

Researchers assess risks to wildlife and ecosystems posed by pharmaceuticals

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A University of York researcher has edited a [special edition of a Royal Society publication](#) examining the potential risks and impacts of pharmaceuticals in the environment on wildlife and ecosystems.

Dr Kathryn Arnold, from York's Environment Department, is one of four experts who has compiled the special edition of *Philosophical Transactions of the Royal Society B*, which presents the latest international research.

Expanding and aging human populations require ever increasing amounts of pharmaceuticals to maintain health. Recent studies have revealed that pharmaceuticals, both human and veterinary, from use and manufacture, disperse widely in aquatic and terrestrial environments with uptake into a range of animals.

In some cases the effects can be dramatic. One article in the special edition explains how in India three species of vulture faced near extinction after eating the carcasses of livestock treated with the anti-inflammatory diclofenac. With numbers of one species declining by more than 99.9 per cent in just 15 years, the article's authors question how alternatives to diclofenac have been received. They suggest that vulture populations may recover with a concerted conservation effort coordinated by the UK's Royal Society for the Protection of Birds (RSPB).

A major route by which human pharmaceuticals disperse into the

environment is via sewage effluent. The issue also shows that effects can be more subtle but still have potentially significant impacts. For example, one article examines the long-term effects of the hormone used in the contraceptive pill on aquatic ecosystems and sheds light on how severe declines in one sensitive fish species can cause negative changes to the whole food web in a lake.

Dr Arnold said: "Thousands of pharmaceuticals are used globally in human and veterinary medicine. They are designed to affect physiology, and in some cases behaviour, of patients at low doses. They are therefore potentially potent environmental contaminants which have been detected in diverse ecosystems. Released from manufacturing plants, agriculture and patients via sewage effluent and sludge, many pharmaceuticals lack environmental data."

This special themed edition critically examines existing and new evidence of exposure to and effects of pharmaceuticals in the environment on vertebrate wildlife and their habitats

Dr Arnold said: "The research presented here shows that pharmaceuticals in the environment can impact upon birds, fish, frogs and other animals living in diverse habitats. In some cases the effects can appear quite 'subtle' – changes in feeding behaviour or risk taking, for example. However, an animal that fails to find food or escape from a predator has a low chance of survival. Given the many benefits of pharmaceuticals, there is a need for science to deliver better estimates of the environmental risks they pose."

The special edition will contribute to ongoing scientific and policy debates on the environmental risk assessment and regulation of pharmaceuticals. It includes a special introduction on 'medicating the environment' by Dr Arnold and her co-editors, which outlines the risks posed by pharmaceuticals to wildlife and ecosystems.

Professor Alistair Boxall, also from York's Department of Environment, is one of the co-authors of an article comparing the ecological risks posed by pharmaceuticals in low, middle and high income countries. The paper highlights that this is a truly global issue. Although most of the research into the environmental risks of pharmaceuticals has been carried out in Europe and North America, this might not be applicable in developing countries which tend to have younger [human populations](#) with differing health issues, as well as different climates and ecosystems.

In the article, Professor Boxall and his colleagues point to striking differences between low and high income countries. For example, high sewer connectivity in developed countries allows capture and treatment of waste stream. However, in many less wealthy countries, sewerage connectivity is generally low and sometimes waste is collected predominantly in septic tanks. This can lead to problems caused by leaking septic tanks resulting in dispersal of excreted pharmaceuticals into the natural environment.

More information: "Medicating the environment: assessing risks of pharmaceuticals to wildlife and ecosystems" is available online: [rstb.royalsocietypublishing.org ... 9/1656/20130569.full](http://rstb.royalsocietypublishing.org/.../9/1656/20130569.full)

Provided by University of York

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