

PhD Project: Spillover! Modelling the dynamics of zoonotic viruses from wildlife to human populations

Start Date: 1st October 2025

Supervisor: [Dr Olivier Restif](#)

Most emerging diseases affecting humans and domestic animals started as a spillover event from a wildlife reservoir, yet we still understand little about the bottlenecks that control the jump of pathogens between species. This aim of this project is to develop a series of mathematical and computational models that will generate predictions about the drivers of disease outbreaks in new hosts. The student will join an international consortium (batonehealth.org) with years of fieldwork, lab work and computational research experience on zoonotic viruses in bats spanning three continents, including Hendra, Nipah and Ebola viruses. The project will integrate data and evidence from different disciplines into stochastic dynamic models to estimate the probability of rare large outbreaks under different spillover scenarios. This research will challenge the common view that pandemics cannot be predicted, using a One Health approach to evaluate the role of ecological, epidemiological and sociological factors.

Specific objectives will be discussed with prospective students and may include the following questions:

- What features of bat-virus systems contribute to zoonotic risk?
- How can wildlife surveillance be optimized to predict spillover risk?
- Can early detection of outbreaks be effective?

Candidates should hold a scientific degree and a Master's level specialisation in a relevant discipline, with University-level credits in probability, calculus, scientific programming, and biological or environmental sciences. Additional training will be provided during the PhD to strengthen skills and knowledge in these areas, tailored to the student's profile. The project will enable the student to work in a multi-disciplinary environment and develop their communication skills with diverse collaborators and stakeholders. Subject to travel grant applications, there will be opportunities to visit field sites overseas and work with local teams.

Suggested reading:

- Plowright, Raina K., Colin R. Parrish, Hamish McCallum, Peter J. Hudson, Albert I. Ko, Andrea L. Graham, and James O. Lloyd-Smith. 'Pathways to Zoonotic Spillover'. *Nature Reviews Microbiology* 15, no. 8 (August 2017): 502–10. <https://doi.org/10.1038/nrmicro.2017.45>.
- Lunn, Tamika J., Alison J. Peel, Hamish McCallum, Peggy Eby, Maureen K. Kessler, Raina K. Plowright, and Olivier Restif. 'Spatial Dynamics of Pathogen Transmission in Communally Roosting Species: Impacts of Changing Habitats on Bat-virus Dynamics'. *Journal of Animal Ecology*, 4 August 2021, 1365-2656.13566. <https://doi.org/10.1111/1365-2656.13566>.
- Glennon, Emma E., Freya L. Jephcott, Olivier Restif, and James L. N. Wood. 'Estimating Undetected Ebola Spillovers'. *PLOS Neglected Tropical Diseases* 13, no. 6 (13 June 2019): e0007428. <https://doi.org/10.1371/journal.pntd.0007428>.

How to apply: Contact the Supervisor to discuss the project before submitting an official application. More info on applying here: <https://www.postgraduate.study.cam.ac.uk/courses/directory/cvvtmpvet>