Tests for drugs in tap water

By Steve Connor, Science editor
Monday, 29 September 2008

Drinking water supplies are to be tested for the presence of prescription drugs amid fears that rivers are being contaminated by the growing quantity of pharmaceuticals flushed unwittingly down the drain.

The Government has commissioned scientists to test river water at intake points where it is abstracted for human consumption, The Independent can reveal. They will also test drinking water after it has been through the water-treatment cycle.

Under a pilot project to begin next year, supplies will be examined for about five of the most common and potentially dangerous prescription drugs. The experts will meet over the next few weeks to decide which drugs to look for and where testing should be carried out. However, an insider said this was likely to be at selected sites on the river Thames because its water-catchment area covered the most densely populated part of the country.

Powerful anti-cancer drugs are of particular concern as they can be excreted unaltered from the body into the sewerage system. They are thought to be potentially dangerous because they are highly toxic to dividing cells, are easily dissolved in water and are difficult to destroy by conventional water-treatment techniques.

About 50 of these "cytotoxic" drugs are prescribed to patients in Britain and researchers are concerned they may have an additive effect – where small concentrations of two or more drugs become more poisonous when absorbed together at the same time in drinking water.

Scientists are also worried that even if cytotoxic drugs are getting into the water supply at doses too low to affect adults, they may still pose a significant risk to babies in the womb because they would be potentially susceptible to the effects of anti-cancer substances aimed at preventing cell division.

The pilot testing has been ordered by the Department for Environment, Food and Rural Affairs (Defra) and the Drinking Water Inspectorate, which is responsible for overseeing the monitoring of water supplies in Britain. The tests will be carried out by a consortium of laboratories led by Defra's Central Science Laboratory in York.

Under European rules, drinking water in the UK is monitored for nearly 50 different contaminants, but none of these include the active ingredients of prescription drugs, such as the powerful cytotoxic drugs used to treat the growing number of cancer patients.

However, a study this year of the theoretical risk posed by one common cytotoxic drug, called 5-fluorouracil (5FU), found there could be sufficient amounts of the chemical being flushed into rivers from chemotherapy patients to end up contaminating the water supply in low concentrations.

"It seems highly probable that in parts of the UK cytotoxic drugs will be present at concentrations of a few nanograms [billionths of a gram] per litre in river water," said Andrew Johnson, a water quality scientist at the Centre for Ecology and Hydrology at Wallingford, Oxfordshire.

"We have no evidence that these particular drugs are entering the drinking water supply, but we conclude that there is a least the theoretical risk of low-level contamination by cytotoxic drugs," Dr Johnson said.

"It is highly unlikely that concentrations below the nanograms per litre level would represent a risk to adults, however, the developing human embryo inside a pregnant woman could be particularly vulnerable to minute amounts of these agents as they would be able to pass through the gut and placenta," he added.

It is estimated that the quantity of chemotherapy drugs used to treat cancer is rising by about 10 per cent a year. Many of these pharmaceuticals are becoming more potent as scientists work out how to ameliorate toxic side-effects and so raise permitted dosages.

Dr Johnson and colleagues believe that, with the expected increase in population density in parts of Britain, and the growing incidence of cancer, along with greater water abstraction from rivers and lower river flows owing to drier summers, there will be a bigger risk of cytotoxic drugs ending up in the drinking water supply. "No one is denying

summers, there will be a bigger risk of cytotoxic drugs ending up in the drinking water supply." No one is denying the enormous benefit society derives from cytotoxic drugs but that is not an argument for saying we should be ignorant of their effects – if any – on the environment," Dr Johnson said.

Alistair Boxall, an environmental chemist at the Central Science Laboratory who will oversee the tests, said it was unlikely that any prescription drugs that ended up in tap water would be present in high enough concentrations to adversely affect health.

"The vast majority of pharmaceuticals probably pose a very small risk to human health. I find it hard to believe they will have any effect – you would have to drink so much water to get anywhere near a viable dose," Dr Boxall said.

Peter Marsden, of the Drinking Water Inspectorate, said that the testing programme would begin next year at four sites along a major river which yet to be designated. It would continue for at least a year before the results were evaluated, he added.

Drugs on tap: Pharmaceuticals in the water supply

*Water purification is a complex process that involves filtration, ozonation, a second filtation through activated charcoal and, finally, a chorination or disinfection stage.

*Several studies have shown that conventional water purification cannot completely remove some prescription drugs from a contaminated water source.

*Water abstraction from rivers is increasing, due to the rise in demand and increasing population density, especially in the south-east of England.

*In 2004, a study of the 50 most common prescription drugs in Britain showed that the amount of each drug consumed annually varied from 12,000kg to 3,500,000kg.

*Cytotoxic (toxic to cells) drugs used in chemotherapy are potentially dangerous in water supplies because they dissolve easily in water, remain potent in low concentrations and may have an additive effect taken together.

*Chemotherapy prescriptions are increasing by 10 per cent a year. Patients having chemotherapy are often given the drugs in hospital but are then allowed home, where they excrete them into the domestic sewerage system.

*Britons consume 2,700kg of 5-fluorouracil – just one of 50 cytotoxic drugs. By comparison, they consume about 45kg of the active ingredient of the contraceptive pill, which is believed to be responsible for freshwater fish changing sex.

*British water companies have to test for 48 potential contaminants in drinking water. None of them is for a pharmaceutical drug that can be excreted from the body.

*Scientists in Germany have found pharmaceutical drugs in Berlin's water supply and have called for further research into what could be a Europe-wide problem.