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# Faecal pollution source tracking & quantitative microbial risk assessment methods for a suitcase laboratory

*“The workshop was an opportunity for me to refresh some molecular biology techniques and most importantly, to learn and update myself on more recent techniques in the field. I also had the chance to meet other researchers from across Africa and to begin to build a network of researchers for future collaborations. Thank you for being very supportive and for investing your time and experience into building capacity on the African continent.”*

George Mangse, Lecturer at Nile University of Nigeria,  
on molecular microbiology training with the suitcase laboratory at the Addis Ababa Water and Sewerage Authority

## Aim

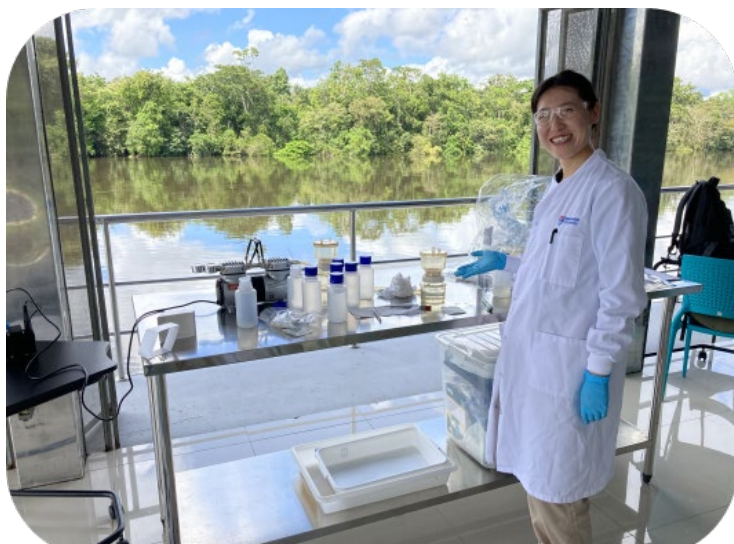
Using a suitcase laboratory that contains the MinION sequencing device of Oxford Nanopore Technologies, over 100 comprehensive water microbiome data sets have been collected from around the globe. This desk study exploits the global data for the development of multivariate data analysis tools which facilitate faecal pollution source attribution and related quantitative microbial risk assessments by suitcase laboratory users. The goal is to facilitate the wider uptake of an affordable suitcase laboratory for molecular water microbiology in environmental surveying and wastewater treatment biotechnology applications around the world.

## Results

Newcastle University researchers have developed an innovative ‘**Lab in a Suitcase**’, a portable water testing lab, that can be used to comprehensively screen water samples for faecal pollution and waterborne hazards. This suitcase laboratory brings advanced genetic testing methods within reach of water, sanitation, and hygiene (WASH) researchers working in low- and middle-income countries. It is also suitable for rapid onsite water quality testing by WASH professionals around the World who run sewage treatment works, manage livestock on farms, assess bathing waters, and provide humanitarian aid to communities displaced by natural or human made disasters.

The Newcastle University researchers developed a protocol for quantitative microbial risk assessment (QMRA) which uses data generated with the suitcase laboratory to rapidly assess risks of contracting gastrointestinal diseases from water that is polluted with faecal matter.

Researchers designed and delivered a hands-on training workshop. The suitcase laboratory was used to detect genetic markers for human sewage pollution in the urban river Ouseburn. Results were obtained within 3 hours of sampling. In Ethiopia, trainees gained hands-on experience in analysing river water and wastewater samples



## RESULTING PUBLICATION:

Environmental DNA clarifies impacts of combined sewer overflows on the bacteriology of an urban river and resulting risks to public health. Rixia Zan, Adrian Blackburn, Jidapa Plaimart, Kishor Acharya, Claire Walsh, Ross Stirling, Chris G. Kilsby, David Werner. *Science of The Total Environment*. Volume 889, 1 September 2023, 164282