The relevance of transposable element dynamics for host-parasite interactions

Supervisory team:
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Project description:

Transposable elements (TEs) are mobile genetic elements that comprise a large proportion of eukaryotic genomes. TE regulation is important for maintaining genomic stability and is in part carried out by small RNAs. We recently found evidence that TE activity is directly linked to parasitism because: (i) Expression of parasite transposases (enzyme involved in insertion of DNA TEs into the genome) increases during infection; (ii) Specific small-interfering RNAs (siRNAs) regulate the activity of TEs in the parasite during infection. Understanding the genetic basis and consequences of parasitism offers opportunities for improved treatment and control of parasites.

This project aims to investigate the role of TEs in parasitism in the parasitic nematode Strongyloides and its host environment. The Strongyloides lifecycle has two genetically identical stages: one is parasitic and infects the intestine of humans and other animals, one is free-living causing no harm. We will make direct comparisons between the free-living 'control' and parasitic stages to understand how TE activity changes during parasitism and how TEs are regulated. The results from this project will contribute to our knowledge in the important and emerging field of TE biology and parasitism. The project addresses three key questions: 1. Is increased parasite transposase activity related to the host immune responses? RNAseq will be used to identify TE expression changes in the parasite under different host conditions e.g. absence of either a Th2 (anti-inflammatory, anti-nematode) or Th1 (inflammatory) immune response, to establish parasite TE responses to the host environment. 2. How does TE-sRNA activity in the parasite change during infection? We will quantify TE expression levels throughout infection and monitor if TEs, and the siRNAs that regulate them, are differentially expressed at early, peak and late stages of infection. We will use RNAi to target genes involved in siRNA pathways to characterise TE regulation pathways. 3. Does host TE activity change during infection? We will perform RNAseq on host (rat) tissues e.g. intestine, during and post-infection, to ascertain if TE activity is involved in the host response to parasitism.

Applicants should have a strong first degree or masters with an interest in laboratory-based and bioinformatic work. The successful applicant will be based in the Hunt lab (Bath) and will work closely with co-supervisors in the Hayward (Exeter, Penryn Campus), Protasio (Cambridge) and Hurst (Bath) labs. The student will receive training in laboratory-based techniques in parasitology and RNA biology, and bioinformatics skills including transcriptomics and TE annotation.