclusions on a cause of death associated with mitragynine concentrations are also highlighted in Papsun et. al., 2019 that concluded "Quantitative reports of mitragynine in biological specimens from forensic investigations in the literature are sparse and may be influenced by poor analyte stability and inadequate resolution of mitragynine from its diastereomers, which could lead to falsely elevated concentrations and subsequently render those reported concentrations inappropriate for comparison to a reference range."

In the latest peer reviewed report of 35 mitragynine-associated deaths (Schmitt et. al., 2021), there was no statistically significant difference in blood concentrations between cases where mitragynine was not listed as a cause of death (mean, 315 ± 297 ng/mL) and cases in which mitragynine was listed as a contributor to death (mean, 269 ± 382 ng/mL; $P < 0.201$). In the only case where mitragynine was considered to be the only drug contributing to death, aripiprazole, an atypical antipsychotic was present at 310 ng/mL but phenibut, a central nervous system depressant prescribed in Russia to treat anxiety, was found at the scene but was not included in toxicological testing.

In addition, as described on NIDA's Kratom Facts web page, the stimulant effects of mitragynine and 7-hydroxy-mitragynine are due to its binding to adrenergic receptors and their

sedating and analgesic effects due to binding to the G-protein coupled opioid receptors. However, the opioid G-protein receptor binding is biased and does not include recruitment of beta-arrestin, resulting in less respiratory depression. https://www.drugabuse.gov/publications/drugfacts/kratom).

Dr. Jack Henningfield and I recently completed a controlled high dose mitragynine vs 60 and 150 mg/kg oxycodone administration study in rats according to an FDA-recommended protocol to evaluate respiratory depression. While significant respiratory depression and some deaths were observed in oxycodone-treated animals, no significant respiratory depression and no deaths were reported in mitragynine-treated animals. We are preparing the data for publication but FDA and NIDA were briefed on outcomes, and we are happy to brief the State of Wisconsin legislative committee. I am advising on a human controlled dosing study of pure mitragynine and other kratom-derived products that is currently being conducted with approval by Health Canada. Full safety evaluation and pharmacokinetics of mitragynine and 7-hydroxy-mitragynine are included. To date, there are no serious adverse events and doses were well tolerated.

I conclude that there is a lack of sufficient scientifically sound evidence that kratom or its alkaloids pose an imminent public health threat that warrants scheduling. Regulations are needed as already established in five US states and Canada to ensure that kratom products are not adulterated or artificially elevated in alkaloid content. In addition, more comprehensive toxicological analysis must be performed prior to designating mitragynine as cause of death.

Thank you for your efforts and the opportunity to comment.

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Wisconsin Medical Society

TO: Assembly Committee on State Affairs
Representative Rob Swearingen, Chair

FROM: Mark Grapentine, JD – Chief Policy and Advocacy Officer

DATE: December 8, 2021

RE: **Opposition** to 2021 Assembly Bill 599

On behalf of nearly 10,000 physician members statewide, thank you for this opportunity to share our opposition to 2021 Assembly Bill 599, which would remove elements found in kratom from our state's Controlled Substances Act. The Society and the Wisconsin Society of Addiction Medicine (WISAM) oppose the legalization of kratom in Wisconsin and urge you to protect Wisconsin citizens from a legalization/regulatory scheme that would increase access to a drug the U.S. Food and Drug Administration has warned "appears to have properties that expose users to the risks of addiction, abuse and dependence."[1]

FDA Warnings are Clear: "Regulation" of Kratom Does Not Protect Consumers
The FDA's posted warning about kratom is clear and should be heeded:

> There are no FDA-approved uses for kratom, and the agency has received concerning reports about the safety of kratom. FDA is actively evaluating all available scientific information on this issue and continues to warn consumers not to use any products labeled as containing the botanical substance kratom or its psychoactive compounds, mitragynine and 7-hydroxymitragynine. FDA encourages more research to better understand kratom's safety profile, including the use of kratom combined with other drugs.

Assembly Bill 599's sections 3 and 4 would remove the substances cited in the FDA's warning, mitragynine and 7-hydroxymitragynine, from the state's Controlled Substances Act. The Wisconsin Medical Society and WISAM believe this would be harmful to Wisconsin's citizens.

The kratom industry and other supporters of AB 599 allege that "[k]eeping kratom illegal isn't solving any problems."[2] To the contrary, the previously cited FDA warning included a number of actions the agency has taken across the country, including a 2016 action in South Beloit, IL, where U.S. Marshals seized 90,000 bottles labeled as "dietary supplements" containing kratom. The FDA's press release[3] about the action makes it clear that such actions are taken for public safety reasons when kratom suppliers attempt to skirt FDA requirements about adulterated dietary supplements:

> "We have identified kratom as a botanical substance that could pose a risk to public health and have the potential for abuse," said Melinda Plaisier, the FDA's associate

[1] "FDA and Kratom", Sept. 11, 2019: https://www.fda.gov/news-events/public-health-focus/fda-and-kratom
[2] Memo to Legislature, American Kratom Association, July 15, 2021
[3] https://www.fda.gov/news-events/press-announcements/us-marshals-seize-dietary-supplements-containing-kratom

> commissioner for regulatory affairs. "The FDA will continue to exercise our full authority under law to take action on these new dietary ingredients, especially if they ignore the notification requirements, as part of our commitment to protecting the health of the American people."

Leading health care systems also warn their patients about kratom – including using kratom as a way to, as the cosponsor memo for AB 599 put it, "alleviate their opioid dependency." The Mayo Clinic has a web page[4] to help answer the question: "Kratom for opioid withdrawal: Does it Work?" From that resource:

> ## Natural, but not safe
>
> Because kratom may ease withdrawal symptoms, researchers have studied it as a potential treatment. The evidence suggests that rather than treating addiction and withdrawal, the use of kratom may lead to them.
>
> In one study, people who took kratom for more than six months experienced withdrawal symptoms similar to those that occur after opioid use. Over time, people who use kratom may develop cravings for it and need the same medications that are used to treat opioid addiction, such as buprenorphine (Buprenex) and naloxone (Narcan, Evzio). When kratom is used during pregnancy, the infant may experience symptoms of withdrawal after birth.
>
> As with pain medications and recreational drugs, it is possible to overdose on kratom. The treatment for kratom overdose is similar to that for opioid overdose, and people experience many of the same treatment problems. Kratom has caused at least 36 deaths. Although people may enjoy the good feelings that kratom can produce, kratom has not proved to be an effective treatment for opioid withdrawal.

Continuing Research into Kratom Use Shows Troubling Effects

Legalizing/regulating kratom will simply exacerbate the problems addiction medicine physician specialists are witnessing in their practices. The active components of kratom, mytraginine and 7-hydroxy-mitragynine, act like opioids in the body, and addiction to kratom requires treatment just like that of an opioid use disorder. The *Wisconsin Medical Journal* in April 2021 published a literature review[5] of how best to treat what the paper terms "Kratom Use Disorder (KUD)." In their introduction, the paper's authors highlight the concerning trend about kratom's effects (citations omitted):

> The increasing consumption of kratom (Mitragyna speciosa) is emerging as a public health concern among Americans, and forecasting models indicate its use will continue to rise. Aside from the Food and Drug Administration (FDA) reports of concern and adverse effects exhibited through increased calls to poison control centers and overdose deaths, the notion of addiction is rapidly emerging.

For more Wisconsin physician-conduced research into kratom and its harmful effects, please review the materials accompanying this memo. Thank you again for this opportunity to provide the Society's and WISAM's opposition to AB 599. Please feel free to contact the Society with any questions on this or other health care issues.

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[4] https://www.mayoclinic.org/diseases-conditions/prescription-drug-abuse/in-depth/kratom-opioid-withdrawal/art-20402170

[5] https://wmjonline.org/wp-content/uploads/2021/120/1/54.pdf

WISAM WISCONSIN SOCIETY of ADDICTION MEDICINE

07/14/2021

Mark Grapentine, JD
Chief Policy and Advocacy Officer
Wisconsin Medical Society
Mark.grapentine@wismed.org

Dear Mr. Grapentine,

Thank you for bringing proposed legislation, LRB-3796/1, to the attention of the Wisconsin Society of Addiction Medicine (WISAM). WISAM strongly opposes LRB-3796/1, which would remove mitragynine and 7-hydroxy-mitragynine - both constituents of the plant kratom - from the schedule 1 controlled substances list in Wisconsin.

Mitragynine (a partial mu-opioid agonist) and 7-OH-Mitragynine (a full mu-opioid agonist, which is similar in action to other opioid analgesics and is likely the greatest contributor to overdose deaths associated with kratom) should remain schedule 1 substances in Wisconsin at this time. Legislation similar to LRB-3796/1 is being proposed in other states where kratom is illegal as part of a lobbying effort that could lead to further commercialization of kratom. There is currently no sound scientific data that kratom, or any of its constituents, is safe and effective for the management of acute or chronic painful conditions. There is also no data that kratom helps treat patients with opioid use disorder (OUD), while there are already FDA-approved treatment options in buprenorphine and methadone for OUD. Of note, I am an author on two, published papers (enclosed) illustrating that the active components of kratom act like opioids in the body and that addiction to kratom requires medical treatment. Thus, access to buprenorphine and methadone for OUD should be prioritized over the legalization of a substance with kratom's concerning record.

Further, as for overdose potential related to kratom, I have served as an expert witness for the plaintiff in a lawsuit in Montana against a distributor of kratom following an overdose death of a young man who incorrectly believed that kratom was safe. The young man believed that it was safe because of the information he had read from participants in the kratom industry, including unsubstantiated statements regarding the potential benefits of kratom for pain management and OUD. At the time of his death, the young man's toxicology results showed no other opioids, benzodiazepines, or controlled substances in his system - only mitragynine and his prescribed medications (none of which was a controlled substance). The case eventually settled after my extensive testimony on the literature regarding the dangers of kratom and that, in my expert opinion, it was the only possible explanation for this gentleman's overdose death.

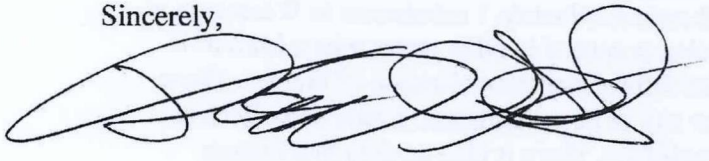
Finally, any attempt to introduce this bill as part of the HOPE legislation under the guise of treatment for OUD is anti-scientific and harmful. The FDA has issued warning letters to

marketers and distributors of kratom that make false claims that kratom has been shown to treat opioid withdrawal symptoms or OUD.

For far too long, persons with OUD and their family members have been misled into believing that kratom is a safe and effective treatment for OUD. As noted above, there are indeed safe and effective FDA-approved treatments for OUD; kratom is neither safe nor effective for this condition. People struggling with OUD should not be misled into taking kratom for this condition, thereby not availing themselves of safe, effective, FDA-approved medications that are proven to help prevent dysfunction, disability, and death.

WISAM truly hopes that our state representatives will not introduce or pass legislation that would allow for a commercial model of legalization for an opioid-like substance like kratom. This would be a tragic mistake. Please do not hesitate to contact me with any questions or concerns or to provide further expert assistance.

Sincerely,



David Galbis-Reig, M.D., DFASAM
President, Wisconsin Society of Addiction Medicine

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A Case Report of Kratom Addiction and Withdrawal

David Galbis-Reig, MD

ABSTRACT

Kratom, a relatively unknown herb among physicians in the western world, is advertised on the Internet as an alternative to opioid analgesics, as a potential treatment for opioid withdrawal and as a "legal high" with minimal addiction potential. This report describes a case of kratom addiction in a 37-year-old woman with a severe opioid-like withdrawal syndrome that was managed successfully with symptom-triggered clonidine therapy and scheduled hydroxyzine. A review of other case reports of kratom toxicity, the herb's addiction potential, and the kratom withdrawal syndrome is discussed. Physicians in the United States should be aware of the growing availability and abuse of kratom and the herb's potential adverse health effects, with particular attention to kratom's toxicity, addictive potential, and associated withdrawal syndrome.

CASE PRESENTATION

A 37-year-old white woman with no previous history of substance abuse treatment was admitted to the inpatient mental health and addiction service after contacting the unit for treatment of an "addiction to kratom." The patient denied any past medical history except for postpartum depression that was partially responsive to sertraline, which the patient discontinued on her own. The patient reported that she works as a teacher and was first introduced to kratom 2 years prior to admission by a fellow teacher who was using it to treat her fibromyalgia pain. Because the patient had been in pain from recent carpal tunnel surgery and was concerned about taking opioid analgesics due to their "addictive potential," her colleague convinced her that kratom, a "nonaddictive, natural option" to "pain killers," could be a good alternative to treat her pain. She gave the patient some capsules containing dried, crushed kratom leaves. The patient reports that it provided her pain relief and also gave her a "boost of energy." Given the expense, however, she decided to purchase the concentrated extract off the Internet on the assumption that it would last longer because it would require less of the substance. Over the course of the next 2 years, the patient continued to purchase kratom extract from a single Internet site based in Florida for $150 for a 20 ml bottle labeled only with the name of the company and the country of origin (in this case Bali). The patient reported that within 6 months she realized that she was using much more of the kratom than she intended. When she attempted to cut back, she discovered that she would experience cravings as well as significant withdrawal symptoms consisting of severe abdominal cramps, sweats, blurred vision, nausea, vomiting, and diarrhea. Over the course of the next 1.5 years she attempted to detoxify in the outpatient setting with medication support from 2 outpatient providers using low dose clonidine, without success. By this point, the patient had also lost a significant amount of weight, stating that the kratom curbed her appetite. Her husband later told the physician that she was hiding the fact that she had continued to use kratom, was hiding the bottles around the home, and had gone to significant lengths to ensure that he would not discover that she had continued to order kratom online by having the product shipped to local FedEx stores. The patient admitted she was worried that she would lose her family if she did not stop taking the kratom. Despite its effects on her health (weight loss, insomnia, cravings, and decreased overall energy level) and the conflict that her use had been creating in her marriage, she had continued to take the kratom extract. Both her husband and father gave her an ultimatum to stop using the kratom, which led to her contacting the inpatient mental health and addiction unit for assistance.

• • •

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CME available. See page 53 for more information.

Figure 1. *Clinical Opioid Withdrawal Scale Scores Over Time*

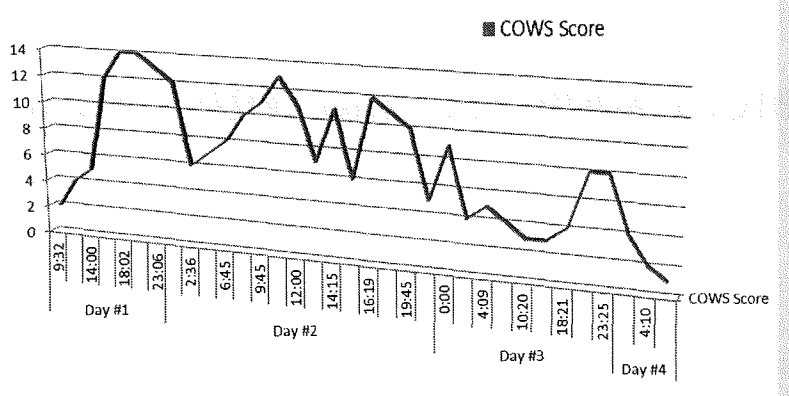
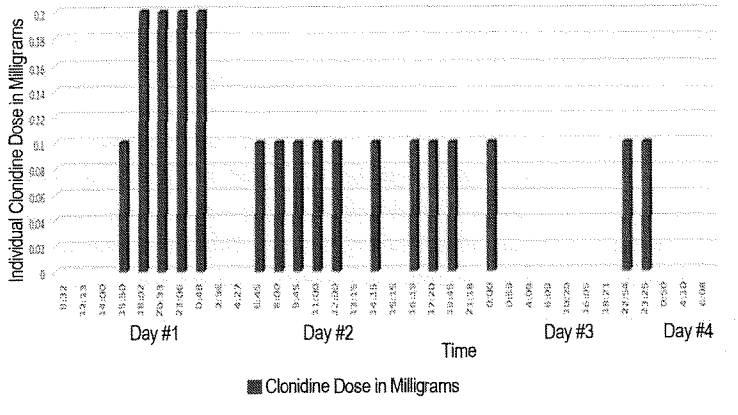


Figure 2. Kratom Withdrawal Clonidine Dose Requirements



On presentation, the patient's pupils measured approximately 2-3 mm in diameter and she complained only of mild diaphoresis. She admitted to taking her last dose of kratom at 5 AM on the day of admission. She brought her last vial of kratom, which contained approximately 2 ml of a clear fluid that she admitted was concentrated kratom extract diluted with water. Unfortunately, there was not enough of the diluted concentrate left in the bottle for laboratory analysis. The initial examination was unremarkable except for mild diaphoresis of the palms and back of the neck and significant cachexia. Electrolytes, renal function, hemogram, and liver studies were within normal limits. Urine toxicology by immunoassay was negative for all drugs of abuse including oxycodone, opioids, and methadone. A sample of urine was sent for liquid chromatography-mass spectrometry (LC-MS) to detect mitragynine (the active alkaloid in kratom), results of which came back positive at a cutoff value of 10 ng/ml. While an exact toxic concentration has not been clearly established for mitragynine, case reports suggest that side effects of mitragynine, including risk of torsade de pointes, appear to be dose dependent.[1,2] The patient was started on the opioid withdrawal protocol using symptom-triggered clonidine at a dose of 0.1-0.2 mg every 2 hours based on the Clinical Opioid Withdrawal Scale (COWS) Score, a validated scale that scores typical opioid withdrawal symptoms such as pupillary dilatation, diaphoresis, gastrointestinal distress, anxiety, fever, bone and joint pains, increased lacrimation or rhinorrhea, tremors, and yawning based on the severity of the symptoms. Scheduled hydroxyzine 50 mg by mouth every 6 hours also was started, along with a 0.1 mg per day clonidine patch to assist with withdrawal symptoms. By 1 PM on the day of admission, the patient's withdrawal symptoms started to increase rapidly as she developed myalgias, bone pain, abdominal cramping pain, nausea, and blurred vision due to rapid pupillary dilatation. The patient developed severe withdrawal symptoms by mid-afternoon, which progressed rapidly requiring up to 2 mg of oral clonidine over the next 36 hours as noted by the Clinical Opioid Withdrawal Scale (COWS) Scores (Figure 1) and frequency and dose of clonidine administered (Figure 2). Fortunately, the hyperautonomic symptoms improved rapidly over the course of 2 to 3 days. During previous attempts at detoxification, the patient described a prolonged period of severe depression and anxiety. Given the patient's previous history of postpartum depression only partially treated with sertraline, she also was started on extended release venlafaxine beginning at a dose of 37.5 mg and titrated daily up to 150 mg for her depression. In order to avoid benzodiazepines, the patient was started on pregabalin at a dose of 25 mg by mouth every 8 hours and titrated to 50 mg every 8 hours prior to discharge for her anxiety. The patient's condition stabilized over the course of 3 days in the hospital. After a family meeting with her husband and father, the patient was discharged to home with an appointment to begin participation in a dual partial hospital program. She was provided with a prescription to start naltrexone 50 mg by mouth daily for opioid antagonist therapy to begin no sooner than 7 days after discharge to avoid precipitating any additional withdrawal symptoms.

Table. Literature Review of Kratom Case Reports, Case Series, and Investigations

Authors	Number of Cases	Type of Article	Outcome	Comments
Nelson JL, et al[7]	1	Case report	Generalized tonic-clonic seizure; discharged to home	Kratom combined with Modafanil
Kronstrand R, et al[8]	9	Retrospective case series	Death	All 9 cases involved combined kratom and O-desmethyltramadol (Krypton).
Singh D, et al[9]	293	Cross-sectional survey of kratom user	Dose dependent effects of toxicity, addiction, and withdrawal	First study to measure kratom dependence, withdrawal symptoms, and drug craving.
Forrester MB[10]	14	Retrospective case series	All patients treated and recovered	Retrospective case series of kratom exposure reports to Texas Poison Centers.
Trakulsrichai S, et al[11]	52	Retrospective review series	Most cases with good prognostic outcome	Study describes toxicity and withdrawal reported to Ramathibodi Case Poison Center in Thailand.
McIntyre IM, et al[12]	1	Case report	Death	Kratom overdose; tissue samples also demonstrated mirtazapine, venlafaxine, and diphenhydramine.
Karinen R, et al[13]	1	Case report	Death	Kratom overdose; blood analysis also demonstrated citalopram, zopiclone, and lamotrigine.
Neerman MF, et al[14]	1	Case report	Death	Kratom overdose; toxicology also revealed therapeutic levels of over-the-counter cold medicine and benzodiazepine.

DISCUSSION

Kratom (*Mitragynia speciosa* Korth) is an herb indigenous to Thailand and other countries in Southeast Asia that has been used by people in that part of the world for hundreds of years to stave off fatigue and to manage pain, opioid withdrawal, and cough.[3] In the past decade, the herb has made its way around the world via Internet sales as an alternative to opioids for pain relief. Unfortunately, kratom is not well known by physicians in the United States. Kratom contains a number of active phytochemicals, but the chemical entity mitragynine (the plant's primary alkaloid) is widely regarded to produce the majority of the plant's psychoactive effects, with additional contributions from other phytochemicals, including 7-hydroxymitragynine (7-HMG) and mitraphylline.[4,5] When ingested orally, the bioavailability of mitragynine is estimated in the laboratory to be approximately 3.03% with an onset of action of approximately 5 to 10 minutes.[2] The half-life of mitragynine is not known with certainty, but its effects appear to last several hours consistent with the initiation of withdrawal symptoms within 12 to 24 hours (as occurred in the current case).[2] At low doses, mitragynine has stimulant effects, but at high doses, mitragynine behaves like an opioid and has been shown to have agonist activity at the Mu and Kappa-opioid receptors.[6] Kratom is not currently scheduled by the Drug Enforcement Agency (DEA) but is listed on its "Drugs and Chemicals of Concern" list and is sold on the Internet as a "nonaddictive" herbal alternative for pain control.[6,7] It also is used by many as a "legal high" and to assist with withdrawal from opioids. Despite its nonscheduled status with the DEA, in 2013 Wisconsin Act 351 classified kratom as a schedule 1 controlled dangerous substance, making it illegal to possess or use in Wisconsin.[8,9] Mitragynine, the primary active component of kratom, currently is being investigated as a potential analgesic with a diminished risk of respiratory depression in overdose compared to traditional opioid analgesics.[6] At the present time, however, the clinical properties of mitragynine and its potential for development as a therapeutic agent are only in the early stages of investigation.

The Internet is ripe with sites and articles that proclaim the analgesic and stimulant properties of kratom while downplaying its adverse side effects and addictive potential. Numerous case series and reports, however, have described the addictive potential of kratom, both in herbal form and as an extract. The oldest of these published articles dates back to 1975 with an early description of kratom addiction in the Thai population.[10] In a more recent study carried out to determine the risk of suicide among illicit drug users in Thailand, the investigators report that the primary drug of abuse in their study was kratom (illegal in Thailand since 1943), which was used by 59% of the 537 respondents who admitted to illicit drug use, followed by methamphetamine (24%).[11] This epidemiological study, however, did not distinguish between abuse and addiction.

More recently, a number of case series and reports of kratom toxicity have started to surface in the United States and Europe (Table). In one such report, a male patient abusing and addicted to hydromorphone attempted to use kratom to prevent withdrawal and was admitted to the hospital after he mixed the kratom with modafanil and suffered a generalized tonic-clonic seizure.[12] It is unclear if the seizure was a result of the kratom or the combination of the 2 drugs. In a separate case series from Sweden, investigators report on 9 cases of krypton intoxication and death.[13] Krypton is an herbal preparation of dried, crushed kratom leaves mixed with another mu-opioid receptor agonist, O-desmethyltramadol.[13] The abuse potential, toxicity, and withdrawal symptoms associated with kratom use have been described in at least 3 case series.[14-16] Three additional case reports also have demonstrated the potentially fatal effects of kratom without the addition of other mu-opioid agonists.[17-19]

The addictive potential of kratom (specifically mitragynine) has been well described in a discriminative stimulus rat model of addiction with properties similar to morphine and cocaine.[20] While the toxicity and addictive potential of kratom and its derivatives has not been well described in human populations, several case series and reports describe a clear addiction potential and a potentially severe, opioid-like withdrawal syndrome in humans.[14,16] Toxicity has included reports of palpitations, seizures, and coma.[12,16] The most extensive description of kratom withdrawal suggests symptoms of physical withdrawal that include myalgias, pupillary dilatation, insomnia, rhinorrhea, lacrimation, fever, hot flashes, anorexia, and diarrhea as well as psychological withdrawal symptoms that include agitation, anxiety, irritability, and depression.[14] Given the mu-opioid agonist effects of the alkaloids mitragynine and 7-hydroxymitragynine found in kratom, the symptom complex of kratom withdrawal is, not surprisingly, similar to the opioid withdrawal syndrome. The investigators of the aforementioned cross-sectional survey study declare that "kratom use is associated with drug dependence, drug withdrawal, and craving" consistent with drug addiction.[14]

Empirical evidence regarding how best to treat the kratom withdrawal syndrome and assist with long-term maintenance of sobriety from kratom is currently lacking, though the current case report suggests that a combination of high dose alpha-2 agonist therapy and hydroxyzine may provide relief from both the physical and mental symptoms of kratom withdrawal. Theoretically, buprenorphine and methadone agonist therapy also might be utilized for long-term maintenance of sobriety in kratom addiction, though kratom's current classification as a distinct chemical entity not related to the opioid class of chemicals creates some medico-legal and regulatory issues that require consideration with respect to opioid agonist therapy. As a result, and because there are no regulatory issues with antagonist therapy, the patient was prescribed oral naltrexone to assist with craving and maintenance of sobriety from kratom.

CONCLUSION

Kratom (*Mitragynia speciosa* Korth), an herb originating in Southeast Asia, which currently is not scheduled by the DEA, but is classified as a schedule 1 dangerous controlled substance in Wisconsin,[21] possesses psychoactive properties that include both stimulant and opioid-like effects. Kratom has grown, and continues to grow, in popularity in the United States and in Wisconsin. Withdrawal symptoms are mediated by the opioid properties of the plant's primary alkaloid compounds and can successfully be treated using an alpha-2 agonist and hydroxyzine as demonstrated by the current case report in which symptom-triggered clonidine therapy was utilized with COWS in conjunction with scheduled hydroxyzine. Physicians should be aware of the growing availability of kratom and its potential adverse health effects, especially its toxicity, addictive potential, and withdrawal syndrome.

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Pharmacotherapy for Management of 'Kratom Use Disorder': A Systematic Literature Review With Survey of Experts

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ABSTRACT

Objectives: An increasing number of Americans are turning to kratom for self-management of various pain, anxiety, and mood states and as an opioid substitute. Addiction to this unique botanical develops and carries a high relapse risk and, to date, there are no guidelines on how to maintain long-term abstinence. The aim of this article is to compile all available information on management of "kratom use disorder" (KUD)—as coined here—from the literature, with evidence from the clinical practice of expert addictionologists in an attempt to develop a standard of care consensus.

Methods: A systematic literature search was conducted to capture all relevant cases pertaining to maintenance treatment for KUD. Results were supplemented with case reports and scientific posters gleaned from reliable online sources and conference proceedings. Additionally, a survey of members of the American Society of Addiction Medicine (ASAM) was administered to assess the practice patterns of experts who treat patients with KUD in isolation of a comorbid opioid use disorder (OUD).

Results: Based on a literature review, 14 reports exist of long-term management of KUD, half of which do not involve a comorbid OUD. Pharmacological modalities utilized include mostly buprenorphine but also a few cases of naltrexone and methadone, all with favorable outcomes. This is supported by the results of the expert survey, which demonstrated that those who have managed KUD in isolation of a comorbid OUD reported having utilized buprenorphine (89.5%), as well as the other medications for opioid use disorder (MOUD).

Conclusions: This is the first comprehensive review to examine the existing literature referring to management of KUD in combination with a survey of current experts' clinical consensus regarding pharmacological management. Based on this information, it seems reasonable that the indication for MOUD should be extended to cases of moderate to severe KUD.

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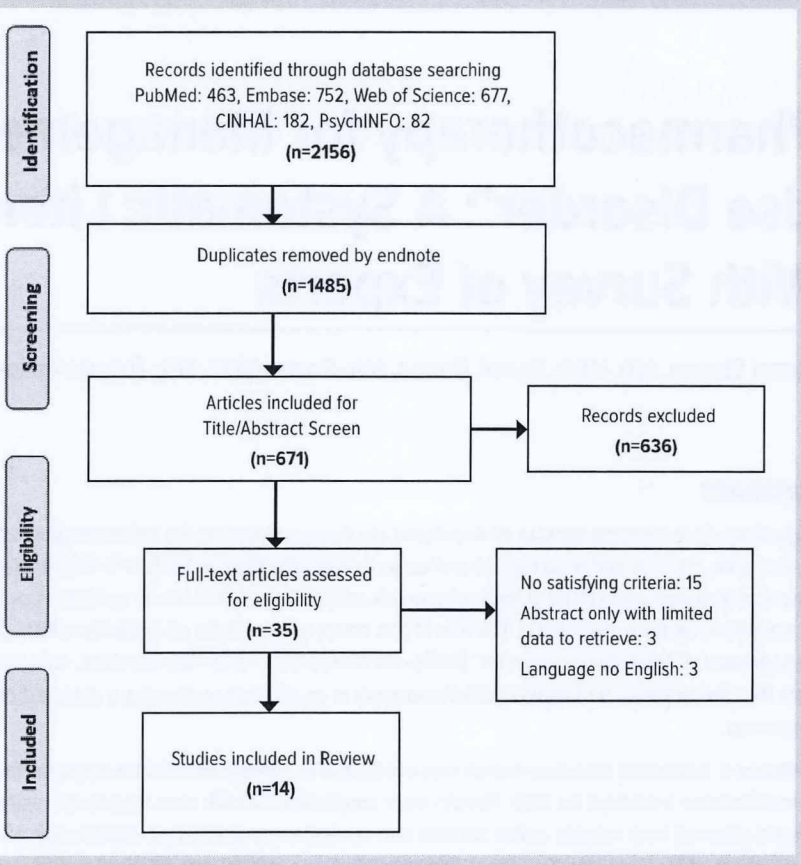
INTRODUCTION

The increasing consumption of kratom (*Mitragyna speciosa*) is emerging as a public health concern among Americans, and forecasting models indicate its use will continue to rise.[1] Aside from the Food and Drug Administration (FDA) reports of concern[2] and adverse effects exhibited through increased calls to poison control centers[3] and overdose deaths,[4] the notion of addiction is rapidly emerging. In Southeast Asia where this botanical is indigenous, 55% of regular users develop dependence and tolerance. Withdrawal and cravings also have been reported.[5-8] There is now substantial evidence showing it is possible for individual kratom users to meet all Diagnostic and Statistical Manual, Fifth Edition (DSM-5) criteria associated with a substance use disorder diagnosis.[9] A category for "kratom use disorder" (KUD)—as we coin in this paper—does not formally exist in the DSM-5, which was last revised in 2013. In the United States, a survey of 8,000 users conducted through American Kratom Association (AKA)[10] revealed that although some disclosed use with an underlying intent to self-manage opioid misuse including withdrawal, 68% reported using to self-manage chronic pain and 65% for anxiety or mood states, where opioids are not involved at all.

The effects of kratom to date are attributed primarily to the 2 active alkaloids—mitragynine (MG) and 7-hydroxymitragynine (7-HMG)—although more than 25 other alkaloids have been identified in the plant.[11] Both exert their primary action through agonism at the μ opiate receptor and weak antagonism at δ and κ receptors.[12,13] There is also evidence that MG is involved in sero-

tonergic (antagonist at serotonin 5-HT-2A receptors), dopaminergic (agonist at dopamine D1 receptors), and noradrenergic (agonist at postsynaptic alpha-2 receptors) pathways.[14-17] These translate to users experiencing stimulant-like and opioid-like intoxicating syndromes when either low or high doses are consumed. In traditional medicine, kratom leaves have been used for pain relief; to increase appetite, mood, energy, and sexual desires; to provide wound healing based on anti-inflammatory properties; as a local anesthetic; and to manage coughs, diarrhea, and intestinal infections, among other uses. It is apparent that MG, 7-HMG, and the rest of the plant's constituents are involved in a multitude of other pathways as well, which have yet to be determined. Although there have been efforts by the FDA to classify MG and 7-HMG as an opioid based on the Public Health Assessment via Structural Evaluation (PHASE) model,[18] this is a very complex botanical with much more unique pharmacodynamic and intracellular signaling actions, hence deserving its own category and classification.

Figure 1. PRISMA Flow Diagram of Literature Search



In a previous review of kratom withdrawal,[6] we outlined that symptoms respond akin to that of opioid withdrawal through symptomatic management of a hyperadrenergic state and/or use of opioid receptor agonists (methadone) or partial agonists (buprenorphine). We also alluded to the notion of cravings being present and that there is a high risk of relapse to use on cessation. To date, no guidelines exist regarding the long-term management of KUD. In medical terminology, the "standard of care" is established based on what the average physician in the appropriate specialty community would do when faced with a specific situation. When it comes to KUD management, there is a great need to establish such a standard of care. In this article we report on all the evidence currently available in the literature and combine it with survey information regarding pharmacological management by the addiction medicine specialty community. The aim here is to evaluate potentially beneficial pharmacotherapy only and not specifically any behavioral treatments.

METHODS

Literature Search

We searched PubMed/MEDLINE, PsycINFO, PsycARTICLES, CINAHL, EMBASE, Scopus, Cochrane, and Academic OneFile for English-language medical literature published between January 1, 1970, and January 1, 2020, using the search terms: "kratom," "mitragyna speciose," "mitragynine," and "7-hydroxymitragynine."

Regarding inclusion and exclusionary criteria, our interest revolved around clinical cases reporting the use of any pharmacotherapy in management of remission from kratom use in both humans and animals. Only English literature was considered.

The original search yielded a total of 2156 returns: PubMed (n = 463), Embase (n = 752), Web of Science (n = 677), CINHAL (n = 182), and PsychINFO (n = 82). After removing duplicates, 671 citations were left. Authors CS and BH examined each by title and abstract. After eliminating studies based on exclusionary criteria and applying the inclusion criteria, 14 papers met the original search criteria (Figure 1, Tables 1 and 2). Any disagreements would have been mediated for proper allocation by a third reviewer, but that was not required. Results were supplemented by references gleaned from recent reviews and citations of searched returns, as well as credible reports from academic conferences (Figure 1).

Survey

A survey was designed via Qualtrics (https://www.qualtrics.com) and distributed to the 40 state chapter presidents of the American Society of Addiction Medicine (ASAM), with a request to extend it to their specific membership group. At the time of the survey,

Table 1. Cases Reporting Maintenance Pharmacotherapy of Patients With Kratom Use Disorder and Opiod Use Disorders

Ref No.	Clinical Paradigm	Reason for Kratom Use	Extent of Kratom Used	Intervention	Maintenance Regimen	Outcome
16	43-year-old man with history of chronic pain from thoracic outlet syndrome treated with hydromorphone. Started subcutaneously injecting crushed 10 mg tablets of hydromorphone and using kratom to help ameliorate withdrawal when hydromorphone not available. Stopped hydromorphone 3.5 years before presenting and was strictly using kratom. Started taking modafinil 100 mg to help with alertness and presented to ED after experiencing a generalized tonic-clonic seizure. Following discharge, stopped kratom and reported a less intense but more protracted withdrawal compared to opioids persisting for 10 days.	Opioid substitution	Initially used unknown amount of kratom to manage episodic withdrawal from hydromorphone. Ultimately continued using unknown quantity of kratom as a tea 4 x/day; reported spending $15,000/year on kratom.	Started on BUP/NX following withdrawal from kratom to assist with cravings, 16-4 mg.	BUP/NX 16-4 mg/day	Ongoing abstinence confirmed by urine toxicology, maintained on BUP/NX 16-4 mg/day.
20	52-year-old woman with depression and chronic pain admitted to inpatient psychiatric unit for suicidal ideations. She was experiencing opioid-like withdrawal symptoms. Years prior had developed iatrogenic opioid addiction and switched to kratom 9 months prior to presentation.	Pain management	9 months of use. Gradually increased from 1 tbsp/day powdered plant matter to 1 tbsp 4-6 times/day.	As inpatient, BUP/NX induction occurred, requiring 16/4 mg on day 1 for withdrawal symptoms. Initial plan was for taper but, due to difficulty tapering, was discharged with 2-0.5 mg 4 times/day. BUP/NX increased to 8-2 mg 2x/day to manage cravings as outpatient.	BUP/NX 8-2mg 2x/day	Ongoing abstinence at 18 months, corroborated via negative urine toxicologies.
21	32-year-old man with history of PTSD, alcohol use disorder, and OUD in remission from heroin for 2 years. Presented to outpatient clinic for help with kratom dependence.	Energy	8 months of use. Started using 1 capsule kratom product/day; increased to 5-10 capsules/day.	As outpatient, started on BUP/NX 4-1 mg/day; increased to 16-4 mg/day due to withdrawal symptoms.	BUP/NX 16-4 mg/day	No cravings endorsed at follow-up visits; toxicology screens unremarkable.
22	28-year-old woman at 19 weeks of gestation with history of alcohol use disorder in remission, stimulant (methamphetamine) and OUD (heroin) complicated by a bipolar spectrum diagnosis; presented to ED for symptoms of withdrawal due to kratom use.	Opioid substitution	4 months of use prior to presentation via smoking; unknown amount, frequency.	Upon admission to inpatient unit, BUP/NX induction occurred. Discharged on 4-1 mg 4 times/day. At 36 weeks gestation, BUP/NX increased to 20-3 mg daily to address withdrawal symptoms.	BUP/NX 4-1 mg 4 x/day; increased to 20-3 mg/day at 36 weeks gestation	Upon induced delivery at 39 weeks, patient continued with BUP/NX 20-3 mg during hospitalization; discharged on it with ongoing abstinence at follow-up.
23	57-year-old man with chronic back pain, anxiety, depression; originally prescribed oxycodone but developed iatrogenic addiction. After oxycodone was discontinued, transitioned to using kratom 1 year prior to presenting. Noted withdrawal when without kratom and sought help.	Pain management	1 year of use; unknown dose, duration, frequency, route of administration. Purchased from online retailer; spent ~$2500/month.	Outpatient induction to BUP/NX was performed; patient transitioned to 24-6 mg/day for maintenance.	BUP/NX 24-6 mg daily	Abstinence maintained at 7-month follow-up; confirmed by urine toxicology.
24	54-year-old man with history of depression, anxiety, and 16-year history of iatrogenic opioid addiction. Used kratom to assist quitting opioids but experienced difficulty when trying to stop. Presented to outpatient addiction treatment clinic for help.	Opioid substitution	Unknown amount, formulation, duration.	Inducted on BUP/NX 8-2 mg on day 1; increased to 16-4 mg on day 2 to target withdrawal symptoms and cravings.	BUP/NX 8-2 mg 2x/day	Maintained abstinence at 2 months while on BUP/NX 8-2 mg 2x/day. Weeks 2-5 post induction, urine mitragynine levels were 52.7, 36.6, 1.2, and < 1 ng/mL (negative), respectively.
25	Report of 9 veterans using kratom in 2013 and 8 more between 2016 and 2017. Two-thirds used kratom daily. One used kratom solely for pain and had an alcohol use disorder. Remainder had history of severe OUD and other substance use disorders. Kratom listed as opioid of choice in 50%; 40% noted tolerance and withdrawal.	Opioid substitution, pain management	Two-thirds had reported daily use of kratom. Formulation included tea/drink, capsules, leaves added to food, or multiple means.		BUP/NX, methadone, naltrexone	All who were opioid dependent were treated with BUP/NX, referred to a methadone clinic, or treated with naltrexone.

Abbreviations: ED, emergency department; BUP/NX, buprenorphine/naloxone; tbsp, tablespoon; PTSD, posttraumatic stress disorder; OUD, opioid use disorder.

ASAM's membership was 6,365. By using formulas for the maximum error of the estimates, we determined that—for a 95% confidence interval and margin of error of 0.4—a sample size of 564 was required.[19] The survey was distributed initially on January 9, 2020 and was available for 10 days, with 1 brief communication reminder sent during this period to the ASAM chapter presidents. A total of 711 participation invites were sent. Participants were registered electronically through an individualized link, responses were anonymous, and no personal identifiers were collected.

The survey was intended to gauge whether specialists have encountered patients suffering from KUD and how they have managed abstinence in such cases. Our main interest was in pharmacological management of KUD in isolation of past or comorbid OUD histories. Specific questions and flow are detailed in Appendix A.

Eighty-two participants completed the survey, a response rate of 11.5%. Data generated were analyzed via Qualtrics. Some participants who had encountered KUD in isolation of OUD also entered comments regarding management and outcomes (see Appendix B).

RESULTS

Literature Search

The literature review yielded 14 reports involving patients for whom long-term maintenance of KUD was required, including 7 with concomitant OUD diagnoses. Of those 7 patients, all received buprenorphine for maintenance with doses of 16 mg daily; 1 patient required increase from 16 mg to 20 mg due to pregnancy, and another required 24 mg daily. All had switched to kratom use to replace their opioid addiction.

Of the 7 patients without concomitant OUD, 4 were using kratom for pain management, 1 for anxiety/insomnia, 1 for concentration and focus, and 1 patient's reason for use was unclear. For maintenance, 1 patient was started on naltrexone, and 5 were started on buprenorphine at the following doses: 8 mg eventually tapered to 2 mg prior to pregnancy, 16 mg, 6 mg (2 patients), and 4 mg daily. The other patient was on buprenorphine initially; however, due to chronic pain, he eventually was switched to methadone. See Tables 1 and 2 and Figure 1 for a summary.

Survey

Eighty-two ASAM members completed the survey, and 69 qualified for study inclusion based on their credentials (physicians only). A total of 57 (82.6%) endorsed having encountered patients with KUD, including 19 (27.5%) who had patients with KUD only—no past or comorbid OUD (Figure 2). In managing their abstinence, 17 used buprenorphine (17/19, 89.5%)—including 6 who combined it with talk therapy 1 used methadone, and 3 used naltrexone. Additionally, 1 respondent used buspirone in conjunction with therapy, and another used talk therapy only (Figure 3). (Some of the participant-reported outcomes are included in Appendix B.)

Statistical Analysis

A biostatistician analyzed 2 research questions: (1) Does the proportion of those with kratom addiction in isolation of comorbid OUD from the survey match that found through the literature review? and (2) Among those without comorbid OUD from the survey, does the profile of maintenance modalities match that from the literature review? To address these questions, the survey data was compared with the historical data via a 1-sample proportion test.

Out of the 69 qualifying participants who completed the survey, 57 encountered cases of KUD, including 19 (19/57, 33.3%) cases in isolation of comorbid OUD. This is contrasted to the 14 reports found in the literature, with 7 (7/14, 50%) in isolation of OUD comorbidity. In terms of the profile for maintenance modalities, 17 survey respondents (17/19, 89.5%) endorsed having used buprenorphine maintenance, compared to 6 (6/7, 85.7%) found in the literature. A 1-sample proportion test shows that the proportion in isolation of OUD from the survey is significantly different from the proportion of 0.50 found in the literature (95% CI, 0.22-0.47; $P=0.02$). Given the small sample size of data and the fact that the upper limit of the confidence interval is close to 0.50, it is reasonable to believe that such a difference is not large. There is no significant difference between the profile of buprenorphine maintenance reported in the survey versus that found in the literatures (95% CI, 0.69-0.97; $P=0.64$).

DISCUSSION

Kratom is a botanical with a known addiction liability and, in vulnerable individuals, dependence may develop rather quickly with tolerance noted at 3 months and 4- to 10-fold dose escalations required within the first few weeks.[31] Kratom addiction carries a relapse risk as high as 78% to 89% at 3 months post-cessation.[7,8,32] Although there are numerous pathways that kratom's constituents act upon, the opioid pathway has received the most interest with respect to mediation of withdrawal and addiction.[33,34] This is consistent with the notion that stimulant effects are noted at low doses—5 grams or less daily, while opioid effects at higher doses and the doses used by those addicted to it indeed seem to range from 14 grams to 42 grams daily.[31] Unfortunately, most of the cases included in our review do not reference doses. In the 3 that do (all without comorbid OUD), 1 describes an individual using 7 grams every 4 hours, and 2 involve doses of 30 grams daily. One of the experts surveyed also mentioned having managed patients with histories of 30 grams daily use.

There are 2 main pathways describing how individuals are introduced to kratom – opioid substitution by those with OUD[35,36] and self-management of various ailments (ie, anxiety and mood states, pain) by those without OUD. The cases included in this review corroborate this notion. For patients with OUD, relapse rates without MOUD are in the 90% range[37-39]–similar to relapse

Table 2. Cases Reporting Maintenance Pharmacotherapy of Patients With Kratom Use Disorder Without Co-occurring Opiod Use Disorder

Ref No.	Clinical Paradigm	Reason for Kratom Use	Extent of Kratom Used	Intervention	Maintenance Regimen	Outcome
22	32-year-old woman at 22 weeks gestation presented to specialty clinic for pregnant women with substance use disorders. Had previously undergone radiation for Hodgkin's lymphoma, resulting in chronic shoulder pain and anxiety. Managed on oxycodone until previous pregnancy, but had been self-managing with kratom for previous 7 months. Attempted to stop kratom at 16 weeks gestation but resumed due to withdrawal.	Pain management, anxiety	7 months of use; unknown dose, duration, frequency, and route of administration.	After kratom abstinence period, patient started on BUP as outpatient; reported good results with 8 mg/day. Given concern of neonatal abstinence syndrome, tapered off BUP over 2 weeks but experienced severe depression and was restarted and maintained on 2 mg for remainder of pregnancy.	BUP 2 mg during pregnancy	Upon planned C-section at 39 weeks gestation, patient maintained on BUP; abstinence maintained at follow-up visits.
23	60-year-old woman with chronic pain and history of alcohol dependence in sustained remission presented following unintentional overdose on illicit methadone. No history of OUD; endorsed kratom use and was on a long-term opioid regimen with tramadol and oxycodone with no evidence of misuse. Discharged following admission and stabilization, but presented several months later because of difficulty stopping kratom due to rebound pain and withdrawal symptoms.	Pain management	At time of evaluation, 0.25 ounces every 4 hours; purchased via online retailer.	Outpatient induction to BUP/NX performed; patient then transitioned to 4-1 mg 4 x/day maintenance.	BUP/NX 4-1 mg 4x/day	Abstinence maintained at 9-month follow-up; confirmed by urine toxicology.
26	37-year-old woman with history of postpartum depression and 2-year history of kratom use to self-manage pain stemming from fibromyalgia and after surgery for carpal tunnel syndrome. Experienced withdrawal symptoms when trying to cut back; attempted outpatient detox with low-dose clonidine without success. Contacted mental health and addiction service for inpatient kratom detox; ultimately admitted for inpatient detox.	Pain management	Started using unknown amount of kratom capsules; transitioned to using kratom extract purchased from online retailer over 2 years.	As inpatient, treated with symptom-triggered clonidine protocol and supportive medications for 3 days prior to discharge.	Naltrexone 50 mg/day	Patient discharged to partial hospitalization program and instructed to start oral naltrexone on day 7 post-discharge.
27	20-year-old man with history of ADHD (treated with stimulant) presented to office-based addiction treatment clinic for KUD management. Had used kratom past 2 years to manage anxiety and insomnia but developed tolerance. Cessation attempts led to opioid-like withdrawal.	Anxiety, insomnia	2 years of use; increased gradually to every 2 hours for 30 g total daily dose. Obtained from local gas station and mixed with water into tea.	Outpatient induction to BUP/NX performed, starting with 4-1 mg 12 hours after last kratom use and with moderate withdrawal. Attempt to taper to 2-0.5 mg over 4 days resulted in withdrawal symptoms and dose was brought back up.	BUP-NX 4-1 mg daily	Noted difficulty tapering off BUP/NX with supervision. After 3 months treatment, had 1 setback on kratom when out of BUP/NX. Has maintained sobriety after several months, working to taper off BUP/NX.
28	35-year-old male veteran presented to addiction treatment clinic reporting escalating kratom use over past 3 years. Started using kratom for concentration but use gradually increased and became singular focus over work, school, and personal activity. Was able to reduce from 30g daily to 5g/day following motivational interviewing, but experienced withdrawal.	Focus, concentration	Daily use increased from 10 g/day initially to 30 g/day. First obtained from gas station; consumed in smoothie or shake form.	Outpatient induction to BUP/NX performed, 4-1 mg 2x/day.	BUP/NX 8-2 mg/day for 16 months, then decreased to 6-1.5 mg/day	BUP/NX increased to 12-3 mg to target evening cravings; decreased back to 8-2 mg/day due to sedation. Maintained abstinence at 16 months, corroborated by urine toxicology screens for mitragynine. After 16 months, BUP/NX dose decreased to 6-1.5 mg/day, with goal of tapering off over 1 year.
29	24-year-old man with history of alcohol use disorder, Asperger's, and kratom use presented to ED after being found down, minimally responsive, hypothermic, and having a witnessed seizure by emergency medical personnel. Upon stabilization in ICU, was transferred to inpatient psychiatric unit.		Unclear duration, but was using 600 mg/day prior to presentation.	BUP 2 mg started on hospital day 13 on psychiatric ward to target kratom cravings. On day 25, BUP increased to 4 mg 2x/day due to persistent signs/symptoms of withdrawal. Discharged to a rehab center on day 28. BUP discontinued initially but restarted at 2-0.5 mg 3x/day due to withdrawal symptoms.	BUP/NX 2-0.5 mg 3x/day.	Tapered off BUP/NX after 45 days at rehab center and discharged home.

continued on next page

Table 2 continued. Cases Reporting Maintenance Pharmacotherapy of Patients With Kratom Use Disorder Without Co-occurring Opiod Use Disorder

Ref No.	Clinical Paradigm	Reason for Kratom Use	Extent of Kratom Used	Intervention	Maintenance Regimen	Outcome
30	44-year-old man with history of alcohol use disorder presented to detox unit for help stopping kratom. Began use after brief use of nonprescription oxycodone for chronic abdominal pain. Noted difficulty stopping after 1 year due to withdrawal.	Pain management	1 year of use. Initally used a "tincture" dosed by "dropper squeeze;" gradually increased to "6 dropper squeezes" every 4-6 hours.	Inpatient induction to BUP to help with withdrawal.		At 15 months post discharge revealed use of oral opiates, including methadone and oxycodone, for chronic pain syndrome.

Abbreviations: BUP/NX, buprenorphine/naloxone; OUD, opioid use disorder; detox, detoxification; ADHD, attention deficit hyperactivity disorder; ED, emergency department.

rates for KUD—versus less than 50% when MOUD are implemented.[7,8,32] Hence, for those with both OUD and KUD, it is logical to utilize MOUD. In all such cases reported above, buprenorphine was used with good results in terms of opioid and kratom abstinence.

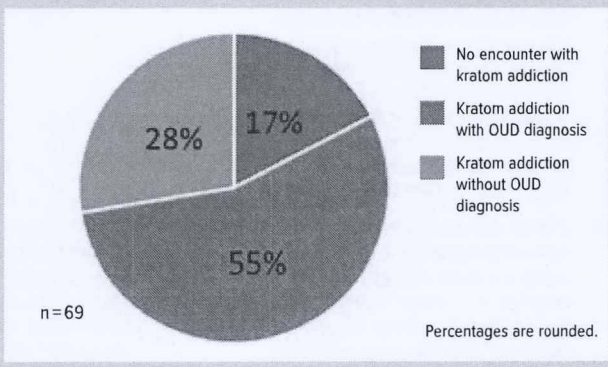
There is a clear need to establish a consensus on how to manage KUD independent of an OUD. As demonstrated in this review, there has been success with treating KUD using the same pharmacological agents as those approved for OUD. In the cases included here that did not involve a comorbid OUD diagnosis, clinicians have utilized naltrexone (n=1 case) and buprenorphine for maintenance. The use of MOUD to treat KUD has been hindered historically by the medicolegal aspects governing these agents, yet reports of treatment do exist and are corroborated by results of the survey conducted as part of this review.

There is pharmacodynamic evidence to suggest for those with OUD, ~70% mu receptor occupancy is required to achieve suppression of psychological aspects of opioid addiction.[40] Depending on the severity of one's OUD, for example high dose and intravenous use, upwards of 90% occupancy may be required.[41] Although the first may be achieved with 2-3 ng/mL plasma concentration of buprenorphine (corresponding with 8-16 mg oral dose), the latter would require 5-6 ng/mL (corresponding to 20-32 mg oral dose).[41] It is still uncertain what the opioid receptor dynamic with MG and 7-HMG is, however, it is believed that—at least for MG—it is very similar to buprenorphine.[12,13] From the cases included here, it appears that lower buprenorphine doses tend to be required for KUD in absence of OUD. Antagonist treatment has even been used in 1 case.

Limitations

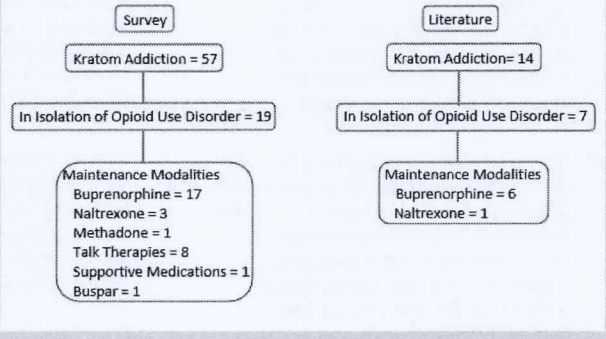
The cases resulting from the literature search and included in the analysis/comparison have a significant amount of heterogeneity in the descriptions, information provided (ie, kratom dose, route, etc), toxicology screens used for abstinence monitoring, reporting of maintenance follow-up duration, etc. Nonetheless, they all used buprenorphine or naltrexone for management of long-term abstinence as a general consensus.

Figure 2. Percentage of Survey Participants Who Have Encountered Any Kratom Addiction



Abbreviation: OUD, opioid use disorder

Figure 3. Pharmacological Modalities for Managing Kratom Use Disorder When Found in Isolation of Opioid Use Disorder



CONCLUSION

Through our survey, we assessed clinical practice patterns for management of KUD without the confounding OUD diagnosis, which would be a clear indication MOUD—the standard of care. A substantial number of respondents (82.6%) have encountered cases of KUD, of which the majority involved a comorbid OUD diagnosis. Those who endorsed treating cases of kratom addiction that did not involve a comorbid OUD reported having used primarily buprenorphine (89.5%) to manage abstinence, with the

rest using naltrexone and methadone. Based on some of the comments in Appendix B, the outcomes have been good and, like with OUD, counseling alone is not sufficient.

Together, the literature review and survey data suggest that a standard of care for maintenance of abstinence from kratom use in those with KUD hints towards the use of MOUD. This is especially true for individuals with histories of using in excess of 24 grams of kratom daily. The maintenance buprenorphine doses seem to be lower than those needed for OUD.

In light of the detrimental risks associated with growing reports of kratom use disorder and lack of any randomized controlled trials to explore treatment, this review provides sufficient evidence that the indication of MOUD should be extended to KUD as well. This is especially true if one's use of kratom involves high doses and meets DSM-5 diagnostic criteria for a moderate or severe substance use disorder.

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I am a Healthcare Executive and Nurse Practitioner who retired early due to disability. Despite struggling through many health issues during my life, I pushed through work and school earning my doctorate in nursing in 2011. Unfortunately, by 2015 my health issues led to an inability to stand longer than a few minutes, severe pain, fatigue, frequent choking, and gait instability. Finally, after extensive research and multiple specialist visits, I was diagnosed with several rare congenital disorders including:

1. Chiari malformation-the cerebellum in my brain was below my skull and placing pressure on my spinal cord and flattened my brain stem.
2. Tethered Spinal Cord- caused severe nerve pain to my trunk and legs.
3. Ehlers-Danlos hypermobility- a connective tissue disorder that leads to instability of joints and severe chronic pain.

Unfortunately, I was never able to find a low-risk tolerable way to control my pain and fatigue. Even after major surgery removing a portion of my skull and sewing a patch to my brain, I was only able to tolerate the prescribed Oxycodone for a week due to dizziness, confusion, and fatigue. I am so drug sensitive even acetaminophen (Tylenol) makes me so sleepy that I can only take it at bedtime. I did take Naproxen (Aleve) daily for 3 months which was minimally helpful but had to discontinue it due to the side effects.

Luckily, my son introduced me to Kratom. I like to say that I gave him his life, but he gave me mine back! Although I am still limited in my activity, my comfort level and fatigue have improved significantly with the use of Kratom without the side effects that I experience with other medications.

The fact that it is illegal to take Kratom in Wisconsin has been an extreme hardship and has affected my family's life significantly. I spend half of my time in Illinois away from my husband where I can take Kratom and have a healthy level of activity.

Please pass this legislation so I don't have to move to Illinois!

Sincerely,

Heidi Sykora RN, DNP

8 December 2021

Written Comment by Jack E. Henningfield, PhD

Vice President, Research, Health Policy and Abuse Liability, PinneyAssociates,

Bethesda, Maryland

To The

Wisconsin Committee on State Affairs Hearing on AB 599

I am Jack Henningfield, Vice President, Research Health Policy, and Abuse Liability at PinneyAssociates where I consult on the abuse/dependence potential of new medicines, tobacco products, cannabinoids, and natural products including kratom. I am also Professor, Adjunct, Behavioral Biology at Johns Hopkins University. Formerly, I was Chief of the Clinical Pharmacology Branch, and the Biology of Dependence and Abuse Potential Assessment Section of the National Institute on Drug Abuse, or NIDA. Through PinneyAssociates, I advise the American Kratom Association (AKA) on kratom science.

I recently completed an update of the abuse potential of kratom which includes over 100 new studies in the past three years. This updated 8-Factor Analysis, that was supported by the AKA, but which had no input or oversight by AKA, is available on the AKA website. A more recent peer-reviewed assessment of kratom abuse potential and safety includes addition studies and should be online in a special issue of Frontiers in Pharmacology addressing kratom science. It has been accepted for publication following peer-review and should be available online within a few weeks.

As a scientist, throughout my career I have worked closely with health policy staff at the Food and Drug Administration FDA), the Department of Health and Human Services (HHS), the National Institutes of Health (NIH), and the Drug Enforcement Administration (DEA) to protect the public by evaluating emerging substances, any safety threat they pose, and their associated addiction liability. All of us shared the common goal of protecting the public, and I continue to have enormous respect for my colleagues even where we occasionally disagree.

Kratom is an area where a substantial disagreement currently exists between the policy staff at the FDA and the scientists at NIH, NIDA, HHS, and DEA. It was not always the case. When the reports of 9 deaths in 2009 in a 12-month period from a powdered kratom product sold on the Internet known as Krypton, that legitimately raised the safety signal on kratom with public health officials around the world.

Over the next several years, the FDA widely disseminated their concerns about kratom that convinced six states, including Wisconsin, to ban kratom based largely on those 9 deaths in Sweden. The FDA also confidently assured the states that the DEA would classify two of kratom's alkaloids as Schedule 1 substances.

But the seven years since Wisconsin's policy makers were assured the DEA would be scheduling kratom, it has not happened. The reason is found in the 8-Factor Analysis where the science clearly

demonstrates that the FDA's assumptions about the safety profile and the addiction liability of kratom were plainly wrong. In fact, in the most recent assessment of the FDA's claims about kratom in a letter on August 16, 2018, by the HHS Assistant Secretary of Health Dr. Brett Giroir that withdrew the scheduling recommendation, it was determined that the FDA failed to provide the evidence and data required to ban kratom, and that "new data" disputed the FDA's claims about kratom. Dr. Giroir called it "disappointingly poor evidence and data" and cited the "significant risk of immediate public health consequences for potentially millions of users if kratom or its components are included in Schedule I."

In 2014, the FDA laid out a case based largely on assumptions to convince states to ban kratom, but the emerging science dramatically contradicts those now outdated assumptions. Today, the threat appears to be part of a common problem where unscrupulous bad actors are spiking otherwise safe substances with dangerous adulterants. With kratom, it is fentanyl, heroin, morphine – all of which are deadly when unsuspecting consumers think they are buying pure kratom.

Extensive new research, much of it supported by the U.S. National Institute on Drug Abuse, supports the following conclusions:

(1) The pharmacology of kratom reveals the profile of a relatively low abuse potential and low risk substance compared to most scheduled substances, and use is overwhelmingly by the oral route and does not escalate to injection, smoked, or nasal routes as is common with opioids and stimulants.

(2) Despite use by an estimated 10-16 million adults in the US, none of the major national surveys used to identify substance use public health threats indicate an imminent threat; the Drug Enforcement Administration or DEA, has never listed kratom in its annual drug threat reports, and in 2018 the Assistant Secretary of Health, Dr. Giroir, rescinded the 2017 FDA scheduling recommendation.

(3) National surveys in the US and Canada and studies in SEA region indicate that most consumption is to enhance health and well-being, and contributes to improved social and occupational performance, which is in contrast to prototypic controlled substances.

(4) There is evidence that removal of kratom would pose an individual and public health risk in countries (e.g., the US and Canada), and regions, (e.g., SEA) where kratom is widely used by people to abstain from opioids (also see Assistant Secretary Giroir's letter)

(5) New research confirms that kratom is rich in alkaloids with potential medicinal value. NIDA is funding extensive research that may lead to safer new medicines modeled or derived from kratom, but this is likely a decade or more away and scheduling would severely impede such research.

(6) Nature got it right: The most abundant alkaloid, mitragynine, common to most marketed products, primarily accounts for kratom's effects, is of relatively low risk and abuse potential, whereas other alkaloids, including the mitragynine metabolite, 7-hydroxymitragynine, is present at such low levels as to not substantially contribute to abuse potential or risks, or are of low pharmacological activity.

(7) I encourage regulatory frameworks such as were adopted by 5 states in the US to ensure that marketed products are pure and not adulterated or artificially elevated in alkaloid content, and with other risk-reducing provisions. Canada also has a potential model regulatory approach.

(9) Drs. Marilyn Huestis and Joseph Rodricks and I recently completed a study of the respiratory effects of oral mitragynine compared to oxycodone in a rat model published by FDA. Oxycodone produced dose related reductions in blood gas measures of respiratory depression and deaths. Over a wide range of doses, mitragynine did not produce dose-related respiratory depressant effects.

Thank you for your efforts and the opportunity to comment. I will be pleased to provide PDFs of research addressing any of my comments.

Pinney Associates

Leading Edge Kratom Science

Addressing Abuse Potential, Safety, Patterns of Use, Reasons for Use, and New Studies of Mitragynine, 7-hydroxymitragynine, and Other Kratom Alkaloids

September 2, 2021

An annotated update of the 2018 published review article:

The Abuse Potential of Kratom According to the 8 Factors of the Controlled Substances Act:

Implications for Regulation and Research

By

Jack Henningfield, Reginald Fant & Daniel Wang

This report was developed by

Dr. Jack Henningfield and colleagues at PinneyAssociates

For the American Kratom Association to inform and update policy makers, health and regulatory officials, and public health and medical experts on kratom safety and abuse potential

August 6, 2021

Acknowledgement and disclosure. This update of the Henningfield et al. 2018 kratom abuse potential assessment review is required to account for the significant number of new research studies that have been completed that collectively adds to the body of scientific evidence about the kratom plant and its constituent alkaloids. The American Kratom Association (AKA) and its affiliate, the Center for Plant Science and Health that funds new research into kratom, have supported an independent assessment of the current research landscape. This update followed a request for partial support of the time and effort for Dr. Henningfield and his colleagues at PinneyAssociates to develop the report. The purpose was to provide a state-of-the-art report to inform policy makers, health and regulatory officials, and public health and medical experts on kratom safety and abuse potential. AKA did not contribute to or influence the conclusions of Dr. Henningfield and colleagues at PinneyAssociates.

Through PinneyAssociates, Dr. Henningfield and his colleagues provide scientific and regulatory consulting to support new drug applications (NDAs) and risk management programs for a broad range of CNS active substances and drug products including psychedelic substances, new chemical entities, and alternative formulations and routes of delivery, as well as dietary ingredient notifications, cannabinoid assessment, and noncombustible tobacco/nicotine products for FDA regulation.

PinneyAssociates scientific experts who contributed to this report include: Rachel Beck, PhD; August Buchhalter, PhD; Yolanda Green; Marilyn Huestis, PhD, HonD; Mark Sembower, MS; and Daniel Wang.

We also acknowledge the thinking embodied in this document by our former colleague and co-author of the 2016 kratom Abuse Potential Assessment submitted to the DEA and FDA and its updated published version in 2018. Dr. Fant died in September 2020, and we miss him dearly. See more about our team and Dr. Fant at www.pinneyassociates.com.

Preface and Main Findings

Background: The 2018 Henningfield, Fant & Wang kratom abuse potential assessment was based on a 2016 assessment developed by Dr. Henningfield and colleagues at PinneyAssociates to inform the United States (US) Drug Enforcement Administration (DEA) and Food and Drug Administration (FDA) in their assessment as to the most appropriate regulatory approach to kratom and whether listing kratom (specifically, its alkaloids mitragynine [MG] and 7-hydroxymitragynine [7-OH-MG]) in Schedule I of the Controlled Substances Act (CSA) was warranted and in the interests of public health.

In brief, we concluded there was no evidence of an imminent threat to public health (a requirement for temporary or emergency scheduling) and that kratom was not like opioids in its safety and addiction risks. Furthermore, there was evidence that millions of people were using kratom for reasons associated with health and well-being, including in place of opioids they had been using for pain and/or addiction, and that thousands of people would be at risk of relapse to opioids and overdose if sale of kratom were banned and possession considered a narcotic criminal offense. We also concluded that banning kratom would foreseeably lead to the emergence of a deadly illicit market that would worsen what appeared to be the main problems with kratom, namely contaminated, adulterated, and inappropriately marketed products. We concluded that these problems could be addressed by continuing to allow legal sale of kratom but with FDA oversight providing standards for product quality, labeling, and other issues that FDA routinely addresses.

Overview of main findings: This update reaffirms all of the conclusions of the 2018 report. The more than 100 new peer-reviewed published studies by researchers worldwide and many laboratory studies in the US with funding from the National Institute on Drug Abuse (NIDA), sustain those earlier findings. These studies provide a much fuller characterization of how kratom works and how it provides the benefits that many people report as their reason for use, but without narcotic-like addiction and overdose risks. The studies include the state-of-the-art types of animal abuse and physical dependence/withdrawal studies that FDA requires for new medicines and which DEA relies on for drug scheduling decisions. New clinical studies in humans provide initial assessments of kratom's physiological health and safety related effects on liver, kidney, and cardiovascular function, as well as brain function, using magnetic resonance imaging techniques.

Conclusions based on new studies since January 1, 2018

- *Since the Henningfield, Fant & Wang (2018) 8-FA, there have been over 100 new published scientific studies, reviews, and commentaries by leading kratom experts, and an accelerating research pipeline funded in part by the US National Institutes of Health (NIH), National Institute on Drug Abuse (NIDA). These studies provide an increasingly strong evidence base for regulation and policy.*

- *Nature got it right. There is a convergence of studies showing that the main natural constituent of kratom that accounts for the reasons people use kratom is MG, which carries relatively low abuse and health risks (See below). 7-OH-MG naturally occurs at*

very low levels and product standards should prevent marketing of products with levels higher than those that appear to carry little risk.

- *Evidence does not support the conclusion that kratom is an imminent public health threat or that it is fueling the opioid and drug overdose epidemic that led to more than 93,000 deaths in 2020. Rather, the evidence supports the conclusion that for many people kratom is a path away from opioids and other drugs to help self-manage craving and withdrawal for people who find kratom more effective, accessible, acceptable, tolerable, and/or prefer natural products.*

- *Animal drug self-administration, physical dependence, and withdrawal studies show low abuse potential and withdrawal risks of kratom relative to opioids. Furthermore, these studies also show that MG administration can reduce self-administration of morphine and heroin as well as withdrawal from morphine. These findings are consistent with human surveys and studies showing that addiction risks for kratom are overall low as compared to opioids.*

- *Numerous surveys and field studies of kratom users have been conducted in the US and Malaysia. These new studies largely confirm the earlier large US survey on kratom consumer usage patterns published by Dr. Grundmann (2017). Most US kratom users are 30-50 years old, employed, have some college education, and have health insurance. Leading reasons for use are to self-manage pain, depression, anxiety, to increase focus and alertness analogous to caffeinated beverage use, and to self-manage opioid and other substance use disorders to relieve craving and withdrawal and often the pain that motivates such drug use.*

- *Surveys also show that users fear a kratom ban and the risks of resumption of opioid and other drug use, and/or turning to illicitly marketed kratom. This makes it foreseeable that thousands of people would be at risk of opioid overdose and other mortality risks associated with illicit drug use, injection drug use, and adulterated kratom products.*

- *Studies of kratom's alkaloids support the conclusion that that MG and other alkaloids are not appropriately categorized as opioids, as they are diverse in their activity, effects, and mechanisms of action. Moreover, the primary active constituent of kratom, MG, does not produce the signature powerfully rewarding and lethal respiratory depressant effects that characterize morphine-like opioids.*

- *Kratom PK and safety studies include examination of the pharmacokinetics (PK) and pharmacodynamics (PD) in rats and dogs by oral and intravenous administration of many kratom alkaloids in addition to MG. MG, at human dose equivalents many times higher than humans take, are without acute serious adverse effects and there is little evidence of a respiratory depressant effect.*

- *Six clinical studies evaluated the effects of long term kratom use on a variety of physiological parameters including kidney and liver function, hematological parameters, cognition, and brain function by magnetic resonance imaging. Although these were*

relatively small studies, none suggest serious adverse consequences of long term kratom use. It is important to note that these are not definitive safety studies and cannot be used to claim that kratom has no adverse effects on any of the studied physiological domains and limitations of each study were noted in the publications. Nonetheless, the findings are encouraging and should facilitate the conduct of more comprehensive follow-up studies.

- *New medicine innovation efforts are developing new molecules as analogs of MG and other kratom alkaloids as possible safer and/or more effective treatments for pain, addiction, depression, and other disorders, due to the promising findings with kratom and its naturally occurring alkaloids. These efforts are also contributing to knowledge about kratom safety and effects; however, New Drug Applications (NDAs) typically require a decade or more of research at costs often exceeding one billion dollars before they can be submitted for review and potential approval by the FDA.*

- *The pipeline of research and new science has been enhanced in quantity and quality not only by funding from the US National Institutes of Health (NIH) and other organizations but as well by regular scientific conferences that are fostering global collaboration and cooperation in an exciting new frontier in search of safer and more effective ways to manage health and well-being. Such efforts are working and should be expanded.*

- *These scientific findings taken together have implications for consideration of kratom regulation by the Controlled Substances Act (CSA). The CSA is intended to protect the public health from substances that pose as imminent threat to public health, and in the case of medicines with a potential for abuse to ensure that they are appropriately regulated if the science supports placement in the CSA. Kratom is not a new drug but rather is a naturally occurring substance with decades of history of use in the US and much longer in Southeast Asia where it grows in abundance and is used by many more people. The scientific evidence does not indicate a profile of meaningful abuse potential or physiological dependence potential of its primary active constituent, mitragynine. This review supports the key findings and action by Assistant Secretary of Health, Dr. Brett Giroir (Giroir, 2018) to rescind the 2017 recommendation (FDA, 2017a) to place MG and 7-OH-MG in Schedule I of the CSA. Specifically, it supports the conclusions that "mitragynine does not satisfy the first of the three statutory requisites for Schedule I", and that "there is a significant risk of immediate adverse public health consequences for potentially millions of users if kratom or its components are included in Schedule I" and that the very research that all parties agree is needed would be severely stifled by CSA scheduling.*

- *Kratom regulation would be better informed by scientific and public health information exchange and active collaboration among CDC, DEA, FDA, NIDA, and the Substance Abuse and Mental Health Services Administration. Kratom science should be accelerated by increased kratom research funding to NIDA, as well as to support increased surveillance that is specific to kratom. As in other areas of science and public health, progress and process would likely be improved if federally funded kratom*

research had input and possibly oversight by a multi-agency task force and with an annual report developed with updates on the state of kratom science and annual surveillance, perhaps led by NIDA.

- *An important development that relates to overall safety, health benefits and risks of kratom use is a regulatory and policy update and is not included in the science updates: at the time of this writing, five states, Arizona, Georgia, Nevada, Utah, and Oklahoma, have enacted laws referenced as the Kratom Consumer Protection Act (KCPA). The KCPA establishes a regulatory framework to protect consumers from unsafe and adulterated kratom products that by requiring manufacturers strict adherence to good manufacturing standards (GMP) to ensure purity; requires testing for contaminants; prohibits adding any dangerous substances to kratom products; forbids boosting the alkaloid levels of MG and 7-OH-MG over those present in the natural kratom plant; bars synthesizing any of the alkaloids; requires registration and product testing; prohibits any therapeutic health claims; and forbids sales to minors. These KCPA laws provide needed consumer protections for consumers. To illustrate the kratom regulatory framework for the Utah KCPA, the Utah Department of Agriculture rule on kratom can be found at https://ag.utah.gov/businesses/regulatory-services/kratom/ . For updates on the status of KCPA legislation in other states, visit the American Kratom Association website at https://www.americankratom.org/advocacy/aka-in-your-state.html .*

Contents

1 Introduction

This is a scientific update to “The abuse potential of kratom according to the 8 factors of the Controlled Substances Act: implications for regulation and research”, by Jack Henningfield, Reginald Fant, and Daniel Wang (Henningfield, Fant & Wang, 2018). Primarily findings and conclusions quoted directly from kratom-related scientific research since December 2017 are included.

Seven of the eight factors of the Controlled Substances Act were affected by new research and survey data. The eighth factor did not change, as neither kratom nor any of the constituents in kratom or its alkaloids are controlled substances, nor are they immediate precursors of controlled substances.

This update includes several new studies employing a variety of state-of-the-art animal models of abuse potential, physical dependence, and withdrawal potential as compared to opioids and other classic drugs of abuse. The understanding of kratom’s mechanisms of action and its safety profile help explain not only why it differs from opioids with respect to safety but also its relatively low potential for abuse and dependence.

1.1 Comments on Efficacy, Risk, and Drug Scheduling According to the Controlled Substances Act

Therapeutic efficacy standard by FDA. This research update includes additional evidence that the major reasons for kratom use for millions of people in the US are for health and well-being including for self-management of pain, addiction, depression, and other disorders. The evidence includes peer reviewed surveys and field studies in the US and Southeast Asia (SEA), some clinical studies, and many animal studies that show that the mechanisms of action of MG are consistent with such effects. Moreover, several animal models used to predict efficacy for treating opioid use disorder, opioid withdrawal, and pain, demonstrated efficacy.

However, none of this research meets FDA’s standard for therapeutic efficacy which is typically determined by evaluation of a New Drug Application (NDA) (whether NDA is based on a new chemical entity or botanical substance). The NDA must be supported by “substantial evidence of effectiveness,” and is defined as “evidence consisting of adequate and well-controlled investigations” (Dabrowska & Thaul, 2018; Katz, 2004). The time and cost to develop and achieve FDA approval of a product as therapeutically effective and acceptably safe varies widely but is often approximately ten years and 1 billion dollars (DiMasi, Grabowski & Hansen, 2016; Wouters, McKee & Luyten, 2020). Only two botanical substances have been developed as drug products consistent with FDA’s Botanical Drug Guidance (FDA, 2016).

Thus, by FDA’s standard for efficacy, no kratom product or kratom alkaloid or derivative is recognized as therapeutically efficacious or “safe and effective”. This report does not endorse or recommend therapeutic use. However, terms such as therapeutic use are used in many of the articles cited and by many consumers of kratom who report using it for and obtaining therapeutic benefits. Denial of this would not be consistent with the science regardless of whether it meets the FDA standard. Neither should it be denied that studies estimate that over ten million people in the US (AKA, 2019; Henningfield, Grundmann, Garcia-Romeu & Swogger, 2021) use kratom products and find them acceptable, and sometimes preferred over

other products. For this population, kratom is perceived as effective, accessible, tolerable, and preferable as a natural product compared to conventional medicines.

1.1.1 Comment on Risk

Risk is a relative concept. This report discusses many risks and benefits of kratom, particularly as compared to morphine-like opioids which carry far greater risks of addiction and overdose death as discussed in the report (see also Henningfield, Grundmann, Babin, et al., 2019). This research does not suggest that kratom consumption is without risk. It is also important to recognize that kratom is not approved for therapeutic use by the FDA. Therefore, surveys showing that individuals use kratom to improve personal health and wellbeing, and for self-management of disease should not be taken as endorsements of such use or that use is without risk.

1.1.2 Comment on Drug Scheduling

Drug scheduling in the US is guided by the Controlled Substances Act (CSA). For new drugs, scheduling recommendations are developed by FDA, with input from NIDA and transmitted to DEA by the Assistant Secretary of Health (ASH) to the Administrator of the DEA (FDA, 2017a; Giroir, 2018). The same process can be applied to substances that are not approved as drugs and this process was followed for the 2017 FDA recommendation that MG and 7-OH-MG be permanently placed in Schedule I of the CSA, although it was concluded in a critique of the FDA recommendation that there was no evidence of actual NIDA input into the FDA 8-Factor Analysis (FDA 2017a; Henningfield, Babin, Boyer, et al. 2018).

By law and in practice, following FDA's 2017 Guidance (FDA, 2017b), scheduling decisions are guided by analysis of the eight factors of the CSA, which include three factors (nos. 4, 5 and 6) that address public health implications of scheduling including whether it is in the interest of public health to schedule a substance and, if so, which schedule is most appropriate. Regardless of the actual level of abuse potential and public health risk, if it is determined that a substance warrants CSA scheduling and it is not approved for therapeutic use by FDA (i.e., as an approved drug), only Schedule I (C-I) is an option. If the substance or product is approved for therapeutic use and is recommended for CSA scheduling then it will be placed in Schedule II, III, IV or V, in which V is least restrictive (e.g., lacosamide, pregabalin, and low dose codeine plus acetaminophen) and Schedule II is most restrictive (e.g., amphetamine, fentanyl, morphine) supported by the 8-factor analysis. For discussions and examples of the process and how public health considerations including risks and benefits related to scheduling are considered, see FDA's 2017 Guidance and review articles (Belouin & Henningfield, 2018; FDA, 2017b; Giroir, 2018: Johnson, Griffiths, Hendricks & Henningfield, 2018; Spillane & McAllister, 2003).

The science update supports the conclusion that kratom is providing a public health benefit by enabling millions of people in the US to self-manage their health and well-being and that it is foreseeable that banning sales and criminalizing those who possess kratom could lead to thousands of opioid overdose deaths among people who reverted to opioid use. We believe that individuals and public health would be better served by regulations that ensure that lawfully marketed products are pure, uncontaminated, and unadulterated by other harmful substances, drugs, or unnaturally high levels of kratom's naturally occurring alkaloids, and that

kratom products are appropriately marketed, packaged, and labeled and unsubstantiated health claims are not made.

1.2 Approach

This update is based on a review of studies published primarily since January 1, 2018 to update the science cited in the Henningfield, et al. (2018) 8-Factor Analysis which was completed and accepted for publication in December 2017.

Published literature was obtained by internet searches and a direct request for the most recent published and "accepted for publication" studies of more than twenty of the leading kratom research centers and research leaders worldwide. Conclusions were also influenced by the several national and international meetings in which new kratom research findings were presented and discussed each year (including virtual meetings from March 2020 to the present).

We do not represent this as a consensus report but have made every effort to reflect the thinking of other leading kratom science and policy experts. The approach to our study summaries is to rely heavily on direct quotes from the authors of articles or brief summaries that we feel accurately represented the articles. We provide the references and will make available the library of the more than 100 articles on request. It is our intent that this transparent process will also facilitate efforts to contact researchers for more information about their research and thinking.

A review of this body of evidence strengthens the conclusions of the 2018 8-FA that the public health benefits of continued access to kratom (ideally, with a regulatory framework developed by FDA with input from stakeholders and experts and other agencies including NIDA) outweigh the risks.

Kratom and its primary alkaloid, mitragynine, is not without risks or devoid of abuse potential; however, those risks are overall relatively small as compared to the serious risks of a kratom ban. The abuse potential of kratom and mitragynine do not rise to the level of abuse potential or risk that would be effectively or appropriately mitigated by placement in the CSA. This takes into consideration the overall public health impact, as required by consideration of factors 4, 5 and 6.

Thus, this update does not fundamentally change the following conclusion of the 2018 8-FA:

> "The overarching public health and policy question is not could kratom be regulated as a controlled substance but rather should kratom be so regulated. From a pharmacological perspective, this review suggests, as concluded by Henningfield (2015) and Pinney Associates (2016) that a case could be made to place kratom in the CSA. In fact, if MG, for example, was a newly discovered active chemical entity in a medicine submitted for approval by FDA, and hence without decades of use in the community, it would certainly be evaluated for potential scheduling according to the CSA and FDA's guidance (FDA 2017b), and it might be recommended for scheduling following its approval as a therapeutic medicine." (Henningfield, Fant & Wang, 2018, p. 585)

1.3 Comment on Current State of Research

There have been extensive new scientific advances since 2018 on the impact of kratom on substance use disorders and rehabilitation. This includes many thoughtful integrative reviews. We provide an example of one of these that we think provides a useful framing from this report.

Drs. Veltri and Grundmann (2019) concluded as follows:

> "Throughout its history of use, Kratom has been known to exert stimulant- and opioid-like effects that is raising concerns with regulatory agencies and resulted in scheduling actions in various countries. Although knowledge from clinical studies is limited, epidemiological data obtained from Southeast Asia, Europe, and the United States indicate that Kratom has a distinct user profile and presents with discrete effects from other stimulants or opioids. A substance-dependent opioid user does not prefer Kratom over another opioid but instead would utilize Kratom as a harm reduction or mitigation agent. This has been the conclusion from studies in Malaysia and the United States although the current information is preliminary in scope based on the small sample sizes and regional limitation of the surveys. The findings do align with preclinical observations in rodents that report a reduction in morphine self-administration with the use of mitragynine. This current knowledge points to a potential for further development of mitragynine or use of Kratom as a harm reduction agent similar to methadone or buprenorphine….While a majority of regular Kratom users in Southeast Asia and the West alike do not experience acute or chronic adverse effects, the incidence of unwanted side effects remains unknown and can include both stimulant and opioid-like sedative effects….a direct causative link between the fatalities in which Kratom was detected cannot be drawn because nearly all of them involved poly-drug exposures. The toxicity of Kratom in various animal species is variable and has not been determined for most of them following acute and chronic exposure. The only clinical pharmacokinetic study in humans that provides blood concentrations of mitragynine does not correlate with post-mortem blood mitragynine concentrations thus not allowing for the determination of a toxic or lethal cut-off level…. Reports and studies of the dependence potential to Kratom are of serious concern given the current opioid crisis in the United States and rising abuse of opioids in other countries. It appears that most Kratom-dependent users had a prior substance use disorder or were seeking relief from a chronic pain condition but wanted to avoid opioid use. The severity of Kratom dependence symptoms appears to be milder compared to opioid use disorder…" (pg. 29)

Note that research is rapidly expanding in the US and SEA, especially at the Center for Drug Research (CDR), Universiti Sains Malaysia, in part due to increased support of kratom related research by NIDA. For nearly a decade, NIDA has supported research into potentially safer and less abusable medicines for pain and treatments derived from kratom alkaloids for opioid use disorder. This is among the more rapidly expanding areas of research providing new facts and insights to characterize the benefits and risks of kratom use and how appropriate regulation could minimize risks.

Along with this accelerated research, NIDA has also supported conferences in the US and internationally which have been important in the facilitation of research sharing. This has also fostered global collaborative efforts that are evident in many of the published articles in this update in which authorship represents multiple research centers, sometimes from three or four countries.

Two conferences in particular are important to note for their important research stimulating effects. The first was the 2018 NIDA International Forum: Building International Collaborative Research on Drug Abuse, June 8–11, as a satellite meeting of the annual College on Problems of Drug Dependence meeting, which itself included a major kratom symposium and several individual presentations by researchers whose work is included in this update.[1,2]

The second major international meeting that accelerated research and fruitful cross disciplinary, global collaborations was the NIDA supported Second International Kratom Symposium convened by the University of Florida Clinical and Translational Science Institute and the Department of Pharmacodynamics from February 8-10,2019.[3] See more about their program and efforts to accelerate kratom science at the University of Florida Kratom Resource page[4].

An additional influence on the conclusions of the present report were policy efforts that involved more than a dozen kratom and substance abuse research leaders developing three reports in the form of open letters to update FDA, DEA, NIDA, the White House, and Congressional leaders[5,6,7] . These reports were also developed with support from the AKA. Each of these reports were co-authored and signed by nine or more contributors with eight contributing to all of them.

As the safety and effects of kratom and its primary active alkaloid MG have become increasingly studied over the past 5-10 years there have been a growing number of articles and scientific meetings exploring the diverse potential public health and therapeutic benefits of kratom that are already evident (Grundmann, Brown, Henningfield, et al., 2018; Prozialeck et al., 2020; Sharma & McCurdy, 2021). All of these articles recognized that the FDA standard for therapeutic benefit, which is generally approval of a new drug application (NDA) for therapeutic use, has not been met.

To date, there has not been an NDA submission to FDA for a kratom product and it is not clear that there ever will be. However, kratom-related potential new drug development efforts are already underway as some companies have announced on their websites (e.g., Kures

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[1] https://www.drugabuse.gov/international/2018-nida-international-forum-building-international-collaborative-research-drug-abuse
[2] https://www.drugabuse.gov/international/kratom-research-presented-nida-international-forum-promotes-international-cooperation
[3] https://www.leg.state.nv.us/App/NELIS/REL/80th2019/ExhibitDocument/OpenExhibitDocument?exhibitId=41965&fileDownloadName=0403ab303c_gasr_symposium.pdf
[4] https://pd.pharmacy.ufl.edu/research/kratom/
[5] February 2018 Letter to White House and DEA at http://www.americankratom.org/images/file/Document%2019%20Science%20Letter%20on%20Kratom%20Sent%20to%20WH%20and%20DEA%20Feb%208%202018.pdf
[6] June 2018 Letter to Leaders of Congress at https://www.americankratom.org/images/16_Kratom_Scientist_Letter_to_Congressional_Leaders_June_21_2018_FINAL.pdf
[7] November 2018 letter to DHHS, FDA, DEA, and NIDA critiquing the FDA's kratom 8 Factor Analysis at https://www.americankratom.org/images/file/Scientists-Response-to-FDA-Kratom-8FA--28-Nov-2018-FINAL.pdf

Therapeutics, Inc[8] and Sparian Biosciences[9]). The foregoing efforts include scientists on their teams who have been researching kratom alkaloids, with support from NIDA, as part of NIDA's efforts to foster research to stimulate the development of new medicines to treat substance use disorders as well as medicines for other disorders for which the present leading medicines carry addiction and safety risks.

2 Summary of Findings

For each factor, this report will begin with a short summary of the main finding of the 2018 8-Factor Analysis (8-FA), followed by key scientific updates, and finally conclusions. Mitragynine is abbreviated "MG" and 7-hydroxy-mitragynine "7-OH-MG". Unless specified, "opioids" means morphine, heroin, oxycodone and fentanyl, and other full opioid agonists, and not opioid antagonists such as naloxone (Narcan®) or naltrexone, or the partial opioid agonist buprenorphine.

2.1 Factor 1 – Actual or Relative Potential for Abuse

2.1.1 Summary of 2018 Findings

Henningfield, Fant & Wang (2018) did not have the benefit of classic animal self-administration and withdrawal studies of kratom's alkaloids; however, other data suggested relatively low abuse potential as compared to opioids and other drugs of abuse. Survey data from the US and field studies in SEA observed most kratom use was for health-related benefits, including management of drug dependence and drug withdrawal, primarily for opioid related dependencies but also for alcohol and stimulant use disorders. Initial drug discrimination and conditioned place preference (CPP) studies with rats suggested weak opioid-like discriminative effects and weak rewarding effects at extremely high human dose equivalents that might not be tolerable in humans. Taken together, the 2018 Factor 1 evidence suggested that kratom was not without abuse potential but that its potential for individual and societal harm was relatively low as compared to opioids and other drugs of abuse.

2.1.2 Factor 1 Science Updates

2.1.2.1 Intravenous (IV) Self-administration Studies of Abuse Potential

Two 2018 studies provided assessment of kratom's abuse potential in the IV rat self-administration model, the most predictive animal model for reinforcing effects and abuse potential (FDA, 2017b). In addition, MG's brain rewarding effects were evaluated in the intracranial self-stimulation model and the CPP procedure.

Hemby, MacIntosh, Leon, et al. (2019) summarized the reinforcing effects of MG and 7-OH-MG compared to morphine, and also evaluated pretreatment of animals with MG or 7-OH-MG on morphine self-administration:

> "The present findings indicate that MG does not have abuse potential and reduces morphine intake, desired characteristics of candidate pharmacotherapies for opiate

[8] https://www.kures.life/
[9] https://www.sparianbiosciences.com/

addiction and withdrawal, whereas 7-HMG should be considered a kratom constituent with high abuse potential that may also increase the intake of other opiates." (p. 1)

It is important to note that the reinforcing human dose equivalents of 7-OH-MG in the rat were many times higher than would be tolerable for humans, and that 7-OH-MG is present at or near de minimis levels in kratom leaves and most marketed products. Their findings support recommendations that marketed kratom products should not contain more than 1-2% 7-OH-MG, the highest concentration found naturally in plants and that does not provide reinforcing or harmful effects. This is the approach adopted by states that passed Kratom Consumer Protection Act laws to regulate kratom.[10]

Yue, Kopajtic and Katz (2018) compared MG's reinforcing effects to heroin and methamphetamine and evaluated MG pretreatment of animals prior to the opportunity to self-administer heroin or methamphetamine. Their conclusions:

> "In rats trained to self-administer methamphetamine, saline substitutions significantly decreased the number of responses, whereas different doses of methamphetamine (0.002–0.068 mg/kg/injection) or heroin (0.001–0.03 mg/kg/injection) maintained self-administration with maximal responding at 0.022 or 0.01 mg/kg/injection, respectively. In contrast, no dose of mitragynine maintained response rates greater than those obtained with saline. Presession mitragynine treatment (0.1 to 3.0 mg/kg) decreased response rates maintained by heroin but had little effect on responding maintained by methamphetamine across the same range of doses. These results suggest limited abuse liability of mitragynine and the potential for mitragynine treatment to specifically reduce opioid abuse. With the current prevalence of opioid abuse and misuse, it appears currently that mitragynine is deserving of more extensive exploration for its development or that of an analog as a medical treatment for opioid abuse." (p. 2823)

2.1.2.2 Intracranial Self-Stimulation (ICSS) Study of Abuse Potential

Another classic model for assessing the brain rewarding effects and drug abuse potential is the intracranial self-stimulation (ICSS) model. In the ICSS model, rats are equipped with electrodes in brain regions that lead animals to press a lever to self-deliver rewarding electrical brain stimulation (Negus & Miller, 2014). Opioids, amphetamine-like stimulants, cocaine, and other classic drugs of abuse reduce the threshold of stimulation and increase the strength of the rewarding effect of brain stimulation that delivers small electrical stimulations.

Behnood-Rod, Chellian, Wilson, et al. (2020) compared the potential brain rewarding effects of MG to morphine and found that morphine robustly and dose-dependently decreased the stimulation threshold consistent with other opioids, cocaine, amphetamine, and other drugs with high abuse potential (see also, Negus & Miller, 2014). In contrast, MG produced only a weak reduction in threshold with higher doses increasing the threshold. 7-OHMG did not reduce thresholds. Behnood-Rod, et al. (2020) concluded:

[10] https://www.americankratom.org/media/attachments/2021/01/25/kcpastates.pdf

> "These initial findings indicate that mitragynine and 7-hydroxymitragynine are not rewarding in the ICSS procedure. The present results suggest that these kratom alkaloids do not have abuse potential." (p. 7)

2.1.2.3 Conditioned Place Preference Studies of Abuse Potential

Four studies employing various preparations of MG on CPP observed mixed effects across studies and some evidence suggestive of abuse potential at high doses. Japarin, Yusoff, Hassan, et al. (2021) evaluated cross-reinstatement of MG and morphine place preference in rats.

Another study found that baclofen pretreatment could prevent the acquisition and expression of MG-induced CPP (Yusoff, Mansor, Müller et al., 2018).

CPP also was demonstrated in mice but at high doses of a methanolic extract of kratom leaves (Vijeepallam, Pandy, Murugan, et al., 2019). The relevance of the high dose CPP studies to humans is not clear but is an example of the importance of diverse scientific approaches to better profile the overall safety including abuse potential of substances.

In the fourth study, described in greater detail I Factor 2, Wilson, Harris, Eans, et al. (2020) evaluated lyophilized (freeze-dried) kratom tea (LKT) as a potential treatment for pain and opioid dependence in a mouse model in which mice (referred to as knockout mice) were absent various drug receptors. The effects of oral LKT were examined in a warm water tail assay for nociception (pain relief), locomotor effects, respiratory depression, conditioned place preference, and to determine if it would reduce withdrawal signs in mice that were made physically dependent to on morphine by chronic morphine administration.

LKT did not induce conditioned place preference. See Factor 2 for summary of results on other measures.

Taken together these seven studies found no evidence of rewarding effects of MG in the IV self-administration and ICSS models, and weak evidence of potential reward in the CPP procedure.

2.1.2.4 Physical Dependence and Withdrawal Studies

The CDR at University Sains, Malaysia is actively evaluating MG's potential to produce physical dependence and withdrawal, as well as how its effects differ from those of classic opioids in animal physical dependence models evaluating substances under development as potential new medicines.

Harun, Johari, Mansor & Shoaib (2020) performed a series of studies comparing withdrawal following chronic MG and chronic morphine administration. Physical dependence with naloxone challenge tests and MG's effectiveness at reducing morphine withdrawal were evaluated. These studies found little evidence of physical dependence or withdrawal as compared to morphine and evidence of potential therapeutic benefits of MG for treating opioid withdrawal, consistent with human reports. Harun et al. (2020) concluded:

> "…the discontinuation of MG was not associated with the disruption of schedule-controlled behaviour in rats. This suggests that MG or analogs might be further investigated as potential therapeutic drugs for treating OUD and opioid withdrawal…The findings from this study suggest that discontinuation of MG is not associated with overt withdrawal effects, a finding that supports published studies using other behavioural models. For example, Hemby et al. (2019) and Yue et al. (2018) found that MG administration reduced IV morphine self-administration in rats but that MG itself did not maintain self-administration. The findings may suggest that MG possesses the desired characteristics of candidate pharmacotherapies for opioid dependence and withdrawal…. Although mitragynine may possess some addictive properties on its own, it may, in low-medium doses, in which humans voluntarily use it, help to manage opiate addiction." (p. 864)

In a follow-up study to Harun, et al. 2020, Johari, Harun, Sofian & Shoaib (2021) compared mitragynine to morphine withdrawal using the pentylenetetrazol (PTZ) discrimination mode for evaluating anxiogenic signs in rats. Although there are qualitative similarities in kratom withdrawal signs with opioid withdrawal signs, they are not only weaker for kratom but also may be distinct in several respects and this model can be helpful in characterizing the profile. The administration of PTZ produces a rodent model of anxiety that is used in pharmaceutical development. Morphine dependent rats press levers associated with PTZ administration when withdrawal is precipitated by naloxone administration. A recent study showed that MG withdrawal was not associated with such a response.

Twenty rats were treated with either MG at doses known to produce some physical dependence and withdrawal in rats and morphine. Then they were challenged with naloxone. Johari, et al. (2021) concluded as follows:

> "Unlike morphine that produced dose-related PTZ-like stimulus, MG at 3, 10, 30 and 45 mg/kg doses showed no substitution to the PTZ discriminative stimulus. In contrast to morphine which produced a time-dependent generalization to the PTZ stimulus, naloxone did not precipitate withdrawal effects in MG-treated rats as they selected the vehicle lever at three withdrawal time points. These results demonstrate that MG produces a very different response to morphine withdrawal that is not associated with anxiogenic-like subjective symptoms. These characteristics of MG may provide further support for use as a novel pharmacotherapeutic intervention for managing opioid use disorder." (p. 1)

Hassan, Pike See, Sreenlivasan, et al. (2020) compared the efficacy of MG to methadone for treating morphine withdrawal in a rat model of physical dependence and withdrawal. Hassan, et al. (2020) concluded:

> "…the morphine withdrawal model induced withdrawal signs for 16 days in rats. Four-day replacement treatment with mitragynine attenuated the withdrawal symptoms significantly, suggesting that mitragynine is able to reduce morphine withdrawal symptoms similar to methadone and buprenorphine. ...The present study suggests that mitragynine may serve as an alternative treatment for opiate withdrawal effects as they occur in opiate addiction. Although mitragynine may possess some addictive properties

on its own, it may, in low-medium doses, in which humans voluntarily use it, help to manage opiate addiction. The current report details the efficacy in comparison to methadone and buprenorphine. While mitragynine is equally effective in reducing opiate withdrawal effects in rats, it may be the safer drug with less undesired side-effects." (p. 9-10)

Although withdrawal signs in rats are weak as compared to morphine withdrawal, there does appear to be evidence of some degree of physical dependence. Other studies have explored brain proteins that might serve as more sensitive biomarkers for physiological dependence in rats (Hassan, Othman, Mansor, et al., 2021). Another study examined the attenuation of MG withdrawal signs in rats with clonidine (Hassan, Sreenivasan, Müller et al., 2021). Another study examined potential signs of naloxone precipitated withdrawal in rats (Harun, Johari, Japarin, et al., 2021a). Overall, such research is consistent with human reports that kratom withdrawal is generally more modest and more readily self-manageable than that produced by opioids.

2.1.2.5 Real World Evidence of Abuse and Dependence

As reported in 2018, there is kratom recreational use; however, all surveys in the US and SEA indicate that its euphoriant effects are relatively low as compared to opioids and other recreational drugs. Also, for opioids, stimulants, and other drug use there is a strong tendency to increase euphoria by smoking, injecting, and/or insufflating the drug. Electronic vaping devices can also be employed. This is notably less common for kratom, as raising the dose produces little increase in euphoria and increases undesirable effects including nausea. These factors limit kratom doses, as reported by kratom users in public hearings and internet discussion groups and may contribute to kratom's overall safety profile. Rapid delivery of high doses by non-oral routes contributes to the morbidity and mortality of opioids, stimulants, and other recreational drugs.

Several new surveys from the US and SEA and conclusions from leading kratom researchers worldwide in consensus-type review articles support the conclusions of the 2018 8-FA. The new survey data are summarized in Factors 4, 5 and 6. Several reviews and studies confirm that chronic high daily intake can lead to kratom dependence and withdrawal in some kratom users, but these are substantially less likely to interfere with family, social and occupational life and commitments as compared to opioid dependence. Moreover, kratom is widely viewed as a healthier and less life-impairing substance to replace opioids and other drugs including alcohol and stimulants (Galbis-Reig, 2016; Prozialeck, et al., 2019; Singh, et al., 2014; Swogger & Walsh, 2018).

A variety of reports confirm kratom use to self-manage opioid withdrawal and also that abstinence from high chronic kratom use is typically associated with milder symptomatology than abstinence from classical opioids as documented in surveys and discussed on the internet in websites and discussion groups such as Erowid and Reddit (See survey and internet discussion data in the following: Coe, et al., 2019; Prozialeck, et al., 2019; Singh, et al., 2014; Singh, et al., 2016; Singh, Narayanan, Müller, et al., 2018; Grundmann, et al., 2017 Garcia-Romeu, et al., 2020; Henningfield, et al., 2020; Smith, et al., 2017; Swogger, et al., 2015; Veltri & Grundmann, 2019).

The conclusions by Prozialeck, et al. (2020) and Grundmann, et al. (2018) were further strengthened by two published US surveys, which found that the overwhelming majority of kratom consumers use for health benefits and not to get high or for other recreational purposes (Coe, et al., 2019; Garcia-Romeu, et al., 2020). A third survey of over 12,000 kratom consumers presented at the 2020 annual meeting of the American College of Neuropsychopharmacology by Henningfield, Barr, Wang & Huestis (2020) showed that approximately 8300 respondents were using kratom to manage some "ailment" other than a substance use related disorder and approximately 3800 (32%) respondents were using kratom to manage "drug" withdrawal.

These three surveys were generally consistent with the Grundmann (2017) survey that reported most US kratom users were approximately 30-50 years old, had some college education and healthcare, were employed and consumed kratom for health and well-being. Leading reasons for use were pain, self-management of opioid and other substance use disorders and withdrawal, and mood disorders including depression, anxiety, and post-traumatic stress disorder. Dependence and withdrawal can occur but are generally reported as more tolerable, less disruptive to work and social function, and more readily self-manageable than opioid and other classic drugs of abuse, dependence, and withdrawal.

While this update on science related to the abuse potential and regulatory status was under development by Dr. Henningfield and colleagues at PinneyAssociates, several of the world's leading kratom researchers, Drs. Harun, Johari, Japarin, Suhaimi, Hassan, & Shoaib (2021b), published a new review article addressing similar scientific issues and reached generally similar conclusions. Harun, et al. (2021b) also described needed research, particularly for development of MG and/or analogs for submission for FDA regulatory approval as new drugs.

2.1.3 Factor 1 Updated Conclusions

Two rat intravenous self-administration studies showed no evidence of morphine or heroin like abuse potential by MG (Hemby et al. 2018 and Yue et al. 2018). Those same studies showed that MG pretreatment of animals reduced subsequent self-administration of morphine (Hemby et al., 2018) and heroin (Yue et al., 2018). These findings are consistent with human reports that kratom is useful in the management of opioid craving and withdrawal and to support opioid abstinence (Grundmann et al., 2018; Prozialeck et al., 2020; Coe et al., 2019; Garcia-Romeu et al., 2020).

Taken together, the new research suggests an overall abuse potential that is relatively low as compared to morphine and morphine-like opioids. Several models revealed little abuse potential, whereas the CPP model suggested weak but not zero abuse potential. This contrasts with opioids, stimulants and other classic drugs of abuse that demonstrate robust rewarding effects across all such abuse potential models. Similarly, MG's potential to produce physical dependence and withdrawal appears relatively low, but not absent, as compared to opioids in animal models. It is worth noting that the animal self-administration studies were published during the summer of 2018 when the Department of Health and Human Services was reviewing the FDA's 2017 recommendation (FDA, 2017a) that DEA permanently list MG and 7-OH-MG as CSA Schedule I drugs (see discussion below in Factors 4, 5 & 6) and one of the studies was cited as a new finding supporting the decision to withdraw the scheduling recommendation (Giroir, 2018).

The relevance and importance of such animal model data are well established, and in the case of kratom, was recognized in the formal FDA rescission of the kratom scheduling request submitted to the DEA in which Assistant Secretary Giroir stated:

> "One recently published peer reviewed animal study indicated that mitragynine does not have abuse potential and actually reduced morphine intake. As such, these new data suggest that mitragynine does not satisfy the first of the three statutory requisites for Schedule I, irrespective of broader considerations of public health."

These animal model findings are generally consistent with human reports that MG has a relatively low abuse potential as compared to Schedule II opioids but can reduce opioid self-administration and withdrawal. Surveys indicate that reducing opioid self-administration and withdrawal are among the most common reasons for kratom use in the US.

Not discussed above because they are not published articles are the tens of thousands of comments by kratom users and others interested in kratom policy to the DEA (approximately 20,300 in 2016) discussed in the Henningfield, Fant & Wang (2018) 8-FA, and many more in public hearings by FDA and NIDA (April, 2018), and public hearings convened by cities and states across the nation since 2018, in which kratom regulatory laws and policies were under consideration. These comments largely focused on the reasons that people use kratom which primarily fall into the category of health and well-being consistent with the surveys discussed in Factors 4, 5, and 6, and relatively rare reports of use to get high, or reporting addiction or serious harm.

2.2 Factor 2 – Scientific Evidence of its Pharmacological Effect

2.2.1 Summary of 2018 Findings:

"More research is clearly needed to elucidate receptor binding profiles and the diverse and probably complex mechanisms of action of the kratom alkaloids singly, in combination, and as commonly occurs in marketed products and brewed extracts." (Henningfield, Fant & Wang, 2018, p. 589).

2.2.2 Factor 2 Science Updates

Since 2018, pharmacological research characterizing kratom's effects and the mechanisms of action of its alkaloids rapidly advanced. For example, as discussed in Factor 1, the impact of drugs such as methadone, buprenorphine, and clonidine on rats that show evidence of MG withdrawal was studied (Hassan, Sreenivasan, Müller et al., 2021). This research documents the lower mortality risks of kratom compared to opioids based upon its mechanisms of action including its biased partial agonist effects that are lower in beta-arrestin recruitment, and thus also relatively low in producing physical dependence and respiratory depression.

There were also rapid advances in characterizing many of kratom's alkaloids in addition to MG and 7-OH-MG. Although most were insufficiently abundant in kratom leaves to contribute to its effects, some may be model analogs for potentially more effective and safe medicines for a variety of medical disorders. Whereas new medicines based on kratom's alkaloids may be ten years in the future, they are attracting increasing attention from leading researchers and pharmaceutical developers.

An important international clinical study collaboration between researchers at Yale School of Medicine and the Center for Drug Research Malaysia investigated kratom efficacy and safety for the treatment of pain (Vicknasingam, Chooi, Rahim, et al., 2020). As reported in 2018, animal models demonstrated MG's analgesic antinociceptive effects consistent with kratom's widespread use globally to self-manage pain; however, clinical evidence was lacking. The Vicknasingam et al. (2020 study employed the classic cold pressor task to evaluate the effects of kratom concoctions on pain tolerance by assessing how long research participants could tolerate the pain of inserting their hands into an ice water bath. Kratom produced significantly increased tolerance for pain as compared to placebo in long term daily kratom users, an important advancement in understanding kratom's therapeutic potential. The authors concluded:

> "These study findings provide the first objectively measured evidence obtained in controlled research with human subjects that are preliminarily supporting or confirming previously published reports of kratom pain relieving properties based on self-reports collected in observational studies." (p. 235-236).

In a study mentioned in Factor 2, Wilson, Harris, Eans, et al. (2020) evaluated lyophilized (freeze-dried) kratom tea (LKT) as a potential treatment for pain and opioid dependence in a mouse model in which mice (referred to as knockout mice) were absent various drug receptors. The effects of oral LKT were examined in a warm water tail assay for nociception (pain relief), locomotor effects, respiratory depression, conditioned place preference, and to determine if it would reduce withdrawal signs in mice that were made physically dependent on morphine by chronic morphine administration. Wilson, et al. (2020) reported the following results:

> "Oral administration of LKT resulted in dose-dependent antinociception (pain relief) in mice lacking the mu-opioid receptor (MOR) and reduced in mice lacking the kappa-opioid receptor. These doses of LKT did not alter coordinated locomotion or induce conditioned place preference, and only briefly reduced respiration. Repeated administration of LKT did not produce physical dependence, but significantly decreased naloxone-precipitated withdrawal in morphine dependent mice. The present study confirms the MOR agonist activity and therapeutic effect of LKT for the treatment of pain and opioid physical dependence." (p. 1)

Obeng, Wilkerson, Leon, et al. (2021) compared MG and 7-OH-MG in in vitro receptor binding affinity studies and in vivo studies of morphine discrimination, antinociception in the model pain "heated plate" test, and naloxone challenge tests to understand the role of endogenous morphine opioid receptors. This series of studies concluded:

> "At human m-opioid receptor (MOR) in vitro, mitragynine has low affinity and is an antagonist, whereas 7-hydroxymitragynine has 9-fold higher affinity than mitragynine and is an MOR partial agonist. In rats, intraperitoneal mitragynine exhibits a complex pharmacology including MOR agonism; 7-hydroxymitragynine has higher MOR potency and efficacy than mitragynine. These results are consistent with 7-hydroxymitragynine being a highly selective MOR agonist and with mitragynine having a complex

pharmacology that combines low efficacy MOR agonism with activity at nonopioid receptors." (p. 412)

Todd, Kellogg, Wallace, et al. (2020) investigated the functional selectivity of MG and 7-OH-MG to produce biased G-protein signaling, with little recruitment of β-arrestin. They concluded:

> "…To evaluate the biological relevance of variable speciofoline levels in kratom, we compared the opioid receptor binding activity of speciofoline, mitragynine, and 7-hydroxymitragynine. Mitragynine and 7-hydroxymitragynine function as partial agonists of the human μ-opioid receptor, while speciofoline does not exhibit measurable binding affinity at the μ-, δ-, or ƙ-opioid receptors. Importantly, mitragynine and 7-hydroxymitragynine demonstrate functional selectivity for G-protein signaling, with no measurable recruitment of β-arrestin. Overall, the study demonstrates the unique binding and functional profiles of the kratom alkaloids, suggesting potential utility for managing pain, but further studies are needed to follow up on these in vitro findings. All three kratom alkaloids tested inhibited select cytochrome P450 enzymes, suggesting a potential risk for adverse interactions when kratom is co-consumed with drugs metabolized by these enzymes." (p.1)

Kruegel, Uprety, Grinell, et al. (2019) examined this possibility in a series of studies and concluded:

> "…preliminary research has provided some evidence that mitragynine and related compounds may act as atypical opioid agonists, inducing therapeutic effects such as analgesia, while limiting the negative side effects typical of classical opioids. Here we report evidence that an active metabolite plays an important role in mediating the analgesic effects of mitragynine. We find that mitragynine is converted in vitro in both mouse and human liver preparations to the much more potent mu-opioid receptor agonist 7-hydroxymitragynine and that this conversion is mediated by cytochrome P450 3A isoforms. Further, we show that 7-hydroxymitragynine is formed from mitragynine in mice and that brain concentrations of this metabolite are sufficient to explain most or all of the opioid-receptor-mediated analgesic activity of mitragynine. At the same time, mitragynine is found in the brains of mice at very high concentrations relative to its opioid receptor binding affinity, suggesting that it does not directly activate opioid receptors". (p. 1)
>
> "Further, it suggests a possible explanation for the seemingly improved safety profile of mitragynine compared to classical opioid agonists. However, the critical involvement of hepatic metabolism also complicates our understanding of mitragynine's pharmacology and introduces the possibility of interindividual variability in the compound's potential therapeutic effects and side effects. We believe mitragynine and related compounds have great potential as future therapeutics, but metabolic processes must be carefully considered as the field continues to advance". (p. 7)

The Kruegel et al. studies provided the foundation for their new pharmaceutical company to develop new kratom derived molecular entities for the treatment of pain, depression, and substance use and other disorders[11].

Reeve, Obeng, Oyola, et al. (2020) evaluated the discriminative stimulus properties of MG in a series of studies to determine the pathway that primarily mediates these effects since it only partially generalizes to opioids. They found full generalization to lofexidine and phenylephrine suggesting that its discriminative effects are primarily mediated by adrenergic and not opioid receptors.

Hiranita, Sharma, Oyola, et al. (2020) investigated the hypothesis that MG exerts opioid agonist activity, in part, through metabolic conversion to 7-OH-MG. The authors concluded:

> "Though the conversion rate of 7-hydroxymitragynine from p.o. mitragynine is low, 7-hydroxymitragynine is a more potent and efficacious μ-opioid receptor agonist than mitragynine, suggesting that conversion to this metabolite may contribute to the in vivo μ-opioid activity of mitragynine." (p. 1)

Multiple investigators' research characterizing MG alkaloids receptor binding profiles and pharmacologic activities also supports pursuit of kratom alkaloid-based substances for the treatment of alcohol use disorder, pain, opioid withdrawal, and other disorders (Chakraborty, Uprety, Daibani, et al., 2021; Gutridge, Robins, Cassell, et al., 2020). Chakraborty, Uprety, Daibani, et al. (2021) concluded:

> "In conclusion, we report a thorough and complete in vitro pharmacological characterization of five kratom based minor alkaloids. Given their low abundance, it seems unlikely that these alkaloids play a major mediating role in the biological actions of kratom consumed by humans. However, these alkaloids represent novel starting points for optimizing probes to better understand opioid receptor function.
>
> There are three major findings from this present work. First, we identify three new templates present in kratom with antinociceptive activity in mice, with corynoxine being equipotent to morphine. Second, we identify ligands with an array of pharmacological profiles, ranging from the partial opioid agonism displayed by corynantheidine and mitraciliatine and full agonism of corynoxine and KOR agonism with isopaynantheine. Finally, we identify corynoxine and mitraciliatine to be structurally unique natural products with safer, MOR dependent antinociception, and we identify isopaynantheine as the first kratom alkaloid with KOR mediated antinociceptive actions." (p. 11)

Animal models are also employed to assess potential cognitive effects of kratom. Although kratom is commonly taken to enhance occupational performance and as a coffee substitute for energy at low doses, it would not be surprising to see performance decrements at high doses. Indeed, in an animal model of special learning and memory, high doses impaired memory in this model (Hassan, Suhaimi, Ramanathan, et al., 2019). The relevance of the results to

[11] https://www.kures.life/

humans cannot be assessed based on this study but it suggests that more research is warranted.

Suhaimi, Hassan, Mansor & Müller (2021) studied brain electroencephalogram (EEG) activity after acute and chronic exposure to chronic MG in rats. Suhaimi, et al. (2021) summarized their findings as follows:

> "… the changes in brain electroencephalogram (EEG) activity after acute and chronic exposure to mitragynine in freely moving rats. Vehicle, morphine (5 mg/kg) or mitragynine (1, 5 and 10 mg/kg) were administered for 28 days, and EEG activity was repeatedly recorded from the frontal cortex, neocortex and hippocampus. Repeated exposure to mitragynine increased delta, but decreased alpha powers in both cortical regions. It further decreased delta power in the hippocampus. These findings suggest that acute and chronic mitragynine can have profound effects on EEG activity, which may underlie effects on behavioral activity and cognition, particularly learning and memory function." (p. 1)

Gutridge, Robins, Cassell, et al. (2020) pharmacologically characterized kratom extracts, kratom alkaloids, and synthetic carfentanil-amide opioids interactions with G proteins and beta-arrestin at mu, delta and kappa opioid receptors *in vitro* and assessed the degree to which opioids reduced alcohol intake and whether they had rewarding properties. The authors stated:

> "In conclusion, we found that kratom alkaloids do not recruit β-arrestin 2 at the μOP, δOP and κOP and can significantly reduce both moderate and binge alcohol intake in male and female mice. This pharmacological profile and effect on alcohol intake in rodents may explain why some find kratom useful to self-medicate for alcohol use disorder. Yet, as we observed that kratom extract and 7-hydroxymitragynine exhibited reinforcing properties, our study also highlights the risks associated with kratom use. Our results indicate that δOPs contributed to the efficacy of the kratom alkaloids to reduce alcohol intake, whereas the lack of efficacy for the G protein-biased μOP agonist TRV130 to decrease alcohol intake argued against a major role for the μOP in this behavioral response. The ability of MP102, a synthetic G protein-biased opioid with a preference for δOP, to reduce alcohol intake without affecting general locomotion or inducing (δOP-mediated) CPP provides support for future efforts to produce G protein-selective, δOP-selective opioids for the treatment of alcohol use disorder, some of which could be plant-derived still as well". (p. 1510)

Hiranita, Leon, Felix, et al. (2019) compared the effects of MG to morphine in behavioral and antinocioception assays in rat models. They wrote:

> "Morphine and mitragynine dose-dependently decreased schedule-controlled responding; the ED50 values were 7.3 and 31.5 mg/kg, respectively. Both drugs increased thermal antinociception (the ED50 value for morphine was 18.3). Further, doses of naltrexone that antagonized morphine did not antagonize mitragynine. Mitragynine (17.8 mg/kg) did not alter the rate-decreasing or antinociceptive effects of morphine. …The antinociceptive effects of mitragynine and morphine occur at doses larger than those that disrupt learned behavior. Opioid receptors do not appear to mediate the disruptive effects of mitragynine on learned behavior. Mitragynine had

lesser antinociceptive effects than morphine, and these did not appear to be mediated by opioid receptors. The pharmacology of mitragynine includes a substantial non-opioid mechanism." (p. 1)

2.2.2.1 Studies of Kratom Minor Alkaloids and their Metabolites

While kratom contains many alkaloids (more than 50 identified to date and more likely to be discovered), only one or a few of these account for most of the effects produced in humans. This is a trait also found in other psychoactive plants, such as coffee, tea, and cannabis.

Most of these alkaloids are likely at what may be de minimis levels with respect to the human experience, effects, and safety. However, it is also possible that while the majority of the effects produced by natural plant-based preparations are mediated by MG, one or more of these minor alkaloids may also play a minor role. This may account for possible differences in strains of kratom products. Increasingly, it appears that 7-OH-MG, long considered a substance of potentially greater concern than MG from a safety perspective may occur naturally at functionally de minimis levels (Chear, Leon, Sharma, et al., 2021; Kruegel, Uprety, Grinell, et al., 2019).

These molecules are also of interest as potential new drug candidates or as templates for novel synthesized molecules. It has been estimated that up to one third to one half of FDA approved medicines are based on natural plant product substances that provided the novel structures utilized in development of the final approved medicines or which at least were critical in the drug development process (Newman & Cragg, 2016; Domnic, Narayanan, Mohana-Kumaran & Singh, 2021).

Chear, et al. (2021) reported the results of an extensive study in which:

> "Ten indole and oxindole alkaloids were isolated from the freshly collected leaves of Malaysian Mitragyna speciosa (Kratom). The chemical structures of these compounds were established on the basis of extensive 1D and 2D NMR and HRMS data analysis. The spectroscopic data of mitragynine oxindole B (4) are reported herein for the first time. The spatial configuration of mitragynine oxindole B (4) was confirmed by single-crystal X-ray diffraction. Simultaneous quantification of the isolated alkaloids in the M. speciosa leaf specimens collected from different locations in the northern region of Peninsular Malaysia was also performed using UPLC-MS/MS. The oxindole alkaloids (1−4) and the indole alkaloid (10) were assessed for binding affinity at opioid receptors. Corynoxine (1) showed high binding affinity to μ-opioid receptors with a Ki value of 16.4 nM. Further, corynoxine (1) was 1.8-fold more potent than morphine in rats subjected to a nociceptive hot plate assay. These findings have important implications for evaluating the combined effects of the minor oxindole alkaloids in the overall therapeutic activity of *M. speciosa*." (p. 1).

Domnic, Chear, Rahman, et al. (2021) showed that combinations of kratom alkaloids may inhibit cell proliferation and migration of nasopharyngeal carcinoma cells suggesting potential for the development of the substances themselves or possibly new analogs as new treatments for cancer. As discussed by the authors, these are early-stage findings but certainly findings that merit further study. Regarding 7-OH-MG, they also reported that 7-OH-MG was only

present at very low levels in all samples, supporting other reports which suggest that it is a postharvest artifact resulting from MG.

Kruegel, et al. (2019) has also suggested that the effects of kratom are not produced by exogenously ingested 7-OH-MG but that the metabolism of MG to small amounts of 7-OH-MG may modulate and contribute to some of the desired effects such as pain relief.

Sharma, Kamble, Leon, et al. (2019) employed a method to simultaneously quantify ten key kratom alkaloids in kratom leaf extracts and commercial products using ultra-performance liquid chromatography–tandem mass spectrometry. They summarized their results as follows:

> "…an ultra-performance liquid chromatography-tandem mass spectrometry (UPLC-MS/MS) method was developed and validated for the quantification of ten key alkaloids, namely: corynantheidine, corynoxine, corynoxine B, 7-hydroxymitragynine, isocorynantheidine, mitragynine, mitraphylline, paynantheine, speciociliatine, and speciogynine… After successful validation, the method was applied for the quantification of kratom alkaloids in alkaloid-rich fractions, ethanolic extracts, lyophilized teas, and commercial products. Mitragynine (0.7%–38.7% w/w), paynantheine (0.3%–12.8% w/w), speciociliatine (0.4%–12.3% w/w), and speciogynine (0.1%–5.3% w/w) were the major alkaloids in the analyzed kratom products/extracts. Minor kratom alkaloids (corynantheidine, corynoxine, corynoxine B, 7-hydroxymitragynine, isocorynantheidine) were also quantified (0.01%–2.8% w/w) in the analyzed products; however mitraphylline was below the lower limit of quantification in all analyses." (p. 1)

Kamble, Berthold, King, et al. (2021) developed and validated a bioanalytical method for the simultaneous quantification of 11 kratom alkaloids in rats following oral administration of lyophilized kratom tea (LKT) and a marketed kratom product, Optimized Plant Mediated Solutions (OPMS). The authors concluded:

> "In the present study, OPMS liquid showed an extended exposure of kratom alkaloids as compared to LKT. Among the tested alkaloids, only MTG, 7-HMG [7-OH-MG], COR, and SPC showed measurable systemic exposure following an oral dose. Having an understanding of the pharmacokinetics of individual kratom alkaloids following the oral administration of kratom products in preclinical species will facilitate the design of clinical trials evaluating kratom products. Additionally, the developed bioanalytical method can be implemented for the analysis of plasma samples obtained from a variety of animal species including humans using standardized kratom products". (p. 6)

Bhowmik, Galeta, Havel, et al. (2021) mapped the neuropharmacology of Mitragyna alkaloids. The authors concluded

> "In summary, we describe a systematic examination of late-stage functionalization of kratom alkaloids, which provided efficient access to MG analogs and identified 11-F-7OH (22) as an important lead compound for further investigations". (p.11)

2.2.2.2 MG Metabolism and Metabolite Profiling.

Another rapidly advancing area of research is understanding the metabolic pathways and modulating enzymes including profiling of MG's metabolites, and identification of enzymes modulating MG metabolism.

Kamble, Sharma, King, et al. (2019) included the following summary in their abstract:

> "Metabolic pathways of MG were identified in human liver microsomes (HLM) and S9 fractions. A total of thirteen metabolites were identified, four oxidative metabolites and a metabolite formed by demethylation at the 9-methoxy group were the major metabolites of MG. 3. The cytochrome P450 enzymes involved in the metabolism of MG were identified using selective chemical inhibitors of HLM and recombinant cytochrome P450. The metabolism of MG was predominantly carried out through the CYP3A4 with minor contributions by CYP2D6 and CYP2C9. The formation of five oxidative metabolites (Met2, Met4, Met6, Met8 and Met11) was catalyzed by the CYP3A4. 4. In summary, MG was extensively metabolized in HLM primarily to O-demethylated and monooxidative metabolites. The CYP3A4 enzyme plays a predominant role in the metabolic clearance of MG and also in the formation of 7-hydroxyMG (Met2), a known active minor alkaloid identified in the leaf material." (p. 1)

Another study by Kamble, Sharma, King, et al. (2020) examined the potential interactions in metabolism of MG and other alkaloids that may occur with other substances including pharmaceutic products. This is also early work but fundamental in understanding potential interactions that could increase risk of use and may thereby at some point be included in warning labels for kratom and/or future potential kratom based drug products.

A systematic metabolic study evaluated how metabolism alters opioid mediated effects, possibly without increasing harmful respiratory effects. Kamble, León, King, et al. (2020) reported:

> "…in human plasma 7-HMG is converted to mitragynine pseudoindoxyl, an opioid that is even more potent than either mitragynine or 7-HMG. This novel metabolite is formed in human plasma to a much greater extent than in the preclinical species tested (mouse, rat, dog, and cynomolgus monkey) and due to its μ-opioid potency may substantially contribute to the pharmacology of kratom in humans to a greater extent than in other tested species." (p. 1)

Such research may explain potential human effects and benefits that may not be predicted in animal studies alone.

2.2.3 Factor 2 Updated Conclusions

Scientific advances in understanding the pharmacology and mechanisms of action of kratom's primary active alkaloid, MG, as well as 7-OH-MG, and increasingly the minor alkaloids that appear to contribute relatively little to the effects of kratom in kratom consumers may ultimately contribute to safer and more effective new medicines for a variety of disorders as well as for general health and well-being. Development and approval of such products may be a decade or more in the future, but in the meantime, this rapidly advancing science is helping to explain

how kratom works, and why its pain relieving and other benefits occur with relatively low levels of abuse, dependence, and harmful decreases in respiration as compared to opioids.

2.3 Factor 3 – The State of Current Scientific Knowledge Regarding the Drug

2.3.1 Summary of 2018 Findings:

The 2018 8-FA highlighted kratom's pharmacodynamic effects described in earlier investigations and reviews (e.g., Prozialeck, et al., 2012; Warner, et al., 2016). In one PK study involving oral MG administration to ten healthy male volunteers, a two-compartment model best described MG's pharmacokinetics (Trakulsrichai, et al., 2015). Preclinical and clinical pharmacokinetic data are limited, with significant variability within and between species. There was little clinical study of human physiological effects and health parameters to draw on.

2.3.2 Factor 3 Science Updates

Several new preclinical pharmacokinetic studies also provide important safety data, as animals were closely monitored over 12 h or more for adverse events associated with MG and 7-OH-MG plasma concentrations.

2.3.2.1 Pharmacokinetics and Pharmacodynamics Findings Related to Safety (MG and 7-OH-MG)

Most human consumption in the US and SEA is in traditional tea-like decoctions containing 0.5-1 mg/kg MG per serving; however, more intense users managing chronic pain or suffering from opioid use disorder may consume four or more servings per day and in some cases, larger serving sizes, totaling 20 mg/kg/day.

Avery, Boddu, Sharma, et al. (2019) studied the pharmacokinetics of mitragynine in rats following oral administration of a variety of preparations. One of the many important findings was summarized as follows:

> "The results provide evidence that an equivalent oral dose of the traditional preparation (lyophilized kratom tea) and formulated/manufactured products (organic fraction) of kratom leaves provide better systemic exposure of mitragynine than that of mitragynine dosed alone." (p. 1)

Maxwell, King, Kamble, et al. (2020) evaluated MG's safety and pharmacokinetics in beagle dogs following 5 mg/kg oral MG (equivalent to approximately 3 mg/kg in humans) and 0.1 mg IV MG. The authors summarized:

> "The dose of 7-HMG used in this study was well tolerated with no adverse events or major abnormalities in clinical parameters…Derived pharmacokinetic parameters of 7-HMG from this study can be scaled allometrically along with the pharmacokinetic parameters of mitragynine to predict the dose of mitragynine while designing the first in human study." (p. 462)

No life threatening or serious adverse events were reported.

The Hiranita, Sharma, Oyola, et al. (2020) study discussed in Factor 2 also evaluated the pharmacokinetics of 55 mg/kg oral MG in rats. As reported:

> "Following p.o. administration of mitragynine (HCl salt, 55 mg/kg), the Cmax value of 7-hydroxymitragynine (85 ng/mL) was 14-fold less than that of mitragynine. The Tmax values of 7-hydroxymitragynine and mitragynine were 30 and 84 minutes, respectively… drug discrimination was used as a pharmacologically selective measure of μ-opioid receptor agonism *in vivo*. In rats discriminating morphine (3.2 mg/kg, i.p.) from vehicle, the discriminative stimulus effects of mitragynine were assessed 90 minutes after p.o. administration to correspond to its Tmax. Mitragynine (up to 178 mg/kg) produced 76% morphine-lever responding (ED50=51 mg/kg). Though the conversion rate of 7-hydroxymitragynine from p.o. mitragynine is low, 7-hydroxymitragynine is a more potent and efficacious μ-opioid receptor agonist than mitragynine, suggesting that conversion to this metabolite may contribute to the *in vivo* μ-opioid activity of MG." (p. 1)

2.3.2.2 Pharmacokinetic and Pharmacodynamic Findings Related to Safety (Minor Alkaloids)

In addition to studies of MG and 7-OH-MG pharmacokinetics, there is increasing attention to the pharmacokinetics and other effects of other alkaloids from traditional kratom tea decoctions and commercial products.

Kamble, Berthold, King, et al. (2021) characterized the pharmacokinetics of eleven alkaloids given orally to rats. As described by the authors, they:

> "…developed and validated a bioanalytical method for the simultaneous quantitation of 11 kratom alkaloids (mitragynine, 7-hydroxymitragynine, corynantheidine, speciogynine, speciociliatine, paynantheine, corynoxine, corynoxine-B, mitraphylline, ajmalicine, and isospeciofoline) in rat plasma. The validated method was used to analyze oral pharmacokinetic study samples of lyophilized kratom tea (LKT) and a marketed product, OPMS liquid shot, in rats. Among the 11 alkaloids, only mitragynine, 7-hydroxymitragynine, speciociliatine, and corynantheidine showed systemic exposure 8 h post dose, and the dose-normalized systemic exposure of these four alkaloids was higher (1.6−2.4-fold) following the administration of the commercial OPMS liquid. Paynantheine and speciogynine levels were quantifiable up to 1 h post dose, whereas none of the other alkaloids were detected. In summary, the method was successfully applied to quantify the exposure of individual kratom alkaloids after an oral dose of traditional or commercial products. This information will contribute to understanding the role of each alkaloid in the overall pharmacology of kratom and elucidating the pharmacokinetic differences between traditional and commercial kratom products." (p. 1)

Berthold, Kamble, Raju, et al. (2021) studied the pharmacokinetics of the minor indole kratom alkaloid, speciociliatine. They summarized:

> "An ultra-performance liquid chromatography tandem mass spectrometry method was developed and validated to quantify speciociliatine in rat plasma. The quantitation range

was 3−600 ng/mL. The validated method was applied to a preclinical pharmacokinetic study in male Sprague-Dawley rats after 2.5 mg/kg intravenous (I.V.) and 20 mg/kg oral (P.O.) dosing. The plasma was analyzed to obtain concentration-time profiles and results were subjected to non-compartmental analysis to determine pharmacokinetic parameters including volume of distribution (6.2 ± 2.3 L/kg I.V.), clearance (0.7 ± 0.2 L/h/kg), and absolute oral bioavailability (20.7%). Speciociliatine had higher systemic exposure and lower clearance compared to the other kratom alkaloids mitragynine and corynantheidine. The speciociliatine pharmacokinetic parameters described here will help to better understand the overall effects reported with kratom product use." (p. 1)

These data suggest why natural kratom leaf based kratom products, extracts, and tea-like decoctions might differ in the effects experienced by kratom users from more refined extracts, as explained by the authors:

> "Interestingly, the exposure of mitragynine when it is dosed orally in rats as lyophilized kratom tea or the organic fraction obtained from lyophilized kratom tea increases by 1.5- and 1.8-fold, respectively [18]. The lyophilized kratom tea and organic fraction contains all the alkaloids that would be present in the plant, including speciociliatine. These results indicate that the presence of other alkaloids found in the traditional preparation have influence on the pharmacokinetics of mitragynine. Similarly, the pharmacokinetic parameters of speciociliatine, when dosed in combination with the other naturally occurring alkaloids, may be altered. Further research into the pharmacokinetics of minor indole alkaloids after administration of a lyophilized kratom tea product must be investigated to determine which alkaloids' parameters are affected by the presence of other compounds." (p. 2)

This is not to imply that chewing kratom leaves, kratom tea like decoctions or more simplified extracts are more beneficial or safer than other MG products, but that they may differ in the effects that users seek, desired and undesired. It supports the conclusion that since none were demonstrated to be more beneficial or harmful than others, with the exception of adulterated products in which other substances are added or possibly an individual alkaloid's concentration is boosted to unnaturally high levels (e.g., 7-OH-MG), that there is yet no safety basis for banning such products from the marketplace.

A published abstract by Jagabalan, Zainal, Ganaby, et al. (2019) reported:

> "Estimated typical clearance (CL/F) value was 2.21 L/hr, absorption rate (Ka) of 0.82/hr, and volume of distribution (Vd) of 30.8L. . . . Based on the single dosing experimental rat data, the model [2-compartment distribution with 1st order absorption] provides a useful tool to quantify the pharmacokinetic parameters to propose an optimal dosing regimen in rats. Subsequently, the pharmacokinetics parameter can be modeled to the pharmacodynamics of MG for extrapolation into human use." (p. 1)

King, Sharma, Kamble, et al. (2020) developed bioanalytic methods to study the PK of corynanthidine, which is a minor kratom alkaloid that binds to opioid receptors and acts as a functional opioid antagonist (e.g., with some naloxone-like properties). This study was important both for its methods development as well as characterization of the PK of corynanthidine given intravenously and orally to rats.

2.3.2.3 Safety Assessments from Preclinical and Clinical Studies

Currently, there are no validated assessments of the lethal dose for humans or animals, mainly due to the unreliability and difficulty in studies that have attempted to determine lethal doses in animals, and the fact that most human deaths in which kratom use was verified were more likely caused by other substances (e.g., Olsen et al. 2019; Henningfield, Grundmann, Babin, et al. 2018, Babin, 2019).

Smith et al., 2019 conducted a study comparing oral and intravenous MG and 7-OH-MG to establish the lethal doses (LD_{50} doses) in mice. They were able to produce death by an oral dose of 547.7 mg/kg MG, though were unable to produce death by oral 7-OH-MG administration. Large intravenous doses of MG (27.8mg/kg), 7-OH-MG (24.7 mg/kg), and heroin (23.7 mg/kg) were also lethal. Some of their observations are inconsistent with those from other laboratories (e.g., Kruegel, Gassaway, Kapoor et al., 2016 and see also Kruegel et al., 2019), though not consistent with rat toxicity study data summarized in Henningfield, Fant & Wang, 2018; thus, this study awaits replication.

It should be noted that human use of kratom alkaloids by intravenous injection is not practiced for several reasons. First, rapid administration (e.g. smoking) does not produce as pleasurable effects or desired effects compared to oral use (Henningfield, Fant and Wang, 2018). Additionally, MG and 7-OH-MG are not soluble in water and must be prepared using specialized laboratory preparations involving a tween/DMSO based vehicle (as used in Smith et al., 2019). Thus, this study represents another line of research that will be important to continue but its relevance to real world kratom safety and toxicity is not clear.

To better understand potential health and safety related effects related to kratom use, Leong Bin Abdullah, Tan, Mohd, et al. (2020) studied the lipid profiles, liver function and other parameters in 100 chronic kratom users compared to 100 healthy nonusers in Malaysia. Although the study was acknowledged by the authors to be relatively small and exploratory, their preliminary findings will be useful in the design of future studies. They found:

> "The liver parameters of the study participants were within normal range. The serum total cholesterol and LDL of kratom users were significantly lower than those of healthy subjects who do not use kratom. There were no significant differences in the serum triglyceride and HDL levels. However, higher average daily frequency of kratom use and increasing age were associated with increased serum total cholesterol among kratom users. Other kratom use characteristics such as age of first kratom intake, duration of kratom use, and quantity of daily kratom intake were not associated with increased serum triglyceride, total cholesterol, LDL, and HDL levels. Our findings suggest regular kratom consumption was not linked to elevated serum lipids, except when there is a higher frequency of daily kratom intake. However, the study was limited by the small sample size, and hence a more comprehensive study with larger sample size is warranted to confirm the findings." (p. 1)

A preliminary study of the impact of kratom use on brain function (as assessed by brain magnetic resonance imaging) among chronic kratom users in Malaysia was conducted by Singh, Chye, Suo, et al. (2018). In brief, they reported:

> "A total of 14 subjects (7 regular kratom users and 7 non-kratom users) voluntarily participated in this cross-sectional study…. There were no significant differences (p>0.05) in the intracranial volume (ICV), cortical volumes (frontal, parietal, temporal, occipital, or cingulate lobe), or subcortical volumes (striatum, hippocampus, or amygdala), as well as in the diffusion tensor imaging (DTI) metrics, fractional anisotropy (FA) and mean diffusivity (MD) between kratom users and the controls.
>
> Conclusion: This preliminary study showed long-term consumption of kratom decoction is not significantly associated with altered brain structures in regular kratom users in traditional settings. However, further study is needed to establish more data for kratom use and its effects." (p. 1)

Singh, Müller, Murugaiyah, et al. (2018) studied various hematological and clinical-chemistry parameters of kratom users in Malaysia. In brief, Singh, et al. (2018) summarized their results as follows:

> "A total of 77 subjects (n=58 regular kratom users, and n=19 healthy controls) participated in this cross-sectional study. All the surveys were conducted through face-to-face interview to elicit subject's sociodemographic characteristics and kratom use history. A full-blood test was also administered. Laboratory analysis was conducted using GC-MS to determine mitragynine content in the acquired kratom samples in order to relate mitragynine consumption with possible alterations in the blood parameters of kratom users. Findings showed that there were no significant differences in the hematological and clinical-chemistry parameters of traditional kratom users and healthy controls, except for HDL and LDL cholesterol values; these were found to be above the normal reference range for the former. Similarly, long-term kratom consumption (> 5 years), and quantity of daily kratom use (≥3 ½ glasses; mitragynine content 76.3–114.8 mg) did not appear to alter the hematological and biochemical parameters of kratom users. These data suggest that even long-term and heavy kratom consumption did not significantly alter the hematological and clinical-chemistry parameters of kratom users in a traditional setting." (p. 1)

Singh, Narayanan, Grundmann, et al. (2020), studied the long-term effects of kratom use in thirteen people in Malaysia who had used kratom longer than 20 years in a cross-sectional pilot study. They summarized their results as follows:

> "Respondents were required to undergo a blood-test and laboratory analysis was conducted to determine the mitragynine content in an acquired street sample of kratom. The regular, long-term consumption of brewed kratom decoction did not cause any significant alterations in haematological, kidney, liver, thyroid, inflammatory and gastrointestinal analytes in a cohort of kratom users who had no history of substance misuse. However, those who had a higher intake (>3 glasses per day) of kratom exhibited higher lipid values (except for HDL-cholesterol), and a moderate elevation of homocysteine level. Long-term (>20 years with a daily intake of ≥87.54mg of mitragynine) kratom consumption was not associated with altered biochemical levels, although prolonged and heavy use (>3 glasses daily) may result in cardiovascular risks. The latter finding, however, requires further investigation." (pg. 1)

Singh, Narayanan, Müller et al. (2019) studied potential long-term cognitive effects associated with kratom use in kratom uses in Malaysia. Singh, et al. (2019) summarized their results as follows:

> "We assessed the cognitive function of 70 regular kratom users and 25 control participants using the Cambridge Neuropsychological Test Automated Battery. Participants performed six neuropsychological tasks that assessed motor, learning and memory, attention and executive function. Relative to control participants, higher consumption (>3 glasses daily or mitragynine doses between 72.5 mg and 74.9 mg) of kratom tea was selectively associated with impaired performance on the Paired Associates Learning task, reflecting deficits in visual episodic memory and new learning. Overall, the performance of kratom users compared to control participants, and the performance of high (>3 glasses per day) as well as low (≤3 glasses per day) kratom using groups, were comparable on all neuropsychological domains. Higher intake of kratom juice (>3 glasses daily) did not appear to impair motor, memory, attention or executive function of regular kratom users." (p. 1)

Increasing attention to safety related signals is evident in much ongoing kratom research. For example, Leong Abdullah, Tan, Narayanan, et al. (2021) studied the prevalence of ECG abnormalities and QTc intervals in kratom users without histories of illicit drug use. They found:

> "…the odds of having ECG abnormalities did not differ between kratom users and non-kratom-using control subjects, except for higher odds of sinus tachycardia in kratom users. Torsades de pointes was not reported among kratom users, but greater age at first kratom use, longer duration of kratom use, the higher daily quantity of kratom use, and intake of kratom less than 3 h before an assessment could increase the QTc interval with an estimated daily mitragynine intake of 434.28 mg (7.06 mg/kg/day). Hence, we found that regular daily kratom consumption led to borderline QTc intervals, but it was not associated with prolonged QTc intervals. However, further controlled clinical studies are needed to confirm our findings." (p. 1)

2.3.3 Factor 3 Updated Conclusions

Among the most important data in assessing product safety is investigation of the patterns of exposure and associated safety in pharmacokinetics and other studies. As described, the science advanced considerably in this domain. It shows that over a broad range of doses, dosage form and within two species (rat and dog) MG can be safely given. This includes oral doses that are many multiples of those consumed by humans.

Additionally, six clinical studies evaluated the effects of long-term kratom use on a variety of physiological parameters including kidney and liver function, blood chemistry hematological parameters, cognition, cardiac parameters including ECG, and on brain function by brain magnetic resonance imaging. Although these were relatively small studies, none suggest serious adverse consequences of use. It is important to note that these are not definitive safety studies and cannot be used to claim that kratom has no adverse effects on any of the studied physiological domains and limitations of each study were noted in the publications. Nonetheless, the findings are encouraging and should facilitate the conduct of more comprehensive follow-up studies.

2.4 Factors 4, 5, and 6 – History and Current Patterns of Abuse; The Scope, Significance and Duration of abuse; What, if any, Risk is there to the Public Health

Note that for this update, Factors 4, 5 and 6 are considered together because they all contribute to understanding nonmedical use, recreational use and abuse, and public health impact, relying on some of the same surveys across factors.

These factors address public health considerations which include the impact of various regulatory approaches on individual and public health risks and benefits of CSA scheduling versus not scheduling, as well as the most appropriate schedule if the substance or product is approved for therapeutic use. Substances that are considered to merit control in the CSA but which are not approved for therapeutic use can only be placed in Schedule I regardless of their actual abuse potential.

For temporary scheduling (also known as “emergency” scheduling) only factors 4, 5, and 6 must be considered. Temporary scheduling lasts for two years and can be recommended by the FDA or conducted by DEA without recommendation from FDA.

The key conclusion of analysis of Factors 4, 5 and 6 that must be drawn to support temporary scheduling is that the substance poses an imminent risk to public health related to its abuse. For poisons and toxins not used for psychoactive and abuse related effects, such as contaminated food products, etc. public health interventions and sometimes regulations other than the CSA are employed as appropriate.

2.4.1 Summary of 2018 Findings:

Survey and public health data are the most important sources of information to determine if a substance merits temporary scheduling. Only Factors 4, 5 and 6 must be considered for temporary scheduling. If these factors together support the conclusion that a substance poses imminent risk to public health related to its abuse and apparently addictive use, then the substance or product can be placed in the CSA. Schedule I is the only option if there is no FDA approved therapeutic use (i.e., approval as a medicine). Note for poisons and toxins that are not used for psychoactive and abuse related effects, the CSA is not considered the appropriate regulatory tool to protect public health.

Factors 4, 5 and 6 of the 2018 8-FA documented several decades of kratom use in the US that began before the 1980s. In contrast to opioids, kratom use in SEA and the US was almost exclusively by the oral route with use primarily for health and well-being including self-management of pain, opioids and other addictions, improvement of mood in people with depression and anxiety disorders, and for many people as an alternative or complement to coffee to improve occupational performance. Use for recreational purposes, e.g., to get “high” was not a major category of use. Major US federal surveys including the Drug Abuse Warning Network (DAWN) (until 2011 when it was discontinued), the Monitoring the Future Survey (MTFS), Treatment Episodes Data Set (TEDS), and the National Survey on Drug Use and Health (NSDUH) showed little evidence of kratom use, abuse, addiction or harm.

Although the DEA’s National Forensic Laboratory Information System (NFLIS) began detecting MG use and reporting it in 2010 as a potential emerging trend, overall reports remained low (less than 200 of 1,549,313) in 2015, and apparently below the threshold for continued

reporting when the 2018 8-FA was written. The Henningfield, Fant & Wang (2018) 8-FA summarized Factor 4 as follows

> "As confirmed by NFLIS, kratom is available to persons who have been found with substances of abuse, yet kratom has not emerged as a substance of abuse by any of the federal surveillance systems. Nonetheless, as MG identifications were a new category, the DEA placed MG on its "watch list," meaning essentially that laboratories and investigators are encouraged to be alert for products potentially containing MG and to be testing for MG....The relative absence of apparent abuse of kratom as measured by national surveys does not mean there is no abuse, but certainly the signal is very weak compared to many other substances that people seek help for to achieve abstinence.…As mentioned earlier, the very low risk of overdose poisoning and serious adverse events does not mean that they have not and will not occur. However, given the two decades during which consumption has increased to an estimated two or more million consumers in the US, in addition to far more extensive consumption in SE Asia, this is a substance and category of product with a remarkable safety record." (p. 580)

2.4.2 Factor 4, 5, and 6 Science Updates

2.4.2.1 Prevalence of Kratom Use in the US

One of the most important questions in public health assessments relevant to a drug's health risks and benefits is the number of users. The surveys and more than 20,000 comments to the DEA in 2016 define the demographics of kratom users and their reasons for use. Although estimates vary across surveys, together they suggest that most kratom users are 30-50 years of age, more male than female, with some college education, employed, have health care, and are a diverse ethnic/racial mix with somewhat more kratom users identifying as White than other ethnicities (Coe et al., 2019; Covvey, Vogel, Peckham, et al., 2020; Garcia-Romeu, et al., 2020; US DHHS, 2020; Palamar et al., 2021). Surveys that focused on kratom use and opioids (e.g., Coe, et al., 2019; Garcia-Romeu, et al., 2020) or kratom use and pain find high rates of opioid use motivated in large part to replace opioids. The Grundmann (2017) survey found that most kratom users were not opioid users, and similarly the survey presented by Henningfield et al. at the American College of Neuropsychopharmacology meeting with more than 14,000 respondents found that most people used for reasons that were not related to opioids or addiction (Henningfield, et al., 2020).

But there still is no reliable estimate of the actual number of kratom users and surveys vary widely in their estimates, as shown in Table 5 below. There is consensus from 2014 that the American Botanical Education Alliance estimate of 3-5 million was credible and consistent with kratom suppliers and marketers estimates, and that kratom sales and use steadily increased. Thus, the American Kratom Association estimate of approximately 10-15 million based on Indonesian kratom export data, and with input from US marketers appears plausible.

The Covvey, et al. (2020) nationally representative online survey estimated past year use to be approximately 10.5 million kratom consumers. Informal marketer estimates suggest that kratom consumption also increased during the COVID-19 epidemic, which is not surprising due to frequent use of kratom to self-manage opioid use disorder, anxiety, stress, and depression.

2.4.2.1.1 National Survey on Drug Use and Health (NSDUH)

Prior to 2019, NSDUH did not include kratom/MG-specific items. From 2010 through 2018, there were a total of nine (9) lifetime kratom mentions (unweighted – not nationally representative), although five of those were in the last two years (2017 and 2018). By contrast, and over the same time frame, lifetime mentions (unweighted) of oxycodone, heroin, cocaine, amphetamine, marijuana, and other prototypic substances of abuse were in the many thousands. Lifetime aspirin mentions ranged from 7 to 23 per year, while lifetime diphenhydramine mentions ranged from 11 to 46 per year. See Table 1.

Table 1: Number of Unweighted Lifetime Cases of Kratom, Aspirin, Diphenhydramine, and Other Substances Reported to the National Survey on Drug Use and Health (2010-2018)

	NSDUH – Lifetime Number of Unweighted Cases								
	2010	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*
Kratom/Mitragynine†	1	0	0	0	1	1	1	3	2
Oxycodone§	2,068	2,097	2,017	1,877	1,835	*	*	*	*
Heroin§	771	826	829	842	946	956	961	1,029	962
Cocaine§	6,464	6,260	6,009	5,653	6,636	6,740	6,580	6,748	6,646
Amphetamine§	3,916	4,136	4,113	4,171	4,179	*	*	*	*
Marijuana§	22,842	22,994	22,238	22,163	23,462	24,302	23,789	24,225	24,280
Aspirin†	17	22	18	18	19	7	7	18	23
Diphenhydramine†	29	21	19	20	12	18	11	21	46

† Unweighted non-medical/illicit use case mentions from open-ended response items only
§ Unweighted non-medical/illicit use case mentions from drug-specific and open-ended response items
** Estimate suppressed by SAMHSA*

In 2019, NSDUH added a series of kratom-related items to the survey, allowing for nationally representative estimates of lifetime, past-year, and past-month kratom use vs. comparators. In 2019, an estimated 3.9 million (1.4%) Americans aged 12 and older had used kratom in their lifetime, with 1.9 million (0.7%) using in the past year and 0.8 million (0.3%) using in the past month. In comparison, 4.5 million (1.6%) had misused prescription amphetamine products and 3.2 million (1.2%) had misused oxycodone in the past year, while illicit drugs such as marijuana (48.2 million [17.5%]) and cocaine (5.5 million [2.0%]) were also used more frequently than kratom. As shown in Table 2, the majority of kratom use is kratom only or kratom with alcohol which is different from the “polypharmacy” that is increasingly normal in recreational drug users; the exception is the common use of kratom by users of opioids, alcohol, stimulants, and other drugs as an aid to reducing and/or stopping use of those drugs and/or managing withdrawal when use of those drugs was discontinued.

Table 2: Lifetime, Past Year, and Past Month Use of Kratom vs. Misuse or Illicit Use of Comparators (Numbers in 1,000s), NSDUH (2019)

	Use / Misuse / Illicit Use N in 1,000s (%)		
	Lifetime	*Past Year*	*Past Month*
Kratom/Mitragynine	3,909 (1.4%)	1,919 (0.7%)	825 (0.3%)
Oxycodone†	*	3,185 (1.2%)	N/A
Heroin§	5,696 (2.1%)	745 (0.3%)	431 (0.2%)
Cocaine§	41,445 (15.1%)	5,468 (2.0%)	1,998 (0.7%)
Amphetamine†	*	4,486 (1.6%)	N/A
Marijuana§	127,139 (46.2%)	48,242 (17.5%)	31,606 (11.5%)

All estimates (N and %) are weighted to be nationally representative
N/A Data not collected by NSDUH
† Misuse of prescription or OTC product
§ Illicit use
** Estimate suppressed by SAMHSA*

Past month kratom use alone and in combination with other substances are presented in Table 3 below.

Table 3: Past Month Kratom Use Among Adults 18+: Overall, Kratom Only Use, and In Combination with Misuse or Use of Other Substances, NSDUH (2019)

	Past Month Kratom Use	
	% of US Adults 18 Years of Age or Older	*% of Adult Past Month Kratom Users*
Overall	0.32%	100.00%
Kratom and Pain Reliever Misuse	0.02%	7.04%
Kratom and Sedative Misuse	<0.01%	1.05%
Kratom and Alcohol	0.23%	71.87%
Kratom and Stimulant Misuse or Cocaine Use	0.04%	12.38%
Kratom Only	0.08%	24.41%

** All estimates are weighted to be nationally representative*
***Categories are not mutually exclusive (e.g., Kratom and Pain Relievers includes all respondents using both kratom and pain relievers, regardless of whether they were using other substances listed here)*
****The Kratom Only category excludes only those substances listed in this table. A respondent using Kratom and a substance not included in this table would be considered a kratom only user for the purposes of this analysis*

However, the NSDUH survey appears to greatly underestimate kratom use (see estimates in **Error! Reference source not found.**), just as it apparently does for many new psychoactive s ubstances (NPS). This deficiency was discussed by Palamar et al. (2015), who called for “new survey methods to prevent underreporting”. Similarly, the RADARS survey (Schimmel, et al., 2021) may have similar deficiencies. Both of these surveys include large panels who are interviewed, and it is possible that panel selection and/or interview approaches that provide realistic assessments of traditional recreationally used drugs and prescription opioids may underestimate use of novel products, and products taken for health and well-being and not for recreational purposes. These hypotheses require examination as the answers are not clear; however, kratom experts and marketers agree that that the NSDUH and RADARS surveys substantially underestimate the number of kratom users in the US.

Table 4: Kratom use prevalence estimates across studies in the United States

Year	Source	Method	Prevalence
2019	NSDUH 2020	• US Federal survey by SAMHSA (N=67,625) • Nationally representative multi-stage probability sample with face-to-face interviews • % estimates of US population aged 12+ (18+ presented in this slide)	Lifetime: 1.5% Past year: 0.7% Past month: 0.3% Past year adult users estimate: 1,790,000
2018-2019	Schimmel et al. 2020	• US survey by RADARS System panel (N=59,714) • Non-probability sample with online self-administration • % estimates of US population aged 18+	Lifetime: 1.3% Past year: 0.8% Past year adult users estimate: 2,040,000
2019	Covvey et al. 2020	• US survey via Qualtrics Panels (N=1,842) • Non-probability sample with online self-administration • % estimates of US population aged 18–59	Lifetime: 6.1% Past year: 4.1% Past month: 3.5% Past year adult users estimate: 10,500,000
2019	American Kratom Association	• Southeast Asian survey of commercial kratom exporters • Average monthly volume of kratom exported to US ÷ average volume of kratom used by US kratom consumer = approximate number of US kratom consumers	estimated US kratom consumers: 15,600,244
2014-2016	Botanical Education Alliance	• US survey of kratom venders	Estimated 3–5 million kratom consumers

2.4.2.1.2 Treatment Episode Datasets (TEDS) and Monitoring the Future (MTF)

There are no updates to the TEDS and MTF data sets since the 2018 report. Note that the lack of reports does not mean there were no instances of treatment seeking or recreational use by young people. In fact, there are internet and media reports that suggest some recreational use by youth, and there are self-reports of addiction in some kratom users on internet discussion groups and in internet surveys of adults. However, the signals from TEDS and MTF are apparently small enough not to warrant reporting.

2.4.2.1.3 Drug Abuse Warning Network (DAWN)

A new iteration of DAWN began collecting data from a sample of hospitals in April 2019. While some preliminary data were released (April 2019-October 2020), data related to kratom are not yet available.

2.4.2.1.4 American Association of Poison Control Centers' National Poison Data System (AAPCC-NPDS)

From 2011-2017, a total of 1,807 exposures involving kratom were reported to AAPCC, with about two-thirds of those occurring in 2016-2017 (Post, Spiller Chounthirath & Smith, 2018). *Kratom* is listed as a separate product in the AAPCC annual reports since 2016; however,

Plants-Mitragyna and *Mitragyna speciosa korthals* are not listed separately in the reports (they are included in broader categories). Thus, only the generic-coded *Kratom* cases are available when using the AAPCC annual reports as a data source. Table 5 below shows those calls listed under the generic *Kratom* code, as well as widely used substances that are readily available without prescription as comparators, for the years 2016-2019. Nicotine gum, lozenge and patch and the lessor used prescription nicotine nasal spray and oral inhaler all carry dependence potential, are used off-label by some people, and can sustain dependence. Abrupt discontinuation is not recommended due to the possibility of a withdrawal syndrome, but these comparators are not listed in the Controlled Substances Act because their abuse potential is lower than the products they replace (namely cigarettes) and it was considered in the interest of public health to make them more readily available (FDA, 1995, 1996).

Table 5: Exposure Cases by Product, (AAPCC-NPDS, 2016-2019)

	2016	2017	2018	2019
Kratom	1	372	1,146	1,357
Diphenhydramine*	55,740	55,075	53,842	53,121
Aspirin**	17,882	18,089	17,380	16,317
Nicotine Pharmaceuticals***	1,571	1,582	1,741	1,809

*Diphenhydramine alone or in combine
**Aspirin only; does not include combination products
***Nicotine gum, patch, and lozenge

2.4.2.1.5 National Forensic Laboratory Information System (NFLIS)

There are no updates to the NFLIS data set since the 2018 report.

2.4.2.2 Reports of Overdose and Death

In FDA's February 6, 2018 report by Commissioner Scott Gottlieb[12], in which FDA stated that it had documented 44 kratom associated deaths (worldwide over nearly ten years), it included the following acknowledgement:

> "Overall, many of the cases received could not be fully assessed because of limited information provided; however, one new report of death was of particular concern. This individual had no known historical or toxicologic evidence of opioid use, except for kratom. We're continuing to investigate this report, but the information we have so far reinforces our concerns about the use of kratom."

About six months later, the Assistant Secretary of Health of the US Department of Health and Human Services (DHHS) reviewed the FDA-prepared 8-FA submitted to the US Drug Enforcement Administration (DEA) in October of 2017 with a recommendation to Schedule MG and 7-OH-MG as Schedule I drugs in the CSA (thus, effectively banning legal sales and possession of kratom). The Secretary discovered that the death highlighted in Commissioner

[12] https://www.fda.gov/news-events/press-announcements/statement-fda-commissioner-scott-gottlieb-md-agencys-scientific-evidence-presence-opioid-compounds

Gottlieb's report due to the apparent absence of other substances was caused by an automobile crash, and there was no evidence that kratom use was a contributing factor.

Babin (2018) evaluated all deaths reported by the FDA as potentially related to kratom. She concluded:

> "None of the case reports released to date support the evidentiary standard required by the CSA to prove there is a risk to the public health that relies primarily on the FDA claim of numerous deaths associated with kratom.
>
> In fact, the data show only that a relatively small number of individuals died from a variety of actual causes related to underlying health issues, abuse of prescription or illicit drugs either at toxic doses or taken in combination when contraindicated. The use of kratom by these individuals has no medical or statistical significance in assessing the safety signal required for scheduling." (p. 8).

Olsen, O'Donnell, Mattson, et al. (2019) commented on 152 unintentional drug overdose deaths listed as associated with kratom, out of 27,338 deaths listed in the State Unintentional Drug Overdose Reporting System (SUDORS). The authors included the following statements supporting their concerns about potential kratom risks, as well as uncertainties about the actual contribution of kratom to deaths reported by medical examiners as "kratom caused" and/or "kratom associated":

> "Data on 27,338 overdose deaths that occurred during July 2016–December 2017 were entered into SUDORS, and 152 (0.56%) of these decedents tested positive for kratom on postmortem toxicology (kratom-positive). Postmortem toxicology testing protocols were not documented and varied among and within states. Kratom was determined to be a cause of death (i.e., kratom-involved) by a medical examiner or coroner for 91 (59.9%) of the 152 kratom-positive decedents, including seven for whom kratom was the only substance to test positive on postmortem toxicology, although the presence of additional substances cannot be ruled out (4)." (p. 1)

Gershman, Timm, Frank, et al. (2019) reviewed autopsy reports and performed additional analyses on available blood samples from 15 death cases that mentioned kratom from 1999 to 2017. They reported:

> "Autopsy reports were reviewed for all 15 deaths, which included 13 men and 2 women, with a median age of 28 years (range, 24 to 53). On the basis of toxicology testing, 11 cases involved multidrug ingestion (two to six drugs), and 8 persons had positive test results for other opioids. Four deaths were reported to involve mitragynine only, and coroners attributed each to mitragynine toxicity. We further investigated the 4 deaths that appeared to be due to mitragynine only, reviewing police investigation records for all 4 and performing comprehensive toxicology screening with high-performance liquid chromatography with tandem mass spectrometry for the 3 cases for which residual blood was available (Table 1). In our investigation of all 15 kratom-related deaths, we determined that 14 deaths clearly involved multiple drugs. Mitragynine levels varied widely, from 16 to 4800 ng per milliliter. Residual blood was not available for confirmatory testing in the remaining kratom-related death." (p. 1)

The Olsen, et al. (2019) and Gershman, et al. (2019) reports are consistent with the evaluation of Dr. Babin (2018) and the position of NIDA (2019) on its website that suggests that in the vast majority of kratom associated deaths, it cannot be ruled out that other substances or conditions were contributing, if not the primary, cause of death.

NIDA's Kratom Facts webpage states:

> "Can a person overdose on kratom? There have been multiple reports of deaths in people who had ingested kratom, but most have involved other substances. A 2019 paper analyzing data from the National Poison Data System found that between 2011-2017 there were 11 deaths associated with kratom exposure. Nine of the 11 deaths involved kratom plus other drugs and medicines, such as diphenhydramine (an antihistamine), alcohol, caffeine, benzodiazepines, fentanyl, and cocaine. Two deaths were reported following exposure to kratom alone with no other reported substances, but the extent of toxicological testing is unknown.* In 2017, the FDA identified at least 44 deaths related to kratom, with at least one case investigated as possible use of pure kratom. The FDA reports note that many of the kratom-associated deaths resulted from intake of adulterated products or taking kratom with other potent substances, including illicit drugs, opioids, benzodiazepines, alcohol, gabapentin, and over-the-counter medications, such as cough syrup. Also, there are reports of kratom packaged as dietary supplements or dietary ingredients laced with other compounds that caused deaths. People should check with their health care providers about the safety of mixing kratom with other medicines." (NIDA, 2019)

NIDA's position is consistent with the conclusion drawn by Assistant Secretary of Health Brett P. Giroir, MD, ADM who stated:

> "There is still debate among reputable scientists over whether kratom by itself is associated with fatal overdoses" (Giroir, 2018).

Palamar (2021) examined data from the 2019 National Survey on Drug Use and Health that included 56,136 respondents. The author concluded:

> "Kratom use is particularly prevalent among those with opioid use disorder but is also prevalent among people who use other drugs. Use has been associated with numerous adverse events, although most have involved use of other drugs." (p. 5)

Gershman, Timm, Frank, et al. (2019) reviewed autopsy reports and performed additional analyses on available blood samples from 15 death cases that mentioned kratom from 1999 to 2017. They reported:

> "Autopsy reports were reviewed for all 15 deaths, which included 13 men and 2 women, with a median age of 28 years (range, 24 to 53). On the basis of toxicology testing, 11 cases involved multidrug ingestion (two to six drugs), and 8 persons had positive test results for other opioids. Four deaths were reported to involve mitragynine only, and coroners attributed each to mitragynine toxicity. We further investigated the 4 deaths that appeared to be due to mitragynine only, reviewing police investigation records for all 4 and performing comprehensive toxicology screening with high-performance liquid chromatography with tandem mass spectrometry for the 3 cases for which residual

blood was available (Table 1). In our investigation of all 15 kratom-related deaths, we determined that 14 deaths clearly involved multiple drugs. Mitragynine levels varied widely, from 16 to 4800 ng per milliliter. Residual blood was not available for confirmatory testing in the remaining kratom-related death." (p. 1)

Henningfield, Grundmann, Babin, et al. (2019) summarized animal toxicology data, surveys and mortality data associated with opioids and kratom to provide a basis for estimating relative mortality risk. Related to safety, the authors concluded:

> "Kratom is not without risk, but the risk estimates as calculated by any of the approaches used, relative to opioids, suggest that morphine-like opioids carry an overdose risk of a thousand or more times greater than kratom. This conclusion has the limitation that some kratom users inherently carry or assume factors that might greatly increase the risk of kratom-associated mortality, e.g., use in combination with opioids, sedatives, alcohol or other drugs, or some preexisting disease states that may make kratom use especially risky. The fact that deaths associated with kratom use varied widely and included liver disease, homicide, suicide, trauma, and overdose with clearly lethal other drug concentrations (Babin, 2018; Henningfield et al., 2018b), cannot form the basis for concluding that co-existing conditions make kratom use more or less risky compared to opioids."
>
> "In fact, while the contribution of kratom to death in some cases cannot be ruled out, there has yet to be an overdose death from kratom alone in either the US or South East Asia where heavy kratom use is common (Prozialeck et al., 2019)."
>
> "Because many deaths possibly involving kratom appear to have also involved opioids and other drugs that are known to carry a high risk of overdose death, a regulatory approach that establishes standards for kratom product purity, packaging, labeling, and alkaloid content is urgently needed to reduce the risks for persons who purchase lawfully marketed products." (p. 2-3)

2.4.2.3 US and International Survey Data

In all of the surveys reporting reasons for use, despite descriptions by some authors with terms such as "therapeutic use", it is important to note that reasons for kratom use provide some basis for establishing benefits, though these do not imply FDA approved therapeutic claims.

Leong Abdullah, Tan, Narayanan, et al. (2021) conducted an analytical cross-sectional study of 200 participants (100 kratom users and 100 control subjects) in Malaysia, where kratom grows in abundance, leaves and marketed products are widely available, and use is widespread despite its illegality. The authors cardiovascular safety conclusions were:

> "The odds of having ECG abnormalities did not differ between kratom users and non-kratom-using control subjects, except for higher odds of sinus tachycardia in kratom users." (p. 7-8)

Leong Bin Abdullah, Yuvashnee & Singh (2021) conducted a cross-sectional study including data from 200 respondents (100 subjects who use kratom and 100 healthy controls) in Malaysia. The authors concluded:

> "The results of this study have some clinical implications to healthcare professionals. People who use kratom may experience some impairment of physical health, psychological, and environment QoL. Longer duration of kratom use may impair the physical health QoL, whereas greater severity of kratom dependence may impair all domains of QoL except for social relationship QoL. Hence, it is necessary to adequately treat kratom dependence in order to achieve better QoL in people who use kratom." (p. 5)

Garcia-Romeu, Cox, Smith, et al. (2020) conducted a MG survey of 2798 respondents. Related to safety, the authors concluded:

> "This study supports the results of previous studies (Coe et al., 2019; Grundmann, 2017; Smith and Lawson, 2017; Swogger et al., 2015) by suggesting that kratom has a relatively benign risk profile compared to typical opioids, with only a minority of respondents endorsing kratom related adverse effects, withdrawal symptoms, or problematic use. Adverse effects reported here were most commonly rated as mild and lasted ≤1 day, and less than 1% of the total sample found the effects of kratom to be severe enough to seek medical treatment. Adverse effects of kratom use were related to a number of demographic, health, and drug use variables including age, sex, education, income, depression, pain severity, and past 12-month alcohol and opioid use. Therefore, younger individuals or people with depression or more severe pain may experience more kratom-related adverse effects, potentially related to co-use with alcohol or other opioids. However, daily kratom users among the current sample were unlikely to meet criteria for a kratom related SUD, or report substantial problems or concerns related to their kratom use. Logistic regression models additionally found that greater kratom-related SUD symptoms predicted negative effects of kratom use, kratom withdrawal, and seeking treatment for kratom use, but not kratom use for the purposes of opioid reduction. Thus, kratom may differ in important respects from typical opioids, and may have significant therapeutic potential in light of the present opioid crisis." (p. 6)

Smith, Rogers, Schriefer, et al. (2021) analyzed 280 kratom subreddit posts and concluded:

> "Ultimately, kratom subreddit posts contained complicated narratives that do not make for simple characterizations. For some, kratom was lifesaving and for others it was ruinous, or yet another substance to which they had become beholden. Like other findings, the (provisional) takeaway is that it is premature to laud kratom as a cure-all and equally premature to demonize it as a dangerous substance with risk that outweighs benefit. At base, this stems from insufficient information, but also from the fact that "kratom" in the US constitutes many different products with variability in alkaloid content, composition, and purity, some of which is an artifact of factors related to the geographic region of the tree, kratom harvesting, post-harvesting handling, or other agricultural or horticultural conditions and practices (Fowble and Musah, 2019; Griffin et al., 2016; Mudge and Brown, 2017; Zhang et al., 2020). Findings here reinforce current scientific consensus, which is that kratom is a highly varied psychoactive substance being used in different doses and for different reasons among a diverse group of people that we are only beginning to understand." (p. 7)

Swogger & Walsh (2018) conducted a systematic review of kratom use and mental health including 13 studies addressing kratom use in the US, SEA, and other countries and regions of the world. Most mental health related uses were for harm reduction as a substitute for less desirable substances including opioids, alcohol, and other drugs, or for modulation of mood including energizing effects to counteract fatigue and self-management of mood disorders including anxiety, depression, and posttraumatic stress. The authors stated:

> "In conclusion, kratom use appears to have several important mental health benefits that warrant further study. Kratom dependence is a risk for some people, though the dependence syndrome appears to be mild in its psychosocial and physiological effects relative to that of opioids." (p. 139)

The Garcia-Romeu, et al. (2020) survey mentioned earlier concluded:

> "Most respondents endorsed using kratom for pain relief (91.3%), and/or to treat mood-related issues such as anxiety (67.2%), and depression (64.5%). Among these, the majority said they would recommend kratom for pain relief (98.7%), and mood-related issues (96.7%). Mean (SD) efficacy ratings of kratom for treating pain on a scale from 0 (not at all) to 100 (extremely) were 83.3 (18.5); for anxiety were 76.7 (24.3); and for depression were 76.5 (25.4). Subgroups also reported using kratom for post-traumatic stress (29.6%) or bipolar mood (24.6%), with mean (SD) efficacy ratings of 60.2 (38.2), and 51.4 (39.9), respectively." (p. 3-4)

Covvey, et al. (2020) conducted an online cross-sectional survey including data from 1,842 respondents, of which 112 (6.1%) reported lifetime kratom use. The authors concluded:

> "Similar to existing data, the presence of emotional and mental health conditions, including concurrent substance use, was ubiquitous for individuals reporting kratom use compared to others. Anxiety, depression, and chronic pain were the most reported medical conditions among both groups, with significantly higher rates among respondents reporting kratom use. Previous surveys of individuals who use kratom cite treatment of pain and mental health conditions as the primary motivations for use. Coe and colleagues identified treatment of pain (48%) or mental health conditions (21.5%) as the most common reasons for use, while Grundmann identified even higher percentages reporting use for pain (68%) or mental health (66%) conditions. While the present study was not able to directly ascertain reasons underlying the use of kratom, these conditions were found with higher frequency among individuals reporting kratom use, suggesting a possible connection." (p. 5)

Singh, Grundmann, Murugaiyah, et al. (2020) conducted a field face-to-face survey including data from 92 respondents (long-term male kratom users). The authors stated:

> "Seventy-two participants (78%) reported using kratom to enhance sexual performance, and 71 of them (71/72, 99%) reported experiencing improved sexual performance. Of those who reported not using kratom to enhance sexual performance, 7/20 (35%) also experienced improved sexual performance after kratom use. The reported enhancements of sexual performance included: more energy during sex (75/92), delayed ejaculation (71/92), help to maintain erection (70/92), longer climax (51/92),

increased sexual desire (44/92), and reduced sex organ sensitivity (43/92). The mean (SD) Mal-BMSFI score was 33.9 (7.1) and 78/92 (85%) reported overall high satisfaction with their sex life in the past 30 days." (p. 1)

Singh, Narayanan, Müller, Swogger, et al. (2019) studied the motives for using kratom among regular kratom users in Malaysia. Singh, et al. (2019) summarized their results as follows:

> "A total of 116 regular kratom users were recruited for this cross-sectional survey. The Drinking Motives Questionnaire (DMQ) was administered to measure kratom use motives. Our results indicate that heavy (> 3 glasses daily, each glass contains 48.24–50.4 mg of mitragynine) kratom use was associated with coping ($t87.09 = 3.544$, $p < 0.001$), and enhancement ($t114 = 2.180$, $p=003$). Single subjects had higher mean scores on the coping domain, relative to married subjects ($t113.89 = 3.029$, $p < 0.003$), while those earning more than RM1500 per month had higher mean scores on the enhancement domain, compared to those earning less than RM1500 per month ($t107 = 2.151$, $p < 0.034$). Higher scores on the coping domain were significantly associated with higher (> 3 glasses daily) kratom consumption ($p < 0.0045$). Coping was associated with high (> 3 glasses daily) kratom consumption among regular kratom users in traditional, rural settings." (p.1)

Singh, Chear, Narayanan, et al. (2020) studied patterns of use and reasons for use by current and former opioid poly-drug users in Malaysia. They summarized their findings as follows:

> "A total of 204 opioid poly-drug users (142 current users vs. 62 former users) with current kratom use history were enrolled into this cross-sectional study. A validated UPLC-MS/MS method was used to evaluate the alkaloid content of a kratom street sample. Results from Chi-square analysis showed that there were no significant differences in demographic characteristics between current and former opioid poly-drug users except with respect to marital status. Current users had higher odds of being single. Similarly, there were no significant differences in the duration, daily quantity, or frequency of kratom use between current and former opioid poly-drug users. While both current and former opioid users reported using kratom to ameliorate opioid withdrawal, current users had significantly higher likelihood of using kratom for that purpose. In contrast, former opioid users were more likely to be using kratom for its euphoric (mood elevating) effects. Results from the UPLC-MS/MS analysis indicated the major alkaloids present in the representative kratom street sample (of approximately 300 mL of brewed kratom) were mitragynine, followed by paynantheine, speciociliatine and speciogynine, as well as low levels of 7-hydroxymitragynine. Both current and former opioid poly-drug users regularly used kratom (three glasses or about 900 mL daily or the equivalent of 170.19 mg of mitragynine) to overcome opioid poly-drug use problems." (p. 1)

2.4.2.4 Public Health and Individual Benefits of Kratom.

In a systematic review of the global mental health effects of kratom, Swogger & Walsh (2018) stated:

> "In conclusion, kratom use appears to have several important mental health benefits that warrant further study. Kratom dependence is a risk for some people, though the dependence syndrome appears to be mild in its psychosocial and physiological effects

relative to that of opioids. More and better research, including well-controlled, prospective studies is necessary to further elucidate kratom's potential for good and harm and the moderators of its effects." (p. 139)

2.4.2.4.1 Kratom Use for Pain Management and Managing Opioid Use/Withdrawal

Coe, Henningfield, Pillitteri, et al. (2019) conducted an anonymous online survey of 3,024 kratom users (2867 current users and 157 former users). The authors wrote:

> "Kratom was used primarily to relieve pain (endorsed by 48% of respondents), for anxiety, PTSD, or depression (22%), to increase energy or focus (10%) and to help cut down on opioid use and/or relieve withdrawal (10%). Over 90% of respondents who used it in place of opioids indicated that it was helpful to relieve pain, reduce opioid use, and relieve withdrawal." (p. 24)

> "In contrast to the well-documented and serious risks associated with opioids (Baldini et al., 2012; Benyamin et al., 2008), respondents reported kratom effects as relatively minor, with few requiring medical attention. The rates and severity of "bad reactions" were generally similar to those reported previously (Grundmann, 2017), occurring in approximately 13% of respondents. The reported incidence of bad adverse reactions was 13%, and reactions were overwhelmingly mild and self-managed." (p.24)

> "The findings from this survey indicate that many individuals are taking kratom for conditions that often involve the prescribing of or self-medication with opioids (i.e., pain, withdrawal relief). Survey respondents overwhelmingly reported that kratom was helpful for these conditions and that bad effects from kratom, including those leading them to seek medical care, were uncommon." (p. 29).

> "Results of this survey and others (Grundmann, 2017) suggest that kratom may be a useful alternative to opioids for some persons with pain, and this would be consistent with what is known about kratom pharmacology (Kruegel et al., 2016; Raffa et al., 2018; Takayama et al., 2002)." (p. 29)

> "Although severity and relatedness of the bad reactions to kratom were not assessed, only 0.8% of respondents stopped using kratom because of a bad reaction or because they didn't like the way it made them feel." (p. 30)

> "The rates and severity of "bad reactions" were generally similar to those reported previously (Grundmann, 2017), occurring in approximately 13% of respondents." (p. 30)

> Müller, Hillemacher & Müller (2020) illustrates the realities of pain management that are typical in the real world. In this case, illustrated by a patient who benefited at times satisfactorily and at others less so. A summarized by the authors:

> "We present the case of a 26-year-old man in Substitol-assisted treatment of excessive Kratom and Tilidin use expressing the wish for a drug-free management of a chronic pain condition. After an accidental calcaneus impression fracture, the patient was suffering from severe chronic pain and anxiety of further accidents. This was managed initially with Tilidin. Resulting from the wish to self-manage the pain condition in a way that permitted continuation of a job, the patient searched for a 'natural' treatment

> alternative obtained from an Internet vendor. He successfully instrumentalized Kratom for 3 years with daily consumption intermixed with occasional Tilidin for pain management. However, the dose of Kratom was increased considerably up to a level of effect reversal, when no analgesic and behaviorally activating effects occurred any more, but only intense drowsiness. The patient was treatment seeking and subsequently detoxified from Kratom and Tilidin. Pain management was shifted to retarded morphine." (p. 1)

Note that in the foregoing report by Müller et al. (2020) (and another below by Müller et al., 2021), as in some other studies from the Malaysia Center for Drug Research reviewed by Henningfield, Fant & Wang (2018), the term "instrumentalized" and "instrumentalization" or "instrumental use" elsewhere, is approximately interchangeable with terms such a "therapeutic" and "beneficial" used in other studies and reviews.

Although the surveys indicate that a major reason for kratom use is the self-management of pain, it is also important to understand that kratom, like other pain management approaches, whether FDA-approved medicines or any other therapeutic approach, is not a panacea for all types of pain, people or pain sufferers (see Henningfield, Ashworth, Gerlach, et al., 2019; Kroenke, Alford, Argoff, et al., 2019).

A harm reduction benefit of replacing opioids and other drugs with kratom is the absence of opioid-like respiratory depressant effects and substantially lower overdose potential of kratom as compared to opioids. Considering the more than 93,000 drug overdose deaths in 2020, the majority of which are due to opioid intoxications, kratom use provides an alternative to opioid use and withdrawal (CDC, 2021). Kratom also has a low risk of inducing psychopathological states or aggression. Swogger & Walsh (2018) concluded:

> "Apart from kratom dependence, available studies give no indication that kratom causes psychopathology…. We searched for scientific information on kratom use and self-and-other directed aggression. Although few studies directly assessed aggression, reports of this outcome were notably absent from studies that indirectly enabled such reporting (e.g., Anwar et al., 2016; Saingam et al., 2012; Swogger et al., 2015; Trakulsrichai et al., 2013). No studies indicated increased self-or-other directed aggression following acute kratom ingestion. Approximately 1% of Malaysian interviewees indicated being aggressive or experiencing hostility while in kratom withdrawal (Ahmad and Aziz, 2012)." (p. 5)

An international consortium of leading kratom researchers (Prozialeck, Avery, Boyer et al., 2019) conducted a scientific and policy analysis of kratom and concluded:

> "The many positive user comments on Erowid.org (Erowid, 2016), SageWisdom.org (Wisdom, 2016), Reddit.com/r/kratom (Reddit, 2018) and Speciosa.org (speciosa.org, 2016) comprise an extensive collection of anecdotal data documenting kratom use. Scientific analyses of such user reports clearly indicate that the therapeutic potential of kratom is too large to be ignored (Swogger et al., 2015). The 23,000+ comments submitted to the federal register in response to the DEA's proposed scheduling action also provide a vast collection of anecdotal data suggesting profound therapeutic benefits for kratom (DEA, 2016a). Another piece of evidence suggesting that kratom

may have significant therapeutic potential is that US patents have been issued for companies and individuals who are interested in developing kratom-based drugs (Heyworth, 1964; Takayama, Kitajima, Matsumoto, & Horie, 2008). Together, these observations provide evidence that kratom may have potentially useful therapeutic effects, and that well-controlled clinical trials are urgently needed to evaluate the safety and efficacy of kratom and its principal alkaloid mitragynine." (p. X)

2.4.2.4.2 Kratom Use During the COVID-19 Pandemic

Müller, Hillemacher & Müller (2021) published a case history of the use of kratom to self-manage anxiety and depression during the COVID-19 pandemic. They reported:

> "Altogether, the present report may add evidence for long-term instrumentalization of Kratom for self-management of major depression and general anxiety disorder and Morbus Meniere. It also evidences the boundaries of drug instrumentalization when environmental conditions change, such as during increased psychological stress in the COVID-19 pandemic." (p. 3)

In the first half-year of the COVID-19 pandemic, Singh, Brown, Cinosi, et al. (2020) discussed how the pandemic may have affected kratom supply and use drawing on observations from researchers globally as well as kratom suppliers and marketers from the SEA region. Their observations included the following:

> "The widespread use of kratom and consistent reports of its benefits or therapeutic value that are important to users raises the question: would sudden decreases in the availability of the plant have negative impacts on kratom users? Various internet studies found that some kratom users are concerned about the possibility of relapsing to opioids and/or seeking alternative, possibly questionable, sources of kratom if products become less readily available. This is a serious concern as kratom, not currently regulated as a dietary supplement, may be adulterated by unscrupulous traders and cause users to relapse to opioid use and inevitably experience a significant increase in overdose risk (7, 9, 14–17). Indeed, there is evidence to suggest that the COVID-19 pandemic has been associated with increased drug overdose deaths and that the reduced access to conventional treatment, as well as mutual-aid groups, is a plausible contributing factor (18), though it is unknown whether diminished access to kratom has explicitly contributed to any overdose deaths." (p. 1)

Note that similar concerns as expressed above were also discussed by US DHHS, Assistant Secretary of Health Dr. Giroir in his August 2018 formal rescission of the October 2017 recommendation developed by the FDA to permanently list MG and 7-OH-MG as Schedule I drugs, which would have abruptly banned legal consumer sales and possession (see below).

As of 2021, it has already been estimated by the US Centers for Disease Control and Prevention (CDC) that total drug overdose deaths rose nearly 30% in 2020 to more than 93,000 in the US (Ahmad, Rossen & Sutton, 2021). The actual impact on kratom use and supply related to the COVID-19 pandemic may not be understood for a year or more to come but would seem to merit further study. Given that a major use of kratom is as a less harmful substitute for opioids and the absence of evidence suggesting that it has contributed to the opioid epidemic (see Factors 4, 5 and 6 and Henningfield, Raffa, Garcia-Romeu & Doshi,

2018), it is hypothesized that kratom access may have prevented many deaths. Regardless of the actual and probably complex relationship, this merits study.

2.4.2.4.3 Potential Effects of Inappropriate Regulation

Public health risks of regulation, including decisions as to where public health is better served by scheduling or not scheduling substances and products, must consider the risks and benefits of decisions. For example, the leading nicotine replacement medicines (gum, lozenge and patch) were not listed in the CSA despite meeting all criteria for CSA control and other risks. Additionally, they were converted to over-the-counter status due to their lower abuse potential and addiction risk and better safety profile than cigarettes (FDA, 1995, 1996; Henningfield, 2011). Similarly, common cough, cold and allergy products (e.g., diphenhydramine and dextromethorphan and caffeine), substances that lead to dependence and withdrawal, are not scheduled in the US or globally. This illustrates the point that drug scheduling and control actions in the US and internationally consider the public health risks and benefits of scheduling actions in the determination of whether drugs are scheduled or not and if they are controlled, which schedule they are placed in (Spillane & McAllister, 2003)

Survey findings and internet monitoring provided no compelling evidence that kratom was fueling the opioid epidemic but provided substantial evidence that kratom offered a life-saving path away from opioids. It appeared that DEA shared similar concerns and that US DHHS agreed. Although DEA proposed scheduling kratom in August 2016, within approximately one month they withdrew the proposal inviting public comment and FDA input (DEA, 2016). This was in response to thousands of comments from kratom consumers describing kratom's health benefits, its use as an opioid replacement, and fear of a relapse to opioids if kratom was scheduled. The DEA Administrator, Chuck Rosenberg, explained that withdrawing kratom from the market could pose risks to people who used kratom to abstain from opioids and a relapse could put them at risk of an overdose death. Assistant Secretary of DHHS, Dr. Giroir, in his MG and 7-OH-MG scheduling rescission letter stated:

> "Furthermore, there is a significant risk of immediate adverse public health consequences for potentially millions of users if kratom or its components are included in Schedule I, such as:
>
> - Suffering with intractable pain;
> - Kratom users switching to highly lethal opioids, including potent and deadly prescription opioids, heroin, and/or fentanyl, risking thousands of deaths from overdoses and infectious diseases associated with IV drug use;
> - Inhibition of patients discussing kratom use with their primary care physicians leading to more harm, and enhancement of stigma thereby decreasing desire for treatment, because of individual users now being guilty of a crime by virtue of their possession or use of kratom;
> - The stifling effect of classification in Schedule I on critical research needed on the complex and potentially useful chemistry of components of kratom."

Assistant Secretary Giroir also noted:

> "I am also concerned about the impact of scheduling kratom on our ability to conduct research, especially survey research and our current inability to routinely test for kratom in those brought into an emergency room as a result of a possible overdose."

Concerns about these foreseeable risks if kratom was banned for sale and criminalized for consumer possession were expanded in several published articles (e.g., Grundmann, Babin, Henningfield, et al., 2021; Grundmann, Brown, Henningfield, et al., 2018), and joint expert report/letters to the DEA, DHHS, FDA, NIDA, White House and Congressional leaders (Henningfield, Swogger, Walsh, Kruegel, et al., 2018a, 2018b). A critique of FDA's own 8-FA (FDA, 2017a) by kratom and substance abuse experts and those experienced in drug scheduling was also published (Henningfield, Babin, Boyer, et al., 2018). These analyses raised concerns in addition to those raised by Assistant Secretary Giroir. These included the foreseeable consequence of a rapidly developing kratom black market increasing the problems of product adulteration and quality, instead of gaining the benefits of legally regulated kratom with standards for purity, packaging, labeling, marketing, and claims.

2.4.2.5 Factor 4, 5, and 6 Updated Conclusions

The most important finding from substantially more survey evidence in the US is that the surveys do not support the conclusion that kratom products and kratom's primary active alkaloid, MG, pose a "serious imminent threat to public health". This extensive survey update supports the Henningfield, Fant & Wang (2018) conclusion:

> "There has been no documented threat to public health that would appear to warrant emergency scheduling of the products and placement in Schedule I of the CSA carries risks of creating serious public health problems…. Although kratom appears to have pharmacological properties that support some level of scheduling, if it was an approved drug, placing it into Schedule I, thus banning it, risks creating public health problems that do not presently exist".

Conversely, the evidence is affirmative that millions of people in the US purchase and use kratom products for the health benefits they provide and are preferred to FDA approved medicines because for them, kratom products are more effective, accessible, and tolerable. Furthermore, many prefer managing health problems with natural products.

For those using kratom products in place of opioids, which appears to be approximately 1/3 of all kratom users, it is foreseeable that removing kratom from the legal marketplace would put many at risk of returning to opioid use and risking opioid overdose death. This was clearly stated in comments to the DEA and public hearings as reported in the 2018 8-FA, and in surveys. As stated by Assistant Secretary Dr. Giroir, as noted earlier:

> "Furthermore, there is a significant risk of immediate adverse public health consequences for potentially millions of users if kratom or its components are included in Schedule I, such as: … Kratom users switching to highly lethal opioids, including potent and deadly prescription opioids, heroin, and/or fentanyl, risking thousands of deaths from overdoses and infectious diseases associated with IV drug use…" (Giroir, 2018).

As noted in Factor 1, the survey data are consistent with comments by kratoms users to DEA[13,14,15,16] and FDA[17],[18] that were summarized in the Henningfield, Fant & Wang, 2018 kratom 8-FA, as well as with comments in public hearings in cities and states that have been considering, and in many cases, implementing kratom regulations, to ensure access to kratom and provide some regulatory oversight over products and marketing. Although some commentors describe addiction to kratom, the most common themes are used for health and well-being, including to stay off opioids. Although not scientific surveys, these comments from real world kratom users provide an important complement to the scientific findings.

2.5 Factor 7 – The Psychic or Physiological Dependence Liability

2.5.1 Summary of 2018 Findings:

Psychic dependence has been commonly referred to in recent years simply as "dependence" (APA, 1994; WHO, 1994) or by the 5th edition of the APA's Diagnostic and Statistical Manual as "substance use disorder" and more commonly as "addiction" though definitions of addiction vary widely. Physiological dependence is often used interchangeably with the most common measure of physiological dependence, namely "withdrawal" which is also considered a clinical disorder (APA, 2013). In the 2018 8-FA, Henningfield, Fant & Wang (2018) concluded:

> "There have not been laboratory studies of physical or psychological dependence or abuse potential in humans caused by kratom." Nor had classic animal studies of employing the drug self-administration and physical dependence/withdrawal model been conducted as have been conduct since 2018 (see Factor 2 in this report)." (p. 584)

Nonetheless, the real-world evidence in the published literature supported the following conclusions:

> "…abrupt discontinuation [of kratom use] may be accompanied by withdrawal symptoms that are qualitatively similar but generally weaker than those observed following discontinuation of opioids. However, such reports make it difficult to disentangle the emergence of preexisting symptoms that had been mitigated by kratom use from those

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[13] See 22,232 comments to the DEA in 2016 at https://www.regulations.gov/document/DEA-2016-0015-0006/comment

[14] An Excel file of the comments is available at https://www.dropbox.com/s/6txmv91536oujhq/DOCKET_DEA-2016-0015.xlsx?dl=0

[15] An analysis of the comments where a comment ID allowed for a classification of the source of the comment (conducted on 19,419 of the comments) is available at https://www.dropbox.com/s/h1b4qz36lzqm1d5/KratomCommentProject_DataSet%20-%20STATISTICS_VERIFIABLE_DATA.pdf?dl=0

[16] A general summary news release of the foregoing analysis is available at https://www.prnewswire.com/news-releases/review-of-dea-kratom-public-comments-shows-strong-support-among-vets-doctors-cops-and-seniors-for-coffee-like-herb-300401575.html

[17] Public comments concerning the benefits of kratom as life-saving assets with respect to the opioid epidemic were also made orally and in written submissions to the FDA and NIDA April 17, 2018 Public Meeting on Patient-Focused Drug Development for Opioid Use Disorder at https://www.fda.gov/industry/prescription-drug-user-fee-amendments/public-meeting-patient-focused-drug-development-opioid-use-disorder.

[18] Written comments for the docket are at https://www.regulations.gov/document/FDA-2018-N-0987-0001/comment

that occur as a physiological rebound accompanying the abrupt discontinuation of kratom use in kratom-dependent people. More studies of kratom's potential to produce physical dependence, tolerance, and withdrawal are needed to characterize the nature and severity, and determinants of abstinence-associated symptoms." (p.584)

2.5.2 Factor 7 Science Updates:

There have been new research findings, a systematic review, and a review by an international consortium of kratom experts that contribute to a significant advance in knowledge on the psychic and physiological dependence potential of kratom.

The systematic review of kratom use and mental health discussed earlier in Factors 4, 5 and 6 by Swogger & Walsh (2018) provided additional perspectives related to kratom's potential to produce dependence or addiction (also referred to as a substance use disorder, APA, 2013), and physical dependence and withdrawal. The researchers concluded:

> "Kratom withdrawal symptoms resemble the opioid withdrawal syndrome (Miranda and Taca, 2017). Extant data suggest that kratom's withdrawal syndrome is uncomfortable, but generally milder and of shorter duration than is characteristic of opioid withdrawal (Singh et al., 2015; Swogger et al., 2015)." (p. 137).

Regarding dependence, Swogger & Walsh (2018) concluded:

> "There is good evidence that kratom dependence is typically less severe than opioid dependence, with which kratom shares some mechanisms of action (Hassan et al., 2013). Moreover, unlike opioids, kratom use does not appear to result in significant respiratory depression (Kruegel et al., 2016) and is thus far less likely to cause fatal overdose. The perception that kratom is a milder and less dangerous opioid-like psychoactive substance is supported by the uptake of kratom use as an opiate substitute (Vicknasingam et al., 2010) and is consistent with data on the unimpaired social functioning of regular kratom users (Singh et al., 2015). For future research on the effects of heavy kratom use, a scale designed to measure kratom dependence has shown good preliminary reliability and validity (Scale; Saingam et al., 2014)." (p. 138)

The international consortium of leading kratom researchers mentioned earlier in Factors 4, 5 and 6 also assessed dependence and withdrawal associated with kratom use. According to Prozialeck, et al., 2019):

> "Regular use of kratom, particularly at higher doses, can lead to tolerance and dependence (Galbis-Reig, 2016; Singh et al., 2014; Swogger & Walsh, 2018; Yusoff, et al., 2016)." (p. 73)

However, available human reports suggest that abstinence from kratom is typically associated with milder symptomatology than abstinence from classical opioids (Erowid, 2017; Henningfield, et al., 2020; Singh, et al., 2014, Singh, et al., 2016; Singh, Narayanan, Müller, et al., 2018; Swogger, et al., 2015). At the same time, although these reports indicate that the effects of kratom can, in some ways, resemble those of opioids, many individuals report that the subjective effects of kratom are quite different from those of opioids. As noted previously, low to moderate doses of kratom tend to be somewhat stimulating, rather than sedating, and

do not produce the “high” or strong euphoric effects associated with opioids, although some users have reported intoxication and euphoria after using higher doses (Erowid, 2017; Henningfield, et al., 2020; Singh, et al., 2016; Swogger, et al., 2015). This distinct spectrum of effects, including attenuated euphoria and abuse potential, is supported by two recent preclinical studies, which found that mitragynine is not self-administered by rats (Hemby, McIntosh, Leon, Cutler & McCurdy, 2019; Yue, Kopajtic & Katz, 2018). Further, even at high doses, kratom does not appear to severely depress respiration as do classical opioids (Singh, et al., 2014, 2016). Thus, even though kratom has some potential for abuse and dependence, several investigators have concluded that kratom has both less abuse liability and much lower risk of fatal overdose than traditional opioids and that the potential benefits of kratom in the treatment of OUD may outweigh these risks (Henningfield, Fant & Wang, 2018; Singh, et al., 2014, 2015, 2016; Swogger, et al., 2015). This does not mean that kratom is not sometimes used by people to get high and/or intoxicated because such use has been documented (Swogger, et al., 2015). Such findings were also considered by Henningfield, Fant & Wang (2018).

The Vicknasingam, et al. (2020) study included in Factor 2 that evaluated kratom’s effects on pain tolerance in a clinical trial also assessed potential withdrawal signs using the Clinical Opiate Withdrawal Scale (COWS) comparing scores on days that the participants were administered placebo to days that participants were administered a kratom concoction (Vicknasingam, et al., 2020). Although this study was not designed to be a definitive withdrawal assessment study, and did not include an opioid comparator, it would have been likely that people who were using opioids multiple times per day for many years would have experienced pronounced withdrawal symptoms. In this study the authors concluded as follows:

> “None of the participants reported withdrawal symptoms either using spontaneous self-report or had significant withdrawal symptoms based on the COWS scores. All urine toxicology screens conducted at the end of the testing day were negative.” (p. 236)
>
> “All participants reported long histories of daily kratom consumption, with high frequency of daily consumption and substantial amounts consumed. It is not possible to quantify these reports into markers that could be used to approximate amounts of plant material or active ingredients consumed. However, despite the reported long duration and high levels of daily kratom consumption, during documented kratom discontinuation lasting from 10 to 20 hours, no participant reported or displayed discomfort, symptoms, or signs of potential withdrawal symptoms.” (p. 236)

Leong Bin Abdullah, Yuvashnee & Singh (2021) studied kratom users in Malaysia to assess potential symptoms related to kratom dependence and withdrawal. They concluded:

> “In the context of regular kratom use, most people with kratom use experience some anxiety and depressive symptoms during kratom withdrawal. . .
>
> Greater Kratom Dependence Scale (KDS) score and longer duration of kratom use were significant predictors of physical health Quality of Life (QoL), while only greater KDS score significantly predicted psychological and environment QoL scores. Prolonged kratom use and kratom dependence may negatively impact the QoL of people who use kratom, hence kratom addiction has to be treated adequately.” (p. 1)

Garcia-Romeu, Cox, Smith, et al. (2020) conducted a survey that specifically asked questions about potential withdrawal symptoms associated with discontinuation of kratom use. They concluded as follows

> "Kratom-related withdrawal symptoms were reported by 9.5 % of respondents with another 17.5 % reporting possible kratom-related withdrawal." (p. 4)
>
> "This study supports the results of previous studies (Coe et al., 2019; Grundmann, 2017; Smith and Lawson, 2017; Swogger et al., 2015) by suggesting that kratom has a relatively benign risk profile compared to typical opioids, with only a minority of respondents endorsing kratom-related adverse effects, withdrawal symptoms, or problematic use." (p. 6)

The survey by Coe, Henningfield, Pillitteri, et al. (2019) also asked questions related to potential kratom use associated dependence and discontinuation related withdrawal. They concluded as follows:

> "The survey did not address whether respondents experienced any physical dependence or craving as a result of kratom use, but it appears likely that chronic kratom use is associated with physical dependence and withdrawal, albeit both are reportedly milder and more readily self-managed compared to opioid dependence and withdrawal (Singh et al., 2014, 2016; 2018). Furthermore, kratom use and dependence reportedly do not interfere with social, family, and occupational functioning (Singh et al., 2014, 2016; Swogger and Walsh, 2018; Vicknasingam et al., 2010) to the extent that conventional opioids do." (p. 30) This conclusion is similar to Grundmann's (2017) findings.
>
> The foregoing conclusions are also consistent with those of Grundmann, Babin, Henningfield, et al. (2021) who stated as follows "Some user reports suggest that regular kratom consumption carries risks of dependency and addiction, though with generally self-manageable withdrawal (12)." (p. 1)

Another study employed widely used psychiatric instruments (Beck Depression Inventory and Beck Anxiety Inventory) to assess potential symptoms of anxiety and depression that may accompany abrupt discontinuation of kratom use in chronic kratom consumers in Malaysia. (Singh, Narayanan, Müller et al., 2018). Singh, et al. (2018) concluded:

> "Most respondents (70%) experienced symptoms of mild anxiety, while 81% experienced symptoms of mild depression during kratom cessation. Those who consumed higher quantities of kratom tea daily (≥4 glasses) had higher odds of reporting longer duration of kratom use history…, higher frequency of daily kratom use (≥4 times) …, and were more likely to experience moderate symptoms of depression during kratom cessation than those who consumed between one and three glasses of kratom tea per day. Cessation from regular and long-term kratom tea consumption was not associated with symptoms of high anxiety or depression." (p.1)

Nonetheless, it is evident that some fraction of chronic heavy kratom users exhibit strong dependence or use disorder, albeit with generally moderate withdrawal symptoms (Singh, Narayanan, Müller et al., 2018). In many such cases, the people had preexisting opioid or

other substance use disorders and/or were using kratom to self-manage chronic pain. It is not known what fraction of kratom users experience what might be termed a kratom use disorder (even though this term is not an APA, 2013 recognized term). Surveys by Grundmann (2017), Coe, et al. (2019), and Garcia-Romeu, et al. (2020) suggest that 5-10% of kratom users report some level of dependence with evidence suggesting that it is tolerable, manageable and not disruptive to life demand for most people. However, as noted in the 2018 scheduling recission letter by Assistant Secretary of Health Giroir, the number is not known and is important to know, particularly before any effort to substantially restrict kratom access.

Swogger & Walsh (2018) concluded as follows "In conclusion, kratom use appears to have several important mental health benefits that warrant further study. Kratom dependence is a risk for some people, though the dependence syndrome appears to be mild in its psychosocial and physiological effects relative to that of opioids." (p. 139)

2.5.3 Factor 7 Updated Conclusions

Several surveys in the US, field studies in Malaysia, and a clinical trial of pain relief efficacy that included assessment of withdrawal support the conclusions of the 2018 8-FA. The main findings are that some people report dependence/addiction and/or withdrawal. The likelihood is generally related to higher levels of chronic daily consumption. In general, it is more readily self-managed and less likely to interfere with occupational, social and family activities and responsibilities as dependencies to opioids, alcohol, stimulants and other drugs of abuse. Many users had histories of opioids and/or other addictive drug use and so the degree to which their addiction to kratom is a new addiction cannot readily be ascertained.

For some people for whom kratom use is considered by themselves and/or others to be a serious problem, they should have the same access to treatment as anyone else with a substance use disorder. Many addiction treatment providers already advertise and offer kratom use disorder treatment assistance. Use of opioids such as methadone and buprenorphine should be used judiciously with people seeing help to manage their kratom use disorder and/or withdrawal. If they were formerly and perhaps still using opioids, then the possibility of treatment with buprenorphine or methadone may be more helpful and appropriate if kratom is not satisfactory. However, for people without prior histories of recreational opioid use and dependence, using buprenorphine or methadone as a treatment may be introducing them to opioids and may not be the best option. For some people that might be like treating unwanted caffeine dependence with amphetamine to replace the caffeine.

3 Conclusions Based on New Studies since January 1, 2018

- *Since the Henningfield, Fant & Wang (2018) 8-FA, there have been over 100 new published scientific studies, reviews and commentaries by leading kratom experts, and an accelerating research pipeline funded in part by the US National Institutes of Health (NIH), National Institute on Drug Abuse (NIDA). These studies provide an increasingly strong evidence base for regulation and policy.*

- *Nature got it right. There is a convergence of studies showing that the main natural constituent of kratom that accounts for the reasons people use kratom is MG which carries relatively low abuse and health risks. 7-OH-MG naturally occurs at very low*

levels and product standards should prevent marketing of products with levels higher than those that appear to carry little risk.

- *Evidence does not support the conclusion that kratom is an imminent public health threat or that it is fueling the opioid and drug overdose epidemic that led to more than 93,000 deaths in 2020. Rather, the evidence supports the conclusion that for many people, kratom is a path away from opioids and other drugs to help self-manage craving and withdrawal for people who find kratom more effective, accessible, acceptable, tolerable, and/or prefer natural products.*

- *Animal drug self-administration and physical dependence/withdrawal studies show low abuse potential and withdrawal risks of kratom relative to opioids. Furthermore, these studies also show that MG administration can reduce self-administration of morphine and heroin as well as withdrawal from morphine. These findings are consistent with human surveys and studies showing that addiction risks for kratom are overall low as compared to opioids.*

- *Numerous surveys and field studies of kratom users have been conducted in the US and Malaysia. These studies largely confirm the large US survey published by Dr. Grundmann (2017). Most US kratom users are 30-50 years old, employed and have some college education and healthcare. Leading reasons for use are to self-manage pain, depression, anxiety, to increase focus and alertness analogous to caffeinated beverage use and to self-manage opioid and other substance use disorders to relieve craving and withdrawal and often the pain that motivates such drug use.*

- *Surveys also show that users fear a kratom ban and the risks of resumption of opioid and other drug use, and/or turning to illicitly marketed kratom. This makes it foreseeable that thousands of people would be at risk of opioid overdose and other mortality risks associated with illicit drug use, injection drug use, and adulterated kratom products.*

- *Studies of kratom's alkaloids support the conclusion that that MG and other alkaloids are not appropriately categorized as opioids, as they are diverse in their activity, effects, and mechanisms of action. Moreover, the primary active constituent of kratom, MG, does not produce the signature powerfully rewarding and lethal respiratory depressant effects that characterize morphine-like opioids.*

- *Kratom PK and safety studies include examination of the pharmacokinetics (PK) and pharmacodynamics (PD) in rats and dogs by oral and intravenous administration of many kratom alkaloids in addition to MG. MG, at human dose equivalents many times higher than humans take, are without acute serious adverse effects and little evidence of respiratory depressant effect.*

- *Six clinical studies evaluated the effects of long term kratom use on a variety of physiological parameters including kidney and liver function, hematological parameters, cognition, and on brain function by brain magnetic resonance imaging. Although these were relatively small studies, none suggest serious adverse consequences of long term*

kratom use. It is important to note that these are not definitive safety studies and cannot be used to claim that kratom has no adverse effects on any of the studied physiological domains and limitations of each study were noted in the publications. Nonetheless, the findings are encouraging and should facilitate the conduct of more comprehensive follow-up studies.

- *New medicines development efforts are developing new molecules as analogs of MG and other kratom alkaloids as possible safer and/or more effective treatments for pain, addiction, depression and other disorders, due to the promising findings with kratom and its naturally occurring alkaloids. Though, it is likely that it may be a decade or more before they result in New Drug Applications to the FDA.*

- *The pipeline of research and new science has been enhanced in quantity and quality not only by funding from the US National Institutes of Health (NIH) and other organizations but as well by regular scientific conferences that are fostering global collaboration and cooperation in an exciting new frontier in search of safer and more effective ways to manage health and well-being. Such efforts are working and should be expanded.*

- *Kratom regulation would be better informed by scientific and public health conversation by active collaboration among CDC, DEA, FDA, NIDA, and the Substance Abuse and Mental Health Services Administration. Kratom science should be accelerated by increased kratom research funding to NIDA, as well as to support increased surveillance that is specific to kratom. An annual report should be provided by multi-agency committee with updates on the state of kratom science and annual surveillance, perhaps led by NIDA.*

- *An important development that relates to overall safety and health benefits and risks that is a regulatory and policy update and is not included in the science updates: at the time of this writing, five states (Arizona, Georgia, Nevada, Utah, and Oklahoma) have enacted laws referenced as the Kratom Consumer Protection Act (KCPA). The KCPA establishes a regulatory framework to protect consumers from unsafe and adulterated kratom products that require adherence to good manufacturing standards (GMP) to ensure purity; requires testing for contaminants; prohibits adding any dangerous substances to kratom products; forbids boosting the alkaloid levels of MG and 7-OH-MG over those present in the natural kratom plant; bars synthesizing any of the alkaloids; requires registration and product testing; prohibits any therapeutic health claims; and forbids sales to minors. These KCPA laws provide needed consumer protections for consumers. To illustrate the kratom regulatory framework for the Utah KCPA, the Utah Department of Agriculture rule on kratom can be found [at https://ag.utah.gov/businesses/regulatory-services/kratom/](https://ag.utah.gov/businesses/regulatory-services/kratom/) . For updates on the status of KCPA legislation in other states, visit the American Kratom Association website at https://www.americankratom.org/advocacy/aka-in-your-state.html .*

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Kratom

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1 Kratom (*Mitragyna speciosa* Korth.) is a herbal product from Southeast Asia with opioid agonist properties

Kratom is a herbal product that is most commonly obtained as a powder and consumed as a beverage.[1–3] Kratom contains the indole alkaloid compounds mitragynine and 7-hydroxymitragynine, which are opioid receptors agonists.[2,3] They reduce pain, cause dose-dependent stimulant and sedative effects, and have an adverse effect profile consistent with opioid activity.[2] Kratom is not detected on conventional urine drug-screening tests.[2]

2 Kratom use is increasing

Avoidance of drug withdrawal, treatment of chronic pain and recreation are common reasons for kratom use.[1,2] American poison centres saw an increase in kratom-related calls, from 18 exposures in 2011 to 357 in the first 7 months of 2018.[4] The US Centers for Disease Control and Prevention identified 91 cases in which kratom was identified as a potential cause of death from July 2016 to December 2017.[5]

3 Effects of kratom use appear to be dose dependent

Kratom use is associated with stimulant effects at low doses (1–5 g), and sedative effects at higher doses (5–15 g).[2] Negative adverse effects most commonly include gastrointestinal symptoms and agitation, and are reported to be dose dependent.[1,4]

4 Kratom users may experience withdrawal with cessation

Moderate to heavy daily users of kratom (≥ 3 doses/d) commonly have cravings and withdrawal symptoms similar to those of opioid withdrawal with cessation.[2,5] Of kratom users, 43% reported negative adverse events if they abstained for more than 48 hours.[1]

5 Management of kratom ingestion is supportive

Doses in excess of 15 g may mimic an opioid toxidrome. Naloxone should be given for drowsiness and respiratory depression.[3] Severe adverse events, including death, have been reported with kratom use in conjunction with opioids, benzodiazepines, modafinil and other medications.[2,5] Supportive management and toxicology consultation are indicated for cases of overdose or intoxication.

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REVIEW

Kratom—Pharmacology, Clinical Implications, and Outlook: A Comprehensive Review

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ABSTRACT

Kratom, or *Mitragyna*, is a tropical plant indigenous to Southeast Asia, with unique pharmacological properties. It is commonly consumed by preparing the leaves into decoction or tea, or by grinding them into a powder. Recent evidence has revealed that kratom has physiological effects similar to opioids, including pain relief and euphoria, as well as stimulant properties, which together raise potential concern for dependence and addiction. Moreover, growing evidence suggests that the prevalence of kratom use is increasing in many parts of the world, raising important considerations for healthcare providers. This manuscript will discuss the most current epidemiology, pharmacology, toxicity, and management related to kratom, while seeking to provide a contemporary perspective on the issue and its role in the greater context of the opioid epidemic.

Keywords: Drug abuse; Drug addiction; Kratom; Mitragynine; Opioid; Stimulant

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Key Summary Points

Kratom (*Mitragyna speciosa*) is a botanical supplement with unique psychoactive properties.

The prevalence of kratom use appears to be increasing in Europe and North America, raising concerns for its possible development into a significant public health threat.

The body of scientific literature concerning kratom is expanding, but has not yet sufficiently characterized the nature and extent of the potential risks posed by kratom.

There is an increasing need for healthcare providers to be familiar with kratom and the management of patients who abuse it.

INTRODUCTION

Mitragyna speciose (Korth) is a tree-like herb consumed for its distinctive psychotropic properties [1]. Commonly known as "kratom"—a term referring to both the plant itself and the botanical products derived from its leaves—the *M. speciosa* tree is a tropical evergreen indigenous to the southeastern Asia-Pacific region, sharing close phylogeny with the coffee plant in the *Rubiaceae* family [2]. The consumption of kratom has been commonplace within this region for centuries, but has also recently gained popularity in the West [3, 4].

Kratom is primarily sought out for its stimulant and opioid-like properties, and may be used either for its perceived therapeutic effects or as a recreational drug. In either case, there is considerable uncertainty regarding the safety of ingesting kratom products. Consequently, it is important that healthcare providers be familiar with the subject, as it represents a growing public health concern. There are multiple aspects for the medical field to consider in addressing the problem of kratom, including reducing interest and accessibility, optimizing management of toxicity and dependence, and investigating its prospective use in research and therapeutics (Fig. 1).

Fig. 1 Key considerations regarding kratom in the medical field. Figure is original and was produced by the authors for this particular publication

The purpose of this review is to provide an in-depth discussion of these points, framing them within the greater context of the opioid crisis at large. Specifically, the article seeks to address the current epidemiology, pharmacology, and toxicity associated with kratom. In addition, we provide a synopsis on the clinical management of kratom in order to assist caretakers as they address patients suffering from overdose, addiction, and withdrawal related to the drug. To achieve these objectives, we have conducted an extensive and detailed literature review of the subject, incorporating both preclinical studies and clinical case reports in order to provide a fuller perspective on the matter.

This article is based on previously conducted studies and does not contain any studies with human participants or animals performed by any of the authors.

KRATOM: BACKGROUND, PREVALENCE, AND LEGAL STATUS

Kratom use has been customary in countries such as Thailand, Malaysia, and Myanmar for several hundred years [5]. Depending on the specific region, kratom is alternatively known as ketum, biak–biak, ithang, or thom [6]. Although raw leaves can be chewed or smoked for the

effects, more frequently the leaves are boiled in water to produce decoctions or teas, which contain multiple biologically active phytochemicals, accounting for its psychoactive properties [3, 7]. In addition to these more traditional methods of preparation, the leaves may be dried and processed into powders, capsules, and extracts, especially in western countries [8].

Historically, kratom has been used in traditional folk remedies for treating a range of ailments, for example, to mitigate symptoms of opiate addiction and withdrawal, or for weaning off dependence [9, 10]. It is also frequently used to relieve pain, produce euphoria, and stave off fatigue, especially among laborers in rural areas [11]. Its potential for dependence and addiction has long been apparent, and led to its categorization as a banned substance in both Malaysia and Thailand in the mid-twentieth century (of note, the Thai National Assembly has recently made it legal for medical purposes) [12, 13]. Nevertheless, the illicit use of kratom remains common; for instance, a survey conducted in Thailand in 2011 estimated the nationwide prevalence (lifetime) to be 2.9%, with nearly half of those admitting to daily kratom use, making it among the most commonly used illicit substance in the country [14].

In recent years, commercial preparations of kratom have become increasingly available in regions far beyond its local origins. Large-scale epidemiological studies evaluating the prevalence of kratom use are scarce, but available evidence indicates that its prevalence is on the rise in the United States [15], Europe [16], and developed eastern countries such as Japan [17]. In the USA, over 1800 total calls related to kratom ingestion were received by US poison centers in the 7-year interval from 2011 through 2017, with nearly two-thirds of these occurring in the last 2 years of the period, signifying the rapid rise in the use of the substance [18]. Moreover, a recent synopsis on kratom estimated the number of users in the USA to be in the range of 3–5 million based on membership numbers obtained from the American Kratom Association [19]. If accurate, this would correspond to approximately 0.9–1.5% of the US population reportedly using kratom. This trend is also reflected in the expanding scientific literature, where the number of case reports describing kratom intoxication continue to accumulate [20–23].

Particularly in the West, kratom is often used as a recreational drug, where it is perceived as a safe, "legal high" [12]. This reputation led to the proposed categorization of kratom as a Schedule I drug by the US Drug Enforcement Administration (DEA) in 2016, but it garnered little interest among policymakers. Thus, a key contributor to the problem is that kratom remains unrecognized as a controlled substance by the DEA and is therefore not subject to regulation by the US Controlled Substances Act [24]. Although it is currently listed on the DEA's Drugs of Concern registry, this is mostly a symbolic measure and does little to prevent its sale. However, as of 2019, six states legislatures (Alabama, Arkansas, Indiana, Wisconsin, Rhode Island, and Vermont) have successfully passed statutes criminalizing kratom possession [25]. In the rest of the USA, it remains legal and is easily obtained in stores or through numerous online retailers. Its sale is permitted throughout Europe as well, with the exception of Poland, Ireland, and Romania, as well as most of the Nordic and Baltic states [26].

To be sure, its unscheduled status and widespread availability have contributed to the expansion of kratom within Western markets [27]. However, in the USA, the more fundamental issue underlying the growing demand for kratom is the current opioid abuse epidemic [28]. As prescribers are pressured to cut back on supplying opioid medications, patients with opioid dependence often resort to alternatives like kratom to support their habit as traditional opioids become scarce [29]. Kratom is also sought out by those who wish to self-medicate for health conditions such as chronic pain or opioid withdrawal/dependence, and it has been heralded as a legal, inexpensive alternative to opioid replacement regimens [30]. The efficacy of kratom for such purposes remains highly questionable, and more research is needed to establish a conclusive answer.

PHARMACOLOGY OF KRATOM AND PROSPECTS IN THERAPEUTICS AND RESEARCH

Kratom does not denote a single, specific compound, but rather a cocktail of the psychoactive alkaloids occurring naturally in the plant. More than 40 of these compounds have been identified to date, although only four are known to be pharmacologically active: mitragynine, 7-hydroxymitragynine (7-OH- mitragynine), speciociliatine, and corynantheidine [31]. The most prevalent is mitragynine, which accounts for approximately 2% of kratom preparations by mass, but up to 66% of the total alkaloid content [32]. Its highly active oxidized metabolite, 7-OH-mitragynine, is present in far lower quantities, generally under 0.02% [33]. Other indole alkaloids present in significant concentrations include speciogynine, paynantheine, and mitraphylline [34]. Like the remaining trace alkaloids, these compounds are not known to be pharmacologically active; however, it is possible they may contribute synergistically to the overall effect of kratom in an unknown manner. Given the diversity of alkaloids present in kratom extracts and the unique potential pharmacodynamic properties of each, the net physiological effect of the substance is complex, intermixing stimulant and opiate-like properties in a dose-dependent manner (primarily stimulant-like at low amounts, with opioid effects predominating at higher doses) [35, 36].

Both mitragynine and 7-OH-mitragynine target opioid receptors, albeit with significant differences in binding affinity [37]. In fact, while the affinity of mitragynine for opioid receptors is less than that of morphine, 7-OH-mitragynine is far more potent than either, approximately 46 times that of mitragynine and 13 times that of morphine [38, 39]. Despite considerable investigation, the precise manner in which kratom alkaloids act at each of the receptors remains disputed. For example, Takayama and colleagues have produced a sizeable body of work on the subject, indicating that both mitragynine and 7-OH-mitragynine behave as agonists, with mitragynine acting primarily on μ- and δ-receptors and 7-OH-mitragynine more selective for μ- and κ-receptors [39–41]. However, competing evidence suggests a different model; rather than acting as simple agonists, mitragynine and 7-OH-mitragynine appear to demonstrate variable effects depending on the receptor. Specifically, the data show that both mitragynine and 7-OH-mitragynine are mixed opioid receptor agonists/antagonists, behaving as partial agonists at μ-receptors and competitive antagonists at δ-receptors, with negligible effects on κ-receptors [42].

Importantly, the indole alkaloids in kratom are structurally and pharmacodynamically distinct from their opioid counterparts, producing partially overlapping but nonidentical effects. Accordingly, these compounds have been called *atypical opioids* to distinguish them from morphine, semisynthetic opioids, and endogenous ligands [43]. Like the opioids, binding of the indole alkaloids to opioid receptors initiates G-protein-coupled receptor (GPCR) signaling; however, unlike traditional opioids, the activation of GPCRs by indole alkaloids does not initiate the β-arrestin pathway [44]. This phenomenon, known as biased agonism or ligand-directed signaling, enables a single receptor to mediate multiple different intracellular effects by selectively disengaging the various signaling cascades coupled to the receptor [45]. Interestingly, β-arrestin recruitment is responsible for most of the symptomology associated with opioid use (e.g., respiratory depression, sedation, constipation) [46, 47]. Thus, the selective inactivation of β-arrestin represents a desirable feature for an opioid, and suggests that mitragynine might be a useful template for designing novel opioids with more tolerable side effect profiles.

In addition to its opioid-like analgesic effects, mitragynine appears to block pain signaling through other mechanisms as well, suggesting a multimodal role in regulating pain perception. For instance, mitragynine shares considerable structural homology with yohimbine, another indole alkaloid, which has well-known adrenergic properties [37]. Like yohimbine, experimental evidence indicates that mitragynine activates α-2 adrenergic postsynaptic receptors [48]. This is significant for

mitragynine's analgesic effects, as α-2 receptors are present in modulatory "descending" pain pathways [49]. The importance of these pathways has only recently become apparent, and represent a major advancement in the complex neurobiological understanding of pain [50]. A third anti-nociceptive mechanism has been proposed in light of evidence that mitragynine impairs neuronal pain transmission via blockade of Ca^{2+} channels [51]. Additionally, indirect analgesic properties have been attributed to mitragynine's putative anti-inflammatory effects, secondary to the inhibition of COX-2 and prostaglandin E_2 mRNA expression [52, 53]. In addition to these anti-nociceptive functions, mitragynine bears some affinity for receptors in the central nervous system, including the 5-HT_{2C} and 5-HT_7 serotonin receptors, D_2 dopamine receptors, and A_{2A} adenosine receptors, but the physiological significance of these interactions is unclear [41].

The metabolism of kratom alkaloids is primarily hepatic, with several cytochrome P450 (CYP) isoforms involved, including CYP3A4, with lesser contributions from CYP2D6 and CYP2C9 [54]. It demonstrates linear pharmacokinetics and has a biphasic elimination pattern from the plasma when ingested orally, suggesting a two-compartment model of distribution [55]. The half-life of mitragynine has been reported to be as short as 3 hours, although some studies suggest it may be much longer [56, 57]. A major development in the understanding of kratom pharmacology has been the recognition that mitragynine is converted into 7-OH-mitragynine by hepatic metabolism in vivo [58–60]. Consequently, it has been postulated that 7-OH-mitragynine actually represents the active metabolite of mitragynine, accounting for most or all of the effects traditionally attributed to the mitragynine precursor. This hypothesis was first described by a trio of 2019 publications conducted by three separate groups [58–60]. These studies provided evidence that the activation of mitragynine occurs by CYP34A-mediated dehydrogenation—a process analogous to the activation of opiates such as codeine, which is converted into is active metabolite by CYP2D6. Although 7-OH-mitragynine is present in kratom extracts, it occurs at trace concentrations, leaving the authors to conclude that any ingested 7-OH-mitragynine is inconsequential relative to the endogenous generation of 7-OH-mitragynine derived from mitragynine. As current work is limited to animal models, future studies will need to confirm the relevance of this discovery in human physiology.

EFFECTS OF KRATOM ALKALOIDS IN PRECLINICAL STUDIES

Concern for the potential adverse effects associated with kratom has led to numerous preclinical investigations on the subject, such as the risk for dependence and addiction posed by mitragynine and related alkaloids. For instance, both mice and rat models have demonstrated addiction potential and cognitive impairment particularly in the setting of chronic mitragynine ingestion [61–63]. Studies also have found that the development of addiction and toxicity is specifically dependent on 7-OH-mitragynine, with mitragynine posing a minor risk [61, 64]. Moreover, chronic use has been associated with enhanced punishment tolerance and reward-seeking behavior [65]. Despite these adverse properties, animal model studies have also identified possible benefits; for example, mitragynine appears to slow the development of opioid tolerance when co-administered with morphine in mice, an observation which raises interesting possibilities for clinical applications [66].

Kratom has also been implicated as a cause of organ dysfunction and toxicity [67]. Animal studies have indicated a risk for drug–drug interactions, namely through modulating hepatic P450 activity and drug metabolism [68, 69]. Mitragynine also appears to inhibit hepatic demethylases and transferases, as well as glucuronidation by UDP-glucuronosyltransferases (UGT) such as UGT2B7 and UGT1A1 [70–73]. This bears important implications for a possible interaction when kratom is co-administered with other drugs known to be UGT substrates (e.g., buprenorphine and ketamine, metabolized by UGT2B7) [73]. Such findings have been used as a potential explanation for cases of

toxicity following co-ingestion of kratom with other medications, including a reported fatality secondary to toxicity from supratherapeutic levels of a prescribed antipsychotic concurrent with kratom ingestion [74]. The authors attribute this outcome to a drastic reduction in clearance of quetiapine (a CYP3A4 substrate) secondary to the acute suppression of hepatic metabolism by kratom.

Clearly, the basic science literature raises legitimate concerns regarding the potential for drug toxicity and behavioral risks following kratom ingestion. However, a major limitation of the preclinical literature is that many of the experiments were conducted using either chemically synthesized mitragynine or 7-OH-mitragynine rather than actual kratom (although a few studies utilized kratom leaf methanolic extracts) [75–77]. Consequently, such evidence likely represents an oversimplified and incomplete portrayal of the possible effects attributable to actual kratom consumption. This fundamental distinction must be considered prior to drawing any conclusions about patient safety from preclinical investigations.

POTENTIAL FOR ADDICTION AND TOXICITY

As alluded to earlier, the historical record concerning kratom's potential for dependence and addiction in humans raises strong concerns about its safety [41, 62, 78]. However, in many cases the primary motivation among regular users may simply be as a means to prevent exhaustion, and improve energy or mood. In such cases, routine use may not constitute dependence or addiction per se, but rather merely the desire to improve productivity [9]. This is in alignment with "drug instrumentation" theories, in which a substance is utilized in a purposeful, goal-directed manner [79, 80]. Such theories may account for the low incidence of kratom use disorder and other side effects among traditional users in Southeast Asia [81–85]. Nevertheless, the successful instrumentation of kratom does not preclude the potential for prolonged drug use, which under certain circumstances can degenerate into outright addiction [78]. It has also been proposed that a significant amount of kratom use occurs as a substitute for more harmful substances (namely narcotics) in patients with existing substance abuse, in which case kratom use represents a sort of harm reduction rather than drug abuse [79, 86]. Yet, while there is convincing evidence that kratom has significantly less potential for dependence and overdose than traditional opioids, the use of kratom in place of established medical opioid replacement regimens has little basis in evidence [30, 87, 88].

Aside from its potential for abuse, kratom poses numerous others risks to patients, largely a consequence of its status as an unregulated supplement. Without regulatory oversight, there is little to ensure the authenticity, purity, quality, potency, and safety of commercially available kratom preparations [89]. Consequently, it is difficult to know for certain what is actually present within commercially available kratom preparations, and the concentration of mitragynine contained can vary considerably [90]. For instance, it has been reported that kratom products may be altered by artificially increasing levels of 7-OH-mitragynine to enhance potency [91]. In addition, multiple instances of deliberate adulteration of kratom have been documented, for instance, by adding synthetic substances such as phenylethylamine (PEA) or *O*-desmethyltramadol, both of which have resulted in patient deaths [92, 93]. Other risks include product contamination (intentional or otherwise). For example, laboratory and epidemiological evidence identified kratom as the source of a multi-state salmonella outbreak in 2018 [94, 95]. There have also been cases describing the sale of kratom products later found to contain harmful heavy metal contaminants [96]. As there is considerable disparity between reported kratom toxicities in the West and in Southeast Asia (where it is comparatively uncommon), it has been suggested that misinformation regarding the content and potency of kratom may be largely responsible for the apparent danger attributed to kratom use [36].

CLINICAL PRESENTATIONS OF KRATOM ABUSE

Seeking to gauge the spectrum of possible symptoms associated with kratom toxicity, a 2019 retrospective review of cases reported to the National Poison Data System and New York City Office of the Chief Medical Examiner identified a wide variety of presenting symptoms, with agitation being the most common at 18.6%, followed by tachycardia at 16.9%, drowsiness at 13.6%, and confusion at 8.1% [97]. Serious neurological sequelae included seizures in 6.1% of cases, and hallucinations in 4.8%, with 2.3% progressing to coma. Toxicity occurred in a dose-dependent manner, particularly when doses of kratom powder exceeded 8 g. The study also determined kratom to be a contributing factor in at least four deaths. Consequently, the authors concluded that kratom supplements pose a public health risk and should not be presumed safe despite being legal for purchase.

Case studies reveal that a wide range of organ systems are susceptible to kratom-mediated injury (Table 1). For example, instances of kidney injury [67], cardiotoxicity and arrhythmia [98, 99], thyroid injury and hypothyroidism [100] lung injury/acute respiratory distress syndrome (ARDS) [101, 102], neonatal abstinence syndrome, [103–107] and hepatic injury [23, 108–116] have all been linked to kratom. Hepatic injury is an especially common presentation, and often presents with a cholestatic hepatitis pattern similar to other drug-related injuries: transaminitis (usually with levels above 100 units/L) along with an elevated alkaline phosphatase (> 200 units/L) and total bilirubin (> 1.2 mg/dL). A variety of neurological complications due to kratom toxicity have also been described, including acute brain injury and coma [21], along with the risk of seizures in both the acute and chronic setting [117, 118]. Long-term cognitive impairment may develop after long-term chronic users [81].

In certain severe cases, kratom toxicities have resulted in death. In fact, the incidence of kratom-related mortality appears to be rising, according to reporting by the Centers for Disease Control and Prevention (CDC), which linked kratom to 152 deaths between 2016 and 2017 [96]. Importantly, the existence of polysubstance abuse is a key risk factor predisposing patients to toxicity and death and has been estimated to occur in 87% of cases [119]. This has led to the belief that death resulting solely from ingestion of kratom is exceedingly rare, even impossible. However, in a 2019 article assessing kratom-related mortality in the state of Colorado, the authors reported that at least 4 of the 15 total deaths between 1999 and 2017 were attributable exclusively to mitragynine toxicity, a result which the authors confirmed using an extensive toxicological and

Table 1 Spectrum of organ system involvement and corresponding injuries associated with kratom use as identified in the case study literature

Organ system	Presentation signs and conditions	References
Hepatic	Acute liver failure, hepatitis, transaminitis, intrahepatic cholestasis, hepatomegaly	[23, 108–116, 131]
Endocrine	Hypothyroidism, hypogonadism	[26, 100]
Renal	Acute kidney injury	[67]
Cardiac	Cardiotoxicity, arrhythmia	[98, 99]
Pulmonary	Acute lung injury, ARDS	[101, 102]
Obstetric	Neonatal abstinence syndrome	[103–107]
Neurological	Acute brain injury, seizure, coma, cognitive impairment	[21, 81, 117, 118]

ARDS acute respiratory distress syndrome
Table is original and was produced by the authors for this particular publication

biochemical workup [120]. Nevertheless, it remains probable that most kratom-related deaths are the result of kratom toxicity superimposed upon the effects of some other noxiousness factor, such as adulterants or contaminants within the kratom product itself, or in conjunction with the ingestion of another illicit substance.

CONSIDERATIONS FOR TREATMENT AND MANAGEMENT

The management of patients abusing kratom can be divided according to three objectives, each addressing a different scenario: (1) stabilization and prevention of organ injury in the setting of intoxication/overdose; (2) alleviation of the symptoms during acute withdrawal; and (3) long-term maintenance of sobriety for behavioral addiction. While there are no published guidelines specifically indicated for kratom, it is reasonable to begin management in a manner similar to that employed for patients presenting with opioid abuse. However, kratom may pose greater potential risk for drug toxicity and organ injury than might be expected with opioids.

In cases of kratom overdose, management is largely supportive. While reversal agents are standard of care for opioid overdose, their efficacy in cases of kratom overdose has not yet been evaluated in clinical trials. However, anecdotal evidence from various case studies supports its use, and it is widely speculated to be beneficial [121, 122]. This has led several experts to recommend it [123, 124]. Depending on the organ system(s) involved, certain additional interventions may also be warranted. Acute hepatitis can be managed with *N*-acetylcysteine in a manner analogous to other cases of drug-induced hepatitis [125]. If seizures or neurological symptoms are present, appropriate management with anti-epileptics is warranted [21]. Kidney injury, cardiovascular events, or other emergency presentation should be similarly addressed with the appropriate measures. The symptomology of kratom overdose can mimic the opioid toxidrome, particularly when patients consume more than 15 g of kratom [125]. Given the absence of any effective therapies, primary prevention is the ideal method for lowering a patient's long-term risk for morbidity and mortality. However, screening is dependent upon patient disclosure, as kratom is not detectable with any commercially available toxicology screens.

Patients presenting with symptoms of kratom withdrawal tend to exhibit a clinical picture similar to that seen in opioid withdrawal [126]. This includes somatic complaints such as nausea/vomiting, chills, diarrhea, sialorrhea/rhinorrhea, body aches, restlessness, and irritability [78]. Physical exam findings include mydriasis, hypothermia, tremors, and diaphoresis. Additionally, a significant number of patients report psychiatric symptoms, most commonly nervousness, anxiety, and depression [33, 127]. Patients in acute withdrawal are managed conservatively, although there is some evidence to suggest that the combination of buprenorphine and naloxone can alleviate both the physical and mental symptoms associated with kratom withdrawal [128]. Additional evidence suggests positive results using high-dose clonidine or other α-2 agonists in combination with hydroxyzine [129].

For patients with chronic kratom addiction and drug cravings, long-term pharmacological replacement therapy may be warranted. Kratom addiction often begins in the setting of patients suffering from opioid dependence, in part because it is perceived as a cheaper, more natural alternative to buprenorphine or methadone in those who wish to cease their abuse of narcotics. However, as previously stated, there is currently no reliable clinical evidence that kratom is an effective alternative for achieving this purpose [30, 88]. Consequently, such patients risk developing habitual kratom use as well, while leaving their underlying chronic addiction inadequately addressed. For motivated kratom-dependent patients actively seeking long-term control of drug cravings in the medical setting, treatment regimens are identical to those employed for traditional opioid dependence, given the lack of empirical treatment guidelines for kratom specifically. However, presumptive management using opioid-

replacement therapy with methadone, buprenorphine, or buprenorphine-naloxone regimens have reportedly been effective [128, 130]. Lastly, consideration should also be given to referral of patients for counseling or enrollment in 12-step addiction treatment programs.

CONCLUSIONS

Although not an epidemic in its own right, the current trends in kratom use are cause for steadily growing concern, and it is likely to become a significant public issue in the near future if it continues on its current trajectory. In seeking to address it, the problem must be understood within the greater context of the current epidemic of opioid abuse, as the desire to alleviate opioid withdrawal symptoms is a critical factor accounting for patients who seek out and abuse kratom. Because it is primarily a consequence of the opioid crisis, it will be difficult to adequately address this issue until the larger opioid problem is resolved. Even then, use of kratom will continue among non-addicts who wish to abuse it for recreational purposes. In this regard, taking actions to limit access may be warranted. But even in the event that kratom is scheduled as a controlled substance, it will likely remain available through clandestine dealings, just as many currently controlled illicit substances are. Given the likelihood of protracted demand for kratom use, health providers and medical educators should take efforts to improve awareness of this still relatively unknown drug.

In addition to promoting awareness among healthcare professionals, there is a great need for more extensive, high-quality studies to better understand the mechanism of its toxicity and to formulate specific and credible guidelines for the management of kratom ingestion. Patients should be made aware of the potential harm kratom poses, including predictable risks such as dependence and toxicity, and unpredictable risks related to product quality and contamination. However, the rising importance and interest in this issue presents new opportunities for research on kratom in the context of opioid pharmacology, and ultimately will support the development of new and improved analgesic agents.

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REVIEW ARTICLE

Outcomes of mothers and newborns to prenatal exposure to kratom: a systematic review

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Abstract
Kratom is a legal, widely available substance that contains opioid agonist alkaloids. Due to the marketing of kratom as an opioid alternative for treatment of pain, anxiety, depression, or to reduce opioid withdrawal symptoms, the use of kratom has increased among persons in the USA including pregnant women. This systematic review of the peer-reviewed literature regarding kratom in relation to maternal and infant outcomes resulted in analysis of six case reports of prenatal kratom exposure. Maternal and infant withdrawal from kratom exposure was described in each case, resulting in pharmacologic treatment for both mothers and infants.

Introduction

The opioid epidemic has brought attention to perinatal substance exposures and the resulting effects on pregnancy, maternal, and newborn outcomes. Besides the substances of use that are identified by routine history and toxicology, novel psychoactive substances (NPS) often are not routinely part of the health history obtained and remain undisclosed or undetected during pregnancy. NPS are legally sold on the internet and in retail locations such as gas stations, herbal stores, and "head shops" [1]. From 2000 to 2017, the United States poison control reported roughly 67,500 calls reporting exposure to NPS [2]. Kratom was one of the four leading substances that had the highest rates of hospitalization and serious medical outcomes. While most exposures to natural psychoactive substances have decreased over the years, exposures to kratom have increased drastically, by 4948.9%, from 2011 to 2017 [2].

cKratom, a derivative of *Mitragyna speciosa*, is in the coffee plant family and originated from Southeast Asia. Kratom is sold as tea, capsules, tablets, raw leaves, and concentrated extracts. The two main alkaloid substances found in kratom are mitragynine pseudoindoxyl and 7-hydroxymitragynine. Mitragynine is an opioid agonist with a small affinity for receptors. Conversely, 7-hydroxymitragynine has a much smaller presence in kratom, yet an increased potency as an opioid agonist [3, 4]. The alkaloid 7-hydroxymitragynine has been reported to have a higher potency than morphine [5]. A major challenge in understanding the actions and effects of kratom is the varying dosage of the alkaloids, additives, or alterations of kratom, the variability of dosage, and simultaneous polysubstance use by consumers [6, 7].

Metabolites of kratom will not appear on a standard urine toxicology. Standard analytical screening techniques for mitragynine and its metabolites, as with other NPS, require a more sophisticated liquid chromatography–mass spectrometry [8–10].

The primary reasons for use of kratom given by persons with past or present substance use disorder include pain, anxiety, depression, and to stop or reduce opioid use by reduction of withdrawal symptoms [11–13]. Kratom is popularly used and marketed in the USA as an opioid substitute and for the reduction of withdrawal symptoms [14–18]. In 2016, the Food and Drug Administration (FDA) attempted to list kratom as a Schedule 1 controlled substance [19], which generated a massive response from pro-kratom advocates. In 2018, the FDA released a report of 36 kratom-related overdose deaths with potential deadly interactions with other substances [20]. In the same year, the FDA released a warning of kratom

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contamination with multiple strains of Salmonella, which resulted in 199 people infected across 41 states and 38% of infected individuals were hospitalized [21]. A subset of states and cities in the USA has banned kratom (Alabama, Arkansas, Tennessee, San Diego, California, Indiana, Rhode Island, Vermont, Wisconsin). The debate on the benefits of kratom versus the risks continues, and highlights the need for research to inform clinical practice guidelines [22].

Prenatal use of kratom incidence is not fully known. The specific effects on pregnant women and their infants/children are unknown. The purpose of this systematic review was to analyze the current evidence published in peer-reviewed journals of the effects of kratom on human mothers and infants.

Methods

The peer-reviewed literature including prenatal kratom exposure and effects on mothers and newborns was analyzed using the following databases: PubMed, Cochrane Review, CINAHL, EBSCOhost, and Google Scholar. Search terms included kratom and pregnancy, kratom, kratom and neonatal effects, kratom and neonatal abstinence syndrome, kratom and infancy, kratom and newborn, and kratom and perinatal exposure. Inclusion criteria for the studies included: (1) the literature using English language; (2) peer-reviewed journals; (3) research studies; (4) studies of kratom when the use was during pregnancy; (5) studies that included effects on the mother and/or infant associated with use of kratom prenatally; and (6) case reports that included prenatal use of kratom and effects on the mother and/or infant. Exclusion criteria for the studies included: (1) non-English language literature; (2) journals that are not peer-reviewed; (3) the literature that was not research; (4) studies of kratom that did not include use during pregnancy; and (5) studies of kratom that did not include effects on the mother and/or the infant.

A total of 31 articles were found in the search of the databases using the search terms described (Fig. 1). Eighteen of the articles were duplicate and were excluded from the review. Abstracts of the remaining 13 articles were reviewed. Five of the articles did not pertain to infant or maternal outcomes relating to kratom prenatal exposure. The remaining eight articles were reviewed in full text. Three articles were excluded due to not being research or case reports in addition to not pertaining to infant or maternal outcomes related to prenatal kratom exposure. Five published case reports in peer-reviewed journals that pertained to prenatal kratom use and maternal/infant outcomes were included in the review (Fig. 1).

Results

The review of the five case reports of prenatal kratom use and maternal and infant outcomes are summarized in Table 1. The five articles included six mothers with an age range of 39–37 years and used kratom during pregnancy [23–27]. The reasons mothers reported using kratom for included: (1) pain relief such as fibromyalgia, back pain, and restless leg syndrome; (2) anxiety; (3) relief of opioid withdrawal symptoms; and (4) desired opioid-like effects. Four of the six mothers used kratom 3–4 times per day for the entire pregnancy [23–27]. The cost of the kratom was reported by one mother as $40.00 per day [24]. Two mothers were treated with prescribed buprenorphine or buprenorphine and naloxone after weaning off kratom during pregnancy [27].

Descriptions of the mothers' withdrawal symptoms from kratom use were reported in the case studies and included anxiety, piloerection, diaphoresis, and restlessness. Symptoms of withdrawal were described as severe resulting in returning to kratom use or being treated with buprenorphine or buprenorphine and naloxone. One mother had to go to the emergency department due to the initial severity and presentation of her withdrawal symptoms when discontinuing kratom use [27]. Prior to pregnancy, one mother reported that if she missed a kratom dose for 4–6 h or if she tried to taper her kratom dose, she experienced symptoms that included diaphoresis, rhinorrhea, myalgia, anxiety, nausea, diarrhea, and piloerection [24]. Psychological dependence was also described by a mother as not being able to function at home or work without taking kratom [24].

Polysubstance use was reported in four cases and included prescribed substances for comorbid conditions [23, 25] (Table 1). Two cases had no other substances identified except kratom [24, 26].

The gestational age of five of the infants ranged between 37 weeks and 5 days to description of full term [23–27]. Infant outcomes included symptoms of neonatal abstinence syndrome in five out of six infants in the case reports, including the two infants that were only exposed to kratom prenatally. Symptoms of neonatal abstinence syndrome appeared to begin as early as 6–8 h after birth and could be detected up to 4 days after birth. The average length of stay in the hospital was ~10 days with a minimum stay of 3 days and a maximum stay of 12 days [23–27].

The five infants that exhibited withdrawal symptoms were pharmacologically treated with a morphine weaning protocol. One of the five was started on morphine then switched to clonidine after signs of over sedation. The infant developed sinus bradycardia on both morphine and clonidine and had no reported prenatal substance exposures other than kratom [26]. A Finnegan score of 18, prior to

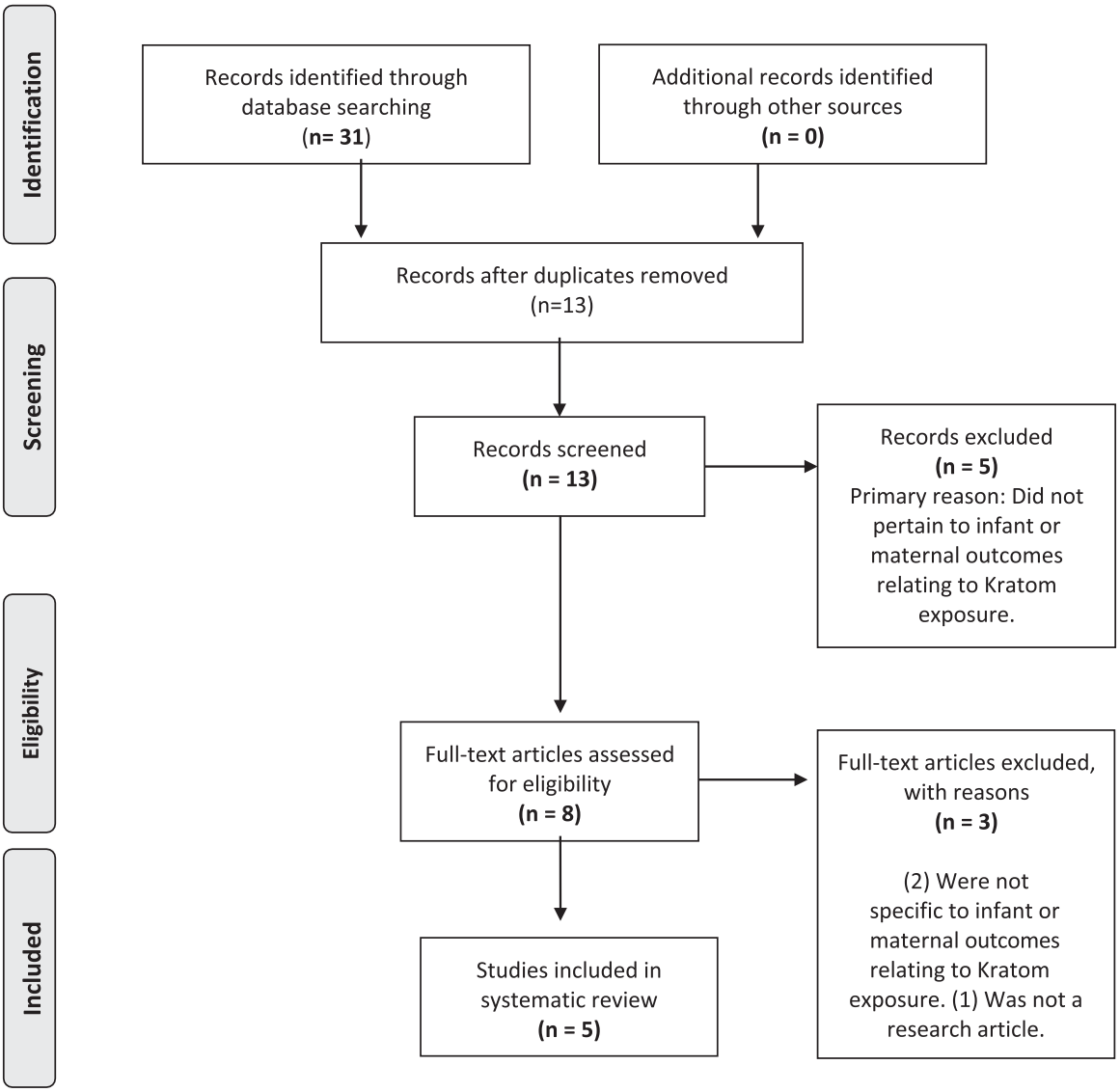

Fig. 1 Prisma flow diagram. Databases used: PubMed, CINAHL, Cochrane Review Google scholar, and EBSCOhost. Key search terms: "Kratom and neonatal abstinence syndrome," "Kratom and neonatal effects," and "Kratom and pregnancy".

morphine treatment, was reported for the infant exposed to kratom (tea used 3–4 times per day), selective serotonin reuptake inhibitors, acetaminophen-methocarbamol, diphenhydramine, valacyclovir, ranitidine, loratadine, salbutamol, and citalopram [25]. One of the infants who was only exposed to kratom, with a maternal daily use pattern of kratom 18–20 g three times per day, developed abstinence symptoms day 2 postpartum. Symptoms included feeding intolerance, jitteriness, irritability, and emesis requiring IV morphine 10 mg/kg/h and was switched on day 7 to oral morphine when able to tolerate oral intake [24].

The one infant that did not exhibit neonatal withdrawal symptoms was not exposed to kratom at the end of pregnancy, but instead the mother was given 2 mg of buprenorphine to alleviate maternal symptoms of withdrawal [27]. In addition, this baby was discharged from the hospital when 3 days old without evidence of withdrawal symptoms and there was no without report in the case study of follow-up of the infant to monitor symptoms post discharge from the hospital.

Discussion

The systematic review of the literature of prenatal kratom use and effects on maternal and infant outcomes revealed case reports of both maternal and infant withdrawal symptoms after kratom use in pregnancy. The majority of mothers in the case studies were using kratom daily prior to their pregnancy. All mothers reported consumption of

Table 1 Prenatal kratom exposure literature on maternal and infant outcomes.

Case study	Maternal characteristics	Other substances during pregnancy	Maternal outcomes	Infant outcomes	Comments
Davidson et al. [23]	29-year-old female	Other substances during pregnancy:	Delivery: Spontaneous vaginal delivery	Gestational age:	Call for research
	Chronic smoker	Gabapentin	Mother's treatment: Maternal treatment not specified in case study	Full term	Safety and efficacy of kratom for prenatal maternal use and effects on the fetus during pregnancy.
	Second pregnancy	Clonazepam		Feeding: Formula Fed	Polysubstance exposure complicates the causal relationship of kratom and withdrawal.
	Mother's kratom use pattern: Chronic kratom user				Further research is needed on polysubstance exposures.
	Reasons for kratom use:	Prenatal vitamins		Signs/symptoms of infant withdrawal: Symptoms 24 h after birth	Clinicians understanding specific spectrometry to identify kratom, routine toxicology will not identify kratom.
	Chronic low back pain, fibromyalgia, and anxiety			Included:	
		Daily over the counter herbal supplements		Reduced oral intake, jitteriness, sneezing, hypertonia, excessive crying. Intermittent tachypnea, excessive suck, hyperthermia.	
		Penicillin prophylaxis		Finnegan 10 and above	
		Nicotine		Pharmacologic Wean: Yes, morphine	
				Length of hospital stay: 14 days	
Mackay and Abrahams [24]	29-year-old female	Other substances during pregnancy:	Delivery: Delivered 37 weeks 5 days	Gestational age: 37 weeks and 5 days	Clinicians need to ask patients about kratom use and observe infants exposed for neonatal withdrawal.
	Gravida 4	No other substances described	Unremarkable pregnancy	Signs/symptoms of infant's withdrawal: On postpartum day 2, exhibited feeding intolerance, jitteriness, irritability, and persistent vomiting	Maternal withdrawal needs to be assessed and treated.
	Para 1-3-0-0		Mother's length of stay in the hospital:	Pharmacologic treatment for infant withdrawal:	Authors suggest the nonpharmacologic measure of rooming-in with mother and breastfeeding for infant withdrawal.
	Mother's kratom use pattern:		4 weeks in perinatal addiction unit	IV then oral morphine	
	18–20 g three times per day prior to and during pregnancy.		Mother's treatment:	Length of infant's stay in the hospital:	
	Reasons for kratom use:		Postpartum day 2 oral morphine	NICU 2 days	
	Back pain		moderate withdrawal symptoms anxiety, piloerection, diaphoresis and restlessness Improved over 2 days	Tertiary NICU 7 days	
	Functioning		4 weeks slow taper	Total length of stay not specified	
	Withdrawal symptoms if dose delayed 4–6 h			Feeding: Breastfed Infant was breastfed at the beginning of day 7	
	Symptoms included				
	anxiety, piloerection, diaphoresis, and restlessness				
Murthy and Clark [25]	37-year-old female	Other substances during pregnancy:	Mother's length of stay in the hospital:	Gestational age:	Maternal kratom demonstrated
	Gravida 2	Selective serotonin reuptake inhibitors	7 days after delivery	Term	withdraw symptoms with clinical features similar to narcotic withdraw.
	Reasons for kratom use:	Acetaminophen-methocarbamol	Delivery:	Feeding: Breastfed	Demonstrates importance of maternal history and practitioners' familiarity of kratom and kratom with polysubstance use.
	Anxiety	Diphenhydramine	C-section		Management principles for managing NAS with maternal kratom use are needed.

Table 1 (continued)

Case study	Maternal characteristics	Other substances during pregnancy	Maternal outcomes	Infant outcomes	Comments
				Signs/symptoms of infant's withdrawal: Within 6–8 h after birth jittery and increased tone	
	Restless leg syndrome	Valacyclovir	Mother's treatment (postpartum): Rapid 7 day detoxification program	12 h, excessive sucking and irritability	Prolonged withdrawal symptoms in infant need further evaluation.
	Mother's kratom use pattern:	Ranitidine		22 h, irritability, sleeplessness between feeds and excessive sucking Finnegan score of 18	
	Kratom tea was used daily 3–4 times per day	Loratadine		Pharmacologic treatment for infant withdrawal:	
		Salbutamol		Morphine with two unsuccessful weans of morphine	
		Citalopram		Length of hospital stay:	
				Discharged home on day 12 on oral morphine. Total wean off morphine took 2 months	
Eldridge et al. [26]	Mother's kratom use pattern: Daily drank kratom tea during pregnancy, which she purchased at a smoke shop, to self-treat opioid dependence	Other substances during pregnancy:	Delivery: Uncomplicated C-section	Signs/symptoms of infant's withdrawal: 33 h post birth, sneezing, jitters, excessive suck, facial excoriations, irritability, resting tremors, high pitched cry	Pediatricians should be aware of the increasing use of kratom as a self-treatment and "opioid alternative" in pregnant mothers and should expect to see more babies with NAS.
	Reasons for kratom use:	No other substances reported during pregnancy	Mother's length of stay in the hospital:	Pharmacologic treatment for infant's withdrawal: Morphine	Pediatricians need to ask mothers specifically about this drug when taking histories because it does not show up in urine samples.
	Opioid withdrawal symptoms	Maternal urine toxicology:	Not reported in case report	Appeared overly sedated and developed sinus bradycardia. Discontinued morphine after 3 days. Finnegan scores rose to 11–13	There is a lack of literature to guide pediatricians in management of babies with NAS due to kratom and more research needs to be done.
	Sleep	Negative	Mother's treatment:	Clonidine for 2 days until sinus bradycardia reoccurred so weaned off day 5	
			Not reported in case report	Length of infant's stay in the hospital: 8 days	
Smid et al. [27]	**Case One**	Other substances during pregnancy:	Delivery: Scheduled repeat C-section	Gestational age:	Kratom exposure in beginning of pregnancy switched to buprenorphine for remaining of pregnancy at a decreased dose.
	32-year-old woman	Buprenorphine:	Mother's length of stay in the hospital: After giving birth, mother remained in the hospital for 3 additional days (infant with her)	39 weeks	Infant was discharged on day 3 postpartum after prenatal exposure to buprenorphine but suggest follow-up if symptoms develop.
	Gravida 4 Para 2-0-1-2	8 mg after period of abstinence from kratom, tried to self-wean in pregnancy with severe depression so began 2 mg of buprenorphine for remainder of pregnancy	Mother's treatment (postpartum):	Signs/symptoms of infant's withdrawal: No evidence of neonatal abstinence syndrome, however child was discharged on day 3 after exposure to buprenorphine	Obstetricians should be aware of kratom use among individuals with opioid use disorders including pregnant women.
	Medical history:	Other substances during pregnancy:	Oxycodone for post cesarean pain	Length of infant's stay in the hospital: 3 days	Suggests that buprenorphine or methadone may be viable options for opioid replacement pharmacotherapy.
	Hodgkin's lymphoma	Switched from kratom to prescribed buprenorphine 16 mg and naloxone 4 and 2 mg, respectively	Buprenorphine	Feeding: BreastfedBreastfeeding:	Further studies should be done on prenatal use of kratom.
				Feeding: Breastfed	

Table 1 (continued)

Case study	Maternal characteristics	Other substances during pregnancy	Maternal outcomes	Infant outcomes	Comments
	Hx of oxycodone use for pain weaned in prior pregnancy	At 36 weeks gestation due to withdrawal symptoms switched to 20 mg buprenorphine and 3 mg naloxone daily			
	Reasons for kratom use:	Escitalopram, lamotrigine, and quetiapine (to treat bipolar disorder)	Length of mother's stay in the hospital:	Signs/symptoms of infant's withdrawal: Diagnosed with neonatal abstinence syndrome on day 4 after birth	
	Used to treat chronic pain and anxiety	Quit smoking cigarettes and switched to using an e-cigarette two to six times daily	2 days after giving birth	Treatment for infant's withdrawal: Treated with morphine	
	Mother's use pattern: Daily use for 7 months prior to discovering she was 16 weeks pregnant. She initially discontinued use, to self-wean, but was unsuccessful so she continued use of kratom		Delivery: Induced vaginal delivery	Length of infant's stay in the hospital: After being weaned off morphine, was discharged after 12 days after birth	
	Case Two		Mother's treatment (prenatal): Maintained 4 mg of buprenorphine and 2 mg of naloxone four times per day, switched to e-cigarettes, increased to 20 mg buprenorphine and 3 mg naloxone daily at 36 weeks of gestation for increased withdrawal symptoms	Feeding: Breastfed	
	28-year-old woman		Mother's treatment (postpartum): Maintained on same dosage of buprenorphine and naloxone until discharge	Infant was breastfed	
	Gravida 5			Gestational age:	
	Para 3-0-1-3			39 weeks	
	Presented to emergency department at 19 weeks gestation with withdrawal symptoms secondary to kratom. After 10–12 h of abstinence from kratom experienced opioid-like withdrawal symptoms			Apgar scores:	
	Past medical history:			8 and 8 at 1 and 5 min	
	History of intravenous methamphetamine and heroin use. Last use 6 months prior to presentation at emergency department			Finnegan scores:	
	Hospitalized several times for suicide attempts, but denied any active suicidal ideation			Not reported in case study	
	Reasons for kratom use: Desired opioid-like effects				
	Mother's use pattern: Smoking kratom for 4 months until reaching 19 weeks of gestation				

kratom because of its opioid-like effects and 66.67% of mothers reported previously being dependent on opioids. Although the previous drug history of all mothers was unclear in the case studies, the women who attempted to decrease or stop their kratom usage reported symptoms similar to opioid withdrawal and expressed psychologic dependence on kratom. Women of childbearing age are using kratom and becoming pregnant without knowing or being advised of consequences of continued use during pregnancy.

Of the case reports that included toxicology results, the results were negative. The presence of kratom metabolites needs specific spectrometry [22] and the standard toxicology testing would be negative if not specifically ordered. Clinicians need to review toxicology panels and understand the limitations of routine testing to detect NPS such as kratom.

Polysubstance exposure was described in the case studies. One mother reported taking prescribed gabapentin during her pregnancy along with a variety of other drugs. Gabapentin while taking opioids has shown an increase in the opioid's effects, and it is unknown whether kratom produces these same effects [28, 29]. The severity of the symptoms could not be fully analyzed due to inconsistent reporting of Finnegan scores in the case study reports; however, pharmacologic wean was needed whether or not the infants had polysubstance exposure or single exposure to kratom.

The treatment plan for the mothers was similar to typical opioid treatment plans. The various treatments performed to discontinue kratom usage included prenatal medically assisted therapy using buprenorphine or buprenorphine and naloxone, partial replacement of kratom with oral morphine (which both were completely weaned off after 4 weeks), and a rapid detoxification program with assistance of psychiatry and an addiction program. All of the treatment plans reported successfully weaning the women off kratom.

Infants experienced withdrawal symptoms that created a need for pharmacologic wean using morphine and in one case clonidine and morphine. In the only case report that did not require pharmacologic treatment, the mother was only using prescribed buprenorphine during the last months of pregnancy [27]. The infant was sent home 3 days after birth, which makes it possible that symptoms may have developed after discharge. Timing of infant withdrawal to prenatal kratom exposure is an area of research that is needed to guide timing of postbirth observation for withdrawal in infants.

Clinicians are educated to take a medical history that includes any drugs or other substances taken by a patient, especially during pregnancy. The public impression that herbal substances do not fall into the category of needing to be disclosed is based on the principal that these substances are "natural" and therefore do not need any special consideration. Due to marketing of kratom that claims it is a nonaddictive alternative for opioids without risk, mothers do not know the potential of risk if they use kratom [30]. In a qualitative study of pregnant or parenting mothers with substance use disorder, mothers expressed their concern on effects of substance use on their infant and were motived to discontinue use for the sake of their child(ren) [31]. Kratom use is not reported to child protective services because it is "legal." All of these factors may lead to misinterpretation of the safety of prenatal exposure to kratom and other legal psychoactive substances. Clinicians providing services to childbearing age, pregnant, or parenting women should specifically ask about the use of any substance. It should be explained to mothers that any substance exposure for the growing fetus may have effects—some that are known and some that are just being discovered as different substances become more available. The lack of incidence data is a result of the current state of undiscoverable use of kratom in pregnancy. Adoption of a validated tool, such as the kratom dependence scale, may assist in screening for the increasing use of psychoactive substances [32]. Understanding the presence of exposure to psychoactive substances during pregnancy assists in anticipating the observation of withdrawal symptoms for both mother and infant in the postpartum period, and scheduling the appropriate timing of discharge to home. Offering substance use treatment, such as detoxification, counseling that includes motivational interviewing, trauma informed care, and medically assisted therapy, is a standard of practice to address substance use disorders and should be made available to all childbearing age and pregnant women.

Research is needed to study the potential impacts of prenatal kratom in maternal and infant outcomes. In order to study the effects of perinatal kratom use, foundational areas of research are needed that include: (1) patterns of maternal use during pregnancy; (2) reasons for use in pregnancy; (3) maternal symptomatology; and (4) reactions to self-weaning during pregnancy. Infant outcomes need to address the crossing of kratom through the placenta, the determination of toxicology identification of kratom exposure, the amount of kratom in breast milk transmission to infants, and the timing, severity, and signs of infant withdrawal from prenatal exposure. Kratom combined with other prescribed and nonprescribed substances is an area of research needed to determine if there is an increased severity of negative maternal and infant outcomes.

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Compliance with ethical standards

Conflict of interest The authors declare no competing interests.

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PHARMACOTHERAPY

BRIEF REPORT

Kratom Use and Toxicities in the United States

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BACKGROUND Kratom is an herbal supplement containing alkaloids with opioid properties. This review was conducted to determine toxicities associated with kratom use in the United States in order to provide insight into its safety as a dietary supplement.

METHODS We conducted a retrospective review of kratom exposures reported to the National Poison Data System to determine the toxicities associated with kratom use. We also reviewed records from a county medical examiner's office in New York State to identify kratom-associated fatalities.

RESULTS A total of 2312 kratom exposures were reported, with 935 cases involving kratom as the only substance. Kratom most commonly caused agitation (18.6%), tachycardia (16.9%), drowsiness (13.6%), vomiting (11.2%), and confusion (8.1%). Serious effects of seizure (6.1%), withdrawal (6.1%), hallucinations (4.8%), respiratory depression (2.8%), coma (2.3%), and cardiac or respiratory arrest (0.6%) were also reported. Kratom was listed as a cause or contributing factor in the death of four decedents identified by the county medical examiner's office.

CONCLUSIONS Kratom use is increasing and is associated with significant toxicities. Our findings suggest kratom is not reasonably expected to be safe and poses a public health threat due to its availability as an herbal supplement.

KEY WORDS opioid use disorder, opioids, kratom.
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Kratom, available as an unregulated herbal supplement in the United States, is prepared from the leaves of the Southeast Asian plant *Mitragyna speciosa*. The plant has been used for centuries in Southeast Asia by manual laborers for its stimulatory and analgesic effects.[1] In the United States, kratom has been predominantly used for self-treating pain or mood disorders.[2] Recently, kratom has gained acceptance among patients with opioid use disorder (OUD) as a practical alternative to evidence-based medication-assisted treatment, such as buprenorphine or methadone.[3,4] Anecdotal reports have posited that kratom is a safe treatment alternative to relieve opioid withdrawal, but clinical evidence to support this claim is lacking. Although a clear dose-response relationship has not been established, preliminary data suggest that lower doses of kratom produce stimulant-like effects and higher doses produce sedative effects.[5]

Mitragynine, the active component of kratom, has agonist activity at mu opioid receptors, and itself may lead to dependence and addiction.[6] Hydroxymitragynine, a minor component of kratom, also has opioid activity and is thought to be more potent than morphine. The addition of synthetic 7-hydroxymitragynine to kratom as an adulterant is thought to produce a product with more profound opioid effects.[7] A myriad of

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other alkaloids, with activity at adrenergic, serotonergic, and adenosine receptors, may produce other clinical effects, but their potency and activity are poorly understood.[5] We conducted a retrospective review of kratom exposures and associated clinical effects reported to the United States National Poison Data System (NPDS), along with a retrospective review of kratom-associated fatalities identified by a county medical examiner's office in New York State.

A kratom case was defined as any call to the NPDS reporting a human kratom exposure between January 1, 2011, and July 31, 2018. Exposures that included substances in addition to kratom in the substance list (multiple substance exposures) were excluded and the remaining exposures (single substance exposures) were reviewed for demographics and associated clinical effects. All case data, including the substance list, clinical effects, and demographics, were extracted based on NPDS case coding. A kratom death was defined as any decedent identified by the county medical examiner's office during the same time period, with kratom listed as a cause or contributory factor to the death. Postmortem toxicology results were reviewed for all decedents. Both reviews were determined to be exempt from review by our Institutional Review Board.

A total of 2312 kratom exposures were reported to the NPDS during the time frame reviewed, with an increase from 18 exposures in 2011 to 357 exposures in the first 7 months of 2018 (Figure 1). After excluding cases involving multiple substances, 935 single substance exposures to kratom were identified for review. A majority of exposures (56.5%) reported kratom being used as a tablet, capsule, or powder and nearly all exposures identified oral ingestion as the route of exposure (86.2%). Most cases reported the reason for the exposure as intentional abuse or misuse (61.6%). The most commonly reported adverse effects were agitation (18.6%), tachycardia (16.9%), drowsiness (13.6%), vomiting (11.2%), and confusion (8.1%). Severe adverse effects included seizure (6.1%), withdrawal (6.1%), hallucinations (4.8%), respiratory depression (2.8%), coma (2.3%), and cardiac or respiratory arrest (0.6%). Four cases of neonatal abstinence syndrome and two deaths were reported to the NPDS during this time frame.

A total of four decedents with kratom listed as a cause or contributing factor to the death were identified by the county medical examiner's office during the time frame evaluated. Kratom alone was identified as the cause of death in two decedents, a combination of kratom and ethanol was identified as the cause of death in one decedent, and mixed drug toxicity with kratom, clonazepam, and cocaine was identified as the cause of death in the fourth decedent. Postmortem blood mitragynine concentrations of 260 and 1400 ng/ml were reported in the two decedents where kratom was the only substance identified. These concentrations are higher than those reported in Thai individuals consuming traditional kratom tea without adverse effects.[1]

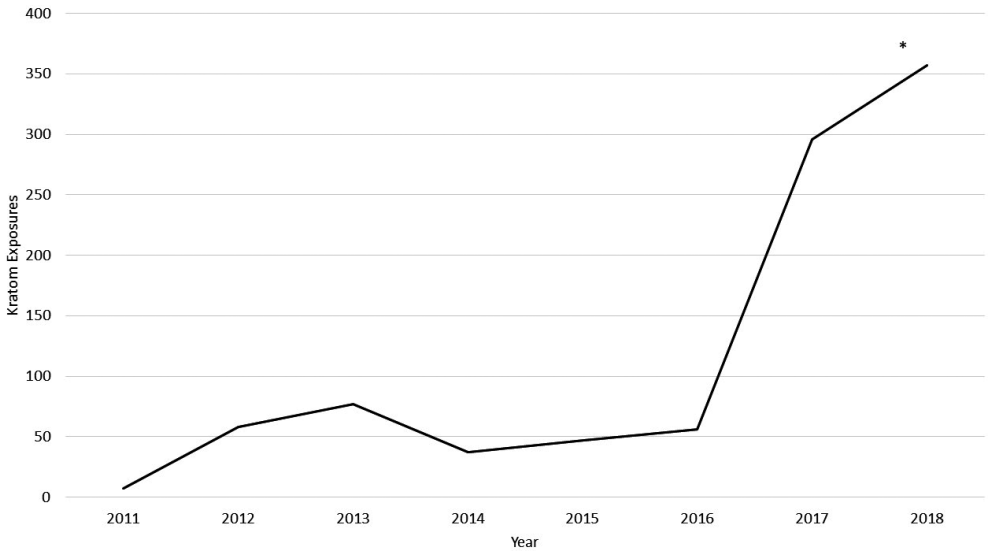

Figure 1. Kratom exposures reported to the National Poison Data System from January 1, 2011, to July 31, 2018. *Data for 2018 is partial and includes exposures from January 1, 2018, to July 31, 2018.

However, there are insufficient pharmacokinetic and postmortem data in patients using kratom for OUD to draw definitive conclusions. In the decedent with kratom and ethanol identified on postmortem analysis, a blood mitragynine concentration of 200 ng/ml and a blood ethanol concentration of 181 mg/dl were reported. In the decedent with mixed drug toxicity, a postmortem blood mitragynine concentration of 540 ng/ml was reported along with qualitative positives for blood cocaine and clonazepam.

Despite kratom's growing popularity as a safe and natural self-treatment option for patients with OUD, our findings suggest there are concerns for significant toxicity. Reports of kratom exposures to the NPDS are rising and have already been associated with serious opioid toxicities, including seizures, agitation, and death. Our county medical examiner's office has also identified four cases where kratom use appeared to contribute to the cause of death. Additionally, reports of withdrawal and neonatal abstinence syndrome suggest that kratom, similar to other opioids, can produce dependence. According to the United States Dietary Supplement Health and Education Act of 1994, herbal and dietary supplements must contain ingredients that are reasonably expected to be safe.[8] Our findings repudiate the idea that kratom meets this criterion. Kratom's opioid effects put patients at risk for withdrawal, respiratory depression, and death.

We concede that further research is needed to determine what role, if any, kratom may have in the treatment of OUD or chronic pain, and to identify the extent of kratom abuse in the United States. Of note, these data were derived from voluntarily reported exposures collected by the NPDS and a single medical examiner's office. We were not able to determine the incidence or prevalence of kratom use from this data set, and due to the voluntary nature of the reporting system, the data likely underrepresent the total number of exposures, toxicities, and deaths associated with kratom use. Data from NPDS are obtained from Poison Center coding and do not provide sufficient details to determine the circumstances surrounding the patient's reason for using kratom. Last, although examining only single substance exposures provides insight into kratom's clinical effects, it limits information on kratom's potential synergistic toxicity when taken with other substances. However, given these serious patient safety concerns and the 44 kratom-related deaths in the United States reported by the Food and Drug Administration, we agree with the United States Department of Health and Human Services that kratom's availability as an herbal supplement should be reconsidered.[9] Furthermore, kratom's rapid rise in popularity in the United States highlights the urgent need to expand access to evidence-based medication-assisted treatment for patients with OUD and to address the complex symptoms of chronic pain.

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REVIEW ARTICLE

Kratom (*Mitragyna Speciosa*) Liver Injury: A Comprehensive Review

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Abstract
Kratom (*Mitragyna speciosa*) leaves contain the mu opioid partial agonists mitragynine and 7-hydroxymitragynine. The US Drug Enforcement Agency considers it a 'drug of concern', and the US FDA is reviewing kratom, but there is a paucity of information regarding health effects. Liver injury is often cited as a potential health consequence, however the same few case reports are repeatedly referenced, without a broader context. Furthermore, reports have largely lacked standardized causality assessment methods. The objective is to evaluate causality in kratom liver injury, through a comprehensive scoping review of human cases, and by reviewing epidemiologic, animal, and mechanistic reports that relate to kratom liver injury. Hepatotoxicity causality was systematically examined using the Roussel Uclaf Causality Assessment Method (RUCAM) for case reports. Biopsy findings, potential pathophysiologic mechanisms, and management options are discussed. This review identified 26 case reports and abstracts, in addition to 7 cases reported from the Drug-Induced Liver Injury Network, 25 in FDA databases, and 27 in internet user forums. Latency periods to symptom onset had a median of 20.6 days and mean of 21 days (range 2–49). Common presenting signs and symptoms were abdominal discomfort, jaundice, pruritis, and dark urine. Histologic findings were predominantly cholestatic, although, biochemically, the condition was heterogenous or mixed; the median R ratio was 3.4 and the mean was 4.6 (range 0.24–10.4). Kratom likely causes liver injury based on the totality of low-quality human evidence, and, in the context of epidemiologic, animal, and mechanistic studies. It remains unclear which subgroups of users are at heightened risk.

1 Introduction

Mitragyna speciosa is a tropical tree native to Southeast Asia. Known colloquially as 'kratom' in Thailand and 'ketum' in Malaysia, the tree has large leaves that contain the partial mu opioid receptor agonists mitragynine and 7-hydroxymitragynine, among other alkaloids. While these compounds bind opioid receptors and have classical mu opioid effects, they are functionally biased, with unique downstream effects compared with classical opioids [1, 2]. The plant is anecdotally popular as a home remedy for opioid withdrawal and opioid use disorder, and few studies have formally investigated this popularity [3]. It is available as powder, extract, tea, tablets, or capsules with ground leaves. In the US and Thailand, regional poison centers have experienced increasing call volumes for kratom exposure [4, 5].

Kratom is illegal in numerous countries, and while sales in the US have been banned in several cities and states, it is not federally scheduled as a controlled substance. In 2016, the US Drug Enforcement Administration (DEA) declared its intention to list kratom as schedule I using emergency scheduling powers, but due to pressure from kratom advocacy groups, the public, and members of congress, scheduling was postponed [6]. The DEA considers kratom a 'drug of concern', and the US FDA is actively reviewing kratom, repeatedly expressing concern for abuse potential and harms associated with use [7, 8].

There is a paucity of information regarding kratom's health effects. Liver injury is cited as a potential health consequence, yet the same few case reports are repeatedly referenced, without a broader context. Furthermore, prior reports have largely lacked standardized methods of causality assessment for drug/herb-induced liver injury. The

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Key Points

Kratom likely causes liver injury based on the totality of low-quality human evidence in the form of case reports, US FDA databases, and online user forums, and in the context of epidemiologic, animal, and mechanistic studies.

Most users do not experience clinically apparent liver injury, and it is unknown which user subgroups are at heightened risk.

Laboratory parameters show heterogenous or mixed liver injury, while liver biopsies show predominantly cholestatic injury.

review evaluates the strength of causality in kratom-induced liver injury by performing the first comprehensive review of human cases, and reviewing the epidemiologic, animal, and mechanistic reports that relate to kratom-induced liver injury.

2 Methods

A scoping review was performed to broadly examine the current heterogenous evidence for kratom causing hepatotoxicity. A literature search for human cases was performed from inception through 20 November 2019, using the PubMed, Scopus, Embase, and Google Scholar electronic databases. The searched keywords were (kratom OR ketum OR Mitragyna OR mitragynine) AND (liver OR hepatic OR hepatotoxic OR hepatotoxicity OR hepatitis OR DILI OR HILI OR cholestatic OR cholestasis OR transaminitis OR transaminases OR LFT OR jaundice OR hepatomegaly). An additional search was performed in the National Health Institute (NIH) LiverTox database.

A literature search for relevant animal studies was also performed using the above timeframes and databases, based on (kratom OR ketum OR Mitragyna OR mitragynine) AND (animal OR model OR rat OR rats OR rodent OR rodents OR mouse OR mice) AND (toxicity OR toxic OR liver OR hepatic OR hepatotoxic OR hepatotoxicity OR hepatitis OR DILI OR HILI OR cholestatic OR cholestasis OR transaminitis OR transaminases OR LFT OR jaundice OR hepatomegaly).

For human and animal studies, only English-language articles were identified. A manual search of relevant article references was performed to further expand the search. Articles were included if they described a unique human exposure or animal study with suspected liver injury.

Causality of hepatotoxicity was systematically examined by calculating Roussel Uclaf Causality Assessment Method (RUCAM) scores for all case reports, and by utilizing a global approach to interpret RUCAM scores in the context of these alternate avenues of evidence.

3 Causality Assessment of Drug-Induced Liver Injury

Drug-induced liver injury (DILI) and herb-induced liver injury (HILI) are terms for a heterogenous group of disorders. The primary mechanisms for DILI are mitochondrial dysfunction, oxidative stress, and altered bile acid homeostasis [9]. Cholestatic DILI likely involves either direct injury of canalicular membranes or cholangiocytes by cytotoxic substances excreted in bile, or inhibition of transporter proteins. Heterogeneity between substances and people complicates attribution of causation.

A number of systems have been developed to evaluate causality, including the Naranjo Adverse Drug Reactions Probability Scale and World Health Organization-Uppsala Monitoring Center (WHO-UMC) criteria, which were not designed specifically for liver injury [10]; the Maria and Victorino scale, which does not account for liver injury pattern [11]; the Digestive Disease Week-Japan scale, which includes specific lymphocyte tests [12]; and a structured expert opinion process used by the Drug-Induced Liver Injury Network (DILIN) [13].

The RUCAM score has also been referred to as the Council for International Organizations of Medical Sciences (CIOMS) score [14]. When compared with the complex structured expert opinion process, the RUCAM tends to underestimate causality [15]. The RUCAM performed well when validated against re-exposure liver injury as the gold standard [16]. RUCAM is ideally used prospectively to ensure completeness of data collection, but has frequently been applied retrospectively, including in the validation study of the original RUCAM [16–18]. The drawback of retrospective use is the risk of incomplete information, resulting in a lower probability estimate.

The RUCAM criteria were modified in 2016 to define the degree of alcohol intake as a risk factor and to shift hepatitis E virus testing from group II to group I of nondrug causes for exclusion [17]. The RUCAM has several drawbacks, as noted by García-Cortés et al. and Shapiro and Lewis, which were only partially addressed by the updates [19, 20]. These obstacles include handling of incomplete data, atypical presentations, changing patterns of liver injury during the illness course, exclusion of histologic information, and subjectivity of some data elements. The RUCAM also has problematic test–retest and interrater reliability [21]. Overall, the

RUCAM remains the most commonly used method of causality assessment for DILI and HILI [17].

While the term DILI is often used to refer to herbal etiologies, HILI is a more specific term. Evaluating causality form herbal drugs has additional complexities that do not exist with pharmaceutical good manufacturing practices [22]. Herbal products can vary significantly, with unknown source harvesters and manufacturers, inconsistent plant parts used, variable solvents and impurities, varying chemical composition and active ingredient strength, and potentially the inclusion of multiple plant species. This multifactorial confounding does not negate the importance of causality assessment, but conclusions must be considered in this context. The RUCAM score has not been specifically validated for HILI but is commonly used to assess causality for herbal etiologies and is considered of value.

4 Epidemiologic Studies

Epidemiologic and cross-sectional studies have reported limited details regarding liver injury, making conclusions difficult to impossible. In 1975, a report on kratom users in Thailand noted that long-term users develop "an appearance similar to a hepatic face", and describes a 55-year-old male with "an appearance similar to a hepatic face", however no jaundice was reported and no laboratory studies were performed [23].

In Malaysia, a structured interview on kratom use in 562 subjects found six subjects who responded 'yes' to "Have you had a medical problem as a result of your Ketum use (e.g. memory loss, hepatitis, convulsions, bleeding, etc.)" [24]. No further details were reported, and it is unknown if these were cases of kratom-induced liver injury.

In a Malaysian cross-sectional study comparing 58 male regular kratom users with 19 nonusing male controls, there was no difference in transaminases [25]. The authors defined regular kratom use as self-reported consumption at least twice daily for at least 2 years, and subjects were excluded if they had ethanol or illicit drug use, nonalcoholic fatty liver disease, viral hepatitis, cirrhosis, coronary artery disease, or diabetes. Snowball sampling allowed authors to identify eligible subjects but may limit generalizability.

Between 2011 and 2017, among 1807 calls to US poison centers for kratom, 59 were for aspartate aminotransferase (AST) or alanine aminotransferase (ALT) > 100 (5%), 30 were for increased bilirubin (2.6%), and 18 were for other liver test abnormalities (1.5%) [4]. No further details are available and causality cannot be estimated. A retrospective, single poison center study from 2002 to 2016 examined calls from healthcare facilities for kratom exposure. Of 12 included patients, one was found to have elevated transaminases and bilirubin after presenting with nausea, abdominal pain, and jaundice [26]. The patient had underlying nonalcoholic steatohepatitis, and 1 month prior he discontinued lupus medications and started using kratom three times daily. Unclear evaluation by gastroenterology did not uncover alternate etiologies to explain his acute presentation. Laboratory values are unknown and transaminases improved after a 21-h course of N-acetylcysteine (NAC).

5 Human Case Reports

Articles state that only a few kratom liver injury cases have been described; however, searching revealed a total of 26 formally described cases: 11 case reports [27–37], 13 conference abstracts representing 12 unique cases [38–50], 1 case not formally published [51], and 2 cases in the NIH LiverTox database (Table 1) [52, 53]. In instances of data omission, we contacted authors to determine whether missing data were available.

The median age was 31.5 years, mean 35.4 years (range 19–70), and 65% of patients were male. Kratom formulations were powder (37%), unknown (37%), tea (15%), capsules (7%), and crushed leaves (3.7%). Among 18 cases with clearly reported latency periods from the start of kratom use to symptom onset, the median was 20.6 days and the mean was 21 days (range 2–49). Common presenting signs and symptoms were abdominal discomfort, jaundice, pruritis, and dark urine. Many cases also had chills and light-colored stools. Dosing amounts and frequency varied significantly and were poorly reported on, preventing dose–response estimation. The latency findings in the above cases are consistent with the separate seven-patient series produced by the DILIN, in which median latency to onset was 22 days (range 15–49).

A RUCAM score could not be calculated for three cases due to an unknown interval between initiating kratom and the onset of liver injury (latency) [29, 36, 41]. One of these cases may have involved re-exposure, which would otherwise likely have had a high RUCAM score [41]. RUCAM separately could not be calculated for one case owing to a lack of documented alkaline phosphatase (ALP), which is required to calculate an R ratio for RUCAM [44, 47].

Most case reports met the laboratory criteria for DILI based on consensus case definitions [54]. Three cases did not meet the DILI criteria; two further cases had insufficient documentation and were excluded [41, 44], and one was included due to an otherwise suggestive case [27, 44]. The included case that did not meet the DILI criteria had mild elevation in transaminases and ALP, and a direct hyperbilirubinemia of 28.6 mg/dL. Isolated hyperbilirubinemia is not considered a DILI; however, we chose to include this case because DILI consensus criteria are based on level 2b evidence, and given the otherwise suggestive elements of

Table 1 Summary of published cases

Article	Description	Diagnostics
Kupferschmidt 2011 [38]	A 30-year-old female used kratom powder 5 g with ethanol (unknown amount), 2 days apart. One day after the second use, the patient had fever and myalgias, which resolved in 1 day. Five days after the second use, the patient had pruritis and jaundice. Pruritis was treated with an antihistamine and a corticosteroid. At 35 days, transaminases and bilirubin normalized	Peak bilirubin total 9.4, ALP 174, ALT 482, AST 271. Unremarkable ultrasound, MR cholangiography, serum electrophoresis, ceruloplasmin, iron, ferritin, autoimmune antibodies, viral hepatitis, EBV, CMV
Kapp et al. 2011 [27]	A 25-year-old male used kratom powder twice daily for 2 weeks, and servings increased from approximately 3 g to approximately 12 g. 2 days after cessation, the patient had chills, and by day 8 had abdominal pain and dark urine. Bilirubin remained markedly elevated for 3 weeks after presentation, then gradually fell	Initial bilirubin total 30.9 (direct 28.6), ALP 173, ALT 94, AST 66. Negative viral hepatitis, ANA. Ultrasound and CT showed steatosis. Detectable urine/serum mitragynine. Biopsy found cholestatic injury
Rivera et al. 2011 [44]	A 26-year-old male used kratom, and had fever, abdominal pain, and jaundice. LFTs normalized over 1 month after stopping kratom	Bilirubin total 7.8, ALT 97, AST 57. Negative ANA, AMA, SMA, hepatitis serologies, CMV, herpes simplex virus, EBV. Negative studies for hemochromatosis and Wilson's disease. Ultrasound was normal
Kesar et al. 2013 [39]	A 34-year-old female used kratom half-spoon (unknown formula) on 2 adjacent days. Within 1 week, the patient had pruritis, dark urine, and light stools. The patient was treated with N-acetylcysteine for possible APAP toxicity, then started on ursodiol and hydroxyzine. At 40 days, tests normalized	Initial bilirubin total 10.6, ALP 298, ALT 93, AST 61. Negative viral hepatitis, EBV, CMV. Excluded autoimmune hepatitis, Wilson's disease, AAT deficiency, hemochromatosis, and primary biliary cholangitis. Ultrasound and hepatobiliary scan found no common bile duct obstruction
Dorman et al. 2015 [28]	A 58-year-old male used kratom powder daily for 1 month, stopped when he had jaundice and dark urine. The patient also had grade I hepatic encephalopathy. 1-year prior, the patient had jaundice after using kratom powder 1 tablespoon daily for 3 months, with bilirubin 9.7 that resolved with discontinuation	Initial bilirubin total 25.6 (direct 17.1), ALP 790, ALT 106, AST 49, ammonia 161 µmol/L Negative viral hepatitis, ANA, SMA. Ultrasound showed irregular liver texture without obstruction
Arens et al. 2015 [48]	A 26-year-old male with no past medical history, ingested, in 24 h, ethanol 15–20 drinks and kratom 15 g. Two days later, the patient had chills and right upper quadrant pain, and 2 weeks later presented again with dark urine. In the hospital, the patient had fever to 38.6 °C and tachycardia and was treated symptomatically. Transaminases peaked at ALT 703 and AST 483. The patient then improved and was discharged on hospital day 3. The time course of transaminase improvement was unknown	Initial bilirubin total 2.3, ALP 171, ALT 448, AST 483, undetectable APAP. Ultrasound found diffuse gallbladder wall thickening and pericholecystic fluid, without cholelithiasis or sludge. Negative acute viral hepatitis, normal ceruloplasmin, and 24-h urine copper. Initial serum mitragynine 13 ng/mL and urine mitragynine 356 ng/mL
Sullivan 2016 [51]	A 19-year-old female used kratom tea made by friends; however, the next morning, the patient had emesis, epigastric pain, fever, and myalgias. By day 6, the patient had pruritis, pale stools, and 'neon yellow' urine. On day 7, the patient had jaundice and went to hospital. Her friends had no ill effect. She had used kratom once approximately 3 weeks earlier without issue. Throughout the illness, the patient took 6 × 325 mg APAP tablets. She had been taking oral contraceptives for > 1 year, and was an occasional binge drinker, but not recently. Symptoms rapidly improved, and 2 weeks later the laboratory tests normalized, and were still normal at follow-up > 1 year later	Initial bilirubin total 5.8, ALP 181, ALT 215, fasting serum bile acids 225 µmol/L (normal < 10). Acute viral hepatitis tests negative, ultrasound normal, ANA 1:80, which may be present in healthy patients. Negative SMA, AMA, and liver kidney microsomal antibodies. Normal ceruloplasmin and AAT

Table 1 (continued)

Article	Description	Diagnostics
Drago et al. 2017 [37]	A 23-year-old male used kratom powder over 6 weeks (estimated 85 g in total). 1 week after the last use, the patient presented with 4 days of jaundice, pale stools, and dark urine. He used 'moderate' alcohol. Over 2 weeks, the liver tests normalized	Initial bilirubin total 7.4, direct bilirubin 5.8, ALP 225, ALT 210, AST 129, INR 0.9 Unspecified tests for viral and autoimmune hepatitis were negative. Biopsy "was entirely consistent with cholestatic liver injury"
Bernier et al. 2017 [40]	A 41-year-old female used kratom 1 teaspoon, twice daily for 1 week. Ten days after stopping, the patient had jaundice, pruritus, diarrhea, and subsequently went to hospital	Initial bilirubin total 15, ALP 245, ALT 144, AST 66. Viral (including E) and autoimmune hepatitis tests negative. Biopsy showed cholestatic overload with discrete destruction of interlobular bile ducts compatible with cholestatic hepatitis. On recheck 51 days later, bilirubin total 6, ALP 126 (Le Boisselier, R, personal communication, 26 June 2019)
Shah et al. 2017 [41]	A 30-year-old female used kratom tea and presented with a few weeks of abdominal pain, jaundice, dark urine, and pruritis. The patient was admitted with similar complaints and similar laboratory test abnormalities as previously. The abstract does not describe timing between use and onset, or whether ethanol or other medications are used, and it is unclear if this was a case of re-exposure	Initial bilirubin total 18, ALP 100, ALT 47, AST 48. Unknown extensive work-up for liver disease was negative, including viral etiologies. MRI and endoscopic ultrasound excluded mechanical biliary obstruction. Biopsy showed intrahepatic cholestasis
Riverso et al. 2018 [29]	A 38-year-old male used kratom and then presented with 5 days of chills and was subsequently discharged with likely viral illness. The patient used five doses of APAP and continued kratom. He initially improved, then returned with dark urine and pale stools. Unknown time interval between kratom use and onset	Initial bilirubin total 5.1 (direct 4.0), ALP 304, ALT 389, AST 220. Unremarkable serum APAP, and serum AAT and phenotype. No active viral hepatitis. Biopsy showed mild centrilobular hepatocellular and canalicular cholestasis
Griffiths et al. 2018 [30]	A 21-year-old male used kratom for 2 weeks, up to 12 capsules daily, and 10 g in the 2 days before admission. The patient had emesis, fatigue, abdominal pain, and dark urine. He drinks 2 beers 3×/week, and uses hallucinogenic mushrooms, last used 2 weeks prior. Discharged after 2 days, lost to follow-up	Initial bilirubin total 2.9, ALP 193, ALT 319, AST 294. Undetectable serum APAP, negative viral hepatitis panel. MRI showed moderate hepatosplenomegaly and small ascites. Ultrasound showed common bile duct dilation per the article, but it was only 6.4 mm, with no cholelithiasis or other abnormality (Olin JL, personal communication, 4 June 2019)
Tayabali et al. 2018 [36]	A 32-year-old male used 60 kratom tablets over 1 week, in addition to powder. Two weeks before presenting, the patient had jaundice, nausea, fatigue, arthralgias, night sweats, pale stools, and dark urine. He used kratom for > 2 weeks, and symptom onset occurred while still using kratom, but unclear latency from the start of kratom use to onset (Tayabali K, personal communication, 22 November 2019). The patient occasionally used APAP for chronic pain, drank alcohol occasionally; neither were quantified. He was treated with NAC 150 mg/kg/h, but had anaphylaxis so therefore stopped	Initial bilirubin total 6.3, ALP 391, ALT 365, AST 222. Negative tests for APAP, hepatitis A, B, C, HIV. Normal ceruloplasmin and AAT. Serum mitragynine 47.8 ng/mL, and detectable metabolite 7-hydroxymitragynine Ultrasound normal
Mousa et al. 2018 [31]	A 31-year-old male used kratom tea for 2 weeks and presented with 4 days of dark urine and malaise. He was treated with 18 doses of NAC (140 mg/kg load then 70 mg/kg every 4 h) and discharged on day 4	Initial bilirubin total 2.2, ALP 191, ALT 578, AST 191. Negative viral hepatitis panel and ANA, unremarkable abdominal CT and ultrasound (Mousa MS, personal communication, 20 June 2019)

Table 1 (continued)

Article	Description	Diagnostics
Mackenzie and Thompson, 2018 [49] De Francesco et al. 2019 [50]	A 27-year-old male ingested kratom powder purchased online. Several weeks after using it multiple times weekly, typically 3–4 tablespoons, the patient had 2 days of 'heavy' alcohol consumption, then developed vomiting, diarrhea, and epigastric pain. The next 3 days he ingested APAP 4 g/day, then presented with liver injury. On day 5 of admission, a liver transplant was performed	Initial bilirubin total 0.98, ALP 109, ALT 330, AST 1,431, APAP 2.6 µg/mL. Liver tests peaked 48 h later, with bilirubin total 11.2, ALP 162, ALT 6969, AST > 14,000, INR 8.8. Comprehensive urine toxicology screen was negative, except APAP and caffeine. Blood culture grew *Salmonella javiana*. Negative tests for viral hepatitis, Wilson disease, and extensive unspecified other causes. Biopsy found extensive hepatocellular necrosis with extracellular cholestasis. Gas chromatography–mass spectrometry of two of the kratom bags found mitragynine, paynantheine, and speciogynine (mitragynine isomer), without chemical adulterants. The kratom was confirmed to have *S. javiana*
Antony and Lee 2019 [32]	A 70-year-old male used kratom twice daily for 4 days and 2–3 weeks later presented with jaundice, nausea, and a 9-kg weight loss, as well as hepatitis that improved. He was readmitted 3 days later for worsening pruritis, melena, and syncope. At that time, Hgb was 4.8, creatinine was 2.9, and the patient had a red blood cell transfusion. Kidney injury of unclear etiology was thought to be as a result of acute tubular necrosis due to pigment nephropathy from hyperbilirubinemia. Three months later, laboratory tests normalized, except creatinine 1.8	Unclear documentation of laboratory test timing between admissions. Bilirubin total 27, ALP 230, ALT 59, AST 53, creatinine 2.27, BUN 80. Negative viral hepatitis, negative for 'various liver diseases', and unremarkable CT and MR cholangiography
Fernandes et al. 2019 [34]	A 52-year-old male used APAP 800 mg twice daily plus kratom for 2 months. He used kratom 1 teaspoon of crushed leaf initially twice daily for a few days, then daily for 2 months. Approximately 2 weeks after starting kratom, scleral icterus and jaundice began that slowly progressed. 16 days after stopping kratom, the patient presented with jaundice. He was treated with ursodiol for 1 month, at which time bilirubin improved but was not normal, and transaminases were rising. Not followed further	Initial bilirubin total 23.2 (peaked 10 days later at 28.9), ALP 255, ALT 66, AST 55, INR normal. MRI showed patent biliary ducts. Negative unknown work-up for alternate causes of liver disease. Biopsy showed acute cholestatic injury Laboratory tests on day 27 (last follow-up) showed bilirubin total 4, AST 71, ALT 78, ALP 183
Osborne et al. 2019 [33]	A 47-year-old male used kratom capsules for 3 weeks, not daily, then developed a few days of dark urine, pruritis, chills, and nausea. He took APAP < 3 g/day for symptoms, and denied any other new drugs, including herbals. The patient was managed as an outpatient. At 16 days, laboratory tests were still slightly abnormal; at 58 days, the only abnormality was ALT 60, possibly from underlying nonalcoholic fatty liver disease given obesity, dyslipidemia 9 months later, the patient presented again with 2 days of pruritis and anorexia, after rechallenge with kratom powder for 1 day. Bilirubin total 3.2, AST 185, ALT 566, ALP 211, and laboratory tests "trended toward normal 3 weeks following re-challenge"	Initial bilirubin total 5.8 (direct 4.3), ALP 170, ALT 265, AST 108. Laboratory tests peaked on day 2 then started downtrending. Undetectable serum APAP, negative EBV and viral hepatitis, normal AAT and ceruloplasmin levels, negative ANA. CMV IgM antibody index 1.7. Ultrasound showed steatosis (in the setting of obesity)
Ricardo et al. 2019 [42]	A 33-year-old female used kratom tea 1–2 small cups for 1 month; she had a history of chronic hepatitis C. The patient presented with 3 days of abdominal pain, jaundice, pruritis, and dark urine. Occasional alcohol use (unquantified). The patient was discharged after 3 days, when jaundice resolved and liver tests downtrended (unknown to what degree)	Initial bilirubin total 5.1 (direct 4.4), ALP 387, ALT 1134, AST 4624, normal INR. Undetectable APAP, ultrasound normal. Hepatitis C antibody reactive, hepatitis C RNA 31,100 IU/mL (Ricardo J, personal communication, 24 June 2019)

Table 1 (continued)

Article	Description	Diagnostics
Desai et al. 2019 [47]	A 36-year-old female used kratom for a few weeks, and was transferred for perinephric abscess. She drank a few beers weekly and used APAP < 10 g/week. ALT and AST more than doubled within a few hours. Started NAC intravenously. Liver enzymes improved to ALT < 300 and AST < 1000. NAC was stopped, but within 16 h, ALT/AST increased again therefore NAC was restarted. Peaked at ALT > 3800 and AST > 12,000; on discharge ALT was 352 and AST was 56. During admission, the perinephric abscess was drained and ciprofloxacin was administered (Desai P, personal communication, 25 November 2019)	Initial bilirubin total 2.4, ALP 239, ALT 592, AST 1482. Unremarkable viral hepatitis panel, ceruloplasmin, autoimmune antibodies, serum APAP, and ultrasound
Bøgevig et al. 2019 [43]	A 56-year old male used kratom powder 1 teaspoon daily. He had obstipation for 10 days and jaundice for 5 days, then presented 14 days after starting kratom. The patient had a history of mild 'liver enzyme' elevation that was normal 6 months prior, and no history of substance abuse, including ethanol. Bilirubin and ALT normalized in 3 weeks	Initial bilirubin total 17.3, ALP 392, ALT 887, AST unlisted. Negative viral hepatitis and CMV Gas chromatography–mass spectrometry of the kratom powder found mitragynine content 0.590 mg/g; there is no description of potential contaminant analysis
Aldyab et al. 2019 [35]	A 40-year-old female used kratom weekly for 1 month, then had abdominal pain and fever, and presented for care. The patient had also started a ketogenic diet 1 month before symptom onset. She had been taking an oral contraceptive and a nettle leaf supplement for a few years. She stopped kratom, contraceptives, and supplements, but started ursodiol, prednisone. The authors questioned if the discrepancy between cholestatic histology and hepatocellular biochemical tests may have been from prebiopsy corticosteroids that reduced lobular hepatitis more than bile duct injury	Initial bilirubin total 5.1, ALP 162, ALT 875, AST 462. Negative viral hepatitis, Wilson's disease, AAT deficiency, ANA, SMA, AMA. CT and MR cholangiopancreatography found mild periportal edema. Biopsy showed bile duct injury with few vague granulomas, and portal tract inflammation
Pronesti et al. 2019 [45]	A 30-year-old male used kratom powder with water for 4–6 weeks at night. He presented with 1 week of dark urine and pale stools, and one day of scleral icterus. The patient had a history of diabetes mellitus. No drug or APAP use. At 1 month, laboratory tests normalized	Bilirubin total 5.7, direct bilirubin 4.5, ALP 556, ALT 308, AST 125. Normal CT, hepatitis A, B, C, iron studies, ceruloplasmin, AAT, AMA, liver–kidney microsomal antibody, except ferritin 405 and SMA 1:20. Ultrasound found coarsened liver texture Biopsy showed inflammation with focal prominent eosinophils, and hepatocellular and canalicular cholestasis without fibrosis
Kaur et al. 2019 [46]	A 42-year-old female used kratom for 4 months, with the last use 4 weeks before presenting. One week before presenting, the patient had subjective fever, fatigue, nausea, anorexia, and dark urine (Kaur R, personal communication, 16 November 2019). No prior liver disease, alcohol use, or APAP use. Jaundice and AST/ALT improved at discharge, and at 1 month had normalized	Initial bilirubin total 3.3, ALP 298, ALT 371, AST 171, INR 0.97. ALT peaked at 606 Ultrasound found thickened gallbladder wall and normal liver. Negative autoimmune liver panel, viral hepatitis, HIV, EBV, CMV. Normal AAT, iron, ceruloplasmin
LiverTox Case 6972 [52]	A 29-year-old male used kratom powder daily, and 23 days after starting, the patient had jaundice, dark urine, pruritis, abdominal pain, and fever. He also used herbs Ma Huang (ephedra), kava kava, and *Sida cordifolia* for 2 days prior to starting kratom. The patient had a history of ethanol and injection drug use, and no history of liver disease. The illness was complicated by hemolysis and acute kidney injury	Initial bilirubin total 22.4, ALP 428, ALT 272, AST 70, INR 1.1. Negative viral hepatitis (including E) and ANA. CT and ultrasound found no biliary obstruction but showed gallbladder wall thickening and increased lymph nodes. Biopsy showed "cholestatic changes with mild necrosis and inflammation", but did not suggest chronic alcoholic liver disease or viral hepatitis

Table 1 (continued)

Article	Description	Diagnostics
LiverTox Case 8332 [53]	A 25-year-old male began using kratom every third day for five doses. 25 days after starting use, he developed jaundice, dark urine, pruritis, and abdominal pain. Documentation is conflicting on whether the patient had excess ethanol intake, but, in scoring, excess intake was used. The patient had no history of liver disease. He had started venlafaxine 3 months prior, and consumed a psilocybin mushroom once	Initial bilirubin total 5.6, ALP 218, ALT 126, AST 73, INR 0.9. Negative viral hepatitis (including E) and negative ANA. Ultrasound showed no biliary obstruction

AAT α-1-antitrypsin, *ALP* alkaline phosphatase, *ALT* alanine aminotransferase, *AMA* antimitochondrial antibodies, *ANA* antinuclear antibody, *APAP* acetaminophen, *AST* aspartate aminotransferase, *BUN* blood urea nitrogen, *CMV* cytomegalovirus, *CT* computed tomography, *EBV* Epstein–Barr virus, *Hgb* hemoglobin, *IgM* immunoglobulin M, *INR* international normalized ratio, *LFTs* liver function tests, *MR* magnetic resonance, *MRI* magnetic resonance imaging, *NAC* N-acetylcysteine, *SMA* smooth muscle antibody

Units are bilirubin, mg/dL; aminotransferases and alkaline phosphatase, units/L

the case with liver biopsy showing cholestatic injury. For one additional case, it was unclear whether the DILI criteria were met as ALP was 230 U/L but a reference range was not provided [32].

Six cases involved acetaminophen and although onset times were compatible for the RUCAM, reported doses were nontoxic and there was no suspected self-harm intent; therefore, as a concomitant drug, acetaminophen was considered not compatible with liver injury. One case used < 2 g/day × 3 days [39], one case used < 3 g/day for several days to treat symptoms of liver injury that were already present [33], one case used 1.6 g/day for 2 months [34], one case used 4 g/day for 3 days (and had serum acetaminophen 2.6 µg/mL [49], one case used < 10 g/week [47], and one case used acetaminophen 'occasionally' without quantification and the authors felt it was noncontributory [36]. Furthermore, Kesar et al. [39] and Fernandes et al. [34] had pure cholestatic patterns, which is inconsistent with acetaminophen toxicity. One case that used five doses of an unknown acetaminophen strength was excluded for lack of documentation [29]. It is unknown if therapeutic dosing of acetaminophen alters the risk for kratom liver injury.

A separate case was noteworthy for sonographic gallbladder wall thickening with pericholecystic fluid, in the absence of cholelithiasis or sludge [48]. The patient reported a single kratom use 2 weeks prior, but, based on serum mitragynine, likely used kratom more recently, and it is unclear to what extent the patient's ethanol use contributed. The patient recovered without cholecystectomy. One case was presented at two conferences, and a combination of the two abstracts was used to calculate the RUCAM [49, 50]. This case was notable for the positive *Salmonella javiana*, with liver failure requiring transplant. It is unclear to what extent kratom use was directly responsible, relative to *S. javiana* infection.

6 Human Reports in the Drug-Induced Liver Injury Network (DILIN)

Using data from 2004 to 2018, a study by Navarro et al. found eight cases of liver injury associated with kratom, out of 404 cases associated with herbal and dietary supplements [55]. There were two cases in 2008, one in 2016, and five in 2018. Rather than RUCAM, the DILIN uses a structured, expert opinion process for causality assessment. The expert opinion process determined a causal association in seven of eight cases, in which the median age was 46 years. The authors reported that "products were used for a median of 22 days (range 15–49) before onset of injury; 5 had jaundice, 6 itching, 5 abdominal pain, 3 fever, and none had rash" [55]. All cases had ethanol use. Hospitalization occurred for six of eight patients, and all recovered. The study did not describe whether NAC or other treatments were administered.

Table 2 Cases in FAERS [57]

Case no	Description	Diagnostics
15346316	A 24-year-old male used kratom 15 capsules on back-to-back days, 1 week apart (total of 4 days). The patient had an unknown pre-existing liver disease. He went to a hospital for routine liver biopsy, diagnosed with unknown staphylococcus infection, determined he would need a liver transplant. FAERS report by the patient's mother, who said his liver failure was thought to be from kratom	No diagnostics listed
14367521	A 25-year-old male used kratom two times on different days, and presented with hepatotoxicity 8 days after the initial use. No past medical history	Initial bilirubin total 4.2, ALP 141, ALT 684, AST 449
14180919	A 26-year-old male used kratom tea for 2 weeks, and had jaundice and lethargy. No past medical history. Treated with N-acetylcysteine	Initial bilirubin total 5.8, ALP 297, ALT 466, AST 214
14345738	A 35-year-old male used kratom for 3 weeks, and had jaundice, dark urine, and pruritis. No other drugs or herbs, 'drinks socially'. No past medical history. The patient was admitted and treated by discontinuing kratom	ALT 461, AST 189
15680525	A 35-year-old male used kratom two to three times over 1 month. The patient had severe abdominal pain. He was treated with N-acetylcysteine and transaminases normalized; surgery for potential cholecystitis was deferred	'Elevated LFTs' with no further laboratory results. Radiographic findings of cholecystitis
15346315	A 35-year-old male developed yellow skin when withdrawing from 2 years of significant daily kratom use, however it was unclear if this was jaundice	No diagnostics listed
15561348	A 45-year-old male presented for a few weeks of malaise, myalgias, and fatigue. He had pneumonia, acute kidney injury, and liver injury. His family found bags of kratom and thought he may have used it for 2–3 months. The patient had a history of hepatitis C and alcohol abuse, and had recent use of over-the-counter cold and flu products. FAERS report by the patient's sibling	ALT 300, AST 1900 at an unclear point in the illness. Undetectable acetaminophen. Thrombocytopenia. Creatinine 2.1. Ammonia 135 (unknown unit)
14347379	A 46-year-old male used kratom for a 'few weeks', and presented with 1 week of jaundice, lethargy, and confusion. He had a history of presumed alcoholic cirrhosis without decompensated events. Per family, no heavy ethanol intake for 1.5 years. Prior laboratory tests showed normal bilirubin, ALT, and AST. Medications were citalopram, lisinopril, metoprolol. Liver failure progressed to death	Initial bilirubin total 12.8, ALT 2426, AST 2609 Last laboratory tests were bilirubin total 24.6, ALT 1162, AST 802, INR 5.4
15373449	A 54-year-old female used an unknown amount of kratom powder. Two days later, the patient presented for unstated reasons. She used kratom once several months prior without effect. She had a history of hepatitis C, tobacco use, myocardial infarct, dilated cardiomyopathy, hypertension, dyslipidemia, and methadone dependence. Medications were aripiprazole, escitalopram, mirtazapine, lorazepam, methadone, aspirin, atorvastatin, losartan, and metoprolol	Initial ALP 114, ALT 2747, AST 3062. CT showed normal liver size/morphology. Ammonia reached 110 μmol/L
15744592	A male of unknown age used kratom tea for an unknown period. He presented for hematuria and bleeding with shaving. The patient was not receiving anticoagulants, gets regular testosterone injections, and the only new medication was meloxicam for 1 month	INR 12. Unremarkable mixing studies and fibrinogen, and factor X, II, and V levels. No other diagnostics

ALP alkaline phosphatase, *ALT* alanine aminotransferase, *AST* aspartate aminotransferase, *CT* computed tomography, *FAERS* US FDA Adverse Event Reporting System, *LFTs* liver function tests, *INR* international normalized ratio
Units are bilirubin, mg/dL; aminotransferases and alkaline phosphatase, units/liter

The following cases were reviewed and considered unlikely to be kratom-induced liver injury: 14212085, 14356493, 14554619, 14995024, 14554565

7 Human Reports to the US FDA

A total of 25 cases of kratom hepatotoxicity have been reported to the FDA, which maintains the Center for Food Safety and Applied Nutrition Adverse Event Reporting System (CAERS) as a database of adverse event reports for food, dietary supplements, and cosmetics. A related database, the FDA Adverse Event Reporting System (FAERS), collects adverse event reports on drugs.

CAERS was queried from 2004 through June 2018, using the terms 'kratom', 'Mitragyna', and 'mitragynine'. This yielded 132 cases, of which 15 were related to liver injury [56]. This attribution was based on reports of 'acute hepatitis', 'drug-induced liver injury', 'acute liver/hepatic failure', 'hepatotoxicity', etc. Case details are unknown and causality was not estimated.

FAERS was queried from 2008 through March 2019, and a total of 408 reports under 'Mitragynine/Herbals' were identified [57]. Of these, 15 were considered potential hepatotoxicity, and case details were obtained from the FDA. Reviewing case notes excluded a further five cases as unlikely to be kratom liver injury. The remaining 10 cases are described in Table 2 and are of varying quality. Some are unlikely to be from kratom, but the lack of documentation prevented this determination.

FAERS has several potential drawbacks, including incomplete reports and lack of information verification. Case overlap between CAERS and FAERS is possible, however there is no overlap of ages between included CAERS and FAERS cases, or of case details between FAERS and LiverTox or published case reports and abstracts.

8 Human Reports in Internet Forums

The internet has numerous drug user forums, with intent ranging from risk reduction to high enhancement. Reports of kratom hepatotoxicity were queried on two popular harm reduction websites—Erowid and Bluelight—from the earliest available through March 2019 [58, 59]. Erowid allows for user posts but is curated by the website's operators, while Bluelight is a traditional user forum. Notably, although the first case report of kratom hepatotoxicity was published in 2011, these two websites have reports from 2004, 2007, 2008, and 2009. This underscores the value of user communities in detecting and reporting potential toxicity prior to identification by the medical community. A total of 27 posts were identified that are suggestive of kratom hepatotoxicity, listed in abbreviated form in Table 3. The reports vary in quality, with some listing specific test results and timeframes, while others omit important information. Given the number of online venues for drug use discussion, these 27 posts likely represent a fraction of online user-generated kratom hepatotoxicity reports. Reports include differing kratom formulations such as powdered kratom and concentrated extract, with frequency of use spanning from daily to weekly or less, and with variable intervals to hepatotoxicity onset. Diagnostic testing included three liver biopsies, and there were no reported deaths (although the majority are self-reports). Causality for user reports was not formally evaluated with RUCAM due to the high rate of omitted information. Despite limitations inherent to data from non-medical user forums, this adjunctive data source has value in demonstrating variations in formulations, time to onset, and frequency of use.

9 Human Biopsies

Twelve human liver biopsies have been described in case reports, not inclusive of internet forums. Kapp et al. found pure cholestatic injury without hepatocellular damage, with bile precipitations and canalicular cholestasis [27]. Kesar et al. found cholestasis, lobular inflammation, and increased eosinophils in sinusoids [39]. Drago et al. noted histology that was "entirely consistent with cholestatic liver injury" [37]. Shah et al. found intrahepatic cholestasis [41], and Bernier et al. found cholestatic overload with discrete destruction of interlobular bile ducts [40]. One of two cases in the LiverTox database showed "cholestatic changes with mild necrosis and inflammation" [52]. Riverso et al. found normal lobular architecture, mild portal tract inflammatory infiltrate with predominantly eosinophils, mild bile duct injury with rare apoptotic bodies and lymphocytic infiltration, and mild duct proliferation [29]. There was also focal steatosis and focal hepatocyte dropout, with mild centrilobular hepatocellular and canalicular cholestasis. Fernandes et al. found marked canalicular cholestasis, portal tract inflammatory infiltrate with lymphocytes, eosinophils, and some neutrophils, and bile duct injury with epithelial disarray [34]. Lobules showed injury with mild sinusoidal mononuclear infiltrate and Kupffer cell hyperplasia, and rare spotty necrosis without steatosis. Aldyab et al. found portal tract inflammatory infiltrate with predominantly nonplasma cells, bile duct injury, and scattered ballooned hepatocytes and endotheliitis [35]. Also noted were a few vaguely formed granulomas encasing interlobular bile ducts. Lastly, Pronesti et al. showed inflammation with focal prominent eosinophils, and hepatocellular and canalicular cholestasis without fibrosis [45]. Two biopsies performed in the DILIN (below) showed cholestasis.

Table 3 Self-reports through March 2019 in the Erowid Experience Vaults and Bluelight forum [58, 59]

Year	Post title (Author); website	Description
2004	Kratom—First time–Another Kratom Success (m#########n); Bluelight	Male used kratom for 3 weeks, and, over 1 week, developed jaundice, weakness, nausea, and dark urine; he suspected it was from kratom. Unknown if he stopped kratom use, it improved. History of prior significant ethanol use
2007	Extreme abdominal pain (PB); Erowid	Male used kratom weekly for several months, then had abdominal pain, malaise, and dark urine. Resolved 1 day later. Used kratom again 2 weeks later with identical symptoms. Not medically evaluated
2008	Kratom-induced hepatotoxicity (Sly); Erowid	25-year-old male used kratom extract every other day. After dose number 4, the patient had abdominal pain, dark urine, and jaundice. He was diagnosed with cholestatic hepatitis, which resolved in 2 weeks
2009	Kratom Health Issues (M#####h); Bluelight	Used kratom 10 g two to three times per week; after an unclear interval, the patient had jaundice, ALP 447–570, AST 375–460, ALT 685–834, urine bilirubin 6
2011	Kratom-induced hepatitis? (nlogn); Erowid	22-year-old female used crushed leaf almost daily for 2 weeks; had jaundice and pruritis. Previously healthy, no heavy ethanol use. Peak ALT 1400, AST 300, Tbili 6, ALP unknown. Ruled out viral and autoimmune hepatitis
2011	Kratom and liver damage (K################e); Bluelight	On day 1 used 10 × kratom extract 2.5 g and that night had abdominal pain. Over the next 2 weeks, the patient had jaundice and pruritis. On day 15, the patient went to hospital and was diagnosed with liver failure. Many tests were performed, including liver biopsy, and the patient was diagnosed with drug-induced cholestasis. Five weeks later, the patient was improving but had not returned to baseline
2012	Trip to the ER (SobeDog); Erowid	A 37-year-old male used kratom extract for first time, then the next day had abdominal pain and malaise that lasted 1 week. Two weeks later, he used kratom extract again, and awoke that night with abdominal pain and went to hospital. ALT 340, AST 250, unknown bilirubin and ALP. Liver tests trended down the next day, and normalized in 3 weeks
2012	Kratom-induced liver issues (Mark); Erowid	A 38-year-old female used kratom then had dyspnea and chest discomfort. In the Emergency Department, she had elevated liver function tests and was discharged. Over the next 5 days, the patient had progressive jaundice and pruritis
2013	Liver issues after very little use of kratom (l#####r); Bluelight	"I developed hepatitis around the same time I was taking kratom fairly often"
2013	Liver issues after very little use of kratom (a########l); Bluelight	Used kratom extract six times over 2 weeks (daily for 3 days, then three times in 1.5 weeks). 1 week after starting, the patient had nausea, and, 1 week after stopping, the patient had jaundice, pruritis, and dark urine, and was admitted. Liver enzymes, which were previously normal, were elevated. Negative hepatitis C. Ultrasound deferred. Previously healthy, no other drug use in 1.5 years, including OTC. Diagnosed as drug-induced cholestasis, which doctors thought was from kratom. Jaundice and pruritis improved but were still present 2 weeks after the last dose. Two years later, the patient used kratom again a few times over 1 week and 'liver symptoms' started returning. The patient stopped immediately, and was not medically evaluated
2013	Liver issues after very little use of kratom (J##########n); Bluelight	Used kratom 9 g daily for 2 weeks. After 1 week, the patient had dark urine, went to hospital, and had ALT > 500, "with other enzymes elevated as well". The patient stopped kratom and urine gradually normalized at the time of the online post; awaiting repeat tests. "I personally think that is [53] was the kratom, but given the other medicines I was taking to ease the [suboxone] withdrawal, I can't be sure."
2013	A warning to new Kratom users (J##########m); Bluelight	Used kratom approximately six times, then had jaundice; unclear timeline. The first four times were 3–10 g, the fifth time was 10 g; the patient had fever and nausea. The patient took an additional 10 g that night, and the next day had jaundice and pale stools. The patient had "elevated liver enzymes that of 6–8 times the normal levels". Further unknown tests were performed. The patient had also recently started the anabolic steroid methylepitiostanol

Table 3 (continued)

Year	Post title (Author); website	Description
2013	Kratom-induced liver injury? (s#########r); Bluelight	A 26-year-old male used powdered kratom 3 g, then a further few grams a few days later. Three weeks later, he drank kratom tea, and a few nights later repeated it. Over the next 2 weeks, he used kratom 5 times, 10 g each time, but never more than once in 2 days. He woke with emesis, went to the doctor, and "liver enzymes were through the roof". He was discharged, but a few days later had jaundice, pruritis, and dark urine, and was admitted. He had "extensive blood tests and several ultrasounds, I tested negative for all common liver diseases and showed no signs of gallstones, bile duct obstruction or anything else likely to cause such a reaction". He had detectable serum mitragynine. In addition, 18 months prior, he had a history of elevated liver enzymes for 3 weeks, which resolved and was attributed to acetaminophen. He used ethanol but not heavily, and marijuana was the only other drug used in this period. "Samples of the powdered kratom showed no obvious contaminants". The patient was diagnosed with "drug-induced hepatic injury causing severe biliary cholestasis", which doctors thought was from kratom. One month later, jaundice resolved, with residual fatigue and elevated liver enzymes
2013	Kratom-induced liver injury? (W######1); Bluelight	Began using daily kratom 1–3 teaspoons of crushed leaf. Five weeks later, the patient had abdominal pain, pruritis, and mild flu-like symptoms. One week later, the patient had scleral icterus, and tests showed "liver enzymes through the roof". The patient was admitted for 4 days, "no infection was detected, had many blood tests and abdominal ultrasound. Doctors thought from kratom". Diagnosed with drug-induced hepatitis. No other drugs were used, drinks "a couple of glasses of wine" in an evening, and abstains at least two nights weekly. 10 weeks later, the patient was back to baseline, and was awaiting repeat tests at the time of the online post
2013	A warning to new Kratom users (M####m); Bluelight	Used kratom daily for 1.5 weeks. The patient had vomiting and was admitted since "enzymes were severely elevated"; discharged after several days. One month later "enzyme levels were only a few points above normal". The patient then used kratom again for 1 week and had identical symptoms. The patient stopped use, did not seek medical care, and improved
2014	Hepatitis-like jaundice (FakeName); Erowid	Used kratom daily for 1 week, then had malaise, jaundice, pale stools, and very elevated 'liver enzymes'. Viral hepatitis tests were negative. Liver biopsy showed "blockage of the bile duct". started ursodiol, resolved over 1.5 months
2014	Killing my liver (happygent1236); Erowid	A male used kratom daily for several months, then suddenly had chills and jaundice. He was diagnosed with 'liver toxicity'. Previously healthy, no ethanol use
2014	Hard to Ignore: Kratom is extremely dangerous for some users (b################t); Bluelight	Used kratom for 3–4 weeks, 2–3 teaspoons of powder once daily. The patient had fever, abdominal pain, and dark urine, then scleral icterus and vomiting. The patient had leukopenia and "enzymes elevated to six times a normal level" with 'intrahepatic cholestasis'. No other hepatotoxic drug use, no pre-existing liver condition or hereditary concern. Doctors thought from kratom. Three weeks after being admitted, liver enzymes fell to slightly above normal. Symptoms gradually improved, starting 8 h after the last dose
2014	Hard to Ignore: Kratom is extremely dangerous for some users (C#######c); Bluelight	Used tramadol for 1 year and stopped, then started kratom six capsules daily. The patient had gradual pruritis, abdominal pain, and 3–4 weeks later stopped kratom. After 2–3 days of stopping, the symptoms resolved. The patient tried kratom again and severe symptoms returned. Did not seek medical care either time
2015	Almost Destroyed My Liver (sammers); Erowid	A 26-year-old previously healthy male (unclear duration of kratom use) awoke with nausea, and outpatient "liver enzymes were through the roof". Several days later, he had worse jaundice, no alternate etiology based on ultrasound, and "extensive blood tests". He was admitted for 1 week, and jaundice resolved over 1 month, with liver tests gradually improving but still elevated at the time of the online post

Table 3 (continued)

Year	Post title (Author); website	Description
2015	Induced hepatoxicity? (EkbatDeSebat); Erowid	A 26-year-old female used kratom once, then a few weeks later began daily use for 2 weeks. She had nausea, dark urine, and pale stools. ALT was approximately 400, Tbili 4.6, ALP unknown. She was admitted for a few days until laboratory tests downtrended. She had a CT scan, HIDA scan, ultrasound, and blood tests. The patient had a history of heavy ethanol use, with unclear frequency
2015	Kratom—Second time–hepatotoxic, ER with liver problems (h##########n); Bluelight	Used kratom once previously, then 2–3 teaspoons twice daily. The patient had abdominal pain, but continued to use for 1–2 days, then stopped use. The patient went to hospital and was diagnosed with hepatitis; had negative viral hepatitis tests. A repeat test showed downtrending liver enzymes. Abdominal pain peaked 2 days after stopping kratom, and improved within 1 week of abstinence. Repeat liver tests showed normalization
2017	Kratom and liver damage (H##########n); Bluelight	A few days after starting kratom, the patient had jaundice, pruritis, lower extremity edema, and vomiting. No other drugs were used in this time. The patient stopped kratom for an unknown period. There was no other drug use during this time, including OTC. The patient began using kratom again 2 weeks later, at a lower dose (1 teaspoon), but redeveloped vomiting and lower extremity edema. Did not seek medical care either time
2018	Bilirubin levels were through the roof (San Salvador); Erowid	A 23-year-old previously healthy male with no heavy ethanol use, used kratom for the first time. He awoke that night with abdominal pain, dark urine, and jaundice. A clinic said he had "drug-induced hepatoxicity and that my bilirubin levels were through the roof"
2018	Shooting liver pains and two trips to the ER (actual_ carrot); Erowid	A 20-year-old female used kratom for first time, but later that night had nausea and malaise. She suspected viral illness. 2 weeks later, she used kratom again, and awoke that night with chills, abdominal pain, and pale stools that progressed over 1 week. CT scan showed hepatomegaly, Tbili 3.9, elevated ALT. Negative viral hepatitis tests and ultrasound, and no heavy ethanol use. Bilirubin normalized over 2 weeks, and symptoms resolved over 2 months
2018	Kratom and liver damage (M########s); Bluelight	A male used kratom and had severe pruritis and elevated liver enzymes for 3 weeks. He also had liver biopsy. No further details are available
2019	Kratom, drug interactions prescription/OTC (a####n); Bluelight	Used kratom concurrent with ethanol, and developed 'severe hepatitis', but recovered

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ALP alkaline phosphatase, *ALT* alanine aminotransferase, *AST* aspartate aminotransferase, *CT* computed tomography, *ER* emergency room, *HIDA* hepatobiliary iminodiacetic acid, *OTC* over-the-counter, *Tbili* total bilirubin

10 Animal Studies

While the majority of animal studies have had neurobehavioral or other focuses, numerous animal studies have evaluated hepatotoxicity. In 1972, Macko et al. conducted the first mitragynine animal toxicity studies, in rats and dogs [60]. Biochemical parameters of liver injury were not tested, however hepatic changes were found on sacrifice. Liver weight actually decreased overall in rats administered mitragynine 5 or 50 mg/kg/day most days per week for 6 weeks. In dogs administered 20 mg/kg/day most days of the week, 3/4 developed diffuse increased sinusoidal cellularity, which did not occur at 5 mg/kg/day.

In a 2010 rat study by Harizal et al. of acute kratom toxicity, methanolic *M. speciosa* extract was ingested at 100, 500, or 1000 mg/kg over 14 days [61]. A positive control group ingested high-dose morphine, and a negative control group received 1% methanol. All three experimental groups and the positive control group had higher mean transaminases versus negative controls, while total bilirubin and γ-glutamyltransferase (GGT) did not differ. Rats in the highest-dose experimental group and the positive control group

also developed severe sinusoidal congestion, centrilobular necrosis, lipid accumulation, hepatocyte hemorrhage, and Kuppfer cells.

In 2012, Kamal et al. administered a single oral dose of *M. speciosa* extract to rats at 175–2000 mg/kg [62]. When measured at 14 days, there was no significant change in ALP or ALT compared with controls; however, histology demonstrated steatosis in all treatment groups, and the 2000 mg/kg group had centrilobular necrosis.

In a 2013 study by Sabetghadam et al. rats received oral mitragynine at 1, 10, or 100 mg/kg for 28 days [63]. A control group received vehicle alone (propylene glycol, Tween-80, water). There was no difference in transaminases versus controls at mitragynine 1 or 10 mg/kg, but the 100 mg/kg group had significantly higher mean transaminases, with higher mean relative liver weights. Bilirubin was not assessed. Histology in the 10 and 100 mg/kg mitragynine groups demonstrated hepatocyte hypertrophy, hemorrhage, and sinusoidal dilation. Centrilobular necrosis and inflammatory cell infiltration were absent in all groups.

In 2013, Fakurazi et al. administered mitragynine at 15 and 25 mg/kg intraperitoneally to mice with and without morphine [64]. There was no change from controls in AST, ALT, or GGT among treatment groups, with the exception of elevated ALT in the mitragynine 25 mg/kg group.

In a 2014 study by Sakaran et al. 32 rats were administered either control 15% Tween-80 on an acute or subacute basis, or administered *M. speciosa* methanolic extract [65]. The two *M. speciosa* groups received either a single oral dose of 1000 mg/kg for 14 days (acute group), or repeated doses of 500 mg/kg daily for 28 days (subacute group). The control groups had normal liver parenchyma. The acute *M. speciosa* group developed hypertrophy of hepatocytes with mild cytoplasmic vacuolation and sinusoidal congestion, while the subacute group demonstrated severe hepatocyte hypertrophy with numerous vacuoles and severe sinusoidal congestion.

A 2014 study by Ali et al. administered oral *M. speciosa* chloroform-methanolic extract to 70 rats, at doses of 10, 30, or 100 mg/kg [66]. One group of rats was additionally exposed to immobilization stress conditions for 2 h daily, and there was also a placebo group. On liver histology, slight and moderate hyperemia were noted in the 100 mg/kg non-stressed and 30 mg/kg stressed groups, respectively.

A 2015 rat study by Ilmie et al. administered oral methanolic *M. speciosa* extract for 28 days at 100, 200, or 500 mg/kg, while controls received water [67]. There was no difference in ALT between groups. Compared with controls, mean AST was significantly higher in the 100 mg/kg group only (lowest dose). The authors noted that "total bilirubin … showed statistically significant differences when compared to the control group", but this data is not provided. Histology in the 200 mg/kg group showed portal inflammation and bile duct proliferation.

In 2018, Haslan et al. investigated *Piper betle* as a hepatoprotective herb in rats with kratom [68]. Controls received oral 15% Tween-80 *or P. betle* methanolic extract dissolved in Tween-80. Experimental groups received *M. speciosa* methanolic extract 500 mg/kg/day in Tween-80 for 28 days, or *M. speciosa* extract with *P. betle* extract. Control groups demonstrated normal liver histology. The *M. speciosa* group developed severe sinusoidal congestion with disrupted central veins, scattered focal necrosis with inflammatory cell infiltrate, 'drop out' lesions, and acidophilic bodies. Some hepatocytes had ballooning degeneration and microvesicular steatosis, and a few areas showed fibrous portal expansion and bridging fibrosis. The *M. speciosa* group with *P. betle* had minimal focal necrotic and acidophilic bodies, and only a few portal triads with fibrous portal expansion. The authors concluded *P. betle* reduced *M. speciosa* liver injury in this animal model.

A 2019 mouse study by Guenther et al. administered oral kratom tea at varying doses, found increased liver size on day 11 in the kratom tea group compared with controls [69]. Kratom was then discontinued and, at 4 weeks after kratom cessation, liver size was similar in the kratom-treated mice and controls. However, after 4 weeks of cessation, the kratom-treated group was noted to have adhesions of the liver to adjacent intraperitoneal organs. Biochemical parameters of liver injury were not measured, and the authors concluded kratom can cause reversible hepatomegaly in as few as 10 days in a murine model.

Overall, animal studies tend to show increased histologic and biochemical marker effects of liver injury at higher doses, however this is not consistent. Pathohistological patterns have included centrilobular necrosis and bile duct proliferation, among other findings. Most studies used *M. speciosa* methanolic extract at doses far higher than typical users are exposed to.

11 Mechanisms of Kratom Hepatotoxicity

Kratom metabolism is primarily hepatic, but its effects on hepatic transporters and enzymes remain poorly studied. Based on current evidence, we propose a multifactorial pathophysiologic mechanism involving pregnane X receptor (PXR) activation and cytotoxicity, but this is likely an incomplete model. The effects on UDP glucuronosyltransferases (UGTs), glutathione S-transferases (GSTs), and P-glycoprotein (PgP) may also play a role. These mechanisms may also reduce the threshold for hepatotoxicity from other substances.

PXR is a nuclear ligand-gated transcription factor that upregulates hepatic expression and activity of multiple

drug-metabolizing enzymes and transporters [70]. PXR activation has been linked to DILI, and postulated mechanisms involve either increased toxic metabolite formation due to upregulated drug-metabolizing enzymes and transporters, or altered homeostasis leading to increased endogenous toxic substances [71]. In general, drugs with significant hepatic metabolism cause DILI at a rate higher than other drugs, likely by generation of local toxic metabolites [72]. A single study has examined the in vitro effect of kratom on PXR. It found that at 0.37 μM for 48 h, mitragynine increased PXR activity 1.2-fold and several other *M. speciosa* alkaloids had increased effect [70]. This in vitro concentration must be considered in the context of plausible human plasma concentrations. A single study examined maximum concentration (C_{max}) in human volunteers and found the highest C_{max} was 0.105 μg/mL (0.26 μM) [73]. This study administered varying concentrations and volumes of kratom tea to regular kratom users, and the highest C_{max} was reached in the subject taking the largest loading dose of 23 mg. In rats, C_{max} has been reported as 1–1.8 μM [74]. Kratom in vitro studies are challenging to extrapolate clinically. Human C_{max} may reach higher levels since those using kratom recreationally often consume doses larger than those reported by Trakulsrichai et al.; however, free mitragynine is likely much lower, since the authors measured total mitragynine, which does not account for high protein binding [74]. Additionally, users often consume kratom for a longer duration than the 48 h studied in vitro by Manda et al. [70].

Cytotoxicity may play a role in kratom liver injury, causing hepatocellular injury or selectively damaging canalicular membranes, with specific pathways unelucidated. Saidin et al. found *M. speciosa* extract and mitragynine cytotoxic in vitro to human neurons, and cytotoxicity was enhanced by cytochrome P450 (CYP) 2E1 [75]. Separately, cytotoxicity and genotoxicity of mitragynine and methanolic *M. speciosa* extract were tested in vitro on human intestinal epithelial and neuronal cells after 4 and 6 h [76]. There was concentration-dependent reduced viability in both intestinal and neuronal cells. Genotoxicity was noted from extract but not pure mitragynine, suggesting it may be mediated by non-mitragynine plant constituents.

Kratom undergoes metabolism by several phase I CYP450 enzymes, in addition to phase II sulfation and glucuronidation [74, 77]. Kratom has been variably shown to affect UGTs, GSTs, and CYP450 enzymes, however these effects lack a clear link to hepatotoxicity, unless there is a resultant increase in an unidentified toxic metabolite.

Mitragynine affects several CYP450 enzymes, particularly CYP1A2, CYP2D6, and CYP3A4. Findings on whether induction or inhibition occurs, and the concentration at which it occurs, have varied among studies [74]. Similar to phase II enzyme inhibition, these effects may reduce the ability of the liver to detoxify metabolites or endogenous substances.

UGTs perform glucuronidation. A 2013 study found *M. speciosa* extracts weakly inhibited UGT activity in vitro, at concentrations too high for clinical relevance [78]. The same study administered *M. speciosa* extract to rats for 2 weeks, and UGT activity actually increased, possibly from an unidentified mechanism not present in the in vitro system. Another in vitro study assessed the effects of mitragynine and 7-hydroxymitragynine on human liver microsomes expressing recombinant human UGTs, and found inhibition only at concentrations too high for clinical relevance [79]. Separately, GST inhibition was demonstrated in rat liver cytosol in vitro by high concentration *M. speciosa* extract, yet the same study found, in rats, an in vivo trend toward GST induction rather than inhibition [80]. The cause for the discrepancy is unclear and may relate to *M. speciosa* metabolites only present in vivo.

Lastly, it is unknown if the effects on PgP may contribute to kratom hepatotoxicity. Mitragynine is not a PgP substrate and has been found to inhibit PgP in three studies and to induce PgP in one study [74, 81].

Several transport proteins strongly implicated in cholestatic liver injury have not been studied with kratom and future research should focus on the bile salt export pump, multidrug resistance proteins 2 and 3, and farnesoid X receptor [82, 83]. Further research may reveal a single protein effect as the dominant pathophysiologic mechanism.

12 Clinical Course

Due to the small number of cases described, the clinical course of kratom liver injury is unclear. There have been no clear deaths from kratom liver injury and a single case in the FAERS database died without sufficient exclusion of alternate etiologies and with likely underlying alcoholic cirrhosis. Hepatic coagulopathy has not been described; one case in the FAERS database had severe coagulopathy, but no conclusions could be drawn due to poor documentation. Hepatic encephalopathy grade I was described in a single case report [28] and two cases in the FAERS database had elevated serum ammonia with no documentation of encephalopathy. Kidney injury was described in two cases, but one had unclear chronicity and was complicated by a duodenal ulcer requiring transfusion [32], and the other in the FAERS database was likely from hemolysis of unknown etiology.

Latency to onset of liver injury is unclear. Several case reports and online self-reports had seemingly fast onset within 1 day. However, some of these may have been re-exposure cases, with subclinical liver injury from prior use that increased to a clinically apparent threshold after re-use [51]. Some reports of liver injury occurred after varying

periods of regular use, while others developed without regular use [38, 39, 51]. The cases in this review had a median latency of 20.6 days (range 2–49), and these findings are similar to the seven-patient series by the DILIN. The cause for latency to clinical manifestations may relate to the half-life of the parent compound and metabolites. This may be supported by Kapp et al. [27] noting detectable urine mitragynine 2 weeks after cessation of use, and by the finding that many cases have laboratory abnormalities that peak following initial tests.

13 Management

Optimal management of kratom liver injury remains unstudied. The majority of cases resolved with discontinuation, and it is unknown if the treated cases would have self-resolved without intervention. Several cases utilized antihistamines for symptomatic treatment of cholestatic pruritis.

Seven cases were treated with NAC, five published cases [26, 31, 36, 39, 47] and two cases in the FAERS database. NAC has classically been used for acetaminophen hepatotoxicity, although it has multiple therapeutic mechanisms and has been used with varying success in other hepatic conditions [84]. In one case, NAC was discontinued due to anaphylaxis [36]. Its utility for kratom liver injury is unknown; however, given the low risk of harm, it may be a reasonable therapeutic option if the etiology in the setting of a hepatocellular injury pattern is unclear.

Three cases were treated with ursodiol (ursodeoxycholic acid) [34, 35, 39]. The mechanisms of ursodiol include protecting cholangiocytes from hydrophobic bile acid cytotoxicity, stimulating hepatobiliary secretion via insertion of transporters into the canalicular membrane, and protecting hepatocytes against apoptosis from bile acids [85]. Anticholestatic effects have been described in a number of conditions, and while there are no data on efficacy for kratom liver injury, ursodiol may be reasonable if a cholestatic pattern is not readily resolving with discontinuation.

Two cases were treated with glucocorticoids and their role in the management of kratom-induced liver injury is unknown [35, 38]. This treatment is occasionally used in severe cases of cholestatic pruritis. A single case underwent lier transplantation, however it is unclear to what extent liver failure was directly due to kratom use, relative to Salmonella infection [49, 50].

In cases of suspected kratom liver injury, after initial tests to exclude common alternate etiologies, pursuing outpatient management for select patients may be reasonable. This depends on the extent of hepatic injury, degree of symptomology, ability to tolerate oral hydration, and resources and follow-up capabilities. Outpatient management was followed by resolution in one case report [33] and for two patients in the DILIN [55]; several others had brief admissions followed by outpatient management.

14 Limitations

The available evidence has several limitations. The total number of cases remains a limited dataset relative to estimated prevalence of use. Furthermore, many of the case reports and abstracts lack the necessary information to calculate accurate RUCAM scores. These omissions range from nonreporting of known data, historical variables that were not asked of the patient, or diagnostic tests that were not performed. In several cases, the patient was not followed for a long enough period for biochemical parameters to improve to the degree dictated by the RUCAM. Many of the cases that did not score higher were due to a lack of information, such as lost to follow-up, laboratory tests not rechecked early enough, or unknown timing. Omitted information overall risks RUCAM scores underestimating causality, given the score penalty for lack of information. We contacted authors in an attempt to obtain instances of missing data.

Additionally, the RUCAM dictates that those receiving treatment for liver injury, such as ursodiol or corticosteroids, must receive a score of 0 for course (dechallenge period), since treatment may mask the natural course [17]. This resulted in a total of five cases each being penalized 2 points on the RUCAM.

Hepatotoxicity from a contaminant cannot be excluded but is less likely given the standardized extracts used in animal studies and the kratom gas chromatography–mass spectroscopy analysis in five cases [27, 49, 55].

R ratios were calculated based on initial laboratory testing when available, however some were based on laboratory testing later in the illness course. Due to variability in both patient presentation timing and report documentation, *R* ratio timing could not be standardized and may have changed during the illness course. This is a recognized drawback of the RUCAM, therefore using the initial values when available is recommended [17].

15 Discussion

This review identified 26 case reports and abstracts, in addition to 7 cases reported from the DILIN, 25 in FDA databases, and 27 in internet user forums. Although evaluation by clinical gestalt is an accepted method of judging causation, its lack of standardization or rigor should preclude its application to a wider cohort. Attributing causation in DILI and HILI is of paramount importance as it affects the drugs a patient can receive and informs policy decisions regarding drug availability. Determination of a substance's

Table 4 Calculation of RUCAM scores

	Liver injury type	Time to onset (days)	Risk factor (ethanol, pregnancy)	Age, years	Course	Concomitant drugs	Nondrug causes ruled out	Prior hepatotoxicity	Re-exposure response	Modified RUCAM
Kupferschmidt, 2011 [38]	R ratio 8.0 Hepatocellular	5–90 [+2]	Absent [0]	< 55 [0]	≥ 50% improved > 30 days [0]	None [0]	5–6 in group I [0]	Published, unlabeled [+1]	Unknown [0]	3
Kapp et al. 2011 [27]	R ratio 1.4 Cholestatic	5–90 [+2]	Absent [0]	< 55 [0]	≥ 50% improved in 180 days [+2]	None [0]	5–6 in group I [0]	Published, unlabeled [+1]	Unknown [0]	5
Rivera et al. 2011 [44]	No ALP for R ratio									Cannot calculate
Kesar et al. 2013 [39]	R ratio 0.5 Cholestatic	≤ 15 from last use [+1]	Absent [0]	< 55 [0]	Corticosteroid/ ursodiol [0]	None [0]	5–6 in group I [0]	Published, unlabeled [+1]	Unknown [0]	2
Dorman et al. 2015 [28]	R ratio 0.24 Cholestatic	1–90 for second exposure [+2]	Absent [0]	≥ 55 [+1]	Unknown [0]	Time incompatible [0]	5–6 in group I [0]	Published, unlabeled [+1]	Positive [+3]	7
Arens et al. 2015 [48]	R ratio 7.5 Hepatocellular	< 5 [+1]	Present [+1]	< 55 [0]	Unknown [0]	None [0]	5–6 in group I [0]	Published, unlabeled [+1]	Unknown [0]	3
Sullivan 2016 [51]	R ratio 3.4 Mixed	5–90 [+2]	Present [+1]	< 55 [0]	≥ 50% improved in 180 days [+2]	Time incompatible [0]	5–6 in group I [0]	Published, unlabeled [+1]	Unknown [0]	6
Drago et al. 2017 [37]	R ratio 2.7 Mixed	≤ 15 from last use [+1]	Absent [0]	< 55 [0]	≥ 50% improved in 180 days [+2]	None [0]	5–6 in group I [0]	Published, unlabeled [+1]	Unknown [0]	4
Bernier et al. 2017 [40]	R ratio 1.7 Cholestatic	≤ 15 from last use [+1]	Absent [0]	< 55 [0]	≥ 50% improved in 180 days [+2]	None [0]	Groups I and II [+2]	Published, unlabeled [+1]	Unknown [0]	6
Shah et al. 2017 [41]	R ratio 1.4 Cholestatic	Insufficient documentation								Cannot calculate
Riverso et al. 2018 [29]	R ratio 4.0 Mixed	Insufficient documentation								Cannot calculate
Griffiths et al. 2018 [30]	R ratio 4.8 Mixed	5–90 [+2]	Absent [0]	< 55 [0]	Unknown [0]	None [0]	5–6 in group I [0]	Published, unlabeled [+1]	Unknown [0]	3
Tayabali et al. 2018 [36]	R ratio 2.7 Mixed	Insufficient documentation								Cannot calculate
Mousa et al. 2108 [31]	R ratio 8.7 Hepatocellular	5–90 [+2]	Absent [0]	< 55 [0]	N-acetylcysteine [0]	None [0]	5–6 in group I [0]	Published, unlabeled [+1]	Unknown [0]	3
Mackenzie and Thompson, 2018 [49] De Francesco et al. 2019 [50]	R ratio 8.7 Hepatocellular	5–90 [+2]	Present [+1]	< 55 [0]	Liver transplant [0]	None [0]	5–6 in group I [0]	Published, unlabeled [+1]	Unknown [0]	4
Antony and Lee 2019 [32]	R ratio 0.7 Cholestatic	≤ 15 from last use [+1]	Absent [0]	≥ 55 [+1]	≥ 50% improved in 180 days [+2]	Time incompatible [0]	5–6 in group I [0]	Published, unlabeled [+1]	Unknown [0]	5
2019, Fernandes et al. 2019 [34]	R ratio 0.7 Cholestatic	5–90 [+2]	Absent [0]	< 55 [0]	Ursodiol [0]	None [0]	5–6 in group I [0]	Published, unlabeled [+1]	Unknown [0]	3

Table 4 (continued)

	Liver injury type	Time to onset (days)	Risk factor (ethanol, pregnancy)	Age, years	Course	Concomitant drugs	Nondrug causes ruled out	Prior hepatotoxicity	Re-exposure response	Modified RUCAM
Osborne et al. 2019 [33]	R ratio 5.2 Hepatocellular	1–15 rechallenge [+2]	Absent [0]	< 55 [0]	> 50% improved in 30 days [+2]	None [0]	5–6 in group I [0]	Published, unlabeled [+1]	Positive [+3]	7
Ricardo et al. 2109 [42]	R ratio 8.4 Hepatocellular	5–90 [+2]	Absent [0]	< 55 [0]	Unknown [0]	None [0]	< 5 in group I [− 2]	Published, unlabeled [+1]	Unknown [0]	1
Desai et al. 2109 [47]	R ratio 7.1 Hepatocellular	5–90 [+2]	Absent [0]	< 55 [0]	*N*-Acetylcysteine [0]	None [0]	5–6 in group I [0]	Published, unlabeled [+1]	Unknown [0]	3
Bøgevig et al. 2019 [43]	R ratio 6.5 Hepatocellular	5–90 [+2]	Absent [0]	≥ 55 [+1]	> 50% improved in 30 days [+2]	None [0]	5–6 in group I [0]	Published, unlabeled [+1]	Unknown [0]	6
Aldyab et al. 2019 [35]	R ratio 10.4 Hepatocellular	5–90 [+2]	Absent [0]	< 55 [0]	Ursodiol [0]	Time incompatible [0]	5–6 in group I [0]	Published, unlabeled [+1]	Unknown [0]	5
Pronesti et al. 2019 [45]	R ratio 1.6 Cholestatic	5–90 [+2]	Absent [0]	< 55 [0]	≥ 50% improved in 180 days [+2]	Time incompatible [0]	5–6 in group I [0]	Published, unlabeled [+1]	Unknown [0]	5
Kaur et al. 2109 [46]	R ratio 3.6 Mixed	> 15 from last use								Cannot calculate
LiverTox Case 6972 [52]	R ratio 2.1 Mixed	Calculated by NIH LiverTox								5
LiverTox Case 8332 [53]	R ratio 2.1 Mixed	Calculated by NIH LiverTox								8

Interpretation: 9–10 highly probable, 6–8 probable, 3–5 possible, ≤ 0 excluded

Notes on scoring: for *R* ratios, upper limits of normal in the manuscript were used, but, if unavailable 40 was used for ALT and 115 was used for ALP. For Kapp et al. [27], serum mitragynine of 20 ng/mL at 12 days was not considered toxic due to the lack of reference ranges for toxicity. Griffiths et al. [30] describe common bile duct dilation, however 6.4 is within the normal limits. Antony and Lee [32] calculated RUCAM based on + 1 for alcohol risk factor, however the above calculation uses 0 because there was not excess ethanol consumption (Antony A, personal communication, 28 February 2019). For Osborne et al. [33], CMV hepatitis was unlikely given immunocompetency, but possible given + CMV IgM. For Ricardo et al. [42], the patient 'occasionally drank alcoholic beverages' that were unquantified, therefore the above calculation conservatively used ≤ 2 drinks/day (0 points). For nondrug causes, AST/ALT > 2 raised the possibility of alcoholic hepatitis, and hepatitis C RNA was moderately elevated, therefore hepatitis C flare is possible (Ricardo J, personal communication, 24 June 2019). Tayabali et al. [36] calculated a RUCAM score, however the latency period was unknown. In cases by Arens et al. [48] and Mackenzie and Thompson [49], ethanol is considered both a risk factor and a possible group I nondrug cause. For Kesar et al. [39] and Fernandes et al. [34], corticosteroid and/or ursodiol were administered, therefore although ≥ 50% improvement in 180 days would be [+2], the course had 0 points. For Mousa et al. [31], Aldyab et al. [35], and Desai et al. [47], N-acetylcysteine or ursodiol was administered, therefore although ≥ 50% improvement in 30 days would be [+2], the course had 0 points

ALP alkaline phosphatase, *AST* aspartate aminotransferase, *ALT* alanine aminotransferase, *CMV* cytomegalovirus, *IgM* immunoglobulin M, *NIH* National Institutes of Health, *RUCAM* Roussel Uclaf Causality Assessment Method

hepatotoxicity based on pooling RUCAM scores has not been well-described but is instructive regarding the confidence in causation attribution. Among the 20 scorable case reports in this review, modified RUCAM scores had a median of 5 and a mean 4.5 (range 1–8) [Table 4]. Using the original RUCAM scoring criteria, the median was 6.0 and the mean was 6.0 (range 1–9). This difference is primarily due to the 2016 RUCAM modifications that emphasize Hepatitis E testing as only a single case report assessed hepatitis E beyond the two cases in the LiverTox database. Unless explicitly reported, it was assumed hepatitis E was not tested for. The updated RUCAM considers hepatitis E a group I nondrug cause due to a low percentage of cases previously attributed to DILI subsequently being attributed to hepatitis E [86, 87]. The 2016 modified RUCAM criteria are the current standard but have not undergone revalidation despite significant score changes due to the inclusion of hepatitis E.

The modified RUCAM scores suggest possible causality, while original RUCAM scores suggest probable causality. Overall, the above RUCAM scores likely underestimate causality, given the score penalty for lack of information, including testing and clinical course. Kratom likely causes liver injury based on the totality of low-quality human evidence in the form of case reports, FDA databases, and online user forums, and in the context of epidemiologic, animal, and mechanistic studies.

The R ratio assists in distinguishing cholestatic liver injury from hepatocellular liver injury, based on ALT and ALP. Determination of a substance's hepatotoxicity pattern by pooling R ratios is not well-described but informs classification in a standardized manner. Among 21 R ratios (Table 4) for which a RUCAM was calculated, the median was 3.4 and the mean was 4.6 (range 0.24–10.4). This result is similar to findings by the DILIN, which found a median R ratio at onset of 3.0 (range 0.9–3.2) [55]. This suggests kratom liver injury may be heterogenous or mixed, although, histologically, it seems predominantly cholestatic. Histology in animal studies was also heterogenous, including findings of both hepatocellular and cholestatic injury.

Kratom use is widespread and while kratom-induced liver injury is likely underreported, it is clear that many acute and chronic users, if not most, do not experience hepatotoxicity. It remains unclear which subgroups of users are at heightened risk and whether kratom liver injury is related to drug metabolizing enzyme polymorphisms (phase I or II) or use behaviors such as dose, frequency, or formulation. An idiosyncratic reaction should not be assumed until further pathophysiologic studies are conducted and the incidence is estimated.

16 Conclusions

Future research should focus on a more systematic investigation of the incidence of kratom-induced liver injury. Human case reports should include complete information to allow more accurate causality assessment, including hepatitis E serologies. Animal studies should utilize formulations and dosings that typical users are exposed to, rather than only methanolic extracts at often exceedingly high doses. Mechanistic underpinnings should be further explored by evaluating the effect of *M. speciosa* compounds on hepatic transporters strongly implicated in DILI, at biologically plausible concentrations.

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Compliance with ethical standards

Conflict of interest Jonathan Schimmel and Richard C. Dart declare no conflicts of interest.

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REVIEW

The pharmacology and toxicology of kratom: from traditional herb to drug of abuse

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Abstract *Mitragyna speciosa* (Rubiaceae), commonly known as kratom, is a tropical tree with a long history of traditional use in parts of Africa and Southeast Asia. In recent years, kratom has gained popularity for use as a recreational drug across the globe. Relatively new to the illicit market and used in a manner different from its traditional applications, preparations of kratom are touted by many as a safe and legal psychoactive product that improves mood, relieves pain, and may provide benefits in opiate addiction. Available literature was reviewed for *M. speciosa* via PubMed, Google Scholar, CINAHL, and EBSCO to summarize its traditional uses, phytochemical composition, pharmacology and toxicology of proposed active constituents, and potential for misuse and abuse. Research has demonstrated that both stimulant and sedative dose-dependent effects do exist, but a growing concern for the drug's effects and safety of use has resulted in national and international attention primarily due to an increase in hospital visits and deaths in several countries that are said to have been caused by extracts of the plant. The main active alkaloid substances in kratom, mitragynine and 7-hydroxymitragynine, present with a range of CNS stimulant and depressant effects mediated primarily through monoaminergic and opioid receptors. Recently, Palm Beach County, located in the southeastern corridor of Florida, has considered regulating kratom due to public safety concerns following the death of a young adult. At the local, state, and even federal levels, governments are now being confronted with the task of determining the safety and the possible regulation of kratom extracts. There are currently no standard analytical screening techniques for mitragynine and its metabolites following ingestion limiting its detection to more sophisticated techniques like liquid chromatography-mass spectrometry to determine kratom use. The growing concern of the abuse potential of kratom requires careful evaluation of its benefits and potential toxicities.

Keywords Kratom · Stimulant · *Mitragyna speciosa* · Psychoactive · Drug abuse

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Introduction

At a time where new synthetic drugs such as cannabinoids and bath salts are increasingly observed in both the clinical and medicolegal setting [1–3], the natural products of *Mitragyna speciosa*, otherwise known as kratom, have also seen increased reports of misuse and abuse. Since the regulation of numerous spice and bath salt compounds, attention has seemingly shifted toward this "new" drug. Historically, kratom has been used by civilizations for many centuries. Cultures located in areas of Southeast Asia have been cultivating and using kratom for several thousand years [4, 5].

Although not new, the drug is, however, novel to the majority of the USA, Europe, and South America and its popularity is on the rise [6]. Its growing misuse and abuse has caused public concern illustrated by recent media attention focusing on its physical effects and implications to society. Moreover, governmental entities are expressing concerns, and local, state, and federal lawmakers are facing challenges in determining the severity of an emerging drug and enacting reasonable regulation.

This review will provide an overview of the appearance and traditional use of kratom, its current use and prevalence, chemistry and pharmacology of the proposed active ingredients, and analysis of the plant material and biological specimens such as blood and urine, as well as discuss some of the issues that are being experienced in local communities. Finally, discussion of legal concerns and where society is headed concerning regulation will be considered.

Methods for literature search

All authors evaluated literature via the available databases PubMed, Google Scholar, CINAHL, and EBSCO to gather the current state and development of the composition, ethnopharmacology, analysis, and abuse potential for *M. speciosa*. Search terms used were "*Mitragyna speciosa*" or "kratom" in combination with "pharmacology," "botany," "history," "analysis," "detection," "regulation," and "abuse". Essential literature as well as recent reports of abuse were included in this review.

Appearance and traditional use

Kratom (*M. speciosa* Korth.) is a tropical tree that is a member of the Rubiaceae or coffee family [4–8]. Dutch botanist Korthals named the genus, *Mitragyna*, due to similarities between the plant's leaves and stigmas compared with a bishop's miter [8]. In Thailand, kratom is sometimes referred as krathom, kakuam, ithang, or thom, while biak-biak or ketum and mambog are street names that respectively descend from Malaysia and the Philippines [6, 8]. The tree is indigenous to tropical and subtropical regions of Southeast Asia including countries such as Thailand, Malaysia, Philippines, Myanmar (Burma), and New Guinea, as well as parts of Africa [4–6]. Growing approximately 15 m tall, the kratom tree possesses relatively large, broad, glossy leaves that are oval shaped and dark green in color (Fig. 1) [4, 5]. The leaves typically grow to lengths of approximately 18 cm and widths of 10 cm [6, 8]. The plant's flowers, nearly 120 florets each, are observed as deep yellow spherical clusters. Wet and humid soil provides optimal growing conditions for kratom. Medium to full sunlight is also ideal. Harvested from the kratom tree, dried leaves and small stems are primarily used for consumption [7].

Historically, kratom was taken to ease opioid withdrawal with use dating back to the 1940s in Thailand [4]. Opium costs soared in 1942 as a result of the Greater East Asia War and drops in opium revenue were experienced. With the increase in cost, users sought out the lower cost kratom to help with withdrawal symptoms. This in turn caused Thai officials to begin controlling kratom in 1943 under the Kratom Act, an effort to gain control in the opium market [4].

Controlled in regions of Southeast Asia, kratom serves as a core component of culture and tradition, particularly in the southern peninsula of Thailand [4, 9]. Similar to that of coca and khat leaves, kratom leaves are traditionally chewed or prepared as a powder. Historically, its stimulant effects have been sought out to help reduce fatigue, in particular for those individuals carrying out manual labor on rubber plantations and seafaring. Known as "chewers," these individuals typically start chewing kratom from the age of about 25 years. Nearly 70 % of "chewers" are males and their day-to-day consumption averages from 10 to 60 leaves. In addition to the workforce, kratom is sometimes used in cultural performances and teashops or as a drink alternative by individuals whom are restricted from alcohol consumption due to their religious beliefs [4].

Dried kratom leaves (Fig. 1) are often crushed and the resulting powder may be inserted into gel capsules or prepared as a hot tea [7]. Plant ashes or baking soda is frequently added to help extract plant alkaloids prior to consumption. One resource states that the addition of lemon juice has also been used to enhance absorption of alkaloids from the small intestines in their ionized form [7] although this is contrary to the common observation that the unionized form of alkaloids is preferred for enhanced absorption. Sugar and honey are sometimes added due to the bitterness of the tea. The powder can also be cooked to yield a syrup-like consistency, which is then compressed into tablets [7].

Current use and prevalence

Kratom use is no longer limited to traditional and ceremonial uses and its recreational misuse and abuse have been increasing. Gaining popularity over the past several years across Southeast Asia, especially Thailand, is a tea-based cocktail known as 4×100 [4, 7, 8]. Consumed primarily by teenagers and young adults in their thirties, the drink is commonly found to be a concoction of kratom leaves, cough syrup, Coca-Cola, and ice [4]. Yet to gain social acceptance, community discrimination of this cocktail is relatively common, and users are sometimes compared to methamphetamine and heroin addicts. Kratom preparations were among the most commonly abused by high school students at a similar rate to cannabis (2.3–4.9 %) [10].

Public attention from local media and conservative groups have also caused an increase in community discrimination and concern since these cocktails are suspected of containing other drugs such as benzodiazepines and household consumer products including fluorescent tubes, powdered mosquito coils, road paint, and pesticides. Even ashes from the deceased have been added to these cocktails. Such additives are suggested to "enhance" the drink's effects, but there is no scientific

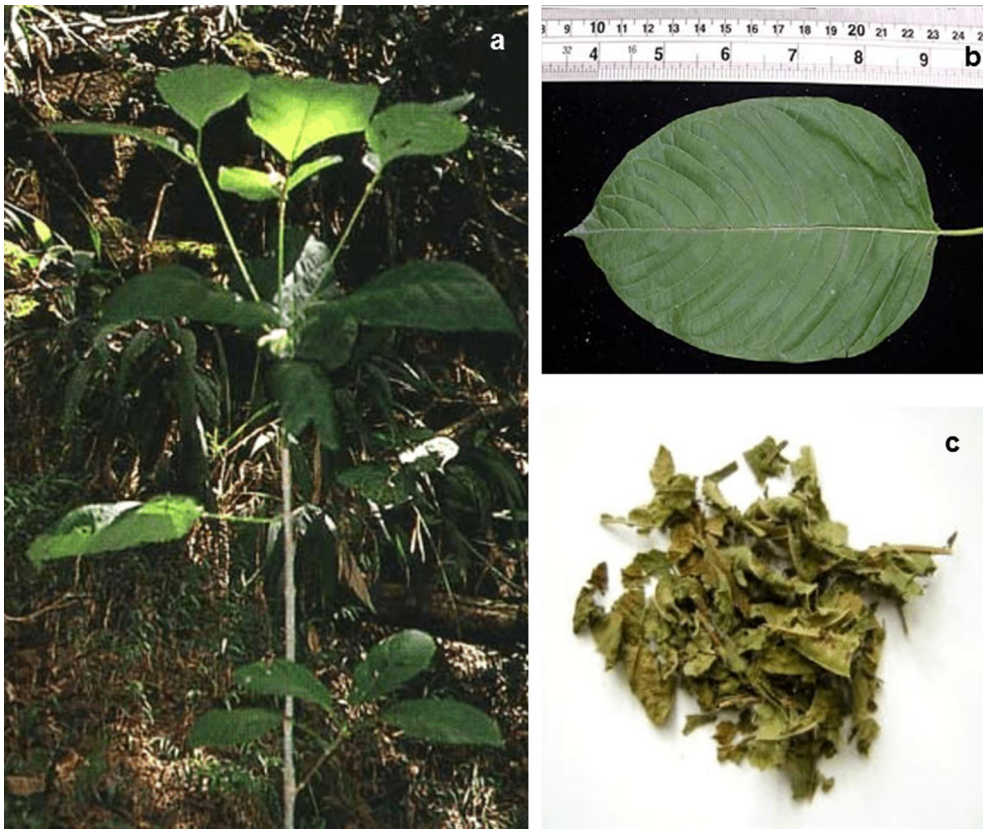

Fig. 1 Young kratom tree (**a**), fresh kratom leaf to scale (**b**), and dried kratom leaves (**c**). All images obtained from the U.S. Drug Enforcement Administration website [6]

evidence that they actually do so beyond increasing absorption of the alkaloids in their unionized state [4].

Popularity has more recently expanded overseas [6]. As a consequence of opioid addiction, especially in the USA, kratom is frequently marketed for treatment of opioid withdrawal symptoms based on its historical use for this indication in Thailand [3, 6]. A case report described the self-treatment of opioid withdrawal by a patient using kratom in conjunction with modafinil leading to a seizure which resolved after discontinuation of kratom use [11]. In addition to treatment of opioid addiction, kratom is used to help control alcohol withdrawal effects and for control of chronic pain. At variable doses, kratom has also been used to reduce appetite and control stomach cramps and diarrhea, and has been reported to have an important impact on controlling diabetes [4, 12]. Investigations have also reported that kratom extracts show antioxidant and antibacterial activity although this has not been related to traditional or current uses [13]. However, the abuse potential of kratom stems from its cocaine- and morphine-like psychoactive effects which are dose-dependent [6, 7].

Although controlled in regions of Southeast Asia [14], ease of access is not an issue in the USA due to limited legal control of kratom and its active components. Federally and statewide, kratom remains largely uncontrolled and is usually legally available [7].

The prevalence of kratom use in the USA has not been well established to date. Poison centers have reported isolated incidences of kratom use dating back to 2008 [15, 16]. Based on its traditional use and ban in Thailand, the prevalence of kratom has been reported to be in the range of 0.9 % among the general population but reaches up to 59 % of those suffering from a mental disorder or substance use disorder [17, 18].

Purchase remains relatively easy in the USA via head shops, kava bars, and especially the Internet [6, 19]. Marketing and advertising has added to kratom's presence dramatically making it widely accessible both inside and outside the country. In addition, sales of a wide variety of kratom preparations varying from the traditional use of leaves for chewing and brewing, powders, gums, and extracts for users to smoke have become prevalent via Internet distributors [6, 19]. In some instances, kratom has been marketed in similar attractive packaging as many synthetic drugs potentially contributing to its sales success [3].

Adding to kratom's popularity is the fact that it is touted as a legal, psychoactive alternative to other sedative and stimulant-type drugs [20]. As a consequence of its current legal status, kratom preparations are economically obtainable for users compared to opioids and other drugs with an ounce selling for US$10–40 [21].

Chemistry, pharmacodynamics, and pharmacokinetics

Kratom leaves have been found to contain over 25 alkaloids [4, 7]. The alkaloids mitragynine and 7-hydroxymitragynine (7-HMG) are believed to be the primary active alkaloids in the plant (Fig. 2) [4]. The total alkaloid content in kratom leaves ranges from 0.5 to 1.5 % [7]. Mitragynine makes up approximately 60 % of this extract with 7-HMG accounting for only up to 2 % [21–23]. The alkaloid paynantheine is the second most abundant compound at approximately 10 % of the total alkaloid content (Fig. 2). Other notable analogs are speciociliatine and speciogynine, which comprise about 9 and 7 %, respectively, of the total alkaloid content. The remaining alkaloids (mitraphylline, rhynchophylline, mitralactonal, raubasine, and mitragynaline) each comprise less than 1 % of the total alkaloid content in kratom (Fig. 2).

Mitragynine is an indole-containing alkaloid, structurally similar to yohimbine and voacangine (Fig. 3) [7, 21]. Structural identification occurred in 1965 and its synthesis was achieved 30 years thereafter [7, 9]. Mitragynine is suggested as having approximately 13 times the potency of morphine in regards to its opioid-like effects [3]. It was originally thought that mitragynine was the most active morphine-like chemical component in kratom [7]. Current research suggests that 7-HMG is 4 times more potent in its CNS stimulant and depressant effects than mitragynine [3, 24].

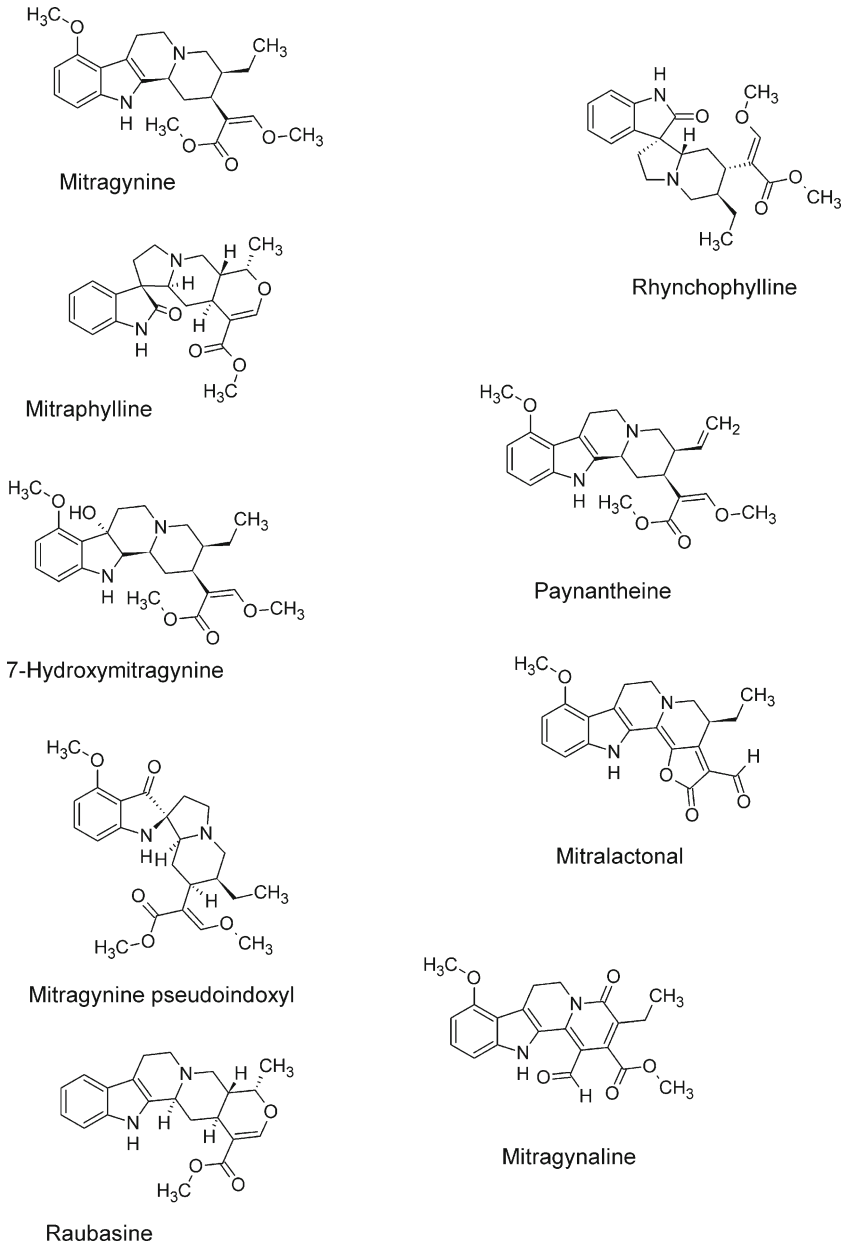

Fig. 2 Structures of *Mitragyna* compounds

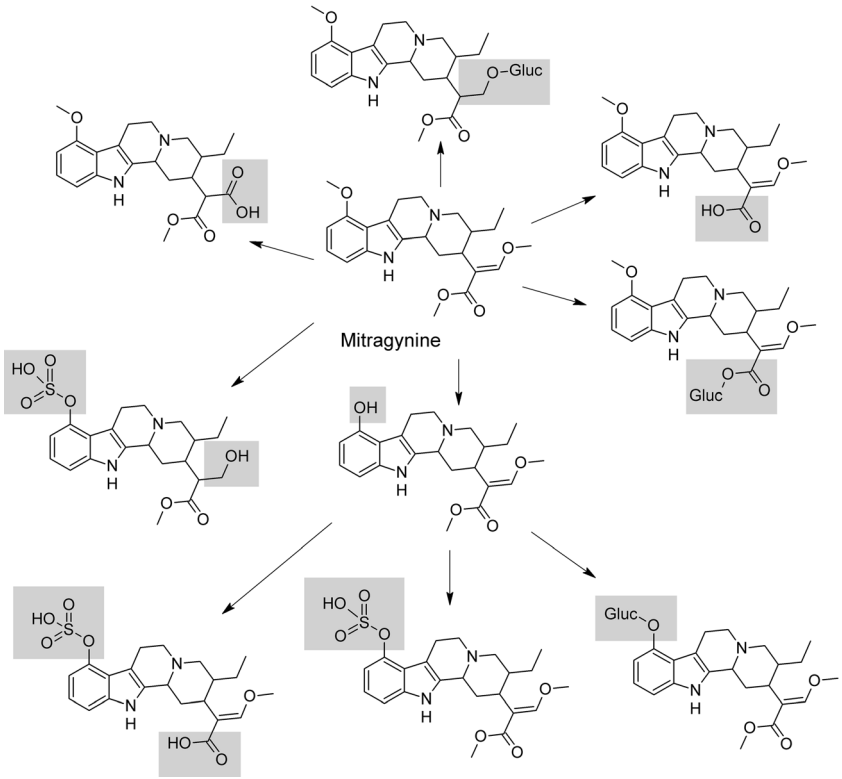

Fig. 3 Reported metabolites of mitragynine in humans. *Highlighted sections* indicate changes in the molecule through nonenzymatic and enzymatic processes

Kratom effects are complex as it may produce either stimulant or opioid-like effects [7, 21]. Depending on particular needs, the relative levels of stimulation/mood enhancement and sedation/analgesia can be controlled by both the strain of kratom chosen as well as the dosage ingested. With regard to the strain, the red vein variety indigenous to Bali tends to be a more powerful pain reliever, while the white or green vein varieties from Malaysia more often exhibit stimulating and mood-enhancing effects. The white vein tends to provide somewhat more energy than the green vein variety [4, 21]. The relative strength of stimulant and opioid-like sedative effects in each strain is most likely directly related to the varying proportions of different alkaloids present in the leaves of each strain.

Approximately 1–5 g of raw leaves, which is defined as a low to moderate dose, will yield mild stimulant effects (Table 1) [8, 21]. The onset of euphoric effects is experienced in about 10 min after using a few grams of dried leaves [8]. This dosage amount is often related to the stimulant effects commonly used by labor workers to fight fatigue [21]. Not only has increased work capacity been reported by users, but alertness, sociability, and increased sexual desire are said to occur [8]. At this dose, the user may also possess normal to slightly contracted pupils and blushing. Unwanted side effects are generally minimal; however, anxiety and internal agitation have been described [21].

Individuals using from 5 to 15 g of leaves are said to exhibit opioid-type effects (Table 1) [8, 21]. At this dosage, kratom may provide the user with pain and opioid withdrawal symptom relief, with diarrhea being a possible side effect. Both mitragynine and 7-HMG yield analgesic and antinociceptive effects. Euphoria is more often achieved at this higher level, but these effects tend to be less intense as compared with opioid drugs [21].

When exceeding 15 g of kratom leaves, one would expect to experience stupor, mimicking the effects associated with opioids [8, 21]. Initially, sweating, dizziness, nausea, and

Table 1 Pharmacological effects of kratom

	Low dose (1–5 g)	High dose (5–15 g)
Stimulant effects	Increased alertness Physical energy Talkativeness Sociable behavior	Tachycardia
Sedative/opioid-like effects	Loss of muscle coordination	Constipation Dizziness Hypotension
Adverse effects	Itching Nausea Loss of appetite Increased urination	Dry mouth Sweating

dysphoria will often result. These effects quickly subside and are followed by calmness and a dreamlike state [8].

Frequent users of kratom have displayed instances of tremor, anorexia, weight loss, seizures, and psychosis [7, 21]. Such individuals are likely using high doses of kratom for a prolonged period of time [7, 21].

Mitragynine and 7-HMG are selective and full agonists of μ-opioid subtype receptors [3, 7, 8, 21]. Mitragynine exhibits activity on supraspinal μ- and δ-opioid receptors causing its characteristic analgesic effects [3, 7, 8, 21]. With consideration to the interactions at the cellular level, studies suggest that neurotransmitter release from the nerve endings at the vas deferens is inhibited [21]. This inhibition is suggested to occur through the obstruction of neuronal calcium (Ca^{2+}) channels [7, 22]. Blocked stimulation of serotonergic 5-HT_{2A} receptors and stimulation of postsynaptic alpha-2 adrenergic receptors are thought to contribute to stimulant activity [3, 8]. Additional psychoactivity is said to exist as a consequence of binding affinities exceeding that of morphine at the δ- and κ- opioid central receptors [21]. Moreover, 7-HMG provides high opioid receptor affinity with full agonist properties [8, 21]. While polarity is increased due to the additional hydroxyl group on 7-HMG as compared to mitragynine, increased activity of 7-HMG is otherwise not well understood [21].

Mitragynine is metabolized in humans via phase I and II mechanisms. The parent undergoes hydrolysis at the side-chain methylester in position 16 [7, 8, 21]. *O*-demethylation then takes place at the 9- and 17-methoxy groups. Oxidative and reductive transformations proceed to the intermediate aldehydes, which yield carboxylic acids and alcohols, respectively. A final step involves glucuronide and sulfate conjugate formation as a result of phase II metabolism which is excreted with the urine [7, 8, 21]. In vitro experiments using isolated CYP450 enzymes indicate that kratom extracts inhibit various CYP enzymes, notably CYP 3A4, 2D6, and 1A2. This may lead to clinically significant interactions with other drugs given that a wide range of prescription and OTC medication are substrates for these CYP enzymes [25].

Kratom users can expect to experience full effects in about 30–60 min after ingestion, although onset can be noticeable within about 10–20 min. The half-lives of mitragynine and 7-HMG are about 3.5 and 2.5 h, respectively. Both are eliminated from the body primarily with the urine [21, 26, 27]. The pharmacokinetics following oral administration of mitragynine in humans has been proposed as a two-compartment model based on the observed kinetics in ten healthy human male volunteers [28]. Certain conditions such as prior food consumption or taking kratom in capsule form can delay the initial response. The effects of kratom typically last about 5–7 h, with the strongest effects at about 2–4 h after ingestion, although weak aftereffects can be felt as late as the next day [3, 21, 29, 30]. Current pharmacokinetic data in both animals and humans is limited, and there appear to be a significant variability within each species and differences between species in terms of mitragynine pharmacokinetics (Table 2).

Side effects, particularly for regular heavy users, can include nausea, weight loss, fatigue, constipation, insomnia, dry mouth, frequent urination, and hyperpigmentation of the cheeks [3, 6]. Despite being opiate-like, withdrawal symptoms are generally nonexistent to mild, even for heavy users.

Kratom is considered minimally toxic, but it is important to note that research evaluating its toxic effects on humans is limited, with the vast majority of studies involving animals [7]. The results of such animal studies have been somewhat confusing and contradictory. In one study on dogs in 1972, doses of mitragynine as high as 920 mg/kg produced no evidence of toxicity as measured by tremors and convulsions, while a more recent 2010 study in rats reported that an oral dose of 200 mg of mitragynine had lethal effects [32]. A separate study in rodents reported hypertension and nephro- and hepatotoxicity in higher doses up to 1000 mg [33]. This may point to a species-specific response which remains unexplained as of yet. It is worth mentioning that in order to ingest 200 mg mitragynine, approximately 22–67 g of kratom leaves would theoretically have to be ingested [7, 20–23]. Established dosage amounts are unavailable; however, an individual would have to consume anywhere from 6–10 up to 19–29 spoons full of kratom powder. Careful examination of animal and other studies is therefore warranted [23]. Interestingly, kratom preparations have also been shown to protect against castor oil-induced diarrhea in rats in oral doses of 400 mg/kg comparable to the effect of morphine pointing to at least partial involvement of opioid receptors in its mechanism of action [34].

There are, however, rare documented reports involving kratom toxicity in humans [21, 23]. Seizures and addiction are predominantly experienced by individuals following long-term kratom consumption or an acute overdose. Liver toxicity is also linked to significant kratom overdose [21, 23]. Specifically, intrahepatic cholestasis has been reported [23]. Studies suggest that glutathione-S-transferase is elevated in individuals consuming large doses although this has only been demonstrated in animal studies [23].

The use of kratom in conjunction with other drugs can be problematic [7, 8, 21]. Adverse effects and even death may result. Literature indicates that kratom is sometimes fatally mixed with carisoprodol, modafinil, propylhexedrine, *Datura stramonium*, fentanyl, diphenhydramine, caffeine, morphine, and/or O-desmethyltramadol (“Krypton”) [7, 8, 21, 35].

Some reports indicate that users may become addicted to kratom. However, contradictory data exists concerning the degree of addiction that is experienced due to kratom use [21]. In some instances, it is thought that kratom is less addictive as compared with traditional opioids. In contrast, some

Table 2 Noncompartmental pharmacokinetic parameters of mitragynine in humans and rats

Mitragynine All data is mean±standard deviation		
Number of data points, species, reference	N=10, human, [28]	N=6, rat, [31]
Terminal half-life ($t_{1/2}$, h)	23.24±16.07	9.43±1.74
Apparent volume of distribution (V_d, L/kg)	38.04±24.32	89.50±30.30
Time point of maximum concentration (t_{max}, h)	0.83±0.35	1.83±1.25
Clearance (CL, L/h)	1.40±0.73	1.60±0.58

case studies suggest kratom addiction to be a significant issue, especially for chronic users [7, 21]. As a consequence, tolerance and cross-tolerance with both CNS stimulant and depressant drugs may result. Withdrawal symptoms consistent with opioids such as morphine are experienced: irritability, dysphoria, nausea, hypertension, insomnia, yawning, rhinorrhea, myalgia, diarrhea, and arthralgias. Agonist and antagonist drugs have been successfully administered to manage withdrawal effects; dihydrocodeine and lofexidine have been found to curb such symptoms in one case report [7, 21, 36].

Analysis

Mitragynine and 7-HMG are not routinely detected in most drug testing or screening procedures in the clinical and forensic toxicology setting [21]. Since kratom remains licit to purchase and possess in most of the USA and other countries, crime laboratories have not expended resources for purchasing drug standards and validating methods for its analysis [21].

Based on the rise in suspected kratom exposures in recent years, a range of methods have been developed for the analysis of the plant material and other kratom-containing substances including numerous chromatographic techniques, which are most frequently used [37] (Table 3). High-performance liquid chromatography (HPLC), the most common of chromatographic techniques, and other LC techniques coupled with either ultraviolet (UV) or mass spectrometer (MS) detectors (e.g., electrospray) may be used to detect the active alkaloids in kratom leaves [3, 22, 37]. Diode array detection (DAD) is fast and simple but lacks specificity [38]. Linear ion trap, quadrupole, and triple quadrupole mass-specific detection are also suitable for detection of kratom alkaloids.

An objective comparison of chromatographic analyses was performed on a prepared solution containing extracted oxindole and indole alkaloids commonly found in kratom samples, some of which are diastereoisomers to each other. Three techniques were studied: ultra-performance liquid chromatography-mass spectrometry-diode array detection (UHPLC-MS-DAD), supercritical fluid chromatography-diode array detection (SFC-DAD), and gas chromatography-mass spectrometry (GC-MS) (Table 3). Resolution of the alkaloids was accomplished for each of the methods except GC-MS. Separation was limited by diastereoisomers mitragynine and speciociliatine, which is a cause for concern in the effective separation of mitragynine where analysis is conducted by GC. Diastereoisomer separation was not accomplished via GC-MS without derivatization. Both UHPLC and SFC were able to separate the diastereoisomers without the use of a chiral column.

Another study involved purchase of online commercial products suspected of containing kratom [29]. The samples were tested by GC-MS, which is frequently utilized for the

Table 3 Analytical techniques used in the identification of kratom plants and its constituents

Analytical technique	Analyte(s)	Matrix	Reference
HPLC-UV/HPLC-DAD	Corynoxine, paynantheine, 3-isopaynantheine, 7-hydroxymitragynine, mitragynine, speciogynine, speciociliatine	Plant	[13, 38]
HPLC-MS/UHPLC-MS	Mitragynine, 7-hydroxymitragynine, paynantheine, speciogynine, speciociliatine	Plant, urine, blood	[3, 22, 37, 38]
GC-MS	Mitragynine, paynantheine, speciogynine, speciociliatine, corynoxine, 16-carboxymitragynine, 9-O-demethylmitragynine	Plant, urine	[38, 39]
icELISA	Mitragynine	Plant	[37]
DART-MS	Mitragynine, mitraphylline, paynantheine, 7-hydroxymitragynine, rhynchophylline, epicatechin, ajmalicine, corynoxine	Plant	[40]
PCR	rDNA	Plant	[30]

HPLC high-pressure liquid chromatography, *UV* ultraviolet, *DAD* diode array detection, *UHPLC* ultrahigh-pressure liquid chromatography, *MS* mass spectrometry, *GC* gas chromatography, *PCR* polymerase chain reaction, *DART* direct analysis in real time, *icELISA* indirect competitive enzyme-linked immunosorbent assay

analysis and identification of commercial kratom preparations for the presence of active ingredients mitragynine and 7-HMG [3, 22, 29, 39]. The recent study utilized techniques for the identification of kratom that met standards recommended by the Scientific Working Group for the Analysis of Seized Drugs (SWGDRUG) [29]. Due to kratom preparations yielding nonspecific color reactions, chemical spot tests were not useful in presumptive identification. However, the study determined that thin layer chromatography (TLC) followed by GC-MS was suitable in both screening and confirming mitragynine with limited sample preparation [29].

In addition to chromatographic analyses of kratom plant material and extracts, research exists for the analysis of metabolites found in biological specimens. As an example, LC-MS using a linear ion trap is suitable to identify metabolites of kratom in rat and human urine [3, 22]. High-resolution mass spectrometry (HRMS) with an Orbitrap (OT) analyzer was also successful in detecting the alkaloids in a research setting. Additional LC techniques may detect mitragynine such as UHPLC-MS and LC-MS/MS. In separate experimental procedures, both techniques were performed for the quantitation of mitragynine in rat plasma in order to evaluate pharmacokinetic parameters such as distribution and elimination [3]. Phase I and II metabolites can also be differentiated in human samples [22]. Using rats that were administered certain doses of mitragynine, metabolites of mitragynine, paynantheine, speciogynine, and speciociliatine were all detected by GC-MS [39].

Though less common, there is additional research involving nonchromatographic techniques [38]. Specifically for the analysis of plant-based products, polymerase chain reaction (PCR) and direct analysis in real-time mass spectrometry (DART-MS) were helpful for confirmatory analysis of samples. PCR using restriction fragment length polymorphism (RFLP) was utilized for the analysis of various plant products for the presence of kratom [3, 30]. Kratom could be distinguished from similar and related psychoactive plants. The technique proved useful due to its wide range of application, high accuracy, and ease of use [30]. The latter technique, DART-MS, also has the ability of differentiating between other plants and *Mitragyna* plant varieties [40]. This method provided both rapid analysis and minimal sample preparation [40].

In contrast, rapid preliminary detection of drugs in biological matrices is often desired in forensic toxicology [37]. Immunoassay is frequently used for its sensitivity and ease of use, especially for various drug preparations and biological specimens. For the detection of mitragynine in kratom leaves, indirect competitive enzyme-linked immunosorbent assay (icELISA) was carried out for the detection of mitragynine. This method proved effective as a screening technique for mitragynine in kratom leaves; however, improvements to sensitivity and potentially specificity are desired for applications involving biological fluids [37].

Present legal situation concerning kratom in the USA

In the past couple of years, kratom use has grown nationally. Internet marketing and retail accessibility have contributed to increased popularity throughout the USA. In fact, kratom's emergence correlates with trends noted in current national drug databases. In one of these drug databases, the System to Retrieve Information from Drug Evidence (STRIDE), drugs seized by DEA forensic laboratories are monitored [6]. The other primary database is the National Forensic Laboratory Information System (NFLIS) which collects analysis data from state and local laboratories. Both databases include data specific to cases of kratom; the data is compiled and quantified concerning mitragynine analysis. Since 2010, cases involving mitragynine have increased. In 2010, only a single instance of mitragynine use was reported. In 2011, there were 44 reports documented. Within only 6 months, this number had increased over 80 % to 81 in 2012 [6]. In 2013 NFLIS reported 181 total cases [32].

The increased use of kratom has contributed to an increase in reports of individuals becoming dependent on kratom [21]. The majority of these instances are case reports involving individuals compulsively using the substance [21]. Emergency room visits have increased with patients becoming ill, especially teenagers using the substance to achieve its euphoric effects [26]. Figures concerning emergency room visits by users of kratom are currently not well documented. Of the data available, there were two instances of emergency visits in 2005 throughout the nation as reported by poison centers. In Phoenix, Arizona, just one of the many metropolitan areas throughout the USA, there were six emergency visits documented in 2011 [26]. Relatively consistent with the observed increase in Arizona, the state of Texas did not have any reported incidents from 1998 to 2008 [15]. From 2009 to 2013, there were 14 incidents of kratom exposure documented by state poison centers [15].

A more recent publication from NMS Labs indicated that 12 % of the postmortem and human performance blood samples submitted for testing from agencies and labs throughout the USA in 2014 contained mitragynine [41]. That is, 55 of the 459 samples contained this component. This is over double the previous year where of the 472 blood samples submitted, 4.7 % or 22 samples were positive for mitragynine [41].

Although death has been attributed to kratom use, there is no solid evidence that kratom was the sole contributor to an individual's death [42]. In most documented instances, mitragynine was detected in combination with other drugs. As an example, death resulted in an individual with high blood concentrations of propylhexedrine and mitragynine—1.7 and 0.39 mg/L, respectively [43]. Propylhexedrine was determined to be the cause of death with mitragynine possibly also contributing to the death. Urine analysis further detected

acetaminophen, morphine, and promethazine [43]. In another event, a fatality was recorded involving multiple drugs, notably mitragynine [27]. Unlike the previous case, a mitragynine blood concentration of 0.60 mg/L was determined. Therapeutic levels of temazepam, diphenhydramine, and dextromethorphan were also detected. Kratom toxicity was declared as the possible cause of death. Interestingly, the autopsy report findings were consistent with opioid toxicity. Pulmonary congestion and edema, as well as urinary bladder distention, were indicated, though nonspecific. Unlike other case studies, the concentration of mitragynine surpassed other drug levels whose effects were determined minimal [27]. A similar fatal report presented with the same postmortem findings of pulmonary edema and urinary retention at a mitragynine peripheral blood concentration of 0.23 mg/L [44]. From these isolated fatalities, it appears that no threshold concentration for lethal mitragynine or kratom exposure can be determined at this point, especially since many cases involve multidrug exposures.

Concerns with kratom in the USA resulting from such case reports caused federal agencies to disseminate information regarding the substance. The DEA Drug and Chemical Evaluation Section published an informational bulletin [6] (Srihari Tella, 2014, personal communication) and listed kratom on its "Drugs and Chemicals of Concern," which include substances monitored by the DEA that are considered to pose a risk to individuals who abuse such substances [45]. However, more reliable research and data is necessary regarding potential health hazards and addictive properties. The drug remains under evaluation and the likelihood of future federal control is currently unknown (Srihari Tella, 2014, personal communication).

The Federal government has taken some steps to reduce its presence in the USA. The DEA officially declared that there is no legitimate medical use for kratom in the USA. As a result, kratom cannot be advertised in this country as a remedy for any medical condition [21]. Early November of 2014, the Food and Drug Administration (FDA) issued an alert due to the increase in the number of shipments of kratom-containing dietary supplements [46]. The FDA concluded that kratom has a limited history of use and insufficient evidence with respect to safety. Therefore, in order to control shipments of the potentially hazardous substance, the FDA may detain products sent from listed vendors without physical examination. Additional vendors may be added to this list based on whether they meet specified criteria [46].

Kratom has followed a slightly different path internationally. United Nation (UN) Member States are not required to follow international drug conventions [4]. Some of these countries are shifting toward the control of kratom and mitragynine due to adverse health effects. *Kratom acetate* and *mitragynine acetate* started coming to light in the early 2000s, a few years ahead of the USA [47]. Surprisingly, mitragynine was not a component of these substances, also known as *krypton*, which contained caffeine and O-desmethyltramadol. It was not until more recently that products referred to as "incense" started containing kratom's active alkaloids. Surveys administered by the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) in 2008 and 2001 discovered that kratom ranked near the top of new psychoactive substances most widely offered among khat and *Salvia divinorum*. In 2011, kratom was listed as being the most frequently identified new psychoactive substance for sale in 220 total shops [48].

Thailand initially regulated kratom under the Kratom Act in 1943, which was loosely enforced [4, 49]. The penalty was later reduced by listing the drug as a Schedule 5 substance on the Thai Narcotics Act in 1979. Myanmar (Burma) and Malaysia moved to control kratom in 1993 and 2003, respectively. In 2004, under the Australian National Drugs and Poisons Schedule, Australia listed mitragynine and kratom under Schedule 9. Neighboring New Zealand added kratom and mitragynine under the prescription drug schedule (I) of the Medicines Amendment Regulations Act of 2009 [50]. Meanwhile, six European Union (EU) Member States have moved to control kratom or some of its chemical constituents: Denmark, Latvia, Lithuania, Poland, Romania, and Sweden. South Korea, Israel, and Germany have also enacted controls of either kratom or its alkaloids [50].

On a notably smaller scale, kratom concerns are also being addressed. Several states and cities throughout the USA plan to ban or have banned the substance [51–53]. As was observed with the emergence of bath salts and synthetic cannabinoids, state and local governments have taken interest and action regarding kratom regulation. More precisely, they are faced with whether or not to control the sale and possession of the substance.

In the state of Florida, Sarasota banned the substance in early 2014 [53]. Other Florida counties and even its state legislatures are currently challenged with determining where kratom regulation should stand. Interest has particularly increased in Florida due to the death of a young adult male which was believed to be caused by kratom [54]. The 20-year old plunged to his death after jumping from an overpass [54–56]. His death captured local and statewide attention as the deceased's mother announced and asserted that addiction to kratom contributed to her son's death [54, 57, 58]. The medical examiner's report revealed that kratom was present (not quantitated). Antidepressants citalopram and trazodone, in addition to the analgesic gabapentin, were found at therapeutic levels in the individual's system [54]. As was observed with other case studies, the cause and manner of death could not be contributed to kratom alone.

In Palm Beach County, kratom use appears on the rise as exhibited by the number of medical examiner cases from 2013 to 2014 that contained mitragynine (not quantitated) in blood

samples [43]. In 2013, it was reported that a single deceased individual's blood contained mitragynine. In 2014, there were five cases of positively identified mitragynine. So far this year, two deaths were reported of individuals where mitragynine was identified.

In February 2015, several months since the 20-year-old's death, the Florida Senate introduced a bill in an effort to control kratom or *M. speciosa* as a schedule I substance. The bill was amended to list mitragynine and 7-HMG instead. In April, the proposed senate bill was adopted by the Florida House of Representatives without objection; however, before becoming law, Florida's Office of the Attorney General (AG) must work in collaboration with the Department of Children and Families' Substance Abuse and Mental Health Program Office and the Florida Department of Law Enforcement (FDLE) in order to determine whether the substance fits placement into a controlled substance schedule by December 31, 2015 [53, 59].

It is interesting to note that while some governments are immersed with the idea of whether the substance warrants the need for regulation, some states in the USA are revoking laws originally enacted in order to ban kratom. In the instance of Illinois, mitragynine and 7-HMG were originally Schedule I controlled substances [60]. They were eventually moved to become regulated under the Kratom Control Act which allows legal purchase or possession by those 18 years of age or older [60]. In Arizona, mitragynine and 7-HMG were initially proposed for addition as a controlled substance [61]. The bill was later amended since kratom is not synthetic allowing it to remain legal [61].

Conclusion

At a time when public awareness is increasing, additional kratom research is necessary. Meanwhile, lawmakers and scientists around the world should continue to monitor kratom use and continue to take efforts focusing on research in order to attain a global view of its current use and abuse potential.

Since the recent death in Florida, counties have considered banning kratom but, as of yet, taken no action [56]. Both Palm Beach and Broward counties have deemed kratom not ready for regulation due to the lack of information demonstrating the substance as being unsafe or hazardous [56]. The position of these counties appears to be consistent with other state and federal legislators throughout the country.

As with any drug of concern, there are many aspects that must be considered in order to help protect society without taking unjustified steps toward regulation whenever there appear to be real advantages. Yet, potential side effects, especially when improperly used, and real health hazards must not go unnoticed. Research of kratom should move forward with close monitoring of any incidents that should arise. As of yet, research has not determined if the medicinal benefits of kratom may prove to outweigh the acute and chronic dangers of its recreational use.

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Pharmacologic and clinical assessment of kratom: An update

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Purpose. This article presents updated information on kratom (*Mitragyna speciosa*), a natural opioid with stimulant properties that is currently sold in the United States without a prescription.

Summary. Kratom exerts opioid and alpha-2 agonistic effects, as well as anti-inflammatory and mild stimulant effects. Respiratory depression has not been commonly reported, but kratom does cause a host of adverse effects. While kratom may have a role in patients who are in chronic pain or dependent on opioid painkillers or heroin, this needs to be established in clinical trials. Kratom may have drug interactions as both a cytochrome P-450 system substrate and inhibitor. Kratom does not appear in normal drug screens and, especially when ingested with other substances of abuse, may not be recognized as an agent of harm. There are numerous cases of death in kratom users, but many involved polypharmaceutical ingestions. There are assessments where people have been unable to stop using kratom therapy and withdrawal signs/symptoms occurred in patients or their newborn babies after kratom cessation. Both banning and failure to ban kratom places people at risk; a middle-ground alternative, placing it behind the pharmacy counter, might be useful.

Conclusion. Kratom has a unique pharmacologic profile that might offer advantages over other opioids, but its high abuse liability, potential for drug interactions and adverse events, and inadequate research into the balance of benefits to harm are concerning. There is mounting information on the adverse events associated with kratom use and potential treatments that can be useful to clinicians.

Keywords: herb, kratom, *Mitragyna speciosa*, opioid, withdrawal

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Since 2017, when *AJHP* published a review of kratom (*Mitragyna speciosa*),[1] continued interest and new information on usage patterns, risks, and potential treatments of adverse events have warranted an update.[2-4]

The Drug Enforcement Administration (DEA) designated kratom a drug of concern but has not yet scheduled it.[5-8] It is illegal to possess or use kratom in Alabama, Arkansas, Indiana, Rhode Island, Tennessee, Vermont, and Wisconsin.[5] In other states where kratom use is permitted, use of the drug is banned in some cities, including Denver, Colorado; Jerseyville, Florida; San Diego, California; and Sarasota, Florida (kratom use is also banned in Washington, D.C.).[9] New York and New Jersey have pending legislation that would make kratom illegal as well. Kratom is banned in Thailand and Malaysia and is controlled in Denmark, Finland, Latvia, Lithuania, Poland, Romania, Sweden, and the United Kingdom but is not listed as a controlled substance by the United Nations Drug Convention.[7,10,11]

Kratom is available as compressed tablets and liquids for oral administration, loose leaves for steeping or smoking, and whole leaves for chewing.[1] The products can be adulterated, contaminated, or used with other drugs in an attempt to accentuate their effects.[12-15]

The American Kratom Association estimates that 4–5 million Americans

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may have used kratom.[5] Kratom users' demographics were assessed in an online Internet survey (n = 8,049).[16] Users were predominantly 21–50 years old (80%), Caucasian (89%), and male (57%). Over 71% of kratom users were employed, 61% had private insurance, 82% had at least some college education, and 63% made between $35,000 and $75,000 yearly. Fifty-four percent heard about kratom from the Internet or social media, 27% from an acquaintance/friend, and only 3% from a healthcare provider. Only 40% of kratom users told their healthcare providers about their use. Among patients using kratom to control or reduce withdrawal from opioids or illicit drugs, participants were more likely to be 21–30 years of age (odds ratio [OR], 1.89; 95% confidence interval [CI], 1.02–3.51) and have no insurance (OR, 1.97; 05% CI, 1.51–2.59). Kratom use is not assessed in National Institute on Drug Abuse surveys of eighth, 10th, and 12th graders in the United States, and kratom's main constituents are not a part of standard drug screens.[13,17]

Over a million people reported using kratom in a 2008 Thailand national survey.[14] The most common reasons for use in Southeast Asia are to feel better or enhance physical performance, coping (use to forget problems), and social interaction. However, in a survey of 116 regular kratom users in Malaysia, those using more than 3 glasses of kratom daily were more likely to use it for coping (p = 0.001) and enhancement (p = 0.031) than those with lesser consumption.[11]

Any subsequent DEA ruling, or continued lack of ruling, will have major implications for recreational users, people substituting kratom for other drugs of abuse, clinicians caring for kratom users, and researchers.

Pharmacologic and pharmacokinetic effects

There are many biologically active alkaloids of kratom, but mitragynine and 7-hydroxymitragynine are 2 of the most significant, constituting 66% and 2% of the total alkaloid content, respectively.[13,18] Other alkaloids include paynantheine, speciogynine, and speciophylline, accounting for 1%–9% of the total alkaloid content.

KEY POINTS

- Kratom is a naturally derived opioid analgesic associated with a low risk of respiratory depression and is currently legal to sell, possess, and use in the United States without a prescription.
- Kratom has important adverse events that could result in death, so using it without any clinical oversight is risky.
- Kratom can cause tolerance and withdrawal symptoms, making it difficult to attain and maintain abstinence once people use it chronically.

Twenty kratom leaves have approximately 17 mg of mitragynine, with an average leaf weighing 1.7 g before drying and 0.43 g afterwards.[19] However, in an assessment of several kratom products that are commercially sold, the concentrations of 7-hydroxymitragynine was higher than could be achieved without adulteration.[20]

The Food and Drug Administration (FDA) applied mitragynine and 7-hydroxymitragynine to a 3-dimensional computer simulation called the Public Health Assessment via Structural Evaluation and is confident that both mitragynine and 7-hydroxymitraginine bind and stimulate the mu opioid receptor.[21] However, in vitro studies suggest that mitragynine and 7-hydroxymitragynine are partial agonists at the mu receptor and interact in a unique way that shunts away from beta-arrestin 2 pathways and more towards G protein–coupled pathways.[22] Beta-arrestin 2 activity may be a cofactor in the development of opioid-induced respiratory depression.[23] The data on how mitragynine and 7-hydroxymitragynine impact delta receptors conflict, and both constituents appear to antagonize kappa receptors.[13] While found in a much lower concentration in kratom leaves than mitragynine, 7-hydroxymitragyinine is 46 times more potent as an antinociceptive compound.[18,22]

In animal studies, naloxone partially reversed kratom's pain-relieving effects, while caffeine and acetaminophen enhanced them.[1,18] Importantly, oral kratom doses of 807 and 920 mg/kg did not induce respiratory depression, the most common life-threatening adverse effect of traditional opioids.[24]

Mitragynine stimulates postsynaptic alpha-2 adrenoceptors and inhibits cyclooxygenase-2 messenger RNA (mRNA) and protein expression, suggesting nonopioid receptor pain-relieving effects.[13,18,25] The alpha-2 adrenergic agonist effect can also lessen withdrawal symptoms. It is possible that mitragynine in lower doses induces a methylxanthine sympathomimetic effect, owing to its coffee family relationship.[3,26]

An extract of kratom reduced diarrhea, and both kratom and subcutaneous 7-hydroxymitragynine slowed intestinal transit in rodents, an effect only partially blocked by naloxone.[18] Speciociliatine, speciogynine, and paynatheine inhibit intestinal smooth muscle function independent of opioid receptors.[13,18]

In human-induced pluripotent stem cell–derived cardiomyocytes, mitragynine and several other components of kratom (paynatheine, speciociliatine, and speciogynine) significantly inhibited the rapid component of the delayed rectifier potassium channel (IKr).[27] IKr tail current inhibition was similarly reduced by each constituent in the range of 39% to 84% in a concentration-dependent fashion, ranging from 1 to 100 μM (p < 0.001 for all baseline comparisons). Mitragynine was then tested at 10 μM and significantly prolonged the action potential duration at 50% repolarization from the normal range of 439.0 ± 11.6 msec to 585.2 ± 45.5 msec (p < 0.001), a level that if seen in humans would dramatically increase the risk of torsades de pointes.

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Even more disconcerting, mitragynine induced early afterdepolarizations, an intermediate surrogate endpoint for arrhythmogenesis. It is unclear whether combining kratom constituents, as occurs with normal ingestion, would produce additive effects on IKr blockade, thus compounding the arrhythmogenic risk. Figure 1 delineates the pharmacologic effects of kratom and how they are related to potential adverse events associated with its use.[1,13,18,21,25,27]

Nine subjects were given kratom at differing doses, and the pharmacokinetic parameters of mitragynine were determined.[28] Kratom pharmacokinetics fit a 2-compartment model, and as the dose on the day of testing increased from 6 to 23 mg, the maximum concentration went up linearly (R^2 = 0.68). The time to reach the maximum plasma concentration was 0.83 ± 0.35 hours, the terminal half-life is 23.24 ± 16.07 hours, and the apparent volume of distribution was 38.04 ± 24.32 L/kg. Only 0.14% of mitragynine was eliminated unchanged in the urine.

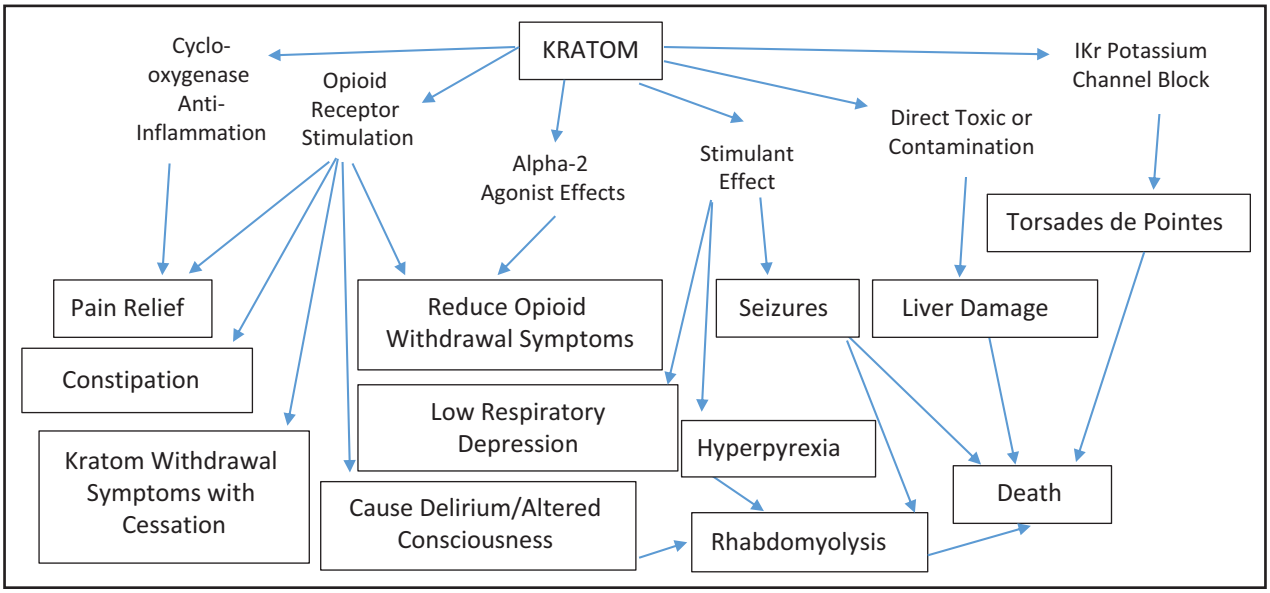
In vitro, mitragynine is converted to 7-hydroxymitragynine via cytochrome P-450 (CYP) isozyme 3A4 but is also metabolized by CYP2C9 and CYP2D6.[29] However, kratom potently inhibits CYP2D6 but also inhibits CYP2C9, CYP2D6, CYP1A2, and CYP3A4.[4,18] Many opioids and other drugs of abuse are CYP2D6 or CYP3A4 substrates.[30–32] In addition, mitragynine was found to be a P-glycoprotein inhibitor and downregulated mRNA and protein expression of P-glycoprotein in vitro.[33,34] Morphine and loperamide are known substrates of P-glycoprotein.[35] However, a methanolic extract of kratom was found to triple the activation of pregnane X receptor, a transcription factor that when activated increases the expression of CYP isozymes and P-glycoprotein.[36] Human drug interaction data are desperately needed to reconcile these conflicting findings.[33,34,36]

Role in pain or opioid abstinence

Anecdotal reports of kratom use for pain or opioid addiction suggest that kratom produces mild stimulant effects at lower doses, but when 5–15 g of raw leaves is ingested, the sedative effects predominate.[13,37] The euphoric effects of kratom are less pronounced than those arising from traditional opioid agonists.[13,37]

There are no published clinical trials assessing the impact of kratom or mitragynine on pain relief or opioid abstinence.[1,4,18] There is only 1 trial reported in ClinicalTrials.gov with the index terms *kratom*, *ketchum*, or *mytragyna* that is currently underway.[38] This is a randomized, double-blind, placebo-controlled trial of 20 participants using a cold pressor pain stimuli. While kratom was identified as a potential opium addiction treatment in Southeast Asia in the 1800s, use for that purpose in the United States was not promoted until discussion threads for opioid addiction surged in 2005.[18,39] In animal models ranging from zebrafish to rodents, kratom has been found to ameliorate opioid withdrawal symptoms but also induce withdrawal after chronic kratom therapy was stopped.[18,40,41] In a survey of 136

Figure 1. Analytical framework of the pharmacology of kratom. The properties of kratom's alkaloid constituents are linked with the reported beneficial and harmful effects. Understanding kratom's complex pharmacology is useful in anticipating issues and potential treatments when they arrive. All of kratom's effects need verification in adequately powered clinical trials or larger registries where confounding can be controlled. The information is based on previous studies.[1,13,18,21,25,27] IKr = delayed rectifier potassium channel.



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kratom users in Malaysia, 90% of people were using kratom to treat addiction, with self-reported benefits including reduced withdrawal symptoms, increase in work capacity, and increased energy.[42] There are 2 case reports of people treating heroin addiction with kratom, and both subjects found it a suitable maintenance medication.[14] One of the patients felt methadone would have been better, but it was unavailable.

Potential averse effects

Common but not serious adverse events associated with kratom therapy include hyperpigmentation of the skin on the cheeks, constipation, weight loss, insomnia, xerostomia, and limited sexual desire.[20,42] There are a growing number of cases of acute toxicity reported in the Western literature, but many of the most severe cases are confounded by the concomitant consumption of other drugs. The acceleration in the number of adverse events associated with kratom use since 2015 could be due to increased use of the product over time or because of increased awareness of kratom as a potential product of use and abuse among first responders and the medical community.

In an assessment of U.S. poison control center calls from 2011 to 2017, there were 1,807 reports of kratom exposure.[43] Sixty-five percent of calls occurred from 2016 to 2017, and the rates of exposure for persons 20 years and older, 13–19 years, and 12 years or younger increased 58.1-fold, 41.7-fold, and 20.1-fold, respectively, from 2011 to 2017. Kratom was the only substance used in 65% of cases, 71% of patients were male, and the users' median age was 29 years. The routes of administration were oral in 83% of cases, with other routes (including smoking and nasal insufflation) being used with, or instead of, oral administration in 8.6% of cases. Overall, 32% of exposures resulted in admission to a healthcare facility, and 52% had a serious outcome. Multiple substance exposure was associated with greater odds of admission to a healthcare facility (OR, 2.8; 95% CI, 2.2–3.6) and serious medical outcome (OR, 2.3; 95% CI, 1.8–2.9) and accounted for 9 of 11 deaths. The major adverse effects among the 1,174 patients using kratom alone at the time of the incident precipitating the poison control center call included agitation or irritability (23%), tachycardia (21%), nausea (15%), drowsiness/lethargy (14%), vomiting (13.2%), confusion (11%), hypertension (10%), and seizures (10%). Other serious outcomes of note included deaths (n = 2), respiratory issues (respiratory depression [n = 42], dyspnea [n = 28], respiratory arrest [n = 6], or cyanosis [n = 4]), cardiac issues (conduction disturbances [n = 33], chest pain [n = 31], cardiac arrest/asystole [n = 5]), neurological issues (tremor [n = 79], dizziness/vertigo [n = 62], hallucinations [n = 61], coma [n = 37], syncope [n = 23], and slurred speech [n = 19]), liver issues (aspartate transamine [AST] or alanine transaminase [ALT] concentration of >100 units/L [n = 59], increased bilirubin [n = 30]), renal failure (n = 6), fever/hyperthermia (n = 27), and rhabdomyolysis (n = 10). Therapy for adverse events included benzodiazepines (n = 368), naloxone (n = 147), intubation (n = 101), antiemetics (n = 89), vasopressors (n = 17), cardiopulmonary resuscitation (n = 12), antihypertensives (n = 11), anticonvulsants (n = 10), antiarrhythmics (n = 8), and hemodialysis (n = 5). In children <12 years of age, most of the use was unintentional (81%), and 69% occurred in children <2 years old. There were 7 cases of neonatal exposure, including 1 exposure from breastfeeding and 1 exposure that also included tramadol. Five of the cases of in utero kratom exposure are described below.[43] These findings are generally similar to those from a U.S. Poison Control Center assessment from 2010 to 2015.[8] In an update of U.S. Poison Control Center data, in the first 7 months of 2018, there were 357 new kratom cases versus 18 in all of 2011 and 300 in all of 2017.[44]

In an assessment from a regional poison control center in Virginia over the years 2002 to 2016, 3 patients had an electrocardiogram taken, and the median QRS and corrected QT (QTc) intervals were 114 msec (normal, 80–100 msec) and 476 msec (normal, 360–440 msec), respectively.[45] While no arrhythmias occurred, these data suggest that the in vitro increases in action potential duration result in QTc interval prolongation in humans and can explain the cardiac conduction issues associated with kratom.

As of February 2018, FDA was aware of 44 deaths associated with the use of kratom-containing products.[46] Many of these occurred after the use of several drugs, including other opioids, tramadol, high-dose loperamide, benzodiazepines, antidepressants, diphenhydramine, and antiseizure medication. Pulmonary causes (edema, aspiration, and arrest), sudden cardiac or cardiopulmonary arrest, and seizures were elucidated as causes of death.[46–48] The lack of detail in most cases and the ingestion of several drugs simultaneously make it very difficult to determine to what extent kratom was a cause of death or a contributor to death (due to direct additive effects or drug interactions) in these cases. In addition, the total number of kratom-associated deaths that have occurred is likely higher than 44, because kratom was not recognized as a potential cause of death prior to 2016 by many users, families, first responders, and healthcare personnel.[1–4] Since it is not a part of standard drug screens, it would not be detected if not specifically assessed for. In the absence of reliable use data, it is impossible to establish if the number of deaths would create a signal for harm, as per FDA's standard practice for assessing prescription drug safety.

Nine of the deaths occurred after concomitant ingestion of kratom and O-desmethyltramadol.[4] Blood levels of mitragynine (0.02–0.18 μg/g) and O-desmethyltramadol (0.4–4.3 μg/g) were identified in these cases.[4] Individual cases of patient death have been reported in the literature, but again, it is difficult to determine causality in many cases given the use of other drugs or herbs or underlying health issues.[4,49–52] In 1 case, a 27-year-old man died from apparent seizures

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and malignant hyperthermia after having taken quetiapine, kratom, and valproic acid.[52] The quetiapine serum concentration was 12 mg/L, much higher than would be anticipated given a pill count that did not suggest an intentional overdose. The authors suggested that the kratom enzyme inhibition coinciding with quetiapine caused this toxic concentration.

In Colorado, death certificates mentioned kratom or mitragynine as a cause of 15 deaths from 1999 to 2017, but 14 involved the use of other drugs that could have caused or exacerbated the adverse impact of kratom, and in the remaining case, no residual blood was available for comprehensive testing.[53] In a recent review of deaths from the County Medical Examiners Office in New York State, 4 cases were identified where kratom had been used.[44] Kratom was identified as the sole cause of death in 2 decedents (blood mitragynine concentrations of 260 and 1,400 ng/mL). Kratom (blood mitragynine concentration of 200 ng/mL) plus ethanol or kratom (blood mitragynine concentration of 540 ng/mL) plus clonazepam and cocaine were identified as the cause of death in the other 2 decedents.

A total of 5 individual cases of seizures linked to kratom use were reported.[54–56] One case had concomitant use of modinafil. Another had concomitant use of *Datura stramonium* (jimsonweed), a plant with analgesic, antispasmotic, and hallucinogenic effects.[54] Thirty minutes after drinking kratom/*Datura stramonium* tea (mitragynine urine concentration, 167 ng/mL), the patient began seizing until lorazepam and phenytoin were administered. There is a recent case of recurrent seizures with prolonged kratom use.[55] A 19-year-old man with attention deficit disorder treated with chronic lisdexamphetamine experienced a generalized tonic–clonic seizure. The patient was deemed to be at low risk for seizures, and no cause could be found after a metabolic profile, electroencephalogram, and urine drug screen (that did not include kratom) were conducted. One year later, the patient had a recurrent seizure and at that point admitted to kratom use starting before both seizure episodes. The patient continued to use kratom and had 4 other seizures over time, even with the prescription of levetiracetam. The last seizure resulted in an automobile accident and was associated with frequent use of kratom and weekly use of cannabis. Cannabis is an unlikely cause of the seizures and may possess anticonvulsant properties. When he stopped kratom and initiated lamotrigine, he was seizure free until breakthrough seizures occurred secondary to kratom relapse.

A case was reported of a 24-year-old patient with massive ingestion of kratom (about 600 mg) but no use of other drugs (urine screen was free of alcohol, amphetamines, barbiturates, benzodiazepines, cannabinoids, cocaine, or traditional opiates).[56] The patient was found minimally responsive and hypothermic and had a seizure witnessed by emergency response personnel. His QTc interval was 492 msec, with a heart rate of 58 beats/min, and the patient had an initial total creatine kinase concentration of 1,342 units/L peaking at 8,099 units/L. The patient had persistent severe delirium and was not discharged until day 28 of hospitalization.

Kratom has been reported to cause hypothyroidism in a single case report.[4] In addition, kratom was found in another case to be associated with poor libido and lethargy that was linked to elevated prolactin and suppressed testosterone levels.[57] The symptoms and laboratory abnormalities were absent after 2 months of kratom abstinence. The extent or duration of his kratom use was not elucidated in the case. However, in a cross-sectional study of 19 regular kratom users (average mitragynine dose, 76–94 mg), no impairment of free thyroxine, testosterone, follicular stimulating hormone, or luteinizing hormone occurred.[58]

Normal serum concentrations of the hepatic enzymes AST, ALT, and bilirubin are approximately 4–37 units/L, 4–40 units/L, and <1 mg/dL, respectively. Before 2017, only a single case of kratom-associated liver toxicity (intrahepatic cholestasis) was reported.[4] Since 2017, 7 additional cases of elevated liver function tests or liver damage have been reported.[59–65] In all cases except 2, AST concentrations ranged from 129 to 294 units/L, ALT concentrations ranged from 210 to 578 units/L, and bilirubin concentrations ranged from 2.2 to 6.3 mg/dL. In one of the 2 cases involving liver transaminase elevations above those ranges, the maximum AST and ALT values were 1,347 and 3,717 units/L, respectively, with no reported bilirubin concentration. In the other case, the AST and ALT concentrations were only modestly elevated, at 53 and 59 units/L, but the bilirubin concentration was 33.7 mg/dL. In all cases, the ALT concentration was higher than the AST concentration on presentation. The AST and ALT concentrations went down continuously over time after kratom was stopped in all cases but 1, in which it rose for another day before trending downward. In 4 cases where repeat bilirubin concentrations were taken, the levels rose slightly the next day or 2 before starting to resolve in 2 cases, remained the same in another case, and went down in the final case. There are basic animal data to support kratom's ability to damage the liver.[4,42] Symptoms in humans, such as upper gastrointestinal quadrant pain and light-colored stools, were reported.[39,42]

There is a case report of posterior leukoencephalopathy after abuse of kratom and dextroamphetamine.[66] Leukoencephalopathy is a syndrome that can be caused by excessive increases in blood pressure, but it is unclear to what extent dextroamphetamine, kratom, or the combination contributed to its occurrence.

In 1 case report, a person was pulled over by a police officer for reckless driving after almost striking an oncoming car.[67] The officer suspected the use of a stimulant and cannabis, but after drug screening, the driver tested positive for amphetamine and mitragynine. In a simulated environment, 70 regular kratom users and 25 controls underwent the Cambridge

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Neuropsychological Test Automated Battery to assess the cognitive impact of long-term kratom use.[68] Relative to control subjects, long-term kratom users had impaired performance on the Paired Associates Learning Task (total errors, $p = 0.001$; total errors with 6-shape adjustment, $p = 0.005$) reflecting deficits in visual episodic memory and new learning. There were also reductions in the simple accuracy score ($p = 0.005$) and a trend towards a reduction in the 5-choice reaction time ($p = 0.057$) under the reaction time field. No deficits were detected in the motor screening tasks, delayed matching to sample tasks, or attention-switching tasks.

It is not only the kratom constituents that can cause harm but also how kratom is cultivated, manufactured, and packaged. FDA is aware of kratom being laced with other opioids like hydrocodone and being contaminated with *Salmonella*.[69] From January 11, 2017, to May 18, 2018, the Centers for Disease Control and Prevention reported 199 cases of infection with outbreak strains of *Salmonella* from 41 states that were subsequently linked to contamination from kratom products. Thirty-eight percent of infected persons were hospitalized, and widescale product recalls were instituted. On June 27, 2018, FDA declared an end to this outbreak and ceased investigation. However, in June 2019, FDA urged Kratom NC to recall several of its kratom products secondary to *Klebsiella*, *Enterobacter*, and *Escherichia* species contamination.[70] Similarly, FDA conducted laboratory testing of 30 different kratom products from a variety of sources and found levels of lead and nickel that were significantly above the recommended levels.[71]

Kratom-induced addiction and withdrawal

In the U.S. Poison Control Center assessment from 2011 to 2017, there were 5 neonates exposed to kratom in utero who experienced withdrawal symptoms such as agitation/irritability, diarrhea, and hyperventilation/tachypnea after birth.[43] Most of the details from these cases were not presented. In the literature, the first case of neonatal withdrawal was reported in 2017, but by 2018, various authors reported 5 additional cases.[72–76] These cases suggest that kratom withdrawal in neonates with in utero exposure begins about 24–36 hours after delivery and is a serious and increasingly common event. Symptoms included runny nose/sneezing, watery eyes, jitteriness, irritability, hypertonia, difficulty breathing, and facial excoriations. An extension of these cases of neonatal abstinence syndrome is the use of kratom in pregnant women.[75,77] There are 3 cases in which women became pregnant and attempted to discontinue kratom use by themselves but were unsuccessful.

In 30 kratom-addicted people from Thailand in 1975, the dose initially was about 3 leaves daily but over time escalated to 10–20 and 21–30 leaves daily in 40% and 37% of people, respectively.[20] Withdrawal symptoms included hostility, tearfulness, rhinorrhea, inability to work, arthralgias, myalgias, and "jerky motions" of the limbs.

In 2014, a study was conducted in Malaysia among 293 male kratom users, of whom 36% were former illicit drug users.[78] Eighty-nine percent of subjects had tried to abstain from kratom in the past, but due to physical withdrawal symptoms, reported as insomnia, anorexia, nausea, vomiting, diarrhea, myalgia, muscle spasms/tremor, shakiness, lacrimation, rhinorrhea, and hot flashes, as well as psychological symptoms of withdrawal, including anxiousness, anhedonia, restlessness, anger, and tension, none were successful. Only 18% of people went more than 3 months from quitting to relapsing.[79] Those reporting consuming greater amounts (OR, 7.05; 95% CI, 4.09–12.13) or more frequent use (OR, 5.19; 95% CI, 3.02–8.92) were 7 and 5 times more likely to report severe dependence, respectively.[78] Urine toxicologic screening confirmed that kratom was the only illicit substance consumed in the previous 30 days.[79] While 13% of people reported depressive symptoms, 14% reported anxiety, 17% reported trouble concentrating or remembering, 6% reported violent behavior, and less than 1% reported hallucinations or attempted suicide in the past 30 days, subjects and researchers believed that kratom maintenance was not as destructive socially and financially as heroin/opium addiction but was indeed an addictive substance.[79]

In 2018, 2 observational studies on kratom withdrawal symptoms were published from the same authors.[80,81] The inclusion criteria for both studies included patients who were regular users of kratom for a prolonged period of time but were not taking other drugs of abuse. The participants were not currently abstinent but were asked to report on the severity of adverse effects from their last abstinence attempt. In the first study, 170 regular users reported on pain using the brief pain inventory and sleep issues using the Pittsburgh Sleep Quality Index. During abstinence, 845 of participants reported moderate-intensity pain, and 70% reported pain that moderately interfered with their normal activities, while 46% reported more severe sleep issues. In the second study, 150 regular users reported on depression and anxiety during abstinence using the Beck Depression Inventory and the Beck Anxiety Inventory. Overall, 81% experienced mild depression, and 70% reported mild anxiety. In both studies, people consuming 4 or more glasses daily experienced greater risk and/or severity of these adverse effects than did those with smaller ingestion amounts.

Treatment of kratom's adverse events and withdrawal

Kratom has opioid- and nonopioid-related adverse events. The opioid adverse events, including pulmonary and gastrointestinal issues, could be amenable to naloxone but could also bring about withdrawal symptoms and acute pain. Constipation, seizures, and arrhythmias can be induced by nonopioid mechanisms, suggesting that other therapies would be adjunctively needed or even superior to naloxone. Seizures

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induced by the stimulant effect of kratom would not be amenable to treatment with naloxone, so benzodiazepines and anticonvulsant therapy have been used most commonly.[32,33,54–56,82]

Kratom-induced torsades de pointes would be due to the direct effects of its constituents on blocking IKr potassium channels and not to opioid receptors.[28] As such, naloxone would not be helpful in this regard. Megadose loperamide and methadone are opioids that have been shown to block IKr potassium channels and induce torsades de pointes and might be used together with kratom.[83,84] Magnesium and cardiac pacing are frequently needed to treat torsades de pointes in these patients. Haloperidol or other antipsychotics could help with kratom-induced agitation and hallucinations but could prolong the QTc interval, an effect that could exacerbate the risk of torsades de pointes.[85]

In a case of possible kratom-induced cardiorespiratory arrest (primarily pulseless electrical activity alternating with ventricular arrhythmia), standard advanced cardiac life-support drugs augmented with sodium bicarbonate for metabolic acidosis and naloxone were given, resulting in the return of spontaneous circulation.[86] While maintaining a perfusing rhythm, the patient needed escalating doses of inotropic agents, so intravenous (i.v.) lipid emulsion was given. To maintain the mean arterial pressure at 90 mm Hg, the norepinephrine and epinephrine requirements fell 30% and 28%, respectively, and the alveolar to arterial oxygenation gap fell by 16% within a few minutes of lipid emulsion administration. These positive effects were maintained for an hour, but then care was withdrawn and the patient died. Anecdotal reports suggest that lipid emulsion may be used successfully in the treatment of cardiac effects from lipophilic local anesthetics, typical and atypical antipsychotics, and tricyclic antipsychotics or from lipophilic constituents of drug formulations.

In most cases, liver toxicity with kratom has been treated with i.v. fluid and supportive measures.[59–65] In 1 case, acetylcysteine (140 mg/kg followed by 70 mg/kg every 4 hours) was used over 4 days, but it is not clear whether this changed the natural course.[62] After rising the day after admission, AST and ALT concentrations were at or above baseline values by day 4 of acetylcysteine treatment, but AST concentration was within normal limits by 2 weeks after the admission and ALT concentration was normalized by 2 months after admission. To treat rhabdomyolysis in 1 case, i.v. fluids were given to prevent renal damage.[56]

Kratom withdrawal symptoms necessitating pharmacologic therapy usually begin 12 to 16 hours after receiving the last dose.[87] In adults, the most commonly employed regimen is to give a fixed dose of hydroxyzine or gabapentin with clonidine doses adjusted for the Clinical Opioid Withdrawal Scale score or to give fixed-dose and/or fixed-interval buprenorphine along with adjunctive drugs such as hydroxyzine and gabapentin.[56,87–90] The initial withdrawal symptoms abate within 4 to 7 days of kratom abstinence, but there can be an ongoing desire to use kratom which could require ongoing psychological and pharmacologic treatment. In most cases, there was no long-term follow-up reported, while in 3 cases, patients were continued on buprenorphine/naltrexone.[56,87–90] In a single case, the use of dihydrocodeine and lofexidine (an alpha-2 agonist) was used to attenuate the subjective and objective withdrawal phenomenon.[91] In another case, the combination of doxepine and diazepam was used to treat a patient with both alcohol and kratom dependence.[92] For selective symptoms, such as anxiety and limb muscle spasms, benzodiazepines can be used sparingly, while diarrhea can be treated with nonopioid antidiarrheals and joint or muscle pain can be treated with nonopioid pain relievers.[56]

In the aforementioned cases of neonatal abstinence syndrome from kratom, the babies were treated with their hospital-approved regimens that included several days of morphine before it was slowly tapered off, and 1 baby required supplemental clonidine that was effective but caused sinus bradycardia.[73–76] In the pregnant women who were addicted to kratom, 2 were switched to buprenorphine (1 with naloxone and 1 without) but were unable to wean off that drug, while in a third case, the patient began morphine and halved the dose of kratom and over 4 weeks tapered both drugs and stopped their use. There was no long-term follow-up to gauge the long-term success of this approach.[75,77] Table 1 summarizes potential treatments for the kratom's reported adverse events.[1,4,8,13,18,27,43,54–56,59–65,86]

Discussion

FDA's position statement about kratom states:

Table 1. Pharmacologic Effects of Kratom Observed in Human Trials[1,4,8,13,18,27,43,54-56,59-65,87]

Adverse Event	Therapy for Adverse Events[a]
Sedation	Naloxone
Constipation	Laxative, stool softener
Tachycardia and hypertension	Benzodiazepines, negative chronotropic drugs
Seizures	Benzodiazepines, anticonvulsants, and naloxone
Delirium	Benzodiazepines, naloxone
Torsades de pointes	Magnesium, cardiac pacing
Liver toxicity	Intravenous fluids
Rhabdomyolysis	Intravenous fluids

[a]These general treatment suggestions are extrapolated from pharmacologic causes or anecdotal experiences.

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> It's very troubling to the FDA that patients believe they can use kratom to treat opioid withdrawal symptoms. The FDA is devoted to expanding the development and use of medical therapy to assist in the treatment of opioid use disorder. However, an important part of our commitment to this effort means making sure patients have access to treatments that are proven to be safe and effective. There is no reliable evidence to support the use of kratom as a treatment for opioid use disorder. Patients addicted to opioids are using kratom without dependable instructions for use and, more importantly, without consultation with a licensed health care provider about the product's dangers, potential side effects or interactions with other drugs.[93]

FDA is rightfully concerned about having people with opioid addiction trying to self-manage a serious opioid addiction with kratom and then having to self-limit their kratom ingestion. People tend to increase their ingested amount of kratom over time, increasing the risk associated with use and inducing significant withdrawal symptoms when stopping therapy. The ability for children to purchase kratom is a scary proposition, as is the creation of neonatal opioid withdrawal when kratom is used among pregnant mothers. Kratom does not appear in normal drug screens and when taken with other substances of abuse may not be recognized but could accentuate the harm caused by these other illicit drugs via pharmacokinetic and pharmacodynamic means. Drug interactions could cause kratom to be more dangerous or could make prescription drugs or drugs of abuse more dangerous. In addition, the kratom supply may include products that are adulterated or contaminated, raising the risks for patients. There are many reported adverse events from kratom use, and the incidence of reports is increasing over time. However, without reliable data on use, it is impossible to know the balance of benefits to harm for this product. Kratom may be found to be effective for opioid withdrawal and to treat chronic pain in the future, but those trials are currently lacking.

Currently, people addicted to opioids could use standard therapy with psychotherapy and drugs such as methadone or suboxone instead of kratom. These therapies are FDA approved and have an acceptable balance of benefits to harm. However, many people are unwilling to confront their opioid addiction, have concomitant chronic pain that is not otherwise alleviated, lack access to healthcare services, or do not want their addiction to be known. For these people, there are 3 common options, kratom, illicit opioids (heroin, fentanyl, and others), or megadose loperamide. While it may seem intuitive that kratom just be banned, such a move may cause kratom users to move to illicit fentanyl or heroin. As such, health professionals need to appreciate the comparative risks among the 3 options.

In 2017, more than 47,000 Americans died as a result of an opioid overdose, mostly secondary to respiratory depression.[94] Over 652,000 people currently suffer from heroin use disorder. Illicit opioids are prone to impurities, undisclosed dosing variability, contamination, and adulteration. Their procurement from drug dealers can place patients at risk, and their possession can result in arrest and incarceration.[94]

Megadose loperamide is increasingly being used as a self-medication alternative or bridge therapy to other opioids.[95] Nonprescription loperamide is free of contamination or adulteration and has standard predictable doses. However, its use is also associated with a host of adverse effects, including cardiac arrhythmias. Since it is not possible to estimate a prevalence of usage for megadose loperamide, the comparative risks between loperamde and kratom are not known. Proposed changes in packaging for loperamide to impede patients from using megadoses, such as blister packs, will make it harder for patients to use this alternative to illicit opioids or kratom in the future.

Kratom might be a candidate for behind-the-counter status.[2] In that scenario, kratom would still be widely accessible but only from a licensed pharmacist. Only high-quality kratom products, certified by outside laboratories, could be sold. Requiring identification to purchase kratom can prevent underage acquisition or recreational use. Drug interactions with kratom could be assessed for and prevented. Pregnant women could be discouraged from using kratom. Patients could be counseled about alternative options for pain relief or opioid addiction during pharmacist interactions. Adverse events could be elucidated and referred to FDA, and the prevalence of use could be determined so the adverse events could be better placed in context. This could be the middle ground between the current unfettered access that people have and a complete ban. Making kratom a prescription product would be untenable given the lack of quality trials establishing benefits and risks.

Conclusion

Kratom has a unique pharmacologic profile that might offer advantages over other opioids, but its high abuse liability, potential for drug interactions and adverse events, and inadequate research into the balance of benefits to harm in patients makes it difficult to justify its use. There is mounting information on the adverse events associated with kratom use and potential treatments that can be useful to clinicians.

Disclosures

The author has declared no potential conflicts of interest.

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Dear Dr. Ferguson,

By way of introduction, my name is Jack Henningfield and I have been involved in kratom research for the past decade and, along with my colleague Marilyn Huestis, PhD, we have collaborated on several kratom research projects that are relevant to the current scheduling of kratom in Wisconsin. Through PinneyAssociates I consult on the development of new medicines and dietary supplements. Prior to PinneyAssociates, I was a pharmacologist at the National Institute on Drug Abuse, Intramural Research Program (1980-1996), serving as Chief of the Clinical Pharmacology Research Branch, and Chief of the Behavioral Biology and Abuse Potential Assessment Section. My responsibilities included working with NIDA, FDA and DEA on drug abuse potential assessment and Controlled Substances Act drug scheduling, and those are my primary activities at PinneyAssociates. Dr. Huestis retired from NIDA a few years ago, where she served as Chief of the Chief of the Chemistry and Drug Metabolism, section also providing expertise in abuse potential assessment, drug testing and analytics, and forensic toxicology.

I have been following the actions of the Wisconsin Controlled Substances Board (CSB) regarding their decision to review and provide guidance to the state legislature about whether kratom meets the statutory criteria to be scheduled. I understand that you have been tasked with leading the review of the available scientific data on behalf of the Wisconsin Medical Examining Board (MEB). Included in the information that was provided by the CSB to the MEB is written testimony that I provided to a legislative committee on AB 599 and the 8-Factor Analysis that we submitted to FDA and DEA in 2016, after the DEA withdrew its August 2016 proposal to schedule kratom in September of 2016 with a request for additional comment and information. In 2018 we published a peer-reviewed 8-Factor Analysis in Psychopharmacology, again concluding that kratom didn't meet the criteria of the 8 factors for scheduling. In fact, we found, as did Assistance Secretary of Health Dr. Brett Giroir, following a 2018 Department of Health and Human Services review, that scheduling kratom carries foreseeable serious public health risks including opioid overdose deaths in people using kratom to stay off opioids, in discouraging pregnant women and others from talking to their health care providers about their kratom use, discouraging research, and more. See Dr. Giroir's formal 2018 scheduling rescission letter to the DEA at https://static1.squarespace.com/static/54d50ceee4b05797b34869cf/t/60145eab6df59e7e36a7cfc1/1611947693695/dhillon-8.16.2018-response-letter-from-ash-radm-giroir.pdf

As you are aware, the actions of the Legislature to originally classify kratom's alkaloids as Schedule I substances in 2014 was predicated on, in addition to now outdated information, the assurances by the US Food and Drug Administration (FDA) that federal scheduling was imminent. The FDA did make the scheduling recommendation in 2016 and that was proposed and then withdrawn by the Drug Enforcement Administration (DEA) for lack of evidence, concern about public health risks, and thousands of comments in opposition by consumers as well as scientists, and bipartisan concerns from members of the US House of Representatives and Senate.

In 2017 the FDA initiated a second scheduling recommendation effort that was formally

submitted to the DEA. That recommendation was officially withdrawn on August 16 2018 by then Assistant Secretary of Health Dr. Brett Giroir for what he characterized as FDA's "poor evidence and data" and ignoring the public safety impact that kratom scheduling would have. See Dr. Giroir's letter at https://static1.squarespace.com/static/54d50ceee4b05797b34869cf/t/60145eab6df59e7e36a7cfc1/1611947693695/dhillon-8.16.2018-response-letter-from-ash-radm-giroir.pdf

Then, in 2021, the World Health Organization Expert Committee on Drug Dependence (WHO ECDD) voted unanimously to reject a petition to the UN Commission on Narcotic Drugs to schedule kratom under the 1961 and 1971 Treaty Conventions. Specifically, the WHO ECDD conducted extensive Pré review and public meeting hearing from public health experts and kratom researchers around the world on the topic. Dr Huestis and I were among those who provided both oral and written comments. The WHO ECDD addressed that evidence and public health considerations including the fact that many people use kratom therapeutically, for a variety of reasons including management of opioid withdrawal. The Committee concluded that there is insufficient evidence to recommend a critical review [that is the formal WHO scheduling pathway] of kratom, mitragynine or 7-hydroxymitragynine. Consistent with Dr. Giroir and other experts, the committee concluded that "Although mitragynine has been analytically confirmed in a number of deaths, almost all involve use of other substances". See the ECDD summary report at https://cdn.who.int/media/docs/default-source/controlled-substances/44ecdd_unsg_annex1.pdf?sfvrsn=9c380ac2_5.

In early 2022, Dr Huestis and I also published an extensive peer-reviewed update of kratom abuse potential and safety related research drawing on more than 100 studies published since FDA's 2017 scheduling recommendation. There has been additional research published and presented since the February publication of our 2022 review and this includes recent studies of the respiratory effects of mitragynine in animals, and of kratom safety and pharmacokinetics in humans that we would be pleased to discuss with you. This extensive research has been primarily funded by NIDA through grants to universities, though there continues to be considerable research in Southeast Asia that had been largely ignored by FDA, but which has been highlighted in NIDA supported conferences, and which currently involves collaborations with NIDA funded researchers. Our 2022 abuse potential update article includes many of these studies. It can be viewed and downloaded at https://www.frontiersin.org/articles/10.3389/fphar.2021.775073/full

Dr. Huestis and I would be pleased to discuss this research with you and provide our perspective on why the FDA's recommendations to schedule kratom, that was accepted by the Wisconsin Legislature, does not meet the required scientific standards including public health considerations required under the federal and Wisconsin controlled substances legislation.

Please let me know a convenient time in your schedule where we could schedule a Zoom call on this important issue.

Thank you,

Jack E. Henningfield, PhD
Vice President, Research, Health Policy, and Abuse Liability
PinneyAssociates | pinneyassociates.com

From: Barr, Adam - DSPS
To: Barr, Adam - DSPS
Subject: Guidance for Reviewing Kratom Scheduling
Date: Friday, October 28, 2022 12:41:42 PM

Members of the Controlled Substances Board,

Please see the message below from Chair Englebert.

I hope this message finds you well.

As the CSB, we have been tasked with reviewing Kratom, applying the 8 factors defined in 961.11(1m) https://docs.legis.wisconsin.gov/document/statutes/961.11(1m). The goal is to begin discussing and formulating our findings at the January 2023 CSB meeting and to complete those findings by the March 2023 meeting, if necessary.

The intent is to respond to the letter sent to the CSB by some of Wisconsin's Legislative Members with the Boards findings. At this time, the CSB has not published a scope statement, so the CSB is not rule writing at this time. This process is responding to a request from some Legislative Members for a review to determine if Kratom is something that would meet criteria to be scheduled.

To that end, I want to make clear the responsibilities for each CSB member, representing their board or agency, is to review the literature/studies that the Department has provided. Each CSB member should review each of the 8 factors in 961.11(1m) and determine if there is evidence supporting that factor and if the extent and quality of that evidence would support the Board in taking action to schedule Kratom. In essence, as a CSB we should be looking at Kratom as a new substance and using the 8 factors to make a recommendation as if the CSB would begin to move to schedule Kratom, or if as a CSB we would table taking action due to the lack of evidence supporting the 8 factors.

If you have any questions, please reach out to Adam Barr.

I look forward to seeing you all at our in-person November 11th meeting and our annual law enforcement hearing.

Adam Barr | Executive Director | Policy Development
Department of Safety and Professional Services

To:	Members, Wisconsin State Assembly
From:	Badger State Sheriffs' Association (BSSA)
	Wisconsin Chiefs of Police Association (WCPA)
	Wisconsin Sheriffs and Deputy Sheriffs Association (WS&DSA)
Date:	September 6, 2022
RE:	**Comments Regarding the Board's Review of Kratom**

Our law enforcement organizations collectively submit these comments regarding the Controlled Substance Board's review of the classification of Kratom (mitragynine).

As the Board is likely aware, for the last several legislative sessions there has been legislation introduced to declassify Kratom as a Schedule 1 controlled substance. Representing the law enforcement on both the county and municipal levels, our respective organizations opposed these bills due to the lack of research and medical consensus on the impairment impacts of Kratom.

The research at this point is inconclusive. The federal regulation is confusing and nonexistent. The legality of Kratom is a state-by-state patchwork. The Drug Enforcement Agency (DEA) has listed Kratom on a list of drugs of concern and the Food and Drug Administration and National Institute on Drug Abuse (NIDA) both concluded that Kratom should be listed under Schedule I of the Controlled Substances Act (CSA).[1] Despite publicly stated and documented federal regulatory agency concerns, Kratom remains unregulated across the country – except in handful of states, including Wisconsin.

In the meantime, there continues to be ongoing Kratom research in many medical institutions. However, there are still numerous unanswered questions about this substance. Here in Wisconsin, both our State Crime Lab and Hygiene Lab test for Kratom, however that is not necessarily the case in other laboratories. Often Kratom is present with other substances, with Fentanyl and fentanyl analogues being the most common combination.[2] According the State Hygiene Lab, between August 2020 and December 2021, there were 64 instances of Kratom reported.

There is much we don't know about this substance – but what we do know is that individuals use it illegally here in Wisconsin – especially in the northeast portion of the state. We asked our network of Drug Recognition Experts (DRE) about their experiences with Kratom. One officer described a situation where the individual was unresponsive, only to quickly turn to "excited delirium" and had to be restrained and medically transported. Another mentioned that often most fatal overdose complaints investigated involved Kratom powder being located. In another case, it was relayed that heroin users say they use Kratom to not go through withdrawal, only to find that there is a withdrawal period with symptoms from Kratom. These are just a few anecdotes, but they illustrate how law enforcement observes Kratom use in the field.

We ask you consider the research, the outstanding questions from the medical community, and the uncertainty of impairment and other drug interactions. At a time when so many Wisconsin communities are dealing with the devastating effects of opioid abuse, why would we legalize a dangerous substance, with links to opioid addiction and death, and that lacks any medically approved FDA-approved uses?

[1] R. W. Patterson, Department of Human Health Services: 18. (2017).

[2] Miles, Amy, WI State Lab of Hygiene UW Madison School of Medicine and Public Health, Kratom Presentation

Koresch, Sandy M.

From: Schreiber, Sara <Sara.Schreiber@milwaukeecountywi.gov>
Sent: Thursday, September 1, 2022 3:55 PM
To: Koresch, Sandy M.
Subject: RE: Kratom stats
Attachments: mitragynine data_CSB_09012022.xlsx

EXTERNAL EMAIL: This email originated from outside the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Sandy,
The Medical Examiner's office of Milwaukee County has identified mitragynine and or 7-hydroxy mitragynine in 6 cases in 2020, 6 cases in 2021 and 5 cases in 2022 to date. It has been included in the cause of death in 1 case in 2020 and 2 cases in 2021. Some of the reason it isn't implicate more often is that we do not have a confirmatory test for the analyte in-house so we need to send to a reference lab when we want it confirmed / quantified. When we have had it quantified the mitragynine has been found at an average concentration of 154 ng/mL with a range of 13-680 ng/mL. Prior to 2020 we didn't have good way to screen for these analytes.
See attached for more data.

Please let me know if you have more questions or if we can be of further assistance.
Sara

From: Koresch, Sandy M. <koreschsm@DOJ.STATE.WI.US>
Sent: Thursday, September 1, 2022 3:25 PM
To: Schreiber, Sara <Sara.Schreiber@milwaukeecountywi.gov>
Subject: RE: Kratom stats

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CaseNum	BarcodeNumber	SpecimenType	AnalyteGroup	QualResult	CalculatedResult	UoM	COD	
20-03599	873715	Subclavian Blood	Mitragynine		20	mcg/L	Acute Mixed Drug Intoxication (Fentanyl, Diphenhydramine, Pregabalin, and Etizolam)	
20-03599	873793	Cardiac Blood	7-hydroxy mitragynine	Detected	NULL	NULL		
20-06408	881173	Iliac Blood	Mitragynine		13	mcg/L	Acute Mixed Drug Intoxication (Fentanyl, Methamphetamine, and Lorazepam)	
20-06422	881349	Cardiac Blood	Mitragynine		680	mcg/L	Acute mixed ethanol and drug (cocaine, fentanyl, and mitragynine) toxicity	
20-09312	1773070	Cavity Blood	7-hydroxy mitragynine	Detected	NULL	NULL	Multiple Blunt Force Injuries	7-hydroxy mitragynine was the only analyte identified in the blood
20-09428	1773297	Cardiac Blood	Mitragynine	Detected	NULL	NULL	Acute mixed drug (cocaine, fentanyl) intoxication	Mitragynine was not confirmed by the reference lab, could have been below their LOD of 5ng/mL
20-09428	1773297	Cardiac Blood	Mitragynine	Not Detected	NULL	NULL		
20-09792	1773929	Iliac Blood	7-hydroxy mitragynine	Detected	NULL	NULL	Acute Nitrate/Nitrite Toxicity	Other analytes found: acetaminophen, caffeine, cetirizine, hydroxyzine
20-09792	1773929	Iliac Blood	Mitragynine		240	mcg/L		
21-01388	1776480	Cavity Fluid	7-hydroxy mitragynine	Detected	NULL	NULL	Acute Mixed Drug Intoxication (Fentanyl, Xylazine, Trazodone, Mitragynine and Diazepam)	
21-01388	1776480	Cavity Fluid	Mitragynine	Detected	NULL	NULL		
21-01388	1776505	AM Serum	Mitragynine		63	mcg/L		
21-06792	3574891	Cardiac Blood	Mitragynine	Detected	NULL	NULL	Complications of Chronic Alcoholism	other analytes found: cortisol, iburofen, venlafaxine, desmethylvenlafaxine
21-06792	3574891	Cardiac Blood	Mitragynine	Not Detected	NULL	NULL		Mitragynine was not confirmed by the reference lab, could have been below their LOD of 5ng/mL
21-06975	3575223	Iliac Blood	7-hydroxy mitragynine	Detected	NULL	NULL	Acute mixed drug (amphetamine, alprazolam, gabapentin, ketamine, paroxetine) intoxication	
21-06975	3575223	Iliac Blood	Mitragynine	Detected	NULL	NULL		
21-07011	3575253	Subclavian Blood	Mitragynine		26	mcg/L	Acute mixed drug (brorphine, cocaine, fentanyl, acetylfentanyl, meta/para fluorofentanyl, heroin, metonitazene) intoxication	
21-07011	3575274	Subclavian Blood	7-hydroxy mitragynine	Detected	NULL	NULL		
21-07085	3575438	Cardiac Blood	7-hydroxy mitragynine	Detected	NULL	NULL	Acute mixed drug (fentanyl, meta/para fluorofentanyl) intoxication	
21-07085	3575438	Cardiac Blood	Mitragynine	Detected	NULL	NULL		
21-07613	3576287	Subclavian Blood	Mitragynine		38	mcg/L	Acute Mixed Drug (Acetylfentanyl, Fentanyl, Ketamine, Clonazepam, Methamphetamine, Phenylpropanolamine, Methylenedioxyamphetamine, and Mitragynine) Intoxication	
21-07613	3576371	Subclavian Blood	7-hydroxy mitragynine	Detected	NULL	NULL		
22-02294	3584296	Subclavian Blood	7-hydroxy mitragynine	Detected	NULL	NULL	Atherosclerotic coronary and peripheral vascular disease	Other analytes found: acetaminophen, caffeine, carboxy-THC glucuronide, citalopram, gabapentin (7400mcg/L), n-desethylloperamide (<10 mcg/L), norcitalopram
22-02515	3584734	Femoral Blood	Mitragynine	Detected	NULL	NULL	Acute mixed drug (fentanyl, heroin, alprazolam, methadone) intoxication	
22-02954	3585844	Iliac Blood	7-hydroxy mitragynine	Detected	NULL	NULL	Acute mixed drug (alprazolam, fentanyl, morphine, loperamide, oxycodone, and xylazine) toxicity	
22-02954	3585844	Iliac Blood	Mitragynine	Detected	NULL	NULL		
22-02982	3586001	Iliac Blood	7-hydroxy mitragynine	Detected	NULL	NULL	Acute mixed drug (cocaine, fentanyl, and meta/para-fluorofentanyl) toxicity	
22-05661	3592371	Cardiac Blood	Mitragynine	Detected	NULL	NULL	Multiple Gunshot Wounds	case still in progress but screen presumptively positive for: alprazolam, salicylic acid, atorvastatin, benzoylecgonine, buprenorphine, caffeine, carboxy-THC glucuronide, cocaine, cotinine, ecgonine methyl ester, ephedrine/pseudoephedrine, etomidate, fentanyl, mitragynine, nicotine, norbuprenorphine, norcocaine noroxycodone, oxycodone, phenylephrine, theophylline

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Case Report

A Case of Kratom Overdose in a Pediatric Patient

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Kratom is a synthetic opioid that is federally unregulated and thus available for purchase through online retail and smoke shops in most states. Due to its availability, there is concern for misuse in the pediatric population. There is existing literature describing toxicity of kratom in adults; yet, to the best of our knowledge, there are no cases describing kratom toxicity in the pediatric population. Thus, we present the case of kratom overdose in a pediatric patient.

1. Introduction

Kratom is a synthetic opioid that is rapidly on the rise in the United States. Poison control centers across the United States reported the number of exposures increased tenfold from 2010 to 2015 [1]. Kratom is federally unregulated and thus available for purchase through online retail and smoke shops in most states. It is marketed as a supplement and perceived as an attractive alternative to prescribed medications. Kratom users report enhanced mood, concentration, analgesic effects, and use for preventing opioid withdrawal [2]. There is emerging literature reporting its potentially harmful effects. Due to its availability, there is concern for misuse in the pediatric population. There is existing literature describing toxicity of kratom in adults; yet, to the best of our knowledge, there are no cases describing kratom toxicity in the pediatric population. Thus, we present the case of kratom overdose in a pediatric patient.

2. Case

We present the case of a 15-year-old Caucasian female with no prior medical history who presented to the emergency department after ingesting 45 capsules of kratom 500 mg as a suicide attempt in context to worsening depression. The patient obtained kratom capsules from her father. After ingestion, she notified her mom who brought her to the hospital. Her parents were not aware of the potential harmful effects of kratom toxicity and thus did not store the capsules in a locked cabinet. Patient denied coingestion of other substances. On exam, patient complained of dry mouth, dizziness, restlessness, palpitations, nausea, and vomiting. Vital signs were positive for tachycardia (heart rate = 100 beats per minute). Physical exam was positive for miotic pupils and bilateral upper extremity tremors. Otherwise, the rest of the neurologic exam was unremarkable. Labs were significant for hypokalemia ($K = 2.9$) and elevated lactic acid (lactic acid = 3.2). Electrocardiogram was significant for sinus tachycardia and elevated QTc = 474. Urine drug screen was negative. Patient was placed on seizure precaution and cardiac monitoring. Patient's nausea initially did not respond to intramuscular trimethobenzamide 200 mg but resolved after one-time dose of intramuscular ondansetron 4 mg. Potassium was replaced. Approximately 14 hours after ingestion, the patient's symptoms had resolved. Behavioral health services were consulted in the emergency room and recommended the patient for inpatient psychiatric hospitalization for the suicide attempt and worsening depression. Once the patient was medical stabilized, she was transported by emergency medical services vehicle to an inpatient pediatric psychiatry unit.

3. Discussion

Kratom is a synthetic opioid that originates from a tropic tree (*Mitragyna speciosa*) native to Southeast Asia [2]. Its active

ingredients are 7-hydroxymitragynine, a highly selective μ and κ opioid receptor agonist, and mitragynine, which acts on 5-HT2A serotonergic, alpha 2-adrenergic, and dopamine receptors. At low doses, users report stimulating effects, and at high doses, it can produce opioid-like analgesic effects [2]. Online retailers recommend a dose of 4 to 10 grams per day, with a maximum dose of 50 grams per day. Our patient ingested approximately 225 grams. Kratom toxicity has been associated with seizures, agitation, psychosis, arrhythmias, hypothyroidism, intrahepatic cholestasis, nephrotoxicity, coma, and death [2]. Cases of death related to kratom exposure almost all occurred in patients 20 years and older, with the exception of one case reporting death in a 17-year-old who coingested over-the-counter cold medications and benzodiazepines [1, 3]. No causality of death has been established with kratom, though coingestion with other drugs of abuse was found in most cases of deaths related to kratom exposure [1].

In the adolescent population, kratom is an emerging drug of abuse. A study from poison control centers in the United States from 2011 to 2017 reported that among adolescents age 13-19 years old, most exposure was due to intentional abuse/misuse (75.9%) and suspected suicide (10.2%) [1]. In addition, site of ingestion of kratom occurred mostly at home (75.9%) [1]. Kratom is attractive in that it produces mood-altering and opioid-like effects yet can be viewed "safer" compared to prescribed medications or other drugs of abuse due to its label as a supplement. Furthermore, parents who use kratom may not be as vigilant in storing it away in a locked medication cabinet due to its perceived safety or lack of knowledge about its potentially harmful effects.

Infants born to pregnant mothers who used kratom during pregnancy were found to exhibit neonatal abstinence syndrome. There have been at least six cases of kratom-associated neonatal abstinence syndrome (KANAS), occurring 6-96 hours after birth. KANAS presents as difficulty feeding, excessive sucking, emesis, jitteriness, irritability, hypertonia, tremors, sneezing, facial excoriations, and high-pitched cry [4]. In addition, electrolyte abnormalities, elevated aspartate aminotransferase (AST) or alanine transaminase (ALT) levels (>100), hypoglycemia, and dyspnea can occur in KANAS [1].

4. Conclusion

In summary, kratom is a substance that is widely accessible yet is potentially harmful when misused or ingested in large amounts. Because it is unregulated and sold as a supplement, it can be misused in the pediatric population due its accessibility, lack of knowledge of its potentially harmful effects from parents, and perceived safety as a supplement.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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A Case of Kratom-induced Seizures

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Abstract

Kratom or Mitragna speciosa is a tropical tree that is indigenous to Southeast Asia, where it has been used for various medicinal reasons. In the West, it is used in the self-treatment of opioid withdrawal, pain, and a variety of mood and anxiety states. Two active ingredients in kratom are mitragynine and 7-hydroxymitragynine, which have affinity at the mu-opioid receptor among others. Kratom is easily available over the Internet and its use is increasing in the United States. It is currently listed by the Drug Enforcement Administration as a drug of concern. In 2017, the U.S. Food and Drug Administration started issuing a series of warnings about kratom, and by early 2018, it released a statement identifying 44 deaths related to kratom use. The Centers for Disease Control and Prevention has also reported 91 deaths directly linked to kratom use in 2019. Although its safety profile needs additional research for clarification, there have been reports of kratom-induced or kratom-related respiratory depression, hypothyroidism, secondary hypogonadism, hyperprolactinemia, psychosis, and seizures. We report a case of kratom-induced tonic-clonic seizures in a 27-year-old Caucasian male with a psychiatric history of anxiety, attention-deficit/hyperactivity disorder, benzodiazepine use disorder, and opioid use disorder. He was hospitalized after a witnessed tonic-clonic seizure. There was no significant metabolic abnormality on laboratory testing. Spinal cord and brain imaging were unremarkable, whereas his urine toxicology was positive for opioids only, which was likely a false-positive result due to cross-reactivity with his sleeping aids. He was evaluated by the Consultation-Liaison Psychiatry team for psychotic symptoms. On evaluation, the patient's psychosis had resolved, but he endorsed racing thoughts, significant anxiety, and insomnia. He admitted to drinking three to four 8-mL bottles of Kratom daily for one-and-a-half years to self-medicate his anxiety after losing his health insurance. In the hospital, he was treated with anxiolytics, counseled to abstain from Kratom use, and was referred for substance use disorder treatment. This case highlights the life-threatening complications of Kratom that is easily available online.

Categories: Psychiatry, Environmental Health, Neurology
Keywords: kratom, opioid, seizures, substance use

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Introduction

Kratom or Mitragyna speciosa is a tropical tree that can grow as high as 16 meters and is native to Southeast Asia, the Philippines, and New Guinea [1]. Kratom, as it is known in Thailand, refers to various preparations derived from the tree and specifically from its leaves. Other names include Thom, Thang, Kakuam, Ketom, and Biak. Although reports of its use in these indigenous regions date back to the 1800s, it is now being cultivated in other parts of the world [2]. Traditional use involved chewing the fresh leaves or preparing tea from its dried leaves. Today, kratom is sold online and at a variety of retail outlets including bars, smoke shops, and even gas stations. It is sold as loosely chopped leaves, tablets, capsules, and concentrated extracts. Routes of use include inhalation and oral ingestion. Kratom is also added to cocktails, caffeinated beverages, cough syrup, and cannabinoid preparations for

recreational use [2].

Over the years, there has been an increase in the use of kratom products in the United States (US) as a drug of abuse and self-treatment of opioid withdrawal and pain. Adverse effects associated with kratom use have caught the attention of federal regulatory bodies including the U.S. Food and Drug Administration (FDA) and the Drug Enforcement Administration (DEA), and these effects have included addiction, psychosis, seizures, liver injury, respiratory depression, coma, and even death. [3-7]. In 2016, the DEA proposed a temporary ban on kratom out of concern for public safety. This triggered negative reactions from advocacy groups, and, in 2017, the ban was rescinded. Individual states in the US, however, introduced legislative bills addressing kratom, with some states banning kratom products. Kratom is banned in the following states: Alabama, Arkansas, Indiana, Rhode Island, Vermont, and Wisconsin. Kratom is also banned in Washington D.C. Previously banned in Tennessee, the ban was reversed, making kratom legal for individuals 21 years or older, as of July 2018 [8].

In February 2018, the FDA released a statement on Kratom's potential for abuse, addiction, and serious health consequences including death. The FDA also reported 44 deaths associated with Kratom use [9]. Efforts to advance regulation of kratom products have been driven by the risks posed by adulteration, which are extremely high concerning overdose and other adverse health consequences [10]. Krypton, a kratom product sold online is adulterated with an active metabolite of tramadol, O-desmethyltramadol, a substance that has been implicated in at least nine deaths [10].

In the US, analysts sponsored by the Centers for Disease Control and Prevention (CDC) in 32 states and the District of Columbia reviewed data on 27,338 overdose deaths that occurred from July 2016 to December 2017. They found that 152 of these decedents were positive for kratom on postmortem examination. Kratom was determined to be a cause of death for 91 of these 152 deaths. According to the CDC report published in April 2019, about 80% of the kratom-positive and kratom-involved deaths had a history of substance misuse [11]. Fentanyl and fentanyl analogs were the most frequently identified co-occurring substances in these deaths. Reports of other co-occurring substances in fatal overdoses have cited propylhexedrine (Datura stramonium), carisoprodol, morphine, and even seemingly innocuous agents such as diphenhydramine and caffeine [2,10,12]. The last two, however, have typically led to fatalities in combination with morphine. Considering that diphenhydramine is a CYP 2D6 inhibitor, one can understand how the toxicity risk of combination products containing diphenhydramine can be elevated [2].

Finally, in an unrelated case for the regulation of kratom and kratom products, the CDC linked kratom to a multistate outbreak of Salmonella infections in 2018. This outbreak involved 199 cases in 41 states and led to 50 hospitalizations, but no deaths were reported. No single source was identified, leading the CDC to advise that, in spite of a wide recall of these products, contaminated kratom products may still be in circulation [13].

This article presents a case of kratom-induced seizures in an individual with risk factors for kratom misuse. The aim is to raise awareness of the dangers of unregulated kratom use among individuals at risk of significant morbidity and mortality from such use. We hope that this report will contribute to the nuances in the ongoing conversations surrounding this controversial plant-based product.

Case Presentation

We report a case of kratom-induced tonic-clonic seizures in a 27-year-old Caucasian male with a psychiatric history of unspecified anxiety disorder, attention-deficit/hyperactivity disorder (ADHD), benzodiazepine use disorder, and opioid use disorder who presented with witnessed

seizures. The patient went to smoke outside his house when his bother found him swinging his arm in the air "like catching a bug." He subsequently lost consciousness and started having a witnessed tonic-clonic seizure for which he was taken to the hospital and admitted for post-ictal confusion and medical workup. No epilepsy risk factors were reported. There were no significant metabolic abnormalities on laboratory testing. Spinal cord and brain imaging were equally unremarkable, whereas his urine toxicology was positive for opioids only. The latter was likely a false-positive result due to cross-reactivity with his over-the-counter sleeping aid, diphenhydramine. Diphenhydramine has been known to cause a false-positive opioid test on urine drug screen [14]. He strongly denied the use of opioids, admitted to drinking alcohol socially, and denied the use of benzodiazepines over the previous few years. He was evaluated by the Consultation-Liaison Psychiatry team for psychotic symptoms because he had been seen flaying his arms in the air prior to the seizure, in a manner reminiscent of someone attempting to catch bugs in the air. His brother had mentioned that there was nothing in the air around the patient when he had witnessed this behavior. On evaluation, however, the patient's psychosis had resolved. He also denied any withdrawal symptoms but endorsed racing thoughts, significant anxiety, and insomnia. He admitted that he had been drinking up to three to four 8-mL bottles of kratom daily for one-and-a-half years to self-medicate his anxiety after losing his health insurance. He was diagnosed as having had a seizure secondary to kratom use. He was then treated with anxiolytics, counseled to abstain from kratom use, and was subsequently discharged after two days of inpatient stay with a referral for benzodiazepine use disorder and opioid use disorder treatment, as well as a follow-up appointment with a psychiatrist to continue managing the unspecified anxiety disorder.

Discussion

The psychoactive properties of kratom, including its addictive potential, have been reported in the literature over the years. Figure *1* shows images of kratom products as they might appear at a typical purchase location [12].

FIGURE 1: Images of kratom products that can be purchased at a "smoke shop" in the US: (A) chopped leaves, which are typically brewed into "kratom tea", (B) capsules containing finely chopped leaves, and (C) compressed tablets containing leaves or resin.

When used at low dosages, it has stimulant effects that reduce fatigue and increase work capacity, akin to the effects of cocaine. The pharmacological mechanism responsible for this remains unclear. At high dosages, however, it has sedative-narcotic "morphine-like" properties and has therefore been used as an opium substitute. Table *1* summarizes the effects of kratom use at low and high doses, whereas Table *2* shows the effect of chronic kratom use, highlighting the potential presentation in withdrawal and dependence.

Effects of kratom at low doses (equivalent of 1-5 g of the raw leaves)	Effects of kratom at moderate to high doses (equivalent of 5-15 g of the raw leaves)
Increased work capacity, euphoria, alertness, sociability, heightened sexual desire, pupils are normal or very slightly contracted, blushing motor excitement, giddiness, loss of motor coordination (positive Romberg's test), tremors of the extremities and face, anxiety, internal agitation (akin to akathisia) leading to dysphoria, aggressiveness, irritability	Analgesia, sedation, sweating, dizziness, nausea, dysphoria, euphoria, dreamlike state, miosis, constipation, itching

TABLE 1: Effects of kratom use at low and high doses[12].

Effects of chronic kratom use
Weight loss
Constipation
Hyperpigmentation of the cheeks
Withdrawal syndrome and dependence: craving, weakness and lethargy, depression, anxiety, restlessness, hostility, aggression, emotional lability, rhinorrhea, lacrimation, dry mouth, myalgia, nausea, sweating, jerky movements of the limbs, tremors, sleep disturbances, psychosis with or without hallucinations (exacerbation or precipitation), higher suicide risk

TABLE 2: Effect of chronic kratom use[12].

More than 20 active compounds have been isolated from kratom. Mitragynine and 7-hydroxymitragynine are the main psychoactive alkaloids found only in the leaves of Mitragyna speciosa [1,15]. They are selective and full agonists of the mu-subtype opioid receptor (MOR). This agonist effect is antagonized by the opioid receptor antagonist, naloxone. Some studies have reported activity at the delta-subtype opioid receptor as well [12]. Other pharmacological mechanisms through which mitragynine mediates its psychoactive effects include 5-HT2a (5-hydroxytryptamine 2A) and postsynaptic alpha-2 adrenergic receptor activity, as well as activity at neuronal Ca2+ channels. These involve the activation of descending noradrenergic and serotonergic pathways in the spinal cord [12]. Three additional mitragynine analogs with psychoactive properties have been described: speciogynine, paynantheine, and speciociliatine [2]. Mitragynine (Figure *2*), 7-hydroxymitragynine (Figure *3*), and their analogs contain the bicyclic indole ring and are structurally similar to yohimbine (Figure *4*), an indole alkaloid with alpha-2 adrenergic blocking activity as well as serotonergic and dopamine receptor D2 antagonist activity [1,15]. The serotonergic activity of mitragynine, its analogs, and yohimbine can be envisaged considering the similarities in their chemical structure with the endogenous bicyclic indolamine, serotonin (Figure *5*) [16-17].

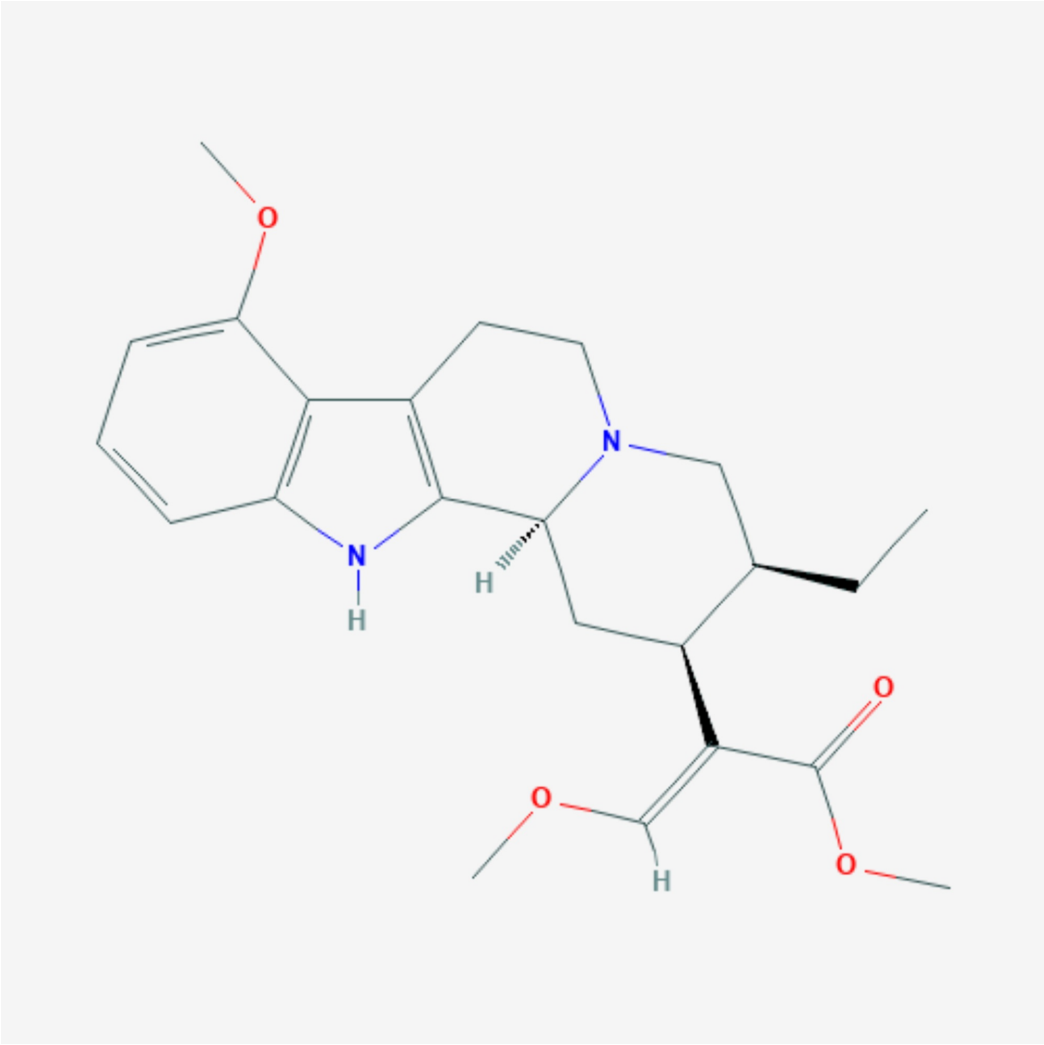

FIGURE 2: Mitragynine – molecular formula: C23H30N2O4; molecular weight: 398.50 g/mol.

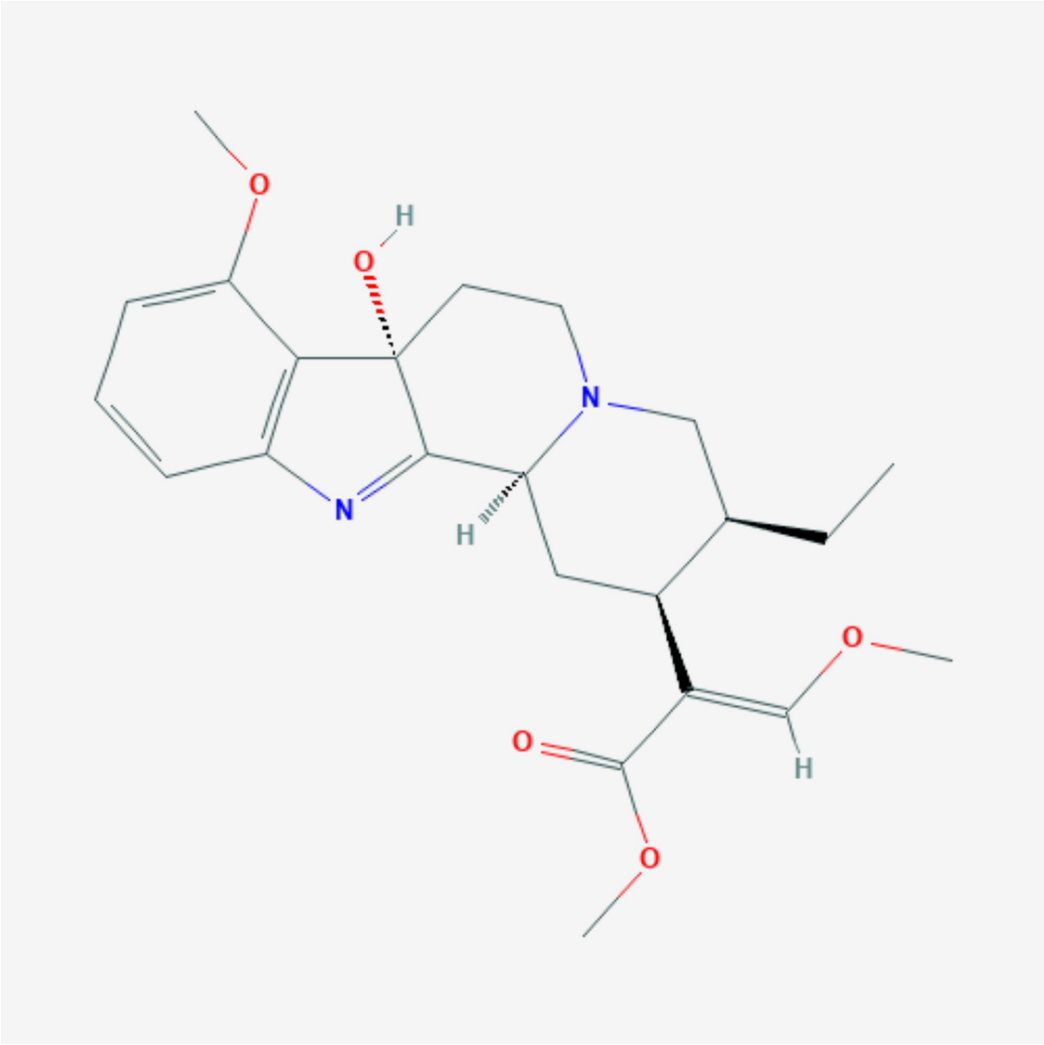

FIGURE 3: 7-hydroxymitragynine – molecular formula: C23H30N2O5; molecular weight: 414.50 g/mol.

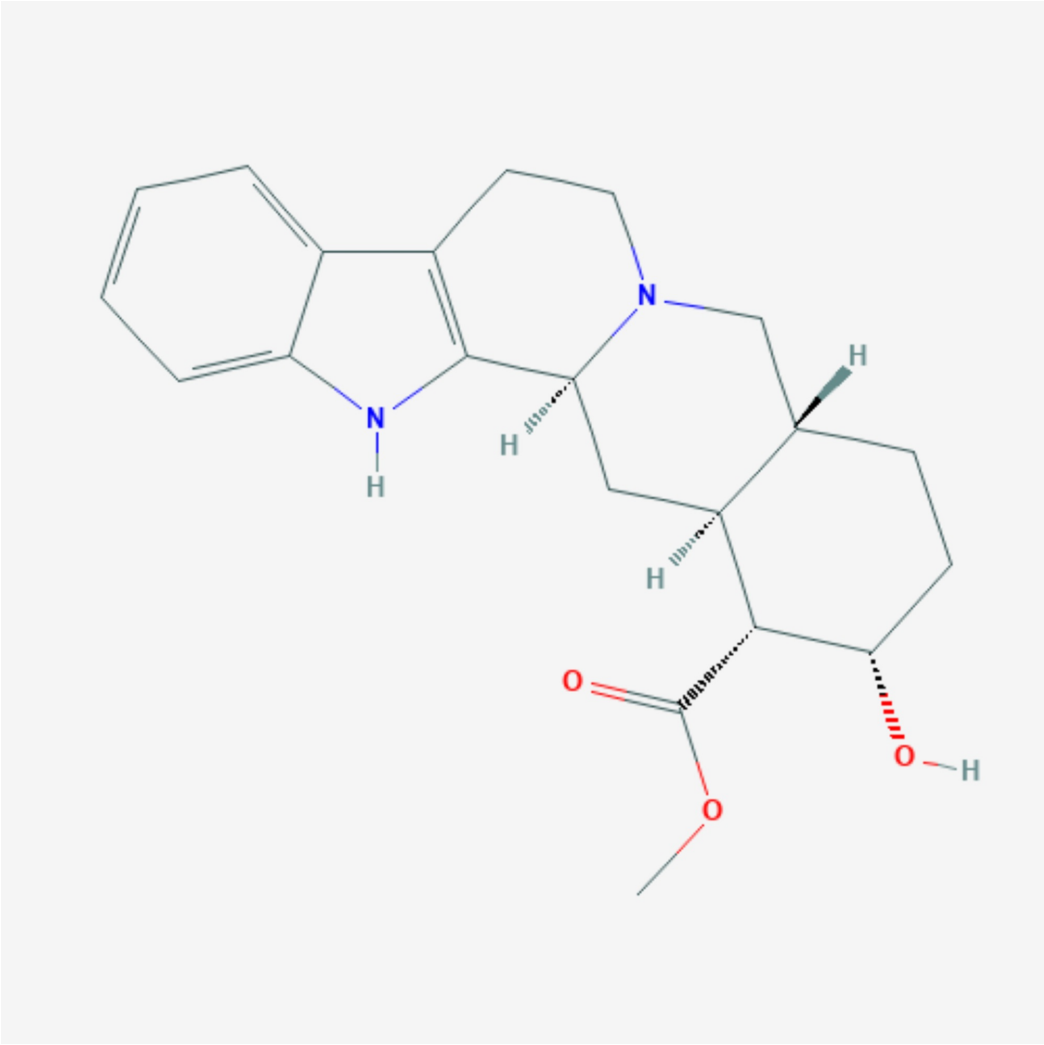

FIGURE 4: Yohimbine – molecular formula: C21H26N2O3; molecular weight: 354.4 g/mol.

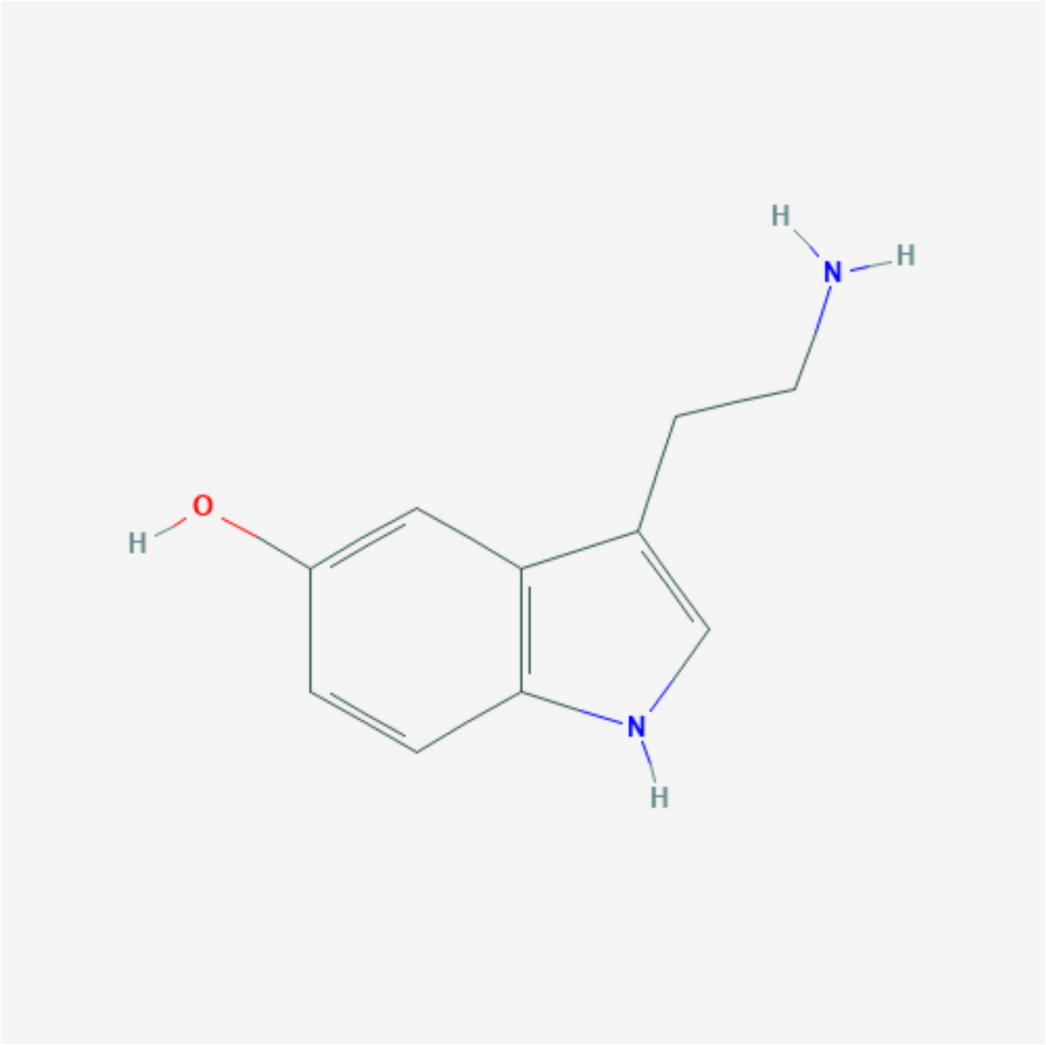

FIGURE 5: Serotonin (5-hydroxytryptamine) – molecular formula: C10H12N2O; molecular weight: 176.21 g/mol.

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It is interesting to note that yohimbine has been used as a mydriatic to treat erectile dysfunction, is considered an aphrodisiac, and has also been used by elite athletes in fat-loss programs [18]. These properties are similar to those produced by kratom products.

7-hydroxymitragynine has been reported as the more potent alkaloid compared with mitragynine. Although kratom contains more mitragynine, 7-hydroxymitragynine appears to be the predominant mediator of its analgesic effects. 7-hydroxymitragynine has better oral bioavailability and blood-brain barrier penetration than mitragynine. It has been reported that individuals who use kratom for analgesia prefer the stimulant effects of kratom to the sedative effects of opioids. Additionally, although euphoria from kratom tends to be less intense than opioid-induced euphoria, it is still sought by individuals with substance use disorders, reflecting its neurobehavioral effect following chronic use.

Individual characteristics play a role in what a user might experience from kratom use. This experience also depends on the duration of use and the dosage (Tables *1*-*4*). The index case presented with multiple risk factors for adverse effects from kratom use. Kratom intoxication

can lead to psychosis and respiratory depression (Table 3). Kratom toxicity can lead to seizures (Table 4), as depicted in the index case. This risk likely became heightened with chronic use as the patient had reported daily kratom use for 1.5 years before his presentation.

Effects of kratom intoxication
Euphoria, psychosis (hallucinations), mania, agitation, respiratory depression

TABLE 3: Kratom intoxication

Effects of kratom toxicity
Psychosis (hallucinations), mania, agitation, seizures, hypothyroidism, intrahepatic cholestatic injury, sudden cardiac death

TABLE 4: Kratom toxicity

The patient's history of ADHD also suggested a susceptibility to neuropsychiatric sequelae from kratom use as this condition is characterized by problems with dopamine and norepinephrine neurotransmitter activity at cellular and circuitry levels. In ADHD, imaging studies indicate that there are alterations in the prefrontal cortex (PFC) and its connections with the striatum and the cerebellum [19]. The PFC requires optimal levels of norepinephrine and dopamine to function appropriately in controlling behavior and attention. Findings from animal studies suggest that norepinephrine's activity at postsynaptic alpha 2A receptors in the PFC as well as dopamine's moderate D1 receptor stimulation work in consonance to mediate these functions. Animal models point to the dysregulation of PFC circuits as the pathophysiology underlying ADHD [19]. While it is possible that mitragynine's stimulating postsynaptic alpha 2 adrenoceptor activity could theoretically have been beneficial for the patient with regard to ADHD symptoms, consuming high doses daily would have likely canceled out any potential benefits. The patient's pattern of use and the resulting complication are more reflective of dependence rather than judicious use for clinically justifiable reasons. Furthermore, this patient presented with an impairment in reward processing evidenced by his comorbid benzodiazepine use disorder and opioid use disorder history. His risk of developing an addiction to kratom was therefore elevated. It is also noteworthy to emphasize the impact of the lost health insurance coverage on this patient's history-the sentinel event that precipitated chronic kratom use and the clinical picture that subsequently emerged.

A review on kratom's abuse potential has concluded that a complete ban on kratom products could lead to public health concerns including the risk of illicit opioid use and overdose in kratom users [20]. Kratom use in the US is rising, leading to kratom dependence and several medical complications. Kratom use has been linked to hepatotoxicity and several neurological complications including posterior reversible encephalopathy syndrome and seizures, both of which can be life-threatening [6]. Tatum et al. reported that kratom use may be related to structural magnetic resonance imaging (MRI) changes in the brain and that its chronic use may result in recurrent seizures requiring treatment with antiepileptic medications [5]. In our study, MRI brain was not performed as the patient presented with a

single seizure episode; however, a case of recurrent seizures following kratom use should prompt MRI studies to evaluate for structural brain changes. Future research should target the effects of kratom on the anatomy and physiology of the central nervous system.

Conclusions

Kratom use is on the rise in the US and there is evidence of its potential to cause opioid-type dependence when used chronically. Apart from its abuse potential, kratom use is also associated with serious medical consequences including liver injury, respiratory depression, psychosis, seizures, and other neuropsychiatric complications. We hope that this case report will increase awareness in the medical community on the risk of neuropsychiatric sequelae, particularly seizures, with chronic use of kratom. Kratom's relatively unknown safety profile and easy availability necessitate further research to hopefully provide additional insight into its appropriate regulatory control.

Additional Information

Disclosures

Human subjects: Consent was obtained by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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REVIEW

Current perspectives on the impact of Kratom use

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Abstract: The leaves from the tree *Mitragyna speciosa*, commonly known as Kratom, in the coffee plant family (Rubiaceae) are commonly used in their native habitat of Southeast Asia as a stimulant to sustain energy during hard day labor and as an opioid-like analgesic and sedative. Traditional and modern uses overlap based on the effects of the leaf extract which has also gained popularity in the United States and Europe in the last two decades. Kratom has and is being used for the mitigation of opioid withdrawal symptoms and as a harm reduction agent with a minority of users subsequently developing a dependence on the extract. The respective demographic use patterns of Kratom differ between Southeast Asia and the Western world. While pure Kratom is primarily used by day laborers and misused in conjunction with cough medicine by youth in Southeast Asia, a majority of users in the United States is middle-aged, has at least middle income, private health insurance, and completed some college. Deaths attributed to the use of Kratom have been reported in Europe and the United States but not in Southeast Asia. Although Kratom was detected as the alkaloid mitragynine in the blood of the decedents, causality could not be established in almost all cases because of poly-drug exposures. It is notable that Kratom can cause herb–drug interactions, especially with other central nervous system -active substances. Given the mostly unregulated market for Kratom products in Western countries, consumers may be exposed to adulterated or contaminated products, especially if purchased through websites or the darknet. A number of countries have scheduled Kratom because of its stimulant- and opioid-like effects and the established interaction of the alkaloid mitragynine with opioid receptors.

Keywords: Kratom, *Mitragyna speciosa*, use pattern, Southeast Asia, substance dependence

Introduction

Kratom (*Mitragyna speciosa Korth.*) is an evergreen tree in the coffee family (Rubiaceae) that is native to Southeast Asia and cultivated especially in Indonesia, Malaysia, and Thailand for its historical medical and recreational uses.[1] Kratom is also referred to as biak-biak, ketum, or Maeng Da in different regions and describes both the tree and the varying extracts and preparations derived from it.[2] The leaves of the tree, that are used for their pharmacological activity, can have different colored veins (white, green, or red) which are not distinguished in its native habitat but have been attributed to varying effects when sold as powdered leaf extracts in Western countries.[3] The main active compounds of current interest are indole alkaloids, primarily mitragynine and 7-hydroxymitragynine that act as partial agonists on opioid receptors.[4] Kratom products contain approximately 2% mitragynine and either none or between 0.01% and 0.02% 7-hydroxymitragynine.[5] Among other mitragyna

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indole alkaloids, mitragynine presents with a unique mechanism of action and pharmacology distinct from classical opioids like morphine, heroin, or fentanyl. Binding to the μ-opioid receptor causes recruitment and activation of the G-protein-coupled signaling cascade but does not lead to recruitment of β-arrestin 2 which has been associated with many of the undesired effects of opioid receptor activation such as constipation, respiratory depression, and dependence.[4,6] In animal models, mitragynine did not cause dependence or increased self-administration and even reduced prior administration of morphine whereas 7-hydroxymitragynine did present with a dependence liability.[7]

The use of Kratom in Southeast Asia has been documented back for at least 150 years and described both a stimulant effect for use in hard day labor when fresh leaves are chewed and an analgesic and relaxing effect if brewed into a tea.[3] It also serves as a substitute and mitigation strategy for opium that was widely used in Malaysia and Thailand from the 1830s to the 1920s.[3] In addition, Kratom remains in use for its antispasmodic, muscle-relaxant, and antidiarrheal effects while both its brief stimulant and analgesic effects remain a popular home remedy in Southeast Asia.[8,9] The use of Kratom is prohibited in Malaysia under Poisons Act 1952, but its use remains widely spread because the tree grows natively and tea decoctions are readily available in local communities.[1] Thailand lifted the ban on the use, production, and possession of Kratom in 2018 for medicinal purposes.[10]

The increase of Kratom sales across Europe and North America caused rising concerns about its safety with several European countries banning the plant and its active alkaloids.[11] The status of Kratom as a dietary supplement remains vague in the United States as of this writing because the Food and Drug Administration (FDA) does not consider Kratom a recognized supplement that has been present on the US market prior to the enactment of the Dietary Supplement Health and Education Act (DSHEA) of 1994 that would have allowed for such a provision.[12] Instead, the FDA has designed mitragynine and 7-hydroxymitragynine as opioids and recommended placement of these compounds into the Controlled Substances Act Schedule I by the US Drug Enforcement Administration (DEA).[13] As of this writing, this scheduling action has not taken place despite an earlier attempt by the agency to do so which was withdrawn based on public comments and the action by several members of the US congress. Several US states have either banned Kratom and its active alkaloid compounds or enacted laws that prohibit the sales of adulterated products that are not appropriately labeled according to Good Manufacturing Practices.[12,14]

Kratom users in the West are using the leaf extract and its varied formulations for a range of health reasons that primarily relate to chronic pain, mood disorders, or mitigating the withdrawal symptoms of a prescription or illicit drug dependency.[15] Although the number of Kratom users in the United States remains vague, the estimate ranges from 3 to 5 million based on survey data and membership information provided by the American Kratom Association.[16]

This review provides a current perspective on the use pattern and impact of Kratom use on the individual and society. The implications of Kratom use are discussed both from the use as a traditional herb and supplement as well as a potential future medicine, either as a pure drug or complex natural extract.

Methods

PubMed and Google Scholar databases were searched on April 9, 2019, for all research and review articles covering Kratom use patterns. The initial search terms were: "Kratom" AND "use pattern" or "Kratom use pattern" or "Kratom" AND "misuse" or "Kratom" AND "abuse". The search returned a total of 2,596 sources. Of these, 91 resulted from PubMed and 2,505 from Google Scholar searches. Both authors evaluated articles for inclusion in the review independently. Initially, duplicates were eliminated, reducing the total number of references to 2,364. Further exclusion of non-English literature resulted in further reduction of the number of references to 1,823. Following evaluation of references, a total of 467 references were initially deemed relevant to the topic of the review. Exclusion of several book chapters that referred back to primary literature and references that referred to original research articles narrowed the references to a total of 44 that were included in this narrative review.

Kratom use pattern in Southeast Asia

The first reported use of Kratom in the scientific literature dates back to 1836 when it was noted that the leaves of the tree were used by Malays as a substitute for opium.[17] In addition, other observations documented the traditional use of Kratom leaves and its preparations as a wound poultice, for fever, and for mitigating the withdrawal symptoms from opium and later heroin.[17] Its traditional use has not been dated and has likely been part of the social fabric for hundreds of years given that the tree grows indigenously throughout Malaysia, Thailand, and

Indonesia.[8] Its use in Malaysia and Thailand has been primarily for two broad applications: as a stimulant to increase work efficiency, endurance, and tolerance to hot and humid climate conditions for manual laborers and as a medical remedy for a range of symptoms. The latter practice as a traditional medicine and home remedy primarily uses fresh or dried leaf material to prepare a decoction by brewing the leaves and ingesting it as a beverage either hot or cold. In this form, the effects have been primarily described as analgesic, relaxing, anti-diarrheal, antipyretic, and anti-diabetic.[18] Far less common is smoking of the dried leaf although it is occasionally reported in Malaysia and associated with a relaxing effect.[18]

The most recent study investigating the prevalence of Kratom use was conducted in 2007 in Thailand among 26,633 respondents between the ages of 12 and 65 years.[11] The lifetime prevalence for Kratom use among all users was 2.3% which was higher than for marijuana use while 13- to 16-year-old students reported a 9.4% lifetime prevalence in a 2004 survey. Kratom is the most commonly used illicit drug in Thailand, and similar percentages are likely for Malaysia based on conducted seizures of Kratom. The high prevalence can be explained by the long history of use as both medicine and recreational drug, readily accessible plant material that grows natively in the area, and perceived safety of Kratom preparations.

Despite its traditional medical uses, Kratom dependence has been known and observed for a long time and is well documented.[17] Unlike opium, opioid, or heroin addiction, Kratom addiction is not associated with a significant stigma in rural communities if a husband is taking it to support his family. However, female Kratom use is much less tolerated and there are far fewer female users in local communities.[8]

Scientific research on Kratom and its effects on users in Thailand and Malaysia has increased in the past 10 years given the rising interest in Kratom extracts in other countries. With a long use history and a socially acceptable tradition of use among the general population, human studies in general appear to be easier to conduct compared to Western countries although Kratom is illegal in Malaysia.

Given the long-term use of Kratom especially by day laborers to boost endurance and withstand physical labor and harsh work conditions, both the stimulant and opioid-like analgesic effects can contribute to dependence development and addiction.[19,20] Two surveys conducted in Malaysia and Thailand reported that the average age of long-term Kratom users was in their mid-30s and a majority were married with lower education levels.[19,20] While Kratom is both used for its stimulant and opioid-like effects, a majority of users had a history of drug abuse and primarily used Kratom to mitigate opioid and stimulant withdrawal symptoms. It was not uncommon among survey respondents to develop a dependence on Kratom. Those with lower education attainment were more likely to successfully stop using Kratom compared to those with a higher level of education.[20] One potential explanation for this inverse correlation is the use of Kratom among higher educated individuals who had previously used a prescription opioid and are now either self-treating a pain condition or mitigating withdrawal symptoms from the former prescription drug. Maintaining the use of Kratom products can be relatively expensive which can correlate higher educational attainment with higher income to allow this habit. Another explanation could be the use of Kratom as a perceived "natural" alternative to prescription or "synthetic" drugs for the self-treatment of a health condition. The belief that "natural" equals safe is prevalent among more educated individuals despite a lack of support for such a statement especially in Western countries.

A cross-sectional survey investigated the correlation between amount and frequency of Kratom consumption and risk of dependence and addiction development in long-term users in three northern peninsular states of Malaysia.[21] There was a correlation between increased consumption of Kratom and risk of dependency development, severity of withdrawal symptoms, and cravings for the extract. Physical withdrawal symptoms manifested as muscle spasms, diarrhea, lack of appetite, fever, pain, and runny eyes and nose. Psychological withdrawal was characterized by mood swings such as anger, nervousness, restlessness, disturbed sleep, tension, and sadness.[21] Despite these findings that are similar to opioid withdrawal and craving symptoms, a majority of participants in surveys and case studies as well as their providers and caretakers do not characterize Kratom withdrawal and cravings as severe as those experienced during opioid withdrawal and those symptoms were of shorter duration.[18,21,22] Although Kratom dependence is widespread, treatment admissions for withdrawal have increased in recent years from 1,000 in 2007 to almost 3,000 in 2011 in Thailand where Kratom accounts for approximately 2% of all drug treatment admissions.[11] It is not yet clear if this change is based on a stricter enforcement of drug policies and how it will change with the legalization of Kratom for medical purposes in 2018.

Even if Kratom dependence and withdrawal are not perceived to be as severe as for opioids, the question of impairment with the chronic use of Kratom remains. A study involving 70 regular Kratom users and 25 control participants evaluated cognitive functioning using the Cambridge Neuropsychological Test Automated Battery (CANTAB) found deficits with higher chronic Kratom consumption (more than 3 glasses of kratom decoction consumed per day) in new learning and visual episodic memory.[23] However, the authors conclude that overall Kratom users independent of the amount they consumed were comparable in their cognitive and executive functions to control participants and does not impair motor, memory, or attention function.

Kratom use and even dependence does not impair social functioning according to several studies conducted in Malaysia.[9,24] A majority of chronic Kratom users are employed, married, and live with their family and rarely present with health problems. This stands in contrast to alcohol, opioids, or amphetamine abuse that are not accepted in society.[25]

Aside from the traditional uses of pure Kratom for its medicinal properties and as an endurance enhancer for hard labor, newer preparations of the plant have emerged that are seen as problematic. Because of its bitter taste, Kratom tea preparations are often sweetened or mixed with beverages to make it more palatable.[9] However, teenagers and young adults in urban areas do mix Kratom leaves and teas with caffeinated beverages such as Coca-Cola and cough syrup containing codeine or diphenhydramine. The mixture is boiled to create a syrup referred to as 4×100.[9] In many cases, the syrup provides for a more intense euphoria and is often consumed together with other drugs such as an antidepressant, anxiolytic, alcohol, or analgesic. Poly-drug use with Kratom increases the risk of fatal additive or synergistic toxic effects whereas there have been no reports in Southeast Asia of fatalities caused by the ingestion of pure Kratom preparations.

Another folkloristic use of Kratom is as a potential aphrodisiac that has been reported in several surveys of chronic Kratom users.[19,20] This activity contrasts with the opioid-like effects since classical opioids are commonly associated with sexual dysfunction and decreased libido. Direct measurement of testosterone, follicle-stimulating and luteinizing hormone did not indicate any differences between Kratom users and non-users although there were some non-pathological differences in blood profiles between the low-dose and high-dose Kratom users.[26] Furthermore, other studies and epidemiological data indicate that despite its use as an aphrodisiac and the potential for impairment, Kratom is not associated with an increased risk for sexually transmitted diseases or needle sharing.[11]

Use pattern in the United States and Europe

Unlike Kratom use in Asia, emergence into the Western markets is a relatively new occurrence. Anecdotal reports suggest that immigrants from Southeast Asia first imported Kratom into the United States in the 1980s and 1990s with an expansion of use in the United States within the past decade.[5,12] In the West, Kratom is sold through the Internet and at herbal stores, tobacco/smoke shops, and "head" shops where it is primarily marketed as an herbal medicine/supplement to treat a variety of ailments (pain, mental health, opioid withdrawal symptoms) as well as a "legal" or "natural" high and alternative to traditional opioids and even promoted as an "herbal speedball."[1,11,15,27–29]

Consumption of Kratom in the United States is predominantly by liquids, but the use of powders added to food or beverages and consumption of Kratom capsules is growing in popularity.[12] Users brew Kratom in a similar fashion as making tea or coffee where the leaf material (whole leaf or powder) is steeped in boiling water or cold extracted. Acids have been used to enhance the extraction. The resulting tea is bitter, so sugar, honey, or various sweeteners are often added.[12]

Because of the route of administration as an oral supplement, there is considerable discussion about the classification of Kratom. To date, there have been few reports of injections or other routes of administration that would indicate a higher degree of abuse and dependence. Furthermore, isolation of mitragynine or 7-hydroxymitragynine has not been attempted for misuse or abuse purposes in a fashion similar to morphine from opium. However, the legality of Kratom as a supplement with limited regulatory oversight has been challenged or restricted in several countries because of its opioid-like effects and the presence of compounds that interact with opioid receptors.

The legal status of Kratom varies in the West from region to region. While the European Union has open borders between members and a shared currency, the legal status of Kratom varies. Kratom is an illegal drug/substance in Denmark, Finland, Ireland, Latvia, Lithuania, Poland, Romania, and Sweden.[30] The legal status of Kratom in the

United Kingdom is complex. While Kratom or *M. speciosa* is not listed as a commonly encountered Schedule 1 controlled substance, it most likely falls under the term of "psychoactive substance" of the Psychoactive Substances Act 2016 in the United Kingdom.[31,32]

Kratom is not scheduled under the US Controlled Substances Act; however, the DEA does not recognize any legitimate medical use for Kratom.[29] The DEA based its stance on the FDA warning that Kratom "should not be used to treat medical conditions, nor should it be used as alternative to prescription opioids," and that the FDA finds no indication that Kratom is safe.[33] As of this writing, Kratom is legal in all US States except Arkansas, Alabama, Indiana, Rhode Island, Wisconsin, and Vermont and the District of Colombia. There are also city bans in Alton, IL; Columbus, MS; Denver, CO; Jerseyville, IL; San Diego, CA; and Sarasota, FL, as well as a county ban in Union County, MS.[34] Further legislation regulating, restricting, banning the use of Kratom or reversing such bans is pending in other jurisdictions.

There are relatively few studies describing Kratom use in the West compared to studies focused on use in Asia. An online anonymous survey in the United States was utilized to answer three questions: 1) Who is consuming Kratom and for what purpose? 2) What perceived beneficial and detrimental effects are reported by Kratom users if dose and frequency of consumption are considered? 3) Does Kratom present with an abuse potential and withdrawal symptoms?[15] Analysis of the demographics of this survey found that US Kratom users are white non-Hispanic males between 31 and 50 years of age, married or partnered, employed with an annual household income of US$35,000 or higher, have private health insurance, had at least some college education, and had used Kratom for more than one year but less than five years. Respondents predominantly identified Kratom use to relieve acute or chronic pain followed by use for an emotional or mental condition. Respondents identified increased energy, decreased pain, increased focus, less depressed mood, lower levels of anxiety, reduced or stopped the use of opioid painkillers, reduction of PTSD symptoms, and elevated mood as beneficial effects of their Kratom consumption. Self-reported detrimental effects appeared to be dose-dependent and included nausea, constipation, and dizziness or drowsiness as the most frequently identified negative effects. Doses of up to 5 g of Kratom presented with lower odds ratios for detrimental effects than doses of 8 g or more. Less than half of the respondents reported withdrawal effects within 12–48 hrs after discontinuation of Kratom and the withdrawal symptoms were mainly rated at a 2 or 3 on a 5-point Likert scale (from 1-severe to 5-not severe at all). This study shows that the US Kratom user population is diverse in demographics and motives for Kratom consumption and that doses of up to 5 g consumed 3 times per day were able to provide beneficial effects while having lower rates of negative effects.

Cinosi and colleagues evaluated literature from 1967 to 2015 to better understand Kratom pharmacology, Kratom use cross-culturally, experience of the user, and to identify risks and side effects related to Kratom consumption.[11] Their analysis identified a growing popularity of Kratom use in areas outside of Southeast Asia, specifically the European Union and United States. The increase in Kratom consumption in the European Union and United States corresponds to an increasing availability of Kratom for sale through the Internet. The European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) conducted an Internet survey of 27 European online shops in 2008 that identified Kratom as one of the most widely offered "legal highs" along with *Salvia divinorum*, Hawaiian Baby Woodrose seeds, Spice, and stimulant-containing capsules.[35] A more extensive study by the EMCDDA in 2011 showed Kratom as the most widely offered product with 20% of the online retailers shipping it to the European Union.[35] More studies are necessary to help understand the impact of Kratom as its use increases in the West, especially if Kratom follows the pattern of novel psychoactive drugs.[11,36]

The increasing trend in Kratom consumption in the West has corresponded with an increase in reports of Kratom-related exposures to Poison Control Centers in the United States, care received at a health care facility due to Kratom consumption, and association with overdose fatalities.[12,37–39] A retrospective analysis of poison center charts collected from January 1, 2002, to November 30, 2016, in the electronic database Toxicall™ using the keywords Kratom and *M. speciosa* was performed to summarize the clinical effects of Kratom.[39] The study evaluated 12 cases of Kratom exposure (dose and frequency were largely unknown) reported from health care facilities and described the clinical effects to include altered mental status, agitation, central nervous system depression, seizures, and tachycardia.[39] Admission to psychiatry and benzodiazepines were the most frequent treatment methods and no deaths were reported.[39] A larger analysis of

data reported to Poison Control Centers using the National Poison Data System database from 2011 to 2017 identified 1,174 Kratom-only exposures where 1,020 cases resulted in one or more clinical effects.[38] The most common clinical effects reported were agitation/irritability, tachycardia, nausea, drowsiness/lethargy, vomiting, confusion, and hypertension.[38] Serious clinical effects included seizures, respiratory depression, coma, increased bilirubin, bradycardia, rhabdomyolysis, renal failure, respiratory arrest, cardiac arrest/asystole, and cyanosis.[38] More than half (51.9%) of these cases received one or more therapies which included IV fluids, benzodiazepines, oxygen, naloxone, and tracheal intubation.[38]

The national poison center reporting database documented 1,807 calls related to Kratom exposure from 2011 to 2017.[37] The Centers for Disease Control and Prevention analyzed data on unintentional and undetermined opioid overdose deaths from the State Unintentional Drug Overdose Reporting System.[37] Kratom was detected on postmortem toxicology testing in 152 cases of 27,338 overdose deaths from data collected from 11 states during July 2016-June 2017 and 27 states during July–December 2017.[37] Kratom was identified as the cause of death by a medical examiner in 91 of the 152 Kratom-positive deaths, but was the only identified substance in just seven of these cases.[37] Presence of additional substances in these seven Kratom-only cases cannot be ruled out.[37,40] The co-occurring substances in the 91 cases where Kratom was identified as the cause of death include fentanyl (including analogs), heroin, benzodiazepines, prescription opioids, cocaine, and alcohol.[37] Multisubstance exposures involving Kratom, predominantly in combination with opioids, are associated with a greater odds ratio of admittance to a health care facility and occurrence of a serious medical outcome when compared to Kratom-only exposure.[38] These data highlight that Kratom use is associated with a complex population of poly-drug users and especially with opioid use disorder. These data further suggest that a deeper investigation into the toxicity of Kratom is needed, especially focusing on drug–herb interactions.

Kratom–drug interactions are further indicated in several case reports resulting in hepatotoxicity or death.[41–45] A 70-year-old man with a history of hypertension and osteoarthritis, treated with amlodipine and oxycodone, presented with jaundice.[42] The patient admitted to consuming Kratom twice daily for 4 days approximately 2–3 weeks before his initial presentation at a medical center for jaundice.[42] He presented with elevated creatinine (2.3 mg/dL) and total bilirubin levels (33.7 mg/dL) and clinically improved with supportive care, but required a readmission at which time he received 3 units of packed red cell transfusion to treat anemia.[42] His abnormal liver tests normalized after three months, except his creatinine level remained slightly elevated (1.8 mg/dL).[42] The liver damage in this case is most likely due to an amlodipine–kratom interaction involving the enzyme cytochrome P450 3A4 (CYP3A4).[46,47]

The elderly are not the only individuals at risk of adverse events due to drug–kratom interactions. A 32-year-old male with a history of hypertension, anxiety, and lower back pain presented to an Emergency Department with jaundice, nausea, fatigue, joint pain, and night sweats after completing a dose of 60 Kratom tablets over 1 week (as per recommended dose on the bottle) and had mitragynine (47.8 ng/mL) and 7-hydroxymitragynine present in his urine.[45] The patient's history includes alcohol use and acetaminophen use for his back pain, but he has no history of smoking or illicit drug use. The patient received a loading dose of N-acetylcysteine (150 mg/kg/hr) but developed an anaphylactic response and further doses withheld. While the patient's liver enzymes were trending down, he was discharged prior to them normalizing. The authors attributed the acute liver injury solely to the patient's use of Kratom;[45] however, the repeated use of acetaminophen could have attributed to the liver injury and the consumption of Kratom could have been overwhelming to an already damaged liver.

Hepatotoxicity associated with Kratom use is rare and appear to be associated with chronic or high consumption of the product.[48] In animal experiments, high concentrations of mitragynine (100 mg/kg) or a methanolic Kratom extract (1000 mg/kg) in rats showed organ damage primarily to the kidneys and liver with elevated liver enzymes and hepatic cellular damage. Although these doses exceed both acute and chronic human doses, further research on the impact of chronic kratom consumption on liver and kidney function is warranted.

Kratom use could have serious adverse events due to drug–herb interactions, specifically with the antipsychotic quetiapine. A 27-year-old male with a history of Asperger Syndrome, bipolar disorder, and substance abuse was found deceased.[43] The postmortem analysis of subclavian blood revealed valproic acid (8.8 µg/mL), quetiapine (12,000 ng/mL), and mitragynine (qualitatively positive).[43] The death was ruled an accident and

due to acute toxic effects of quetiapine.[43] The high levels of quetiapine were ruled to be due to a drug–herb interaction with Kratom since there was no evidence of significant discrepancies in quetiapine pill quantities in his residence.[43] This case further highlights the need for more investigation into Kratom–drug interactions, specifically involving CYP2D6 and CYP3A4.

A better understanding of Kratom–drug interactions is needed specifically when dealing with consumption of Kratom to aid with withdrawal symptoms from, or as a substitute for, traditional opioids. Individuals suffering from opioid addiction are using Kratom out of curiosity and ease of purchasing.[49,50] These individuals are highly variable and have an extensive substance use history.[49] The variability in both user and drug use/preference will further complicate developing a treatment plan and dealing with patients consuming Kratom. It is necessary for scientists to further elucidate Kratom drug–herb interactions to aid physicians who can then better educate their patients about the potential benefits and harms associated with Kratom through a more open dialog.

Discussion and conclusion

The traditional and current diverse uses of Kratom in both Southeast Asia and the Western world indicate that the impact of the leaf and its extracts are of multidimensional complexity including sociocultural, economic, medico-legal, and often individual issues. Throughout its history of use, Kratom has been known to exert stimulant- and opioid-like effects that is raising concerns with regulatory agencies and resulted in scheduling actions in various countries. Although knowledge from clinical studies is limited, epidemiological data obtained from Southeast Asia, Europe, and the United States indicate that Kratom has a distinct user profile and presents with discrete effects from other stimulants or opioids. A substance-dependent opioid user does not prefer Kratom over another opioid but instead would utilize Kratom as a harm reduction or mitigation agent. This has been the conclusion from studies in Malaysia and the United States although the current information is preliminary in scope based on the small sample sizes and regional limitation of the surveys. The findings do align with preclinical observations in rodents that report a reduction in morphine self-administration with the use of mitragynine. This current knowledge points to a potential for further development of mitragynine or use of Kratom as a harm reduction agent similar to methadone or buprenorphine. This will have to be further studied under controlled clinical conditions.

The toxicity of Kratom remains a topic of discussion. From the CDC report and published cases, it is clear that Kratom has the potential to cause herb–drug interactions and even be involved in fatalities. While a majority of regular Kratom users in Southeast Asia and the West alike do not experience acute or chronic adverse effects, the incidence of unwanted side effects remains unknown and can include both stimulant and opioid-like sedative effects. Although some regulatory agencies, including the US FDA, have determined that Kratom and the alkaloids mitragynine and 7-hydroxymitragynine are opioids and thus should not be available without regulation, a direct causative link between the fatalities in which Kratom was detected cannot be drawn because nearly all of them involved poly-drug exposures.[51] The toxicity of Kratom in various animal species is variable and has not been determined for most of them following acute and chronic exposure. The only clinical pharmacokinetic study in humans that provides blood concentrations of mitragynine does not correlate with post-mortem blood mitragynine concentrations thus not allowing for the determination of a toxic or lethal cut-off level. In addition, at this point, only the concentration of mitragynine is reported as indication of the presence of Kratom while it is not clear that mitragynine is in fact the toxic compound.

Reports and studies of the dependence potential to Kratom are of serious concern given the current opioid crisis in the United States and rising abuse of opioids in other countries. It appears that a majority of Kratom-dependent users had a prior substance use disorder or were seeking relief from a chronic pain condition but wanted to avoid opioid use. The severity of Kratom dependence symptoms appears to be milder compared to opioid use disorder and can be treated in a similar manner with buprenorphine or methadone and subsequent tapering. The incidence of Kratom dependency is not known and to date no US nationwide reporting system such as the National Survey on Drug Use and Health (NSDUH) or Monitoring the Future have indicated the use of Kratom in their reports.

Given the diversity in patterns of use for Kratom, additional research is paramount to support and expand on current findings. The labeling of Kratom products available to consumers needs to follow appropriate regulatory standards as well as quality good manufacturing practices to ensure that consumers who seek out

Kratom are not exposed to adulterated or contaminated products.[51] Health care providers should be trained on the science of Kratom and its clinical implications to assist consumers in making the right choice and avoid herb–drug interactions.

Disclosure

The authors report no conflicts of interest in this work.

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From: Kathryn West
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 12:14:28 PM

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Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me. I am a 43-year-old female from New Jersey. I have been suffering from back pain in one form or another for over 12 years. I have tried physical therapy, exercise, TENS units, epidural and other steroid injections, acupuncture, medication, chiropractors (briefly), and massage. I've had CTs and MRIs. I've seen half a dozen doctors. While they think they know the source, nothing has helped resolve the pain or issue in those 12 years. Except kratom. I tried it out of sheer desperation in a lot of pain, every day. I would wake up in pain, suffer pain after trying to clean or do work around my home, play with my kids, and go to bed in pain most nights. Until kratom, I was pretty sure that was going to be my life. Chronic pain, no answers, no help. When I tried kratom as a last resort, I didn't expect the complete relief of my pain to the point I was in tears. It was like a miracle. For the first time in years, I could actually do things without hurting constantly. I have been using it *as needed* for at least 7 years because it works. Just like I drink coffee every day because it helps me wake up and it's enjoyable to drink, I take kratom in pill form and marvel every day at how a little leaf could be such a wonderful thing for pain sufferers like me.

PLEASE consider rescinding the ban in Wisconsin. PLEASE do not continue to take it away from people like me who have found it to be the only answer to pain besides opioids. The same opioids that are being restricted even for those with chronic intractable pain because of an epidemic of abuse (not by those same people who are prescribed it and use it properly, mind you, but they're punished all the same). It is impossible to overdose on kratom, though. The only way to be hurt by kratom is to buy it cheaply and adulterated from a source that shouldn't be selling anything of that kind. The American Kratom Association is fighting to keep those sources out of the market and protect kratom consumers. I hope you will consider working with the knowledgeable people at the AKA to regulate kratom instead of not allow it to be sold or purchased at all. Let adults make their own choices. There is also a Kratom Consumer Protection Act that many states are considering or have put in place that will prevent adulterated kratom from being sold, and I hope you will consider that in place of a ban. Please listen to those who want nothing more than the help that kratom provides and have no ulterior motive other than the truth and access to something that actually works.

Thank you so much for your time.

Sincerely,
Kathryn West
4 Linden Dr
Blackwood, NJ 08012

From: Noah Jenkins
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 12:13:26 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin. My name is Dr. Noah Jenkins. I have a PhD in Molecular Biology, am classically trained in cancer research, and now am a Vice President of R and D and Innovation at a health and nutraceutical company. Natural products and herbal medicine (that can be scientifically substantiated!) is my passion. Kratom is a very intriguing plant that may have many beneficial effects for the human body, if used correctly. Right now it is being classified with broad strokes as an "opiate", and that undoubtedly makes many people automatically view it in a negative light before really diving into the research, or experiencing it personally. I have heard it called a "narcotic" or "heroin-like". I hope that the exaggerations can cease in the future, and that people in positions of power can open their minds and become educated on this matter, just as I certainly had to, years ago. Kratom does hit certain opiate receptors in the body, but the secondary signaling pathways are much different than classical opiates in that an "overdose" is not going to have the same result, by a long shot. Basically, because downstream signaling after Kratom use does not go through the Beta-Arrestin pathway, it will not affect the respiratory system or central nervous system like other opiates do. The worst that can happen is that you feel nauseous (soundslike another common legal substance popular with residents of Wisconsin?) , after which you quickly feel better. The effects are not "heroin-like" to say the least (not that I have ever tried heroin). The proper dose gives my a cognitive boost, an emotional calm, anxiety relief, and mild inflammation and pain relief.

I use Kratom often. I use it before doing public speaking, experiments that require steady hands, long road trips, and before sleeping. I am an athlete (Brazilian jiu-jitsu instructor and Black Belt competitor) and use it prior to and directly after practices and competion. If it were disabling or in any way shape or form really "heroin-like", I am sure I wouldn't have won the Utah State Heavyweight Olympic Lifting title, or the recent gold medal in the Heavyweight jiu-jitsu black belt division.

About 10 years ago, I had a string of injuries and surgeries that led to me being prescribed a large amount of opiate pain pills. Unfortunately, I found myself becoming more and more dependent on them, a common situation. I did my research, came across this plant, and experimented with the right amount and dosing schedule for myself. I have not touched a pain pill since, despite being prescribed them twice more for recent surgeries. I simply don't like them, and enjoy the mild relief that Kratom brings without the mind-numbing effects. This plant has helped me so much. It can greatly help others who suffer from more dangerous addictions, while it itself is about as addicting as coffee. Please reach out to me personally if

you want to have a deeper conversation.

Sincerely,
Noah Jenkins
1958 21 7/8 Street
Rice Lake, WI 54868

From: Karen Chilton
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 12:01:11 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I am the primary caregiver to a child with significant special needs. I have hip arthritis which is quite painful and not able to be controlled with Ibuprofen and Tylenol. I see an orthopedic doctor for my hip and he said he has done all he can do. I'm not a candidate for surgery. I drink Kratom tea a few times per week so I can relieve the ache and provide physical care to my child while also working and having a highly productive life. . This also enables me to avoid having to resort to prescription opioids: which I do not want to start taking for multiple reasons. Thank you so much for your time.

Sincerely,
Karen Chilton
204 Carpenter Lane
Maple Glen, PA 19002

From: James Morrissette
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 11:21:45 AM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Last year I had a family member shoot themselves in their car due to their inability to control their addiction. He left 2 kids and a wife alone to raise them. I consider myself lucky that I do not have the recessive traits demanding the use of opiates like in the poor souls who do have them. On a regular basis so many put in their opinions on these problems. Until you witness a persons desires to consume these horrendous products, you do not have the right to judge them. Only one or two uses drags them in and the addictions begins.

Why are we leaving our boarders open to allow these real problems to continue to surface?
Why do we not hold China responsible?
Why do we continue to lie to ourselves and blame cessation products?

Does this make us feel better to say that we are doing something about it? We are not! The longer we blame cessation products the more people are going to die. We need to stop pacifying ignorance and start facing the truth. Close our boarders and stop blaming Kratom for the inability to all be working together on the same concepts.

If you make Kratom illegal the problem will get worse. Look at the statistical data from year to year in Alabama.

Sincerely,
James Morrissette
2743 1st St. 404
CAPE CORAL, FL 33916

From: Ben Pruski
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 9:37:21 AM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me. Although there may be several claims of Kratom being addictive, that can happen with almost anything with certain people, from fast food, to alcohol or cigarettes, even coffee, and it is definitely a much better choice for many people who cant afford, or do not want to be on much stronger painkillers, or other psychiatric drugs for various conditions. In the past, before the ban, I had taken kratom, it had helped me a lot more than pharmaceuticals ever had, not sure why, but every drug prescribed by a doctor I had ever taken gave me horrible side effects, and as much as I'd love for the pure lifestyle changes I've made, including eating healthy, exercising, getting out in the sun frequently and more, kratom helped a lot more than anything could. There are people out there who may claim they had bad side effects from kratom, but when used responsibly in conjunction with a healthy lifestyle, and in moderate amounts, those effects can be avoided. I would consider it to be a substance on par with coffee, can be a little stronger, but not too much so, just with less negative side effects. It may affect opioid receptors, but the affect is very mild, and very different from hard opioids on the street and even the ones prescribed by doctors due to it only having a partial binding affinity to the receptor. At the dose I was using it, it had no effect on any pain I may have been feeling because I was using a moderate responsible dose. Responsibility is key when using this, just like with coffee, alcohol, or any other substance or thing that can be abused in excess.

Sincerely,
Ben Pruski
330 S Owen drive
Madison, WI 53705

From: Lymm Cook
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Thursday, September 15, 2022 8:16:51 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I'm 71 years old and been a kratom consumer for over 4 years. I have several chronic conditions that cause severe pain. Kratom helps control that pain so I can function like a human again instead of being bedbound the majority of the time. There are millions of us out there that consume kratom. It needs to be available not banned.

Thank you for your consideration,
Lynn Cook

Sincerely,
Lymm Cook
2418 Henry Avenue
Newberry, SC 29108

From: Misty Brown
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Thursday, September 15, 2022 7:33:09 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

'In 2008. I was diagnosed with degenerative disc disease(L4-L5) and epilepsy. That began a whole slew of different kinds of pain pills, injections, doctors' appointments and pharmacies. I noticed I started becoming addicted to pain pills after I lost my house and my job in 2009 due to my health issues. That and issues going on in my home life slammed me into a deep depression. From then on I couldn't function without a pill. I'd be so out of it for 2 weeks out of the month because my 30 day supply would only last me a couple of weeks. When I wasn't pilled up, I stayed in bed and only did the bare minimum in life until my next doctor's appointment. My pill cocktail was Oxycodone, MS Contin, Soma, Klonopin and fioricet.'
'I was fired from my pain management clinic in April 2019 because I didn't show up for a per contract pill count. I knew I was 11 pills short so I just didn't show up! From May to June my kid's father came out here for my second daughter's graduation. I had already gone through detox and I think he helped occupy my mind. My plan was once we dropped him off at the airport, I was going to start looking for another doctor. Instead I watched Leaf of Faith, a movie about kr@tom, on Netflix on June 25th 2019. I learned that kr@tom is a Southeast Asian herb that many are using for pain relief and to treat addiction.'
'The very next day I went to the local smoke shop and bought some Kr@tom. And here I am today, sober and staying sober because of kr@tom and w33d! Kr@tom not only brings my pain level from a 10 to a 3, it also stops the opioid cravings and elevates my mood along with the w33d. I am a brand-new version of the old me. I am a thriving and functioning mother and member of society again. Kr@tom and w33d are the tools I need for sobriety. In all honesty, I am still amazed that I'm alive today. If you think Kr@tom doesn't work, then by all means ask me how I am clean, sitting here typing this out. I and millions of others are living, breathing proof that kr@tom works! Kr@tom is FREEDOM, kr@tom is LIFE!'

Sincerely,
Misty Brown
5032 e 127 way
Thornton, CO 80241

From: Michelle Speranza
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Thursday, September 15, 2022 7:29:49 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Sincerely,
Michelle Speranza
90 North Taylor Ave
Norwalk, CT 06854

From: Michelle Fontenot
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Thursday, September 15, 2022 7:00:53 PM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.
Kratom saved my sons life
He came out of the military with a roxy codeine addiction and 90 percent disabled at the age of 21 years old. It was horrible he shot a gun in his home one time. He would be passing out. He kids and wife were struggling. He has been on kratom for 5 years now and he is able to function and even do light work which he couldn't do before on all the pills the VA had him on. Without this amazing plant I don't know where he would be. I believe we should be able to choose what we put into our own bodies. Sending love light and blessings

Sincerely,
Michelle Fontenot
12397 lake Charles hwy
Leesville, LA 71446

From: Todd A Britt
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Thursday, September 15, 2022 5:41:03 PM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.
It's given me my life back. Fighting alcoholism and depression ,the drugs from doctors made it worse and very expensive to afford especially in these days. This is a natural tree grown from earth but very much demonized. Please consider soany people's story's. Thank you

Sincerely,
Todd A Britt
5259 state highway 70
Eagle River, WI 54521

From: Travis Dregne
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Thursday, September 15, 2022 5:38:19 PM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal feelings on Kratom and why decriminalizing it is important me. I am a career law enforcement Officer with over 15 years of service. I have lived and served in other states over the years before returning back to Wisconsin over 10 years ago. While residing out of state, I often kept some Kratom tea at home for those times where I was feeling run down and low on energy. I found that Kratom gave me a nice boost in my mood and energy. I struggle with understanding the abuse concerns in our state because I have personally never found Kratom to be intoxicating or addictive. That said, I concede there are those with substance abuse issues that will abuse anything possible. Since I have returned to Wisconsin, I have respected the laws of this state, including the Kratom ban, but I must admit I am puzzled by this statute. The scheduling of controlled substances generally follows the abuse potential vs medical use standard. Regarding Kratom, I can attest from my past experiences that it had a positive effect on my mood and an increase in alertness and general energy. I now consume more energy drinks than my primary care physician would like, and would prefer a warm cup of Kratom tea occasionally in its place. While these uses are not likely a concerning medical issue to most, it's important to me and I would appreciate having the option, much like being able to purchase coffee. Regarding abuse, I have yet to come across Kratom during my time as an officer. Also, I have yet to deal with a kratom related crime or a kratom related operating while intoxicated offense. It is my personal and professional opinion that Kratom has unquestionable therapeutic benefits and potential medical value that has yet to be fully realized by the medical community. In regards to the abuse potential, I feel it has very little potential for abuse. Put simply, my opinion is Kratom is not the monster it's been made out to be and would not be the downfall of our great state. My limited research tells me it has been in use for thousands of years and the fact that it is not regulated worldwide, or even nationwide, supports my opinion that it mustn't be the monster it's purported to be. Methamphetamine is one such drug that certainly garners a lot of attention from law enforcement because it is unquestionably a dangerous drug with massive abuse potential. It is so obvious it cannot reasonably be contested. Regarding Kratom, the same cannot be easily concluded. I feel that anyone who opposes Kratom should be encouraged to visit a neighboring state, where it's not prohibited by law, and try a warm cup of Kratom tea before making a judgement. I feel they would change their mind when they see how truly harmless it is. In closing, please consider my arguments during your review. In doing so, I believe the sensible outcome is to return the decision about Kratom to the people.

Sincerely,

Travis Dregne
1102 Cedar Rd
Boscobel, WI 53805

From: Amy Johnson
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Thursday, September 15, 2022 4:48:06 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me. I have fibromyalgia and am on Cymbalta to help but without Kratom I feel I would not be a productive member of society. It helps me so much with the pain and stiffness. I hate having to feel like a criminal while using something that is really helping me. I also have been grooming dogs for 32 yrs and also find much relief with kratom with day to day pains from my very physical job. At one point before I found kratom I was taking upwards of 12 ibuprofen a day to function!!! Please reconsider the ban for Wisconsin

Sincerely,
Amy Johnson
W2564 Kittie Ct
East Troy, WI 53120

From: Julie Scott
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Thursday, September 15, 2022 12:13:03 PM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Sincerely,
Julie Scott
303 E Henry Clay St
Whitefish Bay, WI 53217

From: Christopher Deaney
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Thursday, September 15, 2022 11:24:31 AM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I would like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I was looking for other avenues in my struggle to maintain a functioning, less painful lifestyle. Kratom has been one of those plants that I wish I would have known about years ago. I was hit by a car at 8 years old while crossing the street, and that began the problematic life that I know today. Between 8 and 13 I went through about forty dislocations of my knees, requiring my first surgery at 13 and second at 22.

It is not much fun going through life as a child not being able to join in with the rest of the children. I sat on the sidelines in gym most of my school years. I learned early that there are plenty of other things to do for fun besides physical activity. My physical education class was learning about health and nutrition, which is why I love plant medicine today.

I became a couch commando for a few years in between surgeries and ended up gaining about sixty pounds in a 3-year period between the ages of 12-15. This is when most of my surgeries and dislocations were the worst.
I did finally loose the weight at 16 and got involved with minor strength training.

At 36 years old I had a heart attack in which I had a blockage and took a helicopter ride. I had two stents placed. My desire to live more naturally was even stronger after the heart attack.

I must take metoprolol and atorvastatin daily to ensure I do not have any more cholesterol or heart issues. I can use kratom to alleviate my pain and live a much more functional lifestyle. I wake up at a ten on the pain scale daily. Within 20 minutes of drinking my kratom tea I can get my pain down to a functional four and start my day. I also had ADHD as a child, and it still affects me as an adult. Kratom seems to help me focus and able to do my job better. Kratom was used for thousands of years for numerous reasons and is still used today. I was reminded the other day that the pharmaceutical industry was started not that long ago, and they began with herbs.
Let us allow people to make tea and use herbs the way our ancestors did years ago. Herbal Medicine and alternative medicine are original medicine.
Thank You for your time and consideration.
Christopher

Sincerely,
Christopher Deaney
257 Cedar St
Penns Grove, NJ 08069

From: Cynthia Miller
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Thursday, September 15, 2022 11:15:27 AM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

My 67 year old husband has chronic pain. Age does that to you. He retired as a manager in a Fortune 50 company several years ago. Our retirement was empty of any joy until he discovered Kratom. A little bit each day dulls the pain and we are able to do so much more. We just got back from Cooperstown and the Baseball Hall of Fame and are planning future trips.

Kratom has made a difference for him. Being a child of the 60s, he knows what it is to get high and Kratom doesn't do it. In fact, he has a medical marijuana card but he prefers Kratom because there is no high with Kratom.

Outlawing Kratom is just punishing good people. It is pointless to put people like my husband in jail over a harmless leaf. Regulating it is wise. I was in Wisconsin in 2019, and would like to be able to visit again, but not while you have a ban on Kratom. He can't go to prison, and he can't go back to that life of pain.

Thank you.

Sincerely,
Cynthia Miller
2024 Waycross Ave
Akron, OH 44320

From: Beverly Veyna
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Thursday, September 15, 2022 10:43:05 AM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

For the past 49 years I have been a working RN; was injured early in my career which resulted in a back surgery and many years on opiates. About 5 years ago I became fed up with the issues surrounding opiates and my ability to work as an RN. Researched internet for alternative. Found kratom, purchased in N J at my daughters and was able to get completely off the opiates and remain an actively employed RN. The process took awhile, but I was successful and continue to work as an RN. Kratom gave me my life back. I testified twice in Madison regarding kratom and hope never to be without it. My daughters are thankful they have a mom back. It is awful that kratom is illegal in WI, but i do what is necessary to have access to it. This is not an addiction, but rather an answer to prayer. I would be willing to share my story in depth as legalization of kratom in WI is a high priority for me.

Thank you sir.

Sincerely,
Beverly Veyna
2556 airport rd
Portage, WI 53901

From: Mark Scott
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Thursday, September 15, 2022 10:37:32 AM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Sincerely,
Mark Scott
438 Cobblestone Ct
Cedarburg, WI 53012

From: Dijon Evans
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Thursday, September 15, 2022 9:47:10 AM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I am absolutely positive that if it weren't for kratom, I wouldn't be alive right now! After the 2016 guidelines were SUGGESTED and every doctor around (ok, 90 % of them), acted as if they were law and abandoned their patients who weren't terminal cancer patients - even if a patient had been on a successful maintenance program with opioid and several decades of extremely documented medical records 0f the most painful condition known to us... no taper, no discussion, no warning or failed tests; patients were and still are abandoned by the medical professional. Some, is understandable as they were losing everything they'd worked for and their livelihoods. Others fought for their patients and those who aren't theirs, and have had everything threatened, but they take their oaths seriously! As they should.
I am terminal but I didn't have cancer at the time, but there is still absolutely nothing that can be done for me. That didn't matter. A couple hundred surgeries, amputations, pulmonary embolisms, sepsis, gangrene, multiple organ failure and more. I tried to do it on my own, and utilized self hypnosis, visual imagery, and countless years of therapy. After 40 years and then being abandoned by the medical profession, and being in this position because of medical malpractice; I lost all hope. No quality of life and my condition was dragging my loved ones through hell as they sat by and helpless to do anything to help. I learned about kratom and after 7 months of research, talking about it to everyone I knew- INCLUDING MY MEDICAL TEAM, I ordered some. After laughing at it, mocking it and no faith in it whatsoever. I came from the medical school/research field and definitely held no belief in dietary supplements or natural foods for helping people with things other than inflammation.
I do not quit anything. I have fought for my life with everything I have for decades. If I was looking for a quick way out, I would have done it years earlier. But I have been on my deathbed far too many times and was bedridden for over 10 years. I had gotten to the point where I couldn't do anything for myself and I was tired. After making plans and putting everything in place. Not letting ANYONE know about them,I figured I had nothing to lose by trying it. I have a wonderful man who loves me and has taken very good care of me. I have a beautiful daughter and 3 of the most beautiful grandchildren that anyone could ask for.
I love life
I love people.
But I was tired and I had lost all hope

I bought some and waited for it to arrive but it was late. I had figured that it was just a scam anyway.
I was on my way out the door and going to put a end to it all
But what happened was ; IT WORKED. IT HELPED ME WITH THE UNRELENTING PAIN OF FULL BODY CRPS AND ORGAN INVOLVEMENT. 14 BOUTS OF OSTEOMYELITIS, SEVERE OSTEOPOROSIS AND A LIFE OF MISERY FROM THE PAIN. I DIDN'T WANT TO DIE!!! Especially at my own hands. It was against everything I believed in.
But what I found through kratom was- HOPE
HELP FROM THE DEPRESSION
A MEANS OF BEING ABLE TO ONCE AGAIN PARTICIPATE IN LIFE.

YES!! I still have bad days. Some of which I don't know how I can get through it
NO! There is no reprieve from the burning stabbing sharp shooting electrical jolts that feel as if I am being electrocuted from the inside out and my tissues are being seared together. But on the days in-between the flares.. KRATOM HAS GIVEN ME MY LIFE BACK.
I STILL CAN'T DO MUCH. BUT I CAN DO ENOUGH! I LAUGH AND SMILE SINCERELY
I HAVE PEOPLE BACK IN MY LIFE WHO HAD WALKED OUT OF IT.

I HAVE HOPE!

The incessant negative and false articles are disturbing and because of the false, smear campaign by the articles and other agencies- people who are looking to get high and determined to do so, try to use it, and try to mix it with lethal amounts of already deadly substances. The failed drug war is no place for kratom because millions of people are staying OFF OF AND AWAY FROM THEM through kratom.
Pure unadulterated kratom leaf, used in conjunction with the KRATOM CONSUMER PROTECTION ACT, ADEQUATE TESTING AND AGE RESTRICTIONS AND COMMON SENSE IS SAVING LIVES AND IT WILL CONTINUE TO DO SO IF YOU ARE NOT ADULTERATING IT, AREN'T SHOT IN THE CHEST WITH IT IN YOUR ROOM FOR A RIDICULOUS DEATH CONCLUSION. OR 8F YOU DON'T MIX IT WITH TOXIC SUBSTANCES LIKE COCAINE, METH, HEROIN, FENTYNAL OR OTHER SUBSTANCES SUCH AS THOSE... IT IS A VERY SIMPLE HELPFUL FOOD PRODUCT.
People need to use their heads and realize that there are some who just want to get high. Some can't help themselves and others are looking for a way to forget traumatic events in their lives. Our Veterans are another whole set of people who have been forgotten, suffering from PTSD, and multiple injuries.

Sent from my MetroPCS 4G LTE Android Device

Sincerely,
Dijon Evans
3242 6th Avenue

Sacramento, CA 95817

From: Carl Baehr
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Thursday, September 15, 2022 9:37:59 AM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me. Kratom is life saver for me. let me explain. when I was injured in a car accident years a ago I suffered from severe back pain. Kratom allowed me to work again and function without the risk of associated with pain killers! It literally saved my life! To make Kratom illegal is to kill more innocent people who live in pain everyday. Kratom tree is related to the coffee plant. If big Pharma told you they were going to ban coffee because it can cause high blood pressure how would you react? Its time to bring back common sense and remove big Pharma from the equation as they are a criminal organization!

Sincerely,
Carl Baehr
111 N Maple Ln
Burlington, WI 53105

From: kendell clark
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 1:01:52 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me. I've been taking kratom since december of 2019, initially to get off of the opioid and antidepressant tramadol, and now take it for management of pain from scoliosis. Kratom is not a dangerous plant and thus should not remain banned in wisconsin. I was involved in advocating for the ban's removal earlier this year when the KCPA was introduced into the house, only to fail when law enforcement and rehabs raised objections. All you need do is look at the science and the comments of advocates that are being sent to you to understand that. Also check out kratomanswers.org for current research. My intent is not to criticize the decision to ban but to try to get the ban undone. Lots of advocates in wisconsin who currently do not have access to kratom because of this decision. I also feel I should bring up the various kratom danger groups who will no doubt contact you over the coming weeks to claim danger. I can say without a doubt that their claims of death are false. Please listen to the science and the positive stories when making your decision about kratom's legality in wisconsin

Sincerely,
kendell clark
307 south washington street
grand saline, TX 75140

From: Seth Collins
To: Barr, Adam - DSPS
Subject: Kratom
Date: Friday, September 16, 2022 3:12:55 PM

CAUTION: This email originated from outside the organization.
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You guys need to look at all the benefits this wonderful plant has. People have been using this amazing plant for thousands of years. Nothing has changed but just more laws to ban stuff that is actually good for poeple. It has saved my life and a huge number of others also, this plant does so many good and wonderful things that no big pharmaceutical company has, that is why they are pushing to ban it.. because we arent giving them money anymore.. thats fine with me because kratom(plant) has givin me my life back. Its time to do whats right and end the ban and start saving lives.

From: David Martin
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 1:44:53 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about Kratom and why decriminalizing it means so much to me. I suffer from Lupus and do take doctor prescribed medications for Lupus. Even though I take my doctor prescribed medications I still have flare ups that case significant issues in my ability to function, dealing with exhaustion to pain. Kratom is a natural way for me to continue through my day when these flare ups happen. By choosing the correct type and dose I am able to manage through the flare up and continue working, thus keeping me a productive team member while working.

Sincerely David Martin

Sincerely,
David Martin
209 Williams ave
Daytona Beach, FL 32118

From: Christopher Allison
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 2:02:15 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

While I currently live across the border in MN, I went to high school in WI & my parents live there. I try to visit there with my son as often as possible. It really bothers me that the only treatment I've found to work on my otherwise debilitating Crohn's disease is illegal in WI.

I take Kratom about an hour before bed every night. I do not take enough to feel any effects that anyone would consider addiction-like behavior. A nightly dose is simply the only thing that properly treats my Crohnj's disease & has given me my daily life back. Before Kratom I was in considerable pain most of the time, could not travel certain distances in one day, and had to plan my life around making sure I was always close to a restroom. My nightly Kratom dose has done what no prescription drug (including medical marijuana) has ever accomplished.

If I do not take my nightly dose of Kratom, I will start to feel a return of my Crohn's symptoms within 24 hours. Sometimes I will intentionally stop taking Kratom for a period of time to make sure that I have not developed any unwanted physical addiction, but I want to do this in the comfort of my home, not when I am visiting my parents in WI with their grandson.

Sincerely,
Christopher Allison
64 MELBOURNE AVE SE
MINNEAPOLIS, MN 55414

From: Alexander Karp
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 2:19:33 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I have suffered from a degenerating disc since high school. I used physical therapy, a healthy diet, exercise, and chiropractic care to manage this pain. Even with this routine, I would experience 4-7 days of extreme pain every 1-2 years. As I became older these periodic pain episodes became more frequent and lasted longer.
During a particularly long 5-month pain episode I was not able to walk, sit, stand, or even lay down without excruciating pain. My doctor confirmed the pain was due to a worsening degenerating disc between my L5 and S1 vertebrae. I tried EVERY therapy, physical therapy, muscle relaxers, inversion, stretching, but nothing seemed to help. And my only option was to manage the pain and consider 'surgery' even though the success rate is 50/50 or worse?!
In order to manage the pain I had stopped playing all sports, I had stopped exercising, stopped going out with friends…this is when I started to get depressed, angry, and no longer envisioned a future I wanted to be a part.
In Dec of 2016 I heard about kratom because the FDA was urging the DEA to do an 'emergency scheduling'. 'Emergency' meaning the FDA and DEA would bypass the public review…this seemed very strange since kratom has been widely available for several decades.

After doing research about the pharmacokinetics properties of the alkaloids in kratom (my mom was a pharmacist), I tried kratom for the first time in 2016.

Kratom is a miracle!!!

When I consume kratom, my pain is reduced from a debilitating 9-10 to a 2-3 and I am able to get my life back! Exercise, yoga, spending time with friends and family! Not only does kratom help with the pain immediately, but it has allowed me to heal my back. 6 years ago I used kratom 3 times per day because my pain was horrible. Now, I consume kratom less than 3 times per week as needed when my pain flares up.

Regards,
Alexander Karp

Sincerely,
Alexander Karp

3169 Juniper Street
San Diego, CA 92104

From: Brandon Lage
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 3:30:24 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me. for years of my life I was put on many different anti depressants. nothing helped. until 2015 when I heard about kratom. I'm not on 6 different medications anymore I just take kratom once a day and that does it. kratom truly saved my life. I can be a productive citizen work a 9 to 5 job, take care of my family. I thank God everyday for showing me this plant

Sincerely,
Brandon Lage
1558 sw Wright pl
Troutdale, OR 97060

From: Jason West
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 3:37:38 PM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me. It has been very helpful in my life and saved my life I believe from chronic pain that was unmanageable with pharmaceutical medication. It has helped me avoid suicide and i think it has probably helped many others like me. Thank you for your time and consideration.

Sincerely,
Jason West
8179 W 123rd Terr
Overland Park, KS 66213

From: Thomas Roberts
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 4:40:31 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Finally I am able to sleep at night.

Sincerely,
Thomas Roberts
1324 Victoria St. N.
St.Paul, UM 55117

From: Jennifer Gillis
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 4:50:40 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.
I was diagnosed with Transverse Myelitis 17 years ago and with that I've also had to deal with the chronic pain that it has brought with it... I have used OTC pain meds (Tylenol, ibuprofen, Aleve), toradol, Pain patches,MS contin, for years as well as hydrocodone, and to be honest other things (some of them may or may not be legal) I've tried acupuncture and nerve blocks, electrical stimulation therapy, etc ..I started drinking heavily after about 10 years of dealing with my pain every single day.. only to realize that it probably not only made my pain worse,but it started becoming out of hand. My drinking started affecting my marriage and me being a good momma to my boys but before it got really bad I was lucky a close friend of mines mom had Crohn's disease and she'd been struggling with chronic pain she told me about this amazing plant. No lie I was VERY skeptical at first. A plant that can help... After hard core prescriptions weren't, I doubt it I was literally ready to try ANYTHING to stop the pain and just be able to do things with my kids! I remember the very first day I was absolutely amazed!!! Not only have I not wanted to touch any alcohol since I started drinking my kratom yes, but I am a better mom and wife because I'm not in constant pain and laid up in bed. I'm not in a constant state if depression because of the chronic pain. When you have something like Transverse Myelitis and have to deal with not being able to walk very far at all or sometimes not at all, having to wear depends everytime you leave the house, I will never be able to run or jump again for the rest of my life, and baby other things. Dealing with all of those things AND being in pain absolutely every day is something I hope you or anyone else in the world NEVER have to go through.
My husband and my kids are my entire world and I'm so thankful that kratom has helped me be able to live a better life. I hope that you take this to heart and know that there are MANY MANY more people who's story is so similar to mine and some even worse. Kratom is giving all of chronic pain sufferers a ray of sunshine to FINALLY have some of our lives back and not being absolutely consumed by chronic pain every day of our lives.

Thank you so much for your time
Sincerely,
Jennifer Gillis

Sincerely,
Jennifer Gillis
5137 Brunswick Rd

Arlington, TN 38002

From: Martin Bravek
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 5:22:35 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.
Kratom has saved my life and the lives of many peers. I was a heavy drinker for over 30 years due to some depression issues and and tried 3 times to quit which didn't work. I luckily found Kratom through a friend who told me about it. He was in a similar situation and it has helped him tremendously as well. i can happily say that i have been completely sober now for 7 years and i cintribute all of this to Kratom. But it also has a myriad of other benefits, as it is highly effective for aches and pains, anxiety and more. to illegalize it would mean to pull the rug out from millions of people who depend on it to fulfill their jobs and live happy and productive lives. Thank you so much for listening and truly hope you do take this into consideration when deciding on the future of this truly miracious leaf

Sincerely,
Martin Bravek
3500 SW 186TH CT
Dunnellon, FL 34432

From: Andrew Box
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 6:26:14 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I take kratom for back pain but the ban means I can’t travel to your state for work. I work in IT and computing and kratom has helped me tremendously to be able to sit all day at the computer without pain and without taking strong opioid drugs.

Thanks!

Sincerely,
Andrew Box
9200 marsh
Kansas city, MO 64138

From: Isaiah Moore
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 7:01:57 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me. I got into a pretty bad car accident about two years ago. I had some pretty bad neck and back pain from this, I received chiropractor care but It was often a couple days of pain due to appointment availability. I read about Kratom online and decided to try it as an alternative pin relief. I had more pain relief then Tylenol or Advils. I also felt better about taking it because it won't damage my liver due like other pain meds. I also feel better that Kratom is a plant and not some artificial pill. My neck and back pain have subsided since then but I still use it 1-2 times a week due to my line of work.

Sincerely,
Isaiah Moore
980 coulee trail
Roberts, WI 54023

From: Avery Sullivan
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 7:05:46 PM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Kratom has helped me with my OCD tremendously. I believe God has used this plant to help me. It has been such a blessing and I thank God quite a bit for blessing me with kratom. I hope people in your state will be able to be blessed with it like I have been.

With much love and respect,

Avery :)

Sincerely,
Avery Sullivan

Norfolk, VA 00000

From: Todd o Harris
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 11:39:56 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Kratom has helped me as an antidepressant for over 10 years. When all the medications failed to help this plant has worked. In that 10 years I have had no health problems despite many check ups with my doctor. I have stopped using it a couple of times with only mild discontinuation symptoms like trouble sleeping. I have heard so many other stories from other people about how this plant has helped them stop using much more dangerous opiates or alcohol. It is literally a life line for a lot of people. Kratom is much safer than so many legal medications and helps so many people. If you do not listen to our stories you are doing your community a great wrong.

Thank you

Sincerely,
Todd o Harris
2581 Southwest Pontiac Place
Stuart, FL 34997

From: Alex Fiorenza
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 11:01:52 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I suffered with an eating disorder for 16 years.. nearly half my life.. before finding kratom, binging and purging every day, multiple times per day. I tried everything.. in-patent treatment, countless prescription drugs, therapy. They worked as well as a cheap bandaid on a gaping wound. I would get a few "good" days and slip right back into old habits. I started going to church. And while that has forever changed my life, that too was not enough to stop my self-destructive behavior.

In the six months since taking kratom, my eating disorder symptoms have COMPLETELY ceased! The thoughts swirl in my head from time to time but I do not act on them. I have begun cooking and nourishing my body with good, plant-based foods, and I'm even a few weeks into training for my very first half marathon! My life, for the first time, feels like it's getting back on track.

I do not abuse kratom. I take a specific amount every 4-5 hours and this has not changed since I began taking it. This plant is my medicine. It has healed me like nothing else. I pray that no one takes this plant away from me and people like me. I don't ever want to go back to my old life. I can't go back.

Sincerely,
Alex Fiorenza
103 Webster Ave
Stratford, NJ 08084

From: Anton Gorodetsky
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 10:35:22 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I have had to deal with Chronic pain all my life pretty much. I cant hardly walk or stand for longer than 30 minutes and having debilitating pain down my wast and back all the way to my feet. I used to take Oxycodone for pain and then stopped because I didn't want to become addicted. I also have a very low tolerance level and took 1/4 of a 3mg pill one night and was sick the entire night and thought I had accidentally overdosed. So after that night I swore off "opiates". I had been trying to manage pain for years since with Naproxen to no avail until I heard about Kratom. This sir is a miracle plant. Not only is it natural but I can take just a small dose of 0.6 grams and be pain free for a few hours. Naproxen would barely touch my pain. Please don't let the people who are using Kratom responsibly ruin it for the rest of us. If Kratom ever becomes illegal and I can no longer take it, I don't know what I will do. To me, its either live pain free somehow, or death. So please don't take Kratom from us, and from the people who really do need it for pain alleviation. Don't let a few "miscreants" who don't know how to take substances responsibly, ruin it for the rest of us. I appreciate your time and attention to this matter.

Respectfully yours,

Anton Gorodetsky

Sincerely,
Anton Gorodetsky
1212 Fifth
Beverly Hills, CA 90210

From: Seth Collins
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 8:10:16 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.
You guys need to look at all the benefits this wonderful plant has. People have been using this amazing plant for thousands of years. Nothing has changed but just more laws to ban stuff that is actually good for people. It has saved my life and a huge number of others also, this plant does so many good and wonderful things that no big pharmaceutical company can, that is why they are pushing to ban it.. because we arent giving them money anymore.. thats fine with me because kratom(plant) has givin me my life back. Its time to end the ban and start saving lives.

Sincerely,
Seth Collins
4318 Golf Lane
Waterford, WI 53185

From: Tandy Byrd
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 7:36:57 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Hi. I'm Tandy Byrd, and I'm a 54 year old alcoholic. My father is an alcoholic, my grandfather was an alcoholic, and my great grandfather was an alcoholic....you get the idea.

I don't think it is an exaggeration to say that I've spent the majority of my life in pain due to my alcohol abuse. When I was drinking, I was in pain from the bad decisions I made, the damage I was doing to my body, and the hurt I was causing others. When I attempted to not drink, I was in pain from the incredible mental push to get to my next drink. There was never a day in 25 years that I was not in pain, in one way or another, related to my drinking.

I discovered kratom 4 years ago and began taking it to relieve symptoms of anxiety and depression, and it was some time before it began to dawn on me that my drinking had begun to decrease, and more importantly, it was happening through no conscious effort on my part. The ever-present mental pressure to drink had lessened until it is now absent. I am able, for the first time in my life, to have A sip of wine, A glass of beer, or indeed, to casually forgo drinking all together. This has been the closest thing to a miracle I have ever experienced.

I firmly believe, and there is much anecdotal evidence to support, that kratom is the cause of my relief from alcohol abuse. I'm happy to talk to you in more detail about the mechanism of how kratom has effected this change in my brain at a later time, but today I'm here to ask that this committee think of my story, and the other stories you're hearing, legalize kratom in your state, and further, to adopt legislation to keep kratom safe for those of us who use it.

I was born an alcoholic, and I am going to die an alcoholic, but thanks to kratom, I no longer feel that I will die BECAUSE I'm an alcoholic. Please think on how extraordinary and important this is for me, and might be to someone you love, and legalize kratom. . Thank you.

Tandy.

Sincerely,
Tandy Byrd
2006 Adeline St
Hattiesburg, MS 39401

From: Carolyn McCoy
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 7:06:44 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.
Kratom has saved me from a life of pain and depression. As a person who suffers from hereditary chronic migraines and overall body/joint pain, for decades, I went to every doctor/specialist and tried every pill, homeopathic and physical therapy. Absolutely nothing worked. Discovered kratom and it changed my life. Body pain is completely gone, and migraines are reduced to 2-3 a year. They were 5-6 days a week with debilitating head pain. I now am active, walk 3 miles a day, volunteer, have more energy and just feel great and happy each day!

Sincerely,
Carolyn McCoy
478 Rosemont Ave
Saline, MI 48176

From: Dusti Young
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Saturday, September 17, 2022 11:05:52 AM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.
On 3/25/21 my younger brother whom just turned 28 died after having a seizure from kratom use. He had been using kratom for 4 years for anxiety. Which the kratom made it worse. He lost a lot of weight and was sickly and moody all the time because of it. His tox report states that marijuana and kratom was in his system. Kratom was stated the cause of death. My comfort comes from bringing awareness the yes Krayom can and does kill. Please help to save lives and keep this banned. Thank you.
Sincerely, Dusti Young

Sincerely,
Dusti Young
403 n Dresden st
Rice, TX 75155

From: Rob Nixon
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Saturday, September 17, 2022 12:24:25 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me. My name is Rob and I'm 43 years old. I've had three back surgeries over the years. My first one was in 2009 when I was 30 and then had my second one a year later in 2010. Over the course of these 2 years I was prescribed opioid medications and became addicted. Doctors still continued to prescribe these medications for next 5 years until I stopped it my self. My need for these medications were affecting my job and personal life and it was time to do something. This is where Kratom saved my life.

A fellow co worker introduced me to Kratom and suggested I tried it for my pain and could maybe help get off the opioid medications that had serious side effects. After only a couple days the results were amazing. Helped with pain and didn't feel the need to use opioids. I felt like a new person. All my friends and family said I had that sparkle back in my eye that was missing for about 7 years. I felt great. Not only did it help with pain but it drastically reduced my anxiety and depression that was caused by my opioid use. My quality of life almost immediately improved. I never used opioids again!!! I drink one cup of Kratom tea in the morning and then again after dinner. Similar to having a cup of coffee.

Now fast forward to 2021 when I injured my back again. I had to have my third back surgery. Even though opioids medications were available to me again I didn't even use them. Kratom was all I needed!! This plant has truly gave my life back to me. I feel there is plethora of potential for this plant to make a difference in the opioid pandemic.

Please consider reversing this ban in Wisconsin. I currently have to spend time in Illinois to consume and acquire Kratom. I feel the Kratom Consumer Act is great for assuring the Kratom is not adulterated and not dangerous. Kratom is a very safe substance. I've been taking the same amount for about seven years and have zero side effects. So please seriously consider reversing this ban. Kratom has seriously saved life and I'm sure you will be reading a lot of similar stories. This plant can make a serious difference. Thanks for listening and reading.

Sincerely,
Rob Nixon
5113 Taylor Rd.
McFarland, WI 53558

From: Iris Antonietti
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Sunday, September 18, 2022 12:03:27 AM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I was a long time drug addict, and more specifically opiate/ heroin addict. I was incarcerated in 2017 due to selling drugs and offenses that go hand in hand with one another. Upon my release in '18 I was presented with an opportunity to start a suboxone regime from DOC, which I immediately turned down. I was successfully able to do this by the grace of this incredible plant.

Upon my release I was able to find employment and move my way up to management position. Worked there for about a year and then went back into the trade I learned before my addiction consumed my life. Which is fire protection sprinklers.

I got married, bought a new car, purchased a house, gained custody back of my son, raise two other children whom I consider my own, started a business of my own and stayed employed during the entirety of the pandemic. All of these successes were done during the time of the pandemic and even then it didn't stop or deter me.

I only bring these things up because I am a succes story and I owe a lot of this to this incredible plant and not allowing my addict mind and behavior allow me to cosign with the DOJ and just accept their offer of getting back on medically assisted treatment.

I would hope your really read my message and take heed to what I am saying trying to explain. This plant is not the problem and all the mis- information and stigma around this miracle plant is obviously presented for the pharmaceutical companies stigma. It needs to be controlled and dispensed in a manner that is safe for everyone including the consumers and strict rules and laws should be set in order to make this possible.

I hope what I am writing to you today is considered in your ultimate decision on decriminalizing it and allowing for safe consumption and practices. Thank you very much for your time and consideration.

Sincerely,
Iris Antonietti
2615 ne 166th pl

Vancouver, WA 98684

From: Samuel Andras
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Sunday, September 18, 2022 6:38:53 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Sincerely,
Samuel Andras
1600 Badt Avenue
Thibodaux, LA 70301

From: Nicky Jones
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Monday, September 19, 2022 1:33:47 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Sincerely,
Nicky Jones
458 Tenth St
Crossville, TN 38555

From: Nicky Jones
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Monday, September 19, 2022 1:39:13 PM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me. I have been chronic pain patient over 20yrs 4.5yrs ago they started forcing people off pain pills. I was in pain and withdrawal when I researched and found kratom. It helped me reclaim my life.was able to get off pain meds.it helped me get back to working out.it helped me live a better quality of life. Please unbanned kratom for the people that are suffering from pain and they are having to buy off the streets.and risk dying from counterfeit fentynl pills.the only side effects I had from kratom is constipation in 4.5yrs.the science that NIda is doin on kratom is showing amazing potential to help treat pain and help opiate withdrawal. Please adopt the kratom consumer protection act to help protect people from adulterated kratom.

Sincerely,
Nicky Jones
458 Tenth St
Crossville, TN 38555

From: wchamberlain11@yahoo.com Chamberlain
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Monday, September 19, 2022 10:18:20 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why it should be scheduled . My son died 8/30/2020 from mitragynine toxicity only . He had no other substances in his system. Please consider scheduling kratom .. It is dangerous and has no business being sold in gas stations, vape shops or online or in homes…

Sincerely,
wchamberlain11@yahoo.com Chamberlain
4884 NY-365
Oneida, NY 13421

From: Debby Sosic
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Tuesday, September 20, 2022 9:26:15 AM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.
Prior to the Wisconsin ban my neurosurgeon had me on so many medications including: hydrocodone, morphine, and a butrans patch. Even though my pain was excruciating & debilitating most times. I was always in a fog, at home, at work. I had a friend notice the difference in me and told me to try kratom. I knew I was never going to be pain free but, anything helped. So I went off all rx scheduled medications and used only kratom. With in a week it was like someone turned the lights on. I was so clear headed. It was an amazing feeling. I wasn't tired, or slurring my words anymore. I felt amazing! Everyone wanted to k now what I did to come off all this gross narcotics and told them it was kratom. Did it help my pain, depression, Yes & Yes.
God gave us this wonderful plant. I will say since Wisconsin has made it a crime to use or take it. I haven't found anything else naturally that comes close. Could I go back to my doctor and get all these dangerous meds again, yes. But why? Why is kratom even ph Crapola. illegal? I went days and days without it. It wasn't addictive for me. So when people say it is, that dosent make sense. It wasn't my experience with it at all.
Please feel free to contact me with any questions or concerns.

Thank you,

Debby sosic

Debisosic@yahoo.com

Sincerely,
Debby Sosic
1373 Meadowcreek Dr #1
Pewaukee, WI 53072

From: Aaron Ellebrecht
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Tuesday, September 20, 2022 3:59:01 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Sincerely,
Aaron Ellebrecht
5936 Spur Dr
House Springs, MO 63051

From: Thomas Barker
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Tuesday, September 20, 2022 6:34:51 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I have been a kratom user for the past six years, and I am concerned about your proposal to ban this supplement. I personally have only seen positive results from this useful plant, and I haven't seen any of the negative effects that the FDA is warning against. While using this plant I graduated college, started a career, and lived my life to the fullest. As you can see, I have used this plant to improve the quality of my life. By using this supplement, I have been able to naturally increase energy and reduce chronic pain from my arthritic ankle. Please, I request that you allow the people to have the freedom to improve their lives with this amazing supplement.

Sincerely,
Thomas Barker
6912 Moorfield Dr
Cincinnati, OH 45230

From: Alan Zgoda
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Tuesday, September 20, 2022 11:47:21 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

My name is Alan Zgoda, and I'm an alumnus from the University of Kentucky, with a Bachelor's Degree in Accounting with departmental honors.

I've had severe Crohn's disease since I was 10 years old (now 31). I've had three major surgeries, two of which removed parts of my intestines, and almost 10 minor surgeries. For almost thirteen years, I was experiencing excruciating pain and discomfort daily, having to go to the bathroom up to 20 times a day (not exaggerating), and I was severely fatigued to the point where only through sheer force of will did I avoid depression. I've tried just about every medication they have for the disease, including Remicade, Humira, Cimzia, Methotrexate, Asacol, Mercaptopurine and others that I can't even remember the names of. I was on-and-off of highly addictive, dangerous medications, such as oxycodone and various amphetamines which were prescribed for the pain and fatigue.

Over ten years ago from today, a friend told me about a plant commonly referred to as "Kratom" and suggested that it may help with my symptoms. About a month after I started taking Kratom, I was able to completely taper off all those very dangerous, addictive medications. A couple of years after that, I had to have surgery to remove scar tissue that had built up from my first major surgery, and to my doctor's and my own surprise, they said there was no sign of any disease. It was at this time where I was still smoking cigarettes, eating an unhealthy diet, and not exercising. The only thing that had changed was that I started taking Kratom.

I've now been in complete remission for about ten years. After my disease went away, I decided to go back to college for the aforementioned Accounting Degree. I graduated with honors and got an internship at a mid-level CPA firm. Thanks to my newfound health I was able to work hard enough that it turned into a full-time staff accountant position. During this

time, I was also able to pass all four parts of the CPA exam on the first attempt. I now have a great job, a nice apartment, a comfortable living, and work at a prestigious accounting firm.

After taking Kratom for just over ten years, I've realized it's essentially a close equivalent to coffee, but with some additional effects, including anti-inflammatory and mild pain-relieving effects. This plant has allowed me to be a healthy, normal person, whose now able to contribute to society instead of leeching from it when I used to need others to take care of me. Now I can not only take care of myself, but I can take care of my family, my newfound wife and add value to my community. Please do not take this away from people like me, there are a lot of them out there and we're just trying to live normal lives that would not otherwise be possible

Sincerely,
Alan Zgoda
1100 English Green Ln Unit 304
Louisville, KY 40299

From: Shelby Verdine
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 21, 2022 5:29:58 AM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.
I found kratom after I moved from Wi. I was being cut off my pain meds. I was in a wheelchair for 4 spinal treats. After finding kratom I am 90% pain free. I have energy and my life back with -zero high . I no longer need my wheelchair
. I've seen 1000s of lives change from it for the good. Its one of the safest pain relievers. I've been a user 5 years now. Please help Wisconsin change their ban. I have family and friends who would benefit from unadulterated kratom.

Sincerely,
Shelby Verdine
N922519th ct
Neshkoro, WI 54960

From: Mark Berkowicz
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 21, 2022 2:07:31 PM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

After a serious back injury I had become partially disabled and unable to work. I was in a wheelchair for months and in great pain. I developed a dependency on opioid pain medication that began to ruin my life in many ways. Most tragic is that these prescription drugs caused me to lose so much valuable time with my young children and my friends. I found Kratom approximately 8 years ago and gradually stopped taking the toxic and addictive prescription pain medicines. Kratom has controlled my pain better than the opioids did and Kratom gave me my life back. I'm once again a happy father and active member of society. My life has never been better since finding Kratom. Please remove the ban on Kratom so it can help Wisconsin citizens like it has helped me.

Thank you for your time and consideration.

Sincerely,
Mark Berkowicz
1 Switlik Road
Trenton, NJ 08690

From: Ryan Schulz
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 21, 2022 2:17:58 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me. I've personally been dealing with opioids addiction for most of my adult life, I have not take Kratom personally taking it but I have known people that have, this herb is life changing. From people dealing with pain, depression, and addiction, it would change lives for the better. Giving people who suffer another option other then alcohol and opioids.

Sincerely,
Ryan Schulz
548 West spring street
Waupun, WI 53963

From: Michael Gevedon
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 21, 2022 2:48:20 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I had stage 4 throat cancer. The cancer is gone but the pain medication they had me on produced a habit that I hated. I discovered Kratom and not only did it actually help with my pain naturally I no longer felt the need for the opiates.. banning Kratom 8s I e it the worst things you could do to people who are trying to get away from opiates. You REALLY need to reevaluate and look at the REAL science as 8t pertains to Kratom. Bans are a huge mistake. You really need to know this.

Thanks for your time
Michael Gevedon

Sincerely,
Michael Gevedon
7271 Battlefield Memorial Hwy
Berea, KY 40403

From: Michael Wright
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 21, 2022 2:53:04 PM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I currently use Kratom every day to control joint pain associated with an auto immune disease, Ankylosing Spondylitus.
The condition causes inflammation in my spine, pelvis and coccyx. Kratom has very high anti-inflammation properties. In fact, I suspect that because of the reduced inflammation, my overall health is greatly benefited from my use of this plant. Likely this is why big pharma wants to make it illegal, so they can synthesize, patent, and profit from it. At my expense.

Five years ago I could not sleep because of the pain. Nothing I tried offered by the pharmaceutical industry helped. I refused to use opioids, preferring instead to endure the pain than to be addicted to pills. Regular use of Kratom has completely alleviated my pain and I can assure you the only addiction is to that of feeling normal. Sadly, for me, feeling normal makes me a lawbreaker in Wisconsin. You have the power to change that. Please consider it.

Mike Wright
Washburn, WI

Sincerely,
Michael Wright
432 W 4th St
Washburn, WI 54891

From: Ashley Jakab
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 21, 2022 3:01:47 PM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Sincerely,
Ashley Jakab
13531 S Lamon Ave #202
Crestwood, IL 60418

From: Ragina Winkle
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 21, 2022 3:28:11 PM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Sincerely,
Ragina Winkle
210 4th St NW
Mitchellville, IA 50169

From: Dewey Bodenhamer III
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 21, 2022 3:34:58 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Sincerely,
Dewey Bodenhamer III
1325 Jonestown rd.
Winston Salem, NC 27103

From: Jackie M
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 21, 2022 3:41:50 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I'm a 26 year old and have been using Kratom for 4-5 years. I've been born with scoliosis and have been to chiropractors all my life to alleviate pain. I live with chronic back pain everyday and work in the restaurant industry. I found Kratom thanks to my uncle who also has severe scoliosis (and has had major surgeries including spinal surgery, a kidney transplant, facial reconstruction surgery and more). He was taking 10-15 different medications including dangerous opiates. He fell into a deep depression because of all the side effects from the pharmaceutical drugs he had to take. He found out about Kratom and did thorough research before trying it. Well today he is down to using only 5 medications and is completely off of opiates! He said he has never felt better. Unfortunately we have had a few family members pass away from opiate overdoses..my heart goes out to those with addiction and dependency. If only they knew about Kratom, they very well might be alive today. Kratom has saved my family members lives and my own. We are able to live comfortably and happy. As they say, "health is wealth". I no longer take crazy amounts of ibuprofen or even drink alcohol. Using Kratom has been life changing and I feel so much healthier than I have before. It breaks my hearts that the FDA would try to take away a life saving plant from people who suffer with chronic pain, PTSD, anxiety, depression, substance abuse, inflammation, etc. I believe whole heartedly we should be able to make the decision ourselves to live happier healthier lives by having the option to use this God given plant. I'll always support unadulterated Kratom. Thank you for listening.

Sincerely,
Jackie M
4 Phillips Trl
Greenville, SC 29609

From: Derrick Johnson
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 21, 2022 3:42:17 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I am a recovering alcoholic and cannot have addictive chemicals such as most pain medication contains. Kratom has helped manage my foot pain to where I can now walk for even extended periods of times now. I can keep up with my kids now. Sometimes without even a limp. Thanks to Kratom

Sincerely,
Derrick Johnson
6407 Ambrose Cir
Temple, TX 76502

From: Chris Easley
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 21, 2022 3:46:24 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.
Kratom has been a life changer for me. I was put on medications for anxiety and depression in my teens, which i took until my early twenties. The anxiety medication was impacting my daily life, making it difficult to work, so I decided to stop taking it. Unbeknownst to me, quitting this medication can cause seizures. I wasn't informed of this during years of it being prescribed. I had a seizure and hit my head on cement. This lead to brain surgery to stop a subarachnoid hemorrhage. Life hasn't been the same since. I was forced to start the medication again, and even placed on more medications; one specifically for seizures now. I was placed on disability due to the injury and how my medication made it impossible to work. Over the next 13 years, the medication list just kept getting longer and longer. More prescriptions to treat more symptoms. There had to be an end to this pattern. The human body can only take so much before it starts to fail. I began to taper myself off everything. Kratom has replaced all but one medication, with no side effects. I'm able to function without brain fog, walk and move with less pain, and feel myself again.

Sincerely,
Chris Easley
113 Oak St # 1077
Mount Vernon, TX 75457

From: Ryan Matthes
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 21, 2022 4:20:13 PM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.
This plant has helped me I. So many different ways. I was able to get off of pain meds and reduce anxiety.
Just from this one plant. It’s very important to people that know about it. If it was legal in our state. I’m sure it could help other people .
This is not something that can be harmful if taken in large dowses or mind altering. It has really helped me. I found out about it when I was struggling earlier in my life and found out about by traveling to another state for help.
Please consider this to be legal.

Thank you for your time.
Ryan

Sincerely,
Ryan Matthes
3403 Squire Ln
West Bend, WI 53090

From: Mary Decker
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 21, 2022 4:26:44 PM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Kratom has helped me more than the 15 medications (and many more that were discontinued or stopped due to ineffectiveness) that I was taking for all of my chronic pain and autoimmune disease issues. I suffer from 19 diagnosed conditions, and several more suspected that are not yet diagnosed. I was like a zombie on so many medications, I had memory issues, slept all the time and started to have organ swelling (liver and spleen) with no known cause, AND I STILL HAD PAIN.

With Kratom use, I still have some pain as before, but now I am awake, I was able to sit with my mom clear-headed, and I was able to administer her medications and keep her schedule etc the whole way until she passed, which was extremely important to me and I couldn't have done it without Kratom. I am NOT HIGH, or intoxicated, as my friend says, it's calming to my body and soul. Please continue to make this plant available to those who wish to utilize it, we need to support a Kratom Consumer Protection Act to keep this plant safe, unadulterated and legal. Banning it will cause millions of people to seek other ways of coping with their pain, addiction and anxiety including seeking street drugs, turning to alcohol and definitely a huge rise in suicide.

Sincerely,
Mary Decker
200 Poplar Dr
New Florence, PA 15944

From: Robynn Phalsgraff
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 21, 2022 5:00:53 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I have MS, fibromyalgia and PCOS. When I first started dealing with these things I was on a large amount of prescription medications. On top of that, my doctor had given me Vicodin and then oxycodone. I was literally just a zombie. I was so tired, and I couldn't do my job because of my prescriptions. But when I found kratom, I approach my doctors and my job and they approved of it. I was able to limit most of my prescriptions down, quit taking the narcotics, and go back to work.
Kratom didn't make the pain disappear, but it dulled it enough that I could survive and do things that I wasn't able to do before. It didn't make me feel like a zombie anymore, and it gave me my life back. It also has made my blood work better, my kidneys and liver aren't as stressed out, and I don't have a brain fog anymore.
Kratom gave me my life back. Pure Kratom is safe. And I know too many people who would end up going back to harder drugs then what I was even on if they have to stop taking kratom. And I don't want to see my friends turn into lifeless husks because they had to turn to harder drugs on the street.
Please look into this. Truly look into it. Listen to the people that take it and got their lives back. Listen to the addicts who are able to stop heroin, or other hard drugs and can now live their life again. Listen to the people with diseases who want to be able to do things that everyone else can do. Listen to the people who are tired of taking thousands of pills a year, and want to do something healthier with their bodies. Thank you.

Sincerely,
Robynn Phalsgraff
1797 Gless Ave
Akron, OH 44301

From: Greg Horning
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 21, 2022 5:17:00 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Sincerely,
Greg Horning
315 south broad street
Myerstown, PA 17067

From: Colin Senior
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 21, 2022 6:36:29 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom. I think if it regulated, it could be a miracle substance but more and more people Are becoming addicted to it. How do I know? I was. It was absolutely terrible detoxing off of it. Some have said this stuff is worse than heroin. Many have succeeded in quitting meth and heroin with kratom but only to be addicted to it. The opioid ban is absolutely insane! There are many people who really need it. But now these people like myself have been driven to alternative help. Many to the fentanyl poison and others to kratom. This can be a miracle of its well regulated but there are several groups on Facebook and Reddit dedicated to getting sober from this. I don’t agree with the ban of this but it does NEED to be regulated!

Sincerely,
Colin Senior
6622 Haven Forest Ln
Richmond, TX 77469

From: DeAnn Peterson
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 21, 2022 7:37:32 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I have a rare, degenerative neurological disorder that causes severe pain, muscle spasms, skin discoloration, and air blowing on my skin on a bad day feels like knives. I wasn't born here but where I'm from, kratom is legal and saved my life. I was being over-medicated by my doctors and spent many of my days bed ridden which, as a mom & wife, is humiliating and embarrassing. Those medications weren't therapeutic and I spent a lot of time being hospitalized for various infections. I heard about kratom from a friend and gave it a chance. It has saved my life. I became a productive member of society again and my pain & other symptoms were better managed than any doctor or pill had ever done. All from a plant. I'm the mom & wife my family deserves. I'm not constantly in and out of multiple doctors. I am ME again. Kratom has no known overdoses unless it's adulterated and it's affordable. Not having access to this plant causes so many people to seek out harsher drugs thus resulting in the increase in overdose deaths we're seeing in this state. I know that if you hear our voices and make the change to legalize kratom that we will be saving lives together. Thank you for taking the time to read my story. I hope you consider mine and so many others messages of hope they have coming from this natural plant.

Sincerely,
DeAnn Peterson
830 1/2 Stark Street
Wausau, WI 54403

From: Josh Howell
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 21, 2022 9:50:27 PM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I learned about kratom about 5 years ago, and began using it occasionally to help with sleep and reduce my use of alcohol. After a lot of experimentation with different strains of kratom, from various vendors, I have found this plant to be highly useful for reducing use/overuse of other prescription drugs (especially painkillers), alcohol, and to some degree caffeine. The biggest challenge with kratom is making sure you find quality vendors and learn which strains help with sleep, alertness/motivation, or pain. I don't manage chronic pain, so I have the least experience with kratom's ability in that area, but kratom as a sleep aid is where I have the most experience. Kratom for sleep has a very gradual effect and you have to be open to turning off the lights and going to sleep. If you are looking at a bright screen in bed, for instance, the light may be stimulating enough to counteract the peak of sleepiness from kratom and if you don't fall asleep at its peak onset, you may be awake for the couple hours as if you didn't take any kratom. The good thing about this is that you are not knocked out or blacked out light with sleeping pills or alcohol. If you fall asleep with kratom you will not feel any hangover or grogginess or lingering impairment that are often accompanied by sleeping pills and alcohol. I also means if you are woken in the middle of the night after using kratom to fall asleep, you will be very conscious and responsive with no mental impairment. The only symptom that you may have to deal with is a slight lack of balance, but this feel like a very physical symptom with no impact to cognitive function.

I have tried a number of extracts and concentrated kratom that have even more volatility in quality and strength and have decided using only the un-concentrated and unadulterated plant powder is the safest and healthiest. I have heard of people becoming addicted to kratom but I do believe this risk is much higher with highly concentrated extracts that can create dangerously high tolerances requiring higher doses over time.

Personally I have not experienced any form of addiction or craving related to kratom, and I often go days or weeks with using it with no withdrawal symptoms. I also get lab work done every 6 months and kratom doesn't seem to have any negative impact or liver function, blood sugar levels, or any other results in blood and urine. I believe the lack of addiction or negative health outcomes is influenced significantly by my choice to use only high quality plant powder rather than extracts. With all that said, I don't want to speak entirely for those who have used extracts without addiction or negative health outcomes. It is certainly possible, but I have not

tried enough extracts to make a full assessment as I have for the plant powder.

Sincerely,
Josh Howell
6901 Ranch Forest Dr
Columbus, GA 31904

From: brandon millard
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 21, 2022 10:48:10 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.
I've been using kratom for 3 years now for pain. I have 16 bulging disc's with multi level degenerative along with 5 possible types of arthritis and unable to get surgery cause osteoarthritis all along my spine!
Since they have removed opioid they have no alternatives to replace it other then depression meds that just cause more problems and kratom has no highs or lows I can feel normal and it helps reduce my pain down by 50% and has saved my life. I'm finally able to do more around my house and don't feel like I'm dying of a slow death. I also strongly believe kratom can change many people's life's without all the dangers of other drugs the Dr's push on us and I sincerely hope you will take the time to really look into the facts of kratom cause I absolutely hate needing to worry about what the Dr's are giving me and if they will make things worse. With kratom I've never even experienced any side effects at all and no highs like other drugs and without them im in unimaginable pain that most people could ever understand. With the removal of opioid they never had an alternative to replace it so please do the homework on kratom and give it some consideration and if needed id gladly give more insight in regards
Sincerely Brandon

Sincerely,
brandon millard
2945 w avalon rd
Janesville, WI 53546

From: Marcelle Morfin
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Thursday, September 22, 2022 12:35:48 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I am an Army veteran who injured my back on AD. I've since been diagnosed with spinal cord compression (cervical stenosis with myelopathy) along with nerve root compression (radiculopathy) and other painful health issues. The spinal cord compression was not caught early enough so it has caused some permanent damage and the nerve compression causes significant pain. I had surgery in March of 2018 in order to avoid becoming a quadriplegic and will require another surgery in the future for another problematic level of my cervical spinal cord. In the spring of 2017, I was on the edge looking down. I could not see living with the pain and limitations I was suffering from for another 10 years or more. I have lived with significant pain since 2006. The pain, along with depression and anxiety was causing me to seriously consider suicide. Just when I was about to give up, over the course of two days, I kept seeing people mention Kratom in one of my support groups. They discussed how it had helped to ease their pain. I decided to give it a try because at this point I felt I had nothing to lose. Since then I am able to be a mother, fiance, sister, and friend again. No, I am not made perfect by Kratom, but I have some quality of life back and no longer want to end my life. It has also helped ease my depression and anxiety and I am in better moods as a result. Kratom has changed my life for the better and allowed me enough relief from pain, anxiety, and depression to want to continue living. It has allowed me to be able to play a more active role in my life, rather than watching my life completely pass me by. Kratom has made this possible.

Sincerely,
Marcelle Morfin

P.S. I have family in Wisconsin I would love to visit but can't, due to this ban.

Sincerely,
Marcelle Morfin
1513 Washington Dr
Woodland, CA 95776

From: Aaron Kleiser
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Thursday, September 22, 2022 2:21:10 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.
I cannot even begin to tell you how much kratom has positively changed my life, and without my past use of kratom I would very likely not be alive today.
I first discovered kratom after nearly 10 years of being prescribed/taking heavy amounts of strong pain meds such as Morphine and OxyContin. After several accidental overdoses I decided I had to find another path or my life would surely be cut short. I had heard of kratom, but I never thought that a natural organic leaf would be much help at all considering the large doses of painkillers that I had been put on for many years. However this was not the case. I certainly had to be strong willed, but amazingly I was able to completely taper myself off of the painkillers without any assistance from doctors or a rehab facility.
This completely changed my life, and now I successfully use kratom as a replacement for the strong painkillers without any of the horrible side effects from the pain meds!
On top of that kratom success story, I've also been able to replace my antidepressant use with it, and also to stop the use of the benzodiazepines that I had been prescribed for much of my life!
Kratom truly is a lifesaver and a safe alternative to many other medications. Removing the kratom ban in Wisconsin will only help so many others as it does me, and will significantly decrease the amount of deaths in WI each year due to the opioid pandemic that's been ravaging our state for too long.
Thank you for reading my story, and I strongly beg of you to help the citizens of WI and remove this nonsense kratom ban! People should have the right to safely access this incredible natural leaf. Only benefits will come of this for the people of WI.
Please please choose to do the right thing for the people of your state, and do not listen to the nonsense being spewed out by the FDA and other ignorant politicians.
Thank you kindly,
-Aaron Kleiser

Sincerely,
Aaron Kleiser
6239 Trail Ridge Ct.
Oregon, WI 53575

From: Tiara sommer king
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Thursday, September 22, 2022 4:45:21 PM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me
My daughter was introduced to Kratom in 2016 when she was fighting cervical cancer. Her primary care doctor suggested she try Kratom to manage the pain and nausea from the treatment instead of traditional medications. At 10 years old our son was diagnosed with Irritable Bowel syndrome (IBS). He tried many pharmaceuticals with no relief. Due to the relief our daughter experienced, our son researched Kratom to see if it help with auto immune disorders. He found that in 2016 1.5 million Americans used Kratom to manage many auto immune disorders such as Irritable Bowel Syndrome and the symptoms associated.

For the last 5 years our son has used Kratom to relief symptoms which are associated with IBS such as bloating, nausea, and diarrhea just to name a few. My daughter, now 32 years old, has been cancer free and is raising two amazing young boys. Our son 26 years old, has finished his bachelor's degree in biology with a minor in chemistry.

We are thankful to the doctor that introduced Kratom to us and consider this plant to be a life saver to our family. We are regular people just trying to better our lives.

Thank you for your service, Sincerely Tiara Sommer King

Sincerely,
Tiara sommer king
59518 sunridge drive
new hudson, MI 48165

From: Tanner Hovland
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 23, 2022 4:48:18 AM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Back in 2010 when I lived in a different state I was diagnosed with Hodgkins Lymphoma and was given dozens of different medications to help combat all of the negative effects of the disease. These medications helped for a time but they stopped having therapeutic value and the side effects of these pills made the cancer treatment much worse.

Kratom was brought to my attention of my Healthcare team and I started to substitute it for the pills I was given. After a few weeks I was completely off all the pills and was only taking Kratom which gave me much more relief that the pills originally did with literally no negative side effects. I took Kratom for many years after I achieved remission and felt great.

I took a job here in Wisconsin and unfortunately Kratom here is banned so I had to give it up. Since I have been off Kratom for a few years now I can tell that my quality of life isn't as high as it was when I was taking it. I am hoping that this message will help to reverse the ban for Kratom.

Sincerely,
Tanner Hovland
1116 Ellis Ave S
Ashland, WI 54806

From: Kami Davis
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 23, 2022 4:58:10 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.
Hi there, my name is Kami Davis. I am a former nurse who suffered a bad accident that nearly killed me. It left me with several injuries and permanent debilitation. I have Fibromyalgia, Chronic Fatigue Syndrome, Degenerative Disk Disease, torn disks, TMJ, bursitis, several herniated disks spondylolithesis and ligamentous laxity. I also have PTSD. I wasn't able to enjoy life as a mother or caregiver for a lot of that time, due to negative side effects from medication, such as increased brain fog, lethargy, and drowsiness caused by some of these FDA approved drugs. I do approve of opioids also, however; not everyone can take them due to unwanted side effects. We need options for people, who are suffering in pain and fatigue.
I was homebound most of the time and could not participate in many functions. However, that all changed after I found Kratom, an herb grown in southeast Asia. I got my life back. It gave quality back in my family's life as well. Now, I can sleep better. I am not weighed down with fatigue anymore. My pain is well controlled. I have mental clarity, with zero change to my personality.
Instead of taking 30 mg of morphine a day, I wake up and stir 1 tsp of pure leaf Kratom Powder into hot bubbling water and make myself a cup of Super Green Malaysian Tea. Across this country, Kratom is saving lives.

Sincerely,
Kami Davis
2390 Nut Tree
Vacaville, CA 85776

From: Ronald Sizemore
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Sunday, September 25, 2022 3:35:05 PM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I'll keep this short and sweet.
I went from the typical opiate addiction to being a successful small business owner. I still deal with pain daily, but kratom makes it tolerable. After 6 years of daily use, I do feel as though I'm dependent, but definitely not addicted. I am as dependent on kratom as I am coffee. Please, for the sake of the citizens of the great state of Wisconsin, reverse this ban.

Sincerely,
Ronald Sizemore
333 Vicksburg Dr
Summerville, SC 29486

From: Renee Canfield
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 16, 2022 1:23:48 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me. With the help of kratom I have a quality to life that I couldn't even dream possible when I was taking Dr prescribed medications. I suffer with severe chronic pain hypothyroidism anxiety Barrett's esophagus pinched nerves sciatica pain depression chronic kidney disease PTSD and arthritis all through my body. I've had so many surgeries and procedures that I'm a living raggedy Ann - all stitched together. I was basically bedfast and using a walker to walk and with the help of my last surgery and kratom I'm now a contributing member of my community again. I now teach anyone that wants to learn how to grow veggies herbs and flowers in an inner-city community garden and flower beds that my husband and I helped start. This year makes 5 years since we started the community flower beds and garden, I especially love to work with the kids. I love the life I have now and can't even imagine what would happen to me if I didn't have kratom to help me control my pain. Kratom is not a cure or fix all but it's a huge help. With kratom I love the fact that I'm clear headed and can concentrate and that's definitely not something I could say when I was taking my Dr prescribed medications. I went from suffering and suicidal to a happy woman. Even my Dr is impressed with how much healthier and happier I am with the help of kratom. Please give others a chance to see if kratom can help their lives the way it helps mine and regulate kratom instead of it being banned. Thank you for your time

Sincerely,
Renee Canfield
129 W Walnut St Apt D
Lancaster, OH 43130

From: Matt Maloney
To: Barr, Adam - DSPS
Subject: Kratom legalization
Date: Friday, September 23, 2022 12:23:17 PM

CAUTION: This email originated from outside the organization.
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Hi Mr. Birr. I am writing to ask that your committee please consider making the purchase of kratom legal in Wisconsin. I am a person diagnosed with multiple sclerosis, and kratom helps with my anxiety and muscle spasticity brought on by my condition. Wisconsin is one of only a few states that doesn't allow the purchase of kratom, and it would be most helpful if I didn't have to obtain it from outside the state. Thank you in advance for your consideration. If you have any updated information as to the status of your probe into this matter, I would be pleased to hear it. Kindest regards, Matt Maloney

From: Megan Heldt
To: Barr, Adam - DSPS
Subject: Kratom saved my life!
Date: Saturday, September 17, 2022 12:58:53 AM

CAUTION: This email originated from outside the organization.
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Hi, Mr. Barr.

When I was between 11-13 years old I had some very traumatic things happen to me. I started having daily back pain when I was 14 and developed severe depression around that age because of those traumatic events. I have struggled to find something that would help my chronic pain and make me more productive physically and mentally (I know that I can be) but it seemed impossible. Until I found out about kratom when I was 27 years old. 13 years after having this pain and trying a multitude of different pain killers. Every over-the-counter drug you could think of and I even ended up down other bad paths due to the drug I needed to subside my constant, dibilitating pain. Kratom is the best thing that has ever happened to me and my life. Many others also! I hope that you consider our personal experiences.

From: Ryan Brocci
To: Barr, Adam - DSPS
Subject: Mitragyna Speciosa saved my life.
Date: Saturday, September 24, 2022 9:43:56 AM

CAUTION: This email originated from outside the organization.
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Hello sir,

I have been informed of a ban on the plant, Kratom, in Wisconsin. Please understand that this plant has helped many including myself, get completely away from pharmaceutical pills with horrible side effects. I was prescribed an anti anxiety medicine but after a year it was giving me a horrible rash and I could not sleep without it. There wasn't any hope until I gave Kratom a try for the sleep and uncomfortable withdrawal from the medicine. In summation, it worked, and the side effects of Kratom ie addiction potential are bounds and leaps underneath your least addictive pharmaceutical.

Do not take from the people, access to a plant that has been used for centuries by the natives of Southeast Asia. No human population would've continued use of a harmful herb, that just goes without saying.

Kratom has never been proven to been ANYONES cause of death. It's addictive potential is on par with coffee.

Thank you for considering other ways to help the people be safe, perhaps education but no outright ban ever has worked in history, you and I know that... it is an inalienable right given to all people that they have access to every part of nature in order to heal, as we are of God and he did not put all of these amazing medicines just for the states to start 'Banning' them.

From: Collin Malone
To: Barr, Adam - DSPS
Subject: Mr. Barr, please read.
Date: Wednesday, September 21, 2022 9:27:03 AM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I could talk about personal freedoms but instead I'll tell you about a friend.

I had a friend die from a drug overdose a couple years ago. I hadn't seen him in a couple years and one day he was gone. Another victim of the opiate crisis. I was shocked. Dead in his 20s.

Restricting access to opiates didn't help him. He died from it. But what if there was something else there for him that people in 40 some states have? Something that has proven to help addicts. Something where don't have to jump through a series of hoops and expenses of doctor visits or the stigma of getting help. Something they could get from a corner store in a moment of wanting to be clean. Something to at least give them a CHANCE at life without playing Russian roulette with deadly drugs laced with even deadlier drugs from China and Mexico. Something that didn't make them a criminal. I don't know if that friend would have switched to kratom. I never will and that's what bothers me. If he didn't live in the state of Wisconsin would he have found out about kratom and be alive? I have no idea. But I'm sure it's the case for at least one life somewhere and that's enough to bother me. Right now if someone were to be caught with kratom in Wisconsin they're going to be charged like they would with other drugs. That makes it less appealing to addicts and that's a problem. There needs to be a less deadly substance with some appeal. In a society that allows you to get as drunk as you want, and be prescribed as much medication as a doctor feels you need it is just plain ridiculous to think we cannot handle kratom. I'd rather every addict be consuming kratom and living than doing drugs and dying. Please choose to do the right thing. Please don't let anyone else wonder if kratom could have saved their friends life if they lived one state away. I've contacted my local politicians and they cannot deliver. I hope that you can.

From: Dr. Heidi Sykora
To: Barr, Adam - DSPS
Subject: Protect Kratom
Date: Saturday, September 24, 2022 9:15:10 AM

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Dear Mr. Barr,

I am writing to share my personal story of how beneficial Kratom has been in my life.

In 2015, after a 15-plus year career as a healthcare executive and nurse practitioner, I was forced into retirement by overwhelming pain and physical disabilities. I was routinely experiencing severe pain, fatigue, gait instability and the inability to even stand for very long. After extensive specialist visits, I was diagnosed with several rare congenital disorders including Chiari malformation, a tethered spinal cord, and Ehlers-Danlos hypermobility.
For years, I couldn't find a tolerable way to control my pain and fatigue. I am extremely drug sensitive, so even over-the-counter medications produce too many side effects. Even after major brain surgery, I was only able to tolerate the prescribed opioids for about a week.
Finally, my adult son recommended I take kratom to improve my deteriorating situation. The result was life-alerting. I like to say that I gave him his life, but he gave me mine back. Although I still experience fatigue, my overall comfort level and quality of life has increased remarkably since consuming kratom and I don't experience the side effects I have with most medications.
Currently, kratom is illegal Wisconsin. The effect has been a hardship for me and my family. I spend half of my time in Illinois away from my husband so I can legally consume kratom, which allows me to stretch and exercise, leading to reduced injuries and improved well-being.
Recent research has shown that kratom has a considerably lower potential for abuse than drugs like opioids. In order for Wisconsin to prevent kratom products from being sold with adulterants like fentanyl, it is critical that regulation is introduced to protect kratom consumers, not bans or criminalization.
I implore the Wisconsin Controlled Substances Board to re-evaluate based on the findings of recent kratom research so they can truly help people who are still struggling like I was.

I fully support the Kratom Consumer Protection Act to ensure safety, quality and access. Please feel free to contact me if I can be of any assistance. You can reach me at this email or call/text my phone 262-573-7848.

Thank you for your consideration.

Regards,

Heidi

Heidi Sykora GNP, DNP
2321 Ridgewood Rd
Grafton, WI 53024

Sent from Mail for Windows

From: Seth Collins
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, October 14, 2022 5:32:34 PM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.
You guys need to look at all the benefits this wonderful plant has. People have been using this amazing plant for thousands of years. Nothing has changed but just more laws to ban stuff that is actually good for poeple. It has saved my life and a huge number of others also, this plant does so many good and wonderful things that no big pharmaceutical company can. This plant has givin me my life back. Its time to end the ban and start saving lives.

Sincerely,
Seth Collins
4318 Golf Lane
Waterford, WI 53185

From: Carolyn Emerick
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Tuesday, September 27, 2022 6:57:31 AM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

There is so much to say. It's a well known fact that autoimmune conditions as well as conditions that medical science does not understand nor know how to treat are on the rise. I was diagnosed with RA and fibromyalgia which cause severe all over body pain. Because of the opioid epidemic, doctors deny me pain relief. This is a whole other topic itself! Kratom was available to help ease my chronic pain so that I could have some semblance of a normal quality of life back.

During the covid pandemic, I was traveling abroad where Kratom is banned. Ironically codeine was available over the counter there. I didn't WANT the opioid, especially as it came mixed with acetaminophen which destroys the liver. But that's what their government would give me.

Furthermore, having had taken it for years I can tell you that any light euphoria is no different to a nicotine hit or caffeine lift. In order to get anything more than that, the dosage causes nausea before any real "high." So people who take it for pain (which seems to be 99% of us!) limit our dosage for that reason.

And it bears saying that people have sought highs throughout history. We are just tail chasing if we think we can legislate this desire out of people. It's not the government's business what adults do in their homes to relax, to ease their pain, to unwind at night. As someone who used this herb for years for pain relief (also for the energizing effect and sedative effect of different strains which are crucial for managing fibromyalgia which causes fatigue and sleep disturbances), I can promise you that alcohol affects the mind FAR more than Kratom can. I would not feel unsafe behind the wheel or with someone else behind the wheel who had used Kratom for pain that morning. The hype is exaggerated enough to make your eyes roll if you know anything about it! Except it's more than an annoyance when people's quality of life is at stake.

Sincerely,
Carolyn Emerick
1092 Farnsworth Rd S
Rochester, NY 14623

From: Laurie Bellino
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Tuesday, September 27, 2022 7:13:30 AM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

This product has helped my husband for years of relieving his back pain that he suffered from an injury at work when he was just 20. It's all natural and it's non addictive. Whatever these doctors are telling you is b*******. My husband can be off this for months and not get a craving for it. He only takes it when he needs it to relieve his pain. It's not like these prescription drugs that doctors push on people that not only cost hundreds of dollars, but are very addictive as we have seen in the news with the Perdue Pharma settlement. Stop being a pushover to these pharmaceutical, medical doctors, health insurance companies that are trying to make a buck and not care about the people that they serve. I know I've gone to the doctor and they don't give a s*** about their patients like they used to. All the good doctors are long gone and have passed away and that goes for dentists as well.

Sincerely,
Laurie Bellino
22710 Cash Rd
Harvard, IL 60034

From: Keith Pascuch
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Tuesday, September 27, 2022 7:30:43 AM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I found Kratom in 2011 in lieu of opioids. I saw the damage first hand in family and friends what Rx and illicit opioids can do. I was over 300 lbs and suffering from 2000-2011 with severe Degenerative Disk Disease. I used OTC meds only and they caused even more problems. Advil damaged my kidneys. Tylenol damaged my liver. Aleeve damaged my stomach. I was using all my sick time as a teacher. On 12\16\2011 I received my first order of plain leaf Kratom tea and brewed up a cup using quality resources on how to use it. Within 30 minutes my back pain diminished significantly. I thought this was just temporary. How could this be I thought. I began drinking a single cup of tea at 6am and 6pm. From that day forward life changed forever. I put a full gym in my home and I was able to exercise and work out like I used to. I am now 179 lbs and in the best shape of my life at the age of 50. I am still a NYC school teacher and have not taken a back related sick day since 2011. Although I do not live in Wisconsin, I know a lot of people that could greatly benefit from Kratom being legal and available in your state. Things like the Kratom Consumer Protection Act (KCPA) are what's needed to keep it safe. Advocates have literally been begging the FDA to regulate it for safety but all they do is refuse, and circulate fear mongering information, trying to scare people into not using it. Plain leaf UNADULTERATED Kratom is perfectly safe. I do not support extracts or gas station shots. I do support cGMP compliant vendors and products. The ban in Wisconsin must be overturned. Please listen to your constituents and #KeepKratomLegal in Wisconsin. With all the deadly illicit street drugs out there, Kratom is a way out. I have seen thousands of people get off deadly opioids all while using this tea responsibly.

Thank you for your time,

Keith Pascucci

Sincerely,
Keith Pascuch
11 Jackson Ave
Scarsdale, NY 10583

From: Dylan Baker
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Tuesday, September 27, 2022 9:58:25 AM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me. Kratom saved my life from pharmaceutical opiates benzodiazepines and alcohol if this plant had not been around to help me taper off of drugs I would still be on them most likely and even more likely I would be dead with this entire opiate and fentanyl crisis. You would be saving hundreds or thousands of Young lives by making a less harmful substance that cannot kill you legal so that people will not take more harmful substances like pharmaceutical narcotics or heroin which are destroying our country.

Please respectfully legalize create them for the greater good of the people of Wisconsin if we have more dangerous drugs out there already it can't hurt to try and see how it helps people. Or talk to direct consumers of the product.

I honestly do not know if I would be alive today if it Kratom didn't save my life. Please a Ford other human beings that luxury don't make a possible medicine for The People and illegal and bad thing it will only hurt them more and cause them to use more hard-core other drugs.

I'm how much happier sober person now,
Dylan

Sincerely,
Dylan Baker
1001 University Ave
Madison, WI 53715

From: PETER BARTOLOMEO
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Tuesday, September 27, 2022 10:22:12 AM

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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Sincerely,
PETER BARTOLOMEO
6254 magnolia dr
CHINCOTEAGUE, VA 23336

From: Sue MCMANUS
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Tuesday, September 27, 2022 11:48:35 AM

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Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I am been taking kratom since 2017. I am a mom of 3. I am a grandmother of 3. I have worked as a nurse, a computer tech and studied as a software engineer.

In 2005, while hiking in Mexico, I fell and hit my shin. I was dx'd with CRPS, the worst pain known to medicine. I became housebound. I couldn't lay down. I lived and slept in a recliner. I could barely walk. The pain was excruciating. I took 5 kinds of RX meds for pain -morphine, methadone and gabapentin.

At one point in 2014, I almost died from my Dr prescribed medications. I took my meds exactly as prescribed. Yet I still had issues when having a stent surgically placed. I quit breathing and ended up in ICU incubated for days. I knew then I had to find another way to survive my pain.

In 2016, I moved from CO back home to FL. and tapered off my meds. I was lucky to find kratom. I have been taking it since summer 2017. Since then, my pain is mostly down by half. My head is clearer. I can carry a whole conversation. I sleep in a bed instead of a recliner. I can walk at least a mile a day. I can do my writing, painting and crafts again. Kratom certainly has not taken 100% of my pain away but neither did opioids. The difference is I am not in a stupor and passing out mid-sentence or take dangerous chemicals or have to worry if I will die from an opiod overdose. I feel I more like myself again.

Kratom has given me my life back. I can have plans for a life and finally, after years of hardship and pain, I have hope again. Please allow chroni. pain patients in Wisconsin the ability to choose.
Sincerely,
Sue McManus

Sincerely,
Sue MCMANUS
829 camellia dr

Melbourne, FL 32901

From: Christopher M BROWNSBERGER
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Tuesday, September 27, 2022 2:33:26 PM

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Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me. Kratom is a helpful but harmless herbal remedy for physical discomfort. It's demonization is misguided and undoubtedly strongly related to it being quite effective and diminishing the market for pharmaceutical drugs.

Sincerely,
Christopher M BROWNSBERGER
3201 S 147th East Ave
Tulsa, OK 74134

From: Keith Pittatsis
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Tuesday, September 27, 2022 2:49:43 PM

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Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

First off, thank you for your time for reading this. We're literally surrounded by states that have kratom legalized. For common sense reasons this causes problems with law enforcement and citizens who are just trying to live a healthier lifestyle.

I was diagnosed with testicular cancer in 2015 and got addicted to the pain medication after the surgery and became suicidal. I sought help within months and was then prescribed to suboxone. It did help for the time but it didn't help with the pain and it was very difficult trying to wean off the suboxone because of withdrawals.

I had learned about kratom and finally purchased some and it helped me to get off of the suboxone without any issues. I did not get addicted to the kratom or go through any withdrawals from the kratom either. It helped with the pain and helped ease the withdrawals and helped me mentally also.

Currently i do not take kratom every day. I take it from time to time when my pain gets bad. This botanical has helped save my life and countless other people's. Keeping kratom banned in Wisconsin will only cause more harm to everyone. Especially for people wanting to live a healthier lifestyle outside of the pharmaceutical industry which is a trap anyway to keep you sick and coming back for more treatment.

Also since the opioid epidemic, most doctors won't even prescribe anything that helps with pain. Where does that leave people who are truly hurting and suffering? I know first hand it leaves you suicidal and that's not good for anyone especially if you go through with committing suicide.

Kratom is natural and part of the coffee family. It's absolutely ludicrous to ban something that helps so many people and gives them hope when the medical system has failed them. Please consider my words and my testimony. Thank you so much again for your time.

Keith

Sincerely,

Keith Pittatsis
14458 county road m
Suring, WI 54174

From: Nick Pittatsis
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Tuesday, September 27, 2022 3:39:11 PM

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Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.I have spinal pain&other health issues &was on opiates for years.A few years ago some family&friends in Illinois informed me to try Kratom&I am completely opiate&drug free to this day because it is legal in almost every other state.We live in the United States of America but I have to go to Illinois,Michigan or Minnesota to buy Kratom for my health &it is a huge hardship&one that I cannot endure for much longer&may need to move out of state to receive the same rights as them.That is just wrong.Please give us the same rights &freedom that our so called 'United'other states have.It is so unjust to keep it criminalized here in Wisconsin.Thank you for helping the people of Wisconsin share in the same benefits/rights/laws as our neighboring states.United we stand or divided we fall.Thank you Mr.Barr for defending the defenseless&truly doing a great service to the people of Wisconsin by the decriminalization of Kratom like our neighboring States&fellow Americans enjoy. Sincerely,Nicholas A.Pittatsis Jr.

Sincerely,
Nick Pittatsis
415 N Mill St
Suring, WI 54174

From: Elizabeth Cornell
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Tuesday, September 27, 2022 5:51:15 PM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

I implore you, despite what Mitragaia, The American Kratom Association or any Kratom support group has to say, donot to decriminalize it. Kratom is not only ineffective and unsafe, and again despite the claims of proponents to the contrary, is highly addictive and according to many, more difficult to get off of than benzodiazepines and opiates, and has caused many deaths. Basically, like every other addictive and lethal drug and I say this from personal experience, KRATOM DESTROYS LIVES.

If you would like to read some direct accounts of its dangers please checkout a support group that I participate in called "Quitting Kratom, Addiction Support" by clicking on the following link:

https://www.facebook.com/groups/129777827629141.

This is only one of many support groups on Facebook dedicated to the thousands who are desperately trying to get their lives back from the horrendous mental and physical damage they incurred as a result of the trust they placed in the hollow and misleading claims put forth about its so-called benefits. I am sure that after reading the many horror stories you will find on these pages you will agree that there are no benefits to it whatsoever and that the only choice you have in order to protect the health and safety of the people of your state is to make sure that its illegal status remains intact.

Thank you very much for your attention to this matter.

Sincerely,
Elizabeth Cornell
1447 17th St.
Santa Monica, CA 90404

From: Mitchell Demarte
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 28, 2022 12:50:43 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I have been taking kratom for approximately six years now. I began taking kratom after a car accident when I was in great deal of pain. My Dr. prescribed opioids, which I did not want to take for various reasons, addiction, moodiness and what it does to your body.

I researched kratom and found the dependency level was low (caffeine) and it has no side effects. I continue to take kratom for mood enhancement (better than the prescribed pills) and pain relief when needed. I would much rather take a natural product then Tylenol or Ibuprofen, which both have had recalls and are bad for your stomach.

The FDA is backed by BIG Pharmacy money and will do whatever it takes to push their agenda, not do what's best for the American People.

Regards:

Mitchell Demarte

Sincerely,
Mitchell Demarte
PO Box 446
Loomis, CA 95650

From: Christine Wilds
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 28, 2022 1:06:48 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.
Due to a service- connected injury (I'm a disabled Veteran) I've been living life in a world of pain you never knew existed, and can't wrap your head around, but Kratom helps! Because of the CDC's opioid guidelines, pain management in the U.S. is run by the DEA, and I'm under medicated for my condition, I'm allowed 4 opioid pills a day. Before Kratom, one pill would be effective for about three hours. Now that I've found Kratom's Red Maeng Da strain, I can get up to five hours of relief. This miraculous plant from God, Kratom, has improved my quality of life! This plant has been used for millennia by indigenous peoples for medical and relaxation purposes, and the American Kratom Society has ensured safe access in the United States for some time now. What knowledge or expertise has given legislators authority to ban a God given plant that has done nothing but help people? What knowledge do legislators have of being disabled with with relentless, debilitating pain? Would you care to attempt walking a mile in my shoes? Legislators have done enough damage to our hidden population, trapped in agony by unobvious disability with across the board regulation of opioids prescriptions that has done nothing to end the "opioid crisis," except turn it into a more deadly fentanyl crisis on the street and a suicidal crisis in the legitimate pain community. Please don't ban another natural substance with the God-given power to help us all.

Sincerely,
Christine Wilds
2309 Forest View Ln
Wilmington, NC 28401

From: Sean Roberts
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 28, 2022 3:01:16 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I know you may be wondering why someone so far away I even concered with the state of kratom in your state. The reason is simple. Kratom means alot to me and I can't stand the idea of anyone in our country not having access to it.

As someone who has taken it for years and knows plenty of other people who have done the same, I have never heard anything but good experiences with it. For me it started as a way I could battle an addiction on my own terms and it worked! Then shortly after that I began to see all kinds of other ways it helps me besides just that.

For instance I've always had trouble getting up in the morning. I would over sleep and have the worst starts to my days. Take a little bit of kratom in the morning like you would have coffee and suddenly I had no issues with mornings anymore. Another reason is pain management. I've worked in restaurants my whole life so I regularly experience pain from long and strenuous hours. A different type of kratom helps me with that.

I could go on and on but I won't take up anymore of your time. I stand by kratom and the science behind it. All I'm asking from you is too open your mind and hear the other side to kratoms story and decide the truth for yourself.

Thank you for your time

Sincerely,
Sean Roberts
1311 W 18th Ave
Covington, LA 70433

From: Elliott Mevis
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 28, 2022 7:32:49 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Executive Director Barr,

I am writing you today to express my concerns related to a longstanding, statewide ban on a particular plant by the name of Mitragyna Speciosa.

I will cut right to the chase by letting you know this plant should NOT be banned in this state (WI), or any state for that matter. I know people may not seriously take into consideration just how many are in one way or another addicted to opioids and opiates, and the difficulties they have kicking their habit. I graduated high school 12 years ago and have known more than one person within a close circle that have passed away from overdoses in my city of Appleton, WI. If they knew about this plant that could have given them a lifeline and second chance, their untimely deaths may not have taken place.

Knowing about the plant is one thing - having access to it is another thing. I know people in the United States that use this plant safely with minimal issues. It has many beneficial uses being proven by science and I truly hope that you folks find good reason to reverse the current ban on this plant.

If people support this plant, in turn, they will be saving lives. I truly hope that my concerns on this matter are heard.

I am more than willing to take phone calls from anyone who may have any questions on the topic or who would like to hear my story.

Thanks for your time.
Sincerely,
Elliott Mevis
920-470-7523

Sincerely,
Elliott Mevis
214 south rankin street
appleton, WI 54911

From: kyra p
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, September 28, 2022 8:52:40 PM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

My name is Kyra. I'm 47 years old. I'm a professionally licensed massage therapist with 20 years of experience. I'm a productive member of society who helps heal people and take away their pain, tension and other negative effects. Sometimes I even keep them from undergoing needless surgery or taking harmful medication.

I started using kratom in 2016. I was informed about it by a friend who told me how much it helped her. I suffer from depression, insomnia, anxiety and migraine headaches. Kratom has helped me greatly manage these symptoms.

I don't drink or do drugs. I have no need to get high. I use kratom medicinally, and I'm not addicted to it. I take a small amount of it once per day.

I firmly believe that it's my right to decide what goes into my body. People are killing themselves and/or destroying their bodies with alcohol and cigarettes, which are legal and readily available everywhere. I believe that the individual should be punished for any crimes related to what they consume, and not the public. It's very difficult for me to imagine anyone on kratom doing destructive things, as its effects are more like an energy drink or caffeine, things that are obviously also legal and widely consumed.

Banning kratom is something I'm firmly against, and a decision that would hurt millions, both directly and indirectly. I do not want to even think of a life without kratom. It would severely hurt me, and make me less efficient at doing my job, which helps others to also be more productive.

At this point, my life would not even be worth living without kratom. I'd gotten to such a low point in 2016 that I was considering suicide. I then was timely introduced to kratom, which helped turn things around for me and spared my loved ones and massage clients a lot of pain. If kratom is banned, I fear I would go back to the path of potential suicide.

In my opinion, kratom should be readily available to anyone 18 years of age or older. It is a natural leaf, and has a myriad of health benefits (both mental and physical) which I've experienced firsthand. I believe denying it to the public and making productive members of society criminals for its possession is both wrong and unfair.

Thank you for your consideration. I respectfully ask that those involved in decision-making educate themselves about kratom, and review some scientific facts before simply dismissing it without no thought.

Kyra P.

Sincerely,
kyra p
no
athens, GA 30605

From: A. Boynton
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Thursday, September 29, 2022 2:30:30 AM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Kratom has helped me recover and also live with some elements of intractable chronic pain. Literally a godsend when I was near to suicide after my doctors admitted they had reached the end of ideas on how to improve my condition. Now I no longer have so much pain that took so much of a toll on my life for many years.

I believe that some botanicals have a very useful role for humans to utilize. They are long recognized as such by cultures going back for many many years. While newer medical interventions also have their place in advancing health, complementary use of natural traditional treatments gathered from our natural world do as well. So that is how I maintain a better quality of life-through a balance of those two approaches, that each have something to offer.

Removing access to one type of option for care does and will be deleterious to individuals' health who might someday find use in such supplements and from those who currently do.

Please grant and/or preserve access to such options for those who have or may someday need access to them.

Thank you.

Sincerely,
A. Boynton
1181 Medley Grove
Colorado Springs, CO 80921

From: Shaw Daniel
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Thursday, September 29, 2022 7:11:45 AM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

6 years of daily Kratom use has kept me pain-free and also allows me to manage anxiety attacks. It is simply a leaf from a tree that's been around for thousands of years. My dose has remained the same, unlike pain medicine... If I started taking pain medicine 6 years ago, my milligram dosage would be through the roof.
My organs are healthy, pain manageable, and it's a leaf from a tree, not an opiate derived from other countries where wars happen over it.
Sincerely,
Daniel

Sincerely,
Shaw Daniel
7617 13th Avenue
Brooklyn, NY 11228

From: Nathan Hokit
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 30, 2022 5:40:25 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me. Hello my name is Nathan I just wanted to tell you about how Kratom saved my life. I was a volunteer Boxing Coach for at risk youth, it was a fantastic time I would work my 10hr shift in the oil fields then head to the area of town which held the boxing program I would train right along with them an be there to listen to there problems. It was kinda neat to see young ppl graduating from high school instead of getting lost in the streets cause they had this place to go to. Well anyways I was training and I threw a punch an tore my shoulder up I had to go to the urgent care where they prescribed my some norcos now I don't need to tell you how addictive those things are but Mann it stole my life I was able to work an work out but I wasn't the same I quit coaching an I was always looking to get more it was awful for 5years I went down that rabbit hole then one day my cousin who was going to Virginia Tech for nano technology hit me up an asked if I ever heard of Kratom of course I said no an he showed me all the science of how it's safe an it can help with opioid addiction. He gave me some an it changed my life it wasn't easy but Kratom gave me hope just enough to help me push through. I have been sober from opioids an alcohol for 7years now an I really believe that Kratom saved my life an the crazy thing is my story is not unique Kratom has been a tool for thousands if not millions of people. Just please really look into the science an testimony's before you make criminals of people just trying to take back there lives . I know you have a hard job an your trying to what's right but please really look into it thank you for time an have a blessed day

Sincerely,
Nathan Hokit
5301 California ave
Bakersfield, CA 93309

From: Melissa Moen
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, September 30, 2022 11:35:06 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.
I began abusing opoids when I was 19, my father was fighting cancer and I was a young mom, trying to find enough energy to get thru my day. I was also prescribed opoids for chronic migraines. For the next 20 years, I was addicted to taking opiods daily, whether buying someone else's methadone or going to the rehab clinic myself. These clinics did little to dissuaid my addiction, but had everything to do with the revenue they were bringing in. Many parents, living off state aid, were chronic patients, as the state paid all their fees. I was cash pay, which was expensive, as was the driving there every day. I eventually switched to suboxone, but same story. Just seen as revenue to the rehab clinic with little action taken to 'rehabilitate me'. After taking suboxone every 4 hrs for a decade, I had little hope of ever living without it. 12 hrs without and I was in a deep spiral of anxiety and depression and panic. Unable to work or function. The longest I ever quit was 2 weeks...at that point I thought the physical and mental torture would lesson...it only became worse and I seriously contemplated suicide. I was not using any other drugs and had only been taking it orally. I had weaned myself down to the tiniest bare amount. The clinic would have cold turkey me at 5 times that amount and called it good. Then I read about kratom...a supplement from a plant that could help with the withdrawal symptoms. I originally bought it online but soon found it was avaliable in MN, a short drive from where I live. I CANNOT stress enough that it was life changing for me! Read that again. Absolutely gave me quality of life and hope, that I could be free of the prison I was in from suboxone. A medication I was prescribed for years. I weaned off of suboxone and on to Kratom and I was increadous. I was able to stop taking suboxone or any other opiate. Something I never thought would be possible. Because of chronic health issues I have with joint pain, I do still take kratom at a very small dose daily. If I didn't have such debilitating pain, I could very easily see not needing it. But as it stands, I take a small amount daily, it helps with my pain and energy levels without giving me any drug like stupor effects.
If there is something that can help WI citizens be free from the prison of opiate and or methamphetamine addiction..why would we be opposed to it!?!?! It needs to be regulated and sold like any other substances in the state. Legally and to of age citizens. Dont deny others this chance, I beg of you. The opiate epidemic has ruined so many lives...this is a chance for people to free themselves.
Thank you for your time.
Melissa

Sincerely,
Melissa Moen
N1930 989th st
Eau Claire, WI 54701

From: Mark Sweet
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Saturday, October 1, 2022 5:34:22 AM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

I am 53 year old man with Chronic Fatigue syndrome, which means I have zero energy. Imagine having the flu every day, that is what it is like for me. I can barely hold my job because I can't function. Kratom at a small dose has given me enough energy to make it through every day. It has literally given me the Quality of Life I desperately need. If you continue to ban Kratom, you destroy good people like me, who need it to live. Put yourself in my shoes for a minute, and see how you would feel. It has literally allowed me to keep my job, and to live again. Please do not ban Kratom anymore. There are so many people out there that are like me. Thank you so much.

Sincerely,
Mark Sweet
18553 Iguana Cir NW
Racine, WI 53401

From: Jon McCloud
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Saturday, October 1, 2022 2:01:07 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

My name is Marc and I am a 33 year old male that resides in Maine. My experience with "Kratom" and its legality is my focus of this letter.

I have had a long and treacherous battle with substance abuse. I have had multiple recurring bone tumors on the medial side of my tibia below my knee. The diagnosis and subsequent surgeries started at the age of 14. I have had six major surgeries on my right leg. Three of which were for tumor removal and the other three for MRSA treatment and debridement. My knee is completely damaged from the tumor destroying the top of my tibia and the MRSA completely eating away at my meniscus and cartilage. I have severe chronic and acute pain in that leg as a result of this. I am not a candidate for a knee replacement due to the bone being too damaged and not a stable site for the new artificial joint. I have also been in a severe car accident that lacerated my left arm, broke the fibula in my left leg, and tore the meniscus in my left knee.
The treatment of these ailments came with a lot of prescribed narcotic pain medications on a regular basis from age 14 on. My tolerance to these medications started to grow astronomically over 15 years and they stopped working effectively. I eventually was buying OxyContin on the street and abusing them heavily. This eventually led to IV heroin and cocaine use and the loss of anything of real value I had. I struggled with this crippling addiction for 18 years. I tried methadone, Suboxone, Vivitrol, complete abstinence and had NO significant success with any of them. Finally I found that a strong 12 step recovery was what I needed and it would work temporarily but the physical pain I suffer from would become too much and I would relapse on opiates. Two years ago I found kratom and decided to try it for pain relief. It helps me with pain, it helps me sleep, curbs craving, allows me to function and participate in activities of daily living without being in extreme pain. I do not have the extreme tolerance building problems with kratom like I did with traditional opioids. The side effects are extremely minor and do not impair my judgment or ability to function.
I am up at 4:30 AM every day and at the gym by 4:45 cycling for an hour. I have found the recumbent bike does not hurt my leg that bad at all. I have lost weight in a healthy fashion due to my exercise and diet change that kratom has helped me make. I am much more positive about taking care of myself and am able to be present for life. My pain hasn't completely vanished but it is manageable due to kratom. My spiritual growth has been a big factor as well in my 12 months of sobriety along with kratom. I have found that these two things working in

harmony has literally saved my life! I am a completely different person and my family has their son back.

Sincerely,
Jon McCloud
505 Congress St
Portland, ME 04101

From: Marc Perdue
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Saturday, October 1, 2022 2:06:20 PM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I had been on pain medicine from doctors from the ages o 13 to 30 years old for chronic pain as a result from several reoccurring bone tumors and 6+ surgeries. I suffer from both acute and chronic severe pain. Kratom ,12 step recovery, diet and exercise have helped me remain abstinent from all drugs now for 5 years. Kratom helps me with pain, sleep, anxiety and motivation to take care of myself to the best of my ability. I am a successful business owner, friend and family member. This plant has been a Godsend to me and my well being. I do not abuse it, take it safely and responsibly. Please do not make this plan inaccessible to myself and millions of other people it helps!

Sincerely,
Marc Perdue
511 Congress Street 503-5
PORTLAND, ME 04101

From: Colleen McAleavey
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Tuesday, October 4, 2022 10:59:56 AM

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Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me. I was in a serious accident 5 years ago. My doctor prescribe me Hydrocodone at first for my pain. But after taking Hydrocodone, I became addicted to it. This was not the live I dreamt of, being an addict so I was able to get off Hydrocodone when I discovered kratom. Kratom has saved my life! I am so glad that a friend of mine told me about kratom. It takes my pain away without any side affects. I can be the person and the mother I always dreamt of, because of kratom takes my life long pain away from me without any side affects. If I was still using Hydrocodone who knows where I would have ended up in life. I ask that you please look at the science behind kratom and remove the ban you currently have in your state.

Sincerely,

Colleen

Sincerely,
Colleen McAleavey
2145 Estes Park Court
Allen, TX 75013

From: Carolyn McCoy
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Tuesday, October 4, 2022 11:45:04 AM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me. Kratom has saved me from a life of pain and depression. As a person who suffers from hereditary chronic migraines and overall body/joint pain, for decades, I went to every doctor/specialist and tried every pill, homeopathic and physical therapy. Absolutely nothing worked. Discovered kratom and it changed my life. Body pain is completely gone, and migraines are reduced to 2-3 a year. They were 5-6 days a week with debilitating head pain. I now am active, walk 3 miles a day, volunteer, have more energy and just feel great and happy each day!

Sincerely,
Carolyn McCoy
478 Rosemont Ave
Saline, MI 48176

From: Lawrence Harrison
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Tuesday, October 4, 2022 1:15:10 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Sincerely,
Lawrence Harrison
1328 Myrtle Street SE,
Gainesville, GA 30501

From: Berkley Walker
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Tuesday, October 4, 2022 2:33:25 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me. Mitragyna speciosa has been a positive influence on my life helping me deal productively with social anxiety and helping me remain focus throughout my academic career. I was able to graduate top of class in college because Mitragyna speciosa allowed me to focus in a productive manner. I hope to keep the benefits of this tree alive for my kids and future generations. From a supplement perspective the benefits clearly.....Clearly outweigh the cost. For the future of our society it is pertinent that we keep access available to the public in a responsible manner

Regards,
Berkley Walker BSRT (R)(MR)

Sincerely,
Berkley Walker
1550 SE 196th Ct
Morriston, FL 32668

From: Christine Wilds
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Tuesday, October 4, 2022 3:11:47 PM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.
Due to a service- connected injury (I'm a disabled Veteran) I've been living life in a world of pain you never knew existed, and can't wrap your head around, but Kratom helps! Because of the CDC's opioid guidelines, pain management in the U.S. is run by the DEA, and I'm under medicated for my condition, I'm allowed 4 opioid pills a day. Before Kratom, one pill would be effective for about three hours. Now that I've found Kratom's Red Maeng Da strain, I can get up to five hours of relief. This miraculous plant from God, Kratom, has improved my quality of life! This plant has been used for millennia by indigenous peoples for medical and relaxation purposes, and the American Kratom Society has ensured safe access in the United States for some time now. What knowledge or expertise has given legislators authority to ban a God given plant that has done nothing but help people? What knowledge do legislators have of being disabled with with relentless, debilitating pain? Would you care to attempt walking a mile in my shoes? Legislators have done enough damage to our hidden population, trapped in agony by unobvious disability with across the board regulation of opioids prescriptions that has done nothing to end the "opioid crisis," except turn it into a more deadly fentanyl crisis on the street and a suicidal crisis in the legitimate pain community. Please don't ban another natural substance with the God-given power to help us all.

Sincerely,
Christine Wilds
2309 Forest View Ln
Wilmington, NC 28401

From: Edythe Wells
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Tuesday, October 4, 2022 3:19:35 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I grew up in Wisconsin and raised my children there. I still have a lot of Family in Wisconsin.

I rely on Kratom to control my chronic neck & back pain. It doesn't make me "high" or altered in any way except that I no longer despair of being able to enjoy life!

Wisconsin law makes it frightening to visit family in the RV I live in, and where I keep my kratom in my kitchen cabinet. I can't believe that Wisconsin legislators have allowed loud voices to prevail in this matter. Please look at the science and change that horrible law.

Thank you.

Sincerely,
Edythe Wells
411 Walnut St.
Green Cove Springs, FL 32043

From: Adam Warner
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Tuesday, October 4, 2022 6:00:03 PM

CAUTION: This email originated from outside the organization.
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Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Sincerely,
Adam Warner
608 Sandy Hill Rd
Valencia, PA 16059

From: kyra p
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Tuesday, October 4, 2022 8:30:20 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Thank you for your service to Ohio. I'm writing to ask you to support House Bill 236 that helps protect consumers in Ohio by ensuring all kratom sold is pure and safe.

Kratom is currently unregulated in Ohio and as a kratom consumer, I want to make sure the products I purchase are free from adulterants. HB 236 keeps Ohio consumers safe and adds accountability to vendors. If you aren't familiar with kratom, I recommend visiting www.KratomAnswers.org to learn more.

Kratom matters to me and I'd like to share my story with you.

My name is Kyra. I'm 47 years old. I'm a professionally licensed massage therapist with 20 years of experience. I'm a productive member of society who helps heal people and take away their pain, tension and other negative effects. Sometimes I even keep them from undergoing needless surgery or taking harmful medication.

I started using kratom in 2016. I was informed about it by a friend who told me how much it helped her. I suffer from depression, insomnia, anxiety and migraine headaches. Kratom has helped me greatly manage these symptoms.

I don't drink or do drugs. I have no need to get high. I use kratom medicinally, and I'm not addicted to it. I take a small amount of it once per day.

I firmly believe that it's my right to decide what goes into my body. People are killing themselves and/or destroying their bodies with alcohol and cigarettes, which are legal and readily available everywhere. I believe that the individual should be punished for any crimes related to what they consume, and not the public. It's very difficult for me to imagine anyone on kratom doing destructive things, as its effects are more like an energy drink or caffeine, things that are obviously also legal and widely consumed.

Banning kratom is something I'm firmly against, and a decision that would hurt millions, both directly and indirectly. I do not want to even think of a life without kratom. It would severely hurt me, and make me less efficient at doing my job, which helps others to also be more

productive.

At this point, my life would not even be worth living without kratom. I'd gotten to such a low point in 2016 that I was considering suicide. I then was timely introduced to kratom, which helped turn things around for me and spared my loved ones and massage clients a lot of pain. If kratom is banned, I fear I would go back to the path of potential suicide.

In my opinion, kratom should be readily available to anyone 18 years of age or older. It is a natural leaf, and has a myriad of health benefits (both mental and physical) which I've experienced firsthand. I believe denying it to the public and making productive members of society criminals for its possession is both wrong and unfair.

Thank you for your consideration.

Sincerely,
kyra p
no
athens, GA 30605

From: Lecil McGlocklin
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Wednesday, October 5, 2022 6:59:18 AM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

Sincerely,
Lecil McGlocklin
116 Hillview St Lot 14
Bluff City, TN 37618

From:	Holna Storin
To:	Barr, Adam - DSPS
Subject:	kratom analysis
Date:	Thursday, October 6, 2022 2:26:53 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.
For 20 years I have been addicted to opiates and Suboxone. I recently traveled to Colorado to visit a friend and she talked to me about Kratom. She sat and educated me on the significance of the plant and the help that it provides for people like me. People that are prisoners to opiates and the long term effects of Suboxone. I gave Kratom a try. And sir, let me tell you, I have never felt more free from the chains I wore so long with opiates. My husband has his wife back. My children have their mother back. I have myself back. Please, help lift this ban on Kratom. Help others get their lives back.

Sincerely,
Holna Storin
316 Phipps Ave
Rice Lake, WI 54868

From: Sarah Geiger
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Friday, October 7, 2022 3:27:08 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Mr. Barr,

Thank you for your service to Wisconsin citizens. I'd like to share with you my personal story about kratom and why decriminalizing it means so much to me.

I have witnessed first hand the benefits of Kratom as many others have. Please allow me to share my story.

My dad was diagnosed with a medical condition which lead him to needing prescription medications to live day to day. Through research we discovered Kratom and all of it's been benefits. This was until Kratom was scheduled in Wisconsin. Once my dad started started utilizing Kratom he was able to live a normal life without the heavy use of prescription medications. This plant gave him his life back and allowed him to live a healthier life.

I have spent years of research on this plant and even completed a college project regarding all of the benefits Kratom has to offer. This plant is non addictive and offers many health benefits to people. This plant is able to save lives and save people from addiction.

I ask that you please reconsider the ban of Kratom in Wisconsin. Instead, consider an age restriction. Again, I ask that you reconsider and overturn the ban of Kratom in Wisconsin.

Sincerely,

Sarah Geiger

Sincerely,
Sarah Geiger
W261 N4321 High ST
Pewaukee, WI 53072

From: Liam Mullan
To: Barr, Adam - DSPS
Subject: kratom analysis
Date: Saturday, October 22, 2022 7:05:39 PM

CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Exec. Director Adam Barr,

Dear Director Barr,

Thank you for your public service, to the people of Wisconsin and of every state across the republic. It is from such a feeling of kinship with the citizens of all states that I am writing to you, from California, about the review of kratom which the government of Wisconsin has recently taken up in light of their ban. That the government of our country acts only in the best interest of the people is an idea perhaps more estranged today from the public imagination than ever before, and of this we may find ourselves to be in greater agreement than of any other issue. Whether our conviction is that those interests lie in the corporations, the mass media, the ruling class, the fossil fuel industry, in Wall Street or or in Silicon Valley -- the interests seem ulterior. It is in such a way that we feel the banning of kratom -- likewise of the most dangerous substances by what is called the War on Drugs (a war whose great failure is made obvious in the face of the nation's Opioid Epidemic) -- is not of an inclination to protect its users or the people, but of a moral position which has less to do with virtue or goodness than with the social prejudices of respectability. If such efforts were truly of a benevolent protectiveness then surely we would not seek to eliminate the least dangerous alternatives available to the drug user, abuser, or addict. Rather it would necessitate the opposite course of action -- one with the goal of harm reduction instead of absolutes. Kratom, as with any other legal or illegal object of addiction or dependence (including those such as fast foods, for which we blame the widespread problem of obesity), is not without negative effects -- and surely there is nothing which can be said to be free of such nuances. But it is my belief in writing this that we must show kindness and love to even those most dejected, vice-ridden, and delinquent of our fellow citizens, and to act not in order to criminalize, marginalize, demoralize or disenfranchise those sad and unfortunate folk, but to seek only the improvement of their condition, if even in the smallest way.

Sincerely,
Liam Mullan
1632 Hayes Street
San Francisco, CA 94117

Eight-Factor Analysis of Kratom

Final Report from PHAR 537 – Medicinal Natural Products

Claudia Betancourt-Perez, Mackenzie E. Burns, Mitchell J. Glodoski, Timothy H. Vogt

Uvidelio Castillo (Course Coordinator), Terry-Elinor R. Reid, Christopher W. Cunningham

Abstract. As a semester-long course project, the third-year pharmacy students of PHAR 537 (Medicinal Natural Products) completed an "eight-factor analysis" of *Mitragyna speciosa* ("kratom"). The eight factors are considered as part of a process by which legislatures determine whether a product should be regulated as a controlled substance. We evaluated the literature concerning the pharmacokinetic and pharmacodynamic (PK/PD) properties of *M. speciosa*, and its impact on public health to the United States at large and Wisconsin specifically. Based on our review of the available literature, we conclude that regulation of *M. speciosa* in Wisconsin as a schedule-I substance is not justified at this time. We base this conclusion, in part, on the scientific evidence demonstrating that *M. speciosa* and its chemical constituents have lower potential for overdose and abuse relative to other agents that are not scheduled in this way. We believe that controlling *M. speciosa* and its chemical constituents under schedule-I harms public health and stifles much-needed research into its therapeutic and toxic properties.

I. Introduction

Per Wisconsin statute 961 (Uniform Controlled Substances Act), the state legislature has the authority to regulate the "manufacture, distribution, delivery, possession, and use of controlled substances for other than legitimate purposes" [1]. The authority to determine whether a substance shall be scheduled is given to the Controlled Substances Board (CSB) [2], and the CSB shall consider the following factors, generally known as the "eight factors" [3]:

(a) The actual or relative potential for abuse;
(b) The scientific evidence of its pharmacological effect, if known;
(c) The state of current scientific knowledge regarding the substance;
(d) The history and current pattern of abuse;
(e) The scope, duration and significance of abuse;
(f) The risk to the public health;
(g) The potential of the substance to produce psychological or physical dependence liability; and
(h) Whether the substance is an immediate precursor of a substance already controlled under this chapter.

Further, the CSB "shall add a substance to schedule I upon finding that the substance:

(a) Has high potential for abuse;
(b) Has no currently accepted medical use in treatment in the United States;
(c) Lacks the accepted safety for use in treatment under medical supervision." [4]

Alternately, the CSB could schedule a substance to schedule I if it is controlled in this way under 21 USC 812 (c) [5].

Controlling a substance under schedule I has broad consequences. First, there are legal consequences to individuals who are caught with a compound that is controlled under schedule-I, as the penalties for possessing schedule-I compounds are generally harsher than those for compounds that are regulated under higher schedules [6]. Patients that experience legitimate therapeutic value from products that are regulated under schedule-I would also be harmed, as scheduling substances in this way effectively prevents them from accessing the therapeutic agent. The process of controlling substances also has consequences for research and innovation. In terms of research, schedule-I substances are subject to stricter control and regulation, which adversely impacts the ability of faculty at smaller schools to engage in scholarship related to these substances [7]. Such scheduling also adversely impacts innovation: businesses seeking to develop

medicinal products would be disincentivized from working with partners in states that label products as schedule-I substances [7].

Recognizing the significance that scheduling a substance has on patient health and beyond, our class took on the challenge of conducting an "eight-factor analysis" of *Mitragyna speciosa*, also known as "kratom." Two constituents of *M. speciosa*, termed mitragynine (MG) and 7-hydroxy-mitragynine (7-OH-MG), are explicitly listed under schedule-I in the state of Wisconsin [8]. This project was conducted as a part of a 3rd year elective course for Pharm.D. graduate students at Concordia University Wisconsin called Medicinal Natural Products (PHAR 537). What follows is the result of our independent review of the available literature surrounding this medicinal plant. In the next section, we will summarize our findings in the context of the "eight factors" outlined above. Of note, none of the students of PHAR 537, nor the instructional faculty, have conducted research using *M. speciosa*, its constituents, or their derivatives, nor do any of the co-authors of this document have plans to do so in the immediate future. This project is an exercise in state and federal pharmacy law, and we intend for this analysis to be potentially of value to the Wisconsin CSB as they consider whether schedule-I is the appropriate place for the constituents of kratom.

II. Results and Discussion

Aiding our research were two recent reviews that were written by experts in the field of substance use disorders [9][10]. These two articles provided helpful content and context as we conducted this analysis. Since the second article was written in 2021, we also sought to find newer articles that were published in 2022 that could further aid the discussion. Our analysis can be considered complementary to these articles previously published; we agree with their assessment that kratom should not be considered a controlled substance at this time.

a. **Factor 1: The actual or relative potential for abuse.** For this factor, we considered behavioral tests in animals performed using kratom or its purified constituents (MG, 7-OH-MG).

The first test we considered under this factor was the intracranial self-stimulation (ICSS) test. In this test, an animal is placed in a chamber and will receive electrical stimulation when it presses a lever. The first ICSS test we reviewed was conducted in 2020 by Behnood-Rod, et al [11]. In this procedure, a dose of drug is considered rewarding if it decreases brain reward threshold and is considered aversive if it increases the brain reward threshold. At low doses, MG slightly lowered the reward threshold and at high doses, MG slightly increased reward threshold, indicating that there is a mild dose-dependent rewarding effect. 7-OH-MG slightly lowered reward threshold at lower doses, but significantly increased the reward threshold at higher doses, indicating that there is a strong aversive effect of 7-OH-MG at high doses. When compared to morphine, the effects of MG and 7-OH-MG are less rewarding.

The drug self-administration (SA) test determines whether an animal will work to receive a dose of drug. Under this paradigm, a drug that has high potential for abuse will be readily self-administered by an animal, and a drug that has low abuse liability will not. The first SA test we reviewed was conducted by Hemby, et al., in 2018 [12]. This test was set up to first train rats to self-administer morphine, then determine whether those rats would instead self-administer MG or 7-OH-MG. In this test, only 7-OH-MG substituted for morphine. After the rats were substituted to MG or 7-OH-MG, the rats that substituted with MG showed a significant decrease in morphine self-administration and those that received 7-OH-MG showed a significant increase in morphine self-administration. Major conclusions from this study were: 1) that MG does not show abuse liability; 2) that because MG significantly decreased morphine self-administration, MG is potentially therapeutically valuable as a treatment for opioid abuse; and 3) that 7-OH-MG has abuse liability. A second SA test that was published by Yue, et al. [13], also showed that MG has low abuse liability and decreases self-administration of heroin.

The conditioned place preference (CPP) test determines whether an animal spends more time in a drug-paired chamber (rewarding behavior) or less time in the drug-paired chamber (aversive behavior). Yussof, et al. [14] showed that MG produced CPP at doses of 10 and 30 mg/kg following injection, which was similar to morphine. Unlike morphine,

however, MG produced anxiolytic effects at low and high doses. A similar U-shaped dose-response curve was observed for locomotor behavior, with MG stimulating locomotion at low and high doses. The authors concluded that MG has abuse liability and can produce effects that are similar to those of psychostimulant and opiate drugs. Similar conclusions were drawn by Iman, et al. [15] and Japarin, et al. [16], though it should be noted that the rewarding effects of MG were observed when MG was administered at higher doses (10-30 mg/kg, *ip*).

In 2019, Meepon and Sooksawate [17] reported that MG at doses from 30-90 mg/kg (*ip*) induced preference for the drug-paired chamber in rats; however, at doses from 10-30 mg/kg, MG significantly blocked morphine CPP, suggesting that the rewarding effects of morphine could be attenuated by MG. MG at doses between 10-30 mg/kg (*ip*) also blocked naloxone-precipitated withdrawal from chronic morphine, again suggesting that MG holds promise as a potential treatment option for patients experiencing opioid withdrawal.

b. **Factor 2: The scientific evidence of its pharmacological effect.** For this factor, we reviewed additional behavioral tests that demonstrate that *M. speciosa* alkaloids have pharmacologic activity *in vivo*. The *in vivo* tests described above would also be considered evidence that MG and 7-OH-MG produce a pharmacologic effect in subjects.

The first test we considered was the drug discrimination (DD) test. In this test, an animal is trained to respond to the stimulus effects of a training drug and then compare whether the animal responds in a similar way to a test drug, in this case MG or 7-OH-MG. The DD test can be useful for determining whether a test drug works through a similar mechanism of action as a training drug.

The first DD test we reviewed was published in 2015 [18]. In this study, a two-lever DD test was used to see if male rats could discriminate MG from vehicle and whether MG would substitute for morphine in rats trained to discriminate morphine. The ability of rats to discriminate morphine from vehicle was also used as a comparator. This study found that MG discrimination in one group of rats was similar to morphine discrimination in a second group. Administration of MG resulted in full substitution for morphine. The authors concluded that the pharmacologic effects of morphine and MG are similar, and that MG appears to be responsible for the potential for kratom to be abused.

A second DD test [19] was published in 2019 and used male and female rats. In this study, the authors tested the ability of morphine and MG to disrupt operant responding for food and increase antinocicetption response to a thermal stimulus in the hot plate test. To determine whether the pharmacologic effects of MG were mediated by opioid receptors, the study included co-administration tests for MG with 1) the mu opioid receptor antagonist, naloxone, and 2) morphine. The results found that both MG and morphine decreased schedule-controlled responding and increased thermal antinociception, though MG was less potent than morphine. Naloxone did not block the effects of MG, suggesting a non-opioid mechanism of action for MG. The results of this study support that MG is effective in reducing pain stimuli, though the mechanism of action differs substantially from that of morphine.

c. **Factor 3: The state of current scientific knowledge regarding the substance.** For this factor, we considered *in vitro* receptor binding and efficacy studies. We also reviewed experiments that included human volunteers.

To determine the receptor binding profile of MG and 7-OH-MG, we first consulted the Ki Database provided by the Psychoactive Drug Screening Program (PDSP), which is housed at the University of North Carolina in Chapel Hill and supported as a free service by the National Institute of Mental Health (NIMH) [20]. The available binding data for MG is included in an accompanying spreadsheet. Among the opioid receptors, MG has highest affinity for mu (average MOR Ki 624.2 nM), then kappa (average KOR Ki 823.25 nM), then delta (DOR Ki 2637 nM). MG also has weak (micromolar) affinity for certain serotonin receptors (5-HT1A, 5-HT1D, 5-HT2B, 5-HT7), adrenergic receptors (alpha2A, alpha2B, alpha2C), and dopamine receptors (D2). For comparison, morphine has nM affinity for opioid receptors (MOR ~ KOR > DOR) and negligible affinity for other monoamine receptors.

Two papers described opioid receptor binding and efficacy of MG and 7-OH-MG in detailed functional assays [21][22]. In these experiments, researchers determined the functional selectivity (aka signaling bias) of kratom alkaloids

for activating G protein pathways or beta-arrestin pathways. Both studies found that MG and 7-OH-MG were G protein-biased partial agonists of MOR, KOR, and DOR, and neither recruited arrestins. In contrast, morphine is a non-biased MOR agonist; this distinction in PD profile is important, as beta-arrestin2 is associated with respiratory depression and constipation, two key adverse effects of MOR agonists [23].

A 2022 study published by Henningfield, et al., compared the respiratory depressant effects of oral MG (20-400 mg/kg, *po*) to oral oxycodone (6.75-150 mg/kg, *po*) in rats [24]. Whereas oxycodone produced significant, dose-dependent sedative and respiratory depressant effects, MG produced mild sedative effects at the highest doses and no respiratory depressant effects at any doses, demonstrating the significant different in observed pharmacologic profiles between canonical MOR agonists and kratom alkaloids.

Structurally, MG and 7-OH-MG are unrelated to other natural and synthetic MOR agonists (**Figure 1**). MG and 7-OH-MG are considered indole alkaloids, whereas morphine (a natural MOR agonist) is considered a phenanthrene derivative and fentanyl (synthetic MOR agonist) is a 4-anilidopiperidine. All of these MOR agonists share in common a basic amine group, thus they are all alkaloids. There are over 40 indole alkaloids present in the plant that have been reported to date. 7-OH-MG is present in the leaves of *M. speciosa*, though in quantities that are unlikely to contribute to its pharmacologic effect when taken orally; however, MG is metabolized into 7-OH-MG *in vivo*, and could indeed be considered an active metabolite of oral MG. More research is needed to determine this.

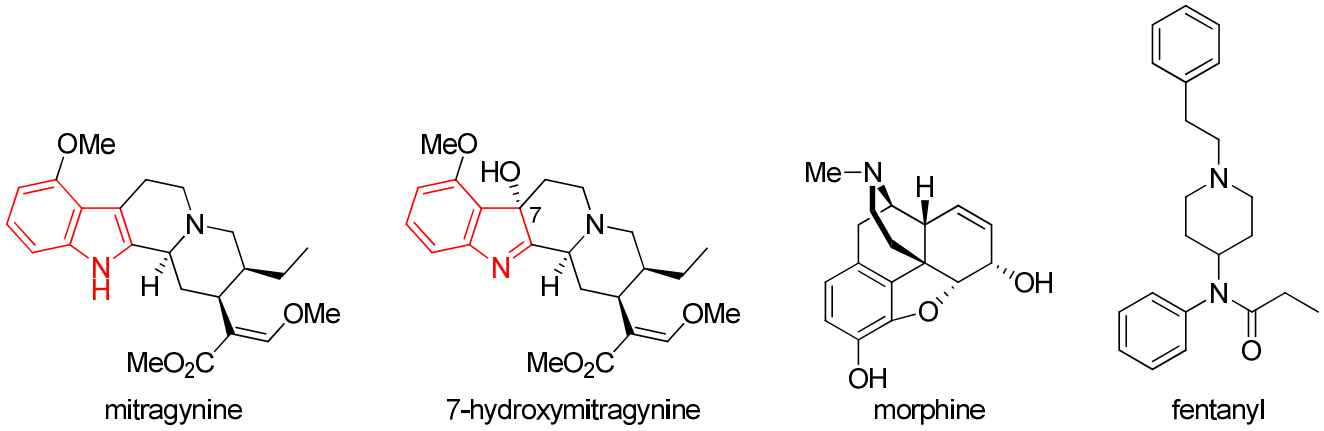

Figure 1. Structures of mitragynine (MG), 7-hydroxymitragynine (7-OH-MG), morphine (a naturally occurring MOR agonist), and fentanyl (a synthetic MOR agonist). The indole group of MG and 7-OH-MG is shown in red.

The PK profile of MG was determined in healthy male volunteers who were regular users of kratom [25]. When administered orally as a tea, the terminal half-life ($t_{1/2}$) was 23.24 ± 16.07 h, the time to Tmax was 0.83 ± 0.35 h, volume of distribution (Vd/F) was 38.04 ± 24.32 L/kg, and the clearance (CL/F) was 98.1 ± 51.34 L/h kg. In 2022, Tanna, et al., published the results of a clinical PK study using a single low (2g) dose of kratom orally to six healthy volunteers [26]. This study found the following parameters using a two-compartment model: $t_{1/2,\alpha}$ 1.76 ± 0.0163 h, Tmax 1.13 ± 0.111 h, V1/F 1170 ± 105 L, CL/F 227 ± 8.11 L/h. In contrast to the earlier study, this study used standardized kratom material that had thoroughly characterized alkaloid content.

According to Smith, et al., the median typical dose of kratom by frequent users was reported to be 4.57 ± 3.61 g, and the median number of doses per day was 2.68 ± 1.73 [27]. The median age of kratom use initiation (29.9 ± 8.8 y) was higher than for initiation of alcohol (15 ± 3.3 y), nicotine (15.9 ± 4.5 y), and cannabis (16.8 ± 5.4 y). Ya, et al., reported that the median oral bioavailability of MG is approximately 21% [28].

d. **Factor 4: The history and current pattern of abuse.** Kratom has been used traditionally in Southeast Asia, the Philippines, and New Guinea. Traditionally, the leaves (dried or fresh) are chewed or brewed into a tea. Kratom leaves are

used in this way to battle physical fatigue, improve mood, relieve pain, and help treat opiate addiction [29][30]. Use of kratom is restricted or banned in most of Europe, Indonesia, Argentina, Israel, New Zealand, and Australia [31]. In the United States, kratom is illegal to buy, sell, possess and use in 6 states: Alabama, Arkansas, Indiana, Rhode Island, Vermont, and Wisconsin [32]. Though the US Drug Enforcement Agency (DEA) initially proposed to control the use of kratom under its emergency scheduling authority in August 2016, this was withdrawn months later in October 2016 [33]. It is difficult to find reputable data regarding the current pattern of abuse of kratom in Wisconsin.

e. **Factors 5 and 6: The scope, duration, and history of abuse, and the risk to public health.** 0.8% of people over the age of 12 in the United States (2.1 million people) used kratom in 2020 [34]. For comparison, 17.9% (49.6 million) used cannabis in the past year, and 3.4% (9.5 million) misused opioids in the same period. Kratom use was lowest among younger people (adolescents age 12-17, 0.2%). According to the 2020 Annual Report of the American Association of Poison Control Centers [35], there were 1262 calls to poison control centers regarding kratom. For context, there were 10,636 calls regarding the FDA-approved cardiovascular drug clonidine, and 17,051 concerning the OTC antihistamine cetirizine (generic for Zyrtec®). **Table 1** compares poison center calls for kratom compared to heroin, prescription fentanyl products, and methadone, which is an FDA-approved treatment for opioid use disorder (OUD). When compared to these products, there were fewer calls made regarding kratom, and the incidence of major outcomes or death were also reduced. Notably, these data for kratom are an improvement over methadone. A 2022 report using data from the British Columbia Drug and Poison Information Centre in Canada found that there were 32 calls regarding kratom between 2012-2019, at increasing frequency near the end of the study period; there were no deaths and the authors attributed the increase potentially to more patients with opioid use disorder (OUD) using kratom to manage their disease [36].

Table 1. Calls to US poison centers regarding single substance pharmaceutical exposures to kratom, heroin, prescription fentanyl, and methadone, and selected outcomes. Data from ref [35].

	Number of calls	Outcome: Major (%)	Outcome: Death (%)
Kratom	1,262	66 (5.2%)	5 (0.4%)
Heroin	8,007	2,210 (27.6%)	124 (1.5%)
Fentanyl (prescription)	2,976	558 (18.8%)	31 (1.0%)
Methadone	2,345	193 (8.2%)	16 (0.6%)

There were 152 unintentional overdose deaths between July 2016 and December 2017 that tested positive for kratom [37]. Of those, in only 7 (4.6%) did the deceased test positively for kratom only. In this period, there were 27,338 drug overdose deaths, meaning kratom was detected in 0.56% of them. Of the polydrug deaths involving kratom, 65% of postmortem samples tested positively for fentanyl, 33% tested positively for heroin (as metabolites), and nearly 20% tested positively for prescription opioids. At doses over 25 g, patients are at risk of hospitalization due to respiratory depression, hallucinations, seizures, and psychosis [38].

A 2022 study investigated the impact of the covid-19 pandemic on kratom use in comparison to use of other drugs of abuse [39]. This study found that there 33% reported an increase in kratom use compared to the period before the pandemic and 24% reported a decrease in use. Alcohol, tobacco, and prescription opioid use were all more likely to have gotten worse during the pandemic. A 2022 study found that reasons for using kratom are diversifying, with users indicating that they are using the product as, among other things, a treatment substitute for opioids, alcohol, and stimulants [40].

Adverse effects of kratom include: loss of muscle coordination; constipation; dizziness; hypotension; increased alertness; and tachycardia. These adverse effects can vary in severity based on the amount and strain of product consumed. In one case report, a 15 year old Caucasian female presented to the emergency department after consuming 45 capsules of kratom 500 mg (22.5 g) in a suicide attempt [41]. Notably, the patient did not show signs of respiratory depression or loss of consciousness, which are hallmarks of the opioid toxidrome and could be life-threatening. Another

case report concerned a 37 year old Caucasian male who presented to the emergency department unresponsive, with minimal response to naloxone [42]. The patient's family reported that he consumed 500 g of kratom the previous day.

f. **Factor 7: The potential of the substance to produce psychological or physical dependence liability.** An individual is considered physically dependent on a substance if they experience withdrawal symptoms when drug use is abruptly ceased. In addition to the studies discussed above, we also reviewed investigations into kratom withdrawal and how kratom impacts withdrawal from other drugs of abuse.

Wilson, et al. [43] determined physical dependence using an induced hyperalgesia model in mice. Products tested include a kratom alkaloid extract (KAE) and MG, both administered orally. Induction of hyperalgesia was used as a marker for drug dependence. Additionally, the team investigated naloxone-precipitated withdrawal following chronic opioid treatment. Like morphine, KAE and MG produced hyperalgesia after 5 days. Following naloxone administration, the somatic signs of withdrawal were strongest with morphine and attenuated in mice dependent on KAE and MG. Furthermore, mice administered KAE or MG demonstrated fewer withdrawal signs than mice who continued to receive morphine. These results suggest 1) that KAE or MG has lower dependence liability than morphine, and 2) that KAE or MG could be useful as treatments for opioid withdrawal. A cross-sectional study conducted in Thailand found that users were likely to experience signs of physical dependence that were directly related to duration, frequency, and amount of kratom consumed [44]. As mentioned above, Gutridge, et al. [21] showed that kratom alkaloids were effective in reducing ethanol intake in mice, suggesting that kratom may have therapeutic potential in patients with alcohol use disorder (AUD).

g. **Factor 8: Whether the substance is an immediate precursor of a substance already controlled under this chapter.** As mentioned in section II.c and shown in **Figure 1**, MG and 7-OH-MG are structurally unrelated to other opioids and to other agents under strict control in Wisconsin.

III. Conclusions

Kratom is a plant-based product that has a long history of traditional use in Southeast Asia and recently has gained attention in the United States as both a recreational substance and an herbal treatment for drug and alcohol use disorders. Though the subjective and pharmacologic effects are similar to MOR agonists like morphine and fentanyl, the indole alkaloids present in *M. speciosa* are structurally and pharmacodynamically distinct.

Several points must be addressed when considering the translation of animal studies to the human condition. First, animal studies using purified MG and/or 7-OH-MG will not necessarily tell an accurate story of the pharmacologic profile of the *M. speciosa* plant material because other constituents of the plant – e.g., other minor indole alkaloids, terpenes, flavonoids, etc. – could influence MG or 7-OH-MG PK. This is commonly observed with natural products-based pharmacologic research. Second, many *in vivo* studies using purified alkaloids administer those compounds via injection (e.g., *ip*), which is not the way kratom is typically consumed [26].

It is important to consider polydrug abuse when reading drug overdose statistics. For example, Olsen, et al. [37] reported that nearly 2/3 of all drug overdose deaths in 2016-2017 involving kratom also tested positively for fentanyl, a high-potency/high-efficacy MOR agonist that, depending on dose, can have minimal response to naloxone [45]. A 2022 report [46] described kratom products that were adulterated with other high-potency MOR agonists, highlighting the need for detailed analysis of kratom products when asking the question, "what is to blame for this overdose?"

The limited number of case reports and national overdose deaths suggests that the risks of kratom are low. Nonetheless, the few case reports that are available require critical examination. For example, in ref [41], the patient consumed a quantity that is over 5x the typical psychoactive dose in a suicide attempt. An even higher dose was observed in ref [42]. Other issues associated with the interpretation of case reports were recently raised by Smith, et al. [47]. It has been understood since Paracelsus that "the dose makes the remedy or the poison," and so labeling a substance as "toxic" based on a small number of case reports where the dose is high seems excessive.

As a final consideration, an early eight-factor analysis of kratom [9] reported that "abrupt discontinuation [of kratom use] may be accompanied by withdrawal symptoms that are qualitatively similar but generally weaker than those observed following discontinuation of opioids." This was updated in 2021: "Some user reports suggest that regular kratom consumption carries risks of dependency and addiction, though with generally self-manageable withdrawal" [48]. The key phrase "self-manageable withdrawal" distinguishes kratom from other opioid agonists that have a severe withdrawal profile.

In conclusion, kratom is a plant product that produces subjective effects distinct from those of other opioids that have high abuse liability. The risk of life-threatening respiratory depressant effects appears to be very low, again different from MOR agonists with high risk of overdose like heroin and fentanyl. Though calls to poison centers in the United States and Canada appear to be increasing, the number of calls is low compared to other, high-risk drugs and may be due to self-medication as part of the ongoing opioid public health crisis. Preclinical assessment of kratom and its constituents suggest that the risk of dependence and withdrawal is minor compared to other drugs that are considered controlled substances, and that kratom and its alkaloid constituents may be therapeutically useful as treatments for substance use disorders when used under the supervision of a clinician. Finally, the US DEA and legislatures of 44 of 49 other US states do not believe that kratom or its constituents meet the requirements to be a schedule-I controlled substance. We agree.

IV. References

[1] WI 961.001(1m). https://docs.legis.wisconsin.gov/statutes/statutes/961. Accessed 26 October, 2022.

[2] WI 961.11(1). https://docs.legis.wisconsin.gov/statutes/statutes/961. Accessed 26 October, 2022.

[3] WI 961.11(1m)(a-h). https://docs.legis.wisconsin.gov/statutes/statutes/961. Accessed 26 October, 2022.

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State of Wisconsin
Department of Safety & Professional Services
AGENDA REQUEST FORM

1) Name and title of person submitting the request:	2) Date when request submitted:
Nilajah Hardin **Administrative Rules Coordinator**	**01/03/23** **Items will be considered late if submitted after 12:00 p.m. on the deadline date which is 8 business days before the meeting**

3) Name of Board, Committee, Council, Sections:

Controlled Substances Board

4) Meeting Date:	5) Attachments:	6) How should the item be titled on the agenda page?
01/13/23	☒ Yes ☐ No	**Administrative Rule Matters – Discussion and Consideration** **1. Preliminary Rule Draft** **a. CSB 2.92, Relating to Scheduling 38 Anabolic Steroids** **b. CSB 2.93, Relating to Scheduling Daridorexant** **c. CSB 2.94, Relating to Scheduling 7 Synthetic Benzimidazole-Opioids** **d. CSB 2.95, Relating to Scheduling Ganaxolone** **2. Affirmative Action Order** **a. CSB 2.96, Relating to Scheduling Amineptine** **b. CSB 2.97, Relating to Scheduling Zipeprol** **c. CSB 2.98, Relating to Scheduling Excluding [^{18}F] FP-CIT** **d. CSB 2.99, Relating to Scheduling Mesocarb** **e. CSB 2, Relating to Scheduling Methiopropamine** **3. Drafting Proposals** **a. CSB 4, Relating to National Provider Identifier Requirement** **4. Pending or Possible Rulemaking Projects** **a. Rule Projects Chart**

7) Place Item in:	8) Is an appearance before the Board being scheduled? *(If yes, please complete Appearance Request for Non-DSPS Staff)*	9) Name of Case Advisor(s), if required:
☒ Open Session ☐ Closed Session	☐ Yes ☒ No	**N/A**

10) Describe the issue and action that should be addressed:

Attachments:

- Preliminary Rule Drafts: CSB 2.92-2.95
- Affirmative Action Orders: CSB 2.96-2.99, Methiopropamine
- Drafting Proposals: CSB 4 Scope Statement, Wis. Admin Code Ch. CSB 4
- Rule Projects Chart

(All Board Rule Projects can be Viewed Here if Needed: https://dsps.wi.gov/Pages/RulesStatutes/PendingRules.aspx)

11) Authorization

Nilajah D. Hardin — 01/03/23

Signature of person making this request — **Date**

Supervisor (if required) — **Date**

Executive Director signature (indicates approval to add post agenda deadline item to agenda) **Date**

Directions for including supporting documents:

1. This form should be attached to any documents submitted to the agenda.
2. Post Agenda Deadline items must be authorized by a Supervisor and the Policy Development Executive Director.
3. If necessary, provide original documents needing Board Chairperson signature to the Bureau Assistant prior to the start of a meeting.

STATE OF WISCONSIN
CONTROLLED SUBSTANCES BOARD

IN THE MATTER OF RULE-MAKING PROCEEDINGS BEFORE THE CONTROLLED SUBSTANCES BOARD	:	PROPOSED ORDER OF THE CONTROLLED SUBSTANCES BOARD ADOPTING RULES (CLEARINGHOUSE RULE)

PROPOSED ORDER

An order of the Controlled Substances Board to create CSB 2.92 relating to scheduling thirty-eight (38) anabolic steroids.

Analysis prepared by the Department of Safety and Professional Services.

ANALYSIS

Statutes interpreted: s. 961.16, Stats.

Statutory authority: s. 961.11 (1) and (4), Stats.

Explanation of agency authority:
Section 961.11 (1), Stats. provides that "[t]he controlled substances board shall administer this subchapter and may add substances to or delete or reschedule all substances listed in the schedules in ss. 961.14, 961.16, 961.18, 961.20 and 961.22 pursuant to the rule-making procedures of ch. 227."

Section 961.11(4), Stats. provides that "[i]f a substance is designated, rescheduled or deleted as a controlled substance under federal law and notice thereof is given to the controlled substances board, the board by affirmative action shall similarly treat the substance under this chapter after the expiration of 30 days from the date of publication in the federal register of a final order designating the substance as a controlled substance or rescheduling or deleting the substance or from the date of issuance of an order of temporary scheduling under 21 USC 811 (h), unless within that 30−day period, the board or an interested party objects to the treatment of the substance. If no objection is made, the board shall promulgate, without making the determinations or findings required by subs. (1), (1m), (1r) and (2) or s. 961.13, 961.15, 961.17, 961.19 or 961.21, a final rule, for which notice of proposed rulemaking is omitted, designating, rescheduling, temporarily scheduling or deleting the substance. If an objection is made the board shall publish notice of receipt of the objection and the reasons for objection and afford all interested parties an opportunity to be heard. At the conclusion of the hearing, the board shall make a determination with respect to the treatment of the substance as provided in subs. (1), (1m), (1r) and (2) and shall publish its decision, which shall be final unless altered by statute. Upon publication of an objection to the treatment by the board, action by the board under this chapter is stayed until the board promulgates a rule under sub. (2)."

Related statute or rule: s. 961.16, Stats.

DRAFT

Summary of, and comparison with, existing or proposed federal regulation:
On December 16, 2005 and July 30, 2012, the Department of Justice, Drug Enforcement Administration published its final rules in the Federal Register placing thirty-eight (38) anabolic steroids into schedule III of the federal Controlled Substances Act. The scheduling actions are effective January 20, 2005 and August 29, 2012

Plain language analysis:
This rule schedules adds thirty-eight (38) anabolic steroids to schedule III under ch. 961, Stats.

The Controlled Substances Board did not receive an objection to similarly treating thirty-eight (38) anabolic steroids as schedule III under ch. 961, Stats. within 30 days of the date of publication in the federal register of the final order designating thirty-eight (38) anabolic steroids as a controlled substance.

Therefore, pursuant to s. 961.11(4), Stats., the Controlled Substances Board by Affirmative Action similarly treated thirty-eight (38) anabolic steroids under chapter 961, Stats and is now following up with a final rule.

The Affirmative Action order, dated July 20, 2022, took effect on July 25, 2022, when it was published in the Administrative Register and expires upon promulgation of a final rule.

Summary of public comments received on statement of scope and a description of how and to what extent those comments and feedback were taken into account in drafting the proposed rule: N/A

Comparison with rules in adjacent states:
Illinois: Illinois has included the thirty-eight (38) anabolic steroids listed in this rule as schedule III controlled substances [720 Illinois Compiled Statutes 570/102 (c-1) and 208 (f)].

Iowa: Iowa has included the thirty-eight (38) anabolic steroids listed in this rule as schedule III controlled substances [Iowa Code 124.208 (6)].

Michigan: Michigan has not included the thirty-eight (38) anabolic steroids listed in this rule as schedule III controlled substances [Michigan Compiled Laws s. 333.7201-7231].

Minnesota: Minnesota has included the thirty-eight (38) anabolic steroids listed in this rule as schedule III controlled substances [Minnesota Statutes 152.02 (4) (f) (1)].

Summary of factual data and analytical methodologies:
The methodology was to schedule thirty-eight (38) anabolic steroids to conform with the federal Controlled Substances Act.

Analysis and supporting documents used to determine effect on small business or in preparation of economic impact analysis:

The rule schedules thirty-eight (38) anabolic steroids as Schedule III controlled substances which will not have any effect on small business.

Fiscal Estimate:
The proposed rule will be posted for a period of 14 days to solicit public comment on economic impact, including how the proposed rules may affect businesses, local government units, and individuals.

Effect on small business:
These proposed rules do not have an economic impact on small businesses, as defined in s. 227.114 (1), Stats. The Department's Regulatory Review Coordinator may be contacted by email at Jennifer.Garrett@wisconsin.gov, or by calling (608) 266-6795.

Agency contact person:
Nilajah Hardin, Administrative Rules Coordinator, Department of Safety and Professional Services, Division of Policy Development, 4822 Madison Yards Way, P.O. Box 8366, Madison, Wisconsin 53708; telephone 608-267-7139; email at DSPSAdminRules@wisconsin.gov.

Place where comments are to be submitted and deadline for submission:
Comments may be submitted to Nilajah Hardin, Administrative Rules Coordinator, Department of Safety and Professional Services, Division of Policy Development, 4822 Madison Yards Way, Madison, WI 53708-8366, or by email to DSPSAdminRules@wisconsin.gov. Comments must be received by (date) to be included in the record of rulemaking proceedings.

TEXT OF RULE

SECTION 1. CSB 2.92 is created to read:

CSB 2.92 Addition of thirty-eight (38) Anabolic Steroids to schedule III. Section 961.18 (7), Stats., is repealed and recreated to read:

961.18 (7) ANABOLIC STEROIDS. Unless specifically excepted or listed in another schedule, any material, compound, mixture, or preparation containing any quantity of any of the following anabolic steroids, including any of their esters, ethers, isomers, esters or ethers of isomers, salts and salts of esters or ethers, isomers and esters or ethers of isomers that are theoretically possible within the specific chemical designation. Except such terms do not include an anabolic steroid that is expressly intended for administration through implants to cattle or other nonhuman species and that has been approved by the Secretary of Health and Human Services for such administration. If any person prescribes, dispenses, or distributes such steroid for human use, the person shall be considered to have prescribed, dispensed, or distributed an anabolic steroid within the meaning of this section:

(a) 3beta,17-dihydroxy-5alpha-androstane.
(ag) 3alpha,17beta-dihydroxy-5alpha-androstane.
(ar) 5alpha-androstan-3,17-dione.

(b) 1-androstenediol (3beta,17beta-dihydroxy-5alpha-androst-1-ene; 3alpha,17beta-dihydroxy-5alpha-androst-1-ene).
(bg) 4-androstenediol.
(br) 5-androstenediol.
(c) 1-androstenedione.
(cg) 4-androstenedione.
(cr) 5-androstenedione.
(d) Bolasterone.
(dg) Boldenone.
(dr) Boldione.
(e) Calusterone.
(eg) 4-chlorotestosterone, which is also called clostebol.
(er) Dehydrochloromethyltestosterone.
(f) Desoxymethyltestosterone.
(fg) delta1-dihydrotestosterone.
(fr) 4-dihydrotestosterone, which is also called stanolone.
(g) Drostanolone.
(gg) Ethylestrenol.
(gr) Fluoxymesterone.
(h) Formebulone, which is also called fromebolone.
(hg) Furazabol.
(hr) 13beta-ethyl-17beta-hydroxygon-4-en-3-one.
(i) 4-hydroxytestosterone.
(ig) 4-hydroxy-19-nortestosterone.
(ir) Mestanolone.
(j) Mesterolone.
(jg) Methandienone, which is also called methandrostenolone.
(jr) Methandriol.
(k) Methasterone.
(kg) Methenolone.
(kr) 17alpha-methyl-3beta, 17beta-dihydroxy-5alpha-androstane.
(L) 17alpha-methyl-3alpha,17beta-dihydroxy-5alpha-androstane.
(Lg) 17alpha-methyl-3beta,17beta-dihydroxyandrost-4-ene.
(Lr) 17alpha-methyl-4-hydroxynandrolone.
(m) Methyldienolone.
(mg) Methyltrienolone.
(mr) Methyltestosterone.
(n) Mibolerone.
(ng) 17alpha-methyl-delta1-dihydrotestosterone, which is also called 17-alpha-methyl-1-testosterone.
(nr) Nandrolone.
(o) 19-nor-4-androstenediol (3beta, 17beta-dihydroxyestr-4-ene; 3alpha, 17beta-dihydroxyestr-4-ene).
(og) 19-nor-5-androstenediol (3beta, 17beta-dihydroxyestr-5-ene; 3alpha, 17beta-dihydroxyestr-5-ene).
(or) 19-nor-4,9(10)-androstadienedione.

(p) 19-nor-4-androstenedione (estr-4-en-3,17-dione).
(pg) 19-nor-5-androstenedione (estr-5-en-3,17-dione).
(pr) Norbolethone.
(q) Norclostebol.
(qg) Norethandrolone.
(qr) Normethandrolone.
(r) Oxandrolone.
(rg) Oxymesterone.
(rr) Oxymetholone.
(s) Prostanozol.
(sg) Stanozolol.
(sr) Stenbolone.
(t) Testolactone.
(tg) Testosterone.
(tr) Tetrahydrogestrinone.
(u) Trenbolone.

SECTION 2. EFFECTIVE DATE. The rules adopted in this order shall take effect on the first day of the month following publication in the Wisconsin Administrative Register, pursuant to s. 227.22 (2) (intro.), Stats.

(END OF TEXT OF RULE)

DRAFT

STATE OF WISCONSIN
CONTROLLED SUBSTANCES BOARD

IN THE MATTER OF RULE-MAKING PROCEEDINGS BEFORE THE CONTROLLED SUBSTANCES BOARD	:	PROPOSED ORDER OF THE CONTROLLED SUBSTANCES BOARD ADOPTING RULES (CLEARINGHOUSE RULE)

PROPOSED ORDER

An order of the Controlled Substances Board to create CSB 2.93 relating to scheduling Daridorexant.

Analysis prepared by the Department of Safety and Professional Services.

ANALYSIS

Statutes interpreted: s. 961.16, Stats.

Statutory authority: s. 961.11 (1) and (4), Stats.

Explanation of agency authority:
Section 961.11 (1), Stats. provides that "[t]he controlled substances board shall administer this subchapter and may add substances to or delete or reschedule all substances listed in the schedules in ss. 961.14, 961.16, 961.18, 961.20 and 961.22 pursuant to the rule-making procedures of ch. 227."

Section 961.11(4), Stats. provides that "[i]f a substance is designated, rescheduled or deleted as a controlled substance under federal law and notice thereof is given to the controlled substances board, the board by affirmative action shall similarly treat the substance under this chapter after the expiration of 30 days from the date of publication in the federal register of a final order designating the substance as a controlled substance or rescheduling or deleting the substance or from the date of issuance of an order of temporary scheduling under 21 USC 811 (h), unless within that 30−day period, the board or an interested party objects to the treatment of the substance. If no objection is made, the board shall promulgate, without making the determinations or findings required by subs. (1), (1m), (1r) and (2) or s. 961.13, 961.15, 961.17, 961.19 or 961.21, a final rule, for which notice of proposed rulemaking is omitted, designating, rescheduling, temporarily scheduling or deleting the substance. If an objection is made the board shall publish notice of receipt of the objection and the reasons for objection and afford all interested parties an opportunity to be heard. At the conclusion of the hearing, the board shall make a determination with respect to the treatment of the substance as provided in subs. (1), (1m), (1r) and (2) and shall publish its decision, which shall be final unless altered by statute. Upon publication of an objection to the treatment by the board, action by the board under this chapter is stayed until the board promulgates a rule under sub. (2)."

Related statute or rule: s. 961.16, Stats.

DRAFT

Summary of, and comparison with, existing or proposed federal regulation:
On April 7, 2022, the Department of Justice, Drug Enforcement Administration published its interim final rule in the Federal Register listing Daridorexant into schedule IV of the federal Controlled Substances Act. The scheduling action is effective April 7, 2022.

Plain language analysis:
This rule schedules Daridorexant as a schedule IV controlled substance.

The Controlled Substances Board will promulgate a final rule, without making the determinations or findings required by ss. 961.11(1), (1m), (1r) and (2) or s. 961.19 and omitting the notice of proposed rulemaking, listing Daridorexant as a schedule IV controlled substance.

Pursuant to s. 961.11(4), Stats., the Controlled Substances Board by affirmative action similarly treats Daridorexant under chapter 961, Stats. by creating the following:

CSB 2.93 Addition of Daridorexant to schedule IV. Section 961.20 (2) (cpm), Stats., is created to read:

961.20 (2) (cpm) Daridorexant.

The Affirmative Action order, dated July 20, 2022, took effect on July 25, 2022, when it was published in the Administrative Register and expires upon promulgation of a final rule.

Summary of public comments received on statement of scope and a description of how and to what extent those comments and feedback were taken into account in drafting the proposed rule: N/A

Comparison with rules in adjacent states:
Illinois: Illinois has not scheduled Daridorexant as a schedule IV controlled substance [720 Illinois Compiled Statutes 570/210 (c)].

Iowa: Iowa has not scheduled Daridorexant as a schedule IV controlled substance [Iowa Code 124.210 (3)].

Michigan: Michigan has not scheduled Daridorexant as a schedule IV controlled substance [Michigan Compiled Laws s. 333.7218].

Minnesota: Minnesota has not scheduled Daridorexant as a schedule IV controlled substance [Minnesota Statutes 152.02 (5)].

Summary of factual data and analytical methodologies:
The methodology was to schedule Daridorexant to conform with the federal Controlled Substances Act.

DRAFT

Analysis and supporting documents used to determine effect on small business or in preparation of economic impact analysis:
The rule schedules Daridorexant as a Schedule IV controlled substance which will not have any effect on small business.

Fiscal Estimate:
The proposed rule will be posted for a period of 14 days to solicit public comment on economic impact, including how the proposed rules may affect businesses, local government units, and individuals.

Effect on small business:
These proposed rules do not have an economic impact on small businesses, as defined in s. 227.114 (1), Stats. The Department's Regulatory Review Coordinator may be contacted by email at Jennifer.Garrett@wisconsin.gov, or by calling (608) 266-6795.

Agency contact person:
Nilajah Hardin, Administrative Rules Coordinator, Department of Safety and Professional Services, Division of Policy Development, 4822 Madison Yards Way, P.O. Box 8366, Madison, Wisconsin 53708; telephone 608-267-7139; email at DSPSAdminRules@wisconsin.gov.

Place where comments are to be submitted and deadline for submission:
Comments may be submitted to Nilajah Hardin, Administrative Rules Coordinator, Department of Safety and Professional Services, Division of Policy Development, 4822 Madison Yards Way, Madison, WI 53708-8366, or by email to DSPSAdminRules@wisconsin.gov. Comments must be received by (date) to be included in the record of rulemaking proceedings.

TEXT OF RULE

SECTION 1. CSB 2.93 is created to read:

CSB 2.93 Addition of Daridorexant to schedule IV. Section 961.20 (2) (cpm), Stats., is created to read:

961.20 (2) (cpm) Daridorexant.

SECTION 2. EFFECTIVE DATE. The rules adopted in this order shall take effect on the first day of the month following publication in the Wisconsin Administrative Register, pursuant to s. 227.22 (2) (intro.), Stats.

(END OF TEXT OF RULE)

DRAFT

STATE OF WISCONSIN
CONTROLLED SUBSTANCES BOARD

IN THE MATTER OF RULE-MAKING PROCEEDINGS BEFORE THE CONTROLLED SUBSTANCES BOARD	:	PROPOSED ORDER OF THE CONTROLLED SUBSTANCES BOARD ADOPTING RULES (CLEARINGHOUSE RULE)

PROPOSED ORDER

An order of the Controlled Substances Board to create CSB 2.94 relating to scheduling seven (7) synthetic benzimidazole-opioid substances.

Analysis prepared by the Department of Safety and Professional Services.

ANALYSIS

Statutes interpreted: s. 961.16, Stats.

Statutory authority: s. 961.11 (1) and (4), Stats.

Explanation of agency authority:
Section 961.11 (1), Stats. provides that "[t]he controlled substances board shall administer this subchapter and may add substances to or delete or reschedule all substances listed in the schedules in ss. 961.14, 961.16, 961.18, 961.20 and 961.22 pursuant to the rule-making procedures of ch. 227."

Section 961.11(4), Stats. provides that "[i]f a substance is designated, rescheduled or deleted as a controlled substance under federal law and notice thereof is given to the controlled substances board, the board by affirmative action shall similarly treat the substance under this chapter after the expiration of 30 days from the date of publication in the federal register of a final order designating the substance as a controlled substance or rescheduling or deleting the substance or from the date of issuance of an order of temporary scheduling under 21 USC 811 (h), unless within that 30−day period, the board or an interested party objects to the treatment of the substance. If no objection is made, the board shall promulgate, without making the determinations or findings required by subs. (1), (1m), (1r) and (2) or s. 961.13, 961.15, 961.17, 961.19 or 961.21, a final rule, for which notice of proposed rulemaking is omitted, designating, rescheduling, temporarily scheduling or deleting the substance. If an objection is made the board shall publish notice of receipt of the objection and the reasons for objection and afford all interested parties an opportunity to be heard. At the conclusion of the hearing, the board shall make a determination with respect to the treatment of the substance as provided in subs. (1), (1m), (1r) and (2) and shall publish its decision, which shall be final unless altered by statute. Upon publication of an objection to the treatment by the board, action by the board under this chapter is stayed until the board promulgates a rule under sub. (2)."

Related statute or rule: s. 961.16, Stats.

DRAFT

Summary of, and comparison with, existing or proposed federal regulation:
On April 12, 2022, the Department of Justice, Drug Enforcement Administration published its temporary scheduling order in the Federal Register placing the following seven (7) synthetic benzimidazole-opioid substances into schedule I of the federal Controlled Substances Act. The scheduling action was effective immediately.

Plain language analysis:
This rule adds seven (7) synthetic benzimidazole-opioid substances to schedule I under ch. 961, Stats.

The Controlled Substances Board did not receive an objection to similarly treating the following seven (7) synthetic benzimidazole-opioid substances as schedule I under ch. 961, Stats. within 30 days of the date of publication in the federal register of the final order designating them as controlled substances:

- 2-(2-(4-butoxybenzyl)-5-nitro-1Hbenzimidazol-1-yl)-N,N-diethylethan-1- amine (butonitazene),
- 2-(2-(4-ethoxybenzyl)-1Hbenzimidazol-1-yl)-N,N-diethylethan-1- amine (etodesnitazene; etazene),
- N,N-diethyl-2-(2-(4-fluorobenzyl)-5- nitro-1H-benzimidazol-1-yl)ethan-1- amine (flunitazene),
- N,N-diethyl-2-(2-(4- methoxybenzyl)-1H-benzimidazol-1- yl)ethan-1-amine (metodesnitazene),
- N,N-diethyl-2-(2-(4- methoxybenzyl)-5-nitro-1Hbenzimidazol-1-yl)ethan-1-amine (metonitazene),
- 2-(4-ethoxybenzyl)-5-nitro-1-(2- (pyrrolidin-1-yl)ethyl)-1Hbenzimidazole (N-pyrrolidino etonitazene; etonitazepyne), and
- N,N-diethyl-2-(5-nitro-2-(4- propoxybenzyl)-1H-benzimidazol-1- yl)ethan-1-amine (protonitazene).

Therefore, pursuant to s. 961.11(4), Stats., the Controlled Substances Board by Affirmative Action similarly treated the seven (7) synthetic benzimidazole-opioid substances listed above, under chapter 961, Stats and is now following up with a final rule.

The Affirmative Action order, dated July 20, 2022, took effect on July 25, 2022, when it was published in the Administrative Register and expires upon promulgation of a final rule.

Summary of public comments received on statement of scope and a description of how and to what extent those comments and feedback were taken into account in drafting the proposed rule: N/A

Comparison with rules in adjacent states:
Illinois: Illinois has not included the seven (7) synthetic benzimidazole-opioid substances listed in this rule as schedule I controlled substances [720 Illinois Compiled Statutes 570/204].

Iowa: Iowa has not included the seven (7) synthetic benzimidazole-opioid substances listed in this rule as schedule I controlled substances [Iowa Code 124.204].

Michigan: Michigan has not included the seven (7) synthetic benzimidazole-opioid substances listed in this rule as schedule I controlled substances [Michigan Compiled Laws s. 333.7212].

Minnesota: Minnesota has not included the seven (7) synthetic benzimidazole-opioid substances listed in this rule as schedule I controlled substances [Minnesota Statutes 152.02 (2)].

Summary of factual data and analytical methodologies:
The methodology was to schedule seven (7) synthetic benzimidazole-opioid substances to conform with the federal Controlled Substances Act.

Analysis and supporting documents used to determine effect on small business or in preparation of economic impact analysis:
The rule schedules seven (7) synthetic benzimidazole-opioid substances as Schedule III controlled substances which will not have any effect on small business.

Fiscal Estimate:
The proposed rule will be posted for a period of 14 days to solicit public comment on economic impact, including how the proposed rules may affect businesses, local government units, and individuals.

Effect on small business:
These proposed rules do not have an economic impact on small businesses, as defined in s. 227.114 (1), Stats. The Department's Regulatory Review Coordinator may be contacted by email at Jennifer.Garrett@wisconsin.gov, or by calling (608) 266-6795.

Agency contact person:
Nilajah Hardin, Administrative Rules Coordinator, Department of Safety and Professional Services, Division of Policy Development, 4822 Madison Yards Way, P.O. Box 8366, Madison, Wisconsin 53708; telephone 608-267-7139; email at DSPSAdminRules@wisconsin.gov.

Place where comments are to be submitted and deadline for submission:
Comments may be submitted to Nilajah Hardin, Administrative Rules Coordinator, Department of Safety and Professional Services, Division of Policy Development, 4822 Madison Yards Way, Madison, WI 53708-8366, or by email to DSPSAdminRules@wisconsin.gov. Comments must be received by (date) to be included in the record of rulemaking proceedings.

TEXT OF RULE

DRAFT

SECTION 1. CSB 2.94 is created to read:

CSB 2.94 Addition of seven (7) synthetic benzimidazole-opioid substances to schedule I. Section 961.14 (2) (mm) and (pe), stats. are renumbered to 961.14 (2) (xm) 3. and 5. And amended to read:

961.14 (2) (xm) 3. Etonitazene (2-(2-(4-ethoxybenzyl)-5-nitro-1H-benzimidazol-1-yl)-N,N-diethylethan-1- amine).

961.14 (2) (xm) 5. Isotonitazene (N,N -diethyl-2-(2-(4-isopropoxybenzyl)-5-nitro-1H-benizimidazol-1-yl)ethan-1-amine).

Section 961.14 (2) (xm) 1., 2., 4., and 6. to 9., Stats., are created to read:

961.14 (2) (xm) Synthetic Benzimidazole-opioid Substances, specifically including all of the following:

1. Butonitazene (2-(2-(4-butoxybenzyl)-5-nitro-1H-benzimidazol-1-yl)-N,N-diethylethan-1-amine).

2. Etodesnitazene also known as Etazene (2-(2-(4-ethoxybenzyl)-1H-benzimidazol-1-yl)-N,N-diethylethan-1- amine).

4. Flunitazene (N,N-diethyl-2-(2-(4-fluorobenzyl)-5- nitro-1H-benzimidazol-1-yl)ethan-1-amine).

6. Metodesnitazene (N,N-diethyl-2-(2-(4- methoxybenzyl)-1H-benzimidazol-1- yl)ethan-1-amine).

7. Metonitazene (N,N-diethyl-2-(2-(4- methoxybenzyl)-5-nitro-1H-benzimidazol-1-yl)ethan-1-amine).

8. N-pyrrolidino etonitazene also known as etonitazepyne (2-(4-ethoxybenzyl)-5-nitro-1-(2-(pyrrolidin-1-yl)ethyl)-1H-benzimidazole).

9. Protonitazene (N,N-diethyl-2-(5-nitro-2-(4- propoxybenzyl)-1H-benzimidazol-1- yl)ethan-1-amine).

SECTION 2. EFFECTIVE DATE. The rules adopted in this order shall take effect on the first day of the month following publication in the Wisconsin Administrative Register, pursuant to s. 227.22 (2) (intro.), Stats.

(END OF TEXT OF RULE)

STATE OF WISCONSIN
CONTROLLED SUBSTANCES BOARD

IN THE MATTER OF RULE-MAKING PROCEEDINGS BEFORE THE CONTROLLED SUBSTANCES BOARD	:	PROPOSED ORDER OF THE CONTROLLED SUBSTANCES BOARD ADOPTING RULES (CLEARINGHOUSE RULE)

PROPOSED ORDER

An order of the Controlled Substances Board to create CSB 2.95 relating to scheduling Ganaxolone.

Analysis prepared by the Department of Safety and Professional Services.

ANALYSIS

Statutes interpreted: s. 961.16, Stats.

Statutory authority: s. 961.11 (1) and (4), Stats.

Explanation of agency authority:
Section 961.11 (1), Stats. provides that "[t]he controlled substances board shall administer this subchapter and may add substances to or delete or reschedule all substances listed in the schedules in ss. 961.14, 961.16, 961.18, 961.20 and 961.22 pursuant to the rule-making procedures of ch. 227."

Section 961.11(4), Stats. provides that "[i]f a substance is designated, rescheduled or deleted as a controlled substance under federal law and notice thereof is given to the controlled substances board, the board by affirmative action shall similarly treat the substance under this chapter after the expiration of 30 days from the date of publication in the federal register of a final order designating the substance as a controlled substance or rescheduling or deleting the substance or from the date of issuance of an order of temporary scheduling under 21 USC 811 (h), unless within that 30−day period, the board or an interested party objects to the treatment of the substance. If no objection is made, the board shall promulgate, without making the determinations or findings required by subs. (1), (1m), (1r) and (2) or s. 961.13, 961.15, 961.17, 961.19 or 961.21, a final rule, for which notice of proposed rulemaking is omitted, designating, rescheduling, temporarily scheduling or deleting the substance. If an objection is made the board shall publish notice of receipt of the objection and the reasons for objection and afford all interested parties an opportunity to be heard. At the conclusion of the hearing, the board shall make a determination with respect to the treatment of the substance as provided in subs. (1), (1m), (1r) and (2) and shall publish its decision, which shall be final unless altered by statute. Upon publication of an objection to the treatment by the board, action by the board under this chapter is stayed until the board promulgates a rule under sub. (2)."

Related statute or rule: s. 961.16, Stats.

DRAFT

Summary of, and comparison with, existing or proposed federal regulation:
On June 1, 2022, the Department of Justice, Drug Enforcement Administration published its interim final rule in the Federal Register listing Ganaxolone into schedule V of the federal Controlled Substances Act. The scheduling action is effective June 1, 2022.

Plain language analysis:
This rule schedules Ganaxolone as a schedule V controlled substance.

The Controlled Substances Board will promulgate a final rule, without making the determinations or findings required by ss. 961.11(1), (1m), (1r) and (2) or s. 961.19 and omitting the notice of proposed rulemaking, listing Ganaxolone as a schedule V controlled substance.

Pursuant to s. 961.11(4), Stats., the Controlled Substances Board by affirmative action similarly treats Ganaxolone under chapter 961, Stats. by creating the following:

CSB 2.95 Addition of Ganaxolone to schedule V. Section 961.22 (11), Stats., is created to read:

961.22 (11) Ganaxolone.

The Affirmative Action order, dated July 20, 2022, took effect on July 25, 2022, when it was published in the Administrative Register and expires upon promulgation of a final rule.

Summary of public comments received on statement of scope and a description of how and to what extent those comments and feedback were taken into account in drafting the proposed rule: N/A

Comparison with rules in adjacent states:
Illinois: Illinois has not listed Ganaxolone as a schedule V controlled substance [720 Illinois Compiled Statutes 570/212].

Iowa: Iowa has not listed Ganaxolone as a schedule V controlled substance [Iowa Code 124.212].

Michigan: Michigan has not listed Ganaxolone as a schedule V controlled substance [Michigan Compiled Laws s. 333.7220].

Minnesota: Minnesota has not listed Ganaxolone as a schedule V controlled substance [Minnesota Statutes 152.02 (6)].

Summary of factual data and analytical methodologies:
The methodology was to schedule Ganaxolone to conform with the federal Controlled Substances Act.

DRAFT

Analysis and supporting documents used to determine effect on small business or in preparation of economic impact analysis:
The rule schedules Ganaxolone as a Schedule V controlled substance which will not have any effect on small business.

Fiscal Estimate:
The proposed rule will be posted for a period of 14 days to solicit public comment on economic impact, including how the proposed rules may affect businesses, local government units, and individuals.

Effect on small business:
These proposed rules do not have an economic impact on small businesses, as defined in s. 227.114 (1), Stats. The Department's Regulatory Review Coordinator may be contacted by email at Jennifer.Garrett@wisconsin.gov, or by calling (608) 266-6795.

Agency contact person:
Nilajah Hardin, Administrative Rules Coordinator, Department of Safety and Professional Services, Division of Policy Development, 4822 Madison Yards Way, P.O. Box 8366, Madison, Wisconsin 53708; telephone 608-267-7139; email at DSPSAdminRules@wisconsin.gov.

Place where comments are to be submitted and deadline for submission:
Comments may be submitted to Nilajah Hardin, Administrative Rules Coordinator, Department of Safety and Professional Services, Division of Policy Development, 4822 Madison Yards Way, Madison, WI 53708-8366, or by email to DSPSAdminRules@wisconsin.gov. Comments must be received by (date) to be included in the record of rulemaking proceedings.

TEXT OF RULE

SECTION 1. CSB 2.95 is created to read:

CSB 2.95 Addition of Ganaxolone to schedule V. Section 961.22 (11), Stats., is created to read:

961.22 (11) Ganaxolone.

SECTION 2. EFFECTIVE DATE. The rules adopted in this order shall take effect on the first day of the month following publication in the Wisconsin Administrative Register, pursuant to s. 227.22 (2) (intro.), Stats.

(END OF TEXT OF RULE)

DRAFT

STATE OF WISCONSIN
CONTROLLED SUBSTANCES BOARD

IN THE MATTER OF RULE-MAKING PROCEEDINGS BEFORE THE CONTROLLED SUBSTANCES BOARD	:	AFFIRMATIVE ACTION ORDER OF THE CONTROLLED SUBSTANCES BOARD

FINDINGS

1. On November 17, 2022, the Department of Justice, Drug Enforcement Administration published its final rule in the Federal Register adding Amineptine into schedule I of the federal Controlled Substances Act. The scheduling action is effective December 19, 2022.

2. The Controlled Substances Board did not receive an objection to similarly listing Amineptine as a schedule I under ch. 961, Stats. within 30 days of the date of publication in the federal register of the final order listing Amineptine as a schedule I controlled substance.

3. The Controlled Substances Board will promulgate a final rule, without making the determinations or findings required by ss. 961.11(1), (1m), (1r) and (2) or s. 961.19 and omitting the notice of proposed rulemaking, listing Amineptine as a schedule I controlled substance.

ORDER

Pursuant to s. 961.11(4), Stats., the Controlled Substances Board by affirmative action similarly treats Amineptine under chapter 961, Stats. by creating the following:

CSB 2.96 Addition of Amineptine to schedule I. Section 961.14 (7) (r), Stats., is created to read:

> **961.14 (7) (r)** 7-[10,11-dihydro-5H-dibenzo[a,d]cyclohepten-5-yl)amino]heptanoic acid, commonly known as Amineptine.

This order shall become effective upon publication in the Administrative Register. The order expires upon promulgation of a final rule.

Dated _____

_____
Doug Englebert, Chair
Controlled Substances Board

DRAFT

STATE OF WISCONSIN
CONTROLLED SUBSTANCES BOARD

IN THE MATTER OF RULE-MAKING PROCEEDINGS BEFORE THE CONTROLLED SUBSTANCES BOARD	:	AFFIRMATIVE ACTION ORDER OF THE CONTROLLED SUBSTANCES BOARD

FINDINGS

1. On November 21, 2022, the Department of Justice, Drug Enforcement Administration published its final rule in the Federal Register adding Zipeprol to schedule I of the federal Controlled Substances Act. The scheduling action is effective December 21, 2022.

2. The Controlled Substances Board did not receive an objection to similarly listing Zipeprol as a schedule I under ch. 961, Stats. within 30 days of the date of publication in the federal register of the final order listing Zipeprol as a schedule I controlled substance.

3. The Controlled Substances Board will promulgate a final rule, without making the determinations or findings required by ss. 961.11(1), (1m), (1r) and (2) or s. 961.19 and omitting the notice of proposed rulemaking, listing Zipeprol as a schedule I controlled substance.

ORDER

Pursuant to s. 961.11(4), Stats., the Controlled Substances Board by affirmative action similarly treats Zipeprol under chapter 961, Stats. by creating the following:

CSB 2.97 Addition of Zipeprol to schedule I. Section 961.14 (2) (zm), Stats., is created to read:

> **961.14 (2) (zm)** Zipeprol (1-methoxy-3-[4-(2-methoxy-2-phenylethyl)piperazin-1-yl]-1-phenylpropan-2-ol).

This order shall become effective upon publication in the Administrative Register. The order expires upon promulgation of a final rule.

Dated _____

_____
Doug Englebert, Chair
Controlled Substances Board

DRAFT

STATE OF WISCONSIN
CONTROLLED SUBSTANCES BOARD

IN THE MATTER OF RULE-MAKING PROCEEDINGS BEFORE THE CONTROLLED SUBSTANCES BOARD	:	AFFIRMATIVE ACTION ORDER OF THE CONTROLLED SUBSTANCES BOARD

FINDINGS

1. On November 21, 2022, the Department of Justice, Drug Enforcement Administration published its final rule in the Federal Register removing [^{18} F]FP-CIT from schedule II of the federal Controlled Substances Act. The scheduling action is effective December 21, 2022.

2. The Controlled Substances Board did not receive an objection to similarly excluding [^{18} F]FP-CIT as a schedule II controlled substance under ch. 961, Stats. within 30 days of the date of publication in the federal register of the final order removing [^{18} F]FP-CIT as a schedule II controlled substance.

3. The Controlled Substances Board will promulgate a final rule, without making the determinations or findings required by ss. 961.11(1), (1m), (1r) and (2) or s. 961.15 and omitting the notice of proposed rulemaking, excluding [^{18} F]FP-CIT as a schedule II controlled substance pursuant to s. 961.16 (2) (a).

ORDER

Pursuant to s. 961.11(4), Stats., the Controlled Substances Board by affirmative action similarly treats [^{18} F]FP-CIT under chapter 961, Stats. by creating the following:

CSB 2.98 Excluding [^{18} F]FP-CIT from schedule II. Section 961.16 (2) (b), Stats., is amended to read:

> **961.16 (2) (b)** Coca leaves and any salt, compound, derivative, or preparation of coca leaves. Decocainized coca leaves or extractions which do not contain cocaine or ecgonine are excluded from this paragraph. [^{123}I]Ioflupane ~~is~~ and [^{18} F]FP-CIT are excluded from this paragraph. The following substances and any of their salts, esters, isomers, and salts of esters and isomers that are theoretically possible within the specific chemical designation, are included in this paragraph:

This order shall take effect upon publication in the Administrative Register. The order expires upon promulgation of a final rule.

Dated _____ _____

Doug Englebert, Chair
Controlled Substances Board

DRAFT

STATE OF WISCONSIN
CONTROLLED SUBSTANCES BOARD

IN THE MATTER OF RULE-MAKING PROCEEDINGS BEFORE THE CONTROLLED SUBSTANCES BOARD	:	AFFIRMATIVE ACTION ORDER OF THE CONTROLLED SUBSTANCES BOARD

FINDINGS

1. On November 22, 2022, the Department of Justice, Drug Enforcement Administration published its final rule in the Federal Register adding Mesocarb to schedule I of the federal Controlled Substances Act. The scheduling action is effective December 22, 2022.

2. The Controlled Substances Board did not receive an objection to similarly listing Mesocarb as a schedule I under ch. 961, Stats. within 30 days of the date of publication in the federal register of the final order listing Mesocarb as a schedule I controlled substance.

3. The Controlled Substances Board will promulgate a final rule, without making the determinations or findings required by ss. 961.11(1), (1m), (1r) and (2) or s. 961.19 and omitting the notice of proposed rulemaking, listing Mesocarb as a schedule I controlled substance.

ORDER

Pursuant to s. 961.11(4), Stats., the Controlled Substances Board by affirmative action similarly treats Mesocarb under chapter 961, Stats. by creating the following:

CSB 2.99 Addition of Mesocarb to schedule I. Section 961.14 (7) (s), Stats., is created to read:

> **961.14 (7) (s)** N-phenyl- N' –(3-(1-phenylpropan-2-yl)-1,2,3-oxadiazol-3-ium-5-yl)carbamimidate, commonly known as Mesocarb.

This order shall become effective upon publication in the Administrative Register. The order expires upon promulgation of a final rule.

Dated _____

_____
Doug Englebert, Chair
Controlled Substances Board

STATE OF WISCONSIN
CONTROLLED SUBSTANCES BOARD

IN THE MATTER OF RULE-MAKING PROCEEDINGS BEFORE THE CONTROLLED SUBSTANCES BOARD	:	AFFIRMATIVE ACTION ORDER OF THE CONTROLLED SUBSTANCES BOARD

FINDINGS

1. On December 9, 2022, the Department of Justice, Drug Enforcement Administration published its final rule in the Federal Register adding Methiopropamine to schedule I of the federal Controlled Substances Act. The scheduling action is effective January 9, 2023.

2. The Controlled Substances Board did not receive an objection to similarly listing Methiopropamine as a schedule I under ch. 961, Stats. within 30 days of the date of publication in the federal register of the final order listing Methiopropamine as a schedule I controlled substance.

3. The Controlled Substances Board will promulgate a final rule, without making the determinations or findings required by ss. 961.11(1), (1m), (1r) and (2) or s. 961.19 and omitting the notice of proposed rulemaking, listing Methiopropamine as a schedule I controlled substance.

ORDER

Pursuant to s. 961.11(4), Stats., the Controlled Substances Board by affirmative action similarly treats Methiopropamine under chapter 961, Stats. by creating the following:

CSB 2. Addition of Methiopropamine to schedule I. Section 961.14 (7) (t), Stats., is created to read:

> **961.14 (7) (t)** N-methyl-1-(thiophen-2-yl)propan-2-amine, commonly known as Methiopropamine.

This order shall become effective upon publication in the Administrative Register. The order expires upon promulgation of a final rule.

Dated _____

_____
Doug Englebert, Chair
Controlled Substances Board

DRAFT

STATEMENT OF SCOPE

CONTROLLED SUBSTANCES BOARD

Rule No.: CSB 4

Relating to: National Provider Identifier Requirement

Rule Type: Permanent

1. Finding/nature of emergency (Emergency Rule only):

N/A

2. Detailed description of the objective of the proposed rule:

The objective of the proposed rule is to amend CSB 4 to reflect that there will be updates made to the Prescription Drug Monitoring Program relating to requiring a National Provider Identifier to be reported for prescriber accounts and on dispensing records.

3. Description of the existing policies relevant to the rule, new policies proposed to be included in the rule, and an analysis of policy alternatives:

Wisconsin Administrative Code Chapter CSB 4 currently outlines requirements for what is to be recorded in the Prescription Drug Monitoring Program. These requirements do not currently include the provision of a National Provider Identifier. By requiring this information, the program will be able to accurately monitor non-controlled substances that the Controlled Substances Board has deemed necessary to track, such as Gabapentin. Without making this change, the program will continue to operate without the ability to accurately monitor non-controlled substances.

4. Detailed explanation of statutory authority for the rule (including the statutory citation and language):

961.385 (2) (b) states that the board shall establish by rule and have the prescription drug monitoring program “Identify specific data elements to be contained in a record documenting the dispensing of a monitored prescription drug, including the method of payment and, subject to sub. (2m), the name recorded under s. 450.44 (1b) (bm). In identifying specific data elements, the board shall consider data elements identified by similar programs in other states and shall ensure, to the extent possible, that records generated by the program are easily shared with other states.”

5. Estimate of amount of time that state employees will spend developing the rule and of other resources necessary to develop the rule:

60 hours

6. List with description of all entities that may be affected by the proposed rule:

Pharmacies, pharmacists, prescribers, and law enforcement.

7. Summary and preliminary comparison with any existing or proposed federal regulation that is intended to address the activities to be regulated by the proposed rule:

None.

8. Anticipated economic impact of implementing the rule (note if the rule is likely to have a significant economic impact on small businesses):

None to minimal. It is not likely to have a significant economic impact on small businesses.

Contact Person: Nilajah Hardin, (608) 267-7139, DSPSAdminRules@wisconsin.gov

Approved for publication:

Douglas Englebert

Authorized Signature

10/05/22

Date Submitted

Approved for implementation:

Douglas Englebert

Authorized Signature

12/7/22

Date Submitted

Chapter CSB 4

PRESCRIPTION DRUG MONITORING PROGRAM

Note: Chapter Phar 18 was renumbered chapter CSB 4 under s. 13.92 (4) (b) 1., Stats., Register September 2015 No. 717.

CSB 4.01 Authority and scope. The rules in this chapter are adopted under authority in ss. 227.11 (2) (a) and 961.385, Stats., for the purpose of creating a prescription drug monitoring program to collect and disclose information relating to the prescribing and dispensing of monitored prescription drugs.

History: CR 12–009: cr. Register October 2012 No. 682, eff. 1–1–13; correction made under s. 13.92 (4) (b) 7., Stats., Register September 2015 No. 717; EmR1706: emerg. am., eff. 4–1–17; CR 17–028: am. Register December 2017 No. 744, eff. 1–1–18.

CSB 4.02 Definitions. As used in this chapter:

(1) "Access" means to have the ability to view monitored prescription drug history reports, audit trails, and PDMP data as authorized by s. CSB 4.09.

(2) "Administer" has the meaning given in s. 961.385 (1) (a), Stats.

(2m) "Agent" has the meaning given in s. 961.385 (1) (ab), Stats.

(3) "Animal" has the meaning given in s. 89.02 (1m), Stats.

(3m) "ASAP" means the American Society for Automation in Pharmacy.

Note: Contact: American Society for Automation in Pharmacy, 492 Norristown Road, Suite 160; Blue Bell, PA 19422; phone: (610) 825–7783; fax: (610) 825–7641; webpage: http://asapnet.org/index.html.

(3s) "Audit trail" means the log that contains information about each time the PDMP system discloses PDMP data, monitored prescription drug history reports, and prescribing metrics reports.

(4) "Board" means the Controlled Substances Board.

(4m) "Business day" has the meaning given in s. 961.385 (1) (ad), Stats.

(5) "Controlled substance" means a drug, substance, analog, or precursor described in any of the following:

(a) Schedule I, II, III, IV, or V in the federal controlled substances act, 21 USC 812 (b) (1) to (b) (5) and (c), as changed and updated by 21 CFR 1308.

(b) Schedule I, II, III, IV, or V in subch. II of ch. 961, Stats., as amended by ch. CSB 2.

(5k) "DEA registration number" means the registration number issued to a dispenser or practitioner by the federal department of justice, drug enforcement administration.

(5m) "Deliver" or "delivery" has the meaning in s. 961.385 (1) (ae), Stats.

(6) "Department" means the department of safety and professional services.

(7) "Dispense" has the meaning given in s. 961.385 (1) (af), Stats.

(8) "Dispenser" means all of the following:

(a) A pharmacy.

Note: A site of remote dispensing authorized under s. 450.062, Stats., is under the supervision of a pharmacy.

(b) A practitioner who dispenses a monitored prescription drug.

(9) "Dispenser delegate" means any of the following:

(a) A managing pharmacist of a pharmacy.

(b) An agent or employee of a practitioner who has been delegated the task of satisfying the data compilation and submission requirements of ss. CSB 4.04 and 4.05.

(10) "Dispensing data" means data compiled pursuant to s. CSB 4.04.

(11) "Drug" has the meaning given in s. 450.01 (10), Stats.

(11c) "Healthcare Professional" means a pharmacist, practitioner, registered nurse licensed under s. 441.06, Stats., substance abuse counselor, as defined in s. 440.88 (1) (b), Stats., or individual authorized under s. 457.02 (5m), Stats., to treat alcohol or substance dependency or abuse as a specialty.

(11g) "Hospital" has the meaning given in s. 50.33 (2), Stats.

(11n) "Law enforcement agency" has the meaning given in s. 165.77 (1) (b), Stats.

(11r) "Managing pharmacist" means a pharmacist designated by the pharmacy owner to have responsibility for and direct control of pharmaceutical operations in a pharmacy.

(11w) "Medical coordinator" means a person who medically coordinates, directs, supervises, or establishes standard operating procedures for a healthcare professional.

(12) (a) "Monitored prescription drug" means all of the following:

1. A controlled substance included in s. 961.385 (1) (ag), Stats.

2. A drug identified by the board as having a substantial potential for abuse in s. CSB 4.03.

(b) "Monitored prescription drug" does not mean a controlled substance that by law may be dispensed without a prescription order.

(12m) "Monitored prescription drug history report" means all of the following information about a patient, patient address, practitioner, or dispenser compiled by the PDMP system and disclosed as authorized in ss. CSB 4.09 and 4.11:

(a) PDMP data.

(b) Reports submitted to the program pursuant to s. 961.37, Stats.

(c) Information submitted to the program by a healthcare professional.

(d) Information from the analytics platform.

(13) "Patient" has the meaning given in s. 961.385 (1) (aj), Stats.

(14e) "PDMP" means the Wisconsin prescription drug monitoring program.

(15) "PDMP data" means the information compiled and analyzed by the PDMP system from dispensing data submitted to it by dispensers.

(15b) "PDMP system" means the web−based application, analytics platform, and all related hardware and software that facilitates the submission of dispensing data and the access to and disclosure of PDMP data, monitored prescription drug history reports, audit trails, and prescribing metrics reports.

(15e) "Personally identifiable information" means information that can be associated with a particular person through one or more identifiers or other information or circumstances.

(15g) "Pharmacist" has the meaning given in s. 961.385 (1) (aL), Stats. For the purposes of this program, the board recognizes a pharmacist licensed by another state that engages in the practice of pharmacy within the contiguous borders of this state or who practices at a pharmacy licensed under s. 450.065, Stats. as a person authorized to engage in the practice of pharmacy.

(15r) "Pharmacist delegate" means an agent of a pharmacist to whom the pharmacist has delegated the task of accessing monitored prescription drug history reports.

(16) "Pharmacy" has the meaning given in s. 961.385 (1) (an), Stats., including a pharmacy that chooses to solely dispense to animal patients.

(17) "Practitioner" has the meaning given in s. 961.385 (1) (ar), Stats. For the purposes of this program, the board recognizes a practitioner licensed by another state that engages in the practice of their credentialed profession within the contiguous borders of this state as a person authorized to prescribe and administer drugs.

(18) "Practitioner delegate" means an agent of a practitioner to whom the practitioner has delegated the task of accessing monitored prescription drug history reports.

(18m) "Prescribing metrics report" means all of the following information about a practitioner compiled by the PDMP system and disclosed as authorized in s. CSB 4.09:

(a) PDMP data.

(b) Audit trails.

(c) Reports submitted to the program pursuant to s. 961.37, Stats., about a patient to whom the practitioner has issued a prescription order.

(d) Information from the analytics platform.

(19) "Prescription" has the meaning given in s. 450.01 (19), Stats.

(20) "Prescription order" has the meaning given in s. 961.385 (1) (b), Stats.

(21) "Program" means the prescription drug monitoring program established under this chapter.

(21m) "Prosecutorial unit" has the meaning given in s. 978.001 (2), Stats.

(23) "Zero report" means a report that indicates that a dispenser has not dispensed a monitored prescription drug since the previous submission of dispensing data or a zero report.

History: CR 12−009: cr. Register October 2012 No. 682, eff. 1−1−13; correction in (5) (b) made under s. 13.92 (4) (b) 7., Stats., Register October 2012 No. 682; CR 13−065: cr. (3m), (13e), am. (16), (17), r. (22) Register February 2014 No. 698, eff. 3−1−14; (13e) renum. to (14e) under s. 13.92 (4) (b) 1., Stats., Register February 2014 No. 698; correction in (17) made under s. 13.92 (4) (b) 7., Stats., Register February 2014 No. 698; CR 14−003: am. (8) (a), renum. (9) to (9) (intro.) and am., cr. (9) (a), (b), (11g), (11r), am. (15) (intro.), cr. (15g), (15r), am. (17) Register August 2014 No. 704, eff. 9−1−14; correction in (3), (9) (b), (10), (12) (a) 1., 2., (15) (b), (15g), (17), (20) made under s. 13.92 (4) (b) 7., Stats., Register September 2015 No. 717; CR 15−101: am. (4) Register June 2016 No. 726, eff. 7−1−16; EmR1706: emerg. am. (1), (2), cr. (2m), (3s), (4m), (5m), am. (7), cr. (11c), (11n), am. (11r), cr. (11w), am. (12) (a) 1., cr. (12m), am. (13), r. (14), cons. and renum. (15) (intro.) and (a) to (15) and am., r. (15) (b), cr. (15b), (15e), am. (15g), (15r), (16), (17), (18), cr. (18m), (21m), eff. 4−1−17; CR 17−028: am. (1), (2), cr. (2m), (3s), (4m), (5m), am. (7), cr. (11c), (11n), am. (11r), cr. (11w), am. (12) (a) 1., cr. (12m), am. (13), r. (14), cons. and renum. (15) (intro.) and (a) to (15) and am., r. (15) (b), cr. (15b), (15e), am. (15g), (15r), (16), (17), (18), cr. (18m), (21m) Register December 2017 No. 744, eff. 1−1−18; **(5k) renumbered from CSB 4.04 (1) (a) under s. 13.92 (4) (b) 1., Stats., Register August 2021 No. 788.**

CSB 4.03 Drugs that have a substantial potential for abuse. Pursuant to s. 961.385 (1) (ag), Stats., the board has identified all of the following drugs as having a substantial potential for abuse:

(1) A controlled substance identified in schedule II, III, IV or V in the federal controlled substances act, 21 USC 812 (b) (2) to (b) (5) and (c), as changed and updated by 21 CFR 1308.

(2) Gabapentin.

History: CR 12−009: cr. Register October 2012 No. 682, eff. 1−1−13; correction in (2) made under s. 13.92 (4) (b) 7., Stats., Register October 2012 No. 682; CR 13−065: am. (intro.) Register February 2014 No. 698, eff. 3−1−14; correction in (intro.) made under s. 13.92 (4) (b) 7., Stats., Register February 2014 No. 698; correction in (intro.) made under s. 13.92 (4) (b) 7., Stats., Register September 2015 No. 717; CR 15−101: r. (3) Register June 2016 No. 726, eff. 7−1−16; EmR1706: emerg. r. (2), eff. 4−1−17; CR 17−028: r. (2) Register December 2017 No. 744, eff. 1−1−18; **CR 20−080: cr. (2) Register August 2021 No. 788, eff. 9−1−21.**

CSB 4.04 Compilation of dispensing data. (1) As used in this section, "NDC number" means national drug code number, the universal product identifier used in the U.S. to identify a specific drug product.

(2) Subject to s. CSB 4.08, a dispenser shall compile dispensing data that contains all of the following information each time the dispenser dispenses a monitored prescription drug:

(a) The dispenser's full name.

(b) The dispenser's DEA registration number.

(c) The date dispensed.

(d) The prescription number.

(e) The NDC number of the monitored prescription drug.

(f) The quantity dispensed.

(g) The estimated number of days of drug therapy.

(gb) The drug dosage units.

(gd) The partial fill indicator.

(ge) The classification code for payment type.

(gm) The number of refills authorized by the prescriber.

(gs) The refill number of the prescription.

(h) The practitioner's full name.

(i) The practitioner's DEA registration number.

(j) The date prescribed.

(L) The patient's full name or if the patient is an animal, the animal's name and the owner's last name.

(m) The patient's address, or if the patient is an animal, patient's owner's address, including street address, city, state, and ZIP code.

(n) The patient's date of birth, or if the patient is an animal, patient's owner's date of birth.

(o) The patient's gender.

(p) The name recorded under s. 450.11 (1b) (bm), Stats.

(4) The board may refer a dispenser and dispenser delegate that fail to compile dispensing data as required by sub. (2) to the appropriate licensing or regulatory board for discipline.

History: CR 12−009: cr. Register October 2012 No. 682, eff. 1−1−13; CR 13−065: am. (1) (b), (e), (3) (b), (d), (i), (k) Register February 2014 No. 698, eff. 3−1−14; CR 14−003: am. (title), renum. (2) to (2) (intro.) and am., cr. (2) (ge), (gm), (gs), renum. (3) (a) to (g) and (h) to (j) to (2) (a) to (g) and (h) to (j), r. (3) (k), renum. (3) (L) to (o) to (2) (L) to (o) and am. (L) to (n), am. (4) Register August 2014 No. 704, eff. 9−1−14; correction in (2) (intro.) made under s. 35.17, Stats., and in (4) made under s. 13.92 (4) (b) 7., Stats., Register August 2014 No. 704; correction in (2) (intro.) made under s. 13.92 (4) (b) 7., Stats., Register September 2015 No. 717; CR 15−070: cr. (2) (p) Register April 2016 No. 724, eff. 4−9−17; numbering correction in (2) (p) under s. 13.92 (4) (b) 1. Register April 2016 No. 724; republished to correct CR 15−070: cr. (2) (p) effective date Register May 2016 No. 725; EmR1706: emerg. r. (1) (b), (d), (e), am. (2) (b), (e), (i), (4), eff. 4−1−17; CR 17−028: r. (1) (b), (d), (e), am. (2) (b), (e), (i), (4) Register December 2017 No. 744, eff. 1−1−18; CR 19−156: cr. (2) (gb), (gd) Register August 2020 No. 776, eff. 9−1−20; **(1) (a) renumbered to CSB 4.02 (5k), and (1) (intro.) and (c) consolidated and renumberd to (1) under s. 13.92 (4) (b) 1., Stats., correction in (1) made under s. 35.17, Stats., Register August 2021 No. 788.**

CSB 4.05 Electronic submission of dispensing data. (1) Unless exempt under s. CSB 4.08, a dispenser shall electronically submit dispensing data to the PDMP in any of the following ways:

(a) As a file that complies with the data standards identified in version 4 and release 2 of ASAP implementation guide for prescription monitoring programs.

(b) Using the prescription record entry functions of the PDMP system.

Note: The guide for dispensers which specifies the data standards in version 4 release 2 of the ASAP implementation guide for prescription monitoring programs and other electronic formats identified by the board may be obtained online at https://pdmp.wi.gov or obtained at no charge from the Department of Safety and Professional Services, 1400 East Washington Avenue, P.O. Box 8366, Madison, WI 53708.

(4) The board may refer a dispenser and dispenser delegate that fail to submit dispensing data as required by sub. (1) to the appropriate licensing or regulatory board for discipline.

History: CR 12–009: cr. Register October 2012 No. 682, eff. 1–1–13; CR 13–065: am. (2) Register February 2014 No. 698, eff. 3–1–14; CR 14–003: am. (1), (4) Register August 2014 No. 704, eff. 9–1–14; correction in (intro.) made under s. 13.92 (4) (b) 7., Stats., Register September 2015 No. 717; EmR1706: emerg. renum. (1) to (1) (intro.), cr. (1) (a), (b), r. (2), (3), r. and recr. (4), eff. 4–1–17; CR 17–028: renum. (1) to (1) (intro.), cr. (1) (a), (b), r. (2), (3), r. and recr. (4) Register December 2017 No. 744, eff. 1–1–18.

CSB 4.06 Frequency of submissions. (1) A dispenser shall submit dispensing data to the PDMP no later than 11:59 p.m. of the next business day after the monitored prescription drug is dispensed.

(2) If a dispenser does not dispense a monitored prescription drug on a business day, the dispenser shall submit no later than 11:59 p.m. of the next business day a zero report to the PDMP that accounts for each business day on which the dispenser did not dispense a monitored prescription drug.

(3) If a dispenser is not able to submit dispensing data zero report before 11:59 p.m. of the next business day as required by subs. (1) or (2), the board may grant an emergency waiver to a dispenser who satisfies all of the following conditions:

(a) The dispenser is not able to submit dispensing data or a zero report because of circumstances beyond its control.

(b) The dispenser files with the board a written application for an emergency waiver on a form provided by the board prior to the required submission of dispensing data or zero report.

Note: The application for an emergency waiver may be obtained online at www.dsps.wi.gov or obtained at no charge from the Department of Safety and Professional Services, 1400 East Washington Avenue, P.O. Box 8366, Madison, WI 53708.

(4) Unless otherwise specified by the board, an emergency waiver granted under sub. (3) shall only be effective for 7 days.

(5) The board may refer a dispenser and dispenser delegate that fail to submit dispensing data or a zero report as required by subs. (1) and (2), or be granted an emergency waiver under sub. (3), or a dispenser and a dispenser delegate that submit false information to the PDMP to the appropriate licensing or regulatory board for discipline.

History: CR 12–009: cr. Register October 2012 No. 682, eff. 1–1–13; CR 13–065: am. (1), (2), (3) (intro.), r. (4) to (6), (9), renum. (7) to (4) and am., renum. (8) to (5) Register February 2014 No. 698, eff. 3–1–14; CR 14–003: am. (2), (5) Register August 2014 No. 704, eff. 9–1–14; EmR1706: emerg. am. (1), (2), (3), (5), eff. 4–1–17; CR 17–028: am. (1), (2), (3), (5) Register December 2017 No. 744, eff. 1–1–18.

CSB 4.07 Correction of dispensing data. (1) A dispenser shall electronically correct dispensing data in the PDMP system within 5 business days of discovering an omission, error, or inaccuracy in previously submitted dispensing data.

(2) The board may refer a dispenser and dispenser delegate that fail to correct dispensing data as required by sub. (1) to the appropriate licensing or regulatory board for discipline.

Note: The written notice to the board may be submitted through an account with the board, sent by electronic mail or sent by U.S. mail to the Department of Safety and Professional Services 1400 East Washington Avenue, P.O. Box 8366, Madison, WI 53708.

History: CR 12–009: cr. Register October 2012 No. 682, eff. 1–1–13; CR 14–003: am. Register August 2014 No. 704, eff. 9–1–14; EmR1706: emerg. r. and recr. eff. 4–1–17; CR 17–028: r. and recr. Register December 2017 No. 744, eff. 1–1–18.

CSB 4.08 Exemptions from compiling and submitting dispensing data. (1) The board shall exempt a dispenser from compiling and submitting dispensing data and from submitting a zero report as required under this chapter until the dispenser is required to renew its license, or until the dispenser dispenses a monitored prescription drug, if the dispenser satisfies all of the following conditions:

(a) The dispenser provides evidence sufficient to the board that the dispenser does not dispense monitored prescription drugs.

(b) The dispenser files with the board a written request for exemption on a form provided by the board.

Note: The application for an exemption may be obtained online at www.dsps.wi.gov or at no charge from the Department of Safety and Professional Services 1400 East Washington Avenue, P.O. Box 8366, Madison, WI 53708. A dispenser who is already exempt can renew his or her exemption as part of the licensure renewal process.

(2) A dispenser is not required to compile or submit dispensing data when the monitored prescription drug is administered directly to a patient.

(2m) A dispenser is not required to compile or submit dispensing data when the monitored prescription drug is compounded, packaged, or labeled in preparation for delivery but is not delivered.

(3) A dispenser is not required to compile or submit dispensing data when the monitored prescription drug is a substance listed in the schedule in s. 961.22, Stats., and is not a narcotic drug, as defined in s. 961.01 (15), Stats., and is dispensed pursuant to a prescription order for a number of doses that is intended to last the patient 7 days or less.

(4) A dispenser who is not otherwise required to have a DEA registration number is not required to compile or submit dispensing data when dispensing Gabapentin.

History: CR 12–009: cr. Register October 2012 No. 682, eff. 1–1–13; CR 14–003: am. (1) (a), cr. (3) Register August 2014 No. 704, eff. 9–1–14; CR 15–101: am. (1) Register June 2016 No. 726, eff. 7–1–16; EmR1706: emerg. cr. (2m), eff. 4–1–17; CR 17–028: cr. (2m) Register December 2017 No. 744, eff. 1–1–18; **CR 20–080: cr. (4) Register August 2021 No. 788, eff. 9–1–21.**

CSB 4.09 Access to monitored prescription drug history reports and PDMP data about a patient. (1) Healthcare professionals may access monitored prescription drug history reports about a patient for any of the following reasons:

(a) The healthcare professional is directly treating or rendering assistance to the patient.

(b) The healthcare professional is being consulted regarding the health of the patient by an individual who is directly treating or rendering assistance to the patient.

(c) Scientific research purposes if all of the following requirements are met:

1. The patient is a direct patient of the healthcare professional.

2. The healthcare professional has obtained informed consent from the patient to access monitored prescription drug history reports for scientific research purposes.

(d) Purposes of conducting an overdose fatality review.

(2) Pharmacist delegates and practitioner delegates may access monitored prescription drug history reports about a patient for any of the following reasons:

(a) A pharmacist or practitioner who is directly treating or rendering assistance to the patient has delegated the task of obtaining monitored prescription drug history reports about the patient to the pharmacist delegate or practitioner delegate.

(b) A pharmacist or practitioner who is being consulted regarding the health of the patient by an individual who is directly treating or rendering assistance to the patient has delegated the task of obtaining monitored prescription drug history reports about the patient to the pharmacist delegate or practitioner delegate.

(3) Healthcare professionals, pharmacist delegates, and practitioner delegates may only disclose a monitored prescription drug history report about a patient obtained pursuant to sub. (1) or (2) in the following situations:

(a) To the patient as part of treating or rendering assistance to the patient.

(b) To another healthcare professional or a medical coordinator for consultation about the health of the patient or as part of treating or rendering assistance to the patient.

(c) To the pharmacist or practitioner who is directly treating or rendering assistance to the patient.

(d) To a law enforcement agency as required by s. 146.82, Stats.

(4) To obtain access to monitored prescription drug history reports as authorized in subs. (1) and (2), healthcare professionals, pharmacist delegates, and practitioner delegates shall do one of the following:

(a) Create an account with the PDMP system.

(b) Create an account with a prescription monitoring program operated by a relevant agency in another jurisdiction with which the board exchanges monitored prescription drug history reports or PDMP data pursuant to s. CSB 4.14.

(c) Create an account with a pharmacy or other entity at which pharmacists dispense or administer monitored prescription drugs in the course of professional practice with which the board has determined to have at least equivalent capability to maintain the confidentiality of monitored prescription drug history reports or that is connected to and lawfully obtains data from the state−designated entity under ch. 153, Stats.

(d) Create an account with a hospital or other entity at which practitioners prescribe, dispense, or administer monitored prescription drugs in the course of professional practice with which the board has determined to have at least equivalent capability to maintain the confidentiality of monitored prescription drug history reports or that is connected to and lawfully obtains data from the state−designated entity under ch. 153, Stats.

History: CR 12−009: cr. Register October 2012 No. 682, eff. 1−1−13; CR 14−003: am. (1), renum. (2) to (2) (intro.) and am., cr. (2) (a) to (d), am. (3) Register August 2014 No. 704, eff. 9−1−14; corrections in (1), (2) (b), (3) (a) Register September 2015 No. 717; EmR1706: emerg. r. and recr., eff. 4−1−17; CR 17−028: r. and recr. Register December 2017 No. 744, eff. 4−1−17; s. 35.17 corrections in (3) (intro.), (4) (intro.), Register December 2017 No. 744; CR 19−156: cr. (1) (c), (d) Register August 2020 No. 776, eff. 9−1−20.

CSB 4.093 Monitored prescription drug history reports and audit trails about healthcare professionals. (1) Healthcare professionals may access audit trails about themselves and their practitioner delegates or pharmacist delegates.

(2) A practitioner may access the audit trails accessible to healthcare professionals and a prescribing metrics report about themself.

(2m) Department staff who are charged with investigating dispensers, dispenser delegates, pharmacists, pharmacist delegates, practitioners, and practitioner delegates may access the audit trails related to s. CSB 4.12 (3) (f) and (g).

(3) Medical coordinators may access prescribing metrics reports and audit trails about a healthcare professional whom the medical coordinator coordinates, directs, or supervises or for whom the medical coordinator establishes standard operating procedures that contain no personally identifiable information about a patient if the medical coordinator is conducting any of the following activities:

(a) Evaluating the job performance of the healthcare professional.

(b) Performing quality assessment and improvement activities, including outcomes evaluation or development of clinical guidelines for the healthcare professional.

(4) To obtain access to prescribing metrics reports and audit trails as authorized in subs. (1) and (2), healthcare professionals, pharmacist delegates, and practitioner delegates shall create an account with the PDMP system.

(5) To obtain access to prescribing metrics reports, and audit trails about a healthcare professional, a medical coordinator shall create an account with the PDMP system.

History: EmR1706: emerg. cr. eff. 4−1−17; CR 17−028: cr. Register December 2017 No. 744, eff. 4−1−17; s. 35.17 correction in (4), Register December 2017 No. 744; CR 19−156: cr. (2m) Register August 2020 No. 776, eff. 9−1−20.

CSB 4.097 Deny, suspend, revoke or otherwise restrict or limit access. (1) The board may deny, suspend, revoke, or otherwise restrict or limit a healthcare professional's, pharmacist delegate's, practitioner delegate's, or medical coordinator's access to monitored prescription drug history reports, prescribing metrics reports, PDMP data, and audit tails for any of the following reasons:

(a) The healthcare professional, pharmacist delegate, practitioner delegate, or medical coordinator is suspected of attempting to access, accessing, or disclosing a monitored prescription drug history report, prescribing metrics report, PDMP data, or audit trail in violation of s. 146.82 or 961.385, Stats., this chapter, or other state or federal laws or regulations relating to the privacy of patient health care records.

(b) The healthcare professional is no longer licensed in this state or in another state and recognized by this state as a person to whom the board may grant access pursuant to s. CSB 4.09 or 4.093.

(c) The board, or other licensing board, or regulatory agency takes adverse action against the healthcare professional, pharmacist delegate, practitioner delegate, or medical coordinator.

(d) A licensing board or equivalent regulatory agency in another jurisdiction takes adverse action against the healthcare professional, pharmacist delegate, practitioner delegate, or medical coordinator.

(e) The federal department of justice, drug enforcement administration takes adverse action against the healthcare professional, pharmacist delegate, practitioner delegate, or medical coordinator.

(f) The healthcare professional, pharmacist delegate, practitioner delegate, or medical coordinator is convicted of a crime substantially related to the prescribing, administering, or dispensing of a monitored prescription drug.

(g) The pharmacist delegate or practitioner delegate is no longer delegated the task of accessing monitored prescription drug history reports.

(h) The medical coordinator no longer coordinates, directs, supervises, or establishes standard operating procedures for a healthcare professional.

(2) The board may temporarily suspend access to monitored prescription drug history reports, prescribing metrics reports, PDMP data, and audit trails upon discovering circumstances that indicate a healthcare professional, pharmacist delegate, practitioner delegate, or medical coordinator has performed any of the actions identified in sub. (1) (a).

History: EmR1706: emerg. cr., eff. 4−1−17; CR 17−028: cr. Register December 2017 No. 744, eff. 1−1−18.

CSB 4.10 Requests for review. (1) A dispenser, healthcare professional, pharmacist delegate, practitioner delegate, or medical coordinator may request that the board review any of the following:

(b) The denial of an emergency waiver requested pursuant to s. CSB 4.06 (3).

(c) The denial, suspension, revocation or other restriction or limitation imposed on the healthcare professional's, pharmacist delegate's, practitioner delegate's, or medical coordinator's account pursuant to s. CSB 4.097.

(2) To request a review, the dispenser, health care professional, pharmacist delegate, practitioner delegate, or medical coordinator shall file a written request with the board within 20 days after the mailing of the notice of the action in sub. (1). The request shall be in writing and include all of the following:

(a) The dispenser's, healthcare professional's, pharmacist delegate's, practitioner delegate's, or medical coordinator's name and address, including street address, city, state and ZIP code.

(b) The citation to the specific statute or rule on which the request is based.

(3) The board shall conduct the review at its next regularly scheduled meeting and notify the dispenser, healthcare professional, pharmacist delegate, practitioner delegate, or medical coordinator of the time and place of the review.

(4) No discovery is permitted.

(5) The board shall preside over the review. The review shall be recorded by audio tape unless otherwise specified by the board.

(6) The board shall provide the dispenser, healthcare professional, pharmacist delegate, practitioner delegate, or medical coordinator with an opportunity to submit written documentation, make a personal appearance before the board and present a statement. The board may establish a time limit for making a presentation. Unless otherwise determined by the board, the time for making a personal appearance shall be 20 minutes.

(7) If the dispenser, healthcare professional, pharmacist delegate, practitioner delegate, or medical coordinator fails to appear for a review, or withdraws the request for a review, the board may note the failure to appear in the minutes and affirm its original decision without further action.

History: CR 12–009: cr. Register October 2012 No. 682, eff. 1–1–13; correction in (1) (b) made under s. 13.92 (4) (b) 7., Stats., Register February 2014 No. 698; CR 14–003: am. (1) (intro.), (2) (intro.), (b), (3), (6), (7) Register August 2014 No. 704, eff. 9–1–14; correction in (1) (a) to (c) made under s. 13.92 (4) (b) 7., Stats., Register September 2015 No. 717; CR 15–101: am. (1) (c), (2) (a) Register June 2016 No. 726, eff. 7–1–16; s. 35.17 correction in (1) (c), Register June 2016 No. 726; EmR1706: emerg. am. (1) (intro.), r. (1) (a), am. (1) (c), (2) (intro.), (a), (3), (6), (7), eff. 4–1–17; CR 17–028: am. (1) (intro.), r. (1) (a), am. (1) (c), (2) (intro.), (a), (3), (6), (7) Register December 2017 No. 744, eff. 1–1–18; correction in (1) (c) made under s. 13.92 (4) (b) 7., Stats., December 2017 No. 744.

CSB 4.105 Practitioners' requirement to review monitored prescription drug history reports. (1) A practitioner, or a practitioner delegate assisting the practitioner in accordance with the standards of practice for the practitioner's profession, shall review the monitored prescription drug history report about a patient before the practitioner issues a prescription order for the patient unless any of the following conditions are met:

(a) The patient is receiving hospice care, as defined in s. 50.94 (1) (a).

(b) The prescription order is for a number of doses that is intended to last the patient 3 days or less and is not subject to refill.

(c) The monitored prescription drug is lawfully administered to the patient.

(d) The practitioner is unable to review the patient's monitored prescription drug history reports before issuing a prescription order for the patient due to an emergency.

(e) The practitioner is unable to review the patient's records under their program because the PDMP system is not operational or due to other technological failure that the practitioner reports to the board.

(2) Reviews of reports or other information not provided by the board as part of the program that summarize or analyze PDMP data do not satisfy the requirement to review a monitored prescription drug history report under sub. (1).

(3) The board may refer a practitioner that fails to review a monitored prescription drug history report about a patient prior to issuing a prescription order for that patient to the appropriate licensing or regulatory board for discipline.

History: EmR1706: emerg. cr., eff. 4–1–17; CR 17–028: cr. Register December 2017 No. 744, eff. 1–1–18.

CSB 4.11 Methods of obtaining monitored prescription drug history reports. (1) The board shall disclose the monitored prescription drug history report about a patient to the patient if he or she does all of the following:

(a) Appears in person at the department with two forms of valid proof of identity, one of which is valid government–issued photographic identification or mails to the department copies of two forms of valid proof of identity, one of which is valid government–issued photographic identification.

(b) Makes a request for the monitored prescription drug history reports about the patient on a form provided by the board. If the request is mailed, the form shall be notarized.

(2) The board shall disclose the monitored prescription drug history report about a patient to a person authorized by the patient if the person authorized by the patient does all of the following:

(a) Appears in person at the department with two forms of valid proof of identity, one of which is valid government–issued photographic identification.

(b) Provides proof sufficient to the board of the authorization or delegation from the patient.

(c) Makes a request for the monitored prescription drug history report on a form provided by the board.

(5) The board shall disclose the minimum necessary amount of information in a monitored prescription drug history report about a patient, patient address, practitioner, or dispenser to designated staff of a federal or state governmental agency in the same or similar manner, and for the same or similar purposes, as those persons are authorized to access similar confidential patient health care records under ss. 146.82 and 961.385, Stats., this chapter, and other state or federal laws and regulations relating to the privacy of patient health care records if the designated staff does all of the following:

(a) Creates an account with the PDMP system.

(b) Provides proof sufficient to the board that the federal or state governmental agency is entitled to the information under s. 146.82 (2) (a) 5., Stats.

(c) Makes a request for the monitored prescription drug history report through its PDMP system account.

(d) If the PDMP system is unable to fulfill a request from designated staff through their account with the PDMP system, the board may disclose the minimum necessary amount of information necessary to designated staff of a federal or state governmental agency upon written request that cites the agency's specific authorization to access similar confidential patient health care records under ss. 146.82 and 961.385, Stats., this chapter, and other state or federal laws and regulations relating to the privacy of patient health care records.

(6) The board shall disclose the minimum necessary amount of PDMP data or information in a monitored prescription drug history report about a patient, patient address, practitioner, or dispenser to designated staff of the department who is charged with investigating dispensers, dispenser delegates, pharmacists, pharmacist delegates, practitioners, and practitioner delegates in the same or similar manner, and for the same or similar purposes, as those persons are authorized to access similar confidential patient health care records under ss. 146.82 and 961.385, Stats., this chapter, and other state or federal laws and regulations relating to the privacy of patient health care records if the designated staff does all of the following:

(a) Creates an account with the PDMP system.

(b) Provides proof sufficient to the board that the department is entitled to the information under s. 146.82 (2) (a) 5., Stats.

(c) Makes a request for the monitored prescription drug history report through its PDMP system account.

(7) The board shall disclose the minimum necessary amount of information in a monitored prescription drug history report about a patient or patient address to a prisoner's health care provider, the medical staff of a prison or jail in which a prisoner is confined, the receiving institution intake staff at a prison or jail to which a prisoner is being transferred or a person designated by a jailer to maintain prisoner medical records or designated staff of the department of corrections in the same or similar manner, and for the same or similar purposes, as those persons are authorized to access similar confidential patient health care records under ss. 146.82 and 961.385, Stats., this chapter, and other state or federal

laws and regulations relating to the privacy of patient health care records if the person does all of the following:

(a) Creates an account with the PDMP system.

(b) Provides proof sufficient to the board that the person is entitled to the information under s. 146.82 (2) (a) 21., Stats.

(c) Makes a request for the monitored prescription drug history report through its PDMP system account.

(8) The board shall disclose the minimum necessary amount of information in a monitored prescription drug history report about a patient to a coroner, deputy coroner, medical examiner, or medical examiner's assistant following the death of a patient in the same or similar manner, and for the same or similar purposes, as those persons are authorized to access similar confidential patient health care records under ss. 146.82 and 961.385, Stats., this chapter, and other state or federal laws and regulations relating to the privacy of patient health care records if the person does all of the following:

(a) Creates an account with the PDMP system.

(b) Provides proof sufficient to the board that the person is entitled to the information under s. 146.82 (2) (a) 18., Stats.

(c) Makes a request for the monitored prescription drug history report through its PDMP system account with the board.

(9) The board may disclose PDMP data without personally identifiable information that could be reasonably used to identify any patient, healthcare professional, practitioner delegate, pharmacist delegate, or dispenser for public health and scientific research purposes. The board may require evidence of institutional review board approval.

(10) The board shall disclose the minimum necessary amount of information in a monitored prescription drug history report about a patient, patient address, practitioner, or dispenser to designated staff of a law enforcement agency or prosecutorial unit if the designated staff does all of the following:

(a) Creates an account with the PDMP system.

(b) Provides documentation demonstrating the law enforcement agency or prosecutorial unit is engaged in one of the following activities:

1. An active and specific investigation or prosecution of a violation of any state or federal law involving a monitored prescription drug and that the information being requested is reasonably related to that investigation or prosecution.

2. The monitoring of a patient as part of a drug court, as defined in s. 165.955 (1).

(c) Makes a request for the monitored prescription drug history report through its account with the PDMP system.

History: CR 12–009: cr. Register October 2012 No. 682, eff. 1–1–13; CR 14–003: r. (3), (4), am. (6) (intro.), renum. (9) (intro.) to (9) and am., r. (9) (a) to (c) Register August 2014 No. 704, eff. 9–1–14; correction in (5) (intro.), (6) (intro.), (7) (intro.), (8) (intro.), (10) (intro.) Register September 2015 No. 717; CR 15–101: am. (1) (intro.), (b), (2) (intro.), (c), (7) (intro.), (c), (8) (intro.), (c) Register June 2016 No. 726, eff. 7–1–16; EmR1706: emerg. am (Title), (1), (2) (intro.), (c), (5) (intro.), (a), (c), cr. (d), am. (6) (intro.), (a), (c), (7) (intro.), (a), (c), (8) (intro.), (a), (c), (9), (10) eff. 4–1–17; CR 17–028: (Title), (1), (2) (intro.), (c), (5) (intro.), (a), (c), cr. (d), am. (6) (intro.), (a), (c), (7) (intro.), (a), (c), (8) (intro.), (a), (c), (9), (10) Register December 2017 No. 744, eff. 1–1–18; CR 19–156: am. (9) Register August 2020 No. 776, eff. 9–1–20.

CSB 4.12 Use of PDMP data by the board and department. (1) The board shall develop and maintain a PDMP database to store dispensing data and PDMP data in a secure environment and an encrypted format.

(2m) The board shall develop and maintain a PDMP system to facilitate all of the following:

(a) The submission of dispensing data to the PDMP database.

(b) The creation of monitored prescription drug history reports about specific patients, practitioners, and dispensers.

(c) The access to and the obtaining of monitored prescription drug history reports, prescribing metrics reports, and audit trails.

(3) The board shall maintain audit trails that contain all of the following information:

(a) A log of dispensing data submitted to the PDMP database by each dispenser.

(b) A log of persons to whom the Board has granted direct access to the PDMP system under ss. CSB 4.09 or 4.093 and a log of each time a person attempts to access PDMP data or a monitored prescription drug history report.

(c) A log of prescription monitoring programs operated by a relevant agency in another jurisdiction with which the board exchanges PDMP data pursuant to s. CSB 4.14 and a log of each time a person from another jurisdiction attempts to access PDMP data.

(d) A log of pharmacies or other entities at which pharmacists dispense or administer monitored prescription drugs in the course of professional practice with which the board has determined to have at least equivalent capability to maintain the confidentiality of monitored prescription drug history reports and a log of each time a person from a pharmacy or other entity attempts to access PDMP data or a monitored prescription drug history report.

(e) A log of hospitals or other entities at which practitioners prescribe, dispense, or administer monitored prescription drugs in the course of professional practice with which the board has determined to have at least equivalent capability to maintain the confidentiality of monitored prescription drug history reports and a log of each time a person from a hospital or other entity attempts to access PDMP data or a monitored prescription drug history report.

(f) A log of monitored prescription drug history reports and PDMP data disclosed pursuant to s. CSB 4.11, including the name of the person to whom the information was disclosed.

(g) A log of requests for PDMP data or monitored prescription drug history reports even when no information was disclosed.

(6) Staff assigned administrative duties over the PDMP, vendors, contractors, and other agents of the board shall only have access to the minimum amount of PDMP data necessary for all of the following purposes:

(a) The design, implementation, operation, and maintenance of the program, including the PDMP database, PDMP system, the disclosure of information via other entities pursuant to s. CSB 4.09 (4), and the exchange of information pursuant to s. CSB 4.15 as part of the assigned duties and responsibilities of their employment.

(am) The operation of an analytics platform that provides data cleansing and standardization, data integration, advanced analytics, and alert management capabilities as part of the PDMP database and PDMP system.

(b) The collection of dispensing data as part of the assigned duties and responsibilities under s. 961.385, Stats., and this chapter.

(c) Evaluating and responding to legitimate requests for monitored prescription drug history reports, audit trails, and PDMP data.

(cg) Preparing monitored prescription drug history reports, audit trails, and PDMP data for the board to determine whether suspicious or critically dangerous conduct or practices has occurred or is occurring pursuant to s. CSB 4.15.

(cr) Conducting a review of the program as required by s. 961.385 (5), Stats.

(d) Other legally authorized purposes.

History: CR 12–009: cr. Register October 2012 No. 682, eff. 1–1–13; CR 14–003: am. (4), cr. (4g), (4r) Register August 2014 No. 704, eff. 9–1–14; correction in (6) (b) made under s. 13.92 (4) (b) 7., Stats., Register September 2015 No. 717; EmR1706: emerg. am. (title), (1), r. (2), cr. (2m), r. and recr. (3), r. (4), (4g), (4r), (5), am. (6) (intro.), (a), cr. (6) (am), am. (6) (c), cr. (6) (cg), (cr), eff. 4–1–17; CR 17–028: am. (title), (1), r. (2), cr. (2m), r. and recr. (3), r. (4), (4g), (4r), (5), am. (6) (intro.), (a), cr. (6) (am), am. (6) (c), cr. (6) (cg), (cr), Register December 2017 No. 744, eff. 1–1–18; ; correction in (3) (b) made under s. 13.92 (4) (b) 7., Stats., December 2017 No. 744.

CSB 4.13 Confidentiality of PDMP records. (1) The dispensing data, PDMP data, audit trails, monitored prescription drug history reports, and prescribing metrics reports maintained,

created, or stored as a part of the program are not subject to inspection or copying under s. 19.35, Stats.

(2) A person who discloses or a person whose delegate discloses dispensing data, PDMP data, audit trails, monitored prescription drug history reports, or prescribing metrics reports in violation of s. 146.82 or 961.385, Stats., this chapter, or other state or federal laws or regulations relating to the privacy of patient health care records, may be referred to the appropriate licensing or regulatory board for discipline, or the appropriate law enforcement agency for investigation and possible prosecution if the board determines that a criminal violation may have occurred.

History: CR 12–009: cr. Register October 2012 No. 682, eff. 1–1–13; correction in (2) made under s. 13.92 (4) (b) 7., Stats., Register September 2015 No. 717; EmR1706: emerg. am., eff. 4–1–17; CR 17–028: am. Register December 2017 No. 744, eff. 1–1–18.

CSB 4.14 Exchange of PDMP data. (1) The board may exchange monitored prescription drug history reports and PDMP data with a prescription monitoring program operated by a relevant agency in another state or jurisdiction if the prescription monitoring program satisfies all of the following conditions:

(a) The prescription monitoring program is compatible with the program.

(b) The relevant agency operating the prescription monitoring program agrees to exchange similar information with the program.

(2) In determining the compatibility of a prescription monitoring program to the program, the board may consider any of the following:

(a) The safeguards for privacy of patient records and the prescription monitoring program's success in protecting patient privacy.

(b) The persons authorized to access the information stored by the prescription monitoring program.

(c) The schedules of controlled substances monitored by the prescription monitoring program.

(d) The information required by the agency to be submitted regarding the dispensing of a prescription drug.

(e) The costs and benefits to the board of sharing information.

(3) The board may assess a prescription monitoring program's continued compatibility with the program at any time.

History: CR 12–009: cr. Register October 2012 No. 682, eff. 1–1–13; CR 14–003: am. (1) (intro.) Register August 2014 No. 704, eff. 9–1–14; EmR1706: emerg. am. (title), (1) (intro.), eff. 4–1–17; CR 17–028: am. (title), (1) (intro.) Register December 2017 No. 744, eff. 1–1–18.

CSB 4.15 Disclosure of suspicious or critically dangerous conduct or practices. (1) The board may review dispensing data, monitored prescription drug history reports, PDMP data, and data compiled pursuant to s. CSB 4.12 to determine whether circumstances indicate suspicious or critically dangerous conduct or practices of a pharmacist, pharmacy, practitioner, or patient.

(2) The board may include any of the following factors when determining whether circumstances indicate suspicious or critically dangerous conduct or practices of a pharmacist or pharmacy:

(a) The pharmacist or pharmacy's monitored prescription drug dispensing practices deviate from accepted pharmacist or pharmacy practices.

(b) There are unusual patterns in the payment methodology used by patients to whom monitored prescription drugs are dispensed by the pharmacist or pharmacy.

(c) The history of actions taken against the pharmacist or pharmacy by other state agencies, agencies of another state, or law enforcement.

(d) The type and number of monitored prescription drugs dispensed by the pharmacist or at the pharmacy.

(e) The pharmacist or pharmacy has dispensed forged prescription orders for a monitored prescription drug.

(f) The distance patients travel to have monitored prescription drugs dispensed at the pharmacy.

(g) The number of patients dispensed monitored prescription drugs at the pharmacy or by the pharmacist who satisfy any of the criteria identified in sub. (4).

(3) The board may include any of the following factors when determining whether circumstances indicate suspicious or critically dangerous conduct or practices of a practitioner:

(a) The practitioner's monitored prescription drug prescribing practices deviate from accepted prescribing practices.

(b) The practitioner prescribes potentially dangerous combinations of monitored prescription drugs to the same patient.

(c) The type and number of monitored prescription drugs prescribed by the practitioner.

(d) The history of actions taken against the practitioner by other state agencies, agencies of another state, or law enforcement.

(e) The distance patients travel to obtain monitored prescription drug prescriptions from the practitioner.

(f) The number of patients to whom the practitioner prescribed a monitored prescription who satisfy any of the criteria identified in sub. (4).

(4) The board may include any of the following factors when determining whether circumstances indicate suspicious or critically dangerous conduct or practices of a patient:

(a) The number of practitioners from whom the patient has obtained a prescription for a monitored prescription drug.

(b) The number of pharmacies from where the patient was dispensed a monitored prescription drug.

(c) The number of prescriptions for a monitored prescription drug obtained by the patient.

(d) The number of monitored prescription drug doses dispensed to the patient.

(e) Whether the monitored prescription drugs dispensed to the patient include dangerous levels of any drug.

(f) The number of times the patient is prescribed or dispensed a monitored prescription drug before the previously dispensed amount of the same or a similar monitored prescription drug would be expected to end.

(g) The payment methodology used by the patient to obtain controlled substances at a pharmacy.

(5) Upon determining that circumstances indicate suspicious or critically dangerous conduct or practices of a pharmacy, practitioner, or patient, the Board may disclose monitored prescription drug history reports, audit trails, and PDMP data to any of the following:

(a) A relevant patient.

(b) A relevant pharmacist or practitioner.

(c) A relevant state board or agency.

(d) A relevant agency of another state.

(e) A relevant law enforcement agency.

(6) Upon determining that a criminal violation may have occurred, the board may refer a pharmacist, pharmacy, or practitioner to the appropriate law enforcement agency for investigation and possible prosecution. The board may disclose monitored prescription drug history reports, audit trails, and PDMP data to the law enforcement agency as part of the referral.

History: CR 15–101: cr. Register June 2016 No. 726, eff. 7–1–16; CR 17–028: am. (1), (5) (intro.), cr. (6) Register December 2017 No. 744, eff. 1–1–18.

Controlled Substances Board
Rule Projects (updated 01/03/23)

CH Rule Number	Scope Number	Scope Expiration Date	Code Chapter Affected	Relating Clause	Stage of Rule Process	Next Step
22-011	070-21	02/29/2024	CSB 2.78	Scheduling Crotonyl Fentanyl	Submitted to the Legislature on 04/14/2022	Legislative Review
22-014	071-21	02/29/2024	CSB 2.79	Scheduling Remimazolam	Submitted to the Legislature on 04/14/2022	Legislative Review
22-016	072-21	02/29/2024	CSB 2.81	Scheduling Brorphine	Submitted to the Legislature on 04/14/2022	Legislative Review
22-032	088-21	04/18/2024	CSB 2.82	Scheduling Serdexmethylphenidate	Submitted to the Legislature on 08/18/2022	Legislative Review
22-033	089-21	04/18/2024	CSB 2.83	Scheduling 10 Fentanyl Related Substances	Submitted to the Legislature on 08/18/2022	Legislative Review
22-034	090-21	04/18/2024	CSB 2.84	Scheduling Alfaxalone	Submitted to the Legislature on 08/18/2022	Legislative Review
22-035	091-21	04/18/2024	CSB 2.85	Excluding 6-beta-Naltrexol	Submitted to the Legislature on 08/18/2022	Legislative Review
22-036	092-21	04/18/2024	CSB 2.86	Scheduling Fospropofol	Submitted to the Legislature on 08/18/2022	Legislative Review
22-037	093-21	04/18/2024	CSB 2.87	Scheduling Embutramide	Submitted to the Legislature on 08/18/2022	Legislative Review
22-039	094-21	04/18/2024	CSB 2.88	Scheduling Lacosamide	Submitted to the Legislature on 08/18/2022	Legislative Review
22-038	095-21	04/18/2024	CSB 2.89	Scheduling Perampanel	Submitted to the Legislature on 08/18/2022	Legislative Review
22-040	096-21	04/18/2024	CSB 2.90	Transferring 1-phenylcyclohexylamine and 1-piperidinocyclohexanecarbonitrile, Immediate Precursors to Phencyclidine, Also Known as PCP	Submitted to the Legislature on 08/18/2022	Legislative Review

Controlled Substances Board
Rule Projects (updated 01/03/23)

CH Rule Number	Scope Number	Scope Expiration Date	Code Chapter Affected	Relating Clause	Stage of Rule Process	Next Step
22-054	015-22	08/28/2024	CSB 2.91	Scheduling 4,4'-Dimethylaminorex	Submitted to the Legislature on 11/03/2022	Legislative Review
Not Assigned Yet	091-22	05/21/2025	CSB 2.92	Scheduling 38 Anabolic Steroids	Preliminary Rule Draft Reviewed at 01/13/2023 Meeting	Submission for Fiscal Estimate and Clearinghouse Review
Not Assigned Yet	092-22	05/21/2025	CSB 2.93	Scheduling Daridorexant	Preliminary Rule Draft Reviewed at 01/13/2023 Meeting	Submission for Fiscal Estimate and Clearinghouse Review
Not Assigned Yet	093-22	05/21/2025	CSB 2.94	Scheduling 7 Synthetic Benzimidazole-Opioids	Preliminary Rule Draft Reviewed at 01/13/2023 Meeting	Submission for Fiscal Estimate and Clearinghouse Review
Not Assigned Yet	094-22	05/21/2025	CSB 2.95	Scheduling Ganaxolone	Preliminary Rule Draft Reviewed at 01/13/2023 Meeting	Submission for Fiscal Estimate and Clearinghouse Review
Not Assigned Yet	Not Assigned Yet	Not Assigned Yet	CSB 2.96	Scheduling Amineptine	Affirmative Action Order Reviewed at 01/13/2023 Meeting	Scope Statement Review
Not Assigned Yet	Not Assigned Yet	Not Assigned Yet	CSB 2.97	Scheduling Zipeprol	Affirmative Action Order Reviewed at 01/13/2023 Meeting	Scope Statement Review
Not Assigned Yet	Not Assigned Yet	Not Assigned Yet	CSB 2.98	Excluding [^{18} F] FP-CIT	Affirmative Action Order Reviewed at 01/13/2023 Meeting	Scope Statement Review
Not Assigned Yet	Not Assigned Yet	Not Assigned Yet	CSB 2.99	Scheduling Mesocarb	Affirmative Action Order Reviewed at 01/13/2023 Meeting	Scope Statement Review
Not Assigned Yet	Not Assigned Yet	Not Assigned Yet	CSB 2 (Possible renumbering project)	Scheduling Methiopropamine	Affirmative Action Order Reviewed at 01/13/2023 Meeting	Scope Statement Review
Not Assigned Yet	095-22	05/21/2025	CSB 4	National Provider Identifier Requirement	Drafting	Board Review of Preliminary Rule Draft

State of Wisconsin
Department of Safety & Professional Services

AGENDA REQUEST FORM

1) Name and title of person submitting the request: Adam Barr, Executive Director			**2) Date when request submitted:** 1/5/2023 **Items will be considered late if submitted after 12:00 p.m. on the deadline date which is 8 business days before the meeting**
3) Name of Board, Committee, Council, Sections: Controlled Substances Board			
4) Meeting Date: 1/13/2023	**5) Attachments:** ☒ Yes ☐ No	**6) How should the item be titled on the agenda page?** Prescription Drug Monitoring Program (PDMP) Updates – Discussion and Consideration	
7) Place Item in: ☒ Open Session ☐ Closed Session	**8) Is an appearance before the Board being scheduled?** *(If yes, please complete Appearance Request for Non-DSPS Staff)* ☐ Yes ☒ No	**9) Name of Case Advisor(s), if applicable:**	

10) Describe the issue and action that should be addressed:

1. WI ePDMP Operations
    a. Recent and Upcoming Releases
    b. Status of Grant Projects:
        i. FY 2020 Harold Rogers Prescription Drug Monitoring Program
        ii. FY 2021 Harold Rogers Prescription Drug Monitoring Program
        iii. FY 2022 Harold Rogers Prescription Drug Monitoring Program
    c. Interstate Data Sharing
    d. EHR Integration Status

11) Authorization

Adam Barr — 1/5/2023

Signature of person making this request — **Date**

Supervisor (Only required for post agenda deadline items) — **Date**

Executive Director signature (Indicates approval for post agenda deadline items) — **Date**

Directions for including supporting documents:

1. This form should be saved with any other documents submitted to the Agenda Items folders.
2. Post Agenda Deadline items must be authorized by a Supervisor and the Policy Development Executive Director.
3. If necessary, provide original documents needing Board Chairperson signature to the Bureau Assistant prior to the start of a meeting.

2021-2023 Development and Release Summary

Updated 01.03.2023

Release Date	Description
Pending	
Harold Rogers Grant 2020 Component 3 Release date TBD	Automation of top prescribing reports Site reskin/redesign Ability for users to change the order in which the sections of the patient report are presented. Adding a Buprenorphine Naïve Alert section to the patient report.
Harold Rogers Grant 2020 Component 2 Release date TBD	Infrastructure and Technology stack changes to improve performance in the following areas: • Patient Matching • Dispensing Matching • Reporting Statistics
Completed	
R29 October 2022	Updated mapping tool Adjusted language for expired temporary licenses Modified file processing
R28 July 2022	Adding language related to Buprenorphine Alert Override • Minor text changes to submission error emails • Minor language changes around alert messaging Maintenance Updates
Harold Rogers Grant 2021 Promotional Materials May 2022	Promotional Materials for free EHR Integrations Maintenance Updates
R26 April 2022	Buprenorphine Alert Override • Ability to override prescriber facing alerts, metrics, and MME calculations for certain drugs. Maintenance Updates RxCheck 3.0 Upgrades
Harold Rogers Grant 2020 Component 1 December 2021	Security Enhancements • Two-Factor Authentication • Compromised Email Address Check Patient Report and other User Experience Updates
R25 November 2021	Maintenance Updates • Adjustments to triggering Annual Terms and Conditions prompt • Enhanced EHR Integration Testing capabilities Chatbot display changes

R24 **August 2021**	Text Updates • Gabapentin related text changes to the Submitter Error Email. Security-Related Enhancements
R23 **July 2021**	Text Updates • Gabapentin related text changes to the Submitter Error Email.
R22 **July 2021**	Pharmacy-Related Enhancements • Missing DEA Number Error Process Updates Administrative-Related Enhancements
R21 **May 2021**	New Design Enhancements • Proactive MC/HCP linkage renewals • Search enhancements Administrative-Related Enhancements Additional administrator tools
R20 **March 2021**	WI DOJ-Medical College of Wisconsin DataShare Project • Automatically send data extracts to DOJ-MCW • Automatically receive data extracts from DOJ-MCW Administrative-Related Enhancements • Additional improvements to query process • Additional administrator tools

Interstate Data Sharing

RxCheck/EHR	PMPi
In Progress	
ME*	
Connected	
IL, MD, NE, PA, UT, WA,	AZ, CO, DE, FL, HI, IA, ID, IN, MI, MN, MT, NC, ND, NM, NV, NY, PR, SC, SD, TN, WV, Military Health System
*Moving from PMPi to RxCheck	

WI ePDMP Integration Services Summary

Current as of 01.03.2023

Pending Health Systems and EHR Platforms	Status	Notes
Advent Health	Pending Implementation	
Marshfield	Pending - Kickoff	
Bluestone Physician Services	In discussion	
OCHIN	Went live on 12/21/2022	
Time 4 U MD	Pending - Sign Agreement	
Marshfield Medical Center - Dickinson	Pending - Sign Agreement	
SRS Pharmacy Systems	Pending - Sign Agreement	
Chet Johnson Drug	Pending - Kickoff	
Wisconsin Statewide Health Information Network (New Platform)	Pending Implementation	

Connected Health Systems (approx. 57% of monthly patient queries)	Free Pricing Model	Implementation Date	Est. Total # of Users	Notes
Ascension Wisconsin				
Aspirus Health Care				
Aurora Health Care				
Children's Hospital of Wisconsin	Y	09/01/2022	300	
Clean Slate	Y	09/01/2022	26	
DrFirst				
Froedtert & the Medical College of Wisconsin				Pending signed Free agreement
GHC of South Central Wisconsin				
Gundersen Health System				Pending signed Free agreement
HealthPartners				
HSHS / Prevea Health				
M Health Fairview	Y	08/01/2022	30	
Marshfield Clinic	Y	09/01/2022	100	
Mayo Clinic				
Mercy Health	Y	08/01/2022	766	

Monroe Clinic				
NOVO Health Technology Group				
ProHealth Care				
SSM Health				
Thedacare				Pending signed Free agreement
UnityPoint				
UW Health				
Wisconsin Statewide Health Information Network	Y	09/01/2022	3500	

DrFirst Facilities
Alay Health Team
Behavioral Health Svcs of Racine Co.
Door County Memorial Hospital
Fort Healthcare
GI Associates LLC
Heartland Hospice
Lake Superior Community Health Center
Lifestance Health WI
Marshfield Clinic Health System
Mile Bluff Medical Center
Oak Medical
Oral Surgery Associates of Milwaukee
Orthopedic Hospital of Wisconsin
Richland Hospital
Watertown Rainbow Hospice
Regional Medical Center
Rogers Memorial Hospital
Sauk Prairie Memorial Hospital
Wauwatosa Children's Clinic
Watertown Regional Medical Center