

Informing policy and managing risk
associated with the environmental
dimension of antimicrobial resistance (amr)

Background

Antimicrobial resistance (AMR) currently kills 700,000 people a year and is estimated to be the leading cause of death by 2050 with a total economic cost to global society of \$100 trillion. At the European Centre for Environment and Human Health Prof Will Gaze and his research group are leading the way to address this global challenge, informing national and international policy and practice of the environmental dimension of AMR.

Over £3mill UKRI funded research generated by Prof Gaze's group has demonstrated that environmental pollution plays an important role in the evolution, ecology and transmission of AMR. Uniquely Prof Gaze's research focuses on the behavior of bacteria in complex microbial communities, rather than single strains in isolation, so bringing real-world insights into the evolution and ecology of AMR. His work also considers three themes, ecology, evolution and public health, which align to the WHO priorities identified as being important in considering the environmental dimension of AMR, so integrating all aspects of AMR and environment.



Key findings

- Research findings on evolution of resistance at low antibiotic concentrations conducted by Dr Aimee Murray have significantly improved understanding in this area by challenging the long-standing assumption that selection occurs in a dose-dependent manner.
- Ecological work conducted by Dr Lihong Zhang and collaborators showed that waste water treatment plants introduce and/or select for AMR in downstream aquatic sediments and that this is a reproducible and predictable phenomenon across entire river catchments. This demonstrates that anthropogenic pollution (point source and diffuse) significantly increases the prevalence of antibiotic resistance within aquatic sediments where there is increased probability of evolution of novel emerging resistance and increased acute transmission risk to humans.
- Work on environmental transmission of AMR undertaken by Dr Anne Leonard identified environmental exposure to coastal bathing waters as a significant human exposure risk with millions of exposure events to E. coli carrying clinically important resistance genes implicated in treatment failure of human infections occurring each year.

‘Influencing policy means our research can make a difference to the environment and people’s lives’ - Prof Will Gaze, University of Exeter

Policy recommendations and outcomes

Prof Gaze's group constitutes one of the most significant research programmes on the environmental dimension of AMR in the UK and internationally. The research has informed government strategy and policy across the UN, WHO, UKRI, UK and international government. In addition, extensive engagement with stakeholders has greatly increased the perception of the public health risks associated with AMR.

Significant contributions include:

- In 2014 the research councils and key funders formed the AMR Funders Forum, with Professor Gaze's work covering two of the seven featured case studies, illustrating how central his contribution was from the beginning of the current emphasis on AMR as a national priority. He has also acted as an expert advisor at a UKRI scoping workshop on AMR in the environment defining future research priorities for the AMR Funders' Forum.
- Advising Defra's Hazardous Substances Advisory Committee on AMR on the risks posed by antibiotic residues in the environment and was invited to speak at the Houses of Parliament as part of the UKRI AMR research strategy refresh.
- Informing policy, regulation and practice through a NERC Knowledge Exchange Fellowship on AMR and the environment, working with Defra, EA, the water industry and pharmaceutical industries. Prof Gaze is cited in the 2019 UK AMR 5 year strategy.

Team

The European Centre for Environment and Human Health environmental dimension of AMR research group with over 20 members including Dr Anne Leonard, Dr Aimee Murray, Dr Lihong Zhang and collaborating closely with Dr Mick Vos.

Research funding

NERC, BBSRC, MRC, ESIF, BBSRC/Astra Zeneca, DHSC/UKAid; UoE/Chinese University of Hong Kong, UoE/Queensland University.

Government Areas of Research Interest:

Defra: Environmental quality, Water, Livestock production systems; Department of Health: Antimicrobial Resistance





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Get in touch

Send us an email at PolicyEngagement@exeter.ac.uk at any stage of the process for assistance.



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