Endocrine-disrupting chemicals pose cancer risk

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Longtime environmental health researchers at Tufts University School of Medicine describe the carcinogenic effects of endocrine-disrupting chemicals (EDCs), ubiquitous chemicals that have hormone-like effects in the body. In a review article published online May 25 in *Nature Reviews Endocrinology*, the researchers express the need for more complex strategies for studying how these chemicals affect health but report that ample evidence already supports changing public health and environmental policies to protect the public from exposure to EDCs.

"The strength and breadth of existing research on the negative effects of EDCs, including bisphenol A, warrants immediate action to reduce EDC exposure, particularly among the developing fetus and women of reproductive age," said author Carlos Sonnenschein, MD, professor in the department of anatomy and cellular biology at Tufts University School of Medicine (TUSM).

"Developing embryos 'read' environmental cues as a forecast of the outside world. These cues can affect the way certain genes are expressed and in this way alter the structure and function of organs. Studies in rodents show that EDCs can cause harm at much lower levels if exposure happens during organ formation as opposed to exposures during adulthood," said author Ana Soto, MD, professor in the department of anatomy and cellular biology at TUSM.

"The evidence indicates that exposure to BPA and other EDCs may contribute to diseases that manifest during adult life, such as increased

cancer rates in the industrialized world. These chemicals have also been linked to obesity, altered behavior, and infertility," continued Soto.

The researchers drew several key points from the body of observational, epidemiological, and animal research examining EDCs, emphasizing that embryos display an increased sensitivity to the chemicals. In particular, Soto and Sonnenschein focused on bisphenol A (BPA), a chemical they have spent 15 years investigating. BPA, which is found in plastic bottles, reusable food containers, and food cans, is ubiquitous in industrialized nations and is linked to cancer.

"EDCs act additively and their effects are dependent upon exposure and context, making them inherently complex to study. New mathematical modeling tools and computer simulations will provide a more precise understanding of how these chemicals interact with each other and within the body at different stages of life. That said, we already have ample evidence supporting policies that reduce exposure to EDCs, and we recommend rapid action to diminish these harmful environmental exposures," said Sonnenschein.

In previous animal studies, Soto and Sonnenschein observed that exposure to even trace levels of BPA can increase cancer risk in adulthood. The pair also collaborated in proposing the tissue organization field theory of carcinogenesis and metastasis as an alternative to the currently-held somatic mutation theory, arguing that cancer is a tissue-based disease rather than a cell-based disease as proposed by the somatic mutation theory of carcinogenesis. Both authors are also members of the cell, molecular and developmental biology program faculty at the Sackler School of Graduate Biomedical Sciences at Tufts.

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