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Increasing neurogenesis might prevent drug addiction and relapse

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Researchers at UT Southwestern Medical Center hope they have begun paving a new pathway in the fight against drug dependence. Their hypothesis - that increasing the normally occurring process of making nerve cells might prevent addiction - is based on a rodent study demonstrating that blocking new growth of specific brain nerve cells increases vulnerability for cocaine addiction and relapse.

The study's findings, available in the *Journal of Neuroscience*, are the first to directly link addiction with the process, called neurogenesis, in the region of the brain called the hippocampus.

While the research specifically focused on what happens when neurogenesis is blocked, the scientists said the results suggest that increasing adult neurogenesis might be a potential way to combat drug addiction and relapse.

"More research will be needed to test this hypothesis, but treatments that increase adult neurogenesis may prevent addiction before it starts, which would be especially important for patients treated with potentially addictive medications," said Dr. Amelia Eisch, associate professor of psychiatry at UT Southwestern and senior author of the study. "Additionally, treatments that increase adult neurogenesis during abstinence might prevent relapse."

Increasingly, addiction researchers have recognized that some aspects of the condition - such as forming drug-context associations - might involve the hippocampus, which is a region of the brain associated with learning and memory. Only with recent technological advances have scientists been able to test their theories in animals by manipulating the birth of new nerve cells in the hippocampus of the adult brain.

Physical activity and novel and enriched environments have been shown in animal studies to be good for the brain in general, but more research is needed to see if they can increase human adult neurogenesis.

Dr. Eisch and her colleagues used advanced radiation delivery techniques to prevent hippocampal neurogenesis. In one experiment, rats were allowed to self-administer cocaine by pressing a lever. Rats with radiated brains took more cocaine and seemed to find it more rewarding than rats that did not receive radiation.

In a second experiment, rats first self-administered cocaine and then received radiation to decrease neurogenesis during a period of time that they were without drugs. Rats with reduced neurogenesis took more time to realize that a drug lever was no longer connected to the drug dispenser.

"The nonirradiated rats didn't like the cocaine as much and learned faster to not press the formerly drug-associated lever," Dr. Eisch said. "In the context of this experiment, decreased neurogenesis fueled the process of addiction, instead of the cocaine changing the brain."

Dr. Eisch said she plans to do similar studies with other drugs of abuse, using imaging technology to study addiction and hippocampal neurogenesis in humans.

"If we can create and implement therapies that prevent addiction from happening in the first place, we can improve the length and quality of life for millions of drug abusers, and all those affected by an abuser's behavior," she said.

Another study author from UT Southwestern was Sarah Bulin, a graduate student research assistant. Other researchers involved in the work include Dr. Michele Noonan, former graduate research assistant in psychiatry, and Dwain Fuller from the VA North Texas Health Care System.

Provided by UT Southwestern Medical Center

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