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Scientists call for safety testing of chemicals to include prenatal exposures

Breastfeeding, risk of breast cancer, male breast development may be affected by very small exposures

(RESEARCH TRIANGLE PARK, NC) A review published online June 22 ahead of print in the peer-reviewed journal *Environmental Health Perspectives (EHP)* reports the conclusions of an international workshop on ways to improve chemicals safety testing for effects on the breast. The studies reviewed by workshop scientists indicate that chemical exposures during critical periods of development may influence breast growth, ability to breastfeed, and cancer risk. The scientists recommend that future chemical testing evaluate effects on the breast after prenatal and early-life exposure.

The recommendations are based on studies of rodent mammary gland development following prenatal or early-life exposure to certain pesticides (including atrazine and methoxychlor), industrial by-products known as dioxins, polybrominated diphenyl ether (PBDE) flame retardants, and some chemicals used in consumer products, including bisphenol A (BPA), perfluorooctanoic acid (PFOA), dibutylphthalate, and nonylphenol. Effects also have been observed with exposure to hormones, such as estrogen, and plant estrogens such as genistein, which is found in soybeans. Most chemicals in use have not been evaluated for these effects, highlighting the need for improved chemicals testing.

As a step in implementing the workshop recommendations, the National Toxicology Program (NTP), a division of the National Institute of Environmental Health Sciences (NIEHS), National Institutes of Health, recently moved toward including assessments of male and female mammary gland development in studies of chemical effects on cancer and reproduction.

The Mammary Gland Evaluation and Risk Assessment Workshop met in Oakland, California, in November 2009. Participants included over 60 international experts, including biologists, epidemiologists, toxicologists, physicians, public health officials, and breast cancer activists. Workshop leaders reviewed the scientific literature and interviewed 18 toxicologists and risk assessors to learn how they interpret data from rodent mammary gland studies.

“Up to now, testing methods have overlooked effects of chemicals on breast development even though we are learning the breast is very sensitive. Changes in breast development could have significant

public health impact because of the long-term implications for breastfeeding and breast cancer,” said Ruthann Rudel, Director of Research at Silent Spring Institute and the lead author of the article.

Workshop participants agreed that, for some chemicals, the breast is more sensitive than other tissues to low-dose exposures. In addition, there is evidence the male breast is even more sensitive to some chemicals. According to the American Cancer Society, there were an estimated 1,970 new diagnoses of invasive breast cancer and 390 breast cancer deaths among U.S. men in 2010. However, breast cancer is about 100 times less common in men than in women.

Workshop participants agreed that rats and mice are useful surrogates for human breast development, because the stages of mammary gland development are similar. Animal studies are crucial for studying the effects of chemicals on breast development, given that development of breast tissue cannot be studied directly in girls. Also, a definitive study of breast cancer development from birth to late adulthood in humans would be not be feasible because of the length of followup time required and the inability to control exposures in an observational setting.

The article “Environmental Exposures and Mammary Gland Development: State of the Science, Public Health Implications, and Research Recommendations” will be available June 22 free of charge at <http://ehponline.org/article/info:doi/10.1289/ehp.1002864>. The workshop was supported by the California Breast Cancer Research Program, U.S. Environmental Protection Agency, NIEHS, NTP, and the Susan S. Bailis Breast Cancer Research Fund at Silent Spring Institute.

Two related articles and an editorial by some of the same authors will appear with the review article in the August 2011 issue of *EHP*. These articles are available at:

- <http://ehponline.org/article/info:doi/10.1289/ehp.1002741>
“Gestational and Chronic Low-Dose PFOA Exposures and Mammary Gland Growth and Differentiation in Three Generations of CD-1 Mice”
- <http://ehponline.org/article/info:doi/10.1289/ehp.1002676>
“Current Assessment of the Effects of Environmental Chemicals on the Mammary Gland in Guideline EPA, OECD, and NTP Rodent Studies”
- <http://ehponline.org/article/info:doi/10.1289/ehp.1104077>
“Testing Chemicals for Effects on Breast Development, Lactation, and Cancer”

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