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Obese male mice father offspring with higher levels of body fat

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Male mice who were fed a high-fat diet and became obese were more likely to father offspring who also had higher levels of body fat, a new Ohio University study finds.

The effect was observed primarily in male offspring, despite their consumption of a low-fat diet, scientists reported today at the annual meeting of The Endocrine Society in San Francisco, Calif.

"We've identified a number of traits that may affect metabolism and behavior of offspring dependent on the pre-conception diet of the father," said Felicia Nowak, an associate professor of biomedical sciences in Ohio University's Heritage College of Osteopathic Medicine who is lead author on the study.

The researchers point to epigenetics—the way genes are expressed, as opposed to mutations in DNA that are "hard-wired into the genes"—as a possible cause of these inherited traits. Because gene expression is impacted by environmental and lifestyle factors, this finding suggests that individuals with obese fathers may be able to proactively address health concerns.

The effect of parents' diet and weight on children has been well-established in humans, Nowak explained, but scientists have been studying the issue in mice to learn more about the biological mechanisms behind the phenomenon. The Ohio University team studied the impact of the high-fat diet only with male mice parents, as most of the previous

research had focused on female mice parents.

To conduct the study, the researchers fed male mice a high-fat diet for 13 weeks before mating. (The female mates were fed a matched low-fat diet.) Male and female offspring were fed a standard low-fat diet and studied at 20 days, six weeks and at six and 12 months.

Compared with offspring from control mice (who were fed the low-fat diet), the male offspring of paternal mice with diet-induced obesity had higher body weight at six weeks of age. They also were more obese at the six- and 12-month study markers. In addition, the male offspring of obese fathers had different patterns of body fat composition—a marker for health and propensity for disease—than the control mice.

The researchers were surprised, however, to find that the offspring of the obese paternal mice also were more physically active. At six weeks, the male offspring voluntarily ran more, and their female siblings demonstrated the same behavior at six and 12 months, the scientists report. Nowak's team is studying possible causes for this behavior, which might offset the increased body fat and reduce the offspring's risk of metabolic disease such as diabetes and heart disease.

In the next phase of the research, the team will seek to identify the genes responsible for the physiological and behavioral changes. This, in turn, may inform clinicians about possible epigenetic factors in human obesity.

"Early detection and prediction of risk for obesity, diabetes and related diseases will enable individuals and health care workers to delay or prevent the related disabilities and increase life expectancy," Nowak said. The study was funded by the Ohio University Research Council and the Heritage College of Osteopathic Medicine.