New animal study may explain why alcohol consumption increases breast cancer risk

April 29 2007

For the first time, scientists have used a laboratory mouse model to mimic the development of human alcohol-induced breast cancer.

The results are part of a new study, Chronic Alcohol Consumption Increases Tumor Growth and Amgiogenesis of Breast Cancer in Female Mice, conducted by Brandi Busby, Wei Tan, Jordan Covington, Emily Young, and Jian-Wei Gu, all of the University of Mississippi Medical Center, Department of Physiology and Biophysics, University of Mississippi Medical Center, Jackson, MS. Dr. Gu will present the team's findings in detail during the American Physiological Society annual meeting, which is being held as part of the Experimental Biology meeting.

Alcohol (EtOH) consumption -- even moderate -- is a well-established risk factor for breast cancer in women. A recent study showed that 60 percent of female breast cancers worldwide were attributable to alcohol consumption. Nevertheless, the mechanisms of alcohol-induced breast cancer are poorly understood.

The definitive biological effects and molecular mechanisms of EtOH on progression and malignancy of breast cancer have not been investigated using a mammalian breast cancer model that mimics the human disease. Scientists have suggested that the possible mechanisms involved include the agitation of estrogen metabolism and response; cell mutation by the EtOH metabolite acetaldehyde; oxidative damage; and one-carbon metabolism pathways through reduced folic acid.

To date, there has not been an animal model that faithfully mimics the human disease with respect to characteristics of breast cancer, immunocompetence, and physiologically relevant EtOH intake. The researchers addressed and overcame the obstacles and developed a novel mouse breast cancer model. The model mimics human breast cancer disease in which the estrogen receptor-positive breast adenocarcinoma cells were subcutaneously injected near the pad of the fourth mammary gland of female immunocompetant mice (C57BL/6). The six-week-old female mice were fed with moderate EtOH (one percent in drinking water) for four weeks, the equivalent of two drinks per day in humans. The control mice received regular drinking water only.

In the second week of the experiment, mouse breast cancer cells (5x105 E0771) were injected at cite referenced above. At the end of the experiment, the tumors were isolated to measure tumor size, examine intratumoral microvessel (IM) density via CD 31 immunohistochemistry staining, and assessing VEGF protein levels via ELISA. These steps were taken to determine the effects of EtOH intake in physiologically relevant doses on tumor growth and angiogenesis in mouse breast cancer.

The researchers found:

-- that moderate alcohol consumption significantly increased the tumor size of breast cancer in mice, which was a 1.96-fold increase in tumor weight vs. control mice;

-- that alcohol intake caused a 1.28-fold increase in tumor microvessel density vs. the control group;

-- a significant increase in tissue protein levels of VEGF were found in the tumors of the mice treated with EtOH vs. control group;

-- EtOH intake did not cause significant changes in the body weight of

the mice.

This study presents the first animal model to confirm that alcohol consumption stimulates tumor growth and malignancy of breast cancer, and reveals some of the mechanisms of alcohol-induced breast cancer. The findings demonstrate that even moderate alcohol consumption significantly stimulates tumor growth of breast cancer and that induction of tumor angiogenesis and VEGF expressions are mechanisms which are associated with the progression of this deadly disease.

Source: American Physiological Society