Using One Health AMU and AMR data to inform stewardship

Project ID: 3594

Supervisory team

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Host institution: University of Bristol

CASE partner: Welsh Lamb and Beef Producers

Project description: Antimicrobial resistance (AMR) poses a significant One Health challenge. Antimicrobial usage (AMU) is considered a primary driver of AMR. The antimicrobials key to human healthcare are also essential tools in maintaining the health, welfare and productivity of farmed livestock. Understanding the epidemiology of AMU and AMR in ruminant livestock could improve the health, welfare and productivity of these animals whilst providing broader One Health benefits. This project will continue to explore the substantial and growing volume of Welsh ruminant AMU and AMR data collated through our group at the University of Bristol's Veterinary School, as part of the award-winning Welsh Government-funded Arwain DGC project. Here, the student will have the flexibility to build on existing – or initiate new – research through the generation of novel hypotheses. To date, our research group has addressed key epidemiological questions around ruminant livestock AMU and AMR. For example, unique AMU profiles have been identified across multiple data-derived sheep flock and dairy herd typologies, in addition to spatiotemporal Bayesian regression modelling identifying variation in AMU across space and time. Further exploration – utilising multivariate statistical and machine learning approaches to group farms with similar AMU or AMR patterns – may help inform where stewardship intervention may be required. Recent work investigating the farmer-reported reasons for AMU has also built preliminary understanding of between-farm utilisation of antimicrobials and the extent to which antimicrobials are used off-label by indication. Additionally, pilot work is exploring how responsible use interventions (i.e. selective dry cow therapy) correlate with farm AMU dynamics. Future work incorporating farm disease incidence data into analyses presents an exciting opportunity to cost-effectively detect disease on the basis of AMU patterns, complementing syndromic livestock disease detection, but also building on other approaches elucidating the dynamics of antimicrobial utilisation in farmed livestock and. The student may also work with industry professionals and experts to explore the appetite for – and complexities of – collecting these granular disease data and consider how challenges and barriers are overcome. Beyond AMU, the ongoing screening of AMR – as part of Arwain DGC – offers exciting room for further research. Current work has focused on the modelling of longitudinal farm environment AMR E. coli with local weather patterns (and therefore climate change), where further exploration is needed to fully elucidate the climatic and weather-related factors associated with AMR phenotypes. There is scope to develop and refine methods to facilitate more widespread, national-level livestock AMR surveillance.

Our aim as the SWBio DTP is to support students from a range of backgrounds and circumstances. Where needed, we will work with you to take into consideration reasonable project adaptations (for example to support caring responsibilities, disabilities, other significant personal circumstances) as well as flexible working and part-time study requests, to enable greater access to a PhD. All our supervisors support us with this aim, so please feel comfortable in discussing further with the listed PhD project supervisor to see what is feasible.