

Changes in the brain hinder addiction recovery in people who are HIV-positive

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Microscopic image of an HIV-infected T cell. Credit: NIAID

Researchers with the Del Monte Institute for Neuroscience at the University of Rochester are studying how the brain puts the 'brakes' on behavior. That may be different in individuals recovering from cocaine

addiction and who are also HIV-positive.

"Scientists have long known that [drug abuse](#) can cause damage to the brain. We also know HIV infection can cause brain changes," said John Foxe, Ph.D., director of the Del Monte Institute for Neurosciences and senior author of the study published in *Neuropharmacology*. "Since [drug use](#) is common in individuals with HIV, an important question is how brain deficits associated with both conditions might add up."

Researchers used [functional magnetic resonance](#) imaging (fMRI) to measure the brain responses of cocaine addicts and patients with HIV while participants played a game that involved purposefully withholding responses to target stimuli. "The challenging thing about the game we asked participants to play isn't exactly playing it, *per se*," said Kathryn Mary Wakim, Ph.D., a recent graduate from the Neuroscience Graduate Program at the University of Rochester and the first author of the study. "What's really hard is *not* playing the game. What we wanted to measure was how the brain holds back a response under certain task conditions."

Difficulty withholding inappropriate responses are thought to be a central issue in addiction. Researchers found that participants diagnosed with both HIV and cocaine dependence had a difficult time holding back behavioral responses while playing the game, changes which were also reflected in brain activity. A companion study also published in *Neuropharmacology* found similar results while brain activity was measured using electroencephalography (EEG). Brain activity during response withholding in HIV+ participants in recovery from [cocaine dependence](#) was different than [brain activity](#) in HIV- participants in recovery.

"Currently, when someone who is HIV positive enters a recovery program they are treated in much the same fashion as any other person with an addiction issue," said Foxe. "But our findings show that they,

very likely, need to be treated differently or more intensively. HIV and drug addiction should be a dual diagnosis when it comes to recovery, and we will need to design specific targeted intervention approaches for this population, given their unique vulnerability."

"When people with HIV relapse, it's a big deal. The majority of participants in our study contracted HIV—not by injecting cocaine—but by having unprotected sex," Wakim said. "Relapse is an outcome that should be minimized in this population, because cocaine use is strongly associated with risky sexual behavior, which makes the spread of HIV more likely when a relapse occurs."

Additional co-authors are Edward Freedman, Ciara Molloy, Madalina Tivarus, Nicole Vieyto, and Zhewei Cao with the University of Rochester, and Armin Heinecke at Maastricht University in the Netherlands.

More information: Kathryn-Mary Wakim et al, Assessing combinatorial effects of HIV infection and former cocaine dependence on cognitive control processes: A functional neuroimaging study of response inhibition, *Neuropharmacology* (2021). [DOI: 10.1016/j.neuropharm.2021.108815](https://doi.org/10.1016/j.neuropharm.2021.108815)

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