

Imaging study provides glimpse of alcohol's effect on brain

April 29 2008

New brain imaging research published this week shows that, after consuming alcohol, social drinkers had decreased sensitivity in brain regions involved in detecting threats, and increased activity in brain regions involved in reward. The study, in the April 30 issue of *The Journal of Neuroscience*, is the first human brain imaging study of alcohol's effect on the response of neuronal circuits to threatening stimuli.

“The key finding of this study is that after alcohol exposure, threat-detecting brain circuits can't tell the difference between a threatening and non-threatening social stimulus,” said Marina Wolf, PhD, at Rosalind Franklin University of Medicine and Science, who was unaffiliated with the study. “At one end of the spectrum, less anxiety might enable us to approach a new person at a party. But at the other end of the spectrum, we may fail to avoid an argument or a fight. By showing that alcohol exerts this effect in normal volunteers by acting on specific brain circuits, these study results make it harder for someone to believe that risky decision-making after alcohol ‘doesn't apply to me’,” Wolf said.

Working with a dozen healthy participants who drink socially, research fellow Jodi Gilman, working with senior author Daniel Hommer, MD, at the National Institutes on Alcohol Abuse and Alcoholism, used functional magnetic resonance imaging (fMRI) to study activity in emotion-processing brain regions during alcohol exposure. Over two 45-minute periods, the study participants received either alcohol or a

saline solution intravenously and were shown images of fearful facial expressions. (Previous studies have shown that expressions of fear signal a threatening situation and activate specific brain regions.)

The same group of participants received both alcohol and placebo, on two separate days.

Comparing brain activity, Gilman's team found that when participants received the placebo infusion, fearful facial expressions spurred greater activity than neutral expressions in the amygdala, insula, and parahippocampal gyrus—brain regions involved in fear and avoidance—as well as in the brain's visual system. However, these regions showed no increased brain activity when the participants were intoxicated.

In addition, alcohol activated striatal areas of the brain that are important components of the reward system. This confirms previous findings and supports the idea that activation of the brain's reward system is a common feature of all drugs of abuse. Gilman's team found that the level of striatal activation was associated with how intoxicated the participants reported feeling. These striatal responses help account for the stimulating and addictive properties of alcohol.

“I think the authors have set the standard for how studies on acute alcohol consumption should be conducted in the fMRI literature,” says Read Montague, PhD, at the Baylor College of Medicine, also unaffiliated with the study. “The findings are a stepping stone to more liberal use of imaging methodologies to advance our understanding of addiction.”

Since its development in 1993, fMRI has allowed the noninvasive mapping of function in various regions of the human brain. This

technological advance is an important source of information for neuroscientists in a range of fields.

Source: Society for Neuroscience

Citation: Imaging study provides glimpse of alcohol's effect on brain (2008, April 29) retrieved 10 April 2024 from <https://medicalxpress.com/news/2008-04-imaging-glimpse-alcohol-effect-brain.html>

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