

Meth and the Brain (pbs.org.) (/frontline)

- Meth releases a surge of dopamine, causing an intense rush of pleasure or prolonged sense of euphoria.
- Over time, meth destroys dopamine receptors, making it impossible to feel pleasure.
- Although these pleasure centers can heal over time, research suggests that damage to users' cognitive abilities may be permanent.
- Chronic abuse can lead to psychotic behavior, including paranoia, insomnia, anxiety, extreme aggression, delusions and hallucinations, and even death.

"There [are] a whole variety of reasons to try methamphetamine," explains Dr. Richard Rawson, associate director of UCLA's Integrated Substance Abuse Programs.

"[H]owever, once they take the drug ... their reasons are pretty much the same: They like how it affects their brain[s]." Meth users have described this feeling as a sudden rush of pleasure lasting for several minutes, followed by a euphoric high that lasts between six and 12 hours, and it is the result of drug causing the brain to release excessive amounts of the chemical dopamine, a neurotransmitter that controls pleasure. All drugs of abuse cause the release of dopamine, even alcohol and nicotine, explains Rawson, "[But] methamphetamine produces the mother of all dopamine releases."

For example, in lab experiments done on animals, sex causes dopamine levels to jump from 100 to 200 units, and cocaine causes them to spike to 350 units. "[With] methamphetamine you get a release from the base level to about 1,250 units, something that's about 12 times as much of a release of dopamine as you get from food and sex and other pleasurable activities," Rawson says. "This really doesn't occur from any normally rewarding activity. That's one of the reasons why people, when they take methamphetamine, report having this euphoric [feeling] that's unlike anything they've ever experienced." Then, when the drug wears off, users experience profound depression and feel the need to keep taking the drug to avoid the crash.

When addicts use meth over and over again, the drug actually changes their brain chemistry, destroying the wiring in the brain's pleasure centers and making it increasingly impossible to experience any pleasure at all. Although studies have shown that these tissues can regrow over time, the process can take years, and the repair may never be complete. A [paper](#) published by Dr. Nora Volkow, director of the National Institute on Drug Abuse, examines brain scans of several meth abusers who, after 14 months of abstinence from the drug, have regrown most of their damaged dopamine receptors; however, they showed no improvement in the cognitive abilities damaged by the drug. After more than a year's sobriety, these former meth users still showed severe impairment in memory, judgment and motor coordination, similar to symptoms seen in individuals suffering from Parkinson's Disease.

In addition to affecting cognitive abilities, these changes in brain chemistry can lead to disturbing, even violent behavior. Meth, like all stimulants, causes the brain to release high doses of adrenaline, the body's "fight or flight" mechanism, inducing anxiety, wakefulness and intensely focused attention, called "tweaking." When users are tweaking, they exhibit hyperactive and obsessive behavior, as journalist Thea Singer's sister Candy did on her meth binges. "When she was high, which was almost always, she had to be on the computer -- diddling with programs to make them run faster, ordering freebies on the Internet," [writes](#) Singer. "Then computers faded, and she was obsessed

with diving into dumpsters -- rescuing audio equipment from behind Radio Shack, pens from behind Office Depot." Heavy, chronic usage can also prompt psychotic behavior, such as paranoia, aggression, hallucinations and delusions. Some users have been known to feel insects crawling beneath their skin. "He picks and picks and picks at himself, like there are bugs inside his face," the mother of one meth addict told *Newsweek*. "He tears his clothes off and ties them around his head." The same [article](#) told the story of another former addict, who, even after five years of sobriety, can't go to the bathroom without propping a space heater against the door, in case someone is after him.

Visible Signs

- Meth abuse causes the destruction of tissues and blood vessels, inhibiting the body's ability to repair itself.
- Acne appears, sores take longer to heal, and the skin loses its luster and elasticity, making the user appear years, even decades older.
- Poor diet, tooth grinding and oral hygiene results in tooth decay and loss.

One of the most striking effects of meth is the change in the physical appearance of meth users. Because meth causes the blood vessels to constrict, it cuts off the steady flow of blood to all parts of the body. Heavy usage can weaken and destroy these vessels, causing tissues to become prone to damage and inhibiting the body's ability to repair itself. Acne appears, sores take longer to heal, and the skin loses its luster and elasticity. Some users are covered in small sores, the result of obsessive skin-picking brought on by the hallucination of having bugs crawling beneath the skin, a disorder known as formication.

In addition, stimulants such as meth cause tremendous bursts of physical activity while suppressing the appetite, an attractive combination for many people who began using meth to lose weight. But while contemporary culture may idealize slim figures, heavy meth users often become gaunt and frail. Their day- or week-long meth "runs" are usually accompanied by tooth-grinding, poor diet, and bad hygiene, which lead to mouths full of broken, stained and rotting teeth.

While a meth high makes users feel more confident, attractive, and desirable, the drug is actually working to make them unattractive. "Some people I have in here over a hundred times, and I can look over a 10, 15, 20-year period and see how they've deteriorated, how they've changed." says Deputy Brett King, from Oregon's Multnomah County Sheriff's Department. "Some were quite attractive when they began to come to jail: young people who were full of the health and had everything going for them ... and now they're a shell of what they once were." Curious about this particular effect of the drug, King began collecting mug shots of individuals who had been booked repeatedly with meth in their blood. One of the faces that made a particular impression on him was that of Theresa Baxter: "She came in, and she was quite visibly intoxicated by methamphetamine. She looked horrible. She looked at least 20 years older than she was. Her teeth were missing, and I looked back in her history, and at one time she was a fairly attractive young woman."