● UNDERSTANDING PESTICIDES

ENDOCRINE DISRUPTORS: WHEN LESS IS MORE

The unfolding discovery of how endocrine disrupting chemicals work challenges the most basic assumptions about how pesticides should be regulated. Endocrine disruptors are chemicals that at very low doses interfere with the hormonal systems in humans and wildlife. Hormones control and coordinate many of the body's functions, especially those related to reproduction and brain chemistry.[1]

What makes endocrine disruptors so significant is that they are not bound by the classic assumption that "the dose makes the poison," that by lowering the dose, at some point the chemical will no longer be toxic. This threshold-based system of determining pesticide toxicity, used in regulations and by industry, is simply not capable of identifying and protecting people and wildlife from endocrine disrupting chemicals.

Many pesticides are believed to be endocrine disruptors. The European marine protection organization, the OSPAR Commission, has identified fifteen endocrine disrupting pesticides or groups of pesticides that are of concern to marine life.[2] But dozens more are being looked at as threats to humans and wildlife as well.[3] Some so-called inert ingredients found in pesticide products, already identified as hazardous by EPA but not listed on product labels, also show up on lists of suspected endocrine disruptors.

Endocrine disruptors are not just pesticides. They are found in a variety of manufactured products in wide usage, including plasticizers, resins, flame retardants, texturized soy protein, spermicidal gels, and various industrial chemicals.

What Damage Is Caused?

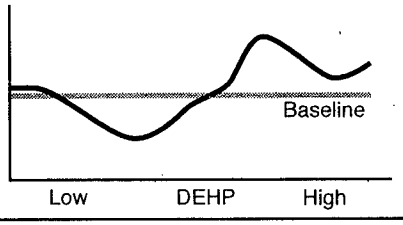
Studies have shown that endocrine disruptors are linked to fetal deaths, hypospadias (a birth defect of the penis), compromised immune systems in children, lower sperm counts, and early onset puberty.[4] Their role in causing cancer is suspected though not proven. Especially sobering is the fact that every human being alive today contains measurable levels of endocrine disruptors.[5] Even polar bears and Inuits living in the Far North have them.[6] The website of the authors of *Our Stolen Future*, the book that first documented the effects of endocrine disrupting chemicals on wildlife, discusses the health and environmental effects of endocrine disruptors in detail.[7]

Throw Out Your Old Dose-Response Curves

Until the discovery of endocrine disruptors, toxicologists worked on the assumption that higher doses would always have more of an effect than lower doses. This is called a monotonic dose-response curve.[8] It turns out that endocrine disruptors are often more active at *lower* doses than at higher doses, and may not even be active at higher doses. This means that regulators cannot just look for the lowest response level to a pesticide, add a "safety factor," and assume it will be safe.

This is demonstrated in a recently published study that looked at the endocrine disrupting phthalate, DEHP. The authors found that at certain very low doses of DEHP, *similar to those estimated to be found in the general human population*, male rat brains were not becoming "masculine."[9] At these low levels of exposure, the brain activity of aromatase, an enzyme essential for making male brains "masculine,"was being suppressed below baseline levels. At the same time, higher doses of DEHP increased artomatase activity above and beyond baseline levels. DEHP was creating disruptive effects in two different directions! This information creates a non-monotonic dose-response curve (see Figure 1). This response would have been totally missed by threshold-based toxicology.

Figure 1
Non-monotonic Dose-Response Curve



Endocrine disruptors may have non-monotonic dose-response curves, and there may not be an identifiable "no-effect level."

Regulatory Changes Are Needed

Clearly, a new system needs to be put in place to evaluate endocrine disrupting pesticides. Under the Food Quality Protection Act, the U.S. Environmental Protection Agency was supposed to have a system in place to do this by 1999, but now says the system won't be ready until 2009.[10] This delay is much too long.

In the interim, each of us can keep the pressure on EPA to get this work done, and be prudent about limiting exposure to endocrine disruptors. Knowing where pesticides have been used and what is in them is especially important when trying to limit exposure to this far-reaching class of chemicals.

—Dan Stein

References

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3. See Endocrine Disrupting Pesticides, http://www.pan-uk.org/pestnews/issue/pn50/pn50p5.htm, for a more comprehensive list.
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