

Trends in temporal gene expression in adult Parasitic and Free-living *Strongyloides ratti*

Amongst the neglected tropical diseases, soil transmitted helminths remain a substantial one-health challenge. In particular, the parasitic nematode, *Strongyloides stercoralis*, is estimated to infect around 600 million people globally, constraining physical and socio-economic development. The distinct lifecycle of *Strongyloides* which produces genetically identical parasitic and free-living adult female populations offers a unique opportunity to explore the genetic basis of parasitism through comparative analyses. Previous work comparing the transcriptome at single time points has identified several gene families that are highly upregulated in the parasitic female and are expanded amongst parasitic *Strongyloididae*, suggesting that they have an active role in parasitism. However, the temporal expression of genes throughout the course of infection, and thereby relative activity in parasitism, remains unknown. Here, we present novel insight into temporal regulation of the *S. ratti* transcriptome through time-course RNAseq analysis, focusing on co-expressed genes both between and within the parasitic and free-living adult female populations. Differentially expressed clusters of co-expressed genes between generations largely captured reproductive and developmental differences. Gene families believed to be active in parasitism were largely upregulated and co-expressed in the parasitic female, with evidence of physical clustering within the genome into “parasitism hotspots”. In the free-living female, co-expressed gene clusters similarly isolate reproductive and developmental activity, but also offer insight into potential mechanisms of aging with decreasing regulation of the response to oxidative stress. Understanding both the activity and wider context of parasitism associated gene families allows us to refine the scope of interest for future work that holds potential for developing novel therapeutic interventions.