Childhood exercise may stave off some bad effects of maternal obesity

November 25 2013

Rats whose mothers were fed a high-fat diet during pregnancy and nursing were able to stave off some of the detrimental health effects of obesity by exercising during their adolescence, new Johns Hopkins research shows.

Even though the rat offspring weighed the same as their sedentary counterparts, the exercising rats had fewer fat deposits and their brains were better able to respond to a hormone known to suppress the appetite—long after they stopped running on their exercise wheels.

Because mammals (including rats and humans) share much of their biology, the findings suggest that childhood exercise might help mitigate some of the risks that human children of obese parents are biologically primed to follow in their parents' footsteps and to develop diabetes and other obesity-related disorders. A report on the research is published in the November issue of the *American Journal of Physiology—Regulatory, Integrative and Comparative Physiology*.

"Just three weeks of exercise early in life had a persistent effect on the satiety centers of the brains of these rat pups," says study leader Kellie L. K. Tamashiro, Ph.D., an associate professor of psychiatry and behavioral sciences at the Johns Hopkins University School of Medicine. "If we can find a way to take advantage of that phenomenon in humans that would be great, because preventing obesity is probably going to be much easier to do than reversing it."

Tamashiro and her colleagues fed pregnant rats a high-fat diet and continued that diet while they were nursing their pups. The animals were weaned on a healthier, standard low-fat diet and at four weeks of age, the equivalent of rodent early adolescence, some were given free access to running wheels in their cages, while the others remained sedentary. The running wheels were taken away after three weeks.

To determine the impact of the exercise on appetite, at 14 weeks of age, the rats' brains were injected with the appetite-suppressing hormone leptin. Those that had exercised weeks before ate less, while the sedentary rats showed no differences in their appetites.

Leptin is naturally secreted by fat cells and helps many people to maintain a healthy weight. But obese people who have more leptin circulating in the bloodstream because they have more fat appear to develop insensitivity to the hormone, and at a certain point, their brains stop responding to it, Tamashiro says.

"There was something about the exercise that improved their leptin sensitivity, even the equivalent in humans of years later," she says.

She says their research suggests that exercise may better enable human brains to respond to leptin and eat less.

Previous research by Tamashiro and her Johns Hopkins team has shown that rats born to mothers fed high-fat diets but get normal levels of dietary fat right after birth avoid obesity and its related disorders as adults. They also found that rat pups 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.

Obese humans are often encouraged to exercise as part of a weight-loss program, but results are often frustration, Tamashiro says.

"Kids these days don't have as much opportunity for physical activity in school and are spending lots of time playing video games and engaging in other sedentary activities after school," she says. "Our research suggests that efforts to increase activity in kids could have positive long-term effects, regardless of whether they continue to exercise into adulthood."

Provided by Johns Hopkins University School of Medicine