Hormones in the environment: how the facts were covered up

Paul Mitchell
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Every male fish in some European rivers shows pronounced female characteristics, according to Professor Alan Pickering of the Natural Environment Research Council. Speaking to the British Association's Festival of Science in London earlier this month, Pickering said, "We are finding this problem right across northern Europe, it is clearly widespread."

Pickering said that "It seems to relate to a mixture of chemicals both industrial and also some of the natural excretory products from the human body." These substances, known as endocrine disrupting chemicals (EDCs) or “gender-benders”, are found in some agrochemicals, paints, oils, toiletry products and detergents. They mimic the hormones produced by the female ovaries and the male testes in animals, which regulate growth and reproduction.

The evidence that they affect human health is conflicting and controversial. According to a report by the Royal Society in June 2000, “Humans are exposed daily to environmental chemicals which have potential endocrine disrupting activity, raising concerns, provided that the level of exposure is sufficient, that such chemicals might be linked with phenomena such as declining sperm count in the adult male, testicular cancer, breast cancer, age at puberty, etc.” The incidence of testicular cancer, for example, has increased three-fold in the last thirty years in Britain, becoming the commonest cancer in young men.

However, the situation is complex, also involving genetic and dietary factors. Breast cancer in China and Japan is much lower than in Western countries. Scientists think this could be linked to a high-fibre, low fat diet, and yet there is high consumption of soya in these countries, which produces weak EDCs.

Because humans produce hormones in their bodies naturally, the effects of EDCs are difficult to unravel. But it is thought possible that the foetus, which is naturally protected from the high levels of hormones in its pregnant mother, could still be affected.

Chemicals that are now known to be EDCs were first manufactured in the 1930s. In 1938 researchers showed that medicines containing them could cause reproductive changes. In the 1950s and 60s, a synthetic female hormone, diethylstilbesrol, given to prevent miscarriages increased vaginal abnormalities in mothers and reduced fertility in some of the six million babies that were exposed to it.

Evidence of similar effects in the environment was developing. Pesticides such as DDT caused reproductive problems in animals and paints used on ships to prevent the growth of barnacles led to shellfish sterility.

In England, the government-run Water Research Centre published a report called *Steroids as Water Pollutants* in 1976. (Steroids include the female hormone oestrogen and its male counterpart testosterone, as well as hormones produced by the adrenal gland.)

At about the same time abnormal fish were noticed in rivers in southern England downstream of sewage works. Scientists first thought pharmaceutical factory wastes discharging into the sewers were the cause. Research into the abnormalities was carried out in 1981 by Liverpool University, commissioned by the then state-owned water authorities. It was never published because they claimed the research was flawed.

The Ministry of Agriculture carried out a further investigation in 1988 that showed “all sewage treatment works effluents were oestrogenic to fish and whatever chemical, or mixture of chemicals was causing the effects, it was ubiquitous”. It was suggested that natural and synthetic oestrogens were the cause. The Conservative government kept these potentially explosive discoveries confidential—they were in the middle of privatising the water industry— until 1992. Even then the research was only published in a magazine produced by the Foundation

for Water Research that had a restricted circulation within government departments and the water industry.

A further one-off study was commissioned by the government to look at river water used in the public water supply. It concluded there was “insufficient evidence to justify general regulatory action, other than further research”. It appears that the EDCs in sewage break down in the river or are destroyed in the water treatment works.

This research was also intended to be confidential, but in 1993 specialist magazines, then newspapers and the BBC's *Countryfile* program had picked up the Foundation for Water Research report. The BBC program *Horizon* later that year brought the issue to wider public attention. It accused the water companies and government of a cover-up. It quoted a water company spokesman who said, “There is no need and no requirement in the United Kingdom Water Quality Regulations to look for these substances. Nor are sufficiently sensitive techniques available. Hence routine monitoring has not been carried out”.

Although the regulations say the companies should monitor for a few dozen specific substances, they also say the companies should monitor for any other substance that could be injurious to public health. It is likely the companies have monitored for hormones in the public water supply, despite the difficulties of analysis. The results have never been made public, even though the companies say the treatment process destroys hormones and the water is safe. (One might ask, if the methods used to analyse hormones were suspect, how could the companies say the water was safe?)

This year the Labour government has updated the Regulations in line with revised European legislation, but EDCs are not mentioned specifically. How much of this was due to lobbying by the powerful water industry group EUREAU is uncertain.

In the meantime, Britain's water companies have other problems. They have carried out a large program of water pipe renewal. To cut costs existing pipes have been lined inside with plastic rather than being dug up and replaced. This involved the use of epoxy resins containing bisphenol-A, another EDC, to harden the plastic. In 1995, Welsh Water was prosecuted for not checking the resins had set before using the renovated pipe work for drinking water.

Despite this evidence and an Environment Agency report in 1997 that enzymes in sewage re-activated hormones normally excreted by humans in an inactive form, the government said the following year that it had “made no estimates of cost of removal since the impacts are unclear”.

Recent scientific evidence confirms the suggestion made in 1988 that two natural human hormones and one synthetic contraceptive hormone are the likely EDCs in sewage works' discharges. On the River Aire in Yorkshire it is chemical rather than human substances that are responsible—an industrial detergent used for cleaning wool in the remaining mills along this waterway.

It is clear that the British government and the water companies have worked together to minimise the impact of the revelations. The House of Lords also criticised water companies for doing the bare minimum of research into water safety compared to the huge profits they have made since privatisation. The situation has been further complicated by the confidentiality surrounding the precise chemical formulae of many industrial products.

Vital time has been lost in the scientific resolution of this complex environmental problem. The Royal Society recommended in its June 2000 report that the “effects of endocrine chemicals released into the environment” should be further investigated and that “regulations cannot be ‘put on hold' until all the evidence has been collected”. Twenty five years after the first abnormal fish were discovered in Britain's rivers, the report notes that, “Few, if any, studies have attempted to look for such evidence” affecting human health and there has been “no guidelines on testing pharmaceuticals for environmental impact, despite the fact that these chemicals are designed to be extremely potent and to degrade slowly.”