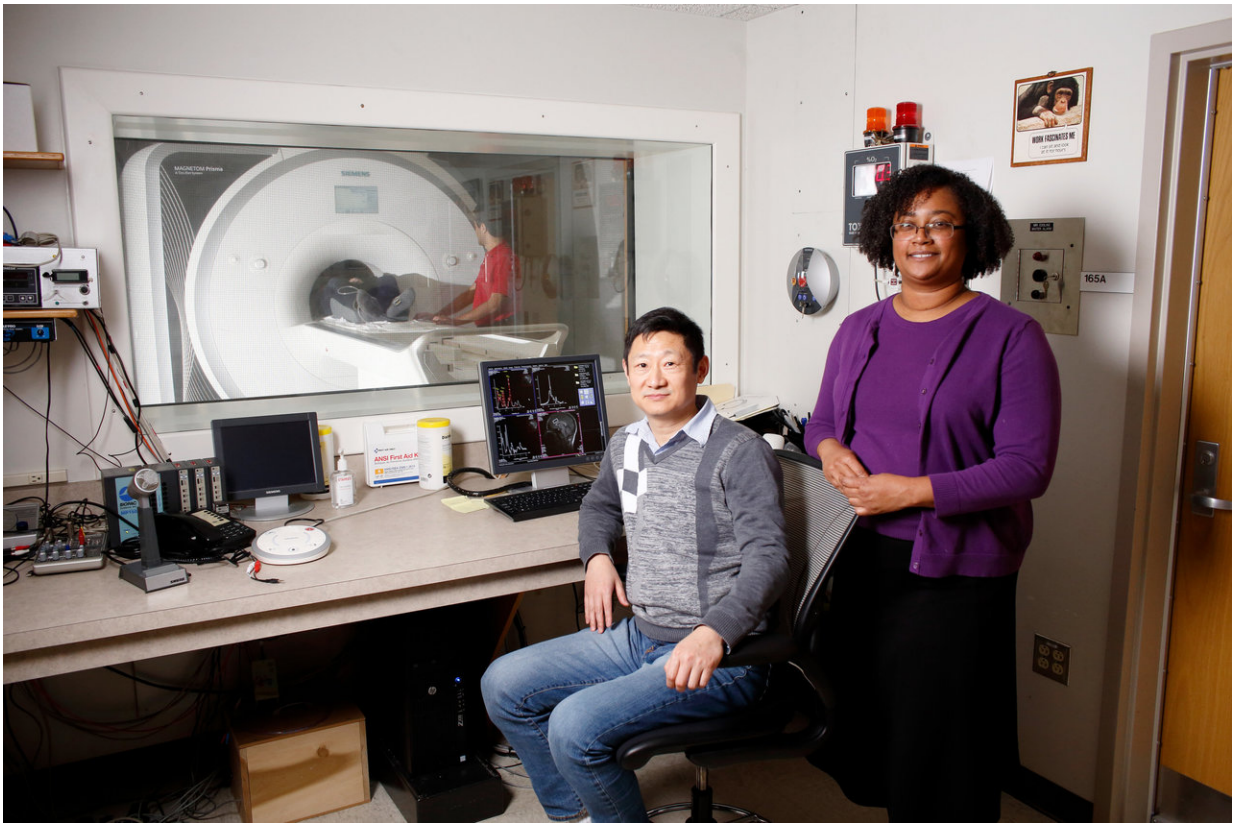
Study finds neurotransmitter may play a role in alcohol relapse, addiction

February 12 2018



IU professor Sharlene Newman and senior scientist Hu Cheng in the IU Bloomington Imaging Research Facility. Credit: Eric Rudd, Indiana University

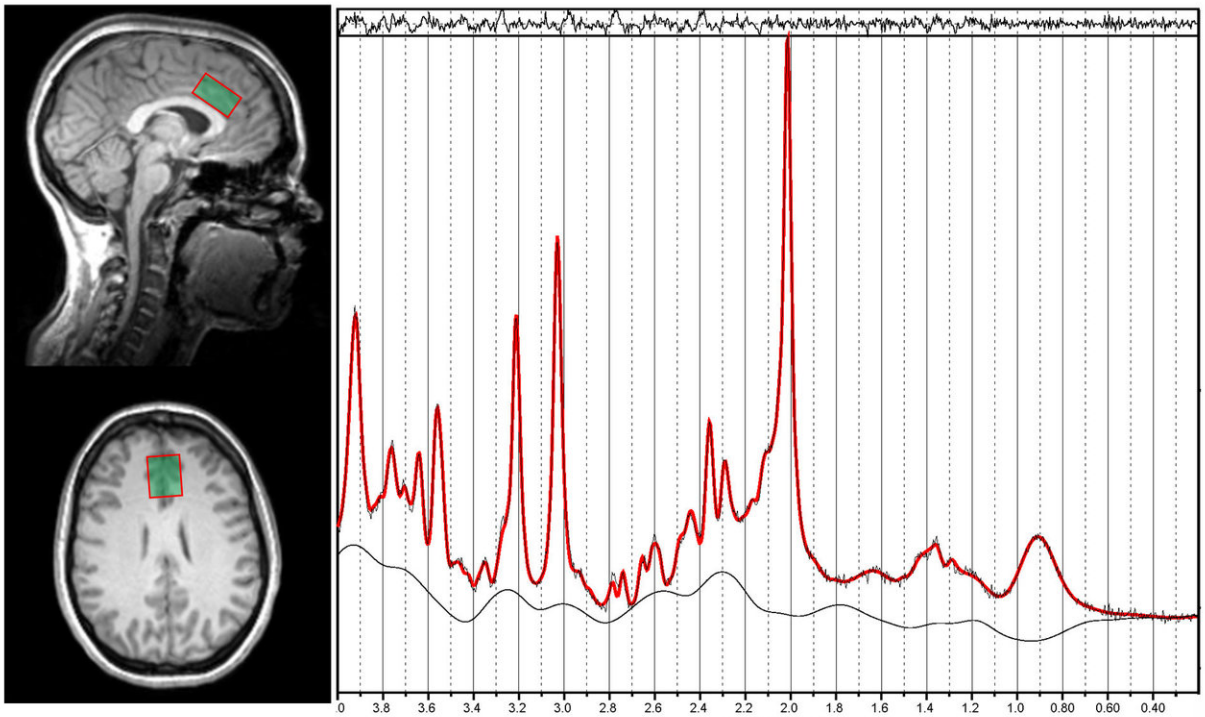
A study led by Indiana University on neurochemical changes associated with alcohol addiction found that the neurotransmitter glutamate plays a

role in some alcohol cravings.

Alcohol dependence and alcohol use disorders occur in about 30 percent of all Americans, taking a severe toll on people's lives, as well as on the health care system and economy. Ninety percent of all attempts to cure the dependence or abuse of alcohol result in relapse within four years. These relapses are primarily triggered by sights, sounds and situations associated with past drinking experiences.

"This is the first study to document changes in glutamate levels during exposure to alcohol cues in people with alcohol use disorders and shines a spotlight on glutamate levels as an important target for new therapies to treat the condition," said Sharlene Newman, a professor in the IU Bloomington College of Arts and Sciences' Department of Psychological and Brain Sciences.

The study, recently published in the *Journal of Alcohol and Alcoholism*, builds upon research by scientists such as George Rebec, a professor emeritus in the Department of Psychological and Brain Sciences who previously found that sights and sounds associated with addictive substances such as cocaine or alcohol affect glutamate levels in the brains of rats addicted to these substances. These sights and sounds are called "cues" because they elicit a craving for the previously abused substance.



The study used magnetic resonance spectroscopy to show how images associated with alcohol use cause glutamate levels to change in a region of the brain known as the dorsal anterior cingulate, which plays an important role in addiction. Credit: Hu Chang, Indiana University

"Glutamate is the real workhorse of all transmitters in the brain," Rebec said. "Dopamine is the more popularly known neurotransmitter, a lack of which contributes to depression, anxiety, attention deficit hyperactivity disorder and Parkinson's disease—but it actually accounts for less than 5 percent of all synaptic activity. By contrast, glutamate?accounts for about 50 percent of this activity and is especially involved in the reward-motivation circuits integral to addiction."

To conduct the new study, researchers enlisted 35 subjects, 17 with alcohol use disorder and 18 without the disorder. Then they measured

concentrations of glutamate using a technology called magnetic resonance spectroscopy. The study found a decrease of the chemical in the brain of people with alcohol abuse disorder after they were shown cues associated with drinking—such as a photo of alcohol in a glass—compared to when they viewed neutral photos. Individuals without the disorder showed no change in glutamate levels when viewing the same images.

"We recognized we could measure glutamate levels in the human brain using magnetic resonance spectroscopy," said Newman, who led the collaboration between her department's addiction researchers to build upon Rebec's previous work in animals. "Scientists can now confidently target glutamate levels in the brain as they develop new treatments for alcoholism and other forms of addiction."

More information: Hu Cheng et al, Effects of Alcohol Cues on MRS Glutamate Levels in the Anterior Cingulate, *Alcohol and Alcoholism* (2017). DOI: 10.1093/alcalc/agx119

Provided by Indiana University