

**Ecopharmacology: an issue that needs urgent action**

Sir,

In recent years great concern has been expressed over the potential impact of pharmaceuticals in the environment. Pharmaceutical from various therapeutic classes have increasing being detected in the environment typically at low concentration in surface water.<sup>1</sup> This has lead to development of ecopharmacovigilance (EPV). World Health Organization (WHO) defines eco pharmacovigilance as the science and activities associated with the detection, evaluation, understanding, and prevention of adverse effects of pharmaceuticals in the environment.<sup>1,2,3,4</sup> Compared to the west EPV in India is still in infancy, there is no formal frame-work to monitor for potential adverse effects of the pharmaceuticals on the environment.

The unused or expired medicines can pose a hazard to public safety and to the environment, if they are not safely disposed of, as many drugs lead double lives: one within the body of animal/humans and one in the environment. Products of concern include both prescription and over-the-counter medications.

***Routes of release of pharmaceuticals into environment***<sup>1-5</sup>

- Patient excretion of the drug or its metabolites via the sewage system
- Inappropriate disposal practices, such as flushing unused or expired drugs down toilets and sinks and discarding them in household waste, are common and often a significant contributor of pharmaceuticals present in wastewater and other environmental media
- Direct release from waste water system from manufacturing units as most pharmaceuticals enter the water cycle through wastewater discharges or from poorly controlled manufacturing or production facilities
- Terrestrial deposition for examples via sludge application to land, leaching from Solid waste landfills or irrigation with treated or untreated waste water.

***Drugs in the environment***<sup>1-8</sup>

- Ciprofloxacin levels found to be at 28-31mg/L in Patancheru (Hyderabad, India)
- Carbamazepine (28.3 µg/L) found in the Kaveri river near Tiruchirapalli (India)
- Prozac in the Thames (UK)

- Cocaine in the Po river (Italy)
- Antidepressants, antiepileptic and statins in Niagara river and Ontario lake (Canada)
- Traces of prescription heart medications and caffeine have even found their way into Atlantic Ocean.

**Table 1: How to dispose of medicines properly.**

Do	Do not
Take your drugs out of their original packets and Mix drugs with an undesirable substance such as, cat litter or used coffee grounds.	Do not flush medicine down the toilet/sink unless accompanying product information instructs otherwise.
If the medicine is a solid, add a small amount of water to dissolve it.	Don't keep unneeded medications in the home.
Put the mixture into a disposable container with a lid the, or into a sealable bag.	Don't give or sell them to others.
The sealed container with the drug mixture can now be placed in the trash	

***Adverse environmental impact***<sup>1-8</sup>

- In Toansa village (Punjab, India), groundwater has been found to be polluted up to a depth of 100 feet
- Diclofenac Na<sup>+</sup> induced vultures death in India sub-continent
- Feminization of male fishes by Ethinyl oestradiol
- Spawning in shellfishes by Fluoxetine
- Dying of frogs by contraceptive pills
- Aggressiveness induced in lobsters by antidepressants.

Antibiotic resistance in the aquatic environment.

***How to dispose of medicines properly***<sup>1-9</sup>

The primary aim should be to reduce the quantity of unused medications. This can be done by purchasing only the drugs that are needed, taking the medication as prescribed by your physician, storing all medicines in a centralized location away from children and pets at the proper temperature and humidity, as recommended on the label. This may also help to reduce risks and inadvertent

over-purchasing of drugs and say “No” to physician samples if you are not going to use them.

Combinations of management strategies will likely be most effective in mitigating the risks presented by Pharmaceuticals in the environment such as;

- Rational drug use could be an important issue
- Pharmaceutical-return programs
- Raising awareness among stakeholders, i.e., patients, doctors, nurses, and pharmacists
- Advanced effluent treatment with sophisticated sewage treatment plants and waste water treatment plants
- Incentives for the development of “green” pharmaceuticals, and improved regulations and guidance on pharmaceutical waste management.

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