

"Breast Cancer Prevention: Avoiding Toxic Triggers"

The word "prevention" is not heard often enough in discussions about breast cancer. But given the continuing rise in the incidence of breast cancer rates, it is not surprising that women want to know more about what causes this devastating disease, and to learn what they can do to protect themselves and their families.

While scientists do not yet fully understand the complex interactions which can initiate the development of breast cancer, many of those involved in basic cancer research believe that the environment - from pesticides and plastics to radiation - plays a significant role. Despite limited funding, scientists have produced compelling evidence that women can reduce their risk of developing breast cancer by limiting or avoiding certain environmental exposures.

The information presented here has been taken from published, peer-reviewed studies and discussions with leading scientists around the world who are working to discover the links between cancer and our environment.

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The Environmental Trigger

Over the past ten years, cancer researchers have concluded that only 5 - 10% of breast cancer cases are related to inherited genetic factors, and a consensus is now beginning to coalesce around a new theory regarding breast and other cancers. According to this theory, it is a combination of genetic susceptibility and exposure to environmental triggers at critical periods of development which can initiate cell mutation and subsequent cancer development. As Judith Stern, Professor of Internal Medicine and Nutrition at the University of California at Davis, recently told USA Today, "Genetics loads the gun, but the environment pulls the trigger."

In other words, a woman can inherit a genetic predisposition but never actually develop the disease unless she is exposed to the right environmental trigger; other women without the genetic susceptibility may not develop the disease even when exposed.

This may help explain why so many studies of environmental links to breast cancer in the past have been inconclusive (including the recent study of DDT levels in the blood of Long Island women with breast cancer).

"..the current scientific thinking [is] that genetic susceptibility and exposure to environmental toxicants interact in the individual to produce disease. Current gaps in our knowledge keep us from preventing the loaded gun from going off again and again."

Kenneth Olden, Director
National Institute of Environmental Health ¹

To further complicate matters, the timing of an environmental exposure can be critical. A woman can have both a genetic susceptibility and exposure to an environmental trigger, yet still not develop the disease unless the exposure happens at what scientists call a "critical window." Exposures in utero, in childhood or during puberty seem to increase the risk of developing disease later in life.

"Breast cancer is likely caused by the interaction of exposure to environmental carcinogens at an early age, resulting in initiation of neoplastic transformation and growth factors that determine the likelihood of progression to clinical disease. The environmental carcinogens are numerous (each contributing relatively little to overall risk) and probably interact with genetic 'host susceptibility'".

L. H. Kuller; "The etiology of breast cancer--from epidemiology to prevention." ²

"Time of life when exposures take place is important, and this claim is strongly supported by data on cigarette smoking and radiation. Also, basic research has demonstrated that mammary tissue is more susceptible to carcinogenesis at certain periods of breast development."

Wolff MS, Collman GW, Barrett JC, and Huff J; "Breast cancer and environmental risk factors: epidemiological and experimental findings" ³

The Role of Estrogen

Exposure to estrogen underlies many of the known risk factors for breast cancer. While it is widely accepted that early onset of menstruation and late menopause can increase a woman's risk of developing breast cancer, studies have shown that estrogen exposures from environmental sources may also play a significant role.

Estrogen-mimicking chemicals (xenoestrogens) can be found in a wide variety of products, from lawn pesticides to certain types of plastic. Although these chemicals are less potent individually than the body's own estrogen, they can nevertheless have a significant impact when combined or when they interact with the body's own estrogen. Prescription hormones in the form of hormone replacement therapy and birth control pills have both been shown to increase a woman's risk of breast cancer.

A group of prominent scientists from Cornell Medical Center, the American Cancer Society, Beth Israel Medical Center and the International Agency for Research on Cancer suggested recently that although the science is not yet conclusive, the public should begin to reduce its exposure:

"Cumulative exposure to estradiol and other hormones links many of the established risk factors for breast cancer.Some hormonally active compounds, such as those in soy and broccoli and other phytoestrogen-containing foods, can be protective against breast cancer, while others, such as some environmental contaminants, appear to increase the risk of the disease by increasing levels of harmful hormones. Prudent precautionary principles suggest that reducing exposure to avoidable or modifiable risk factors should receive high priority from the public and private sectors."

Devra Lee Davis, Deborah Axelrod, Lisa Bailey, Mitchell Gaynor, and Annie J. Sasco; "Rethinking Breast Cancer Risk and the Environment: The Case for the Precautionary Principle" ⁴

Scientists believe that synthetic estrogen has the potential to disrupt the human endocrine system, often resulting in abnormal sexual development. If the exposure comes at a critical time, the effects can be significant, although they may not be immediately observable.

"In 1949, the insecticide DDT was the first intentionally released chemical found to be estrogenic when a number of aviation crop dusters handling DDT were found to have low sperm counts. Decades later, workers at a plant producing the insecticide kepone were found to have lost their libido, became impotent and had low sperm counts. These cases of occupational exposure to pesticides provided evidence that these chemicals may be estrogenic. Subsequent experiments on laboratory animals unambiguously confirmed their estrogenic activity."

Drs. Ana Soto and Carlos Sonnenschein "An Updated Review of Environmental Estrogen and Androgen Mimics and Antagonists" ⁵

Chemicals used in certain types of plastic can mimic estrogen in humans. One compound known as "bisphenol A" ("BPA") is used in the lining of tin cans, in dental sealants and in polycarbonate plastic bottles. Although tests conducted by the manufacturer concluded that certain low levels of BPA did not pose a risk to human health, researchers have found that perinatal exposure to BPA may have adverse effects on development.

"The nonsteroidal estrogenic compound bisphenol A (BPA) is a monomer used in the manufacture of polycarbonate plastics and resins. BPA may be ingested by humans as it reportedly leaches from the lining of tin cans into foods, from dental sealants into saliva, and from polycarbonate bottles into their contents. Because BPA is weakly estrogenic--approximately 10,000-fold less potent than 17 β -estradiol--current environmental exposure levels have been considered orders of magnitude below the dose required for adverse effects on health. Herein we demonstrate measurable effects on the offspring of Sprague-Dawley female rats that were exposed, via their drinking water....these data indicate an increased sensitivity to BPA during the perinatal period and suggest the need for careful evaluation of the current levels of exposure to this compound."

Beverly S. Rubin, Mary K. Murray, David A. Damassa, Joan C. King, and Ana M. Soto ; "Perinatal Exposure to Low Doses of Bisphenol A Affects Body Weight, Patterns of Estrous Cyclicity, and Plasma LH Levels" ⁶

Chemical Cocktails

Everyone knows that combining chemicals in new ways can produce exciting new products and medicines. Some of these are life savers, while others appear to jeopardize life itself.

Chemical manufacturers test their new creations in laboratories to develop data supporting their applications for governmental approval. But the interactions between these new chemicals and the thousands of others which already exist in our environment are neither measured nor considered. How will these new chemicals interact with others, and how will those interactions affect human health? No one knows.

Each year, manufacturers release hundreds of new chemicals into the environment and scientists are just beginning to look at how those chemicals interact with each other.

One group recently reported that a combination of estrogenic chemicals, each of which had previously shown “no effect” at the tested dosage, nevertheless exhibited stronger effects when combined because, according to the researchers, “the combined effect of all four compounds can be termed additive.”

"Human populations.... are exposed to mixtures of estrogenic and estrogen-like agents and it is necessary to consider the impact of these combined effects.....Regression analysis demonstrated that there were combination effects even when each mixture component was present at levels at or below its individual no-observed-effects concentration."

Joachim Payne, Martin Scholz and Andreas Kortenkamp;
"Mixtures of Four Organochlorines Enhance Human Breast Cell Proliferation" ⁷

Other scientists reported similar findings:

"The E-screen test also revealed that estrogenic chemicals may act cumulatively; when mixed together they induce estrogenic responses at concentrations lower than those required when each compound is administered alone. "

Ana M. Soto, Kerrie L. Chung, and Carlos Sonnenschein; "The Pesticides Endosulfan, Toxaphene, and Dieldrin Have Estrogenic Effects on Human Estrogen-Sensitive Cells" ⁸

Another group of scientists explored how some common “pyrethroid” pesticides are made more effective (or lethal) by combining them with a “synergist.” In some cases the active ingredient became ten times more lethal when it was combined with another chemical:

"Since the technical (chemically pure) grade of a pyrethroid is usually formulated (mixed with carriers, solvents, etc.) for use in commercial pest control, the toxicity of these other ingredients must be taken into consideration when assessing the toxicity of a formulated product. For example, fenvalerate is much less toxic to mice than the formulated product, Pydrin. A ten-fold difference in toxicity between formulations with the same active ingredient, but with different carriers, can be seen in some cases."

Doria Mueller-Beilschmidt, "Toxicology and Environmental Fate of Synthetic Pyrethroids." ⁹

The active chemical ingredients in some types of pesticides commonly used for mosquito control have been shown to have estrogenic potential and have demonstrated an ability to increase the growth rate of existing breast tumor tissue.

"Pyrethroids are commonly used insecticides worldwide, but little has been done to characterize their hormone agonist/antagonist potential. We tested four frequently encountered pyrethroids, fenvalerate, sumithrin, d-trans allethrin, and permethrin, for estrogen and progesterone agonist/antagonist activities using the Ishikawa Var-I human endometrial cancer cell line and the T47D human breast cancer cell line.....Fenvalerate and sumithrin demonstrated significant estrogenicityThrough these hormonal pathways, exposure to certain pyrethroids may contribute to reproductive dysfunction, developmental impairment, and cancer."

Joan Garey and Mary S. Wolff, Department of Community and Preventive Medicine, Mount Sinai School of Medicine, "Estrogenic and Antiprogestagenic Activities of Pyrethroid Insecticides" ¹⁰

Radiation

Unlike other environmental risk factors, there is no dispute among scientists that radiation can cause cancer. Even a single x-ray is capable of causing irreparable damage to genetic material inside cells. Despite recent advances in technology that lower the amount of radiation received in a single x-ray or other radiological diagnostic procedure, it is the long-term, cumulative effect of these exposures, especially at critical windows of development, that appears to increase the risk of breast cancer.

Scientists from the National Cancer Institute and other institutions recently conducted a study which found that the 5,466 women in the study who had been exposed to multiple diagnostic x-rays during childhood and adolescence had a 70 percent higher risk of developing breast cancer than women in the general population..

“These findings provide yet another indication that radiation exposure, especially in childhood, is associated with increased breast cancer risk later in life, and that the amount of risk is proportional to radiation dose.”

Michele Doody, M.S. National Cancer Institute Radiation Epidemiology Branch ¹¹

The Precautionary Principle

In 1998, an international group of physicians and research scientists met to discuss the alarming evidence that endocrine-disrupting chemicals were wreaking havoc on the human and animal populations of the earth. The result of the “Wingspread Conference” was a new paradigm for scientific endeavor.

In what became known as the "Precautionary Principle" the conference attendees wrote:

"If an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationship are not fully established scientifically...."¹²

In other words, if we have reason to think that a substance acts as an environmental trigger endangering the health of people or animals, we should not wait for science to complete its exhaustive study before we act to protect ourselves and our environment.

The cost of eliminating toxic chemicals and replacing them with safe alternatives would be substantial, but compared to the cost of an increasing cancer epidemic, both in terms of financial loss and personal tragedy, it is small.

Taking Steps for Prevention

In the meantime, there are some very specific things women can do to reduce their risk, and the risk to their children:

- Avoid using pesticides on lawns and gardens or in the home.
- Use non-toxic cleaning products.
- Store food in glass or lead-free ceramic containers.
- Never microwave food in plastic containers or wrap.
- Avoid consumption of dairy, poultry and meat products containing hormones or other growth stimulants.
- Eat organic fruits and vegetables (grown without pesticides).
- Avoid all non-essential medical and dental x-rays.
- Avoid prolonged use of oral contraceptives and estrogen replacement therapy.

Conclusion

"As we enter the next millennium, we face exciting new possibilities in broadening our understanding of how the environment impacts women's health. Sophisticated new technology and scientific information are now available to help us more precisely define environmental contributions to disease. Moreover, further development of our information base in environmental health sciences will usher in a new era of informed preventive care for women of all ages. The hallmark of this new era will be our ability to finally address the etiology and prevention of disease, rather than simply focusing on treatment and management of human illness."

Kenneth Olden, Director of the National Institute of Environmental Health Sciences and Retha Newbold, Laboratory of Toxicology, Environmental Toxicology Program, NIEHS; "Women's Health and the Environment in the 21st Century" ¹³

Where do we go from here? How do we bring about change in a way which is consistent with the principles of our society and fair to all of those involved?

- Get involved. Call, write or e-mail your elected officials and demand protection from carcinogenic and endocrine-disrupting chemicals.
- Be informed. Visit the library or search the internet. Read the scientific studies and decide for yourself.
- Be wary of organizations, campaigns or scientific studies funded by corporate interests. Ask questions and consider that hundreds of millions of dollars are at stake.
- Vote. Special interests can buy influence but they can't buy your vote. Be sure your representatives know that.
- Any step you take to reduce your risk is a step in the right direction.

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In 1998, a group of the nation's most highly respected physicians and cancer researchers authored an article focusing on the unique vulnerability of children to environmental triggers. They called for:

"...a campaign to educate the public, health professionals, and policy makers that environmental disease is caused by preventable exposures and is therefore avoidable."

Philip J. Landrigan, Joy E. Carlson, Cynthia F. Bearer, Joan Spyker Cranmer, Robert D. Bullard, Ruth A. Etzel, John Groopman, John A. McLachlan, Frederica P. Perera, J. Routt Reigart, Leslie Robison, Lawrence Schell, and William A. Suk; "Children's Health and the Environment: A New Agenda for Prevention Research" ¹⁴

Grassroots is proud to be a part of this campaign.

Suggested Reading

Living Downstream, An Ecologist Looks At Cancer and the Environment by Sandra Steingraber PhD. Addison-Wesley Publishing Company, Inc. Menlo Park, CA 1997.

Our Stolen Future by Theo Colborn, Dianne Dumanoski & John Peterson Myers; A Dutton Book, 357 Hudson Street, New York, NY 10014, 1996.

Toxic Deception by Dan Fagin, Marianne Lavelle, & the Center for Public Integrity. A Birch Lane Press Book, Carol Publishing Group, 120 Enterprise Ave., Secaucus, NJ, 07094, 1996.

Designer Poisons, How To Protect Your Health and Home From Toxic Pesticides by Marion Moses, M.D. Pesticide Education Center, P.O. Box 420870, San Francisco, CA 94142, 1995.

Breast Cancer, Poisons, Profits and Prevention by Liane Clorfene-Casten. Common Courage Press, P.O. Box 702, Monroe, ME 04951, 1996.

The Breast Cancer Prevention Program by Samuel Epstein, M.D. and David Steinman. Macmillan, A Simon & Schuster Macmillan Company, 1633 Broadway, New York, NY 10019, 1997.

Life's Delicate Balance, Causes and Prevention of Breast Cancer by Janette D. Sherman, M.D. Taylor & Francis, 29 West 35th Street, New York, NY 10001., 2000.

Silent Spring by Rachel Carson. Houghton Mifflin Company, 215 Park Avenue South, New York, NY 10003, 1962.

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- ² Public Health Reviews. 23(2):157-213, 1995
- ³ Annual Rev Pharmacol Toxicol, 36:573-596, 1996
- ⁴ Environmental Health Perspectives Volume 106, Number 9, September 1998
- ⁵ Journal of Steroid Biochemistry & Molecular Biology 1998 Apr; 65 (1-6):143-50
- ⁶ Environmental Health Perspectives Volume 109, Number 7, July 2001
- ⁷ Environmental Health Perspectives Volume 109, Number 4, April 2001
- ⁸ Environmental Health Perspectives, Volume 102, Number 4, April 1994
- ⁹ Journal of Pesticide Reform, Volume 10, Number 3, Fall 1990.
- ¹⁰ Biochemical and Biophysical Research Communications 251, 855-859
- ¹¹ "Breast Cancer Mortality After Diagnostic Radiography: Findings from the U.S. Scoliosis Cohort Study." Michele Morin Doody, John E. Lonstein, Marilyn Stovall, David G. Hacker, Nickolas Luckyanov, and Charles E. Land.Spine, Aug. 15, 2000, Vol. 25, No. 16.
- ¹² The Wingspread Conference on the Precautionary Principle was convened by the Science and Environmental Health Network, an organization that links science with the public interest, and by the Johnson Foundation, the W. Alton Jones Foundation, the C.S. Fund and the Lowell Center for Sustainable Production at the University of Massachusetts-Lowell.
- ¹³ Environmental Health Perspectives Volume 108, Supplement 5, October 2000
- ¹⁴ Environmental Health Perspectives 106, Supplement 3, June 1998