

Can plastic make you sick?



by Dr Rye Senjen, chemical campaigner, Friends of the Earth Australia

The use of plastics has become one of the defining characteristics of modern life. Few of us can imagine living without plastics. Plastic is used in most consumer products, in food packaging, car parts, microwaves and CD packaging to name just a few applications.

Most of the clear, shatterproof plastics used in baby bottles, food storage containers, small kitchen appliances and hard plastic water bottles are made of a plastic which contain the chemical bisphenol A or BPA. Bisphenol A is also used in epoxy resin, as a lining of food, beer and soft drink aluminum and tin cans (see Table 1).

BPA leaches into our food

Unfortunately, BPA leaches from plastic containers into foods and liquids and seeps out of food can linings. The scientific literature

confirms that BPA is leached from countless consumer products and food contact materials and is released during its production into the environment (see Table 2). The amount of BPA that leaches is related to the type of food or liquid, the temperature and the heating time. Alarming,ly, this leaching occurs under normal conditions of use.

Leached BPA has been detected in vegetables, fish, fruit (including fresh), canned instant coffee, powdered milk and infant formula, canned milk and honey. BPA has also been found to migrate from polyvinyl chloride or PVC hoses and water storage tanks, contributing to the possible contamination of drinking water. An unexpected source of BPA may be fresh fruit and vegetables grown in greenhouses, as the chemical appears to migrate from the PVC panels used for the walls of greenhouses into the indoor atmosphere.

Table 1: Examples of consumer products containing bisphenol A

Polycarbonate Plastics (65% of use)	Epoxy Resins (30% of use)	Other Uses (5% of use)
Impact-resistant glazing	Coatings	Pesticide formulations
Street-light globes	Food & beverage can linings	Antioxidant
Household appliance parts	Electrical laminates for printed circuit boards	Flame retardant
Components of electrical/ electronic devices	Composites	Brake fluid
Compact discs	Adhesives	Rubber & PVC stabiliser
Automotive applications	Paints	Water supply pipes
Reusable bottles	Nail polish	Dental sealant.
Food and drink containers		Thermal paper additive
Sunglasses		Water main filters
Refrigerator shelving		Reinforced pipes
Microwave ovenware		Electric insulators
Eating utensils		Floorings

Sources: Bro-Rasmussen 2006, Weise and Szabo 2008, Endocrine/Estrogen Letter 2003

The potential overall environmental contamination due to BPA production is considerable and largely unacknowledged. BPA has been found in freshwater, seawater, landfill leachates (the liquid that drains from landfill), air, and dust particles. Human exposure to BPA is worldwide and pervasive. Numerous studies have found BPA in human serum, urine, amniotic fluid, follicular fluid, placental tissue, and umbilical cord blood despite the chemical being metabolised (ie. broken down) in the human body within 6 hours. The conclusion is that we are continuously and permanently exposed to quantities of BPA through the food we consume and the liquids we drink.

Bisphenol A is implicated in many diseases from cancer to obesity

Scientific research has shown again and again that BPA is a known and proven endocrine disrupting chemical (a chemical that disturbs the hormone system). A 2007 scientific review linked exposure to BPA with an increased risk of cancer of the hematopoietic system (eg. marrow, spleen, tonsils, and lymph nodes), a significant increase in cell tumours of the testes and an alteration of the number of chromosomes in some cells and tissues (potentially leading to mutations and ultimately cancer). Additionally, early life exposure may induce or predispose humans to an increased risk of breast cancer. When exposure occurs during foetal or early childhood development, BPA may increase a person's susceptibility to cancer in later life by affecting their genetic developmental 'programming'.

Alarmingly, a 2007 study showed that BPA can alter how genes are expressed (ie. turned on or off) and that "low-dose BPA exposure during pregnancy has multi-generational consequences: it increases the likelihood of chromosomally abnormal grandchildren". In humans, abnormal chromosomes may lead to miscarriages, death soon after birth or conditions such as Down's syndrome and Turner syndrome.

Barely a month goes by without new scientific studies being released linking BPA to a variety of human health problems. A study published in September 2008 linked bisphenol A to heart disease, diabetes, and liver abnormalities in adults. A further study released in October 2008 found that BPA interferes with chemotherapy used to treat breast cancer, raising the possibility

that the chemical undermines the efficacy of cancer-fighting drugs.

While the amount of BPA ingested is incredibly small, it is very significant

One of the key arguments of the chemical and plastics industry and most governments (including our own) is that the amount of BPA we ingest is so incredibly small that we do not have to worry about it. It is the traditional idea that the greater the amount of a poison, the more harmful it is.

New understanding about how hormones act at extremely low concentrations is putting "the dose makes the poison" credo into a whole new and much more sophisticated context. It is now indisputable that endocrine disrupting chemicals, such as Bisphenol A, can interfere with the body's hormonal system by acting like natural human hormones at concentrations much lower than those at which other toxic chemicals have an impact.

Industry and government have for years run a disinformation campaign

Food Standards Australia & New Zealand (FSANZ), along with the relevant government organisations in Europe and the US continue to proclaim the safety of food plastics containing BPA. The industry even has a disinformation website of its own: www.bisphenol-a.org/human/index.html. Its pronouncements are at times astonishing given that the overwhelming scientific evidence from independent studies (i.e. not industry studies) clearly points to the dangers of BPA.

In this respect BPA is rather reminiscent of the tobacco industry campaign that aimed to deny the health hazards of smoking. Manufacturing doubt is one of the methods used by industry to advance their economic and political causes. In the case of BPA, the tactic appears to have been to deny, delay and/or dismiss research on low dose effects, primarily by conducting industry studies that somehow were unable to replicate 'low dose' effects. As numerous independent 'low dose' studies found effects on hormone sensitive tissues and systems below safety standards, the industry begun to argue that the reported results did not apply to humans, due to the different physiological characteristics

Table 2: Major sources and modes of bisphenol A exposure

Product	How
Baby bottles	Leaching from bottle into milk increases with the temperature of the content, length of contact with the bottle and significantly after repeated use.
Polycarbonate plastic bottles	55 fold increase in leaching when filled with boiling water.
Microwave plastic containers	Leaching increases with heating of containers
Polyvinyl chloride plastic wraps	Leaching observed when in contact with water, olive oil or acetic acid.
Paper towels from recycled paper	Bisphenol A is used in the production of thermal paper. Different types of recycled paper contain very different levels of BPA.
Polycarbonate plastic tubing	Leaching levels greatest in river water
Canned food lining	Leaching into foods, including vegetables, fish, fruit, instant coffee, powdered milk and infant formula.
Fresh food	Leaching from PVC in glass house panels via air onto fruit and vegetables.

Sources: as cited by Vandenberg et al. 2007, Lopez-Espinoza et al. 2007, Le et al. 2008.

of humans and animals. The overall effect has been an industry-led effort to determine what constitutes legitimate, relevant, and reliable scientific research and to delay proper regulation of dangerous chemical substances for as long as possible.

Governments have played along with industry. For instance, the European Food Safety Authority (EFSA) AFC Panel (food additives, flavourings, processing aids and materials in contact with food) confirmed its opinion on the safety of dietary exposure to BPA in early 2007. But can an opinion be trusted when it relies on an industry-funded study that had not been published and peer reviewed at the time of the EFSA review? The panel also failed to invite experts on 'low dose' BPA effects or endocrine disruptors to provide their opinion. Finally, the panel was composed of 'experts' with industry links, including the plastics industry and an industry-funded NGO (non-government organisation). The EU scientific assessment process appeared to lack proper governance, transparency and guidelines and may have been unduly influenced by industry interests.

The tide is turning – BPA will be banned

There is broad scientific consensus that human exposure to, and contamination with, BPA is widespread around the world and at much higher levels than expected for a chemical supposed to be metabolised (ie. broken down) in the human body within 6 hours. Due to the growing body of scientific evidence and thanks to the continued efforts of civil society, the regulatory landscape for BPA in the US and Canada is gradually beginning to catch up with scientific research.

Foreshadowed for some months, on the 18 October 2008, Canada became the first country to formally declare BPA hazardous to human health. It officially informed the baby-product industry it will no longer be able to use the chemical in baby bottles (by 2009).

Will our regulators follow?

Demand change: engage with retailers, producers and government

- **Always read the labels.** Sometimes a company declares that their product is free of BPA. Avoid buying products that do not declare the content of their products.
- **Ask your retailer to stop using and selling polycarbonate food contact materials.** Write to them with this request.
- **Contact the manufacturer** and ask them whether the food contact material contains BPA. Tell them that you will stop buying their products, if it does.
- **Write to Food Standards Australia & New Zealand (FSANZ)** to request that they review their opinion on BPA. **Ask them to ban BPA for use in all food contact material immediately.**
- **Write to your member of parliament and ask them to take action on BPA.** Ask them to support a bill that bans the use of BPA for use in all food contact material.

What you can do to reduce BPA exposure: choose safe options

Whenever possible: choose safe options

- Store food in glass, ceramic or stainless steel containers.
- Buy fresh local products; try to avoid fruit and vegetables grown in greenhouses.

If you need to use plastic that comes into contact with food, choose safer options where possible. Avoid plastics with recycling codes no. 3, 6 or 7

- No. 7 (other plastics) may contain bisphenol A and are best avoided. Additionally take care and avoid PVC (no. 3) and polystyrene (no. 6), as the possible residues (vinyl chloride and styrene) may also be harmful.

Avoid heating foods or drinks in plastic containers

- Avoid heating all plastics, irrespective of their recycling numbers.
- If you need to store heated food or liquid in plastic containers, wait until the food has cooled down before transferring it.

Avoid canned food and foods grown in plastic greenhouses.

Caution: food wrapping

- Commercially-wrapped foods in delis and supermarkets may be wrapped in PVC, which we recommend you avoid.
- Some of the commercial wraps sold for home use are made from polyethylene (no. 4), which are probably ok.

Caution: unlabelled could mean unsafe

- Many plastic items are unlabelled and the only way to find out what they are made of is by contacting the manufacturer.
- We encourage you to do so and to express your concerns.
- In the absence of information, avoid using plastics where possible. The safer alternatives are glass and stainless steel.

Take care with all plastic products

- Take plastic products to recycling stations where possible.
- Ask your dentist to use dental sealants that do not contain BPA.

Plastic Code Quick Guide

Avoid: 3, 6, 7

- No. 3 PVC (polyvinyl chloride)
- No. 6 PS (polystyrene)
- No. 7 PC (polycarbonate)

Probably Safe: 1, 2, 4, 5

- No. 1 PET (polyethylene terephthalate)
- No. 2 HDPE (High-density polyethylene)
- No. 4 LDPE (Low-density polyethylene)
- No. 5 PP (Polypropylene)



Note: No. 7 is the general code for 'other plastics' and may therefore include many sorts of plastics. When followed by the letter PC, it clearly indicates polycarbonate plastics, which contain BPA and should therefore be avoided.

Dr Rye Senjen researches and writes on behalf of the Friends of the Earth Australia (www.foe.org.au). Her many areas of interest are nanotechnology and chemicals in the environment and she is a regular contributor to Living Wisdom magazine and many other trade and consumer publications.

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