**University of Leicester**

**BBSRC MIBTP Studentship Project 2025-6 entry.**

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**Section 2 – *Project Information***

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| **Project Title** | Dynamics of Multispecies Interactions within Polymicrobial Infections: A one Health Perspective   |
| **Project Summary**  |
| Polymicrobial infections are shaped by the complex interactions between pathogens and commensals across diverse environments in humans, animals, and the broader ecosystem. These microbial communities engage in intricate relationships, where the balance between cooperation and competition determines the trajectory of both zoonotic as well as human infections. Commensal organisms can play a dual role, sometimes acting as defenders that limit pathogen invasion, while at other times enhancing virulence and facilitating the spread of antibiotic resistance. The cross-talk among these bacteria triggers shifts in gene expression, alters metabolic processes, and modulates virulence traits. Adopting a One Health perspective allows us to understand how these interconnected microbial interactions ripple through different species and environments, ultimately influencing health outcomes on a global scale. Understanding these dynamics is key to addressing the challenges posed by polymicrobial communities and developing holistic strategies for disease prevention and treatment.   The aim of this project is to investigate how pathogens and commensals interact within polymicrobial infections, using advanced molecular and analytical techniques to reveal their roles in disease progression and antibiotic resistance from a One Health perspective.  Objectives of this PhD project:   *i)* Develop and optimize *in vitro* models that simulate polymicrobial infections to study interactions between pathogens and commensal organisms in controlled laboratory settings to elucidate mechanisms of cooperation and competition that influence infection outcomes.  *ii*) Examine how external factors influence the dynamics of polymicrobial infections, with a focus on cross-species implications within the One Health framework.  *iii*) Utilize systems biology approaches to integrate genomic, transcriptomic, and metabolomic data, revealing the molecular mechanisms driving polymicrobial communities     These objectives aim to equip you with a comprehensive understanding of polymicrobial interactions while promoting a One Health perspective that considers the interconnectedness of human, animal, and environmental health.   We are looking for motivated candidates with a background in microbiology, molecular biology, or related fields. If you're eager to delve into the world of microbial interactions and their implications for health on a global scale, this opportunity is for you! Techniques that will be undertaken during the projectAs part of this PhD project, you will receive comprehensive training in biosafety practices essential for bacteriological research. You will develop expertise in bacterial genetics, co-culturing techniques, and various *in vitro* models - key skills for exploring complex microbial interactions. You will also have the opportunity to gain hands-on experience with advanced transcriptomics and metabolomics approaches, unlocking insights into microbial gene expression and metabolic pathways. Training in confocal and scanning microscopy, provided by the cutting-edge imaging facility at the University of Leicester, will enable you to master state-of-the-art visualization techniques. To further enhance your research capabilities, you will develop computational skills for analysing gene expression data and receive in-depth training in mass spectrometry.   |
| **References** |
| (1) Khare A. Trends Microbiol. 2021 Dec;29(12):1083-1094.  (2) Jenul C *et al*. Cell Rep. 2023;42(6):112540.  |