Synthetic Estrogen Threatens Small Fish
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After an exhaustive seven-year research effort, Canadian biologists found that miniscule amounts of estrogen present in municipal wastewater discharges can decimate wild fish populations living downstream.

The research, led by Karen Kidd, Ph.D., a biology professor at the University of New Brunswick (Saint John) and the Canadian Rivers Institute, confirms that synthetic estrogen used in birth control pills can wreak havoc on the sex lives of fish. Small amounts of estrogen are excreted naturally by women whether or not they are taking birth control pills.

Male fish exposed to estrogen become feminized, producing egg protein normally synthesized by females. In female fish, estrogen often retards normal sexual maturation, including egg production.

"We've known for some time that estrogen can adversely affect the reproductive health of fish, but ours was the first study to show the long-term impact on the sustainability of wild fish populations," Kidd said "What we demonstrated is that estrogen can wipe out entire populations of small fish -- a key food source for larger fish whose survival could in turn be threatened over the longer term."

Estrogen is part of a broader class of sex-changing chemical compounds known as endocrine disrupting substances. These contaminants, also present in pulp mill effluents, can seriously interfere with normal hormonal processes, notes Kidd.

To better understand the impacts of estrogen on fish, the researchers conducted a seven-year, whole-lake study at the Experimental Lakes Area in northwestern Ontario. Over three summers, they added tiny amounts -- low parts per trillion -- of the synthetic estrogen used in birth control pills to the lake to recreate concentrations measured in municipal wastewater.

During that period, they observed that chronic exposure to estrogen led to the near extinction of the lake's fathead minnow population as well significant declines in larger fish, such as pearl dace and lake trout.

"Generally, the smaller the fish, the more vulnerable they are to estrogen," remarks Kidd.

Part of the reason, she adds, is that smaller fish have a shorter lifespan and will often die after reproducing only once.

The researchers used synthetic estrogen because it tends to persist longer in the environment than natural estrogens. Yet the problem with estrogen is not its

environmental persistence but rather its persistent discharge in municipal wastewater into surface waters.

Kidd says the risk is greatest for aquatic ecosystems downstream from municipalities that either discharge untreated wastewater or maintain only primary treatment facilities. On the flipside, the problem is of less concern near cities that remove a wide range of chemical contaminants, including estrogens, from wastewater using secondary and tertiary treatment processes.

It is now understood, she says, that removing estrogen through wastewater treatment can reverse the adverse impact of this substance/hormone on wild fish. In fact, three years after halting additions of synthetic estrogen to the experimental lake, the researchers discovered that the fathead minnow population was on the rebound.
"To me, that's the good news. Once you take the stressor out the system, we now have ample evidence that suggests affected fish populations will recover."

[note: the study can be found at
http://www.pnas.org/cgi/content/full/104/21/8897?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&fulltext=karen+kidd&searchid=1&FIRSTINDEX=0&resourcetype=HWCIT]