

Bisphenol A



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Bisphenol A is not found naturally in our environment; therefore it is a man-made molecule. First “made” by this man:

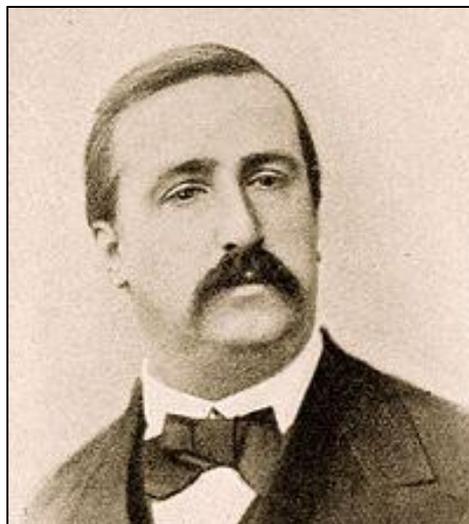
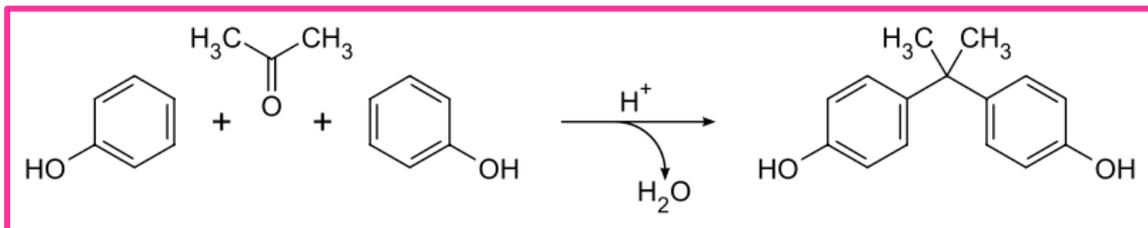


Fig. 1: Alexander Dianin

WHAT IS BPA?

4, 4'-(propane-2, 2'-diyl)diphenol, a.k.a. bisphenol A (BPA). It is synthesized by the condensation of acetone with two equivalents of phenol; this reaction requires a strong acid (*i.e.* HCl) to be used as a catalyst. It is very efficient and the only waste product is water. Industrially an excess of phenol is used to ensure complete condensation:



A LITTLE BIT OF HISTORY...

In the 1930's a British chemist, Charles Dodds, recognized BPA as an artificial estrogen, as their phenol groups are very similar. He then developed a drug for women and animals, which would be later forbidden because of the possibility of causing cancer.

Fig. 2: Sir Charles Edward Dodds

It has been used since 1957 due to chemical research at Bayer and General Electric, based on Thomas Zinckes' 1905 scientific publication at Marburg University in Germany, where he reported key physical properties but no applications.

WHERE CAN WE FIND IT?

BPA is an important industrial chemical, used primarily for polycarbonate plastics and epoxy resins.

Back in the 1980's the world's production capacity was set at 1 million tons. In 2003, in the United States alone, consumption was estimated at 856,000 tons worth of BPA, mostly because of its use in the plastic industry, only 21% was destined to be used in epoxy resins. Currently we manufacture 3.6 million tons annually.

We can find this molecule in many everyday products: baby/water bottles, sport equipment, dental fillings, thermal paper, cans... Fortunately, according to the latest estimates only 5% is found in consumer goods involved with nutrition and packaging.



But saying that BPA is used to manufacture plastic is too vague, where could we find this molecule?

Well, plastic is classified in 7 groups, being the seventh group where “all-others” are included. There still is no requirement for BPA labeling in most countries. It is found in PVC-3 as it is used as an antioxidant in plasticizers. However, it is more frequently encountered in PVC-7 because it is the main monomer involved in the production of PC-plastics and epoxy resins.

HEALTH ISSUES

FOR

VS

AGAINST

European Commission’s Scientific Committee on Food

EU’s European Chemicals Bureau

European Food Safety Authority

US Food and Drug Administration until 2012

Environmental Protection Agency

UK Food Standards Agency

The Chapel Hill Consensus Statement-US Government

The Endocrine Society

US Food and Drug Administration after 2012

Environmental Working Group

Natural Resources Defense Council

In the past years, BPA has been an interesting object of study, especially when it comes to health issues. As this molecule is a potent estrogen mimicker it is believed that it may have an influence on transcriptional gene **regulation**, and therefore on obesity.

Scientists have also published reviews on how it can bind itself to the thyroid **hormone** receptor and modify its functions. A 2010 review also concluded that endocrine disruptors, such as bisphenol A, play a role in the development of **cancer**.

It also affects reproductive systems; in males it has been observed how it reduces sperm count. BPA has been recommended to be avoided by women of reproductive age.

SO...WHAT SHOULD WE DO?

In 2008 the FDA released a report announcing that BPA was safe. It was followed by a growing concern about its link to neurological, developmental, and reproductive harm to children. It was then reported by the Integrity in Science Project that the main studies, on which the FDA based its analysis, were funded by the American Chemistry Council (industry trade group which includes BPA-producing companies). Meanwhile in many countries there is still no ban.

We should be able to have a critical eye on what we read and try to have our own point of view on the discussion.

We should try to get BPA out of food packaging, as already achieved in France.

References

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