News
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RAT BRAIN STUDIES

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***Dallas scientists study effects of alcohol, drugs on brain activity

DALLAS--You might drink and still do all right if you have a simple task and a one-track mind. But when it comes to complicated tasks like driving a car, alcohol seriously degrades a person's ability to perform. This is an early implication of a brain study now underway at The University of Texas Health Science Center at Dallas. The study aims to find out exactly how alcohol and other drugs affect patterns of activity in the brain.

The project, directed by Drs. John Chapin and Donald Woodward of the departments of Cell Biology and Physiology at UTHSCD, has been made possible by grants from the National Institute on Alcohol Abuse and Alcoholism. It is one of only a few studies in the U.S. mapping the abnormal patterns of brain activity that correspond to inebriation.

The study marks the first time that abnormal physical movement has been precisely correlated with the changes in brain activity that occur during intoxication. "The question was," explains Woodward, "could we find a pattern of neural activity that would give us insight into how these abnormal functions appear?" To record these brain patterns, videotapes are made of laboratory rats running on a computerized treadmill. Microelectrodes feed the neuron output of the rats' brains directly into the memory of the control computer. The videotapes and computer records are then played back simultaneously and synchronized.

Baseline readings from normal, healthy rats are compared with readings taken from genetically identical rats performing the same task under the influence of measured amounts of alcohol. Variations in the level of activity in different parts of the brain reveal the ways in which alcohol consumption affects brain function.

Says Woodward, "The suggestion is that drugs will lay down a unique 'fingerprint' of brain activity.

"We were able to show that when an animal begins to move, normal sensory input from the foot to the brain is suppressed in a highly selective way. In human everyday behavior, this mechanism may be useful. The feelings of feet on stairsteps are shut down, but sensation from obstacles is allowed to be perceived.

"But the opposite appeared when we recorded from neurons in the sensory cortex of intoxicated rats--alcohol caused an impairment of the shut-down of sensory input."

The implication for human behavior, Woodward speculates, may be that "intoxicating substances cause the inability to control sensory input by shutting it down. Drunkenness may cause poor performance in a strange way. If you concentrate and you are not too drunk, you perform pretty well if you have only a single task in mind. Champion dart throwers, for instance, have only one task to complete, and are allowed to concentrate and prepare, so they may drink moderate amounts and still play well.

"But multi-tasking problems, in which you have to switch attention from one task to another and consider a lot of distractions, cannot be done so well. It's with this multi-attentional mechanism that impairment of function occurs." Drivers who have been drinking, say Chapin and Woodward, cannot quickly distinguish safe from unsafe actions, and are unable to perform well the multiple tasks involved in driving.

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