

Bisphenol A (BPA)

Bisphenol A (BPA) is an organic compound with the chemical formula $(\text{CH}_3)_2\text{C}(\text{C}_6\text{H}_4\text{OH})_2$. It is part of the bisphenols group of chemical compounds with two hydroxyphenyl functionalities. It is a colorless solid that is soluble in organic solvents, but poorly soluble in water. Having two phenol functional groups, it is used to make polycarbonate polymers and epoxy resins, along with other materials used to make plastics.

A 2010 report from the United States Food and Drug Administration (FDA) warned of possible hazards to fetuses, infants, and young children. In September 2010, Canada became the first country to declare BPA a toxic substance. The European Union, Canada, and recently the United States have banned BPA use in baby bottles.

The first large study of health effects on humans associated with bisphenol A exposure was published in September 2008 by Iain Lang and colleagues in the Journal of the American Medical Association. The cross-sectional study of almost 1,500 people assessed exposure to bisphenol A by looking at levels of the chemical in urine. The authors found that higher bisphenol A levels were significantly associated with heart disease, diabetes, and abnormally high levels of certain liver enzymes. An editorial in the same issue concludes:

"Based on this background information, the study by Lang et al,¹ while preliminary with regard to these diseases in humans, should spur US regulatory agencies to follow the recent action taken by Canadian regulatory agencies, which have declared BPA a "toxic chemical" requiring aggressive action to limit human and environmental exposures.⁴ Alternatively, Congressional action could follow the precedent set with the recent passage of federal legislation designed to limit exposures to another family of compounds, phthalates, also used in plastic. Like BPA,⁵ phthalates are detectable in virtually everyone in the United States.⁶ This bill moves US policy closer to the European model, in which industry must provide data on the safety of a chemical before it can be used in products."

A later similar study performed by the same group of scientists, published in January 2010, confirmed, despite of lower concentrations of BPA in the second study sample, an associated increased risk for heart disease but not for diabetes or liver enzymes. Patients with the highest levels of BPA in their urine carried a 33% increased risk of coronary heart disease. In 2012, David Melzer and colleagues also published a correlation between BPA levels in urine and heart disease. BPA exposure was higher in those with severe coronary artery stenoses compared to those with no vessel disease.

A Chinese human study conducted from May 15, 2009 to May 15, 2010 links BPA to noncancerous brain tumors. Those with higher urine BPA levels were about 1.6 times more likely to have meningioma compared to those with lower concentrations.

A 2011 study found higher BPA levels in women with polycystic ovary syndrome compared to controls. Furthermore, researchers found a statistically significant positive association between male sex hormones and BPA in these women, suggesting a potential role of BPA in ovarian dysfunction. A 2010 study found that people over age 18 with higher levels of BPA exposure had higher CMV antibody levels, which suggests their cell-mediated immune system may not be functioning properly.

In the U.S., consumption of soda, school lunches, and meals prepared outside the home was statistically significantly associated with higher urinary BPA.

BPA is also used to form epoxy resin coating of water pipes. In older buildings, such resin coatings are used to avoid replacement of deteriorating hot and cold water pipes.

Chlorine dioxide oxidize the BPA.