National Institute of Environmental Health Sciences
Your Environment. Your Health.

Endocrine Disruptors and Your Health

Endocrine disruptors are natural or human-made chemicals that may mimic or interfere with the body's hormones, known as the endocrine system.

Hormone-like chemicals had harmful effects on the organs and bodily functions of test animals, according to an independent panel of scientific experts organized by the National Toxicology Program (NTP), which is located at NIEHS.[1] The Endocrine Society stated in 2015 that endocrine-disrupting chemicals may affect health and disease in people.[2]

How do we encounter these chemicals?

Endocrine disruptors are found in everyday products, including some food and beverage packaging, cosmetics, toys, flame retardants, and pesticides. Your contact with these chemicals may occur through diet, air, skin, and water.

Chemicals that may disrupt your endocrine system

- **Bisphenol A (BPA)** is used to make polycarbonate plastics and epoxy resins found in many plastic products, including food storage containers.
- **Dioxins** are a byproduct of some manufacturing processes, such as herbicide production and paper bleaching, and are released into the air from waste burning and wildfires.
- **PFAS** (per- and polyfluoroalkyl substances) are a large group of chemicals used widely in industrial applications, such as firefighting foam, nonstick pans, paper, and textile coatings.
- **Phthalates** are used to make plastics more flexible; they are found in some food packaging, cosmetics, fragrances, children's toys, and medical devices.
- **Phytoestrogens** are naturally occurring substances in plants that have hormone-like activity, such as genistein and daidzein in soy products like tofu and soy milk.
- **Polybrominated diphenyl ethers (PBDE)** are used to make flame retardants for products such as furniture foam and carpet.
- **Polychlorinated biphenyls (PCBs)** are used to make electrical equipment, such as transformers, and are in hydraulic fluids, heat transfer fluids, lubricants, and plasticizers.

What is NIEHS doing?

NIEHS-supported research leads to a greater understanding of how endocrine-disrupting chemicals may harm health and cause disease.

NIEHS contributed to a 2019 consensus statement that gives scientists a framework for evaluating potential endocrine disruptors.[3] The framework is a descriptive list of 10 key characteristics of endocrine disruption. The characteristics pinpoint common ways in which hormones function and how chemicals can interfere. This approach to endocrine-disruptor research is a breakthrough in understanding how chemicals produce toxic effects.

Endocrine-disruptor research concerns health problems related to:

- Reproduction
- Cancers
- Thyroid
- Obesity and metabolism
- Neurodevelopment

Related research includes:

- Developing new models and tools to better understand how endocrine disruptors work.
- Improving ways to identify endocrine-disrupting substances.
- Understanding linkages between exposure to endocrine disruptors and health effects.
- Identifying and forming strategies to reduce or prevent exposures.

PO Box 12233 • Research Triangle Park, NC 27709
Phone: 919-541-3345 • **www.niehs.nih.gov**

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NTP evaluates endocrine disruptors including pesticides; perfluorinated chemicals, compounds that may replace BPA in the marketplace; and components of flame retardants for how they may affect body tissues, such as breast, uterus, fat cells, male reproductive tract, and liver. In addition, they conduct laboratory studies to prioritize endocrine-disrupting chemicals for toxicity testing.

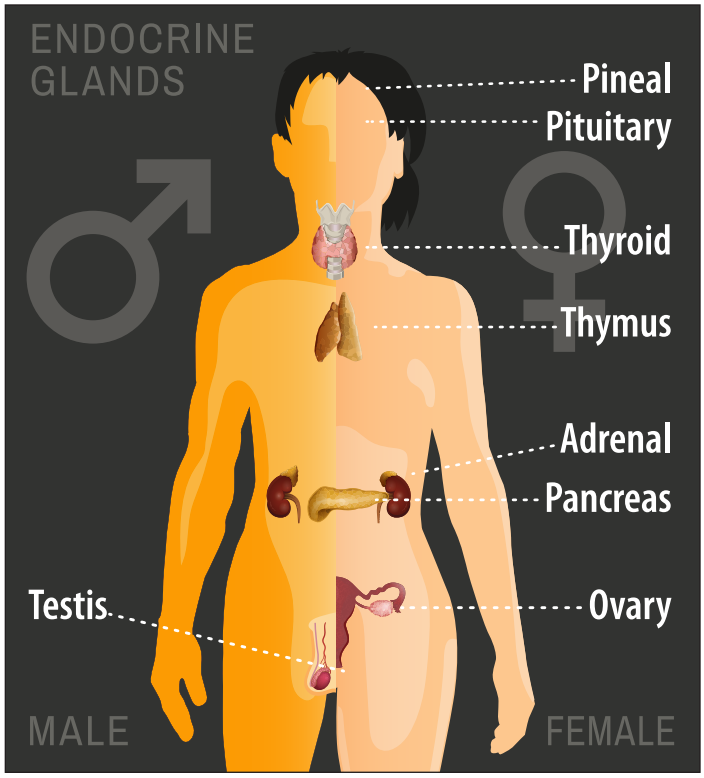
Through NTP, NIEHS participates in Tox21, a multi-agency program that is developing and applying new models and tools using robotics to predict endocrine-disrupting activity for environmental substances.

What have NIEHS and NTP discovered?

Recent NIEHS-supported research shows links between endocrine-disrupting chemicals and the ways in which well-being may be harmed, for example:

- **Attention.** The drug diethylstilbestrol (DES) may be linked to an increased chance of attention deficit hyperactivity disorder (ADHD) in grandchildren of women who used it during pregnancy.[4]
- **Immunity.** Children exposed to high levels of PFAS had a diminished immune response to vaccines.[5]
- **Metabolism.** Long-term exposure to arsenic can disrupt metabolism, increasing the risk of diabetes and other metabolic disorders.[6]
- **Puberty.** Chemicals in lavender oil and tea tree oil were associated with premature breast development in girls,[7] and abnormal breast development in boys.[8]
- **Reproduction.** DES can alter the way genes are turned on and off in reproductive organs of mice, potentially affecting fertility and reproduction.[9]

For more information on the National Institute of Environmental Health Sciences, go to **www.niehs.nih.gov**.



Join an NIEHS Study

Join a clinical study and help NIEHS make scientific discoveries. The Body Weight and Puberty Study is recruiting. Email myniehs@nih.gov to learn more.

1 Melnick R, et al. 2002. Summary of the National Toxicology Program's report of the endocrine disruptors low-dose peer review. Environ Health Perspect. 110(4):427-31.

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4 Kioumourtzoglou MA, et al. 2018. Association of exposure to diethylstilbestrol during pregnancy with multigenerational neurodevelopmental deficits. JAMA Pediatr 172(7):670–677.

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