

CONSUMERS AWARENESS: THE RISKS ON ENDOCRINE DISRUPTORS IN INFANT FOOD (Part 1)

Facts: the increased synthesis of industrial chemical molecules which can cause harm to the endocrine system

- What are endocrine disruptors and their importance for consumers
- Endocrine disruptors in the environment



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FACTS: Throughout the 20th century, the chemical industry synthesized over 140,000 molecules, and today, approximately 60,000 industrial chemical products are available worldwide. Many of these products contain substances that have demonstrated the actual or potential ability to disrupt the endocrine system. These substances, known as Endocrine Disruptor Chemicals (EDCs), have garnered significant media attention in recent years due to their ubiquitous presence in people's daily lives. EDCs can be found in various sources, including food, clothing, furniture, the air we breathe, and the water we drink. They often come into contact with our skin. However, despite continuous exposure to these substances, quantifying their negative effects remains challenging. Individuals with the highest exposure to endocrine disruptors tend to experience more frequent occurrences of cancers, reproductive conditions (such as infertility, endometriosis, and miscarriage), and the development of metabolic disorders (like diabetes) and immune disorders. Moreover, several studies have underscored the potential severe impacts of EDCs on neurological and cardiovascular health.

Children, in particular, are a highly sensitive population, especially during their early years. There are several reasons for this sensitivity. Children have a higher intake of air, water, and food per unit of body weight compared to adults. Additionally, their blood-brain barrier is not yet fully mature, making them more susceptible to neurological harm. Skin, too, is a common route of contamination in children. Contaminants often enter the bodies of children, especially infants, through their more permeable skin. Children spend most of their time in homes, daycare centers, and schools, where they are more likely to come into contact with airborne EDCs. Toddlers, in particular, often interact with soil and floors and may put toys or objects in their mouths that could contain EDCs. Furthermore, during developmental stages, biological systems and organs are at various stages of maturation and function, which makes their detoxification systems less effective. In general, the entire period of growth and development is considered critical in terms of adulthood, but recent attention has been particularly focused on fetal life. Indeed, certain categories of EDCs have been detected at various points during pregnancy in maternal blood, urine, and hair.

WHAT ARE ENDOCRINE DISRUPTORS AND THEIR IMPORTANCE FOR CONSUMERS

Endocrine disruptors are chemical compounds that act as imitators of genuine agonist or antagonist ligands to endocrine receptors in animals. They have the capacity to obstruct the normal functions of endocrine systems in animals and humans alike. According to the World Health Organization (WHO), EDCs are considered exogenous substances or combinations thereof that can modify the function(s) of the endocrine system, subsequently leading to adverse effects in humans or in specific sub-populations that are at risk of contamination under certain conditions¹⁸. The Endocrine Society defines EDCs as exogenous, non-natural chemicals or mixtures that interfere with any aspect of hormonal action in humans. Similar effects have also been observed in various other animal species. Disruptive chemicals can exert their influence at remarkably low concentrations, typically in the picograms to nanograms per liter range when they enter cells.



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Hormones are substances produced in the endocrine system that regulate numerous bodily functions. Endocrine active substances (EAS) are molecules capable of influencing these production and regulatory processes. Those with adverse health effects are labeled as endocrine disruptors or endocrine disrupters. Generally, they induce disruptions in development, reproduction, metabolism, and behavior across a range of animal species, including humans. Substances capable of interfering with the normal functioning of the endocrine system can originate from both natural and human-made sources. Natural endocrine disruptors encompass hormones produced by the body (e.g., estrogen and testosterone) and plant-derived substances that mimic their actions, such as phytoestrogens. These are sometimes used in controlled doses in medications and phytochemicals to treat endocrine disorders (e.g., hypothyroidism or birth control pills). Human-made endocrine disruptors may result from inadvertent byproducts of human activities or be intentionally synthesized. Incidental sources can stem from industrial and combustion processes (e.g., waste incineration). Intentional sources are employed in various industries, agriculture (e.g., pesticides), or consumer goods (e.g., plasticizers), potentially releasing them into the environment via household discharges.

According to certain estimates, since the end of World War II, an average of 1000–2000 chemicals have been produced annually, of which approximately 800 are known or suspected endocrine disruptors. However, only a fraction of them has undergone comprehensive study. Many are industrially produced substances, to which natural compounds like phytoestrogens, which also have adverse effects on the endocrine system when consumed in high doses, are often added. Industrially produced EDCs can be found in everyday items, clothing, medications, some medical devices, disinfectants, food and its containers, furniture and construction materials, personal care products, and toys—items frequently encountered by both humans and animals. The extensive utilization of EDCs across various sectors may account for their environmental presence in the atmosphere, water bodies (including seas and oceans), and soil.

ENDOCRINE DISRUPTORS IN THE ENVIRONMENT

Endocrine-disrupting chemicals (EDCs) are typically categorized as either persistent or non-persistent. Non-persistent EDCs, characterized by their short half-lives and rapid metabolism, are not the primary focus of this brief review. These substances include phenols, parabens, phthalates, and organophosphate pesticides. They are commonly found in various consumer products, such as sunscreen lotions (containing phenols for UV filtering) and plasticizers (phthalates). Children are particularly vulnerable to non-persistent EDC exposure due to their frequent contact with potentially contaminated soil and dust, as well as their tendency to engage in hand-to-mouth or object-to-mouth behaviors.

Persistent EDCs pose a significant risk to children, as they are exposed to low doses of these chemicals and their combinations over extended periods, ranging from days to months and years. The specific effects depend on various factors, including the dose and the presence of other chemicals. Exposure to persistent EDCs during pregnancy, infancy, and childhood can have lasting adverse impacts on a child's health and development throughout their lifetime.

The environmental consequences of persistent EDCs are substantial, given their widespread presence, persistence, and potential effects on living organisms. The primary sources of environmental risk from EDCs include non-compliance with current regulations, industrial processes, and improper disposal of products containing plastics like glues and paints.

EDCs characterized by high environmental persistence have a greater tendency to accumulate in organisms. These chemicals can contaminate the food chain at various stages and transfer from one organism to another, leading to increased concentrations along the food chain. This accumulation can potentially result in severe health effects in children, which will be discussed in a later section of this review covering individual prominent EDCs.

Several countries have implemented stringent controls on the use of EDCs. In the European Union, for instance, the 7th Environment Action Programme, adopted in 2013 by the European Parliament and the Council, outlines measures for harmonizing hazard-based criteria to identify endocrine disruptors and for issuing regulations governing specific chemical substances identified as endocrine disruptors.



SAFFI: THE SINO-EUROPEAN CONSORTIUM PARTNER CENTERS



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 - Three European technological SMEs (CremeGlobal, Computomics, BDS)
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