

SUBSTANCE USE IN TEENS LINKED TO PRENATAL MATERNAL SMOKING

A study has found that prenatal exposure to maternal smoking is associated with an increased likelihood of substance use in adolescence (i.e., use of cigarettes, alcohol or drugs). The study was also an attempt to understand how exposure to nicotine *in utero* might affect the developing brain.

Cigarette smoking during pregnancy is not uncommon: 16% to 60% of pregnant women smoke, with the number varying by country and socio-economic group. Yet smoking during pregnancy is associated with a number of adverse outcomes, including spontaneous abortion, sudden infant death syndrome and low birth weight, as well as increased rates of behavioural problems and other negative psychosocial outcomes.

While some studies had previously suggested a link with increased substance use later in life, *“this is the first study that shows what is happening in the brain of adolescents whose mothers smoked during pregnancy, with respect to drug experimentation,”* says Tomáš Paus, Tanenbaum Chair in Population Neuroscience, senior scientist at the Rotman Research Institute and professor of psychology and psychiatry at the University of Toronto.

In particular, researchers sought to determine the role of the orbitofrontal cortex (OFC) in this relationship. The OFC is one of the key structures in reward-related processes, *“a place where the brain decides whether something is rewarding or not, which is what substance use is all about,”* Paus explains. The study looked at nearly 600 adolescents, aged 12 to 18 years, in the Saguenay–Lac-Saint-Jean region of Quebec, Canada. It found that among adolescents exposed to maternal smoking during pregnancy, the thinner the cortex, the more likely it was that the adolescents had experimented with drugs.



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“Our interpretation is that the thinner the cortex, the less sensitive people are to reward, so they keep ‘shopping around’ for another substance,” says Paus. (He emphasizes, however, that increased use does not mean drug addiction, and that trying out cigarettes, alcohol or even marijuana is in fact a fairly normative behaviour in adolescence.)

Researchers suspect that when a pregnant woman smokes, it activates the nicotine receptors of the fetal brain. Repeated activation changes the sensitivity of other transmitter systems, including dopamine, an important neurotransmitter for reward-related processes. While at first this is a functional difference, it can translate into a structural difference, i.e., affecting the thickness of the cortex.

However, the study also suggests that some individuals may be “protected.” Exposed

adolescents who had not tried drugs showed the same OFC thickness as non-exposed adolescents. *“This could mean that some kids who were exposed to smoking prenatally were protected by other factors,”* says Paus. *“It could be that different genes make them less vulnerable, or that certain maternal behaviours offset the potentially adverse effects.”*

Tomáš Paus concludes that his group’s findings help to provide a more detailed picture of the negative outcomes associated with prenatal exposure to maternal smoking. *“But we are also learning that not everyone is affected in same way. Future research might help identify what protects some individuals — so that if we cannot get the mother to quit, perhaps we can still offer some counter-measures.”*

BY EVE KRAKOW

Ref.: Lotfipour S, Ferguson E, Leonard G, Perron M, Pike B, Richer L, Séguin JR, Toro R, Veillette S, Pausova Z, Paus T. Orbitofrontal cortex and drug use during adolescence: Role of prenatal exposure to maternal smoking and BDNF genotype. *Archives of General Psychiatry* 2009;66(11):1244-1252.