

Biodiversity of the functional genomics and microbiome of blood as a response to infection in goats by the nematode *Haemonchus contortus*

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Introduction: The Alpine goat *Capra aegagrus hircus* is parasitized by the barber pole worm (*Haemonchus contortus*). This relationship results in changes that affect the gene expression of the host, the pest, and the microbiome of both.

Purpose: In the study of the immune response of Alpine goats, there have been identifications of blood-based results that can help determine conditions of health through the host-parasite relationship.

Methods: Selected wethers were used as non-infected controls, others infected with *Haemonchus contortus* and antibody T-cells, also some infected with zoledronic acid (a bisphosphonate derivative), all under controlled conditions. We evaluated wethers following the introduction of infections after 7 days post inoculation (dpi) and 21 dpi. Vitals were examined through weight check, whole blood evaluation through CBC with Differential Count if indicated, and fecal egg counts (FEC). There were 7,627 genes expressed identifying different treatment types after 7 dpi. Testing and evaluation were done through extraction of DNA of the samples blood utilizing a modified protocol of Microbiome Norgen Biotek kits. Construction of cDNA libraries were made and later sequenced for 16S rRNA. Metagenomic analysis was completed using Partek® Flow® software suites.

Results: The indication of microbial flora showed growth in age of wethers and the *Firmicutes/Bacteroidetes* (F/B) ratio of pathogen attack, which symptoms of dysentery were noted. Sequencing was completed on blood samples through the NGS illumina RNA-Seq platform. Quality assurance and quality control analytics were used for 19 cDNA libraries and 20 metagenomic samples. In all there were five goat wethers in each of four treatment groups for the analysis of this research. The complete blood count (CBC) with Differential Count (Dif Count) and other blood parameters were measured that can distinguish certain markers to notify health and other immune response symptoms including edema, compromised digestion through lack of absorption of key nutrients, anemia, and other autoimmune deficiencies that lead to eventual death of the subjects under these controls through parasitic attack.

Significance: This study identified a blood-based diagnostic tool for the identification of health or non-infection versus unhealthy or infection with *Haemonchus contortus* in Alpine goats.

Keywords: Small ruminants, parasite diagnostics, gene expression