

## **Longitudinal trends of T-helper cell immune phenotypes in the Soay sheep from St Kilda: can we predict parasite burden?**

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The adaptive immune system is critical for appropriate responses to infections, with T helper (Th) cells playing a key role in orchestrating effective pathogen-specific responses. In contrast to controlled infections of laboratory animals, wild communities are challenged by multiple pathogens and consequently, discerning the responses to individual pathogens is more challenging. The long-term study of the Soay sheep on St Kilda offers a unique opportunity to investigate the variation in adaptive immune response to parasites under natural conditions and link this variation to infection pressures, health and fitness. Over the past four years we have investigated the main Th responses (Th1, Th2, Th17 and regulatory responses) in the population using *ex-vivo* T-cell stimulations to measure cytokine secretion and expression of Th transcription factors in CD4 T cells. Correlation of these immune responses with nematode and coccidian parasite burdens, were carried out to determine the animal's response to micro- and macro-parasites. We collected a total of 750 samples from 530 individuals, of which 149 were sampled more than once. Confirming previous results from analysis of a single year of data, we found that associations among the different immune markers were generally positive and that while CD4+ T cell counts were relatively stable with age, cytokine levels increased in older animals. We found that the canonical Th2 cytokine IL-4 was negatively associated with strongyle nematode faecal egg count, and that the canonical Th1 cytokine IFN $\gamma$  was weakly negatively associated with coccidian faecal oocyst count. Overall CD4+ cell count and cytokine responses were moderately repeatable, with between-individual variation accounting for around 20% of variation in these traits, but CD4+ cell counts associated with different Th phenotypes were not repeatable.