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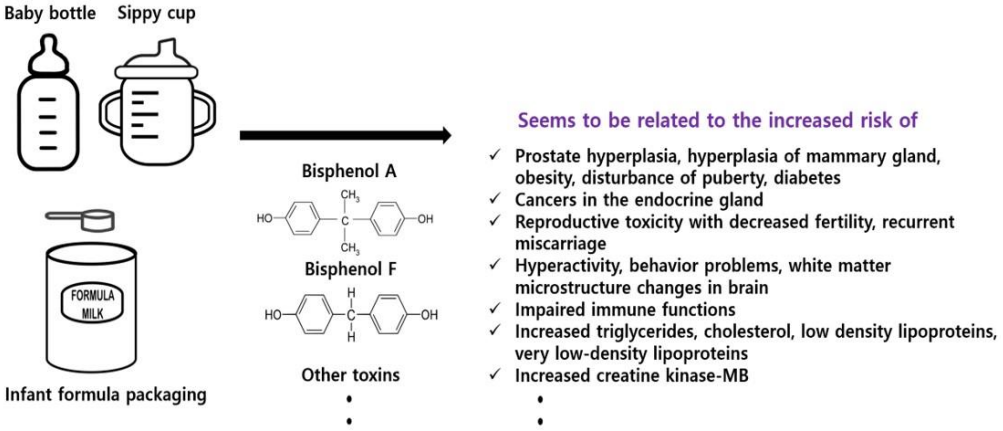
Bisphenol A leaching from polycarbonate baby bottles into baby food causes potential health issues

Key message

Can bisphenol A (BPA) leach out from polycarbonate baby bottles into baby food? BPA and other toxic materials can leach out from baby bottles and increase the risk of various health problems, including endocrine disturbances. Although the use of BPA in baby bottles has been banned, many developing countries still use it, which can cause health issues. Thus, public awareness of this issue is required.

Bisphenol A (BPA), first developed as a synthetic estrogen hormone, has been used in the manufacture of reusable plastic bottles or food and beverage can coatings such as polycarbonate baby bottles, sippy cups, and infant formula packaging since the 1960s. However, there has been increased awareness of its toxicity as an endocrine-disrupting chemical with estrogenic activity. BPA exposure seems related to an increased risk of cancers, impaired immune function, early puberty, obesity, diabetes, and hyperactivity.[1] Due to increasing concern about the toxicity of BPA exposure, the U.S. Food and Drug Administration (FDA) delivered the "Draft Assessment of the BPA for Use in Food Contact Applications."[2] In April 2010, the FDA raised concern about BPA exposure via a Center for Food Safety and Applied Nutrition report.[3] In July 2012, the FDA finally amended its regulations to "no longer provide for the use of BPA-based polycarbonate resins in baby bottles and sippy cups."[4] Although the use of BPA in baby bottles has been already banned by most countries, many developing countries still use it in the manufacture of plasticware such as baby bottles, sippy cups, and infant formula packaging, and the public awareness of this issue is lacking.

According to the National Toxicology Program Center for the Evaluation of Risks to Human Reproduction report, BPA has potential harmful effects on the brain, behavior, and prostate glands of fetuses and infants.[5] BPA, a known endocrine-disrupting chemical, has reproductive toxicity that decreases fertility in animal models.[6] BPA exposure is associated with recurrent miscarriage.[7] Antenatal exposure to BPA in pregnant women is related to white matter microstructure changes in their offspring that cause behavioral problems; this means that pregnant women and young infants are the most vulnerable to BPA toxicity.[8] BPA is also reportedly associated with various endocrine problems related to cancers of the endocrine gland, prostate hyperplasia, mammary gland hyperplasia, obesity, disturbed puberty, and precocious puberty. Pant et al.[9] reported that exposure to BPA-containing plastic baby bottles led to increased triglyceride, cholesterol, low-density lipoprotein, very low-density lipoprotein, creatine kinase-MB, and serum urea levels, indicating the toxicity of BPA to multiple organs. However, in this study, the control group was breastfed infants, and the study group was fed infant formula or bovine or goat milk via baby bottles. The feeding materials differed between the two groups. Therefore, it is difficult to conclude that the



Graphical abstract. Bisphenol A (BPA) can leach out from polycarbonate baby bottles, sippy cups, and infant formula packaging into baby food. Other toxic materials such as bisphenol F, bisphenol S, or phthalate can also leach out from BPA-free plasticware. These materials act as endocrine-disrupting chemicals and appear related to the increased risk of various health problems including endocrine disturbances.

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biochemical differences between the two groups were due to the leaching of toxic BPA from the plastic baby bottles. Despite some limitations, this study is important since it fosters public awareness of the toxicity of BPA that leaches from polycarbonate baby bottles.

BPA easily leaches from baby bottles, especially when washed with hot water in a dishwasher, washed with harsh alkaline detergents, dipped in boiling water for sterilizing, or heated in a microwave.[10] Therefore, young infants using BPA-containing plastic baby bottles may suffer sustained exposure to toxic BPA. Furthermore, with this incorrect handling practice, other toxic materials such as bisphenol F, bisphenol S, or phthalate can leach out from BPA-free plastic baby bottles. BPA, bisphenol S, and other toxins can leach out from type 7 plastic, including polycarbonate commonly used for baby bottles, sippy cups, medical storage containers, and metal food can linings.

Although the use of BPA in baby bottles has already been banned, many developing countries still use BPA in the manufacture of plasticware. Furthermore, other chemical substances can leach out from BPA-free plastic substitutes such as polypropylene (PP), polyethersulfone (PES), polyamide (PA), and silicone bottles while microwaving or washing in a dishwasher. Azacyclotridecan-2-one leaches from PA bottles,[11] 2,6-di-isopropylnaphthalene from PP bottles,[12] benzophenone from PES bottles, and phthalates from silicone bottles.[12] Thus, increased public awareness is crucial to ensure the safe use of plastic baby bottles, sippy cups, and food packaging and prevent the toxic effects of BPA and other chemical substances, especially in pregnant women, newborns, and young infants, who are most vulnerable to the long-term effects of such toxins.

The public and the government must be aware of the release of BPA from polycarbonate baby bottles into baby food and regulate their use in the manufacture of plasticware. Furthermore, consumers must check the plastic type, toxicity level, and most commonly leached toxins when purchasing plasticware. We must also be aware that exposure to high temperature such as boiling, microwaving, washing in a dishwasher with hot water, exposure to harsh alkaline detergent, or changes in pH can aggravate the leaching of BPA and other chemical substances from plasticware.

See the article " Plastic bottle feeding produces changes in biochemical parameters in human infants ? A pilot study " via https://doi.org/10.3345/cep.2022.00234.

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Footnotes

Conflicts of interest: No potential conflict of interest relevant to this article was reported.

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