

The Environment and Breast Cancer

HIGH RISK BREAST PROGRAM OF VERMONT

Summer 2010

Human health is affected by a person's genetics and their environment. Individual characteristics such as diet, life-style, and psychosocial well-being, as well as elements in our environment including ionizing radiation, air and water pollution, lead and other toxins are now well-recognized as critical factors influencing health and disease. An emerging public health concern is the environmental influence of the large number of naturally occurring or man-made chemicals that may interfere with normal physiology and hormone balance. These toxins, which are similar to or mimic naturally occurring hormones in the body are termed endocrine disrupting chemicals or EDCs. These chemicals interfere with growth and development, metabolism, reproduction among other normal processes.



Some naturally occurring chemicals that may disrupt normal endocrine or hormone function include phytoestrogens found in soybeans, coffee, and other plants. Other man-made chemicals of concern are found in household goods, cosmetics, medicines, synthetic hormones, food additives, pesticides and industrial products such as plastics. For example, breakdown byproducts of detergents, cosmetics, plastics, flame-retardants include dioxins, phthalates, PCBs, and bisphenol A (BPA). Many of these compounds reach streams through runoff, industrial effluent, atmospheric deposition, and municipal sewage treatment effluent as well as direct human exposure.

Evidence is emerging that EDCs as well as other environmental factors may have profound effects on birth outcomes, development, as well as predisposition to disease later in life. Exposure to EDCs have been associated with changes in mammary gland and reproductive organ development in both males and females, inappropriate neural (brain) development, inappropriate pubertal development, and increased sensitivity to carcinogens as adults. Exposure during puberty is associated with altered metabolism and with altered sensitivity to carcinogens and EDCs.

Research studies have now revealed that these factors may play a significant role in the development of certain cancers including prostate, thyroid and breast cancer. The impacts of exposure to environmental toxins on cancer development are complicated. The effects are dose related but in some cases with unexpected and profound changes at very low doses. The response to environmental toxins may also be age-related with exposure during pregnancy resulting in different outcomes than exposure during puberty or during menopause. Numerous studies are now focused on understanding the potential roles of these environmental factors on the development of cancer including breast cancer.

Breast cancer is the most common invasive cancer in women worldwide. In the US the incidence of breast cancer rose by more than 40% between 1973 and 1998 and the incidence is rising rapidly in developing nations.

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Bisphenol A

Bisphenol A or BPA is a synthetic estrogen ubiquitous in the environment. BPA is produced at ~1.7 billion kg per year worldwide and used in the production of polycarbonate plastics and epoxy resins used in dental sealants, plastic bottles, food packaging, linings of food cans and water storage tanks. Other common items containing BPA include CDs, plastic coatings on paper as well as other plastic containers. Human exposure occurs when BPA leaches from these common items.

BPA accounts for most of the estrogen-like activity that leeches from land-fills into the ecosystem today and exposure to BPA is widespread among humans and wildlife. Although BPA can be absorbed through the skin, most of the exposure is through ingestion. It has been estimated that ingestion could yield as much as 6.6 ug per person per day from epoxy-lined food cans alone.

BPA has been detected in human blood and urine in a number of industrialized countries around the world. The Center for Disease Control and Prevention has reported that more than 90% of Americans randomly tested have detectable levels of BPA. BPA detection in amniotic fluids and umbilical cord blood indicate significant early prenatal exposure as well.

Research on the potential health effects of BPA has focused on the ability of this chemical to mimic or block the actions of

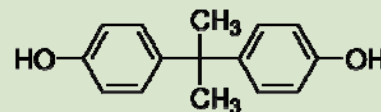


natural estrogen. Animal studies have shown that exposure to BPA during pregnancy results in an increased susceptibility to breast and prostate cancer as adults. In human mammary cell culture studies BPA, at dose levels similar to exposure in the general population, causes an increase in cell growth and a decrease in effectiveness of chemotherapeutic drugs as well as a decreased response to therapeutic radiation. It is as yet unclear what the overall impact of a long-term (years) exposure to low-levels of BPA and other similar chemicals or mixtures is on developmental programming and/or cancer risk. There is extensive ongoing epidemiological, clinical, and basic research expanding upon these observations to determine the risk as well as the mechanisms by which this synthetic estrogen-like compound, BPA, may cause effects.

Vermont ACT 112

In light of the widespread exposure to BPA and mounting evidence of adverse health effects related to BPA, on May 19, 2010 Governor Douglas signed into law Act 112, which imposes restrictions on BPA in Vermont by phasing out the use of BPA in the following products:

- Reusable food and beverage containers, including baby bottles, sports bottles, thermoses, Tupperware, and other reusable food and beverage containers. This provision of the law goes into effect on July 1, 2012.
- Infant formula or baby food stored in a plastic container or jar. This provision of the law goes into effect on July 1, 2012.
- Infant formula or baby food stored in a can. This provision of the law goes into effect on July 1, 2014.



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Evidence suggests that non-genetic factors such as environmental exposures may account for a large proportion of this disease. Low levels of many environmental chemicals can interact to have larger than expected effects on breast cancer risk. It is becoming clear that there are times in life, from prenatal periods through late adolescence, when breast tissue may be more vulnerable to environmental carcinogens.

Understanding how environmental exposures might interact to alter breast cancer development and understanding who might be most susceptible to the carcinogenic effects of these chemicals are ongoing areas of research. Clearly more work is needed to understand which environmental agents or combinations of agents are associated with risk and how that risk can be prevented.

Reduce Exposure to BPA

To reduce your exposure to BPA and the potential adverse health effects, safer alternatives to consider include:

- Use glass and stainless steel bottles and containers (e.g., glass baby bottles and stainless steel water bottles) instead of plastic whenever possible.
- Avoid plastics with recycling code #7 whenever possible. In general, plastics labeled with this code contain BPA. Plastics with recycling codes 1, 2 and 5 are thought to be safer alternatives.
- Avoid canned food; BPA is often found in the lining of canned foods.



Breast Cancer, The Environment & You: Genetics, Toxins, Nutrition & Exposure

The theme of this year's Annual Breast Cancer Conference focuses on the link between breast cancer and the environment. The conference will include over 50 educational sessions and interactive workshops conducted by the regions leading breast cancer experts and health care professionals. Specific talks relating to breast cancer and the environment include:

- **Cancer and the Environment— What is the Connection?**
Patricia O'Brien, M.D.
- **Gene-Environment Interactions and the Development of Cancer**
Barry Finette, M.D., Ph.D.
- **Bench to Bedside Translational Research**
Frances Carr, Ph.D.

The Annual Breast Cancer Conference is presented by the Vermont Cancer Center at UVM/Fletcher Allen and will be held at the Sheraton Hotel and Conference Center in South Burlington on **Friday, October 15th**. This is a free community event open to the public and targeted for survivors, caregivers, and those whose lives have been touched by breast cancer. For more information about the Annual Breast Cancer Conference visit <http://vtbreastcancerconference.org> or call 802-656-2292.

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Creamy Garlic Pasta with Shrimp & Vegetables*From June 2010 issue of Eating Well.***Ingredients:**

- 6 ounces whole-wheat spaghetti
- 12 ounces peeled and deveined raw shrimp, cut into 1-inch pieces
- 1 bunch asparagus, trimmed and thinly sliced
- 1 large red bell pepper, thinly sliced
- 1 cup fresh or frozen peas
- 3 cloves garlic, chopped
- 1 1/4 teaspoons kosher salt
- 1 1/2 cups nonfat or low-fat plain yogurt
- 1/4 cup chopped flat-leaf parsley
- 3 tablespoons lemon juice
- 1 tablespoon extra-virgin olive oil
- 1/2 teaspoon freshly ground pepper
- 1/4 cup toasted pine nuts (optional)

Preparation

- Bring a large pot of water to a boil. Add spaghetti and cook 2 minutes less than package directions. Add shrimp, asparagus, bell pepper and peas and cook until the pasta is tender and the shrimp are cooked, 2 to 4 minutes more. Drain well.



- Mash garlic and salt in a large bowl until a paste forms. Whisk in yogurt, parsley, lemon juice, oil and pepper. Add the pasta mixture and toss to coat. Serve sprinkled with pine nuts (if using).

Nutrition

Per serving: 385 calories; 6 g fat (1 g sat, 3 g mono); 168 mg cholesterol; 53 g carbohydrates; 0 g added sugars; 34 g protein; 10 g fiber; 658 mg sodium; 887 mg potassium.