

## newsletter

# Bisphenol A (BPA)

**Bisphenol A (BPA) is an industrially important chemical which has been abundantly and widely used for decades in the manufacture of plastics. However recent safety studies have reopened the question of whether there is a risk attached to products containing BPA. This particularly relates to plastic items whose surface comes in contact with food.**

### **Bisphenol A, general remarks, usage**

Millions of tonnes of bisphenol A (BPA, 2,2-bis(4-hydroxyphenyl)- propane, CAS NO. 80-05-7) have been employed industrially over a long period as a primary raw material for the manufacture of polycarbonate plastics (approx. 70%) and epoxy resins (approx. 25%). In smaller amounts, BPA is also required for the manufacture of polyamides, container linings, manufacture of thermal paper, tires and brake fluids or in the production and processing of PVC. Most BPA in Europe is produced by just four companies. It is used as a primary raw material by the reprocessing industry for a large number of finished products. Although polycarbonates are relatively expensive in comparison to other plastics, their special characteristics such as good light transmission, high levels of durability and heat resistance make them the preferred option for manufacturing a wide range of end products.

Examples of consumer products containing BPA are:

- coatings for food and beverage packaging, film packaging, bottle caps,
- epoxy resins for internal metal coatings, for example in water pipes, cans,
- plastic bowls, baby bottles, compact disks,
- anti-oxidant additive in plastics,
- plastic dental fillings, contact lenses,
- flame retardants (tetrabrombisphenol: TBBA),
- certain types of adhesive.

### **Toxicity, chronic toxicity, endocrine disruptors**

Extensive toxicological studies have been carried out on BPA and have shown it to be of low toxicity and non-irritant at acute exposure levels. No indications of any carcinogenic effects have been detected to date. However when taken in higher doses BPA can cause damage to the eyes and airways. A 2008 experimental study (Environmental Health Perspectives, 116, 2008) provided the first indications that BPA can impair the action of cytostatica in chemo-therapy for breast cancer, although a final evaluation remains to be carried out. In humans, BPA is converted rapidly into water soluble compounds by enzymatic action and excreted via urine.

Chronic toxicity, or exposure to small amounts over a long period, is of more significance. BPA belongs to the large group of chemicals known as 'endocrine disruptors'. By definition, endocrine disruptors are substances that interfere with the synthesis, transport, binding, action or elimination of natural hormones in the body, disrupting homeostasis (normal cell metabolism) and causing unwanted effects on reproduction, development, and/or behavior. The ultimate extent of the danger to health can however not yet be determined adequately.

*Lit.:* apropos – Endocrine disruptors, AssTech 2002.

**Current issues, risk assessment**

BPA’s action on the endocrine system has been the subject of controversy for many years. The literature contains a large number of studies, some of whose findings are contradictory or difficult to interpret. Current study results (cited in: information notes 036/2008, 048/2005 of the German Federal Institute for Risk Assessment, the BfR) have repeatedly led to public debate on the safety of consumer products containing BPA, particularly plastic baby bottles. For this reason a number of governmental bodies around the world have used the latest scientific data to reassess the potential effects of exposure to BPA on the endocrine system over the last two years:

Governmental bodies	USA <sup>1</sup>	Canada <sup>2</sup>	EU <sup>3</sup>	Actions taken by companies <sup>4</sup>
Adults	of minimum concern	no concern	no concern	Some leading companies have voluntarily ceased using BPA in products that come into contact with baby foods, beverages and food
Pregnant women/ unborn children	negligible concern	no concern	no concern	
Children	of some concern	potential risk	no concern	
Conclusion/ Actions	Further research needed/little concern remaining/no legislative action required	Further research needed/replace BPA wherever possible/ban on baby bottles containing BPA	Difficult to apply results from studies using animal experiments to humans/reconfirms 2006 risk assessment	

<sup>1</sup> Draft National Toxicology Program Brief on Bisphenol A, 2008

<sup>2</sup> Environment Canada Health Canada, Bisphenol A, 2008

<sup>3</sup> EFSA, Toxicokinetics of Bisphenol A, 2008; BfR, Information notes Nos. 036/2008, 048/2005

<sup>4</sup> leading companies in the relevant sector; selected examples

To summarize, all governments have come to the conclusion that a residual risk from exposure to BPA cannot be dismissed out of hand. The precise mechanisms by which it acts have not yet been clarified in detail and there is therefore a need for further research, particularly because the degree to which results based on animal experiments can be interpreted and applied to humans is limited.

The most stringent precautions are those taken by the Canadian government. They recommend that consumer products containing BPA are replaced with alternatives wherever possible and have brought in a total ban on the import and sale of baby bottles containing BPA. Some sectors of the industry have meanwhile voluntarily ceased to use BPA in certain consumer products that come into contact with food, or have announced that they will do so.

**Exposure assessment**

Generally, exposure is possible via the following routes:

- Work-related exposure: Persons are exposed during manufacture of BPA, polycarbonates and other products containing BPA,
- General population: Exposure via consumer products containing BPA (bottles, films, bags, packaging). In the USA, traces of BPA have been detected in the urine of 90% of the population (Environmental Health Perspectives, 116, 2008); the highest levels were found in children.

Potential risks, however, are assessed differently by the different governments (see table); safety levels consequently differ depending on the respective recommendations or bans.

- Environment: There is currently a low risk for the general population; BPA is neither persistent nor bioaccumulative

## Conclusion

BPA is a chemical which has been abundantly employed in large-scale industrial processes for decades as a primary raw material for the manufacture of specialized plastics and resins. BPA enters the human body through food which comes into contact with these plastics, for example via packaging and is subsequently detected in the urine of large sections of the population.

BPA is a so-called endocrinally active chemical, i.e. a chemical with hormone-like activity. Whether and to what extent this is of any significance for humans, and what risks it involves, has been the subject of controversy in the scientific community for many years. Following the precautionary principle, the Canadian government recently introduced a ban on baby bottles containing BPA and leading industrial conglomerates have announced that they will replace a number of plastics containing BPA in their products.

## Information for the underwriter

Plastics containing BPA are widely used in consumer materials. A fundamental problem remains in that, so far, it has not been possible to provide causal proof either of the harmlessness of or the potential risks of exposure to BPA. Consequently, any risk evaluation is associated with a high degree of uncertainty.

BPA is of particular relevance for underwriters in the product liability segment. It represents a typical long tail risk with potential for accumulated losses. BPA producers are exposed as well as manufacturers of end products containing BPA, particularly those whose products come into contact with food. The first complaints against such manufacturers have already been submitted in the USA.

It is likely that systematic studies of industrial chemicals such as those under the chemicals regulation REACH will identify more substances with previously unknown harmful characteristics. BPA is just one example of a chemical that has been used abundantly in products for decades even though its effect on humans is not yet fully understood and a definitive risk assessment cannot yet be made.

*Lit.:* REACH - the European Chemicals Regulation - a challenge for insurers; SwissRe 2008.

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