

Kratom Alkaloids

Mitragynine, 7-Hydroxy Mitragynine and Mitragynine Pseudoindoxyl

Overview

- **MG:** Mitragynine
- **7-OH:** 7-hydroxy mitragynine
- **MP:** mitragynine pseudoindoxyl

- **About Kratom:** Kratom (*Mitragyna speciosa*) is an herbal substance derived from tree leaves. It is native to Southeast Asia where, for centuries, it has been used to treat fatigue and pain. At low-to-moderate doses, kratom can produce mild stimulant effects, while at higher doses, kratom can exhibit more depressant-like effects. [Mitragynine \(MG\)](#) is the primary alkaloid in unenhanced kratom, where [7-hydroxy mitragynine \(7-OH\)](#) is also present but at low levels (<1%). Kratom extract has been enhanced in recent years to [increase 7-OH content](#), and more recently to exploit [mitragynine pseudoindoxyl \(MP\)](#) content. In the body, MG is metabolized to 7-OH, and further converted to MP, which complicates interpretation of biospecimen results containing these substances. [Pharmacological characterization](#) of these kratom alkaloids shows that 7-OH is 10x more potent than MG, with greater binding affinity at the mu-opioid receptor, while MP is 100x more potent than MG. Kratom and its alkaloids are not FDA-approved drugs, and these substances are not federally scheduled (as of June 2026) but are Schedule I drugs in some states.
- **Marketing and Retail Locations:** Kratom (primarily MG-containing preparations), 7-OH and MP are sold in smoke/vape shops and gas stations as dietary supplements, marketed as an energy booster, pain reliever, mood lifter and as a remedy for opioid withdrawal symptoms. These products often lack cautionary [package](#) labeling and may provide misleading certificates of analysis, confusing consumers about the true contents.
- **Product Types:** Powders, pills, capsules, teas, extracts, liquid shots, gummies, and other edibles. Products are often formulated with more than one kratom alkaloid (e.g., 7-OH and MP) and may be formulated to include other compounds (e.g., kratom and kava).
- **Health Effects:** Desired effects include pain relief, mood enhancement and opioid withdrawal support. Negative side effects include nausea and vomiting, constipation, dry mouth, sweating, dizziness, itching, tremors, increased blood pressure, hallucinations and confusion. [Long-term health risks](#) may include addiction, dependence, withdrawal, liver damage, psychosis and delusions. Due to increased potency, 7-OH and MP may be associated with more severe side effects, including respiratory depression, withdrawal and, in extreme cases, death; however, dose consumed remains an important factor.
- **Prevalence:** From [2015 to 2025](#), there was a 1,200% increase in kratom exposures reported to US poison centers, with a surge of 3,424 exposures reported in 2025 that exceeded all prior years. During this time, hospitalizations for single-substance exposure to kratom increased from 43 to 538, and multiple-substance exposure including kratom increased from 40 to 549. Similarly, serious medical outcomes increased for single-substance kratom exposures from 76 to 919, and for multiple-substance exposures involving kratom from 51 to 725.

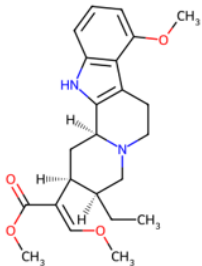
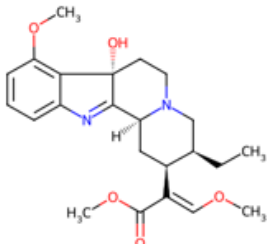
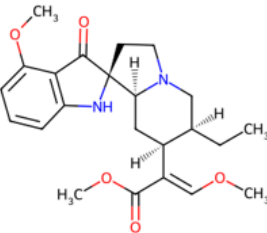
Laboratory and Analytical Information

- **What to test for:** MG, 7-OH and MP

Note: Consider performing a quantitative (or semi-quantitative) analysis, as the ratio between the kratom alkaloids can be useful from a medical toxicology perspective in interpreting suspected substances ingested (i.e., high MG concentration from kratom capsules vs. high 7-OH concentration from smoke shop pills with low MG concentration). See [Table 2 on page 3](#) for guidance on interpretation.

- **Sample preparation:** Due to the chemical instability of these analytes, it is recommended to avoid the addition of acid and base during sample preparation. Biospecimens can be prepared via protein precipitation (acetonitrile crash) and drug products can be prepared by simple solvent dilution (e.g., methanol).

Table 1. Testing Methods and Analytical Approaches

Analyte	Matrix: Detection Window	Stability	Detection Methods
Mitragynine 	Whole blood: No defined detection window; detectable following intoxication	Stable >30 days at 4°C	<ul style="list-style-type: none"> • LC-QQQ-MS and HRMS preferred • GC-MS suitable <p><i>Analytical Note: Adding acid to MG may result in the formation of 7-OH.</i></p>
	Urine: No defined detection window; detectable following intoxication	Stable >30 days at 4°C	
7-Hydroxy Mitragynine 	Whole blood: No defined detection window; detectable following intoxication	Unstable (enzymatically converted to MP)	<ul style="list-style-type: none"> • LC-QQQ-MS and HRMS preferred • GC-MS not advised, may require derivatization <p><i>Analytical Note: 7-OH and MP are isomers, requiring testing to differentiate. Adding base to 7-OH may result in the formation of MP.</i></p>
	Urine: No defined detection window; detectable 1-9 days following intoxication depending on use	Stable 7 days at 4°C; >50% loss by 60 days	
Mitragynine Pseudoindoxyl 	Whole blood: No defined detection window; detectable following intoxication	Stable >30 days at 4°C	<ul style="list-style-type: none"> • LC-QQQ-MS and HRMS preferred • GC-MS suitable but not advised <p><i>Analytical Note: MP and 7-OH are isomers, requiring testing to differentiate.</i></p>
	Urine: No defined detection window; detectable following intoxication	Stable >30 days at 4°C	

Visit the [Overdose Biosurveillance Dashboard](#) for more analytical information

- Interpretation:** The qualitative detection of kratom alkaloids in a biospecimen only indicates exposure to a kratom-based product. A more complete interpretation of the kratom alkaloid consumed is best achieved through quantitative analysis of a biospecimen and analysis of the product. For example, MG could appear in blood as the result of kratom leaf ingestion or could appear after 7-OH tablet ingestion (due to its minor presence in the drug product). Likewise, the presence of 7-OH in urine could be the result of MG consumption and subsequent metabolism or could arise after 7-OH tablet ingestion.

Table 2. Interpretation of Kratom Alkaloid Biospecimen and Product Results

Example	Biospecimen Results	Product Results	Interpretation
1	MG – 5 ng/mL 7-OH – 300 ng/mL MP – 50 ng/mL	Unavailable	Likely consumed a 7-OH product
2	MG – 1,000 ng/mL 7-OH – 10 ng/mL MP – 30 ng/mL	Unavailable	Likely consumed a kratom (MG) product
3	MG – 500 ng/mL 7-OH – 400 ng/mL MP – 200 ng/mL	Unavailable	Likely consumed both kratom (MG) and 7-OH products (or a mixed product)
4	MG – 10 ng/mL 7-OH – 5 ng/mL MP – 300 ng/mL	Unavailable	Likely consumed an MP product, a 7-OH product or a mixture of both
5	MG – Present 7-OH – Present MP – Present	Unavailable	No interpretation can be provided
6	MG – Present 7-OH – Present MP – Present	MG – Present 7-OH – Present MP – Present	No interpretation can be provided
7	MG – 2 ng/mL 7-OH – 450 ng/mL MP – 50 ng/mL	MG – Trace Amount 7-OH – Present	Consistent with the consumption of a 7-OH product
8	MG – 8 ng/mL 7-OH – 150 ng/mL MP – 400 ng/mL	7-OH – Present MP – Present	Consistent with the consumption of a 7-OH and MP product
9	MG – 2,000 ng/mL 7-OH – 20 ng/mL MP – 50 ng/mL	MG – Present 7-OH – Trace Amount	Consistent with the consumption of a kratom product
10	MG – 800 ng/mL 7-OH – 500 ng/mL MP – 1,000 ng/mL	7-OH – Present	Results are inconsistent; likely consumed more than the product tested

How can PHLs provide valuable information for protecting the public?

There are many easily accessible and variable formulations of kratom related products that may result in unintentional overdose or illness. Capability and capacity of testing kratom alkaloid products and biosurveillance specimens varies widely across governmental laboratories based on jurisdictional priorities and available resources.

To support an effective public health response and proactive biosurveillance, public health laboratories should consider the following steps:

- **Establish Baseline Testing:** Begin testing for mitragynine, 7-hydroxy mitragynine, and mitragynine pseudoindoxyl. Consider a quantitative approach to testing that will allow for interpretation.
- **Adapt to Emerging Threats:** Look beyond standard panels to capture current threats as the drug supply changes. Understand that new kratom alkaloids are emerging and others are likely to emerge in the future.
- **Facilitate Rapid Information Sharing:** Promptly communicate testing data and emerging substance trends with state, local, and regional public health partners to drive a coordinated, real-time emergency response.
- **Strengthen Biosurveillance Networks:** Proactively report findings (especially novel or unexpected substances) to poison centers, epidemiologists and local health departments to keep the broader community informed of shifting drug threats.

Resources

1. Increases in Kratom-Related Reports to Poison Centers — National Poison Data System, United States, 2015–2025. MMWR Morb Mortal Wkly Rep 2026;75:139–145. DOI: dx.doi.org/10.15585/mmwr.mm7511a1
2. Krotulski, AJ; Denn, MT; Brower, JO; Papsun, DM; Logan, BK. (2025) Evaluation of Commercially Available Smoke Shop Products Marketed as “7-Hydroxy Mitragynine” & Related Alkaloids, Center for Forensic Science Research and Education, United States. www.cfsre.org/images/content/reports/public_alerts/7-Hydroxy_Mitragynine_NPS_Discovery_033125.pdf
3. Krotulski AJ, Denn MT, Eccarius LK, Logan BK. (2026) Mitragynine & 7 Hydroxy Mitragynine - May 2026, Center for Forensic Science Research and Education, United States. www.cfsre.org/images/content/reports/public_alerts/Mitragynine_and_7-Hydroxy_Mitragynine_NPS_Discovery_050626.pdf
4. Sharma A, Kamble SH, León F, et al. Simultaneous quantification of ten key Kratom alkaloids in Mitragyna speciosa leaf extracts and commercial products by ultra-performance liquid chromatography–tandem mass spectrometry. Drug Test Anal. 2019;11:1162–1171. doi.org/10.1002/dta.2604



Association of Public Health Laboratories

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