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## Endocrine Disruptors

"Endocrine disruptors are chemicals that may interfere with the body's endocrine system and produce adverse developmental, reproductive, neurological, and immune effects in both humans and wildlife. A wide range of substances, both natural and man-made, are thought to cause endocrine disruption, including pharmaceuticals, dioxin and dioxin-like compounds, polychlorinated biphenyls, DDT and other pesticides, and plasticizers such as bisphenol A." (U.S. National Institute of Environmental Health Sciences)

### Chemicals with hormonal activity, i.e. potential endocrine disrupters, include:

- **Natural hormones** released into the environment from any animal, and chemicals produced by one species that exert hormonal actions on other animals, e.g. human hormones unintentionally reactivated during the processing of human waste in sewage effluent may result in changes to fish
- **Natural chemicals** including toxins produced by components of plants (the so-called phytoestrogens, such as genistein or coumestrol) and certain fungi
- **Synthetically produced pharmaceuticals** that are intended to be highly hormonally active, e.g. the contraceptive pill and treatments for hormone-responsive cancers may also be detected in sewage effluent
- **Man-made chemicals** and by-products released into the environment. Laboratory experiments have suggested that some man-made chemicals might be able to cause endocrine changes. These include some pesticides (e.g. DDT and other chlorinated compounds), chemicals in some consumer and medical products (e.g. some plastic additives), and a number of industrial chemicals (e.g. polychlorinated biphenols (PCBs), dioxins).

### How do endocrine disruptors work?

Some chemicals can act on the endocrine system to disturb the homeostatic mechanisms of the body or to initiate processes at abnormal times in the life cycle. The chemicals can exert their effects through a number of different mechanisms:

- They may mimic the biological activity of a hormone by binding to a cellular receptor, leading to an unwarranted response by initiating the cell's normal response to a naturally occurring hormone at the wrong time or to an excessive extent (**agonistic effect**).
- They may bind to the receptor but not activate it. Instead the presence of the chemical on the receptor will prevent binding of the natural hormone (**antagonistic effect**)
- They may **bind to transport proteins** in the blood, thus altering the amounts of natural hormones that are present in the circulation.

- They may ***interfere with the metabolic processes*** in the body, affecting the synthesis or breakdown rates of the natural hormones.

#### General Resources on Endocrine Disruptors

- U.S. National Institute of Environmental Health Sciences - Endocrine Disruptors (Offers an overview, fact sheets, and teaching materials.)
- Our Stolen Future - Companion site for the book *Our Stolen Future*, which brought worldwide attention to scientific discoveries about endocrine disruption and the fact that common contaminants can interfere with the natural signals controlling development of the fetus. This website tracks the most recent developments.
- European Commission Endocrine Disruptors Website - What Are Endocrine Disruptors?
- Center for Bioenvironmental Research (Tulane and Xavier Universities) e hormone Website - Endocrine Disrupting Chemicals overview
- Botham C, Holmes P - Chemicals purported to be endocrine disruptors: A complication of published lists. Leicester, UK, MRC Institute for Environment and Health (2005).
- The International Program on Chemical Safety (WHO, ILO, UNEP) - Global assessment of the state-of-the-science of endocrine disruptors