

Agriculture & Pesticides Facts

PESTICIDES AND THE ENDOCRINE SYSTEM

Many synthetic chemicals and many naturally occurring plant compounds can affect the functioning of the body's endocrine system (the glands, hormones and receptors that regulate many of the body's functions). Such compounds are often called endocrine disruptors or environmental estrogens. We are exposed to these compounds throughout our lives, in food, air, water, soil, household products, pharmaceuticals and probably in the womb and through breast milk. However, there is much debate about how much we are exposed to and how that exposure affects us. Endocrine disruptors have been linked to health and reproductive problems in wildlife and laboratory animals. Some experts believe that endocrine disruptors in the environment also affect human health, development and reproduction, but this has yet to be proven.



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Endocrine disruptors can alter hormonal functions by one of several means. They can:

- mimic the effect of estrogens or androgens (female and male sex hormones)
- interfere with the binding of hormones to the appropriate cellular receptors
- alter production and breakdown of natural hormones
- modify the making and function of hormone receptors.

Endocrine-disrupting compounds are common in the environment. However, identification of specific compounds that have the potential to be endocrine disruptors is difficult because they do not share a common chemical structure, because they produce a range of effects, and because we are continually exposed to a varying mixture of them.

It is known, however, that compounds capable of producing estrogenic responses occur naturally in a variety of plants and fungi, including clover, soybeans and other legumes, whole grains and many fruits and vegetables. Many synthetic chemicals that exhibit estrogenic activity have also been identified. These are compounds that either are manufactured for a specific use or that arise as a byproduct of the production of another chemical.

Synthetic estrogenic chemicals are found in:

- some pesticides
- some compounds associated with plastics
- some pharmaceuticals (e.g., birth control pills and DES)
- some ordinary household products (e.g., breakdown products of detergents and associated surfactants)
- some industrial chemicals (e.g., PCBs and dioxin)
- some heavy metals (lead, mercury and cadmium).

Studies of laboratory animals, cell cultures, wildlife and humans accidentally exposed to high doses have shown that these chemicals can cause reproductive and developmental problems. Fetuses and embryos seem especially vulnerable to exposure. Mothers can pass contaminants to their offspring in eggs or the womb and by breastfeeding. Exposure of a developing embryo to environmental contaminants has been linked with many permanent health effects in the adult. The effects observed in other species include: abnormal blood hormone levels; reduced fertility; altered sexual behavior; modified immune system; masculinization of females; feminization of males; cancers of the female and male reproductive tract; malformed Fallopian tubes, uterus and cervix; and altered bone density and structure.

Despite the evidence from other species, the extent to which environmental estrogens are affecting human health and reproduction, if at all, is not known. Only the synthetic hormone DES has ever been proven to cause endocrine disruption problems in humans. Nor do we know the degree of the risk posed by pesticides, relative to other potential endocrine disruptors. It is clear that not all pesticides have this potential. Some pesticides have been identified as potential endocrine disruptors and precautions have been put into place to reduce the risk they represent.

- Usage of the pesticides that are the most persistent or that can bio-accumulate has been banned in North America and in many other countries.
- Use of other pesticides that are suspected of being endocrine disruptors has been restricted to minimize the risk they might present to the health of the Canadian public.
- All new pesticides are evaluated to determine their potential to act as endocrine disruptors prior to being approved for use in Canada. No pesticide will be registered for use in Canada unless the potential total daily intake of residues of that pesticide, from all sources, is proven to be well below the level that might adversely affect the health of any age group.
- Products currently in use are re-evaluated if evidence of potential endocrine disrupting activity comes to light.

Nevertheless, it is clear that much additional research is required both to determine if endocrine-disrupting compounds are affecting human health and to identify the compounds responsible.

INTERNET RESOURCES:

Environmental Estrogens and Other Hormones
<http://www.tmc.tulane.edu/ECME/eehome/>
Center for Bioenvironmental Research at Tulane and Xavier Universities

Frequently Asked Questions About Endocrine Disrupting Chemicals (EDCs)
<http://res2.agr.ca/london/pmrc/english/faq/edc.html>
Agriculture and Agri-Food Canada