

Antimicrobial resistance—a new perspective on managing a crisis

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Credit: University of Technology Sydney (UTS)

Antimicrobial resistance (AMR) is recognised as a global health crisis far surpassing outbreaks of single diseases such as Ebola and HIV and, arguably, on a par with climate change. Despite this the management of AMR has largely failed to stop or decrease the incidence of AMR in previously manageable diseases. Now, with Antimicrobial Awareness Week approaching, scientists from the University of Technology Sydney (UTS) and La Trobe University are offering a new perspective they hope will lead to the characterisation of AMR as an ecological disease that can be defined and tested and thus monitored in a different way.

AMR happens when microorganisms such as bacteria, viruses, parasites, and fungi develop resistance against medicines that were previously able to cure them.

Dr Carolyn Michael, lead author of an article published in the Royal Society publication *Open Biology*, believes that not enough focus has been given to the problem of rapidly and accurately monitoring the root cause of the AMR crisis and that a better test is required.

"Monitoring the crisis is largely limited to counting increasing numbers of resistant pathogens. Rather than monitoring pathogens we are proposing monitoring resistance genes that exist throughout the microbial world and not just in pathogens. Doing this will let us see rising numbers of resistance genes before they get to a pathogen and also keep an eye on the different types of resistance genes already in pathogens," says Dr. Michael.

Dr Ashley Franks adds: "The World Health Organisation recognises this is an up and coming crisis. What we are providing is a framework for prediction before AMR reaches threshold levels in certain areas."

The research team proposes tracking [resistance gene](#) frequency across the environment, so that the early phases of the rise of resistance genes is detected and managed. This would involve not only monitoring microbial DNA in hospital settings but also sampling in surrounding environments such as shopping precincts and transport hubs and even sewerage treatment facilities. Together with rigorous stewardship of existing antimicrobials this protocol would mean that the effectiveness of current and future antimicrobials would be preserved. Measuring increases in resistance gene numbers gives clinicians and health authorities information allowing them to recommend which antimicrobials should be used and which must be 'rested'.

"What we are proposing is a method that measures the underlying problem and gives a quantifiable solution that can be used to see if measures to control AMR are working," she says.

The researchers also address the critical issue of limiting resistance gene and antimicrobial stressor flow to the environment by advocating high-level precautions typical of quarantine wards, sterilisation of effluent and, when necessary, the complete withdrawal of certain antibiotics with high levels of resistance genes.

For microbial ecologist Maurizio Labbate, AMR is an issue that recognises that the health of people is linked to the health of wild and food-producing animals and the wider environment.

"This approach can be used to monitor AMR across all environments, and if applied, will also help us understand the links between these environments that are contributing to AMR," he says.

Dr Michael's background in developing diagnostic technology, working with infectious diseases in third-world countries, and molecular biology expertise gives her a unique perspective on a crisis that by some estimates suggest will result in 10 million preventable deaths by 2050 if not addressed.

"The ecology of the planet is interconnected, and we need a global management perspective to tackle the AMR crisis. I've spent a lot of time in clinical settings and I know doctors are frustrated that they have no way of knowing how long the antimicrobials that they rely on to cure their patients will continue to work. Global health authorities also need a way to see if their attempts to reduce AMR are working before a newly untreatable disease strikes. What we are proposing is a global protocol that both defines and measures the size of the problem and so offers solutions to handle this critical issue."

More information: Michael CA, Franks A, Labbate M. 2016 The antimicrobial resistance crisis: management through gene monitoring. *Open Biology*. [DOI: 10.1098/rsob.160236](https://doi.org/10.1098/rsob.160236)

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