Best Water Related Presentation at Environ 2021

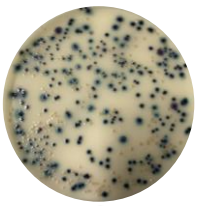
Winner Brigid Hooban, National University of Ireland Galway

Detection of carbapenemase producing Enterobacterales in sewage and aquatic environments in the Republic of Ireland, 2019-2020

Antibiotic resistance is a significant public health concern that impacts both human and agricultural health on a global scale. There are many different forms of antibiotic resistance that vary in their clinical significance based on the availability of alternative antibiotic agents for treatment. Carbapenem antibiotics are considered one of the last resort antibiotic classes that are reserved for critical human cases. Resistance to these antibiotics can spread in different environments by transfer of carbapenemase encoding genes between bacterial populations, making them difficult to contain. Carbapenemase genes encode for beta-lactamase enzymes that may confer resistance by targeting the beta-lactam ring of certain antibiotics, including the carbapenem class. On a national scale, carbapenemase producing Enterobacteriaceae were declared a public health emergency in Ireland back in 2017.

Antibiotic resistance is a 'One Health' concern meaning that it impacts both humans, animals and our shared environment. All three components of the 'One Health' triad are interlinked, making them of equal importance. Antibiotic resistance can spread from humans and animals to the environment through wastewater discharges and agricultural runoff, and vice versa through recreational interaction with environmental waters. Therefore, there is an increasing need to better understand the role of the environment as a reservoir and transmission route for antibiotic resistance in order to protect public health.

As part of the EPA and HSE funded AREST project (www.nuigalway.ie/arest) this research examined both environmental waters and sewage sources for the presence of clinically significant antibiotic resistant bacteria on a national scale. Samples were collected across Dublin, Cork and Galway including coastal and inland freshwaters, in addition to sewage from healthcare facilities and wastewater treatment plants. The aim of this work was to analyse the clinically significant antibiotic resistant bacteria residing in our waters and try to link them back to their original source through comparing the bacteria to those detected in different wastewaters.



The initial sampling round as part of this work was published in the Environment International journal in March 2021 (https://doi.org/10.1016/j.envint.2021.106466). As part of that work we identified carbapenemase producing Enterobacteriaceae in bathing waters as well as different sewage sources. We established the connection between wastewater and the natural aquatic environment through the detection of identical *Klebsiella* bacteria in hospital sewage and two nearby waters.

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