

Drug abuse during pregnancy can cause diabetes in children later in life

November 21 2019



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Data from the U.S. indicate that between 5 to 10 percent of mothers consume psychostimulants (such as amphetamine, cocaine or methamphetamine) during pregnancy. Apart from the negative impacts

on the developing brain, many babies born from drug-abusing mothers present with imbalanced blood glucose levels, which statistically affects more female newborns.

The study, based upon observations in people and conducted in mouse models, explored whether the mechanisms underlying deficient glucose metabolism are similar to those acting on the brain. The researchers therefore studied the effects of psychostimulants on the development of pancreatic beta cells and measured their life-long impact on insulin production. In the fetal brain, psychostimulants act primarily through dopamine signaling pathways, which are not present in the developing pancreas. Instead, as the study revealed, they utilize the [serotonin transporter](#) to affect serotonin signaling, thereby impinging on the development of pancreatic beta cells whose job it is to produce the hormone insulin to regulate [blood glucose levels](#). If the body produces too little insulin, it is no longer able to properly control glucose homeostasis.

"The drugs affected the epigenetic regulation of gene expression in pancreatic beta cells, thereby changing the identity of these cells in a way that the production of the hormone insulin became impaired," explains principal investigator Tibor Harkany. "This type of cellular reprogramming upon maternal consumption of psychostimulants could persist over the entire lifetime of affected children." The glucose tolerance test showed that even occasional drug use—drugs were only administered on three days during pregnancy in mouse experiments—resulted in abnormal blood glucose levels in the offspring, even in adulthood. In mice, female offspring were more severely affected, an observation mirroring gender differences reported in people.

"The mechanisms discovered in our [preclinical study](#) provide clear indications of the mode of action of these drugs, which seem equally

relevant to human development," explains Harkany, "because the clinical consequences manifest similarly in people."

Solomia Korchynska, lead author of the study, concludes: "If pregnant women take drugs, they are increasing the risk of developmental disorders in their child, which not only affect the brain but also peripheral organs, with life-long consequences." A starting point for the development of therapeutic approaches could be "active agents that directly intervene in the epigenetic regulation of gene expression, as has already been attempted with [histone deacetylase inhibitors](#) (HDACs) in Alzheimer's and [cancer treatment](#)." These potential treatments offer exciting perspectives for the future and the current study provides the basis by elucidating molecular and cellular targets of psychostimulant drug action when abused during pregnancy.

More information: Solomiia Korchynska et al. Life-long impairment of glucose homeostasis upon prenatal exposure to psychostimulants, *The EMBO Journal* (2019). [DOI: 10.15252/emboj.2018100882](https://doi.org/10.15252/emboj.2018100882)

Provided by Medical University of Vienna

Citation: Drug abuse during pregnancy can cause diabetes in children later in life (2019, November 21) retrieved 10 May 2024 from <https://medicalxpress.com/news/2019-11-drug-abuse-pregnancy-diabetes-children.html>

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