

EPA's Endocrine Disruptor Screening Program (EDSP)¹

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Use pesticides safely. Read and follow directions on the manufacturer's label. All chemicals should be used in accordance with directions on the manufacturer's label.

Introduction

People have asked questions in recent years concerning the effects that certain chemicals may have on the endocrine system of humans and wildlife. Laboratory studies have produced evidence that show various chemicals disrupt the endocrine systems of animals. Other evidence has shown that the endocrine systems of certain fish and wildlife species have been affected by chemical contaminants. Do some of these same chemical contaminants also affect the human endocrine system? Do pesticides cause these effects? The relationship between human diseases of the endocrine system and exposure to environmental contaminants is poorly understood and controversial. This publication discusses the U.S. Environmental Protection Agency's (EPA) screening program for potential effects to the endocrine system caused by pesticide exposure.

What Is the Endocrine System?

All birds, fish, and mammals possess an endocrine system. It is a complex system consisting of three basic components:

1. Glands, including the following:

- Hypothalamus gland
- Pituitary gland
- Thyroid gland

- Adrenal glands
- Pancreas
- Gonads

2. More than 50 hormones produced by the glands that function as chemical messengers

3. Receptors in various organs and tissues that recognize and respond to hormones

The endocrine system is responsible for regulating important biological processes, including metabolism, blood sugar levels, reproductive system growth and function, and brain and nervous system development.

How Does Disruption of the Endocrine System Occur?

Some chemicals can mimic the effects of natural hormones:

- Causing the body to overrespond (e.g., the effects of growth hormones to increase muscle development).
- Causing a bodily response at the inappropriate time (e.g., insulin production when it's unnecessary).
- Causing a blockage of receptors from responding to the effects of hormones.
- Causing an overproduction or underproduction of hormones.

Some synthetic drugs, such as birth control pills, have been used intentionally to affect the endocrine system. However,

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attempts to regulate endocrine systems do not always have positive effects.

A notorious example of an endocrine disruptor with detrimental effects to humans was the use of the drug diethylstilbestrol (DES), a synthetic estrogen. DES was used to block spontaneous abortion and promote fetal growth in pregnant women. After female children of these women went through puberty, DES affected the development of the reproductive system, resulting in cases of vaginal cancer. Although now long banned, an estimated 5–10 million pregnant women and their children were exposed to DES prior to this discovery, which prompted physicians to cease DES prescriptions. Use of DES as a growth hormone in agricultural livestock was also discontinued.

Rationale for EPA's EDSP Targeting Pesticides

All pesticide active ingredients are required to undergo extensive toxicological testing prior to being granted EPA registration. Some industrial chemicals have also undergone extensive toxicological testing. However, it is unclear if this testing has been adequate to detect the potential for both groups of these chemicals to be endocrine disruptors. The extent and types of additional testing needed for the EPA to assess and characterize human health and ecological risk remain uncertain. Legislation, including the reauthorization of the Safe Drinking Water Act (SDWA) and passage of the Food Quality Protection Act (FQPA), has mandated that the EPA develop a screening and testing program, with the overall objective of reducing or mitigating risk to human health and the environment.

The EDSP Process

EPA's EDSP has been involved in a validation process for several tiers of assays with their accompanying protocols and the policies and procedures for use in the EDSP testing process. In late 2009, EPA issued the first test orders for pesticide chemicals to be screened for their potential effects on the endocrine system. EPA made available the battery of scientific assays and test guidelines for conducting the assays, as well as a schedule for issuing test orders to manufacturers. Of the 67 chemicals, there were 58 pesticide active ingredients and 9 high production-volume chemicals used as inert ingredients during the first phase of testing. Because this list of chemicals was selected on the basis of exposure potential only, it should not be construed or characterized as a list of known or likely endocrine disruptors.

The data generated from the screens provide robust and systematic scientific information to help the EPA identify whether additional testing or other steps are necessary to address potential endocrine-disrupting chemicals. Based on the testing and evaluation of the data, EPA released a comprehensive management plan during 2012. The plan may be viewed in its entirety at <http://www.epa.gov/endo/>.

Additional Information

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Resources

Environmental Protection Agency – <http://www.epa.gov>

EPA's Endocrine Disruptor Screening Program – <http://www.epa.gov/endo/>