New model predicts environmental effect of pharmaceutical products

July 28 2011

A great variety of drugs that could be harmful to wildlife end up in the environment. Credit: SINC

Most synthetic chemical products used in consumer goods end up unchanged in the environment. Given the risks this could pose for the environment and human health, researchers from the Autonomous University of Barcelona (UAB) have developed a new tool to effectively predict what will happen to current and future pharmaceutical products.

Thousands of pharmaceutical products, which are increasingly diverse and increasingly used, are "partially" metabolised by the human body. Those that remain unchanged pass into the waste water treated at sewage plants, which are not always designed to eliminate synthetic organic compounds.

"Sometimes, some substrates can even revert to the original drug within the water treatment plant itself, increasing the concentration of the drug in the effluent discharged, as is the case with carbamazepine (a psychotropic anti-epilepsy drug)", Xavier Domenech, co-author of the study and a researcher at the Department of Chemistry of the UAB, tells SINC.

The result is that a great variety of drugs that could be harmful to wildlife end up in the environment. "This is of greater concern in the case of water treated for human consumption, in which we are increasingly detecting a cocktail of drugs at low concentrations (nanograms per litre), the long-term effect of which is unknown", explains Domenech.

Pinpointing the effect of a drug

The study, which has been published in *Water Air and Soil Pollution*, has made it possible to develop a new tool to determine the likelihood of drugs ending up in the environment, and at what concentrations, thereby fulfilling the European Medicines Agency (EMEA) requirement to evaluate the environmental risk of new drugs that are being proposed for marketing.

The new tool, developed by Marc Ribera, lead author of the study, uses some physical-chemical properties of pharmaceuticals and the rate of growth in their use in Spain between 1999 and 2006 to determine how they will behave in the environment. The drugs analysed are those that are most commonly consumed in Spain (more than 1 mg of active substance per person and year), including, among many others, ibuprofen, diazepam, naproxen, omeprazole and paracetamol.

In order to validate the model, the research team compared the model's prediction results on water with values measured by authors in rivers and

lakes. "The model used is good at predicting the experimental data, and can be seen as a good predictive model for evaluating the environmental risks of current drugs and those that may be marketed in future", concludes Domenech.

Provided by FECYT - Spanish Foundation for Science and Technology