Tackling antimicrobial resistance

October 21 2021

Dr Kelly Jobling in the lab. Credit: Newcastle University

Researchers from Newcastle University, and colleagues from Spain, Canada and Egypt, have successfully trialed two new qPCR assays to help detect the presence of transmissible AMR using water and wastewater samples. Publishing their results in the journal *Water Research*, the scientists present a DNA-based testing method that provides a surrogate for monitoring AMR, which will make AMR screening cheaper and more accessible around the world.

The study presents a method, which is similar to methods used on wastewater samples to detect SARS-CoV-2, that differentiates between bacteria who are carrying AMR genes versus no AMR genes. There is currently no simple "silver bullet" assay for triaging AMR based on DNA from wastewater—this new assay may provide this role. It can be used for rapid screening of transmissible AMR to identify locations where more expensive analysis can be justified.

Study co-author, Professor David Graham, of Newcastle University's School of Engineering, said: "The use of wastewater is becoming an increasingly vital tool for guiding healthcare decisions during the pandemic. We have shown that the same principle can be used to address other problems, including reducing the spread of superbugs. The method provides a more exact way of determining AMR by measuring DNA in wastewater samples."

The global impact of antimicrobial resistance

AMR is major global public health issue that has implications on the effective treatment of a growing number of infections caused by bacteria, parasites, viruses and fungi. Antibiotic use selects for resistance strains in human and animal wastes, which can be released to the environment via wastewater, spreading antibiotic resistance genes (ARGs) and bacteria across nature.

The findings are especially important in light of a recent report by the World Economic Forum on the economic cost of AMR, in which Professor Graham was a co-contributor. The report showed that the cost of AMR is closely related to the capacity of local healthcare systems, with areas without robust healthcare surveillance seeing the greatest levels of AMR and healthcare costs. The report showed AMR costs to the wider economy due to reduced labor supply result in worktime and productivity losses, with waterborne AMR leading to 3.5 million

additional sick days yearly, at a cost of $300 million globally.

Study co-author Dr. Marcos Baluja of Newcastle University's School of Engineering added: "We are now aware of the environmental dimension of AMR and its implication in public health. At Newcastle University, we work to understand this complex ecological and evolutionary problem and design feasible methods to identify the hotspot of AMR selection and maintenance in the environment. These tools are crucial to efficiently interrogate the environment and design comprehensive strategies to mitigate dissemination of environmental sources of AMR."

More information: Marcos Quintela-Baluja et al, Dynamics of integron structures across a wastewater network – Implications to resistance gene transfer, *Water Research* (2021). DOI: 10.1016/j.watres.2021.117720

Provided by Newcastle University