FACING ADDICTION WITH HOPE AND UNDERSTANDING

Why Genetics Matter for Families: Understanding the Science Behind Cocaine's Grip and the Hope It Offers

FAHU Research Desk

November 2026

facingaddictionwithhope.com

All content grounded in peer-reviewed research and clinical evidence.

Why Genetics Matter for Families: Understanding the Science Behind Cocaine's Grip and the Hope It Offers

When a family member struggles with cocaine addiction, the questions that follow are often soaked in anguish: *Why can't they just stop? Why is it so much harder for them than it seems to be for others? Is this my fault? Is this their fault?* These questions are deeply human, and they deserve deeply honest answers. One of the most important answers emerging from addiction science is also one of the most quietly revolutionary: the experience of addiction — including how powerfully a drug takes hold, how dark the withdrawal feels, and how likely someone is to relapse — is shaped, in significant part, by genetics.

This is not an excuse. It is an explanation. And for families trying to understand what their loved one is going through, it may be one of the most compassionate and clarifying pieces of information available.

The Science of Why Some People Struggle More

A landmark study published in 2026 in the journal *Psychopharmacology* by Pollock investigates precisely this question: why do individuals respond so differently to cocaine, even under similar conditions of exposure? The research uses genetically diverse mouse populations — animals that share a high degree of genetic and neuroanatomical similarity to humans — to examine the biological roots of what happens when cocaine use stops.

The findings center on something called *negative affective states*: the profoundly unpleasant emotional and psychological experiences that follow the removal of cocaine from the brain. These include anxiety, dysphoria, irritability, and a crushing sense of emptiness. According to

Pollock, "repeated exposure to psychostimulants can be followed by negative affective mood states when the drug is no longer present," and critically, these states "function as powerful negative reinforcers, intensifying drug cravings and increasing the likelihood of continued use" (Pollock 2026).

Pause on that phrase: *powerful negative reinforcers*. In behavioral science, negative reinforcement means that a behavior is driven not by the pleasure it brings, but by the *relief* it provides from something painful. For many people caught in cocaine addiction, continued use is not about chasing a high — it is about escaping a darkness that their own nervous system generates when the drug is gone. And according to this research, the severity of that darkness is not uniform. It varies. It depends, in part, on genetic makeup.

This distinction matters enormously for families. When we understand that a loved one may be biologically predisposed to experience withdrawal and craving more intensely than the average person, the moral calculus shifts. This is not weakness. This is not selfishness. This is neurobiology meeting life circumstances in a way that creates an almost impossible bind.

The Gap Between Science and Stigma

What Pollock's research also acknowledges is the extent to which "specific genetic factors driving these symptoms remain relatively unknown" (2026). This is a humbling admission from within addiction science itself. We know that genetic variation matters. We know it shapes vulnerability, severity, and the likelihood of relapse. But we cannot yet point to a single gene or cluster of genes and say with certainty: *this is why it happened to your son, your daughter, your spouse*.

This scientific humility should inform our cultural and familial humility as well. If researchers — with all the tools of genomics and neuroimaging at their disposal — cannot fully explain why cocaine takes hold so much more devastatingly in one person than in another, then the family member who blames themselves, or who blames their loved one, is operating on a false premise. Shame and judgment fill the vacuum that incomplete knowledge creates. The antidote is not certainty, but curiosity — and compassion.

For families, this means sitting with uncertainty without resolving it into blame. It means recognizing that the person struggling with cocaine is not a moral failure navigating a character flaw. They are, in part, a genetic individual navigating a neurobiological storm — one that research is only beginning to map.

The Body Under Siege: What Addiction Does to Physical Health

It would be a mistake to think of addiction as purely a psychological or behavioral phenomenon. The body, at every level, is implicated. A 2026 study in *Translational Psychiatry* examining the effects of methylphenidate — a psychostimulant chemically related to cocaine in its mechanisms — on human vascular endothelial cells illuminates this point. The study found that psychostimulants have measurable effects on the cells lining blood vessels, including brain microvascular endothelial cells and aortic endothelial cells, raising concern about cardiovascular risk associated with stimulant use.

While methylphenidate is a pharmaceutical used to treat ADHD and cocaine is an illicit stimulant, they share key pharmacological properties — both are dopamine reuptake inhibitors, both accelerate the cardiovascular system. The vascular findings in this research point toward a sobering reality: long-term stimulant exposure is not merely a brain event. The heart, the blood vessels, the microvasculature of the

brain itself — all are affected. Families watching a loved one's health deteriorate during active cocaine use are witnessing this biological reality in real time.

This matters for family education and advocacy. When families understand that addiction has physical consequences that extend well beyond behavior — that the body itself is being changed — it can help them advocate more effectively for comprehensive medical care, not just counseling or willpower-based interventions. The vascular research reminds us that recovery is a whole-body endeavor.

The Environment Writes on the Body Too

A third piece of research, though not directly about cocaine, adds an essential dimension to this conversation. A 2026 study from *the International Journal of Hygiene and Environmental Health* examines how prenatal exposure to air pollution — a factor entirely outside a child's control — leaves biological marks on the placenta in the form of oxidative stress and accelerated cellular aging. The study, drawn from the BiSC cohort of 499 participants, found associations between maternal air pollution exposure and measurable biomarkers of cellular damage in placental tissue, with downstream effects on birth weight.

Why does this matter for addiction? Because it deepens our understanding of how environment shapes biology before a person ever makes a single choice. If the prenatal environment can alter cellular aging, oxidative stress, and fetal development — all of which have downstream implications for brain function, stress reactivity, and vulnerability to psychiatric conditions — then the notion that addiction is simply a matter of individual will is further undermined by the evidence.

Many people who develop severe substance use disorders come from environments marked by poverty, pollution, trauma, and adversity — not

because those environments make people morally inferior, but because they create biological conditions that increase risk. The science here asks us to expand our moral imagination: to see addiction not as a personal failing dropped from the sky, but as the end point of a long chain of biological, environmental, and genetic influences.

What This Means for Families Right Now

None of this research was conducted with families sitting in waiting rooms, or lying awake at 3 a.m., directly in mind. And yet all of it speaks to them. Here is what the science, taken together, offers:

First, the intensity of your loved one's craving and withdrawal is real, biological, and in part genetically determined. It is not theater. It is not manipulation. The negative affective states that drive continued use are powerful enough that researchers have made them a primary subject of scientific inquiry — because they are among the strongest predictors of relapse (Pollock 2026).

Second, the body bears the burden of addiction in ways that compound vulnerability. Stimulant use affects the vascular system, the brain's microvasculature, the cardiovascular system. Recovery requires medical partnership, not just moral resolve.

Third, the forces that shaped your loved one's vulnerability began long before their first use — in their genes, in their prenatal environment, in the community and air they were born into. This does not remove responsibility from the equation. But it does insist that responsibility be understood in context, not wielded as a weapon.

Finally, the research is honest about what it does not yet know. The genetic factors "remain relatively unknown" (Pollock 2026). Science is still mapping this terrain. Families are not expected to have answers that scientists are still seeking. What families can do — what they are perhaps

uniquely positioned to do — is to remain present without judgment, to advocate for treatment approaches that honor the biological reality of addiction, and to hold hope when their loved one cannot.

CONCLUSION

The science of addiction is not cold comfort. It is, in fact, deeply humanizing. To learn that cocaine's grip varies by genetics, that withdrawal states are biologically driven, that the body is affected at the cellular level, and that the environment shapes vulnerability from before birth — this is to learn that your loved one is not a mystery to be condemned but a person to be understood.

Facing addiction with hope and understanding is not naivety. It is the posture that the evidence demands. The research points not toward judgment but toward curiosity, not toward shame but toward science, and not toward giving up but toward the long, difficult, evidence-honoring work of recovery — together.

Works Cited

Pollock. “Variation in cocaine responses across genetically diverse mouse strains.” Psychopharmacology, 2026. https://pubmed.ncbi.nlm.nih.gov/42489712/.