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Program on
Breast Cancer and Environmental Risk Factors

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Breast Cancer - The Estrogen Connection: Plastics

Certain types of plastics can leach estrogen mimicking chemicals into beverage bottles and food containers. Scientists are concerned that even at low levels, these environmental estrogens may work together with the body's own estrogen to increase the risk of breast cancer. **Watch the video**, see [What you can do](#), and read on to [Learn More About Plastic](#).

Media

[Press Release Article](#)

New! [Plastics and Avoiding Bisphenol A Handout](#)

New! [Alternatives and Recycling Handout](#)



[Breast Cancer - The Estrogen Connection: **Cosmetics and More**](#)
Learn about ingredients in cosmetics that are estrogen mimics.
Duration: 03:11



[Breast Cancer - The Estrogen Connection: **Plastics**](#)
Learn about estrogenic chemicals that can leach from plastics.
Duration: 03:08
[Playing Now.](#)



[Breast Cancer - The Estrogen Connection: **In the Dump and Down the Drain**](#)
Learn about preventing estrogenic chemicals from getting into the environment.
Duration: 04:06

What you can do:

Learn the names of environmental estrogens

- [Bisphenol A \(BPA\)](#) is an environmental estrogen found in polycarbonate plastics (recycle symbol 7). It is also used in the epoxy lining of metal cans (food cans).

Minimize leaching from polycarbonate sports or baby bottles

- Wear and tear, harsh detergents, or heat can cause bisphenol A to leach out.

- Hand wash bottles in mild detergent.
- Don't leave bottles where they can heat up (hot car, hot sand, etc.).
- Don't use bottles that are worn or scratched; recycle or reuse.
- Microwave food or beverages in glass or lead-free ceramic containers.

Make alternative choices

- Consider using food-grade stainless steel water bottles or glass baby bottles.
- Minimize use of canned foods; eat more fresh produce or dried products instead.

Learn More About Plastics - Bisphenol A (BPA)

By Suzanne M. Snedeker, PhD

Bisphenol A is an industrial chemical produced in high quantities worldwide. It is primarily used to manufacture polycarbonate plastics and epoxy coatings (e.g. lining of metal food cans). Exposure to low levels of bisphenol A appears to be widespread in the U.S. population. The most likely sources of exposure are from ingesting canned foods and the use of polycarbonate bottles that are worn or whose contents has been heated, causing the leaching of low levels of bisphenol A. Bisphenol A is an environmental estrogen. Because lifelong exposure to estrogen increases breast cancer risk, there is concern that exposure to environmental estrogens, even at low levels, can add up and work together with the body's own estrogen to increase the risk of breast cancer. More detail is provided below on these topics, along with suggestions on how to reduce your exposure to bisphenol A.

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- [Human Exposure](#)
- [Sources of Exposure](#)
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- [Alternatives that are Bisphenol A Free](#)
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- [Other Evidence of Effecting Breast Cancer Risk](#)

Production Volume

It has been estimated that the global production of bisphenol A exceeds 6 million lbs. per year. In 2004, the estimated production of bisphenol A in the U.S. was 2.3 million lbs. (National Toxicology Program).

Major Uses

- **Manufacture of polycarbonate plastic:** Bisphenol A is used to make polycarbonate plastic, a transparent, rigid plastic that is resistant to breaking. Polycarbonate is used in sports water bottles, baby bottles, food storage containers, sports safety equipment, headlight covers, laboratory plastic ware, CDs and DVDs (<http://www.bisphenol-a.org/about/index.html>, cited May 2008).
- **Identifying polycarbonate plastic:** Some polycarbonate plastics are designated with a #7 recycle symbol and the letters "PC" standing for polycarbonate. However, not all type 7 plastics are polycarbonate, since this category is for "other" plastics. Some manufacturers of polycarbonate containers do not put a recycle code on their products.
- **Lining of metal food cans:** Metal food cans (commonly called "tin cans") are often lined with a coating that contains bisphenol A. This coating, called an epoxy, prevents the metal in the can from corroding, and helps prevent the food from tasting metallic. During the high heat canning process, bisphenol A can leach from the can lining into the food.
- **Dental sealants:** Bisphenol A is used in dentistry to seal teeth to prevent cavities.

Human Exposure

- **Widespread exposure (in U.S. population):** Until recently, there was very little information on the extent of exposure to bisphenol A in the U.S. population (Calafat et al., *Environmental Health Perspectives*, 113:391-395, 2005). To address this lack of information, researchers from the Centers for Disease Control and Prevention (CDC) analyzed the levels of bisphenol A in the urine of 2,517 survey participants. Low levels of bisphenol A were detected in 92.6% of the urine samples. This is the first study to demonstrate that bisphenol A exposure is widespread in the general U.S. population (Calafat et al., *Environmental Health Perspectives* 116(1):39-44, 2008). Researchers have also reported low levels of bisphenol A in the urine of young girls in the U.S. (Wolff et al., *Environmental Health Perspectives* 115(1):116-121, 2007).
- **Breast milk:** Bisphenol A has been detected in human breast milk and colostrum. Please note: BCERF feels strongly that human breast milk is the best source of nutrition for infants. (Vandenberg et al., *Reproductive Toxicology*, 24:139-177, 2007; Ye et al., *Journal of Chromatography B*, 831:110-115, 2006; Kuruto-Niwa et al., *Chemosphere*, 66:1160-1164, 2007)
- **Fat tissues:** After bisphenol A is absorbed, one study in men found that the bisphenol A was metabolized in the liver to a form that was rapidly excreted in the urine (a conjugated form) (Volkel et al., *Drug Metabolism and Disposition*, 33:1748-1757, 2005). The conjugated form is not estrogenic. However, studies in women suggest that some of the ingested bisphenol A is stored in adipose tissue in its "free" non-conjugated form (Fernandez et al., *Reproductive Toxicology*, 24:259-264, 2007). Further research is needed to determine to what extent bisphenol A is stored in fat tissue of women, can be released into the blood over time, and exert its estrogenic effects on breast tissue.

Sources of Exposure

- **Canned Food:** The intense heat used during the canning process causes bisphenol A to migrate from the can's epoxy lining into the food (Goodson et al., *Food Additives and Contamination*, 21(10):1015-1026, 2004). Long-term storage does not appear to affect the level of bisphenol A in canned food.
- **Types of canned food:** A variety of studies conducted in Europe, New Zealand, Asia, and the U.S. have reported detecting low levels of bisphenol A in a variety of canned foods. This includes canned beans, vegetables, fruits, soups, pastas, meats, fish, evaporated cow's milk, coconut cream, pet food, and infant formula. Very low levels of bisphenol A have been detected in canned colas, citrus soft drinks, beer and energy drinks. (Braunrath et al., *J. of Agricultural and Food Chemistry*, 53:8911-8917, 2005; Goodson et al., *Food Additives and Contaminants*, 19:796-802, 2002; Sajiki et al., 24(1):103-112, 2007; Thomson and Grounds, *Food Additives and Contaminants*, 22(1):65-72, 2005; Environmental Working Group, <http://www.ewg.org/book/export/html/20928> cited May 2008; Kang et al., *Research in Veterinary Science*, 73:177-182, 2002).
- **Polycarbonate containers:** Heat or pouring hot liquids into polycarbonate baby bottles or sports bottles can cause leaching of low levels of bisphenol A (Maragou et al., *Food Additives and Contamination*, 25(3):373-383, 2008; Gibson, *Toxic Baby Bottles*, report from the Environment California Research and Policy Center, 2007). University of Cincinnati researchers found that after boiling water was poured into polycarbonate sports bottles, the bottles continued to leach bisphenol A, even if room temperature water was later poured into the bottles (Le et al., *Toxicology Letters*, 172(2):149-156, 2007). Wear and tear (repeated use), and use of harsh detergents has also been shown to increase the leaching of bisphenol A from polycarbonate baby bottles (Brede et al., *Food Additives and Contaminants*, 20(7):684-689, 2003).
- **Food Packaging:** Studies conducted in Europe and Japan have reported that bisphenol A can migrate from plastic polyvinyl chloride stretch plastic wraps to food, and have also detected bisphenol A in recycled cardboard (source probably from thermal fax paper that had bisphenol A) and in "virgin" paper products (Lopez-Cervantes and Paseiro-Losada, *Food Additives and Contamination*, 20(6):596-606, 2003; Vinggaard et al., *Chemistry Research and Toxicology*, 12:1214-1222, 2000; Ozaki et al., *Food*

and Chemical Toxicology, 42:1323-1337, 2004).

- **Landfills and Waterways:** Low levels of bisphenol A are being detected in U.S. waterways (Kolpin et al., Environmental Science and Technology, 36:1202-1211, 2002). A possible source may be bisphenol A leaching from landfills.

Ways to Reduce Exposure

- Hand wash bottles or containers using a mild detergent.
- Do not use harsh detergents or scouring pads that can cause scratches.
- If containers or bottles become scratched, bring to a recycling center.
- PLEASE do not put polycarbonate bottles in the trash.
- Over time, bisphenol A can leach from landfills.
- Do not leave containers where they can heat up (e.g. hot car, hot beach, etc.).
- Do not microwave in polycarbonate bottles or food containers.
- Do not put hot food or liquids into polycarbonate containers.
- Instead, microwave food or beverages in glass or lead-free ceramic containers.
- Consider increasing the use of fresh foods and dried foods (e.g. beans, dried fruit) to avoid canned foods from epoxy-lined cans that may contain bisphenol A.

Alternatives that are bisphenol A free

- Consider using stainless steel containers as an alternative to plastic water bottles. They should be made of high quality, food-grade stainless steel inside and out (e.g. no plastic liner).
- Consider using glass baby bottles in place of plastic baby bottles.

Estrogenicity

- Bisphenol A is a weak environmental estrogen. It is far less potent than the estrogen made by a woman's ovaries (Miller, et al., Environmental Health Perspectives, 109:133-138, 2001).
- Hundreds of studies have demonstrated that bisphenol A can bind to the estrogen receptor and exert estrogenic effects (see Shelby et al., Environmental Health Perspectives, 104:1296-1300, 1996; Bonefeld-Jorgensen et al., Environmental Health Perspectives, 115(suppl 1):69-76, 2007).
- Many studies have shown that bisphenol A can support the growth of estrogen-dependent breast tumor cell lines (see Vivacqua et al., Endocrine, 22(3):275-284, 2003; Recchia, et al., Food Additives and Contamination, 21(2):134-144, 2004).

Other evidence of affecting breast cancer risk

- In tissue culture studies, human breast tissue exposed to bisphenol A expressed genes that are associated with breast tumor aggressiveness (Dairkee et al., Cancer Research, 68:2076-2080, 2008).
- Early-life exposure to low levels of bisphenol A in rats induced a higher number of precancerous lesions (called hyperplasias) later in the adult females (Durando et al., Environmental Health Perspectives, 115:80-86, 2007). This research and other data has been reviewed by the National Toxicology Program (NTP) in its assessment of bisphenol A's possible effect on reproduction and development. The NTP's draft report (69 pages) was released on April 14, 2008, and can be viewed at: http://cerhr.niehs.nih.gov/chemicals/bisphenol/BPADraftBriefVF_04_14_08.pdf.
- It will be revised after the report has been peer reviewed in June of 2008. A helpful guide (questions and answers) for understanding the draft report can be found at: <http://www.niehs.nih.gov/news/media/questions/sya-bpa.cfm>

More information is available on [breast cancer and the estrogen connection](#).

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