Breast Cancer UK
Preventing breast cancer

BCUK Fact Sheet | Bisphenol A (BPA)

What is Bisphenol A?

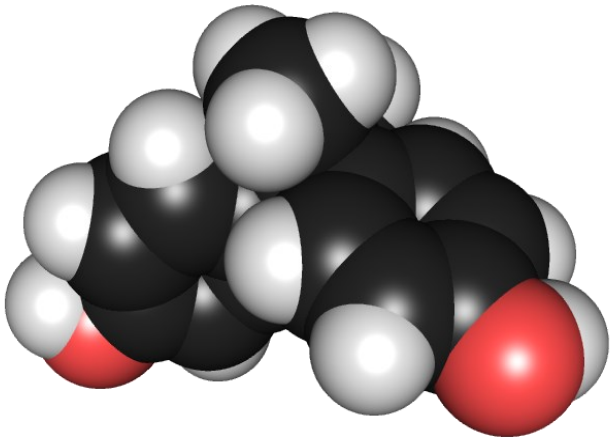
Bisphenol A (BPA) is a man-made chemical. It was first synthesised in 1890 and was originally used to fatten cattle and poultry. The chemical structure of BPA is similar to that of natural oestrogen and the drug Diethylstilboestrol (DES), both of which have been classified as class I, 'known human carcinogens' by the International Association for Research on Cancer (IARC).

BPA was recognised as being an artificial oestrogen as early as 1930 and preceded the use of DES as a synthetic oestrogen by 30 years. BPA's properties as a plasticiser were not discovered until after World War One, when it was found to react with phosgene and yield a clear, hard plastic polycarbonate.

Chemical production of BPA is now big business. Over 3 billion kilogrammes are produced each year and it is estimated to be worth nearly £340,000 an hour to the global economy (1). The production of BPA has increased by 500% in the last three decades and continues to rise.

Where is it found?

BPA is used in polycarbonate plastic food and drink packaging and in epoxy resins that line some metal cans of food and drink. BPA is also used as an additive in polyvinyl chloride (PVC) plastics, CDs, mobile phone and computer casings, glasses, dental sealants, medical devices (2) and thermal till receipts.



Why should we be concerned?

BPA is able to migrate. It can rub off on hands, leach into food and drink contents (3) and is dermally absorbed through the skin. This is because the chemical bonds between the monomers, or individual chemicals within articles or products in which BPA is used, are not stable.

Exposure to ultra-violet light, high temperatures (such as those used in sterilisation processes), or to acidic conditions (for example, in a can of tinned tomatoes), will lead to higher levels of leaching.

BPA is ubiquitous. It is found all over the planet in ecosystems and wildlife (4). It is estimated to be present in over 99.5% of the adult population (5) and has been found in human urine samples (6), human serum (7), sweat (8), placental tissue (9), ovarian follicular fluid and evidence suggests it accumulates over time in human amniotic fluid (10).

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It has also been found in human breast milk (11), which confirms its presence in the breast, and at even higher levels in liver, brain and human fat tissue (12).

There is sufficient evidence to suggest that dietary exposure is the main route of human exposure to BPA, along with regular contact with thermal receipt paper (13).

Whilst proponents of BPA claim that it is safe to use because human levels of exposure are low, evidence suggests that BPA is harmful even at very low levels of exposure (14, 15). BPA gives rise to 'non monotonic' dose responses, which means that it has varying effects at different doses. Therefore, the application of so-called Tolerable Daily Intakes (TDIs) (16) of BPA, which have been predicted from higher doses to permit its continued use in everyday products, may well be unsafe for the consumer.

How is BPA linked with breast cancer?

There is a significant amount of scientific evidence that shows even low level exposure BPA has an adverse effect on the development of breast tissue. Laboratory experiments show that BPA has the ability to transform normal breast cells into cells of a more cancerous or overall malignant nature (17, 18, 19). Animal studies show that exposure to BPA in the womb, or during early life, can increase breast density, cell growth and increase susceptibility to tumours (20, 21, 22, 23, 24, 25). BPA has also been found to trigger DNA strand breaks, to interfere with cell division (26, 27) and with chemotherapy, making it less effective against breast cancers (28).

Like DES, BPA is a synthetic oestrogen and is able to bind to oestrogen receptors both within and on the cell surface. BPA is therefore able to influence how genes and cells behave. Mammary tissues are primed to respond to the presence of oestrogen in order to develop and grow and therefore bind easily to BPA.

Links to other diseases

As well as being linked to breast cancer, BPA is also linked to a range of other conditions including obesity (29), heart disease and cardiovascular problems (30, 31), infertility (32), diabetes (33) and recurrent miscarriage (34).

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What is the current regulatory position on BPA?

The European Commission decided to ban the use of BPA in baby bottles in March 2011 (35), because of concerns about the adverse effect of BPA on human health. It continues to be used, however, in a wide range of other food and drinks packaging.

A recent assessment of the risks to human health of BPA by the European Food Safety Authority (EFSA) conceded that it is likely to have an adverse affect on the kidney, liver and adverse effects on the mammary gland (36). EFSA has, therefore, recommended that the TDI for BPA should be reduced ten fold.

France took unilateral action in December 2012 to ban the use of BPA in food and drinks packaging and in thermal receipt paper. This legislation will come fully into force by January 2015. Sweden, Denmark and Belgium have all taken measures to reduce the use of BPA in products marketed at children under three years old.

What is Breast Cancer UK calling for?

- **The removal of the Tolerable Daily Intake (TDI) for BPA, as set by the EU;**
- **A ban on the use of BPA in all articles intended to come in to contact with food and drink, and its replacement with safer alternatives;**
- **A ban on the use of BPA in till and other printed receipt papers; and,**
- **A ban on the use of BPA in any products intended for children under three years old and its replacement with safer alternatives.**

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