Physiological capacity of hibernating bats and implications for immunity and viral load

Supervisory team:
**Main supervisor:** Dr Orly Razgour (University of Exeter)
**Second supervisor:** Prof Nicholas Harmer (University of Exeter)
Dr Lucy Hawkes (University of Exeter), Prof Anthony Fooks (Animal and Plant Health Agency (APHA))

**Collaborators:** Dr Hugo Rebelo (CIBIO/InBio Research Centre in Biodiversity and Genetic Resources, University of Porto, Portugal)

**Host institution:** University of Exeter (Streatham)

**Project description:**
This project will use an exciting combination of field work in Portugal and molecular and biochemistry techniques to understand the effect of hibernation on viral infection of bats. Bats are hosts of zoonotic diseases that can present increasing risks to global human health, as exemplified by COVID-19. Key to understanding risk of disease spread is a robust knowledge of the physiological capacity of bats to store and spread zoonotic pathogens. This studentship will investigate one such aspect of bat physiology – the expression of torpor. The majority of temperate insectivorous bat species hibernate during the winter months to reduce the cost of defending high body temperature in the face of declining ambient temperatures and variable food supply. During hibernation animals can manipulate their body temperature to control pathogens. Wide variations in temperature and cellular activity could affect interactions between hosts and their pathogens, and may help reduce or even eliminate pathogens[1]. Hence, changes in the frequency, length and depth of torpor bouts can affect pathogen load in bats. The propensity of bats to hibernate is related to environmental conditions, such that bats are more likely to hibernate in cooler temperatures. Insectivorous bats that hibernate in unpredictable environments can show plasticity in their thermoregulatory responses and behaviour[2].

This interdisciplinary studentship will use a natural experiment of bat hibernacula in different environments in Portugal to investigate the winter thermoregulatory physiology of bats and how it affects immune function and virus load. Given that winter temperatures in the UK are predicted to rise over the next few decades, it is important to understand how changes in hibernation are likely to impact viral load and prevalence in bats.

We are looking for a candidate with a strong background in biological sciences and a keen interest in physiology and interdisciplinary research to develop the following objectives:

1. Use field physiological approaches to quantify differences in torpor length and depth and physiological status of bats in hibernacula in warmer Mediterranean versus cooler Atlantic regions.
2. Use flow cytometry and blood enzyme assays to determine impacts of changes in hibernation patterns on immune functions.
3. Use molecular approaches to assess differences in virus load and prevalence between hibernating and non-hibernating bats.