IOI Doctoral Scholarship on Antimicrobial Research

Project title: Food Systems and Antimicrobial Resistance
Registered in the University of Oxford. DPhil in Biology
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This DPhil project will support – and be supported by – the work of a global group of researchers (UK, Germany, Kenya, Tanzania, Nigeria, Sierra Leone, South Africa, Ghana, Pakistan, and India), who are deploying broad interdisciplinary and transdisciplinary methodology to explore the link between different food systems and risks of antimicrobial resistance, and to design, implement, and evaluate interventions and policy initiatives to reduce those risks.

About the programme

This is funded by the Ineos Oxford Institute (IOI), with studentship fully funded for 3.5 years (fixed term). There is only one studentship available, to start in October 2025.

The IOI will provide funding equivalent to UK fees and stipends. International students would need to apply for other scholarships to cover any difference in cost. Please find a list of graduate scholarships available at the University of Oxford here.

Application process

We are now accepting applications.
Application Deadline: **07 January at 11:59pm GMT.**
Start Date: **October 2025.**

The route from food systems to AMR risk

The emergence of pathogens, especially zoonotic and gut-dwelling ones, is shaped by – and in turn shapes – human, animal, and environmental microbiomes. Pathogens evolve differently in different reservoir hosts, and do so under different degrees of intensification and of microbiome stress, including stress from stocking densities, diet, medication, animal health, and climate change. Inadequate food-system hygiene and sanitation, food processing practices, and supply chain management – often facilitated by weak regulation, poor supervision, and distorted incentives – further promote high pathogen transmission and impact, which speeds evolution and shedding into the environment, increasing AMR risk. To help prevent future rising human and animal morbidity and mortality from AMR, and to curb spiralling costs to health systems and economies, we need to develop long-term more sustainable food systems that feed people healthily and equitably without creating AMR risk.

Understanding and mapping the complexity

The group, into whose efforts this DPhil will embed, seeks to disentangle the biological, economic, social, behavioural, political, and other driving forces that lead to the emergence and spread of AMR in food systems, and to integrate multiple data sets to identify cost-effective interventions to mitigate AMR risk in food systems. The group aims to empower local decision makers by better understanding local contexts – including behavioural, regulatory, and business aspects – and devising ways to scale up practical cost-effective solutions that are locally acceptable and work in low-resource contexts.

Using the lenses of anthropology, human geography, and/or economics, the group explores the enormously varied practices of intensification, such as stocking densities, handling of different hosts (mixing, movement, sanitation, slaughter), intensity of food processing, regulation, and environmental stewardship. Source data ranges widely – from small-numbers organic backyard rearing of chickens, dairy cattle, goats, and pigs in Low Income Countries to intensive broiler farming and beef, dairy cattle, and pork rearing in both High and Low Income Countries; from farmers' self-sufficiency and short-distance movement of living livestock and perishable foods to long-distance, even global, transport of already slaughtered and processed foods and supermarket supply chains. Risk-mapping of supply chains and food system practices will identify the stages when economic/social pressures combine with evolutionary pressures to generate the greatest risk (e.g., where profit margins are extremely small, informational asymmetries especially high, regulation especially weak, etc.). This will enable us to work out the AMR impacts and mitigation costs of different food systems and to test a repertoire of interventions and of changes in practices and incentives at different key points. By combining the experience of so many partners, we have a unique ability to do comparative analysis and to share knowledge and lessons that will help reduce risks of AMR in both high-income and low-income settings.

A One Health example

As an example of an interdisciplinary approach using a One Health lens, a student might study critical hazard points in the food systems of a country or region and then carry out lab experiments to confirm hazards in those food systems. This might involve local capacity strengthening especially in LMICs, by, for example, identifying local research gaps, assessing the feasibility of adding components (laboratory, non-laboratory, academic, non-academic, etc.) needed to undertake such research, gauging the state of engagement of different stakeholders, and then mapping out a route to strengthen local capacity. A student might not have the needed laboratory skills initially, but could gain them alongside the other skills of lab/project evaluation. Existing successful case studies of good engagement practices (e.g., TB education) might be explored as models of how to implement a One Health approach and use of new technologies for AMR biovigilance in food systems.

A one-drug example

Another approach a student might take could focus on a particular drug, such as Colistin, which is one of the drugs of last resort used in humans and so is banned for use in animal feed additives. A project might explore what systems or gaps in policies allow Colistin to still infiltrate the food system of many countries. A project to understand usage of, and policies around Colistin, especially from an LMIC perspective, might combine well with an investigation of gaps in systems and in policies that allow such infiltration. This too might involve exploring local capacity strengthening. A student might, for example, conduct genomic analysis of occurrence of resistance genes (e.g. genes that confer resistance to Colistin) on farms or other food systems in a particular country, investigate agricultural systems, the environment, the food chain, and the possibility of spread to humans; and then explore gaps in infrastructure and capacity in LMICs for continuous surveillance of the use of Colistin or of distribution of resistance genes in that country.

A metadata example

Many members of the group have gathered data on AMR source attribution based on sample pathogens from food animals, abattoirs, the environment, food on the shelf, and people in hospitals. Further exploiting our ability to access the metadata of partners' sequence samples, using big-data AI and machine learning tools, and combining this with other data (such as location and date, temperature, heat stress, air quality, human and animal health, household finance, socioeconomic status) and economic modelling will allow us to explore how interventions and their costs impact different groups, and also help us to assess likely acceptability and uptake of proposed interventions. Simple cost effectiveness evidence alone will not suffice; the lens of social determinants of health will be needed to identify impact across populations, adding an equity/social welfare to our understanding of why some antimicrobial stewardship initiatives work while others are resisted.

Climate change, food systems and AMR

Since food choices, AMR, antibiotic use, and climate change are interrelated, we also need to understand feedback loops between climate change and AMR such as those created by increased bacterial growth, heat stress, and poor air-quality (respiratory problems, weaker immune systems, impact on microbiome in the upper respiratory tract and gut) in poorly managed livestock sheds and in densely populated urban areas, which leads to overuse of antibiotics in livestock and humans, which further increases AMR risk. This will provide us with better evidence for combined environmental and AMR interventions.

Achieving behavioural and policy change

It is difficult to shift consumer behaviour even with good evidence. A student might spend some of their time exploring how their findings can be converted into practice and be scaled up for impact. Even when producers and consumers know that what might cost them a little more produces a large societal gain and are told that they should contribute their bit, they may still choose the individually cheaper options. What appears irrational at first glance might turn out rational if we include the full set of constraints and risks faced by producers and consumers that are not immediately visible to the outside observer.

The group also works with those striving to communicate findings to the public so as to change consumer behaviour. The group also seeks ways to incorporate its findings into policies that reshape industry behaviour and into AMR National Action Plans via improved target metrics of food biosecurity, including reduced antibiotics use in food systems, improved animal welfare, and lower consumption of meat.

In summary

The group deploys a mix of bioinformatics, biology, chemistry, epidemiological modelling, anthropology, human geography, economics, political science, and other methodological approaches. Given the multiple facets to the challenge and to possible solutions, we welcome DPhil 'Food Systems and Antimicrobial Resistance' research proposals, be they laboratory or non-laboratory based, from a wide variety of individual disciplinary perspectives, with either a local (including one country) or a global focus, and with or without already existing local partners who might be interested in becoming part of the group of collaborators.

Collaborators:

- **Dr Chioma Achi**, London School of Hygiene and Tropical Medicine
- **Dr Shamsudin Aliyu,** Department of Medical Microbiology, Ahmadu Bello University Teaching hospital, Shika, Zaria, Nigeria
- **Dr Harriet Bartlett**, University of Oxford
- **Professor Adrian Brink**, University of Cape Town, South Africa
- **Professor Jennifer Cole**, Royal Holloway, University of London
- **Dr Tim Eckmanns**, Robert Koch Institute, Royal Holloway University of London
- **Dr Sebastian Haller**, Robert Koch Institute, Berlin, Germany
- **Professor Hermine Mkrtchyan**, University of West of London
- **Fareedah Mohammed Munir,** Office of the Director-General, Nigeria Centre for Disease Control and Prevention, Abuja, Nigeria
- **Mwapu Ndahi,** Federal Ministry of Agriculture and Rural Development, Nigeria
- **Professor Opido Osano,** Department of Environmental Health and Biology, University of Eldoret, Kenya
- **Professor Abdoul-Salam Ouedraogo,** National Public Health Institute, and Centre MURAZ, Burkina Faso
- **Professor Gareth Pearce**, University of Cambridge
- **Professor Eva-Maria Schwienhorst-Stich**, University of Würzburg, Germany and SOPHEA Project
- **Professor Tim Walsh**, University of Oxford
- **Professor Mohammed Yahaya,** Department of Medical Microbiology & Parasitology, Danfodiyo University & Teaching Hospital, Sokoto, Nigeria
- **Ridwan Yahaya,** Antimicrobial Stewardship Program, Nigeria Centre for Disease Control, Abuja, Nigeria
- **Dr Saviour Yevutsey,** National Coordinator, Ghana AMR Secretariat, Ministry of Health, Accra, Ghana
- **Dr Widaad Zemanay**, University of Cape Town, South Africa