

Researchers identify protein involved in cocaine addiction

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A pile of cocaine hydrochloride. Credit: DEA Drug Enforcement Agency, public domain

Mount Sinai researchers have identified a protein produced by the immune system—granulocyte-colony stimulating factor (G-CSF)—that could be responsible for the development of cocaine addiction.

A study showed that G-CSF can alter a mouse's desire for cocaine, but not for other rewards. This effect is modulated by a brain region that plays a central role in [reward processing](#) and addiction. If applicable to humans, these findings represent a potential therapeutic approach to decrease a cocaine addict's motivation to seek the drug without introducing a potential new substance for abuse.

The results of the study will be published online in *Nature Communications*.

Previous research has demonstrated a link between cocaine use and the immune system in humans and animals, with addicts showing altered immune responses to drugs and drug cues.

In this study, the research team identified G-CSF—a cytokine produced by immune cells which was expressed at higher levels in both the blood and brain in mice that were treated with repeated doses of cocaine. Injecting G-CSF into the [nucleus accumbens](#), a brain region associated with reward, causes mice to take more cocaine, but does not change their motivation to consume a more natural reward, sugar water. Conversely, injecting an antibody that neutralizes G-CSF in the nucleus accumbens can reduce the mouse's motivation to take cocaine. Taken together, the results from this study suggest that manipulating G-CSF in the [reward center](#) of the brain changes the biochemical signals that push animals to take cocaine.

"The results of this study are exciting because outside of 12-step programs and psychotherapy, no medication-assisted therapy exists to treat [cocaine](#) addiction," said the study's senior author, Drew Kiraly, MD, PhD, Assistant Professor of Psychiatry at Icahn School of Medicine at Mount Sinai. "Drugs that manipulate G-CSF already exist as FDA-approved medications. Once we clarify how G-CSF signaling can best be targeted to reduce addiction-like behaviors, there is a high

possibility that treatments targeting G-CSF could be translated into clinical trials and treatments for patients."

More information: Granulocyte-colony stimulating factor controls neural and behavioral plasticity in response to cocaine, *Nature Communications* (2018).

[nature.com/articles/doi:10.1038/s41467-017-01881-x](https://doi.org/10.1038/s41467-017-01881-x)

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