Sewage Water Treatment Plants and Fish Reproduction

Belgian researchers have recently analysed to what extent active substances released by sewage treatment plants located on polluted rivers impair the reproductive functions of fish. Their investigation on a Belgian river shows that treatment plants do not systematically impact fish tissues and endocrinal characteristics. However, the results are dependent on the site's characteristics and the findings suggest taking into account the specificity of each site before generalising the negative impacts of such installations.

With increasing industry, agriculture, urbanisation and tourism, every year human activity in Europe emits thousands of tonnes of chemicals that are released into the water. These emissions generate pollution for the environment and in particular for aquatic ecosystems. During the last decades, scientists have largely shown the effects of Endocrine Disrupting Chemicals (EDC), such as estrogens, on aquatic systems. In particular, they have shown that active sexual hormone content in the water can impair the reproduction functions of fish by affecting gamete quality or sexual maturity.

In fresh waters, EDC discharges are mainly associated with Sewage Treatment Plants (STP). While these plants are intended to treat water and reduce pollution, it sometimes happens that the water treatment process reactivates some chemicals such as hormones. In this context, researchers have studied the negative impacts of STP discharges on fresh water fish species. They have shown that STP are often correlated with an increased intersexuality downstream of the treatment plant and with an alteration of gonad growth in fish.

In this regard, Belgian researchers have studied the impacts of the location of STPs on highly polluted rivers in order to assess to what extent these plants are associated with disruption in the physiology of different fish species. For this purpose, they have analysed histological and endocrine parameters (such as diameters of oocytes or hormonal levels in fish) in two sentinel fish species living in a Belgian river that has been highly polluted since the 19th century. Between 1998 and 2004, two STPs were built on this river. The scientists selected gudgeon and stoneloach as sentinel species as they are sedentary, have sexual reproduction and ideally rapid generation times. They caught fish both up and downstream of the STP and compared their tissues and endocrine parameters.

The main result of their investigations is that there are no systematic significant differences between upstream and downstream sites, whatever the STP, species or sampling period. However, stoneloach females present some signs of reproduction impairment or endocrine disruption downstream of the two sewage treatment plants.

The authors conclude that this absence of systematic differences between upstream and downstream sites indicates that the endocrine disruption effects of STP discharges cannot be generalised. They highlight that the presence and magnitude of STP impacts depend on regional urban or industrial activities and on local environmental parameters susceptible to interfering with the possible estrogen content of effluents. The magnitude of the river flow that allows for a dilution of the discharge, the global pollution state of the river or the sensitivity of exposed aquatic organisms are important parameters that may have different effects on fish communities.

Finally, these results highlight the benefits of taking into account site-specific parameters in order to perform a relevant environmental analysis of the location of an installation such as a sewage treatment plant.

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