

Things we can all do

Controlling chemicals

at the source is the easiest and least expensive way to protect the environment and people from the harmful effects of all pollutants, including EDCs. King County has several programs for homes and businesses to reduce the amount of contaminants entering stormwater and wastewater:

- To find out how to safely dispose of stuff you don't want or need, check the Web at <http://dnr.metrokc.gov/WTD/community/oldstuff.htm>. This site tells you what should go down toilets, sinks and other household drains; what should go in the garbage; and what should be disposed of in other safe and healthy ways.
- You can find resources about practicing natural yard care at <http://dnr.metrokc.gov/topics/yard-and-garden/>.
- The Local Hazardous Waste Management Program works with households and businesses to reduce the amount of potentially toxic substances going down the drain. Lots of information on less toxic choices can be found at <http://www.govlink.org/hazwaste/>.
- King County's Industrial Waste Program works with businesses to control the discharge of substances that can degrade water quality or harm workers or facilities. A pilot project is under way in the drainage basin surrounding the Duwamish Waterway to research, identify and control the sources of phthalates (chemicals that make plastic flexible). You can find more information at <http://dnr.metrokc.gov/wlr/indwaste/duwamish/phthalates.htm>.
- The county's Stormwater Services Program works to stop contaminants (including some potential EDCs) from being discharged into surface water or groundwater. Find out more at <http://dnr.metrokc.gov/wlr/stormwater/>.



King County staff offer tips on how to find the safest household products and how to safely dispose of household hazardous waste.



For more information on EDCs, check the following Web sites:

- <http://www.werf.org/pdf/04WEM6a.pdf>
- <http://e.hormone.tulane.edu/>
- <http://www.epa.gov/endocrine/about.html>
- <http://water.usgs.gov/pubs/FS/FS-081-98/#HDR01>

For more information, please contact Jo Sullivan at the Wastewater Treatment Division, 206-296-8361.

Alternate Formats Available

Voice: 206-296-8361 or TTY Relay: 711

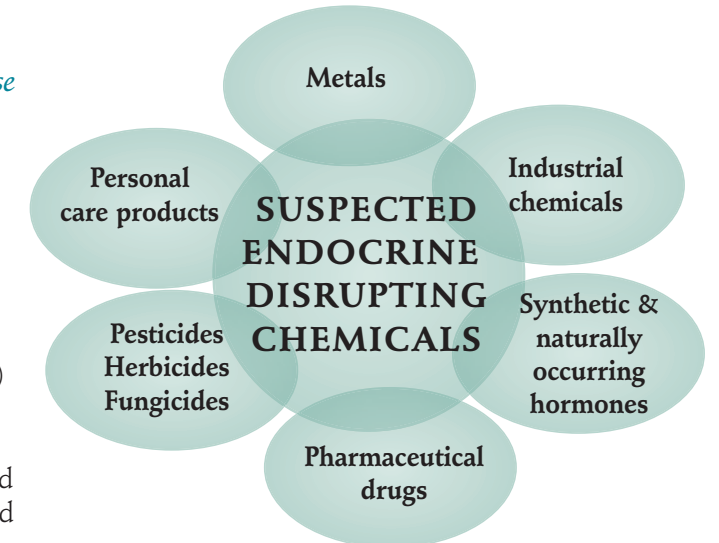
Endocrine Disrupting Chemicals in the Environment

New information is continually emerging about the natural and synthetic chemicals people and industries use every day and dispose of down their drains and toilets. Some chemicals of concern are classified as endocrine disrupting compounds, or EDCs.

EDCs are natural or synthetic chemicals that interfere with or mimic the hormones responsible for growth and development of an organism. Some EDCs are synthetic hormones (such as ethynylestradiol, found in birth control pills) and natural hormones (such as estrogen and testosterone). Some EDCs are found in commonly used products such as personal-care products like soaps and cosmetics (some contain nonylphenol compounds and parabens), industrial byproducts, plastics (phthalates) and pesticides.

When these products are used, disposed of, or excreted by people or animals, they typically end up in either stormwater or wastewater. While wastewater treatment processes can remove a significant amount of these compounds, small concentrations of some are discharged into surface waters.

Nationally and internationally, scientists are studying the potential effects of EDCs on aquatic life and wildlife. Several chemicals have been classified as



Some chemicals from the "families" above are potential endocrine disrupters

EDCs, but many compounds have not yet been tested. Because this impact of EDCs is an issue of national and international scope, it is beyond the capability of a local agency or utility to solve alone. Studies will continue for many years before definitive answers are known and regulations adopted. King County understands public interest and concerns about this issue, so as we learn more, we will respond to recommendations and amend regulations as needed.

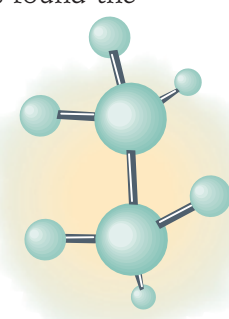
Below is a summary of what we know and what we are doing now to deal with the issue of EDCs:

- Scientific analysis.** King County scientists are tracking this issue carefully to keep up-to-date on new findings. King County's Environmental Laboratory is continuing to investigate new analytical methods for the complex testing of some of these chemicals. Sampling for 15 suspected EDCs in King County marine and fresh waters found the presence of some EDCs at low levels. They are natural estrogen (estradiol), synthetic estrogen (ethynylestradiol), plasticizers (phthalates), surfactants from soaps (nonylphenol), and epoxy compounds (Bisphenol A).

(continued inside)



Nature filters pollutants from the environment with natural processes. When nature can no longer clean the water, we depend on wastewater treatment technology to do it.



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- **Prevention and education for source control.** Preventing EDCs from entering stormwater through a septic tank or sewer system is the easiest and least expensive way to protect people and the environment. To help reduce the problem, we offer resources and programs throughout King County on how to control chemicals at the source.
- **Wastewater treatment.** Conventional secondary wastewater treatment, designed to remove solids and biodegradable organic material from wastewater, removes from 50 to 90 percent of many compounds known to be or suspected of being EDCs. Both the West Point and South Treatment plants use this technology. King County is making efforts to use the advanced wastewater treatment technology where possible. We plan to install membrane bioreactors in the future Brightwater and Carnation treatment plants.



Making good choices keeps harmful chemicals from entering the waste stream in the first place.

Environmental lab scientist testing for trace metals.

Background

Concerns about EDCs emerged more than a decade ago in Europe, where scientists found fish with altered reproductive systems in rivers that received large volumes of treated wastewater. Scientists found that very low levels of some compounds in the effluent were likely causing reproductive effects. New laboratory methods have recently enabled scientists to detect these compounds at very low levels in many of our waterways, so researchers can now begin studying this new endocrine disruption effect.

How do we know if a chemical is an endocrine disrupter?

Only a few compounds are known EDCs. Because the science is young, many potential EDCs have not been tested yet. The U.S. Environmental Protection Agency is leading scientific research in the United States as directed by the 1996 update of the federal Safe Drinking Water Act and Food Protection Act. The European Union is coordinating very active efforts in many European countries. Universities and other government agencies around the world are also actively researching this issue.

Are endocrine disruption effects different from other toxic effects?

Yes, scientists are beginning to discover that these effects may be very complex and different from the familiar toxic effects researched in the past. The familiar, classic chemical toxicity occurs when high doses may cause immediate effects, and lesser doses cause long-term effects, but very low doses are assumed to be benign. With EDCs, very low concentrations appear to be causing effects.

Also, EDCs can have very indirect effects on organs that regulate reproductive or growth processes. Some “turn on” processes while others “turn off” processes—

all at the same time. Thus, predicting the effects of individual chemicals or mixtures of chemicals acting together will take time.

In addition, EDCs are not created equal. Different chemicals have different “potencies” or potential to cause effects similar to natural estrogens. Chemicals like synthetic estrogens in birth control pills have very potent effects while other chemicals like phthalates may be 1,000 times less “potent.” Phthalates may be more concentrated in the environment and pose a concern even though they are less potent.

What is being done?

The first step is to identify which of the many chemicals cause endocrine disruption. The second step is to determine the exposure concentration at which these compounds may affect the endocrine system in aquatic organisms, wildlife and people.

With knowledge about concentration and impacts, the next step is for federal and state agencies to regulate the chemicals identified as being of concern. While scientists have determined levels of some EDCs that may affect some organisms, methods of assessment have not been standardized. At this point, it is difficult to identify concentrations we think cause effects.

How do EDCs get in the water?

Chemicals such as pesticides run off lawns into stormwater systems that drain into local waterways. Residues from drugs and other consumer products we may use regularly—such as birth control pills, soaps, cosmetics and plastics—enter septic systems and sewer systems from toilets, sinks, showers and dishwashers. Domesticated animals and wildlife also contribute EDCs to the environment. Some can also enter water from the atmosphere.

Doesn't wastewater treatment remove EDCs?

Federal regulations require us to remove 85 percent of solid materials from wastewater before we discharge the treated effluent into natural water bodies. Regulations also require our wastewater discharges to meet state water-quality standards, but there are no water-quality standards for some of these compounds. While standards are available for some compounds (PCBs, some pesticides), the standards were not based on impacts to the endocrine system. King County's treatment plants in Seattle and Renton use a two-stage process called conventional secondary treatment that typically removes 95 percent of the solids; however, this process does not remove all contaminants or EDCs.

Membrane bioreactor technologies, an advanced wastewater treatment process, are proving capable of removing a larger amount of solid materials from wastewater than conventional secondary treatment. For example, the membrane bioreactor technology to be used at the Brightwater and Carnation wastewater treatment plants will produce cleaner water by removing more solids and smaller particles than current technology. Even these advanced technologies are not expected to remove all contaminants or EDCs. Higher levels of removal are possible but very expensive.

Preventing EDCs from entering the wastewater stream is the easiest and least expensive way to protect people and the environment. Please refer to the list of resources and programs at the end of this fact sheet on how to control chemicals at the source.

How do EDCs affect fish and people?

Current research suggests that exposure of fish to some EDCs can mimic estrogen and lead to changes in sex ratios (changed percentage of male and female in the wild), “feminization” of male fish (showing some female characteristics), production of vitellogenin (the protein precursor to egg production in female fish) by male fish, and other changes that may affect reproduction or overall health. Other EDCs can mimic androgen (a male hormone) and have different or opposite effects from the estrogen mimicker.

Continuing research by the National Marine Fisheries Service of the National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries) and other agencies throughout the world will help us better understand the potential effects of these chemicals on fish and other aquatic organisms. NOAA Fisheries and the Washington Department of Fish and Wildlife scientists have seen evidence of effects on the reproductive cycle of English sole in Puget Sound. They hypothesize that these effects are due to exposure to EDCs.

To determine the degree of adverse effect on an organism, scientists must find a relationship between the exposure to an EDC and an adverse effect. While experiments can measure the effects on individuals, it is difficult to measure the extent of effects on populations.

Regarding human health issues, the Water Environment Research Foundation has tried to summarize current information on EDCs. The report shows that no studies have linked low concentrations of EDCs in our environment to adverse health effects in people. While effects might be found in the future, they have not been seen so far in several large studies.

DEFINITIONS:

Endocrine disrupting chemicals—natural or synthetic chemicals that interfere with or mimic the hormones responsible for growth and development of an organism.

Endocrine system—a complex network of glands and hormones that regulates various life functions such as growth, reproduction and the way various body organs work in people, wildlife and aquatic organisms.

Effluent—treated wastewater leaving a treatment plant.

Estrogen—a hormone produced mainly in female sex organs to control female maturation, fertility, and development of female physical characteristics.

Hormone—a “chemical messenger” produced by a gland that travels through the bloodstream to an organ and regulates the activity of that organ.