

PART VI

Medicine

Chapters 13–15

Legitimate Medical Uses

The same Schedule II molecule that defines a public-health crisis is also a prescription medicine — a paradox that says a great deal about dose, context, and control.

It surprises many readers to learn that methamphetamine has a current, legitimate, FDA-approved place in medicine. The same substance discussed throughout this book as a drug of the overdose era is, in enantiopure pharmaceutical form, a prescription product. Reconciling these facts requires the distinction drawn in Chapter 2 between the molecule and the context — a regulated, known-dose medicine used under medical supervision is a very different thing from an unregulated street drug, even when the chemistry is identical.

ADHD

The principal approved indication for pharmaceutical methamphetamine is attention-deficit/hyperactivity disorder. The branded product Desoxyn (methamphetamine hydrochloride, as the dextro isomer) is FDA-approved for ADHD in patients six years of age and older.^{1,3} In practice it is not a first-line agent: because of its high abuse potential, it is generally reserved as a second- or third-line option for patients who have not responded to or cannot tolerate the more commonly used methylphenidate and amphetamine products.³ Its therapeutic mechanism is the monoaminergic action described in Part IV — increasing dopaminergic and noradrenergic signaling in prefrontal and striatal circuits that are underactive in ADHD — and the supervised therapeutic doses (Chapter 10) are a small fraction of typical illicit exposures.

Obesity (historical)

Methamphetamine's appetite-suppressing effect led, historically, to its use as an anorectic agent, and older labeling included a short-term obesity indication: a single low-dose tablet before meals, for no more than a few weeks, as an adjunct to

caloric restriction in patients twelve years and older.² This use is now largely of historical interest, and contemporary labeling and practice have moved away from it. Two facts explain the retreat. First, tolerance to the anorectic effect typically develops within weeks, after which dose escalation is futile and dangerous. Second, the risk–benefit calculus is poor: the labeling itself warns that prolonged use for obesity may lead to dependence and that misuse can cause sudden death and serious cardiovascular events.^{1,2} The obesity indication is best understood as a relic of mid-century prescribing rather than a feature of modern therapeutics.

Narcolepsy

Methamphetamine has also been used historically to treat the excessive daytime sleepiness of narcolepsy, and narcolepsy appears among the conditions for which related stimulants are formally approved and for which payers sometimes authorize methamphetamine.³ For methamphetamine specifically, however, this is best characterized as a historical or off-label use rather than its core approved indication, and modern narcolepsy care generally relies on other agents. As with obesity, the role of methamphetamine here has contracted as alternatives with more favorable risk profiles have become available.

Prescription formulations

In the United States, pharmaceutical methamphetamine is available essentially only as the brand Desoxyn, supplied as immediate-release 5-milligram oral tablets of dextromethamphetamine hydrochloride; there is no extended-release form.¹ The product carries a boxed warning for high potential for abuse and the risk of sudden death and serious cardiovascular events; it is a Schedule II controlled substance; it is contraindicated with monoamine oxidase inhibitors (or their use within the preceding fourteen days); and labeling directs avoidance in patients with serious structural cardiac disease, cardiomyopathy, serious arrhythmias, or coronary artery disease, with cardiovascular and psychiatric assessment before use.¹ Several practical realities further constrain its use: it is expensive relative to other stimulants, its commercial availability has at times been limited, and its prescribing is hedged with prior-authorization requirements. The net result is a medicine

that is real and occasionally valuable but used sparingly, under tight control, and rarely as a first choice — first approved in the United States in the 1940s and surviving today as a narrow, carefully governed therapeutic option.^{1,3}

Side Effects

A systematic tour, organ system by organ system, of the harms methamphetamine can inflict on the body — from the well-publicized to the under-appreciated.

Methamphetamine's adverse effects span nearly every organ system, reflecting both its direct sympathomimetic action and the downstream consequences of chronic use. The catalogue below applies most fully to the high, repeated exposures of illicit use; the supervised therapeutic doses of Chapter 13 carry a milder version of the same risk profile, which is precisely why prescribing is so cautious. This chapter surveys side effects; the acute toxicology of overdose is the subject of Chapter 15, and the deeper chronic toxicology of Part IX.

Cardiovascular

The cardiovascular system bears much of the burden, which is why the pharmaceutical product's boxed warning centers on sudden death and serious cardiovascular events.¹ Acutely, methamphetamine raises heart rate and blood pressure and can provoke arrhythmias. It can cause myocardial infarction even in young people without underlying coronary disease, typically through coronary vasospasm or thrombosis, and chronic use accelerates atherosclerosis.⁴ Among the most serious chronic consequences is methamphetamine-associated cardiomyopathy — a dilated cardiomyopathy with markedly reduced left-ventricular ejection fraction that can progress to decompensated heart failure and, in severe cases, require transplantation; a substantial proportion of affected patients develop intraventricular thrombi, which can embolize to cause cardioembolic stroke.⁴ Additional cardiovascular harms include pulmonary edema and pulmonary hypertension, aortic dissection precipitated by hypertensive crisis, and, with injection use, infective endocarditis.^{4,6} Importantly, methamphetamine-associated cardiomyopathy can partially recover with sustained abstinence, making cessation itself a cardiac intervention.

Neurological

Beyond the cardiac risks, methamphetamine is an important and often overlooked cause of stroke in young adults. The literature indicates that hemorrhagic stroke — intracerebral hemorrhage and aneurysmal subarachnoid hemorrhage — is the more common neurovascular complication, driven by hypertensive surges, vasospasm, blood–brain-barrier disruption, chronic hypertension, and aneurysm rupture; ischemic stroke also occurs, through vasoconstriction, accelerated atherosclerosis, and cardioembolism from cardiomyopathy.⁵ There are no methamphetamine-specific stroke treatments; standard acute stroke care applies, with the addition of abstinence.⁵ Other neurological effects include seizures, headache, and movement abnormalities such as choreoathetoid movements and repetitive, compulsive "punding" behaviors, along with worsening of tics and Tourette syndrome.

Dental

The severe dental disease colloquially called "meth mouth" is one of the drug's signature stigmata, and — as flagged in Chapter 1 — it is genuinely multifactorial rather than a simple chemical corrosion of enamel. Contributing factors include reduced salivary flow (xerostomia), which removes the mouth's natural buffering and cleansing; bruxism, the involuntary grinding and clenching of teeth during stimulation; prolonged periods of intoxication during which oral hygiene lapses; frequent consumption of sugary drinks to relieve dry mouth; and the poor nutrition that often accompanies heavy use.⁸ Together these produce the characteristic pattern of rampant caries and tooth loss. Understanding the mechanism matters clinically, because it points to preventive interventions — saliva substitutes, fluoride, and dental care — rather than to a mythical and untreatable acid effect.

Psychiatric

The psychiatric effects are among the most clinically significant. Methamphetamine can produce a psychosis, with paranoia, persecutory delusions, and hallucinations, that closely resembles the positive symptoms of schizophrenia and is the subject of fuller treatment in Chapter 23. A common and distinctive feature

is formication — the sensation of insects crawling on or under the skin — which drives the compulsive skin-picking that produces excoriations and the lesions sometimes called "speed bumps."⁶ Anxiety, agitation, irritability, and aggression are frequent during intoxication, while the withdrawal and post-acute periods are characterized by depression, anhedonia, and, importantly, elevated suicide risk. The overlap between methamphetamine-induced states and primary psychiatric disorders is substantial and complicates diagnosis.

Endocrine

Endocrine and metabolic effects, though less prominent in public discussion, are documented. Pharmaceutical labeling notes impotence and changes in libido among adverse reactions, and the suppression of growth with long-term stimulant use in children is a recognized concern requiring monitoring.¹ Amphetamines may also be associated with significant elevation of plasma corticosteroids.¹ Layered on these are the metabolic consequences of the drug's hyperthermic and anorectic effects, including the disturbances of temperature regulation and nutrition that contribute to harm across other systems.

Gastrointestinal

Gastrointestinal effects begin with the appetite suppression and consequent weight loss and malnutrition that accompany sustained use. More acutely dangerous is mesenteric ischemia: methamphetamine's vasoconstrictive action can compromise blood flow to the gut, producing severe abdominal pain, and the drug has been associated with the formation of ulcers and with ischemic colitis.⁶ Constipation and other motility disturbances are also common. These gastrointestinal harms connect to the broader pattern of vascular injury that recurs throughout the drug's toxicology.

System	Representative effects
Cardiovascular	Hypertension, tachycardia, arrhythmia, MI, cardiomyopathy (with intraventricular thrombus), pulmonary hypertension, aortic dissection, endocarditis

Neurological	Hemorrhagic and ischemic stroke, seizures, choreoathetosis/"punding," tics, headache
Dental	"Meth mouth": rampant caries from xerostomia, bruxism, sugary intake, poor hygiene
Psychiatric	Psychosis/paranoia, formication and skin-picking, anxiety, aggression, depression, suicidality
Endocrine/metabolic	Impotence, libido change, growth suppression (children), corticosteroid elevation, thermoregulatory disturbance
Gastrointestinal	Anorexia/malnutrition, mesenteric ischemia, ulcers, ischemic colitis, constipation
Other (see Part IX)	Renal injury, hepatotoxicity, dermatologic excoriations, ocular (keratitis, retinopathy)

Overdose

Recognizing methamphetamine toxicity and managing it — a domain in which, absent any specific antidote, supportive care saves lives.

Methamphetamine overdose is a medical emergency, and one with a distinctive feature: there is no specific antidote and no approved antagonist, so management rests entirely on recognizing the toxidrome and supporting the patient through it.^{7,10} This chapter is written for clinical understanding; it describes how emergency clinicians stabilize a person in toxicity, not anything bearing on use. A useful framing from the clinical literature is that emergency presentations and deaths frequently result from long-term cumulative exposure and its cardiovascular and cerebrovascular sequelae as much as from a single acute "overdose."⁹

Clinical presentation

Acute methamphetamine toxicity presents as a sympathomimetic toxidrome: agitation and psychomotor restlessness, tachycardia, hypertension, hyperthermia, diaphoresis, dilated pupils, and, in severe cases, psychosis, delirium, seizures, and chest pain.⁷ The most dangerous complications are hyperthermia, intracranial hemorrhage, cardiac events, and rhabdomyolysis with consequent acute kidney injury.^{7,9} The presentation can evolve: profound catecholamine depletion in late or severe toxicity may even produce hypotension, inverting the early hypertensive picture.⁷ Because methamphetamine-induced seizures carry a high risk of intracranial hemorrhage, neuroimaging is indicated when they occur.⁷

Emergency treatment

Management is supportive and symptom-directed, beginning with attention to airway, breathing, and circulation and the provision of a low-stimulus environment with reorientation and reassurance.^{7,9} The pharmacological cornerstone is **benzodiazepines**, which are first-line for agitation and hyperadrenergic features and are titrated to effect and repeated as needed — often in substantial, escalating doses,

since people with methamphetamine toxicity may be relatively resistant.⁷ Antipsychotics such as olanzapine, haloperidol, or droperidol are useful adjuncts, particularly when psychosis predominates, with caution regarding seizure threshold, thermoregulation, and QT prolongation; combination therapy can be more effective than either class alone, and agents such as dexmedetomidine, ketamine, or propofol are options in severe, refractory cases.^{7,9}

Several specific complications demand targeted measures. **Hyperthermia** is a true emergency requiring rapid physical cooling; antipyretics are ineffective because the mechanism is not a fever, and failure to cool aggressively is a major contributor to death.⁷ **Hypertension** is addressed first through benzodiazepine sedation (non-specific sympatholysis); if it persists, an alpha-agonist such as clonidine, or a mixed agent such as labetalol, may be added, and a true hypertensive emergency with end-organ damage is treated with short-acting agents such as phentolamine, nitroprusside, or nitroglycerin.⁷ The long-standing teaching to avoid beta-blocker monotherapy, out of concern for unopposed alpha-mediated vasoconstriction, is widely cited though its clinical significance remains debated.⁷ **Rhabdomyolysis** is managed with generous intravenous fluids and temperature normalization while monitoring creatine kinase, and **seizures** are treated with benzodiazepines.⁷ For recent oral ingestion, activated charcoal may have a role, and whole-bowel irrigation is considered for "body packers"; methamphetamine is not effectively dialyzable.^{1,7}

Hospital management

Admission is warranted for patients with severe agitation, persistent hypertension, hyperthermia, seizures, chest pain, end-organ dysfunction, or rhabdomyolysis.⁷ Inpatient care continues supportive measures, monitors for and treats the cardiovascular, cerebrovascular, renal, and metabolic complications catalogued in Chapter 14, and corrects volume depletion and electrolyte derangements. As acute toxicity resolves, the clinical picture transitions toward withdrawal — a "washout" marked by hypersomnia (which can peak around 72 hours and persist for up to a week), increased appetite, dysphoria, and irritability — managed supportively, as detailed in Chapter 20.⁹ Hospitalization is also an opportunity to engage the patient with treatment and harm-reduction services (Parts VII and VIII).

Prognosis

For uncomplicated toxicity, prompt supportive care generally yields good outcomes. Mortality is driven by the severe complications — hyperthermia, intracranial hemorrhage, and cardiovascular events — and by the cumulative end-organ damage of chronic use. The prognostic outlook is meaningfully shaped by what follows the acute episode: because complications such as methamphetamine-associated cardiomyopathy can partially recover with abstinence, and because the underlying use disorder is treatable, the emergency encounter is not merely an endpoint but a potential turning point. The active research effort to develop the first specific treatments — including monoclonal antibodies against methamphetamine now in clinical trials — is discussed in Part XIII.¹⁰

References — Part VI

Listed in order of first citation within Part VI. Numbering restarts each installment; the apparatus is to be consolidated on final assembly. Sources current as of 2026.

1. Desoxyn (methamphetamine hydrochloride tablets, USP) FDA prescribing information (2023–2024 labeling) — ADHD indication (≥ 6 years); boxed warning (abuse/misuse; sudden death and serious cardiovascular events); MAOI contraindication; cautions in serious cardiac disease; immediate-release 5 mg tablets; initial U.S. approval 1943; endocrine adverse reactions (impotence, libido change, growth suppression, corticosteroid elevation); intoxication treatment (gastric evacuation, activated charcoal, sedation; not dialyzable).
2. Desoxyn FDA labeling (earlier versions) — historical short-term exogenous obesity indication and anorectic dosing (≥ 12 years; not to exceed a few weeks; tolerance to anorectic effect within weeks; dependence warning).
3. Texas HHS Drug Utilization Review Board, *Stimulants and Related Agents* class review (2024–2025) — Desoxyn FDA-approved for ADHD; exogenous-obesity indication associated with amphetamine products; narcolepsy in related stimulants/payer criteria; note on Desoxyn commercial availability ("off-market") status.
4. Richards JR, et al. Clinical characteristics and management of methamphetamine-associated cardiomyopathy: state-of-the-art review. *J Am Heart Assoc.* 2020. Plus case literature on MI via vasospasm/thrombosis, accelerated atherosclerosis, aortic dissection, and intraventricular thrombus/cardioembolic stroke (PMC3555706; PMC5827055; PMC12732741).
5. A review of methamphetamine use and stroke in the young (PMC11076881) — hemorrhagic stroke (intracerebral hemorrhage, aneurysmal subarachnoid hemorrhage) more common than ischemic; proposed mechanisms; standard stroke care plus abstinence; no methamphetamine-specific stroke treatment.
6. Methamphetamine Toxicity, StatPearls (NCBI Bookshelf NBK430895) — pulmonary edema/hypertension, mesenteric ischemia, ulcers and ischemic colitis, rhabdomyolysis and renal failure, dermatologic findings (delusions of parasitosis; prurigo nodularis, "speed bumps"). A Mechanistic Review on Toxicity Effects of Methamphetamine (PMC11783064) — multi-organ toxicity including hepatic, renal, and ocular injury.
7. Emergency management: *Methamphetamine*, StatPearls (NBK535356); EB Medicine, "Evidence-Based ED Management of Methamphetamine Toxicity" (2023); Logan, "Management of the Hospitalized Patient Who Uses Methamphetamine," *J Hosp Med* (2025); Medscape "Amphetamine/Methamphetamine Toxicity Treatment & Management"; EMCrit/IBCC sympathomimetic chapter — benzodiazepines first-line; antipsychotic adjuncts; physical cooling for hyperthermia (antipyretics ineffective); hypertension ladder; debate over beta-blocker monotherapy; rhabdomyolysis fluids; seizure $\rightarrow$ neuroimaging for intracranial hemorrhage; no specific antidote.
8. "Meth mouth" as a multifactorial dental disease (xerostomia, bruxism, high-sugar intake, neglected oral hygiene and nutrition) — American Dental Association and clinical-toxicology references.
9. Methamphetamine Toxicities and Clinical Management (PMC11458184) — emergency pre-

sentations and death frequently from cumulative exposure; agitation agents including olanzapine, dexmedetomidine, ketamine; withdrawal ("washout") course.

10. Investigational specific therapy: anti-methamphetamine monoclonal antibody (IXT-m200) clinical trial ([ClinicalTrials.gov NCT04715230](https://clinicaltrials.gov/ct2/show/study/NCT04715230)) — illustrating the current absence of an approved antidote or pharmacotherapy; see Part XIII.

End of Part VI — Medicine (Chapters 13–15)

*Part VII — Public Health (Chapters 16–18: Epidemiology; Harm Reduction; Pregnancy)
continues the volume.*