

Mother's diet affects offspring alcohol and nicotine use in lab animal study

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Researchers at The Rockefeller University have found in a study with rats that a mother's consumption of a fat-rich diet during pregnancy increases her offspring's risk of a combined alcohol and nicotine abuse in adolescence. The study performed by Olga Karatayev in the Neurobiology Laboratory of Dr. Sarah Leibowitz at Rockefeller provides insight into early life factors that contribute to substance abuse. The results are to be presented this week at the Annual Meeting of the Society for the Study of Ingestive Behavior (SSIB), the foremost society for research into all aspects of eating and drinking behavior.

Clinical studies have demonstrated that [alcohol](#) and [nicotine](#) abuse tend to be linked. Excessive drinking is commonly associated with greater smoking. The question is, what may be contributing to this co-abuse of alcohol and nicotine that has become more evident in recent years?

Whereas most animal studies of such co-abuse combine oral consumption of alcohol with intravenous self-administration of nicotine, Karatayev and Leibowitz developed a new approach that involves training the [rats](#) to press a lever to receive small infusions through an intravenous (IV) tube of either alcohol or nicotine alone, or of both in combination. With this method, rats begin avidly working for the drug, with the confounding factors from alcohol's bitter taste being eliminated.

The investigators revealed that maternal consumption of a high-fat diet caused the offspring to treat the nicotine as more rewarding, especially when it was combined with alcohol, compared to offspring of mothers

eating a low-fat diet. When a test required the young rats to work progressively harder at lever pressing, the fat-exposed rats kept working to obtain the next dose after the control rats gave up. Maternal consumption of fat also caused the rats to take significantly larger amounts of the alcohol plus nicotine mixture than of nicotine alone, an effect not evident in the low-fat control condition. This demonstrates for the first time that exposure to a fat-rich diet in utero causes in the offspring a greater vulnerability to the excessive co-use of alcohol and nicotine during adolescence.

Recent studies from the Rockefeller laboratory have led Karatayev and Leibowitz to propose how changes to specific brain systems during development link maternal fat consumption to adolescents' alcohol and nicotine abuse. A class of chemical signals called neuropeptides, which ordinarily act in the hypothalamus region of the brain to promote food intake, appear to promote drug-seeking as well. They find that the neuropeptides that are stimulated by fat intake in adult animals are similarly responsive in the embryo. Prenatal fat exposure increases the growth of more neurons in these specific brain areas, leading to a long-lasting increase in levels and activity of the chemical messengers during adolescence that are likely to increase the risk for drug abuse.

More information: Research: Nicotine and ethanol co-use in Long-Evans rats: Stimulatory effects of perinatal exposure to a fat-rich diet. Published in: *Alcohol*, 2015, 49(5): 479-89.

Provided by Society for the Study of Ingestive Behavior

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