

Moms' high-fat, sugary diets may lead to offspring with a taste for alcohol, sensitivity to drugs

3 August 2013

Vulnerability to alcohol and drug abuse may begin in the womb and be linked to how much fatty and sugary foods a mother eats during pregnancy, according to findings from animal lab experiments presented at APA's 121st Annual Convention.

"The majority of women in the U.S. at child-bearing age are overweight, and this is most likely due to overeating the tasty, high-fat, high-[sugar foods](#) you find everywhere in our society. The rise in prenatal and [childhood obesity](#) and the rise in number of youths abusing alcohol and drugs merits looking into all the possible roots of these growing problems," said Nicole Avena, PhD, a research neuroscientist with the University of Florida's McKnight Brain Institute.

Compared to pups of rats that ate regular rodent chow, the offspring of rats that ate high-fat or high-sugar diets while pregnant weighed more as adults and drank more alcohol, and those on high-sugar diets also had stronger responses to commonly abused drugs such as amphetamine, Avena said. Her presentation examined experiments from three studies, each lasting about three months and involving three to four adult [female rats](#) and 10 to 12 offspring in each dietary condition.

Researchers compared weight and drug-taking behavior between the offspring of rats fed diets rich in fats, [sucrose](#) or high-fructose corn syrup with the offspring of rats fed regular rodent chow during gestation or nursing. They tested both sucrose and high-fructose corn syrup because they are chemically different and could cause different outcomes, Avena said. Sucrose occurs naturally and is commonly processed from sugar cane or [sugar beets](#) into [table sugar](#), whereas high-fructose corn syrup is synthesized from corn.

To determine effects of the mothers' diets during

gestation, the offspring of rats fed the high-fat, high-sucrose or high-fructose corn syrup diets were nursed by mother rats that were eating regular chow. To determine the effects of the mothers' diets on the offspring during nursing, the pups with mothers that had eaten regular chow were nursed by mother rats that were eating either the high-fat, high-sucrose or high-fructose corn syrup diets.

The pregnant rats' high-fat [diet](#) contained 50 percent fat, 25 percent carbohydrate and 25 percent protein, whereas the control diet reflected a recommended human diet, with 25 percent fat, 50 percent carbohydrate and 25 percent protein, Avena said. The offspring of rats that had high-fat diets while pregnant drank significantly more alcohol in adulthood than the offspring of rats with the regular chow diet, while there were no differences in the average daily amount of water they drank or chow they ate. The offspring of rats on the high-fat diet while pregnant also had significantly higher levels of triglycerides, a type of fat found in the bloodstream that can increase the risk of heart disease. Pups whose mothers had the high-fructose corn syrup or high-sucrose diets did not exhibit any differences in triglycerides compared to the group that ate regular chow.

To test the effects of diets high in sucrose and high-fructose corn syrup, researchers gave one group of the pregnant rats a daily diet of regular chow plus a 10 percent sucrose solution or a 16 percent high-fructose corn syrup solution. Pups nursed by rats with either high-sucrose or the high-fructose [corn syrup](#) diets while pregnant drank more alcohol compared to [offspring](#) born to the group that did not have sugar. Further, pups exposed to either of the sugar-rich diets before birth or during nursing became hyperactive when given low doses of amphetamine, suggesting sensitivity to the drug. These animals also weighed significantly more at

the end of the study than those born to the rats that ate regular chow.

Previous research with lab animals and people has shown that overeating foods that taste good alters brain reward systems, and diets with excessive fat and sugar can lead to increased appetite as well as some addiction-like behaviors, Avena said. "Our findings suggest that even while [[rats](#) are] still in the womb, exposure to high-fat and sugar-rich diets can, in addition to increasing body weight, lead to a predisposition to drink alcohol and a sensitivity to drugs," she said.

More information: Presentation: "Fat and Sugar in Gestation, Pre-weaning and Adulthood: Behavioral Vulnerability to Drugs of Abuse," Nicole Avena, PhD, symposium 4045, Saturday, Aug. 3, 8 - 9:50 a.m. HST, Hawai'i Convention Center, room 305B

Provided by American Psychological Association

APA citation: Moms' high-fat, sugary diets may lead to offspring with a taste for alcohol, sensitivity to drugs (2013, August 3) retrieved 28 April 2021 from <https://medicalxpress.com/news/2013-08-moms-high-fat-sugary-diets-offspring.html>

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