

What babies eat after birth likely determines lifetime risk of obesity, rat study suggests

30 August 2012

Rats born to mothers fed high-fat diets but who get normal levels of fat in their diets right after birth avoid obesity and its related disorders as adults, according to new Johns Hopkins research.

Meanwhile, rat babies exposed to a normal-fat diet in the womb but nursed by rat mothers on high-fat diets become obese by the time they are weaned.

The experiments suggest that what mammalian babies—including humans—get to eat as newborns and young children may be more important to their metabolic future than exposure to unhealthy nutrition in the womb, the Hopkins scientists say.

"Our research confirms that exposure to a high-fat diet right after birth has significant consequences for obesity," says Kellie L.K. Tamashiro, Ph.D., an assistant professor of psychiatry and behavioral sciences at the Johns Hopkins University School of Medicine and leader of the study published online in the journal *Diabetes*. "But it also suggests that by putting children on a [healthy diet](#) in infancy and early childhood, we can intervene and potentially prevent a future of obesity, diabetes and heart disease."

Obesity has become a worldwide public health problem that often leads to many other disorders, such as cardiovascular disease, hypertension, [type 2 diabetes](#), some cancers and arthritis. A significant concern in Western society is the consumption of modern diets high in fat: Rates of obesity are skyrocketing, costing the [health care system](#) billions and reducing longevity.

In the Johns Hopkins experiments, newborn baby rats exposed to a high-fat diet through the breast milk of rat mothers fed high amounts of fat were more likely to gain excessive weight, have impaired tolerance to glucose (a sign of [prediabetes](#)) and become insensitive to the [hormone leptin](#), which regulates appetite and body weight in humans and rodents and can be

disrupted in obese mammals. Leptin, secreted by [fat cells](#), signals how much fat is around and controls food intake; obese people often are insensitive to the signals, for reasons so far unclear.

To compare the impact on offspring obesity of prenatal versus postnatal exposure to a maternal high-fat diet, Tamashiro and her team began by feeding half of the pregnant rats a high-fat diet and half a normal diet. After birth, half of the offspring of the high-fat moms were given to the normal-diet moms to nurse and vice versa. Those exposed to a high-fat diet both before and after birth (through breast milk) gained more weight and were obese by the time they were weaned, as were those who were only nursed by rats on a high-fat diet. Those born to mothers on a high-fat diet but nursed by rats on a normal diet did not suffer the same fate.

Tamashiro and her colleagues currently are trying to determine whether exercise in early rat development, the equivalent of elementary school age in humans, can reverse the effects of exposure to a high-fat [diet](#).

"These animals—like children—are still developing and responding to their environment, and, as much as possible, we want to make sure they develop properly so bad health consequences don't occur," she says.

While the findings are important steps in understanding how prenatal and postnatal environments affect development, Tamashiro cautions that data from rats don't directly translate into human application.

Still, Tamashiro says, obstetricians may be on the right track as they rethink guidelines for pregnant women. Many suggest that obese women limit weight gain during pregnancy by reducing fat and calories. Obese mothers who switch to healthier diets during pregnancy and then maintain them while nursing may be able to help their children

avoid the road to obesity, Tamashiro says.

"Obesity rates have increased threefold over the last 20 years," she says. "We know it's not because of genetics because our genes don't change that quickly. So we are focusing on the developmental environment. Obese children are developing metabolic disorders earlier, affecting their quality of life and health over the long term. Prevention is probably the best strategy we have."

Provided by Johns Hopkins University School of Medicine

APA citation: What babies eat after birth likely determines lifetime risk of obesity, rat study suggests (2012, August 30) retrieved 17 October 2019 from <https://medicalxpress.com/news/2012-08-babies-birth-lifetime-obesity-rat.html>

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