**Abstract EMEC18 Conference, Porto, Nov 26 – 29th.**

***Title: Environmentally friendly technology for the removal of pharmaceutical contaminants from aqueous media***

**Authors:** Yuan Li1,3, Craig McKenzie2, Zulin Zhang3, Mark A. Taggart1,Yonglong Lu4, Stuart Gibb1

**Author Affiliation:**

1. *Environmental Research Institute, North Highland College, University of the Highlands and Islands, Thurso, UK.*
2. *School of Science and Engineering, Fleming Building, University of Dundee, Dundee, UK.*
3. *Environmental and Biochemical Sciences Group,* *The James Hutton Institute, Aberdeen, UK.*
4. *Research Centre for Eco-Environmental Sciences,* *Chinese Academy of Sciences, Beijing, China.*

With a growing and aging global population, and with improving health care in many regions of the world, the use of human pharmaceuticals is increasing. Conventional treatment of domestic wastewater is often not sufficient to remove all pharmaceuticals and other biologically active compounds (such as steroid hormones). As a result, these may be discharged into surface waters in effluent and have been widely detected at trace (part per billion/trillion (ppb/ppt)) concentrations in receiving waters (3). As steroid hormones have been linked to reproductive disturbance and developmental problems in wildlife and humans, regulatory concerns have been raised (4). The environmental and ecological impacts of pharmaceuticals are poorly characterised, but may include environmentally acquired antibiotic resistance and other biological effects (5).

This study evaluates the potential to use industrial and agricultural by-products as low cost biosorbents for the removal of human pharmaceuticals and hormones from aqueous media. The overall aim of the project is to develop a tertiary treatment step that may be applied to waters that have undergone sewage treatment, i.e., an efficient and cost-effective ‘polishing’ treatment to remove residual compounds from a simplified matrix in low flow conditions.

Eleven low-cost biosorbents (derived mainly from Scottish industrial and agricultural wastes), including spent grain, crab carapace, coffee waste and marine macro-algae were investigated in batch studies for their ability to absorb 17 prioritised pharmaceuticals and hormones (using activated carbon as a reference material). The three most efficient materials were biochar, marine macro-algae and wood chippings and these were used to assess kinetics, isotherms, impact factors and sorption mechanisms for two target compounds, diclofenac and trimethoprim. Future work will consider real wastewater effluents and assess the economic feasibility of the approach. This will be done through pilot studies in collaboration with Scottish Water and the Chinese Academy of Sciences. It is anticipated that the resultant treatment system will be applicable in rural or semi-rural (low flow) plants and septic tanks.

**Acknowledgement**

This project is sponsored by the Scottish Government Hydro Nation Scholarship Scheme. Special thanks to Scottish Water, Scottish Environment Protection Agency and Centre of Expertise for Waters.

**References** (1) Wang J, J Environ Manage 2016 11/1;182:620-640; (2) Rivera-Utrilla J, Chemosphere 2013;93(7):1268-1287; (3) Loos R, Water Res 2013 11/1;47(17):6475-6487; (4) Blanchfield PJ, Environ Sci Technol 2015;49(5):3136-3144; (5) Carlsson G, Aquatic Toxicology 2013 1/15;126:30-41.