Synthetic Hormones released in Waters could lead to Fish Extinctions

Canadian and American scientists have recently performed a 7-year whole-lake experiment to assess the consequences of municipal wastewater releases on aquatic ecosystems. They have shown that the synthetic estrogen contained in these effluents from the use of the birth control pill caused the immediate feminisation of male fish, and then a collapse of the population only 1 year after the low-level and chronic exposure of the fish to these hormones began.

Municipal wastewaters are released into water bodies such as lakes or rivers. Because some of the chemicals present in these wastewaters are not completely degraded during treatment, the discharges have been shown to affect the health of fish and other aquatic organisms living downstream. Some of the most harmful chemicals present in these effluents are endocrine disruptors and they can affect the growth, reproduction and development of fish; scientists have shown that the natural and synthetic estrogens found in municipal wastewaters are potent endocrine disruptors and can lead to the feminisation of male fishes in waterways receiving these effluents. Although numerous studies have found feminized male fish in waters receiving municipal wastewaters, none had determined whether low-level, continuous inputs of estrogens to the waters impact the numbers of fish living in these rivers and lakes.

Canadian and American researchers have recently investigated how low-level and chronic exposures of fish to a synthetic estrogen, a potent endocrine disruptor, affect the sustainability of a wild population. To this end, they performed a 7-year experiment at the Experimental Lakes Area in northwestern Ontario. The particular synthetic estrogen EE2 (found in birth-control pills) was added three times a week to this lake each summer for three years (from 2001 to 2003) in order to achieve and maintain EE2 concentrations similar to the ones in municipal wastewater effluents. For two years before the EE2 additions began and for several years after the additions began, they caught fathead minnow living in this lake and measured vitellogenin, a protein normally synthesised by females during the maturation of eggs and development of their ovaries in particular. They focussed on this fish species because it has a short lifespan (2 years), is a common fish species in North America, and is commonly used for laboratory experiments on endocrine disrupters.

Between 2001 and 2003 during the EE2 additions, their investigation showed that, when compared to reference lakes, estrogen exposure caused:

- Vitellogenin concentrations that were 1000 and 40 times higher in male and female fish, respectively;
- Smaller (3 to 5 times) and less developed testes in male fish after the first year and then the production of early stage eggs after the third year of additions; female fish also showed some delayed development of their ovaries.

After the second summer of estrogen additions, the population of fathead minnow collapsed because of a failure of this species to reproduce and a loss of the young-of-the-year. The authors state that this whole-lake experiment shows that low-level and chronic exposure of aquatic species to estrogens lead to a feminisation of males through an increased production of a hormone typically produced by females. They conclude that the release of estrogens in aquatic ecosystem could lead to a collapse of fish populations, especially the short-lived ones.

Acute pollution problems in ground water, rivers and seas due to the release of municipal and industrial wastewaters are common all over Europe. One of the current legislation of particular relevance for endocrine disrupting chemicals is the regulation REACH concerning the Registration, Evaluation, Authorisation, and Restriction of Chemicals, which entered into force on the 1st of June 2007.

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Theme(s): Chemicals.

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To cite this article/service: "Science for Environment policy": European Commission DG Environment News Alert Service, edited by BIO Intelligence Service.