THE HIDDEN POLLUTION

Just because you can't see it doesn't mean it's not there.

Words Edwin Colyer Image J Westrich / Zefa

You step out of the shower, wrap yourself in a warm towel and, as you squeeze toothpaste onto your brush, watch the remaining suds swirl down the plughole. The toothpaste froth soon goes the same way, as does the bathroom cleaner, bleach, detergents, paint washed from paint brushes and a whole host of other everyday chemicals.

Once down the drains we easily forget about their fate, and leave the water companies to wonder about how to clean everything up. Fortunately they do a good job: wastewater treatment plants cope admirably with the chemical cocktail that we send their way.

According to Defra, since 1990 over £20 billion has gone into upgrading the country's wastewater infrastructure. Limits on the amount of pollution that industries and water treatment plants are allowed to discharge to rivers ensure that the UK meets environmental quality standards. Further controls have reduced or even banned the use of several dangerous substances. All these improvements have led to a steady improvement in water quality across the UK. The arrival of salmon in the River Mersey in 2001 testifies to how things have changed.

Yet pollution still slips through the net. No matter how good our wastewater treatment plants are, they don't remove all pollutants. On top of which, not all polluted water passes through them. Scientists have found traces of everything from PCBs to ibuprofen in our river systems. They warn that even in small quantities the accumulative effects of such pollution could be serious.

Meanwhile, new pollutants are coming to light that in the past were not concerns. "Things that were the most obvious and dangerous hazards to human health were dealt with early on to stop us poisoning our estuaries, the environment and potentially people," says Dr Rick Leah, an ecotoxicologist from Liverpool University. "But we are now left with substances that are difficult to control.

"Only recently have people realised that pharmaceutical and personal care products are also a particular problem," notes Dr Leah, "mainly because they are biologically active and are not screened for biodegradability. Today pesticides have to pass rigorous tests to ensure that they will break down into harmless products in the environment but drugs and other personal care products are not tested in this way.

"Scientists are only beginning to realise that some things do not break down or get trapped in the treatment works. Ibuprofen, the common pain killer, for example, is persistent and is now being detected in the environment, although we don't know what it may do yet."

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60-second expert

- Since 1990 over £20 billion has gone into upgrading the country's wastewater infrastructure.
- Together with tighter controls over pollution discharges and the banning of certain substances, this has dramatically improved the obvious 'point source' pollution such as sewage and industrial effluent, leading to far cleaner water in rivers and waterways.
- But researchers are increasingly concerned about substances that in the past were not thought to be a problem, such as medicines and personal care products.
- Some chemicals are known to have dramatic effects in the environment. Bisphenol A, for example, is one of a number of endocrine disruptors, chemicals which can cause the feminisation of male fish and are a particular problem in the River Mersey.
- Modern wastewater treatment plants are highly effective, but they cannot remove all pollutants from the water. There are also substances which campaigners and researchers are concerned about, but for which there is no regulatory requirement to remove from wastewater.
- Another major problem is that not all wastewater gets treated. In urban areas rainwater washes contaminants into the drainage system and during storms this can overwhelm wastewater treatment plants.
- With higher water quality standards coming into force from Europe and new research highlighting the effects of pollutants, we need to keep on finding ways of making our environment cleaner.

"...there is mounting evidence that a chemical cocktail has accumulated in the environment."

There is less doubt over what other chemicals in the environment can do, and it's not good news. Certainly, not all of them are washed down household drains in the same way that medicines and personal care products can be. But wherever they originate, there is mounting evidence that a chemical cocktail has accumulated in the environment.

One such group of chemicals are known as endocrine disruptors - in 2002 researchers published data revealing that low levels of oestrogenic hormones in wastewater could cause the feminisation of male fish.

"Endocrine disruptors are a special problem because small amounts do come through sewage treatment," explains Dr Leah. "They are the natural hormones we secrete and the synthetic hormones found in contraceptive pills. Plus there are other pollutants such as DDT that also have oestrogenic activity."

"Until recently, hormones did not feature on the Environment Agency's list of things to be concerned about," says Dr Leah.

The Mersey estuary has suffered particularly from endocrine disruption; it has the second highest rate of fish feminisation in the country. In other rivers specific sources of the oestrogenic pollution have been identified (sewage effluents or certain detergents used by the wool industry). In the Mersey, however, the hunt is still on.

Chemicals such as endocrine disruptors are just one symptom of a far larger issue now coming to light. Pollutants have accumulated throughout the environment, not just in our rivers.

And it is not just fish in which unexpected chemicals have been found. Blood tests on volunteers in the UK showed that every volunteer was contaminated with a large number of toxic man-made chemicals, albeit at low concentrations. No one is saying that people are starting to change sex, but equally, no one is really sure what the combined effect of the chemicals in our blood streams, even at low levels, might be.

Matthew Wilkinson, head of WWF-UK's Toxics Programme, says research suggests that these chemicals may affect behaviour and health. "At the higher levels of background contamination you start to see subtle effects such as a slight decrease in IQ and altered behaviours. People are conditioned so that if children have the right number of limbs and fingers then everything is OK. But children exposed to these background levels of chemicals may not be able to reach their full potential."

WWF wants to see robust regulation of hazardous chemicals and has a priority hit list of persistent and bioaccumulative substances, as well as endocrine disruptors, that it believes should be banned. They include brominated phenols used in flame retardants. "These could be the next generation PCBs," he warns. "They are already accumulating in whales and polar bears and getting into pristine environments."

WWF is contributing to the European Commission's consultation over the proposed REACH (Registration, Evaluation and Authorisation of Chemicals) legislation that is set to overhaul regulation of the chemical industry in Europe.

So the massive investment in water treatment facilities, combined with tougher laws and actions by industry, has been highly effective in dealing with the obvious 'point sources' of pollution, such as sewage and industrial effluent. This has led to vastly improved water quality. Yet researchers are uncovering more and more sources and types of pollution that in the past went unseen.

One of the big problems is 'diffuse pollution', which Defra recently called "the greatest challenge to further improving water quality." Diffuse pollution typically does not come directly from households or industry into the sewage system, making it hard to trace and harder still to deal with. Essentially, it occurs when rainwater runs off city streets or rural fields and into rivers and waterways, washing pollutants along with it.

In rural locations the bulk of diffuse pollution comes from agriculture, when excess pesticides, fertilisers, slurries and sludges are washed off into rivers or leach into groundwater. With around 70% of the UK's land being agricultural, both the government and most researchers focus on farming when looking at diffuse pollution. But urban environments also make a significant contribution.

Take a city like Manchester, for example, with all its traffic. Whilst you may only change your tyres every 100,000 miles, every journey you make rubs away the tread. Anticorrosive coatings, often containing cadmium, also gradually erode. Of course, you don't notice the effects on a single car, but when thousands of vehicles move around a city or along a motorway, the potential for pollution adds up. When it rains all the dirt, sediments and pollution are washed into the drains and can end up in our rivers.

"Diffuse pollution is caused by the inevitable consequences of how the country is plumbed," says Dr Leah. "Foul water is dealt with more-or-less satisfactorily most of the time in sewage plants, but you cannot treat the large volume of surface water during periods of very heavy rainfall in the same way."

The Mersey is a prime example of an urban river greatly at risk from this type of pollution. Dr Leah says that the figures speak for themselves. "The river may not exceed limits for specific pollutants, but the background levels can still be undesirably high. Whilst the point sources have been dealt with, persistent chemicals and heavy metals still end up in the river."

According to Amanda Wright, research and information manager at the Mersey Basin Campaign, "Some urban runoff eventually ends up at wastewater treatment plants where it can be treated to remove much of the pollution. But it is difficult and prohibitively expensive for treatment works to process all urban runoff, especially during heavy rain."

Indeed, during storms they cannot cope with the increased water flows, and some untreated water has to be diverted directly into the waterways. Storm water overflows (especially when they occur without storm conditions) have been a particular problem along the Mersey, but significant investment is underway. United Utilities, the Northwest's water and wastewater company, is building several large storage tanks to hold storm waters and thus limit the release of untreated waters into the river.

Even so, Dr Leah suggests that regulators should make discharge limits more stringent, especially for storm water inputs. "A larger portion of surface water could be treated by the regular wastewater infrastructure. Sewage works are set up to remove almost everything out of the water, including PAHs and PCBs that settle out with the particulate sludges. They can even deal with some amount of oil and solvent contamination. If this was done, then we would begin to get rid of the impacts that ordinary drain water has on the environment."

Terry Hindle, team leader for environmental management at the Environment Agency, agrees that surface water should be dealt with more carefully.

"The Agency always considers diffuse pollution when consulted by planners," he says. "We also work with local authorities to develop sustainable drainage systems such as percolation systems that leave residues on the surface, buffer strips and middle ditches on roads that foster an environment where organic chemicals are naturally broken down." (See also, page 22).

Settlement or balancing ponds and reed beds are a good solution where diversion of surface water into the sewage system is not possible, such as motorways or new urban developments.

The WWF meanwhile calls for a radical reduction in the use of potentially noxious chemicals. "We don't think in terms of diffuse or point pollution, but simply environmental contaminants," says Matthew Wilkinson. "Once you identify that some chemical in the environment has a toxic effect you can't do a recall. It is too late."

"We want to move away from end-of-pipe regulation," he argues. "We think the problem should be nipped in the bud by stopping the use of the worst chemicals in the first place."

The recent European Water Framework Directive, meanwhile, will help to address the specific issue of diffuse pollution. It sets higher standards for water quality and specifies the drawing up of a list of priority substances to be tackled. Water resources will be managed in terms of water catchment areas, recognising that the quality of water in a river system depends on all the potentially polluting activity within it, not just direct discharges into watercourses.

"We now have to move inland to find the sources of diffuse elements," says Terry Hindle. More often than not, he argues, pollution can be traced to a source, as his experience on the ICREW project illustrates. "We have been monitoring bacterial contamination in Northwest bathing waters. Some contamination comes from sewage, some from sites like caravan parks. It is a question of making lots of site visits and working with the owners to prevent this happening."

Nevertheless, despite the best environmental detective work, some pollution will always remain. "We have a principle that the polluter pays," says Hindle, "but who do you blame?"

Now there's something to think about next time you're in the shower. S

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