

2 PhD Studentships available in Teeling BatLab at University College Dublin, Ireland
<http://batlab.ucd.ie>

Elucidation of the “anti-ageing” mechanisms evolved in bats.

Application closing date: 30th November 2020

Background:

Ageing is the leading risk factor for major life-threatening conditions, such as cancer, neurodegeneration and cardiovascular disorders. Despite centuries of study, the complexity of the ageing process has hampered our understanding of what drives ageing, with multiple theories of how and why we age, but little consensus. To date, most ageing studies have been carried out in laboratory model species, as they are easier to manipulate, house and have shorter lifespan. Although substantial progress has been made in extending lifespan and healthspan in these short-lived model organisms, there is limited evidence that these approaches will be effective in more long-lived species such as humans. **An alternative approach is to explore ageing in species that are even more ‘ageing-resistant’ than humans and have naturally evolved longer healthspans.** By far the most successful mammals in this regard are bats, living up to 8 times longer than expected and showing little signs of ageing. Logistically it is difficult to study bats in an ageing context, as most are only found in the wild, are protected, are too small for non-lethal sampling and not easily maintained in captivity. **However the Teeling team has uniquely overcome these problems, by developing the field, laboratory and state-of-the-art genomic methodologies required to ascertain the molecular age related changes that occur in wild bats, allowing us for the first time to uncover the molecular basis of bats’ extraordinary longevity.**

Two fully funded four year PhD studentships (fees, expenses for the project, 18,000k euro per year stipend, funded by Science Foundation Ireland Future Frontiers Award, LongHealth) are available to join the Teeling lab, available from January 2021.

Project (1): *Ascertain the age-related molecular changes in short- vs long-lived bats*

In this four year fully funded PhD the student will study multiple species of bats in an ageing context across the longevity spectrum (e.g. short- vs medium- vs long-lived bats) to reveal both convergent and divergent anti-ageing adaptations in long-lived versus shorter lived bats. These species were chosen based on their differential longevity across the expected ageing spectrum: two long-lived, two short-lived, two average longevity. Each population has been studied extensively with known demography and life histories and is suitable for non-lethal sampling of known aged individuals, across their lifespans. All populations will be sampled at single time-points over 2-4 field seasons with ongoing field experts (locations: France, UK, Panama, Slovenia) and zoo/captive colony collaborators (locations: Denmark, USA). Using the field methods and laboratory protocols established in the Teeling lab (batlab.ucd.ie), the student will sequence the full blood transcriptome and estimate telomere attrition, across each age cohort (young-middle-old age) per species. These data will be used to ascertain if longer-lived bats have evolved the same or divergent longevity mechanisms; if the ageing profile of bats is different to other mammals and to identify the non-coding RNA regulation of these transcriptomic age-related signatures. This integrative research (i.e. bat field biology, comparative transcriptomics, genomics, molecular ageing biology) will uncover the longevity pathways evolved in long- vs shorter-lived bats and predict the non-coding regulatory regions of these transcriptomic signatures, thus narrowing down shared and divergent pathways that may drive longer healthspan in mammals.

Preferred Start: January 2021.

Project (2): *Elucidate the genomic basis of longer healthspan in bats.*

Twenty-seven new bat chromosome-level genomes, representing all bat families are being generated using novel sequencing technologies (e.g. Pac-Bio, Hi-Ci-Dovetail, 10X) part of Bat1K (www.bat1k.com). These genomes will be near complete error-free assemblies and will include the six-bat species to be studied at the population level (Project 1), and selected pairs of phylogenetically matched short- vs long-lived bat species. The student will use these new genomes to ascertain the evolution of unique longevity pathways in bats compared with other mammals using both a candidate gene/pathway approach and also using a whole genome wide unbiased approach. In particular the student will uncover regions of the genome under convergent/divergent evolution in long- vs short-lived mammals and long- vs short-lived bats using state of the art comparative genomics and phylogenomic methods. These data will be compared with the on-going population analyses of PhD project 1, to ascertain if the *in silico* predicted genomic regions driving longevity adaptations in bats uncovered, correlate with longevity signatures in the population level-ageing transcriptome studies. These analyses will discover the genomic regions under selection in bats, which may underlie bats' longer healthspan and will be the basis for further validation.

Possible start dates: January 2021; May 2021; September 2021.

Candidates:

We are seeking highly motivated students interested in uncovering the genomic basis of the unique traits evolved in mammals, focussing on extended healthspan adaptations in bats. Students with at least a 2:1 honours BSc and/or MSc in Biology (or other relevant disciplines), with relevant research experience (**project 1: e.g. small mammal field work, laboratory bench work, comparative genomics; project 2: e.g. programming skills, genomic statistics, bioinformatics, phylogenomics**) with proven writing and communication skills and who are self-motivated and independent will be the most competitive. Students will join a vibrant and integrative research team with collaborators throughout the world, and therefore should be enthusiastic about working in a collaborative environment. Evidence of oral and written competence in the English language is required.

Application Details:

Applicants should submit the following to emma.teeling@ucd.ie as a single pdf, using the email subject header- **Longhealth Project 1 or Longhealth Project 2:**

1. A cover letter outlining their interest in either project 1 or project 2 and their relevant experience
2. A detailed CV (including a list of any publications if applicable)
3. The names and contact details of two academic referees

Closing date 30th November 2020.

Equality, Diversity and Inclusion:

UCD is committed to creating an inclusive environment where diversity is celebrated, and everyone is afforded equality of opportunity. To that end the university adheres to a range of equality, diversity and inclusion policies. We encourage applicants to consult those policies here <https://www.ucd.ie/equality/>. We welcome applications from everyone, including those who identify with any of the protected characteristics that are set out in our Equality, Diversity and Inclusion policy.