Post: PhD position (4-years full-time)

Project Title:
The transmission of bovine tuberculosis: deciphering biological mechanisms with statistical and mechanistic models.

Supervisors:
Dr Miriam Casey (School of Veterinary Medicine) and Dr Michael Fop (School of Mathematics and Statistics) of University College Dublin.

Starting date:
September 2025.

Funding:
Annual tax-free stipend of €25,000 and an extra allowance of €4,000 per annum for training, travel, and equipment. University College Dublin PhD student fees are fully covered.

Project description:

Understanding mechanisms of transmission of mycobacterial infections is a priority for both human and animal health. Tuberculosis is responsible for the greatest number of infection related deaths and disabilities, and bovine tuberculosis has devastating impacts on the livestock industry and wildlife conservation. The prevalence of bovine tuberculosis in Ireland is increasing, despite a protracted and expensive control programme. Because of its complex multispecies epidemiology, with evidence for both cattle and wildlife related risk factors, there is robust debate about what is driving the recent increase in prevalence and the potential effectiveness of interventions to reduce burden.

Mechanistic modelling can help understand hidden disease transmission processes, and model the potential impacts of interventions for control. However, it is challenging to model mycobacterial transmission realistically due to the chronic and heterogeneous nature of infection and variable diagnostic test performance.

This project will build on a previously developed within-herd bovine tuberculosis transmission model, calibrated by approximate Bayesian computation using Irish cattle surveillance data spanning decades, and will capitalise on extensive cattle-movement and spatial datasets to capture network and environmental drivers. The student will explore alternative methods to fit complex stochastic transmission models, including advanced approximate Bayesian computation approaches and simulation-based inference methods, alongside surrogate-model emulators, to improve parameter estimation and determination of unknown mechanisms. This framework will provide the opportunity to explore the biological mechanisms behind Ireland's recent rise in bovine tuberculosis prevalence. Separately, the student will extend and scale the model to a meta-population (herd-network) level to better understand transmission in the country. The project offers an opportunity to advance understanding of the infection biology of a globally significant pathogen, capitalising on large and detailed data, strong inter-disciplinary expertise and a direct interface with control programme managers and policy makers. It will be delivered in collaboration with range of stakeholders including the Centre for Veterinary Epidemiology and Risk Analysis in University College Dublin. Modelling tools and frameworks developed could be applied to other infectious-disease systems and skills will be developed to maximise the impact of quantitative expertise in infectious disease control.

Eligibility and entry requirements:

Applicants should have (or expect to attain prior to project start) at least a 2.1 honours degree or equivalent in the areas of statistics, mathematics, applied mathematics, computer science or equivalent STEM subject area, with an interest in engaging with biological sciences and solving applied problems. Alternatively, a degree in the areas of biology, ecology, veterinary with demonstrated quantitative skills and a willingness to develop programming skills may also be suitable. A Masters degree relevant to infectious disease epidemiology, or biostatistics is desirable.

Applicants must demonstrate some proficiency in statistical modelling and have experience with computing through R / C++ / Python, or similar programming language. Applicants for whom English is a second language will be required to demonstrate their competence in the English language in line with University College Dublin requirements as appropriate.

How to apply:

Applicants should email Dr. Miriam Casey (miriam.casey@ucd.ie) and Dr. Michael Fop (michael.fop@ucd.ie) to apply.

The application should include a comprehensive CV, academic transcripts of the degree/ degrees, and a short cover letter/statement of purpose (2-pages max) indicating how their skills align with the project and their motivation for applying. The application CV should, at minimum, include the applicant's name, educational institution, qualification stating overall grade (predicted grades are acceptable for those still studying) and contact details of two academic referees.

Please include "PhD application - bTB modeling" followed by your name in the subject line.

Applications not in this form will not be considered.

Evaluation of applicants will commence in June 2025, and will continue on a rolling basis until the position is filled. Only shortlisted candidates will be contacted.

Informal queries can be directed to miriam.casey@ucd.ie and michael.fop@ucd.ie.

Equality, diversity and inclusion:

UCD believes in equality, diversity and inclusion and embeds these fairness principles into all aspects of University life. UCD's mottos, "Ad Astra" and "Cothrom na Féinne" reflecting both excellence and fairness, remind our community that fair play is integral to our mission and informs our policy development, behaviours and decision-making so that the UCD community embraces equality, diversity and inclusion. As such, we warmly welcome applicants from all sections of the community.

About UCD:

UCD is one of Europe's leading research-intensive universities; an environment where undergraduate education, masters and PhD training, research, innovation and community engagement form a dynamic spectrum of activity. Since its foundation, the University has made a unique contribution to the creation of modern Ireland, based on successful engagement with Irish society on every level and across every sphere of activity. The international standing of UCD has grown in recent years; it is currently ranked within the top 1% of higher education institutions world-wide. UCD is also Ireland's most globally engaged university with over 38,000 students drawn from 152 countries, including over 5,000 students based at locations outside of Ireland. The University's main Dublin campus occupies an extensive parkland estate of 133 hectares and offers world-leading facilities including the UCD O'Brien Centre for Science, UCD Sutherland School of Law, UCD Lochlan Quinn School of Business, UCD Moore Centre for Business, and the UCD Student Centre.

As Ireland's largest university, with its great strength and diversity of disciplines, UCD embraces its role to contribute to the flourishing of Ireland through the study of people, society, business, economy, culture, languages and the creative arts, as well as through research and innovation. The University's Strategy to 2030 outlines the objectives and major strategic initiatives set in place in order to accomplish UCD's vision for this era.