Tackling pharmaceutical fall-out in the environment

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Researchers at the University of York say that more should be done to tackle the problem of inappropriate disposal of pharmaceutically-contaminated wastes. They also have a potential solution.

They say that a significant proportion of the population either throw unused medicines in the bin or flush them down the drain with the result that significant amounts of these potentially harmful chemicals end up in landfill or watercourses. Waste from pharmaceutical manufacturing sites is also contributing to the problem.

In a survey conducted by researchers in the Environment Department at York, 30 per cent of people questioned admitted to throwing away unused or out-of-date medicines or that they flushed them down the toilet. Pharmaceuticals found in the environment include painkillers, anti-depressants, antibiotics and anti-inflammatories.

Only 17 per cent of survey respondents were aware of schemes run by pharmacies under which the public can return surplus medicines for appropriate disposal.

Masters student Zoe Williamson carried out the survey under the supervision of Professor Alistair Boxall, a former member of the Defra Hazardous Substances Advisory Committee.

He said: "There are big concerns over the negative impacts of pharmaceuticals on the natural environment. Inappropriate disposal of

pharmaceuticals and emissions from manufacturing sites are thought to be important contributors to these impacts."

Professor Boxall and PhD student, Tom Bean, with scientists in the University's Centre of Excellence in Mass Spectrometry, spent six months working on an Innovate UK-funded Knowledge Transfer Partnership with PyroPureLtd testing a new technology designed to destroy active pharmaceutical ingredients (APIs) found in pharmaceutical waste. The technology relies on pyrolysis, a thermochemical decomposition process using high temperatures and an absence of oxygen, followed by catalytic conversion to clean and convert the gases.

Seventeen of the most thermally stable pharmaceuticals were tested in the trial, which revealed that PyroPure® technology destroys over 99 per cent of 10 of the pharmaceuticals and an average of 94 per cent of the remaining seven.

Professor Boxall added: "Our work demonstrates that the technology could help reduce the emissions of pharmaceuticals to the natural environment and have big benefits for ecosystem health. The system also provides a range of other environmental and economic benefits that could radically change how waste of this nature is collected and destroyed.

"Using this technology, hazardous waste and controlled substances no longer need to be transported across the country to incineration facilities, thus reducing the associated costs, carbon emissions and risks associated with moving waste from its point of origin to its point of disposal. We need to make the public much more aware that take-back schemes exist and of the need for responsible disposable of unwanted medicines. The infrastructure should then be put in place so that this type of technology is readily accessible, for example at larger pharmacies.

"It would mean that surplus pharmaceuticals could be treated on site and there would be no need to put drugs into the environment unnecessarily."

Currently in the UK, pharmaceutical wastes are only disposed of in large-scale, high-temperature incinerators, which can be up to 200 miles away from where the waste is generated. The PyroPuretechnology could be the first viable alternative to high-temperature incineration for pharmaceutical wastes.

Peter Selkirk, PyroPure Ltd's Executive Chairman, adds: "This is a huge step forward for the healthcare sector and one that will pave the way for the future of waste disposal in clinical environments. PyroPure technology makes destroying waste safer, cheaper and more effective. It also negates the need for heavily polluting waste collection vehicles to make long journeys to the UK's incinerators. PyroPure represents a sustainable long-term solution for onsite waste disposal in clinical environments and I'm confident that this breakthrough will irrevocably change the model for waste collection on a global level."

Each PyroPure unit is the size of a chest freezer. The user simply opens the unit's lid and places the waste in the chamber before initiating the process of pyrolysis.

Provided by University of York