Estrogen in the brain prevents obesity and glucose intolerance during menopause in lab animal study

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Researchers at the University of Cincinnati (UC) have found that adding estrogen in the brain may improve health in obese females after menopause.

The study conducted by Christina Estrada, a doctoral candidate in the UC psychology graduate program in the laboratory of Matia Solomon, PhD, an Associate Professor in the UC Department of Psychiatry and Behavioral Neuroscience, used surgically-induced menopause to cause obesity in rats and identified brain areas that benefit from estrogen replacement. The findings will be presented this week at the annual meeting of the Society for the Study of Ingestive Behavior (SSIB), a leading society for research in eating and drinking behavior.

"We know as women age and enter into menopause, they tend to gain body weight and body fat, particularly in the abdominal or 'belly' area. Excess abdominal fat greatly increases risk for cardio-metabolic diseases," says Solomon. "While there are likely many factors that are associated with these risks in menopausal women, estrogen loss is associated with body weight and fat gain during menopause. In fact, estrogen treatment can offset this weight gain in many women."

The medial amygdala (MeA) is a region of the brain that helps regulate body weight and contains an abundance of estrogen receptors (molecules that respond to estrogen). The researchers used an experimental model in rats, which involves removing the ovaries to mimic the hormonal changes of menopause. They targeted estrogen replacement directly in the MeA and found that it prevented weight and abdominal fat gain and improved glucose tolerance, compared to rats in a placebo group. This suggests that the MeA is important in the metabolic health of menopausal females and may be a useful target for treatment.

"Obesity is a national epidemic and women are becoming obese at younger ages. Given the beneficial effects of estrogen on metabolic health, we were interested in determining the consequences of obesity on estrogen-related endpoints in female rats, akin to younger, premenopausal women," says Estrada. A separate group of female rats with intact ovaries were placed on a high-fat diet. Relative to their lean counterparts, obese females had increased blood estrogen levels, irregular reproductive cycles and altered estrogen receptor activity in several brain regions regulating metabolic function.

These findings suggest obesity may dampen the metabolically beneficial effects of estrogen in the body and in the brain in females.

"These findings are particularly important because we know very little about the impact of obesity on brain function in women," Estrada says, adding that the research team believes understanding how the brain and body work together to regulate metabolic health offers a more holistic perspective of how to tackle obesity prevention in women. The research team is focused on understanding how obesity impacts brain health in females and whether these changes are temporary or permanent.

Provided by Society for the Study of Ingestive Behavior