Genetics in Alcohol Associated Breast Cancer

Researchers in Heidelberg, Germany have found that women drinkers who carry a particular form of a gene involved in the breakdown of alcohol have an increased risk of breast cancer.

Women in this genetic sub-group are more likely to develop the disease compared to those lacking this version of the gene. In addition, for women in the sub-group the consumption of even a small quantity of alcohol raises the blood concentration of oestradiol, the major female sex hormone. Elevated levels of oestradiol are known to be associated with an increased risk of breast cancer.

The research focused on a particular version of the gene that produces the enzyme, alcohol dehydrogenase (ADH), which initiates the breakdown of alcohol in the body. It is thought that the actual carcinogen responsible for some cases of breast cancer is not alcohol itself but acetaldehyde, to which it is converted by ADH. Its is possible that a mutant version of the ADH gene might make an unusually active enzyme, which could produce acetaldehyde too quickly for it to be disposed of by the next enzyme in the chain. As a consequence, the carcinogen could accumulate to abnormal levels, triggering the emergence of cancerous cells.

The investigators compared the ADH gene in 117 moderate drinkers with breast cancer and in 111 age-matched women with alcohol-related diseases (such as cirrhosis of the liver and pancreatitis) but not cancer. Moderate drinking was defined as an alcohol intake of 20 grams (2.5 UK units) or less per day. The results showed a significantly higher frequency of the abnormal gene in moderate alcohol consumers than in the women without cancer. The data indicated that women carrying the mutant gene were 1.8 times more likely to develop breast cancer than those with another version of the same gene.

The second part of the study was an investigation into the effect of drinking on the concentration of oestradiol in the bloodstream. Eight pre-menopausal women consumed a small quantity of alcohol at various points in their cycle. The subjects' oestradiol levels were then measured over the following two hours, and compared with those in women not ingesting alcohol. The outcome was a 27–38% higher level of the hormone among the drinkers. Because of the known link between raised oestradiol concentrations and the risk of breast cancer, this evidence augmented the message emerging from the first phase of the study.

The investigators conclude that even moderate drinkers who carry a gene producing the abnormally active version of the ADH gene face a heightened danger of alcohol-associated breast cancer. They suggest two possible reasons why chronic alcohol abusers do not appear to have an increased risk of the disease. Such women may die, as a result of other conditions stemming from their addiction, before they are able to develop breast cancer. Alternatively (or in addition) a decrease in the number of ovulatory cycles, linked with ovarian failure, infertility and early menopause, could mean that they are less exposed to oestradiol.

Risk Factors in Alcohol Associated Breast Cancer: Alcohol Dehydrogenase Polymorphism and Estrogens, International Journal of Oncology (2004), 25, 1127–1132, Coutelle Cet al.

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