

Endocrine Disruptors: An Emerging Local Water Quality Issue

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Recent reports by the local and national news media have focused on an emerging environmental issue that has particular relevance to our region. Evidence is mounting that one or more chemicals in area waters are altering the biology of fish living there. These compounds appear to be interfering with natural chemical signals within the fish, resulting in reproductive abnormalities and immune system deficiencies. Such chemicals are termed endocrine disrupting compounds (EDC's).

Understanding Endocrine Disruptors

Organisms have an internal chemical signaling system known as the endocrine system. The system is comprised of glands that produce compounds called hormones. These hormones travel in the bloodstream to all parts of the body. Each cell within the animal has receptors for the specific hormones. When a hormone binds to the cell's receptor, the chemical signal has been received and the functioning of the cell is altered in some way. For example, hormones produced by the pituitary gland near the brain travel to the ovaries and stimulate cells there to become eggs ready for fertilization. In similar ways chemical signals are sent throughout the organism to control such functions as normal development, sexual differentiation, metabolic rate, and immune responses.

Endocrine disruptors interfere with these signals by a number of possible mechanisms: they may mimic the signaling of natural hormones; they can inhibit the action of natural hormones; or they may alter the production or normal degradation of natural hormones in the body. EDC's have been found to be injurious at very low concentrations. Moreover, exposure of animals to endocrine disruptors during development can lead to harmful effects much later in life.

A wide variety of compounds have endocrine disrupting capability. These include natural hormones produced by humans and domestic animals that enter waterways; runoff of some pesticides and herbicides; and detergent additives, pharmaceuticals, additives to plastics and flame retardants that enter our wastewaters or groundwater. Currently, these types of compounds are not routinely monitored in surface waters.

Endocrine Disruptors in Local Watersheds

While investigating the cause of several fish kills in Potomac River tributaries, Dr. Vicki Blazer, a fish pathologist for the U.S. Geological Survey, noted evidence of endocrine disruption in smallmouth bass. Male bass often contained both testicular and ovarian tissues in their reproductive organs – a condition known as intersex. Males were also

often found capable of producing a compound known as vitellogenin which is a component of egg yolk and normally only produced by females.

Recently, Dr. Blazer conducted similar surveys of smallmouth on the Monocacy River and Conococheague Creek indicating similar abnormalities in fish there. The incidence of intersex in male fish from these streams ranged from 80 to 100% over all sampling sites. Likewise, blood samples from these fish often contained vitellogenin.

The question of how severely this high incidence of intersex impairs reproduction in the smallmouth bass populations of the Monocacy River still remains. Dr. Blazer will lead a team of researchers to investigate the reproductive potential of male bass during their spawning season this spring.

A search for the types and sources of compounds causing endocrine disruption in local waters has also just begun. However, researchers believe that no single compound or source will be discovered. Rather, it is more likely that a mixture of chemicals is causing disruption, and that these compounds have sources ranging from wastewater treatment plant effluents to agricultural runoff.

Next Steps in Dealing with EDC's

As with many emerging environmental issues, much remains to be learned about the sources, effects, and fates of endocrine disruptors before we can effectively address the problem in our local waters. In addition to understanding the types and sources of EDC's, we need to gain answers to questions such as:

- Do EDC's impact fish and other wildlife at the population, community or ecosystem levels?
- Are there specific human health issues related to EDC's originating from water sources?
- How effectively do current wastewater treatment processes remove EDC's? If they are being removed, what becomes of these compounds? Are they destroyed? Are they converted to other similar compounds? Are they becoming a component of the sludge that is being applied to agricultural land?
- Are EDC's a groundwater contamination issue?
- How effectively do water treatment plants remove the range of EDC's from our public drinking water? Should certain types of routine monitoring be established to assure its purity in this regard?

In the meanwhile, individuals can best address the problem of endocrine disruptors by:

- Becoming educated with regard to the types of products in their households that may contain endocrine disrupting compounds.
- Seeking alternatives to such products.
- Disposing of EDC-containing products (for example pharmaceuticals) in ways that minimize their entering the wastewater processing stream.

If you have additional questions, you can contact Drew Ferrier by email at dferrier@hood.edu or by phone at 301.696.3660.