

Breast Cancer and the Environment: Science News from Silent Spring Institute October 2004

Chemicals and Cancer

The statistics on worldwide increases in breast cancer risk are grim. In the US, a woman's lifetime risk of breast cancer moved up this year to 1 in 7 from 1 in 8. And the risk is 1 in 6 when *in situ* diagnoses are taken into account. Rapidly increasing risk in the developing world, where mammography is still rare, tells us we are seeing more disease, not just more diagnosis. The increase cannot be due to inherited genes either, because inherited genes can't change over just a couple of generations. Studies that show increased risk for women who move from low-incidence regions to high-incidence countries, like the US, point to something about the way we live in industrial societies. Thus far, scientists have been able to explain less than half of breast cancer risk with all the identified risk factors. That means that additional, unknown causes must be at work. If we can find out why incidence is increasing, we can learn to prevent future disease.

Where should we look for clues to prevention? Synthetic chemicals that poured into the marketplace after World War II are one promising direction, because laboratory studies point to three mechanisms that could link various chemicals to breast cancer:

- Chemical carcinogens can damage DNA
- Tumor promoters can make cells grow
- Developmental toxicants can leave the mammary gland more vulnerable to carcinogens.

The US National Toxicology Program has identified 42 chemicals as breast carcinogens in laboratory animals, and about 100 have been identified internationally. Many are common. For example, we are exposed to carcinogenic polycyclic aromatic hydrocarbons (PAHs) in grilled and smoked food, tobacco smoke, and air pollution from auto exhaust, power plants, and other fossil fuel-burning processes. Until recently, ethylene oxide was commonly used in hospitals and medical facilities to sterilize instruments, though the Occupational Safety and Health Administration set limits to reduce exposures. Other mammary carcinogens are found in certain furniture finishes, dyes, and solvents, for example.

Once a cancer begins, other chemicals, called tumor promoters, may stimulate growth. We have known for years that natural estrogens and pharmaceutical estrogens (e.g., in hormone replacement therapy) affect breast cancer risk. We now know that synthetic chemicals can also make human breast cancer cells proliferate in laboratory studies. Drs. Ana Soto and Carlos Sonnenschein at Tufts University pioneered the study of estrogen mimics in breast cancer cells after they found a chemical that was accidentally leaching from plastic tubing in their experiments was causing cell growth. Estrogen mimics are part of a larger group of chemicals known as endocrine disrupting compounds (EDCs) because they affect hormones. EDCs are in some plastics, pesticides, detergents, and cosmetics, among other sources.

Most recently, scientists at the US Environmental Protection Agency discovered a third way that chemicals may increase breast cancer risk. When they dosed laboratory animals with the pesticide atrazine during certain weeks of pregnancy, the offspring never developed fully mature mammary glands, leaving the daughters more vulnerable throughout life to carcinogenesis.

Making the link from strong laboratory evidence to epidemiologic studies in women remains a challenge, because it's so hard to measure exposure to a complex mixture of pollutants over a lifetime. But the laboratory studies can help us target precautionary public health policies to reduce exposure, and they point us to urgent areas for breast cancer studies.

For more scientific detail and a list of mammary carcinogens and EDCs, please visit this article from *Environmental Health Perspectives* on the Silent Spring Institute web site:

http://library.silentspring.org/publications/pdfs/brody_rudel_EHP03.pdf

In the next edition: How Are We Exposed To EDCs At Home? Results of the Silent Spring Institute Household Exposure Study.

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Activist Voices: What can I do?

“I never thought about buying a car as anything to do with breast cancer. Knowing that the auto exhaust contains mammary carcinogens puts fuel efficiency in a whole new light. ”