Distinctive gene expression in brains of relapsing heroin-addicted rats

August 6 2009

A group of genes whose expression is significantly altered following exposure to drug paraphernalia after an enforced 'cold-turkey' period have been identified. Researchers writing in the open access journal *BMC Neuroscience* studied gene expression in the brains of heroin-addicted rats, identifying those genes that may be involved in precipitating a relapse.

Kara Kuntz-Melcavage, from Pennsylvania State University College of Medicine, USA, is part of a team of researchers who carried out the experiments. She said, "A number of gene expression studies have investigated changes induced by drug exposure, but few reports describe changes associated with the mental state that leads to relapse. We identified 66 genes involved in the relapse response, including some that are important for neuroplasticity, and through that role may impact learning and behavior".

Kuntz-Melcavage and her colleagues attached rats to a drug supply that for 3 hours each day delivered heroin into their jugular veins when they licked a particular empty spout. Over a two-week period, these animals were free to self-administer heroin, while control rats to whom they were linked received saline instead. One group of addicted rats and their yoked non-addicted partners were then kept without heroin for two weeks before being re-exposed to the spout, which no longer yielded drug infusions. After 90 minutes in this narcotic-associated environment, during which the addicted rats compulsively returned to lick the unrewarding empty spout, they and their yoked control mates were

humanely killed and gene expression in their brains was studied.

By comparing the gene expression in the drug-seeking animals with that in a second group of addicted rats re-exposed to the narcotic environment after only one day of abstinence, and with the saline-yoked controls, the researchers were able to identify genes involved in relapse behavior. According to Kuntz-Melcavage, "The session with the inactive spout served not only to provide an opportunity to observe drug-seeking behavior, but also mimicked a real-life situation in which environmental cues precipitate relapse behavior following an extended period of abstinence".

Speaking about the results of the study, Kuntz-Melcavage said, "As data accumulate, the existence of a single 'relapse gene' is looking increasingly unlikely - it is likely to be a constellation of different genes. Therefore, large scale views of gene expression, like this one, will prove very useful for guiding research into human drug-associated behavior".

More information: Gene expression changes following extinction testing in a heroin behavioral incubation model; Kara L Kuntz-Melcavage, Robert M Brucklacher, Patricia S Grigson, Willard M Freeman and Kent E Vrana; *BMC Neuroscience* (in press); www.biomedcentral.com/bmcneurosci/

Source: BioMed Central (news : web)