Are structural analogues to bisphenol A a safe alternative?

Bisphenol A (BPA) is often used in polycarbonate plastics, coatings of food and drink cans, and in thermal papers. Foods are thought to be a major human exposure route and human biomonitoring data suggest widespread exposure.

BPA is suspected of contributing to effects such as increased birth weight, behavioral changes in children, cardiovascular disease, and diabetes. Regulatory initiatives and increased public awareness, related to the potential adverse effects of BPA, has led to an incitement to find alternative compounds. Structural analogues of BPA are available on the market, some of which are found in foods and have been measured in humans. Due to the structural analogy there is an inherent risk that these compounds may lead to similar effects as BPA.

The aim of this study was to characterize the toxicological profile of BPA and the five analogues using in vitro assays assessing effects on ER, AR, aryl hydrocarbon receptor (AhR), retinoic acid receptor (RAR) and glucocorticoid receptor (GR) activation, effects on steroidogenesis, potential to cause oxidative stress (Nrf2 assay) and genotoxic potential (P53 assay).

Overall the qualitative effects were similar for the BPs tested; however differences in quantitative effects were observed in some cases. All BPs showed antiandrogenic and estrogenic potential and potential to affect steroidogenesis. The site of interference in steroidogenesis appears specific. Results obtained from Nrf2, p53, and AhR reporter gene assays showed that some or all BPs have the potential to activate these assays at high concentrations (LOEC > 50 μM).

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