

BABY'S TOXIC BOTTLE

Bisphenol A
Leaching from
Popular Baby
Bottles

Brought to you by The Work Group for Safe Markets,
a coalition of U.S. public health and environmental NGOs including:

Alliance for a
Healthy Tomorrow

Boston Common
Asset Management

Breast Cancer Fund

Center for Health,
Environment and Justice

Clean New York

Clean Water Action

Environment America

Environmental
Defence (Canada)

Environmental
Health Fund

Environmental Health
Strategy Center

Healthy Legacy

Learning Disabilities
Association of America

MOMS (Making Our
Milk Safe)

Oregon Environmental
Council

US PIRG

Contributors

Mia Davis, Clean Water Action
Jennifer Foulds, Environmental Defence (Canada)
Aaron Freeman, Environmental Defence (Canada)
Kapil Khatter, Environmental Defence (Canada)
Cassandra Polyzou Environmental Defence (Canada)
Judith Robinson, Environmental Health Fund
Michael Schade, Center for Health, Environment and Justice
Rick Smith, Environmental Defence (Canada)
Dr. Fred vom Saal, University of Missouri

Design

David Gerratt, NonprofitDesign.com

Acknowledgements

The Work Group for Safe Markets (U.S.) gratefully acknowledges Environmental Defence (Canada) for its leadership commissioning this study. We thank all of the local/state groups that purchased baby bottles for testing. Thank you to our many readers, especially Dr. Laura Vandenberg and Dr. Maricel Maffini. Thanks to Dr. Fred vom Saal of the University of Missouri-Columbia; Dr. JP Myers of Environmental Health Sciences; Rachel Gibson of Environment California, and the authors and reviewers of the *Is It In Us?* report for helping lay the foundation for what has become an extensive body of scientific knowledge on BPA leaching from products and contributing to chemical body burden.

FOR MORE INFORMATION CONTACT:

Mia Davis — Clean Water Fund
262 Washington Street, #301, Boston, MA 02108 • 617/338-8131 • miadavis@cleanwater.org
Mike Schade — Center for Health, Environment and Justice
9 Murray Street, Floor 3, New York, NY 10007 • 212/964-3680 • mike@besafenet.com

www.babystoxicbottle.org

Contents

Executive Summary	4
Background on Bisphenol A (BPA)	6
Health Effects of Bisphenol A	7
Results	9
Corporate and Governmental Policies Addressing BPA	11
Conclusions and Recommendations	13
References	15
Appendix 1: Retail Locations	18
Appendix 2: Sampling and Analytical Methodology	18
Appendix 3: Scientific Data (U.S. and Canadian Baby Bottles)	19
Tables	
Table 1 — Baby bottles bought in United States for testing	9
Table 2 — Results of bisphenol A concentrations in baby bottles bought in Canada	9
Table 3 — Results of bisphenol A concentrations in baby bottles bought in the U.S.	10
Figures	
Figure 1 — Concentration at room temperature	9

Executive Summary

Bisphenol A, a hormone-disrupting chemical that is the building block of polycarbonate plastic, has been found to leach out of six major brands of popular baby bottles sold in the United States and Canada. *Baby's Toxic Bottle: Bisphenol A Leaching from Popular Brands of Baby Bottles*, commissioned by a coalition of U.S. and Canadian environmental health organizations, tested plastic baby bottles in the U.S. and Canada, including products made by Avent, Disney/The First Years, Dr. Brown's, Evenflo, Gerber, and Playtex, for leaching of bisphenol A. The U.S. bottles were purchased in nine states at major retailers: Babies"R"Us, CVS, Target, Toys"R"Us, Walgreens, and Wal-Mart. Tests found these popular bottle brands leach levels of bisphenol A (5-8 parts per billion) when heated. Laboratory experiments with animals show that exposure to this level of bisphenol A causes a range of adverse effects.¹

Bisphenol A, first synthesized in 1895, was discovered in 1936 to be a synthetic estrogen. The chemical is now utilized in hard, polycarbonate plastics, as well as the epoxy resins used in the linings of some food and beverage containers, dental sealants and numerous other consumer products. Bisphenol A is a developmental, neural, and reproductive toxicant that mimics estrogen and can interfere with healthy growth and body function. Animal studies demonstrate that the chemical causes damage to reproductive, neurological and immune systems during critical stages of development, such as infancy and in the womb. The levels sufficient to cause harm in animals are beneath the average levels reported in people living throughout the developed world². Many scientists now suggest similar damage may be occurring in the human population.

The objectives of this report are to a) determine whether bisphenol A leaches at measurable levels from baby bottles widely available in the United States and Canada; b) add to the growing body of knowledge highlighting the extent to which humans are exposed to bisphenol A; c) identify a responsible and precautionary legislative approach to managing bisphenol A and other harmful chemicals, and d) help parents decrease their children's exposure to bisphenol A.

The test results of our study indicate that the United States' current lack of regulation of bisphenol A exposes infants and children to potentially dangerous levels of this unnecessary toxic chemical. Our study confirms the findings of the 2007 Environment California study that tested Avent, Dr. Brown's, Evenflo, Gerber and Playtex baby bottles. All five brands of the popular polycarbonate bottles tested in Environment California's study leached bisphenol A the range of 5–10 ppb.³ This report is the first dual-nation study to measure BPA leaching from baby bottles purchased from U.S. and Canadian retailers.

Key Findings

- Popular brands Avent, Disney/The First Years, Dr. Brown's, Evenflo, Gerber, and Playtex market baby bottles that leach bisphenol A when heated;
- The laboratory tests detected between 5-8 ng/ml (parts per billion) bisphenol A leached from all bottles when heated;
- Based on over 150 peer-reviewed journal articles on bisphenol A,⁴ we conclude that the amount leaching from heated bottles is within the range shown to cause harm in animal studies and is therefore a health concern for infants;
- This report is the first dual-nation U.S./Canadian study to measure the extent of bisphenol A leaching from plastic baby bottles;

- Dr. Brown's brand bottles had the overall highest levels of bisphenol A leaching, while Avent brand bottles had the overall lowest levels of leaching in U.S. bottles; Canadian results differ.
- The levels of bisphenol A leaching increased dramatically when the bottles were heated, with highest concentrations reported from Dr. Brown's brand bottles. These findings are significant as baby bottles are often heated, and/or very warm liquids are poured into bottles;
- Heating bottles to 80°C provides evidence of leaching when bottles are heated; heating to 80°C has been found to simulate 60–100 bottle washings and normal wear and use conditions;
- Major retailers including Babies'R'Us, CVS, Target, Toys'R'Us, Walgreens, and Wal-Mart sell baby bottles that leach bisphenol A when heated.
- States should act quickly to adopt policies to protect consumers and restrict BPA use in all food and beverage containers, including those intended for use by infants and children.
- The Food and Drug Administration and manufacturers of BPA-lined infant formula cans should respond urgently and with full disclosure to the landmark investigation by Reps. Dingell/Stupak into BPA leaching from infant formula cans.
- Champions at all levels of government should work to reform America's outdated chemical policies that are failing to protect Americans from chemicals already on the market. Policies must be adopted that prevent the leaching of some of these chemicals from our consumer goods into our food and water.
- The federal law regulating industrial chemicals is 30 years old. It is outdated and does not protect Americans. We need to reform this law to protect consumers. The Toxic Substances Control Act (TSCA) must be amended to:
 - Require comprehensive, publicly available health data on industrial chemicals
 - Require product manufacturers to test and disclose the chemical contents of their products
 - Prohibit the use of dangerous chemicals in products, especially those targeted at infants and children
 - Arm consumers with useful information to make safer product choices
 - Provide information and technical resources to businesses so they can make products safe for consumers, and invest in green economic development to spur innovation of safer products.

Recommendations

Based on the results of this study and the research that precedes it, *Baby's Toxic Bottle* calls on major retailers and manufacturers of baby bottles to switch to safer products and phase out bisphenol A. Research shows⁵ that most people are exposed to bisphenol A at levels higher than those that cause health effects in animal studies. We support state policy efforts to safeguard our health by working to pass laws that phase out bisphenol A in baby bottles and other consumer products. And, we urge the federal government to reform chemical regulations to be more protective of human health, particularly the health of pregnant women and the in-utero child, as well as infants and children. In detail:

- Manufacturers and retailers should immediately phase out use of BPA-containing baby bottles in favor of available, safer products.

Background on Bisphenol A (BPA)

In 1936, scientists discovered that **bisphenol A** (BPA) could be used as a synthetic hormone that mimicked estrogen, which they thought might be useful to help control difficult pregnancies. Bisphenol A took a back seat to a similar chemical called diethyl silybestral (DES), which was determined to be more effective in this application. It was not until after it had been given to millions of women that DES was identified as a cancer-causing agent and the cause of serious reproductive defects, including rare vaginal cancer, in the daughters of mothers who had taken DES during pregnancy.⁶

In the 1950s chemists found that BPA could be polymerized to produce commercially viable plastics.⁷ Bisphenol A is now used to make polycarbonate plastics—the clear or tinted, unbendable plastic used to make some of the most popular baby bottle brands and reusable water bottles, including most Nalgene bottles. Polycarbonate plastic bottles often have the number 7 in the recycling triangle on the bottom of the bottle, falling into the “other” category of plastics, and/or the letters “PC” near the recycling triangle. Other products that often contain BPA include CDs, DVDs, eyeglasses, dental sealants, and epoxy resins used in the lining of food and beverage containers. Currently, 95 percent of baby bottles on the market are made with BPA.⁸ Worldwide production of bisphenol A exceeds six billion pounds per year and demand for the chemical has risen significantly in recent years.

Exposure to bisphenol A is widespread. The US Centers for Disease Control and Prevention (CDC) found that 95 percent of Americans tested have detectable levels of BPA in their bodies,⁹ and a 2008 study shows that BPA levels are lowest in adults, mid-range in adolescents and highest in children.¹⁰ The chemical bond between bisphenol A molecules is unstable, and with time and use, the chemical leaches from bottles

into materials it comes into contact with (for example, milk). Heating bottles or pouring hot liquids into bottles, the presence of acidic or basic foods and beverages, and repeated washing have all been shown to increase the rate of BPA leaching from bottles.¹¹ A January 2008 University of Cincinnati study found BPA

Heating bottles or pouring hot liquids into bottles, the presence of acidic or basic foods and beverages, and repeated washing have all been shown to increase the rate of BPA leaching from bottles.

leaching from Nalgene bottles.¹² An August 2007 Environmental Working Group study found BPA leaches from the inner lining of popular infant formula cans. In March 2007, independent laboratory tests found BPA in over half of 97 cans of name-brand fruit, vegetables, soda, and other commonly eaten canned goods.¹³

A recent consensus statement by over 30 expert scientists states that adverse health effects occur at levels in animals within the exposure range typical for people in developed countries,¹⁴ levels well below the current U.S. Environmental Protection Agency “acceptable” human exposure level of 50 µg/kg/day. The EPA standard was set in 1993 on studies completed in the 1980s.

A recent review of scientific literature demonstrates a wide range of health effects resulting from bisphenol A at significantly lower levels than considered “acceptable”, as low as 2 parts per billion in some studies.¹⁵

Health Effects of Bisphenol A

Mounting evidence indicates that low dose exposure to bisphenol A can lead to adverse health effects. As a hormone disruptor, bisphenol A causes a response in cells similar to the effect of estradiol (estrogen hormone). Bisphenol A binds with estrogen-related receptors¹⁶ but does not replace the activity of estrogen. As a result, bisphenol A may be adding a “false” estrogen effect in the body, off-setting the hormonal balance required for healthy human development. Experiments with animals link exposure at very low doses to a range of serious health problems including:

- prostate and breast cancer
- early onset of puberty
- obesity
- hyperactivity
- lowered sperm count
- miscarriage
- diabetes
- altered immune system¹⁷

Scientists and international organizations have identified bisphenol A as a potential reproductive and developmental toxin, as well as a hormone disrupting chemical leading to a variety of adverse health effects. In addition, two recent panels in the U.S. have pointed to potential health effects of exposure to bisphenol A.^{18,19}

Reproductive and Developmental Effects

A recent review of scientific literature affirms that bisphenol A can alter brain chemistry and the reproductive and immune systems in a variety of animals.²⁰ Some research also indicates that the sexual behavior and sexual development of mice can be impaired and variably altered from bisphenol A-induced hormone disruption.²¹ Another study found that female mice exposed to short-term, low doses of bisphenol A experienced sudden and significant increases in



genetic abnormalities in their eggs.²² In preliminary research based on these genetic abnormalities, researchers have also found that women with a history of recurrent miscarriage had higher blood serum levels of bisphenol A than women with successful pregnancies.²³

Bisphenol A has been reported to suppress the activation of thyroid hormone-regulated genes in rats.²⁴ These results show that low doses of bisphenol A can disrupt hormone action within cells by competitively displacing naturally occurring hormones. These hormones regulate the rate of metabolism and the growth of many systems in the body. Thyroid hormones play a significant role in brain development during fetal life.

Studies have shown that bisphenol A can, at low doses, significantly stimulate the release of the hormone prolactin and activate breast cancer cells.²⁵

Low Doses Can Be Dangerous

Recent studies have challenged the current acceptable daily intake level of bisphenol A, as new scientific evidence shows that even low doses of this chemical can disrupt development. The current acceptable level of bisphenol A is set by the U.S. Environmental Protection Agency at 50 µg/kg bodyweight/day, which is a measure in parts per billion (ppb). While *Baby's Toxic Bottle* measured bisphenol A leaching in levels below the 50 µg/kg/day acceptable daily intake from polycarbonate baby bottles, a number of other scientific studies have shown that bisphenol A levels as low as parts per trillion have been found to alter cell function.²⁶ Parts per trillion expresses a concentration 1,000 times smaller than parts per billion, indicating that extremely low-doses of bisphenol A can be potent. Moreover, exposure to BPA from baby bottles may not be an individual's only source of exposure to BPA, making it difficult to calculate any one person's actual daily dose. Finally, we lack studies to determine the synergistic effect of BPA exposure with other chemicals that an infant, child or adult might be exposed to. This further complicates the accuracy of the EPA's current acceptable daily exposure limit for BPA.

Exposure

Testing of Americans done by the U.S. Centers for Disease Control and Prevention found that 95 per cent of adults studied had bisphenol A in their urine.²⁷ This demonstrates the extent of human exposure since bisphenol A spends approximately 10 hours in the body²⁸ and indicates that we are continuously exposed to bisphenol A²⁹. Animal studies suggest that bisphenol A is quickly absorbed and eliminated, but some residual BPA remains in the intestines, liver and kidneys for a period of several days.³⁰ A recent U.S. biomonitoring project titled *Is It In Us? Chemical Contamination of Our Bodies* tested 35 men, women and young people for the presence of a variety of chemicals in their bodies. All of the participants who submitted urine samples had bisphenol A in their urine, and more than half had it in their blood. The levels of bisphenol A

found in the blood and urine of those studied was within the range shown to cause effects in laboratory animal studies, including impacts on cell function.³¹

A November 2007 U.S. National Institute of Environmental Health Sciences expert panel of 38 leading scientists³² found that most people are exposed to bisphenol A at levels higher than those that cause health effects in animal studies. The Washington, D.C.-based Environmental Working Group found high levels of bisphenol A in canned food, including infant formula, ravioli and chicken soup.³³ A 2008 University of Cincinnati study found BPA leaches from the popular polycarbonate Nalgene reusable water bottles.³⁴

Children

Children are especially vulnerable to bisphenol A because endocrine disruptors affect how their bodies grow and develop. Young children still have immature organ systems, high metabolic rates, relatively low bodyweight, and are going through rapid physical development; therefore, even low levels of repeated exposure may lead to adverse health effects.³⁵

An expert panel of the U.S. National Toxicology Program concluded recently that bisphenol A exposure to fetuses and to children could impact their behavioral and neural systems.³⁶ Exposure in the womb is particularly worrisome as fetuses have immature detoxification systems, not equivalent to adults', and they are at a delicate stage of development.³⁷

Bisphenol A is very much present in children's lives. A recent investigation of bisphenol A exposure in preschool children in North Carolina and Ohio (2000–2001) over a 48-hour period found that more than 68 percent of children's liquid food and more than 83 percent of their solid food samples contained bisphenol A.³⁸

Real World Laboratory

Linking the animal and laboratory evidence for bisphenol A with human health effects is diffi-

cult for many reasons, including a lack of concrete data on human exposure, other factors contributing to diseases, and the delay between exposure and some health effects. What cannot be disputed is that a number of tests have detected bisphenol A in human tissue and this

indicates widespread exposure.³⁹ Coupled with the knowledge of increasing rates of infertility, prostate and breast cancer and other conditions such as diabetes and obesity in the human population, the possible effects of hormone disruptors like bisphenol A cannot be ignored.

Results

Ten new polycarbonate baby bottles were purchased from a variety of retailers in California, Massachusetts, Pennsylvania, New York, Oregon, Minnesota, Connecticut, Maine and Washington in December 2007. We selected popular, easily available brands from well-known retail outlets, ranging from 4 oz. to 9 oz. in size. (See Appendix 1: Retail Locations.)

The laboratory of Dr. Frederick S. vom Saal, a leading researcher on bisphenol A at the University of Missouri-Columbia, conducted the analysis. The lab subjected these bottles to a test designed at the University of Missouri to simulate repeated washing. Each bottle was filled with water, sealed and left undisturbed for 24 hours. Two tests were conducted; all bottles were first tested at room temperature and then at 80°C/176°F. The 80°C treatment simulates

repeated washing of the bottles (approximately 60–100 washes) and indicates how much bisphenol A would leach from a well-used bottle. Although it is higher than the temperature range of domestic dishwashers, heating to 80°C/176°F represents the effect of repeated scrubbing and exposure to detergents and warm water. Water in glass bottles, either untreated or spiked with BPA (8.5 ng/ml), were run as negative and positive controls, respectively.

The bottles did not show notable levels of leaching at room temperature but all bottles showed significant levels of leaching in the range of 5-8 ng/ml (ppb) when heated (Table 2). All reported values of 0.00 ng/ml indicate concentrations that could not be detected or fell below the limit of detection of the analytical equipment.

FIGURE 1 Concentration at Room Temperature

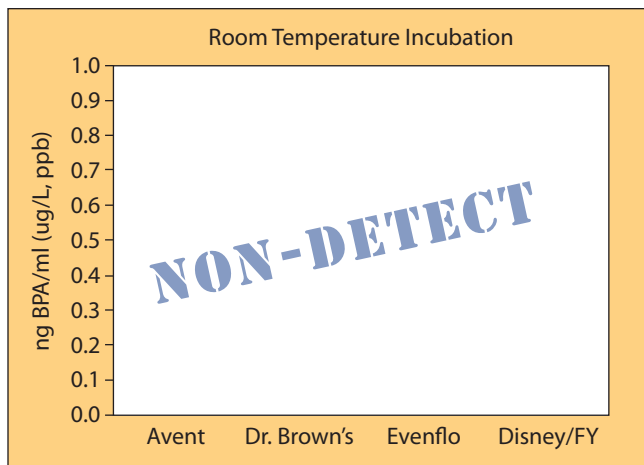
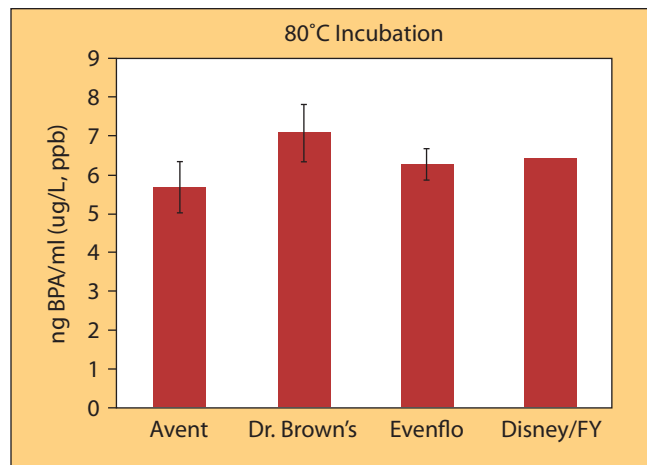


FIGURE 2 Concentration at 80°C



Bisphenol A concentrations in the water in bottles held at room temperature (left) or at 80°C/176°F (right) for 24 hours. Results are expressed as ng/mL in the incubation water, equivalent to micrograms/liter (µg/L) or parts per billion (ppb).

Given the extensive peer-reviewed literature on BPA showing adverse effects in animals at low levels,⁴⁰ we conclude that the amount leaching from heated bottles is a potential health risk for infants drinking from them.

Additional Findings

The bottles tested were brand new. After a polycarbonate plastic bottle goes through

repeat washing in the dishwasher, or simply with hot water, the plastic can degrade and the amount of bisphenol A leaching from the bottle increases.⁴¹ Scientific studies have simulated repeated and long-term use of polycarbonate bottles and found bisphenol A continues to leach over time.⁴² This indicates that polycarbonate plastic products degrade over time and with normal use, especially after exposure to heat. Heated to 80°C to simulate 60-100 washings and the effect of detergent on polycarbonate plastics, *Baby's Toxic Bottle* confirms these previous findings.

TABLE 1 Baby bottles bought in United States for testing

Brand	Retailer
Avent	Target
Avent	CVS
Avent	Walgreens
Disney/The First Years (FY)	Walgreens
Dr. Brown's	Wal-Mart
Dr. Brown's	Babies"R"Us
Dr. Brown's	Target
Evenflo	Target
Evenflo	Target
Evenflo	Toys"R"Us

Acidic materials, such as apple juice, break apart the bonds that hold bisphenol A molecules together.⁴³ The chemical ester bonds in bisphenol A interact with the free hydrogen in acids and break apart. Bisphenol A is primarily hydrophobic, meaning it does not easily dissolve in water but is more soluble in alcohol or fatty materials. Given this characteristic, bisphenol A is likely to leach more in milk than in water. Our testing was conducted using only water and not apple juice or milk. Further laboratory analysis would be useful, although it should not prevent urgent protective action to limit BPA exposure, especially for pregnant women, infants and children.

TABLE 2 Results of bisphenol A concentrations in baby bottles bought in the U.S.

nanogram bisphenol A / ml liquid (ng/ml) or ppb

Bottle Sample	Room Temperature	Heated (80°C)
Avent	ND	4.775
	ND	5.159
	ND	6.981
Dr. Brown's	ND	5.756
	ND	8.307
	ND	7.167
Evenflo	ND	6.189
	ND	7.010
	ND	5.579
Disney/FY	ND	6.405

The average leaching for each bottle when heated:

Avent	5.64 ng/ml
Dr. Brown	7.08 ng/ml
Evenflo	6.26 ng/ml
Disney	6.41 ng/ml

TABLE 3 Results of bisphenol A concentrations in baby bottles bought in Canada

nanogram bisphenol A / ml liquid (ng/ml) or ppb

Bottle Sample	Room Temperature	Heated (80°C)
Avent	ND	7.568
	ND	7.805
	ND	6.495
Evenflo	0.012	7.439
	ND	8.323
	0.009	7.029
Disney/ The First Years	0.044	4.294
	0.037	6.578
	0.063	5.004

The average leaching for each bottle when heated:

Gerber	6.78 ng/ml
Avent	7.07 ng/ml
Playtex	4.92 ng/ml

Corporate and Governmental Policies Addressing BPA

In light of the growing scientific evidence that BPA may cause significant health problems, companies and governmental bodies are beginning to develop policies to minimize the public's exposure to this toxic chemical.

Corporate Policies

Mounting scientific research and consumer concern over the safety of polycarbonate and studies have pressured manufacturers and retailers to make changes. Glass baby bottles are widely available, and a clear plastic baby bottle new to the market advertises itself as "Bisphenol A-Free."



WHOLE FOODS CUTS BPA BABY BOTTLES

Whole Foods, the nation's largest natural foods chain, stopped selling baby bottles and child drinking cups made from polycarbonate plastic. Whole Foods took action because of concerns that, "a growing body of scientific research suggests that small amounts of BPA may leach into foods or beverages stored in polycarbonate containers, especially when the contents are acidic, high in fat, or heated. Research also suggests that BPA acts as an endocrine disruptor, a substance which mimics natural human hormones."⁴⁴ Whole Foods operates 275 stores in the U.S., Canada, and the UK.⁴⁵

TARGET OFFERS MORE BPA-FREE BABY BOTTLES

According to a December 2007 Newsweek article, Target, the nation's fifth largest retailer, will begin offering more BPA-free baby bottles in response to customer demand.⁴⁶

BORNFREE BABY BOTTLES ARE BPA-FREE

Baby products manufacturer BornFree only manufactures and sells baby bottles that are BPA-free. The bottles are available online and at a number of major retailers including Whole Foods, Babies"R"Us, and CVS.⁴⁷

MEDELA OFFERS BPA-FREE BREASTPUMP KITS

Medela products that come into direct contact with breastmilk, including all breastpump kits and breastshields, all collection and storage bottles, as well as feeding systems are made with BPA-free plastic.⁴⁸

PATAGONIA PULLS BPA WATER BOTTLES

In December 2005, Patagonia Inc. stopped selling polycarbonate water bottles from its 40 stores across the world.⁴⁹

CANADIAN RETAILERS PHASE OUT WATER BOTTLES CONTAINING BPA

In December 2007, two major Canadian-based retailers, Mountain Equipment Co-op and Lululemon, announced they would stop selling polycarbonate water bottles in response to a campaign by Environmental Defence (Canada).⁵⁰

EDEN FOODS ELIMINATING BPA IN FOOD CAN LININGS

In 1999, the health foods company Eden Foods phased out the use of BPA in some of their canned

foods. The company has eliminated BPA in cans for products such as beans, however they are still searching for alternatives for cans that hold tomatoes.⁵¹

Consumer pressure and market response is important, but we cannot shop our way out of this toxic problem. Alternatives to products made with BPA are not available for all consumers in all markets, and it is often difficult or impossible to know if some items, like canned goods, contain bisphenol A. Government and the private sector must be part of the solution.

Government Actions

U.S. CONGRESSIONAL INVESTIGATION INTO BPA IN INFANT FORMULA

In January 2008 Rep. John D. Dingell (D-MI), Chairman of the Committee on Energy and Commerce, and Rep. Bart Stupak (D-MI), Chairman of the Subcommittee on Oversight and Investigations, announced an investigation into the use of bisphenol A in products intended for

use by infants and children. In letters to seven prominent manufacturers of baby food and to the Food and Drug Administration (FDA), the lawmakers expressed concern about BPA in infant formula food packaging. The Committee's letters were sent to Hain-Celestial Group Inc.; Mead Johnson & Company; Nestle USA, Inc.; PBM Products; Ross Products Division, Abbott; Solus Products, LLC and Wyeth Nutrition. The Committee sent a separate letter to the FDA.⁵²

U.S. STATE INITIATIVES ON BPA IN 2008

In 2008, a number of states are considering legislation to phase out or ban bisphenol A in response to the hazards this chemical may pose to infants and young children. Below is a summary of some of these key state initiatives.

Canada Reviewing Bisphenol A

The Ontario government in Canada has initiated a process to review bisphenol A and other priority chemicals for safety. An expert panel has been established to make recommenda-

State	Policy Initiative
California	California is considering adding bisphenol A to its Proposition 65 list as a reproductive toxicant. The chemical has passed the first phase in which a reviewing committee unanimously supported compiling hazard materials on bisphenol A. Once compiled, they will review and vote on whether or not to add bisphenol-A to the list. ⁵³
Connecticut	The Connecticut Environment Committee is sponsoring a bill to phase out bisphenol A and other toxic chemicals in children's products sold or manufactured in Connecticut. ⁵⁴
Hawaii	Hawaii introduced an act to prohibit the manufacture, sale, or distribution of certain toys and child care articles containing bisphenol-A or specific types of phthalates in concentrations exceeding 0.1 percent. ⁵⁵
Maine	Maine has introduced a comprehensive children's product bill that will identify the chemicals of highest concern including bisphenol-A, require manufacturers to disclose the use of priority chemicals in children's products and authorize Maine to require safer alternatives, if available, effective and affordable. ⁵⁶
Maryland	Maryland has introduced legislation that would prohibit the use of six different phthalates and bisphenol-A in products intended for children under the age of seven. ⁵⁷
Massachusetts	Massachusetts lawmakers are currently considering <i>An Act for a Healthy Massachusetts: Safer Alternatives to Toxic Chemicals</i> . The bill, which recently passed the Senate, would replace toxic chemicals including BPA with safer alternatives where feasible and stimulate research and development on new technologies, chemicals or solutions when a safer alternative is not currently feasible. ⁵⁸
Minnesota	The Minnesota legislature will consider a bill to phase out bisphenol-A and phthalates in children's products intended for the use of children ages three and under. ⁵⁹
New York	In New York, the legislature will consider a bill that prohibits the manufacture, distribution and sale of certain toys and child care products containing bisphenol-A or phthalates. ⁶⁰
Pennsylvania	In October 2007, Pennsylvania introduced legislation to protect state waters from endocrine disrupting chemicals, including bisphenol-A.

tions to the government. If the federal government fails to act to protect Canadians in this instance, there may be action at the provincial level. Canadian environmental health groups are supporting the proposed *Toxic Use Reduction Act*.

By the end of 2009, the Canadian government will also measure bisphenol A in the bodies of 5,000 Canadians as a part of the Canadian Health Measures Survey. A recent news report indicated Health Canada plans to study the migration rates of bisphenol A from polycar-

bonate products to determine the risk posed to infants.

Environmental groups are calling on the Canadian federal government, using its authority under the *Hazardous Products Act*, to immediately ban bisphenol A from food and beverage containers. For other products containing bisphenol A, groups are urging the government to employ the *Canadian Environmental Protection Act* to undertake an analysis of available substitutes in establishing a schedule for a longer-term phase-out.⁶¹

Conclusions and Recommendations

Based on the results of this study and the research that precedes it, we are calling for a moratorium and immediate phase out of BPA use in baby bottles and other products that come in contact with food and liquids (such as water bottles and infant formula).

Corporate Policy

Manufacturers and retailers should immediately phase out use of BPA-containing baby bottles in favor of available, safer products.

State Policy

States should act quickly to adopt policies to protect consumers and restrict BPA use in all food and beverage containers, especially those intended for use by pregnant women, infants and children.

Federal Policy

- The Food and Drug Administration and manufacturers of BPA-lined infant formula cans should respond urgently and with full disclosure to the landmark investigation by Reps. Dingell/Stupak into the BPA leaching

from infant formula cans. Rep. Dingell (D-MI) is Chairman of the Committee on Energy and Commerce, and Rep. Bart Stupak (D-MI) is Chairman of the Subcommittee on Oversight and Investigations.

- Champions at all levels of government should work to reform America's outdated chemical policies that are failing to protect Americans from chemicals that are already on the market and leaching from our consumer goods into our food and water. The federal law regulating industrial chemicals is 30 years old. It is outdated and does not work. Bisphenol A in baby bottles is one of many examples of need to reform federal law to protect consumers. The Toxic Substances Control Act (TSCA) must be amended to:
 - Require complete health and safety data on industrial chemicals and make data publicly available
 - Product manufacturers should be required to test and disclose the chemical contents of their products
 - Prohibit the use of dangerous chemicals in products, especially those targeted at infants and children

- Arm consumers with useful information to make safer purchases
- Provide information and technical resources to businesses so they can make products safe for consumers, and invest in green economic development to spur innovation in products that are safe for consumers

Recommendations for Parents

Most plastic baby bottles are made from polycarbonate plastic, as are many popular reusable water bottles (like some Nalgene water bottles). You can reduce your child's and your own exposure to BPA by taking the following steps:

- Use glass, or polypropylene bottles (the #5 plastic) instead of polycarbonate (hard, shiny, clear or tinted plastic, usually with a number 7 or "PC" on the bottom/underside) bottles
- If you continue to use polycarbonate bottles, do not use harsh detergents or put bottles in the dishwasher. Instead, clean them with

warm soapy water and a sponge. Scouring brushes can scratch the surface of the bottles and increase leaching rates

- Avoid heating foods in polycarbonate containers, as bisphenol A tends to leach faster with higher temperatures. Use glass or ceramic containers instead
- Avoid use of infant formula brands in cans that use BPA as an epoxy liner (<http://www.ewg.org/reports/infantformula>)
- Cut back on consumption of canned foods and beverages to reduce exposure to bisphenol A contamination from the interior coating of the container. Also, avoid canned foods with higher fat content, which may have higher levels of bisphenol A

We believe cautionary action is necessary to help ensure the health and well-being of future generations. Removing bisphenol A from products marketed to infants and children is an important step.



References

- 1 Richter, C.A. et al. In vivo effects of bisphenol A in laboratory rodent studies. *Reproductive Toxicology*, Volume 24, Issue 2, August-September 2007, pp. 199–224.
- 2 Vandenberg, L.N. 2007. Human exposure to bisphenol A. *Reproductive Toxicology* 24:139-177.
- 3 Gibson, R.L. 2007. *Toxic Baby Bottles: Scientific study finds leaching chemicals in clear plastic baby bottles*. Environment California Research & Policy Center.
- 4 Welshon, W.V., Nagel, S.C., vom Saal, F.S. 2006. Large effects from small exposures. III. Endo-crine mechanisms mediating effects of bisphenol A at levels of human exposure. *Endocrinology* 147(6): s56-s69.
- 5 Center for the Evaluation of Risks to Human Reproduction. 2007. NTP-CERHR expert panel report on the reproductive and developmental toxicity of bisphenol A. U.S. Department of Health and Human Services.
- 6 Colborn, T., Dumanoski, D., and Myers, J.P. 1997. *Our Stolen Future*. p. 52.
- 7 vom Saal, F. 2006. Bisphenol A eliminates brain and behavior sex dimorphisms in mice: how low can you go? *Endocrinology* 147(8): 3679-3680.
- 8 Science News.org: http://www.sciencenews.org/pages/sn_arc99/7_24_99/food.htm. (Accessed January 28, 2008.)
- 9 Calafat, A.M., et al. 2005. Urinary Concentrations of Bisphenol A and 4-Nonylphenol in a Human Reference Population. *Environmental Health Perspectives* 113:391-395.
- 10 Calafat, A.M., et al. 2008. *Environmental Health Perspectives*. Vol. 116, pp. 39–44.
- 11 Gibson, R.L. 2007. *Toxic Baby Bottles: Scientific study finds leaching chemicals in clear plastic baby bottles*. Environment California Research & Policy Center.
- 12 University of Cincinnati. 2008. Plastic Bottles Release Potentially Harmful Chemicals (Bisphenol A) After Contact With Hot Liquids. ScienceDaily. Retrieved January 30, 2008, from <http://www.sciencedaily.com/releases/2008/01/080130092108.htm>
- 13 Environmental Working Group. 2007. EWG's guide to infant formula. Retrieved January 30, 2008 from <http://www.ewg.org/reports/infantformula>.
- 14 vom Saal F. 2007. Chapel Hill bisphenol A expert panel consensus statement: Integration of mechanisms, effects in animals and potential to impact human health at current levels of exposure. *Reproductive Toxicology* 24:131–138.
- 15 vom Saal, F. and Hughes, C. 2005. An extensive new literature concerning low-dose effects of bisphenol A shows the need for a new risk assessment. *Environmental Health Perspectives* 113(8): 926-933.
- 16 Gould, J.C., Leonard, L.S., Maness, S.C., Wagner, B.L., Conner, K., Zacharewski, T., Safe S., McDonnell, D.P., Gaido, K.W. 1998. Bisphenol A interacts with the estrogen receptor α in a distinct manner from estradiol. *Mol Cell Endocrinol* 142:203-214.
- 17 Gibson, R.L., 2007. *Toxic Baby Bottles: Scientific study finds leaching chemicals in clear plastic baby bottles*. Environment California Research & Policy Center.
- 18 Centre for the Evaluation of Risks to Human Reproduction. 2007. NTP-CERHR Expert panel report on the reproductive and developmental toxicity of bisphenol A. National Institute of Environmental Health Sciences.
- 19 vom Saal, F.S. 2007. Chapel Hill bisphenol A expert panel consensus statement: Integration of mechanisms, effects in animals and potential to impact human health at current levels of exposure. *Reproductive Toxicology* 24(2):1-26.
- 20 vom Saal, F. and Hughes, C.. 2005. An extensive new literature concerning low-dose effects of bisphenol A shows the need for a new risk assessment. *Environmental Health Perspectives* 113(8): 926-933.
- 21 Rubin B.S., Lenkowski J.R., Schaeberle, C.M., Vandenberg, L.N., Ronsheim, P.M., Soto, A.M. 2006. Evidence of altered brain sexual differentiation in mice exposed perinatally to low environmentally relevant levels of bisphenol A. *Endocrinology* 147:3681-3691.
- 22 Hunt, P., et al. 2003. Bisphenol A exposure causes meiotic aneuploidy in the female mouse. *Current Biology* 13(7): 546-553.

- 23 Sugiura-Ogasawara, M., et al. 2005. Exposure to bisphenol A is associated with recurrent miscarriage. *Human Reproduction* 20:2325-2329.
- 24 Moriyama, K., et al. 2002. Thyroid hormone action is disrupted by bisphenol A as an antagonist. *Journal of Clinical Endocrinology Metabol* 87: 5185-5190.
- 25 Welshon, W.V., Nagel, S.C., vom Saal, F.S. 2006. Large effects from small exposures. III. Endocrine mechanisms mediating effects of bisphenol A at levels of human exposure. *Endocrinology* 147(6): s56-s69.
- 26 Wetherill, Y.B., Akingbemi, B.T., Kanno, J., McLachlan, J.A., Nadal, A., Sonnenschein, C., Watson, C.S., Zoeller, R.T., Belcher, S.M. 2007. In vitro molecular mechanisms of bisphenol A action. *Reproductive Toxicology* 24:178-198.
- 27 Calafat, A.M., et al. 2005. Urinary Concentrations of bisphenol A and 4-nonylphenol in a human reference population. *113(4):391-95.*
- 28 Center for the Evaluation of Risks to Human Reproduction. 2007. NTP-CERHR expert panel report on the reproductive and developmental toxicity of bisphenol A. U.S. Department of Health and Human Services.
- 29 Vandenberg, L.N., Hauser, R., Marcus, M., Olea, N., Welshons, W.V. 2007. Human exposure to bisphenol A (BPA). *Reproductive Toxicology* 24:139-177.
- 30 Kurebayashi, H., et al. 2005. Disposition of low doses of 14C-bisphenol A in male, female, pregnant, fetal, and neonatal rats. *Archives of Toxicology*. 79:243-252.
- 31 The Commonweal Biomonitoring Resource Center and the Body Burden Working Group. 2007. *Is It In Us! Chemical Contamination in Our Bodies: Toxic Trespass, Regulatory Failure and Opportunities for Action*. <http://www.isitinus.org>. (Accessed January 23, 2007.)
- 32 Center for the Evaluation of Risks to Human Reproduction. 2007. NTP-CERHR expert panel report on the reproductive and developmental toxicity of bisphenol A. U.S. Department of Health and Human Services.
- 33 Environmental Working Group. 2007. Bisphenol A: toxic plastics chemical in canned food. www.ewg.org/reports/bisphenola. (Accessed January 5, 2008.)
- 34 University of Cincinnati. 2008. Plastic Bottles Release Potentially Harmful Chemicals (Bisphenol A) After Contact With Hot Liquids. ScienceDaily. <http://www.sciencedaily.com/releases/2008/01/080130092108.htm>. (Retrieved January 30, 2008.)
- 35 Wilson, N.K., et al. 2007. An observational study of the potential exposures of preschool children to pentachlorophenol, bisphenol-A, and nonylphenol at home and daycare. *Environmental Research* 103:9-20.
- 36 Center for the Evaluation of Risks to Human Reproduction. 2007. NTP-CERHR expert panel report on the reproductive and developmental toxicity of bisphenol A. U.S. Department of Health and Human Services.
- 37 vom Saal, F.S., Welshons, W.V. 2006. Large effects from small exposures. The importance of positive controls in low-dose research on bisphenol A. *Environmental Research* 100:50-76.
- 38 Wilson, N.K., et al. 2007. An observational study of the potential exposures of preschool children to pentachlorophenol, bisphenol-A, and nonylphenol at home and daycare. *Environmental Research* 103:9-20.
- 39 Welshon, W.V., Nagel, S.C., vom Saal, F.S. 2006. Large effects from small exposures. Endocrine mechanisms mediating effects of bisphenol A at levels of human exposure. *Endocrinology* 147(6): s56-s69.
- 40 *Ibid.*
- 41 Brede, C., Fjeldal, P., Skjevraak, I., Herikstad, H. 2003. Increased migration levels of bisphenol A from polycarbonate baby bottles after dishwashing, boiling and brushing. *Food Addit. Contamin.* 20: 684-689.
- 42 *Ibid.*
- 43 Carey, F.A. 2003. Reactions of esters: a review and a preview. *Organic Chemistry*. Chapter 20. McGraw-Hill, Boston.
- 44 Whole Foods Market. Bisphenol A. <http://www.wholefoodsmarket.com/foodsafety/bpa.html>. (Accessed January 23, 2007.)

- 45 Reuters.com. Whole Foods Market Stock Description. <http://stocks.us.reuters.com/stocks/fullDescription.asp?rpc=66&symbol=WFMI.O>. (Accessed January 23, 2007.)
- 46 Kuchmen, A. January 14, 2008. The Baby Bottle Blues. *Newsweek*.
- 47 Born Free website. <http://www.newbornfree.com>. (Accessed January 27, 2008).
- 48 Medela. Confused About Bisphenol A? <http://www.medela.com/whats-new/23/confused-about-bisphenol-a>. (Accessed January 27, 2008.)
- 49 Dobbin, B. December 23, 2007. *Polycarbonate Bottles Raise Questions*. Associated Press.
- 50 Environmental Defence. December 18, 2007. Second Major Canadian Retailer Stops Selling Bisphenol A Bottles. Press Release.
- 51 Voiland, A. August 8, 2007. How to Avoid a Controversial Plastics Chemical. *US News & World Report*.
- 52 Committee on Energy and Commerce, Rep. John D. Dingell, Chairman. January 17, 2008. Committee to Investigate Chemical in Infant Formula Liners. Press Release.
- 53 California Office of Environmental Health Hazard Assessment. January 18, 2008. Announcement of Chemicals Selected by OEHHA for Consideration for Listing by the Developmental and Reproductive Toxicant Identification Committee and Request for Relevant Information on the Developmental and Reproductive Toxicity of These Chemicals: Bisphenol-A; Chlorpyrifos, Chromium, DDE, Sulfur dioxide.
- 54 Correspondence with Sarah Uhl, Clean Water Action. January 2008.
- 55 Correspondence with Adam Schafer, National Caucus of Environmental Legislators. January 2008.
- 56 Correspondence with Harris Parnell, Toxics Action Center. January 2008.
- 57 Correspondence with Davis Kosmos, Maryland Public Interest Research Group. January 2008.
- 58 Correspondence with Cindy Luppi, Clean Water Action. January 2008.
- 59 Correspondence with Lindsay Dahl, Healthy Legacy. January 2008.
- 60 Correspondence with Kathleen Curtis, Clean New York. January 2008.
- 61 Correspondence with Environmental Defence (Canada). January 2008.

APPENDIX 1 Retail Locations

1. Avent, 9 oz size, purchased at Target on 12/03/07
1057 Eastshore Hwy, Albany CA
2. Avent Airflex, 9 oz size, purchased at CVS Pharmacy on 12/03/07
333 Washington St, Boston MA
3. Avent, 9 oz size purchased at Walgreens on 12/03/07
3229 E State St ,Hermitage PA
4. Disney/The First Years, 8 oz size purchased at Walgreens on 12/03/07
3229 E State St , Hermitage, PA
5. Dr. Brown's, 8 oz size purchased at Wal-Mart on 12/03/07
State Route 7, Cobleskill NY
6. Dr. Brown's Natural Flow, 4oz size, purchased at Babies"R"Us on 12/03/07
7805 SW Dartmouth, Tigard OR
7. Dr. Brown's Natural Flow, 4oz size, purchased at Target on 12/03/07
Country Road B, Roseville MN
8. Evenflo Classic Custom Flow, 8oz size, purchased at Target on 11/07/07
475 Hartford Rd, New Britain CT
9. Evenflo Classic Tinted 3-Pack, 8oz size, purchased at Target on 12/02/07
Topsham Fair Mall, Topsham ME
10. Evenflo Classic Tinted, 8oz size, purchased at Toys"R"Us on 12/04/07
Northgate Plaza, Seattle WA

APPENDIX 2 Sampling and Analytical Methodology

Laboratory

Division of Biological Sciences, University of Missouri-Columbia, XenoAnalytical LLC, conducted the analysis for bisphenol A for the *Toxic Baby Bottles* report.

Sample preparation date

11/20/2007, 11/26/2007

Assay date

11/28/2007

Baby bottles were analyzed for bisphenol A by HPLC with CoulArray detection. The detection limit was 0.05 nanograms. The standard curve ranged from 0.06–4 nanograms.

Bottles were rinsed five times with chlorine-free water, and then filled with water and incubated for 24 hours. Two tests were conducted; all bottles were first tested at room temperature and then at placed at 80°C. Water in glass bottles, either untreated or spiked with bisphenol A (6 ng/ml), were run as negative and positive controls, respectively. The 24-hour leachates were concentrated using C18 Sep-pak vac cartridges, and the eluted material was examined using high performance liquid chromatography with CoulArray detection.

Bisphenol A concentrations expressed as ng/mL, equivalent to parts per billion (ppb), in liquid of filled bottle. Recoveries in positive controls (Cp1-3) averaged 104 per cent at room temperature, 93 per cent when heated. Data values are corrected to 100 per cent recovery.

APPENDIX 3

Scientific Data (Baby Bottles bought in Canada and the U.S.)

Individual Data For Baby Bottles Bought In Canada

		ng BPA / ml liquid	
Assay controls	Sample	Room Temperature	Heated
	Cn1	ND	ND
	Cn2	ND	ND
	Cn3	ND	ND
	Cp1	6.806	5.694
	Cp2	5.880	6.838
	Cp3	6.513	6.668
	Bottle samples	Gerber1	ND
Gerber2		ND	7.805
Gerber3		ND	6.495
Avent1		0.012	7.439
Avent2		ND	8.323
Avent3		0.009	7.029
Playtex1		0.044	4.294
Playtex2		0.037	6.578
Playtex3		0.063	5.004

Individual Data For Baby Bottles Bought In the U.S.

		ng BPA / ml liquid	
Assay controls	Sample	Room Temperature	Heated
	Cn1	ND	
	Cn2	ND	
	Cn3	ND	
	Cp1	8.820	
	Cp2	7.620	
	Cp3	8.440	
Bottle samples	G1	ND	4.775
	G2	ND	5.159
	G3	ND	6.981
	A1	ND	5.756
	A2	ND	8.307
	A3	ND	7.167
	P1	ND	6.189
	P2	ND	7.010
	P3	ND	5.579
	D1	ND	6.405

AVERAGE VALUES FOR EACH BOTTLE TYPE				
Sample	Room Temperature, ng/ml		Heated, ng/ml	
	Mean	SEM	Mean	SEM
Gerber	0.00	0.00	6.78	0.38
Avent	0.01	0.00	7.07	0.36
Playtex	0.05	0.01	4.92	0.63

The bottle samples were submitted as individual samples but fell into three different groups based on brand. Below are represented the average BPA values for each brand.

Mean (+ Standard error of the mean), SEM Bisphenol A concentrations in the water in bottles held at room temperature (left) or at 80oC (right) for 24 hours, Results are expressed as ng/mL in the incubation water, equivalent to micrograms/liter (ug/L) or parts per billion (ppb).

AVERAGE VALUES FOR EACH BOTTLE TYPE				
Sample	Room Temperature, ng/ml		Heated, ng/ml	
	Mean	SEM	Mean	SEM
Avent	0.00	0.00	5.64	0.68
Dr. Brown	0.00	0.00	7.08	0.74
Evenflo	0.00	0.00	6.26	0.41
Disney/FY	0.00		6.41	

The bottle samples were submitted as individual samples but fell into four different groups based on brand. Below are represented the average BPA values for each brand.

Bisphenol A concentrations in the water in bottles held at room temperature (left) or at 80oC (right) for 24 hours, Results are expressed as ng/mL in the incubation water, equivalent to micrograms/liter (ug/L) or parts per billion (ppb).



BABY'S TOXIC BOTTLE

Bisphenol A Leaching from Popular Baby Bottles

Brought to you by The Work Group for Safe Markets,
a coalition of U.S. public health and environmental NGOs including:

Alliance for a Healthy Tomorrow
Boston Common Asset Management
Breast Cancer Fund
Center for Health, Environment and Justice
Clean New York
Clean Water Action
Environment America
Environmental Defence (Canada)
Environmental Health Fund
Environmental Health Strategy Center
Healthy Legacy
Learning Disabilities Association of America
MOMS (Making Our Milk Safe)
Oregon Environmental Council
US PIRG

FOR MORE INFORMATION CONTACT:

Mia Davis, Clean Water Fund, 262 Washington Street, #301, Boston, MA 02108 • 617/338-8131 • miadavis@cleanwater.org
Mike Schade, Center for Health, Environment and Justice, 9 Murray Street, Floor 3, New York, NY 10007 • 212/964-3680 • mike@besafenet.com

www.babystoxicbottle.org