

## **The Bisphenol-A Debate: A Suspect Chemical in Plastic Bottles and Cans**

by Catherine Zandonella, M.P.H

If you are like many readers of The Green Guide, you try and choose foods that are as free as possible of harmful chemicals such as pesticides. But if you consume canned soups, beans and soft drinks, organic or not, you also may be swallowing residues of a controversial chemical called bisphenol A (BPA) that can leak out of the can linings into your food. Nearly all can liners contain BPA, says Geoff Cullen, director of government relations at the Can Manufacturers Institute. BPA has also been found to migrate, under some conditions, from polycarbonate plastic water bottles.

Depending on whom you talk to, BPA is either perfectly safe or a dangerous health risk. The plastics industry says it is harmless, but a growing number of scientists are concluding, from some animal tests, that exposure to BPA in the womb raises the risk of certain cancers, hampers fertility and could contribute to childhood behavioral problems such as hyperactivity.

According to its critics, BPA mimics naturally occurring estrogen, a hormone that is part of the endocrine system, the body's finely tuned messaging service. "These hormones control the development of the brain, the reproductive system and many other systems in the developing fetus," says Frederick vom Saal, Ph.D., a developmental biologist at the University of Missouri. Endocrine-disrupting chemicals can duplicate, block or exaggerate hormonal responses. "The most harm is to the unborn or newborn child," vom Saal says.

Plastic water and baby bottles, food and beverage can linings and dental sealants are the most commonly encountered uses of this chemical. Unfortunately, it doesn't stay put. BPA has been found to leach from bottles into babies' milk or formula; it migrates from can liners into foods and soda and from epoxy resin-lined vats into wine; and it is found in the mouths of people who've recently had their teeth sealed. Ninety-five percent of Americans were found to have the chemical in their urine in a 2004 biomonitoring study by the Centers for Disease Control and Prevention (CDC).

Plastics manufacturers do not deny that BPA is found widely in

canned foods and beverages and is routinely ingested. They part ways with vom Saal and other scientists over the human health risks. The levels that leach into food are well below the safety thresholds set by the Environmental Protection Agency (EPA), and the plastics industry website, Bisphenol-A. org, says the chemical is completely safe unless you ingest 1,300 pounds of canned and bottled food daily. In other words, even a canned-food addict will likely ingest 500 times less BPA than the danger level set by the EPA and 100 times less than the standard set by the European Commission Scientific Committee on Food. And common sense tells us that if higher doses are safe, then lower doses must be too, right?

Not necessarily, says vom Saal, who notes that these safety levels are based on 1980s toxicity studies in rats. In those studies, conducted at relatively high doses, the only sign of toxicity was reduced body weight. However, when it comes to hormone disruption, different doses can activate or suppress different genes, vom Saal explains. "That's why early toxicity studies found that the high doses were safe. The studies didn't look at the low doses that are now proving to cause a myriad of harmful effects in animals, including chromosomal damage in female egg cells and an increase in embryonic death in mice. A follow-up to this is a study indicating a relationship of BPA blood levels to miscarriages in Japanese women," he says.

BPA was thrust into the spotlight by a laboratory mishap. In August 1998, geneticist Patricia Hunt, Ph.D., now at Washington State University in Pullman, noticed that chromosomal errors in the mouse cells she was studying had shot up—from 1 or 2 percent to 40 percent, as published in the April 2003 *Current Biology*. Hunt traced the effect to polycarbonate cages and water bottles that had been washed with a harsh detergent. When her team replaced all the caging materials with non-polycarbonate plastics, the cell division returned to normal.

But not all scientists think BPA is capable of doing such harm to humans. Some deny that BPA disrupts hormones. A study funded by the Society of the Plastics Industry and published in the July 2002 *Toxicological Sciences* that explored the effects of low doses on three generations of rats found no effect on reproduction or development. "If you look at all the data together, you don't find a consistent pattern of effects that are characteristic of an

estrogenic chemical," says Steven G. Hentges, Ph.D., executive director of the Polycarbonate Business Unit at the American Plastics Council. Others argue that rodent studies such as Hunt's are not relevant to humans. A study published in the October 2002 Chemical Research in Toxicology of human volunteers found that a human body neutralizes and excretes BPA far more rapidly than a rat's body does.

So far, regulatory agencies agree. "Based on all the evidence available at this time, the FDA sees no reason to change its long-held position that current [BPA] uses with food are safe," George Pauli, Ph.D., associate director for science and policy at the FDA's Office of Food Additive Safety, wrote in a November 28, 2005, letter.

Vom Saal counters that the studies showing BPA is safe are "profoundly flawed and in some cases exhibit outright fraud." Last year, he published a paper showing that 100 percent of the industry-funded studies, 11 in all, found no harmful effects from BPA, while 90 percent of government-funded low-dose studies, 104 in number, found harmful effects. "Among people who have actually read this literature there is no debate, just an illusion of controversy," he says.

Meanwhile, new studies continue to reveal the potential for harm. A January 2006 study indicates that BPA may enhance the risk of developing Type II diabetes. Angel Nadal, Ph.D., and his team at the University of Miguel Hernández de Elche in Alicante, Spain, found that BPA altered the function of mouse pancreatic cells, which produce insulin. Unhealthy diet, a lack of exercise and a genetic predisposition are the main factors in triggering diabetes, says Nadal. "However, our feeling is that these factors could be exacerbated by the presence of environmental pollutants such as bisphenol A."

Human studies might settle the controversy over BPA, but so far they have been too limited to prove much. One study linked women with ovarian dysfunction to elevated blood levels of BPA, and another found that blood levels of BPA were three times higher in women who'd suffered recurrent miscarriages than in women with successful pregnancies. While intriguing, these studies were from a small sample group. A more definitive result could be gained from a large-

scale study to track people's exposures, follow them for years and look for health effects. The National Toxicology Program is planning a future evaluation of BPA.

Some scientists urge that action be taken now, regardless. "Science is not in the business of demonstrating anything beyond a shadow of a doubt," says Ana Soto, M.D., a professor and researcher at Tufts University School of Medicine in Boston, who has found that BPA alters mammary-gland development in mice. "We cannot wait that long to discover whether this chemical is harming human reproduction and development." However, because government agencies remain unconcerned, it is unlikely that BPA will disappear from consumer products anytime soon. A California bill to ban BPA in baby toys and feeding products was defeated in January. In the meantime, see the sidebar for what you can do to reduce your exposure.

#### 8 Ways to Avoid Harmful Chemicals in Plastics and Cans

1. If you already own polycarbonate bottles, including the Nalgene bottles popular on college campuses, labeled #7 on the bottom, wash them by hand with mild dishwashing soap, not in the dishwasher, to avoid degrading the plastic and increasing leaching of BPA (see "Picnic Perfect Plastics").
2. Even plastic does not last forever. Look for cracks or cloudiness on your reusable clear plastic bottles. See The Green Guide's survey, "A Nalgene Bottle Poll."
3. Use glass baby bottles or plastic bag inserts, which are made of polyethylene, or switch to polypropylene bottles that are labeled #5 and come in colors or are milky rather than clear.
4. Choose soups, milk and soy milk packaged in cardboard "brick" cartons, by Tetra Pak and SIG Combibloc, which are made of safer layers of aluminum and polyethylene (#2) and also recyclable.
5. Choose canned foods from makers who don't use BPA, such as Eden Foods ([www.edenfoods.com](http://www.edenfoods.com)), which sells certified organic canned beans and other foods.
6. Eat fresh foods in season and save the canned foods for convenience or emergencies. The exception is some canned fruit such

as that found in smaller fruit-cocktail cans, which do not require a liner, according to the Can Manufacturers Institute.

7. Buy or can your own fruits and vegetables in safe glass jars. For more, see Amy's Green Kitchen "In a Summer Pickle".

8. Some wines have been found to contain up to six times the BPA of canned foods. While most wines probably don't, it's another good reason to drink in moderation. dust the interior of their vehicles.