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Adolescent amphetamine use linked to permanent changes in brain function and behavior

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Amphetamine use in adolescence can cause neurobiological imbalances and increase risk-taking behaviour, and these effects can persist into adulthood, even when subjects are drug free. These are the conclusions of a new study using animal models conducted by McGill University Health Centre (MUHC) researcher Dr. Gabriella Gobbi and her colleagues. The study, published in *The International Journal of Neuropsychopharmacology*, is one of the first to shed light on how long-term amphetamine use in adolescence affects brain chemistry and behaviour. "We looked at the effects of long-term amphetamine use on important neurotransmitters and on risk -taking behaviour in adolescent rats," says Dr. Gobbi, a researcher in Mental Illness and Addiction from the Research Institute of the MUHC and associate professor at the Faculty of Medicine at McGill University. "The brain chemistry of these rodents is very similar to that of humans, so this model provided us with very useful insights into amphetamine use in a human population."

Amphetamine is a psychostimulant drug which produces increased wakefulness and focus, in association with decreased fatigue and appetite. This drug, commonly known as "speed," is also used recreationally and as a performance enhancer. According to the United Nations Office on Drugs and Crime (UNODOC) report (2011), more than 10 per cent of adolescents in the U.S. have used amphetamines. In Europe, between two and seven per cent of adolescents have tried amphetamines, and in Canada the number is estimated at just over five per cent.

Study subjects were given one of three dosing regimens of amphetamine during adolescence. When they reached adulthood, drugs were withdrawn and their neurophysiological activity and risk-taking behaviour were studied. "We focused on the key neurotransmitters serotonin, dopamine and norepinephrine," Dr. Gobbi explains. "We found abnormalities in brain activity associated with all three of these neurochemicals, called "monoamines." Imbalances of monoamines are associated with emotional disturbances and mental diseases such as depression or addiction."

Researchers also noted behavioural changes in all dosing groups. Hyperactivity was observed in rodents exposed to a moderate dose of amphetamine during adolescence, while risk-taking behaviour increased in every dosage group.

"Obviously we have to be very cautious about applying these results to a human population," says Dr. Gobbi. "However, given the basic similarities between human and rodent brains, these results are cause for concern. They suggest that the effects of amphetamine use can persist into adulthood, even if the subject is no longer taking drugs, and that these effects include a tendency toward risk-taking behaviour."

This paper was co-authored by Benoit Labonté (Master's student in Dr. Gobbi's lab during the study and currently at the Douglas Mental Health University Institute); Ryan McLaughlin (University of British Columbia, Psychology); Francis Bambico (Yale University, Molecular Psychiatry); Ilaria Lucchino (University La Sapienza,

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