What happens to pharmaceuticals in the digestive system of a bird?

March 2 2016

Scientists at the University of York have conducted new research into measuring how commonly-prescribed pharmaceuticals behave in the guts of starlings.

In a study led by Tom Bean, Professor Alistair Boxall and Dr Kathryn Arnold, from the University's Environment Department, researchers developed an in-vitro model (a laboratory-based system that avoids use of animal tests) to simulate the digestive system of a starling, recreating gastro-intestinal conditions that appear in real birds.

Worms containing fluoxetine - the active ingredient in antidepressant product Prozac - were fed to the in-vitro system to simulate birds feeding on worms and other invertebrates that have accumulated pharmaceuticals from wastewater treatment plants and soils. Such contamination happens when sewage sludge is applied to land as a fertiliser.

Worms were also fed into an in-vitro model of the human gut to explore how Prozac, when introduced in worms, will behave in a bird gut compared to a human.

The researchers found that the drug behaved similarly in both the bird and human systems. Such results are invaluable in understanding how to use data detailing the effects of pharmaceuticals in humans, applying this across to wildlife species.

The study provides an important part of the toolkit for assessing the potential ecological risk when developing drugs, as little is currently known about the different ways in which pharmaceuticals can impact on wildlife.

Professor Boxall said: "There is increasing recognition that biologically active ingredients contained in pharmaceuticals could potentially affect wildlife, with fish and birds being prime candidates.

"Simulating starling ingestion of Prozac through prey, this research helps to bridge the gap between our knowledge of how drugs affect humans and how this translates to animals in the natural environment. Understanding what happens at different stages of the animal digestive process enables us to build a picture of wider environmental implications.

"With active drug ingredients often entering the environment indirectly through waste treatment systems, it is hoped that new test methods such as this, which do not involve testing on real animals, will be developed and used in the future for assessing the potential ecological impact of pharmaceuticals."

Tom Bean, PhD student and lead author of the project, said: "This study characterises the environmental impact that pharmaceuticals can have, paving the way for intelligence-led assessment in the development of new drugs."

More information: Thomas G. Bean et al. An method for determining the bioaccessibility of pharmaceuticals in wildlife , *Environmental Toxicology and Chemistry* (2016). DOI: 10.1002/etc.3406