

# Social isolation, stress-induced obesity increases breast cancer risk in mice

4 April 2011

Stress from social isolation, combined with a high-fat diet, increases levels of a brain neurotransmitter - neuropeptide Y, or NPY - in mice that then promotes obesity, insulin resistance, and breast cancer risk, say researchers at Georgetown Lombardi Comprehensive Cancer Center, a part of Georgetown University Medical Center (GUMC).

Major increases in NPY levels are seen when isolation and the high fat [diet](#) are combined. Still, the mice that were isolated for two weeks and fed a control diet had elevated NPY levels and increased terminal end buds, a structure in the mammary gland where mammary cancers form.

The researchers say their findings, reported at the American Association for Cancer Research (AACR) 102nd Annual Meeting 2011, appear to link a number of findings in humans, such as the fact that social isolation is associated with an increased risk of cancer development and mortality, and that obesity is a risk factor for breast cancer."

"We suspect that NPY may play a role in development of human breast cancer, but we have no evidence for such a connection because no human studies have yet been done," says the study's lead investigator, Allison Sumis, a Ph.D. student in the Tumor Biology program.

"We do know that NPY has been shown to increase growth of human breast cancer cells in the laboratory," she says. Sumis works with Leena Hilakivi-Clarke, Ph.D., Co-Director of the Division of Molecular Endocrinology, Nutrition and Obesity at GUMC, who is the study's senior investigator.

To conduct the study, the researchers used female mice that develop breast cancer when given progesterone and a carcinogen. They established four groups of these mice: one group that lived together (not socially isolated) and ate a normal diet; a group that was isolated (each alone in a

cage) and ate normally; an isolated group that ate a high-fat diet, and a group that lived together and ate a high-fat diet.

Ten weeks after treatment and living in these environments (for a total of 17 weeks), 92 percent of the socially-isolated mice fed a high-fat diet had developed tumors, compared to 36 percent of socially-isolated mice fed a normal diet and 36 percent of grouped mice that were also fed normally. But 67 percent of mice who were happy in group homes, but were fed a high fat diet, developed breast cancer.

Sumis adds that the tumors that developed in the high-fat, socially isolated mice appeared earlier and were larger than in the other groups.

"We have yet to translate these findings to humans, but it does suggest that social isolation is a potent stressor and initiates a robust central nervous system response," she says. "Others have found that a majority of women gain weight after a diagnosis of breast cancer, and it seems likely that [stress](#), even if it is not from [social isolation](#), may play a role."

Provided by Georgetown University Medical Center

APA citation: Social isolation, stress-induced obesity increases breast cancer risk in mice (2011, April 4) retrieved 11 October 2022 from <https://medicalxpress.com/news/2011-04-social-isolation-stress-induced-obesity-breast.html>

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