

The Sensitivity of the Child to Sex Steroids Possible Impact of Exogenous Estrogens

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Description

Xenoestrogens are a type of xenohormone that imitates estrogen. They can be either synthetic or natural chemical compounds. Synthetic xenoestrogens include some widely used industrial compounds, such as PCBs, BPA, and phthalates, which have estrogenic effects on a living organism even though they differ chemically from the estrogenic substances produced internally by the endocrine system of any organism. Natural xenoestrogens include phytoestrogens which are plant-derived xenoestrogens. Because the primary route of exposure to these compounds is by consumption of phytoestrogenic plants, they are sometimes called "dietary estrogens". Mycoestrogens, estrogenic substances from fungi, are another type of xenoestrogen that are also considered mycotoxins.

Xenoestrogens are clinically significant because they can mimic the effects of endogenous estrogen and thus have been implicated in precocious puberty and other disorders of the reproductive system.

Xenoestrogens include pharmacological estrogens (estrogenic action is an intended effect, as in the drug ethinylestradiol used in contraceptive pill), but other chemicals may also have estrogenic effects. Xenoestrogens have been introduced into the environment by industrial, agricultural and chemical companies and consumers only in the last 70 years or so, but archiestrogens have been a ubiquitous part of the environment even before the existence of the human race given that some plants (like the cereals and the legumes) are using estrogenic substances possibly as part of their natural defense against herbivore animals by controlling their fertility.

The potential ecological and human health impact of xenoestrogens is of growing concern.[5] The word xenoestrogen is derived from the Greek words ξένο (xeno, meaning foreign), οἶστρος (estrus, meaning sexual desire) and γόνο (gene, meaning "to generate") and literally means "foreign estrogen". Xenoestrogens are also called "environmental hormones" or "EDC" (Endocrine Disrupting Compounds). Most scientists that study xenoestrogens, including The Endocrine Society, regard them as serious environmental hazards that have hormone disruptive effects on both wildlife and humans.

Xenoestrogens in plastics, packaged food, drink trays and containers, (more so, when they've been heated in the Sun, or an oven), may interfere with

pubertal development by actions at different levels – hypothalamic-pituitary axis, gonads, peripheral target organs such as the breast, hair follicles and genitals. Exogenous chemicals that mimic estrogen can alter the functions of the endocrine system and cause various health defects by interfering with synthesis, metabolism, binding or cellular responses of natural estrogens.

Although the physiology of the reproductive system is complex, the action of environmental exogenous estrogens is hypothesized to occur by two possible mechanisms. Xenoestrogens may temporarily or permanently alter the feedback loops in the brain, pituitary, gonads, and thyroid by mimicking the effects of estrogen and triggering their specific receptors or they may bind to hormone receptors and block the action of natural hormones. Thus, it is plausible that environmental estrogens can accelerate sexual development if present in a sufficient concentration or with chronic exposure. The similarity in the structure of exogenous estrogens and the estrogens has changed the hormone balance within the body and resulted in various reproductive problems in females. The overall mechanism of action is binding of the exogenous compounds that mimic estrogen to the estrogen binding receptors and cause the determined action in the target organs.

The sex ratios are female biased because xenoestrogens interrupt gonadal configuration causing complete or partial sex reversal. When comparing adjacent populations of white sucker fish, the exposed female fish can have up to five oocyte stages and asynchronously developing ovaries versus the unexposed female fish who usually have two oocyte stages and group-synchronously developing ovaries. Previously, this type of difference has only been found between tropical and temperate species.

Sperm concentrations and motility parameters are reduced in male fish exposed to xenoestrogens in addition to disrupt stages of spermatogenesis. Moreover, xenoestrogens have been leading to vast amounts of intersex in fish. For example, one study indicates the numbers of intersex in white sucker fish to be equal to the number of males in the population downstream of a waste water treatment plant. No intersex members were found upstream from the plant. Also, they found differences in the proportion of testicular and ovarian tissue and its degree of organization between the intersex fish. Furthermore, Xenoestrogens expose fish to CYP1A inducers through inhibiting a putative labile protein and enhancing the Ah receptor, which has been linked to epizootics of cancer and the initiation of tumors.

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