OPEN

Kratom Is an Opioid

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Over the past century, new opioids have repeatedly been introduced with claims that they are fundamentally different from existing opioids and therefore safer or less addictive. Such claims have shaped clinical practice and regulatory policy, sometimes with profound negative public health consequences. One of the earliest examples followed Bayer's introduction of heroin in the late 19th century, when company scientists claimed it was a safer, nonaddictive alternative to morphine.[1] A century later, scientists working for the manufacturer of OxyContin argued that its extended-release formulation reduced addiction risk relative to earlier opioid products.[2] In both cases, these claims proved false, and both drugs went on to fuel devastating epidemics of addiction, overdose, and death.[3]

Over the past decade, another opioid product has become widely available across the United States. Kratom, made from the leaves of a tree native to Southeast Asia, is now sold in the United States as dried powders, capsules, and concentrated liquid extracts and is widely available in gas stations and convenience stores. This growth in availability has been accompanied by a sharp rise in kratom-related harm. Between 2015 and 2025, US poison centers received 14,449 kratom exposure reports, rising from 258 in 2015 to a record 3434 in 2025—an increase of ~1200%.[4] Most involved kratom as the only reported substance, and these single-substance exposures were not benign: roughly 1 in 4 resulted in hospitalization. In a separate analysis of national overdose death data, kratom was detected on postmortem toxicology in more than 5200 deaths reported by 45 jurisdictions between 2020 and 2024. Many of these deaths involved use of other substances, underscoring the risk of dangerous drug interactions involving kratom.[5]

Like Bayer and Purdue before it, the kratom industry has sought to distinguish its products from earlier opioids. But rather than arguing that kratom is a safer opioid, it has advanced the more audacious claim that kratom—and its principal alkaloid, mitragynine—are not opioids at all.

Whether kratom is appropriately classified as an opioid is not simply a semantic or academic question. Drug classification influences how clinicians diagnose and treat patients, how researchers interpret emerging evidence, how the public understands the risks associated with a substance, and how policymakers approach regulation. If kratom is an opioid, then more than a century of accumulated scientific and clinical knowledge about opioids can inform our understanding of its pharmacology, therapeutic effects, adverse effects, dependence liability, toxicity, and public health impact. If it is viewed as something fundamentally different, those lessons may be overlooked.

WHY KRATOM IS AN OPIOID

Standard pharmacology textbooks classify drugs that act on opioid receptors—including agonists, partial agonists, and mixed agonist-antagonists—as opioids.[6,7] US law takes a functional approach in defining an opioid. Under the Controlled Substances Act, the terms "opiate" and "opioid" mean any drug or other substance having an addiction-forming or addiction-sustaining liability similar to morphine, or being capable of conversion into a drug having such addiction-forming or addiction-sustaining liability.[8] Kratom meets both the pharmacological and functional definitions of an opioid.

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Kratom's most abundant alkaloid, mitragynine, is a μ-opioid receptor agonist. Although mitragynine has lower intrinsic efficacy at the μ-opioid receptor than classical agonists such as morphine, it is nonetheless an opioid. It is generally characterized as a partial agonist, although measured efficacy varies by assay system.[9] Mitragynine is metabolized in the liver to 7-hydroxymitragynine, a metabolite with substantially greater μ-opioid receptor efficacy than mitragynine. In one study, oral consumption of dried kratom leaf resulted in mean 7-hydroxymitragynine-to-mitragynine plasma concentration ratios of 0.20 to 0.31 after a single dose and 0.15 to 0.21 after repeated dosing. Although these ratios reflect relative systemic exposure rather than the proportion of mitragynine converted, they demonstrate measurable exposure to both compounds after ingestion of leaf material.[10] Experimental evidence suggests that this metabolic conversion accounts for much of the opioid effects observed after mitragynine administration.[11] Collectively, these findings establish that kratom's principal active alkaloids produce their clinical effects by activating μ-opioid receptors.

Evidence also indicates that kratom meets the Controlled Substances Act's functional definition of an opioid. Regular kratom use can produce clinically significant dependence, craving, impaired control over use, and an opioid-like withdrawal syndrome.[12] Pharmacovigilance data show disproportionate reporting of drug dependence, drug abuse, drug use disorder, and withdrawal associated with kratom.[13] Together, these findings support the conclusion that kratom has addiction-forming and addiction-sustaining liability consistent with the statutory definition of an opioid.

Scientists affiliated with the kratom industry have nevertheless argued that kratom should not be classified as an opioid. Rather than focusing on opioid receptor activation or functional effects, these arguments emphasize characteristics such as botanical origin, chemical structure, current legal status, or distinctive pharmacologic properties.[14] As discussed below, none of these characteristics determines whether a drug belongs to the opioid class.

The opioid class itself illustrates this principle. Morphine, fentanyl, methadone, buprenorphine, tramadol, and tapentadol differ substantially in chemical structure, intrinsic efficacy, receptor pharmacology, potency, metabolism, and adverse-effect profile. Some are full agonists; others are partial agonists. Some have clinically important nonopioid mechanisms of action. Others differ markedly in their respiratory depressant effects. Yet repeated use of each can produce tolerance and dependence, and all are universally recognized as opioids because they act through opioid receptors.[6] This pharmacologic diversity is characteristic of the opioid class; it does not alter classification. At the same time, classification as an opioid does not, by itself, determine a compound's appropriate clinical use or regulatory status, as illustrated by the differing regulatory treatment of opioids such as methadone and buprenorphine. Rather, recognizing that a compound is an opioid is a starting point for evaluating its pharmacology, risks, potential clinical uses, and appropriate regulatory approach —not the endpoint of that assessment.

MISCONCEPTIONS ABOUT KRATOM'S CLASSIFICATION

Kratom is commonly described in both the medical literature and public-facing materials as an herbal product that produces "stimulant-like effects" at lower doses and "opioid-like effects" at higher doses.[15,16] This characterization has become so widespread that it is often treated as a defining feature of kratom.[17–19]

This characterization is misleading in two respects. First, the effects observed at higher doses are not merely "opioid-like": they are opioid effects, mediated through activation of μ-opioid receptors. Describing them as "opioid-like" implies that kratom mimics opioids while belonging to a different pharmacologic class. As discussed above, mitragynine is a μ-opioid receptor agonist that is further metabolized to the more potent agonist 7-hydroxymitragynine. The effects of kratom ingestion should therefore be described as opioid effects, not opioid-like effects.

Second, the presence of so-called stimulant effects at lower doses does not distinguish kratom from other opioids. Opioids have long been recognized to produce biphasic effects, with lower doses increasing perceived alertness, energy, and capacity for sustained work in some individuals, and higher doses producing sedation and other classic opioid effects. This phenomenon has been recognized for centuries: De Quincey[20] described the stimulating effects of opium in Confessions of an English Opium-Eater, and the use of opium to enhance endurance has been documented across a range of historical and contemporary settings.[21–24] More recently, tramadol has been widely misused by manual laborers in parts of West Africa for its perceived ability to increase stamina and work performance.[25] Stimulating effects are not unique to kratom and do not distinguish it from the opioid class.

Mitragynine interacts with receptor systems beyond the μ-opioid receptor, including adrenergic and serotonergic targets.[26] However, there is little evidence that these nonopioid actions account for the stimulant effects reported at lower doses. Rather, the biphasic pattern of stimulation at low doses and sedation at high doses is consistent with long-recognized opioid pharmacology.

Scientists affiliated with the kratom industry have reinforced the misconception that kratom is not an opioid by noting that it belongs to the same botanical family as coffee and by comparing its stimulant effects to caffeine and its withdrawal effects to caffeine withdrawal.[14] These comparisons are wrong and misleading. Botanical classification does not determine pharmacologic classification: caffeine acts as an adenosine receptor antagonist, a mechanism unrelated to mitragynine's actions at opioid, adrenergic, or serotonergic receptors. That kratom belongs to the coffee family no more determines its pharmacologic class than the botanical origin of any other medicinal plant determines the pharmacologic class of its active constituents.

CONTROLLED HUMAN EVIDENCE THAT KRATOM IS AN OPIOID

If kratom is an opioid, it should produce the characteristic physiologic and subjective effects of an opioid in humans. A recent, small, single ascending-dose study by Reissig et al[9] provides controlled human evidence that this is precisely what occurs. Notably, the investigators did not study purified mitragynine or a concentrated 7-hydroxymitragynine preparation; they studied botanical kratom with alkaloid concentrations representative of commercially available leaf products, containing only trace

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amounts of 7-hydroxymitragynine. The doses administered (1 to 12 g) overlapped substantially with amounts commonly consumed by kratom users, making the findings directly relevant to real-world use rather than to artificially high experimental exposures.

Consistent with its opioid receptor pharmacology, botanical kratom produced dose-related pupillary constriction (miosis), one of the characteristic physiologic signs of μ-opioid receptor activation. At higher doses, participants experienced increases in subjective measures including drug liking, good effects, and feeling high—findings characteristic of opioid agonists.

The study also demonstrated that ingestion of botanical kratom produced measurable concentrations of 7-hydroxymitragynine across the dose range studied, providing direct human evidence that mitragynine undergoes metabolic conversion following kratom ingestion. However, the study does not, by itself, establish how much of the observed effect was mediated by metabolically formed 7-OH. Earlier mechanistic work by Kruegel and colleagues demonstrated that 7-hydroxymitragynine is a substantially more efficacious μ-opioid receptor agonist than mitragynine and likely mediates much of the opioid effect observed after mitragynine administration. The pharmacokinetic findings reported by Reissig and colleagues thus extend this mechanistic work by showing that mitragynine conversion to 7-hydroxymitragynine occurs under conditions representative of ordinary kratom use.

Importantly, participants did not report the subjective effects as resembling caffeine, amphetamines, cocaine, or other stimulants. This finding directly challenges the common characterization of kratom as primarily a stimulant at low doses. At high doses, however, subjects did report experiencing effects that resembled opioids. Under controlled laboratory conditions, using botanical kratom at doses representative of real-world consumption, both the objective physiologic findings and participants' subjective experiences were consistent with opioid pharmacology.

The findings reported by Reissig and colleagues do not stand alone. Following its own scientific evaluation of kratom's pharmacology, together with accumulating reports of dependence, withdrawal, addiction, poisoning, and other adverse events, the US Food and Drug Administration independently concluded that kratom contains opioid compounds. As the FDA explained when announcing this conclusion, "the scientific data and adverse event reports have clearly revealed, compounds in kratom make it so it isn't just a plant—it's an opioid."[27] The agency's current position remains that kratom should not be consumed and that it is not lawfully marketed as a dietary supplement.[28]

APPLYING WHAT WE KNOW ABOUT OPIOIDS TO KRATOM

Recognizing that kratom is an opioid is not simply an exercise in accurate pharmacologic classification. It provides a coherent framework for understanding kratom's clinical effects and for applying more than a century of accumulated knowledge about opioids to a rapidly growing public health problem.

Once kratom is recognized as an opioid, many clinical observations that might otherwise appear unique or unexpected become readily understandable. Like other opioid agonists, kratom can temporarily relieve pain, reduce anxiety, and improve mood. But decades of experience with chronic opioid therapy tell a cautionary story: acute benefits rarely persist.[29] With daily use, physiological dependence and tolerance develop rapidly, and dose escalation is required to sustain the initial effect.[30] The same skepticism that now tempers long-term opioid prescribing for chronic pain should temper enthusiasm for kratom as a treatment for chronic pain.

Kratom may also pose risks distinct from those of classical opioids. Case reports and emerging clinical evidence have linked its use to sudden cardiac arrest, hepatotoxicity, seizures, and heavy metal poisoning, among other serious adverse effects.[13,31–39] Although the incidence and mechanisms of some of these adverse events require further study, they underscore the need for rigorous evaluation before mitragynine or botanical kratom is embraced as a therapeutic agent.

Recognition that kratom is an opioid also has direct implications for addiction treatment. Kratom use disorder should be managed as a form of opioid use disorder, using the evidence-based approaches already established for opioid use disorder, rather than as a separate condition based on the mistaken premise that kratom is fundamentally different from other opioids. Consistent with this approach, a growing number of case reports and case series describe successful treatment of kratom use disorder with buprenorphine, reflecting its established role in treating opioid use disorder caused by other opioids.[40–44] However, controlled treatment trials or standardized treatment guidelines for kratom use disorder do not yet exist.

Pregnancy and newborn care illustrate why accurate classification matters. Several published case reports have associated prenatal kratom exposure with neonatal opioid withdrawal syndrome.[45–47] Maternal kratom use should therefore be recognized as prenatal opioid exposure and managed using the same clinical principles applied to exposure to other opioids. Pregnant patients should be counseled about the risks of kratom use and screened for it whenever opioid exposure is being assessed. When clinically indicated, toxicologic testing should routinely include mitragynine and 7-hydroxymitragynine. Recognizing that botanical kratom can produce neonatal opioid withdrawal syndrome should improve recognition of affected newborns, facilitate earlier diagnosis and treatment, and reduce the likelihood that cases are overlooked because maternal kratom use was not identified as opioid exposure.

POLICY IMPLICATIONS

Recognizing that kratom is an opioid allows policymakers to apply one of the central lessons of the opioid crisis: increasing population exposure to opioids increases opioid-related harm. Deceptive marketing that overstated the benefits of prescription opioids while minimizing their risks led to widespread prescribing, substantially increased population exposure, and was followed by dramatic increases in opioid use disorder and overdose deaths, ultimately fueling demand for illicit opioids. If the same principles apply to kratom, policies that reduce exposure to kratom should likewise be expected to reduce kratom-related public health harms and its contribution to the broader opioid crisis.

Recent policy analyses are consistent with this expectation. States prohibiting kratom have experienced substantially lower rates of kratom-related poisonings,

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serious adverse events, and deaths than states adopting age limits, labeling requirements, and other regulatory approaches that preserve broad commercial availability.[5,48] These ecological analyses demonstrate associations between policy environment and reported outcomes and cannot establish that a particular policy caused the differences. They are, nonetheless, what would be expected if limiting availability reduces kratom-related harm.

The rise in public health problems associated with kratom use has prompted state and federal lawmakers to consider restricting access. The kratom industry has responded by arguing that these harms are limited to products enriched with semisynthetic 7-hydroxymitragynine ("7-OH products"),[49] and by portraying 7-OH and botanical kratom as distinct products.

This narrative has increasingly shaped policy: in July 2026, the Drug Enforcement Administration announced its intent to temporarily place 7-hydroxymitragynine in Schedule I whenever it exceeds 0.05% by dry weight in botanical material—a threshold that would exempt the vast majority of kratom leaf products from control—and several states have adopted comparable 7-OH-specific thresholds.[50,51] At the time of writing, this action remains a notice of intent to issue a temporary scheduling order rather than a final scheduling order.

Kratom products span a wide range of potency. Dried leaf and leaf-derived powders contain mitragynine as the predominant alkaloid. Concentrated kratom leaf extracts deliver substantially higher alkaloid doses per serving. Formulation and potency matter, and 7-OH-enriched products appear to carry the greatest risk of overdose.

A regulatory strategy focused on 7-OH rests on a false premise: that botanical kratom and 7-hydroxymitragynine are pharmacologically distinct products, only one of which warrants control. As discussed above, consumption of kratom leaf products results in hepatic formation of 7-OH and produces opioid effects, dependence, withdrawal, addiction and neonatal opioid withdrawal syndrome. Kratom-related poisoning reports, serious adverse events, and deaths were all increasing for more than a decade before 7-OH products became widely available.[4,13,52,53] Restricting 7-OH-enriched products while leaving kratom leaf products commercially available should not be expected to meaningfully reduce kratom's broader public health burden.

CONCLUSION

Classification is not merely a matter of terminology. It determines how drugs are studied, how clinicians diagnose and treat patients, how the public understands risk, and how policymakers respond to emerging public health threats. The evidence reviewed here demonstrates that kratom meets the accepted pharmacologic and statutory definition of an opioid.

Recognizing that kratom is an opioid does not resolve every question about its effects, public health impact, or regulation. It does, however, establish a scientific foundation for answering those questions. Once kratom is recognized for what it truly is—an opioid—more than a century of accumulated scientific and clinical knowledge about opioids becomes directly applicable to its pharmacology, its clinical effects, its therapeutic limitations, its dependence liability, its risks during pregnancy, and the public health consequences of its widespread availability.

The opioid crisis demonstrated the consequences of widespread opioid exposure fueled by deceptive marketing that minimized risk and exaggerated benefits. Kratom has been explicitly promoted as "not an opioid" and "not addictive" and marketed as a safe, natural product with therapeutic benefits.[54] In some instances, these messages have been advanced by scientists associated with the kratom industry, lending scientific credibility to claims inconsistent with the pharmacologic, clinical, and public health evidence reviewed here.[14] The result is an opioid that has become widely available to consumers who may not recognize the product they are purchasing as an opioid.

Recognizing that kratom is an opioid is not the end of the conversation. It is the beginning of ensuring that decisions about kratom are guided by pharmacology rather than marketing, by evidence rather than anecdote, and by the lessons of the opioid crisis rather than by repeating its mistakes.

AUTHOR DISCLOSURE INFORMATION

Dr A.K. serves as President of Physicians for Responsible Opioid Prescribing, a role for which he receives no compensation. He has received compensation for serving as an expert witness on behalf of states, counties, and hospitals in litigation against the prescription opioid industry, including Purdue Pharma. Dr C.P.H. reports no conflicts of interest.

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