Anti-depressants disrupt fish's brains

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Drugs designed to ease the symptoms of mental health problems such as depression, obsessive compulsive disorder and post-traumatic stress can have major disruptive effects on aquatic animals' brains, say scientists.

Anti-depressants are some of the most commonly prescribed drugs in the world. In 2012, there were more than 50 million prescriptions of the drugs in the UK, and in some towns and cities as many as one in six of us are taking them.

In recent years, researchers have found increasing concentrations of the drugs in rivers around the world. Most of them find their way into waterways via sewage and waste water systems, from human waste or from people flushing unwanted prescriptions down the toilet.

A suite of new research, published in a special issue of the journal

Aquatic Toxicology, points to mounting evidence that they could be damaging aquatic species.

Researchers have found that fish exposed to tiny concentrations of the drugs in the laboratory can become more aggressive, less cautious, and even lose their ability to camouflage.

In other aquatic species, their ability to find food and reproduce was affected, their behaviour patterns were altered, and some became more attracted to light. There is also evidence that the drugs may disturb genes controlling the brain function of shrimp.

'In the 90s there was lots of concern about the so-called gender-bending properties of contraceptive drugs that were finding their way into our rivers,' says Dr Alex Ford from Portsmouth University, who edited the special issue.

Signal crayfish.

'There is now substantial evidence from laboratory tests that anti-depressnats can affect animals' behaviour and basic functions even at the very low concentrations that they would be likely to encounter in the wild.'

Most anti-depressants work on the part of the brain which controls the amount of mood-influencing hormones released into the blood stream - usually serotonin. Many aquatic creatures also produce serotonin and appear to be sensitive to the effects of the drugs.

In one experiment, a shrimp was placed in a test-tube which was then lowered into a tank with cuttlefish. Whereas fish not exposed to the drugs would soon give up on the unobtainable snack, those exposed to the anti-depressant continued to slam into the tube, wasting vital energy in the process.

In another, a group of male crayfish became more aggressive - fights lasted longer and rates of female mortality rose sharply. There was even evidence that the ability of cuttlefish to camouflage against their backdrop was hampered by the drugs.

If this were repeated in the wild, it could make the creatures more vulnerable to predators. But for now, difficulties in accurately monitoring exposure levels and animal behaviour in the wild are proving a significant barrier to understanding the threat of anti-depressants in the real-world environment.

And some scientists caution that the effects of the drugs need to be tested at a variety of doses before more robust conclusions can be drawn.

'As a proportion of the whole US population, there are probably as many people taking these drugs now as there are on the contraceptive pill,' says Ford.

'At the moment, it's almost impossible for regulators to work out what is a safe level for these drugs in the environment.'

He warns that these problems are not unique to anti-depressants. Humans

consume hundreds of different drugs every day, and many are likely to find their way into sewage and, eventually, the environment.

There has been talk of increasing the requirements on sewage treatment plants to remove the chemicals, but the costs of doing so make it unlikely to happen anytime soon.

Many countries are instead focusing on those drugs which go unused, encouraging people to take unwanted prescriptions back to their pharmacist instead of flushing them away.

'Like many people, my kitchen drawer at home is full of drugs that are long out of date and no good to anybody,' says Ford. 'We don't want to stop people taking drugs, they obviously save countless lives and bring all sorts of benefits to people, but we need to manage the way that we get rid of them.'

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