

**Project Title: Comparative analysis of nematode communities in wild and domestic horses**

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**Project Description:**

Approximately 50 species of cyathostomines infect horses with co-infections of between 3-15 different species. The worms can currently only be identified to the species level based on faint morphological differences of adult worms and this requires longstanding expertise. During routine diagnosis, this is currently not achievable and this is particularly a problem concerning research on for example the specific pathology of individual species with respect to the different clinical symptoms cyathostomins are associated with. Another problem is the widespread occurrence of resistance of cyathostomines to the benzimidazole and pyrantel anthelmintics. However, the exact species involved in resistance are barely known and the tools to identify them are largely missing. We thus expect that improved diagnostic tools will help to understand the species-specific pathogenetic characteristics of cyathostominosis, to explore biological interdependencies of the fascinating polyspecies infection patterns of cyathostomins. We hypothesize that interdependencies exist between the cyathostomin species composition and (i) host species, (ii) large intestine infection-site preferences and (iii) clinical symptoms.

The project will directly continue the work started in a previous project. In particular, we have established a method to perform combined molecular (DNA barcoding) and proteomic fingerprinting from the same individual worm. The PhD student will further complement the characterized species of the family Cyathostominae with the aim to build a comprehensive combined molecular and proteomic reference database. One task will be the identification of proteins in discriminating peaks in spectra obtained by mass spectrometry. This will help to extend the method to the diagnosis of third stage larvae. Another aspect of this PhD project will be the application of a next generation sequencing barcoding method using the cytochrome oxidase I PCR on populations of wild equines. Strongylid parasite populations in mountain zebras (*Equus zebra hartmannae*) in Namibia and plains zebras (*Equus quagga boehmi*) in Tanzania and Przewalski' horses (*Equus ferus przewalskii*) in Ukraine will be compared with those from local domestic horses (*Equus ferus caballus*). Libraries will be prepared from cyathostomin eggs collected from individual horses and parasite populations analyzed regarding the effects of age, sex, reproductive status and fecal egg count on the species composition and richness. Also cyathostomins obtained from different species of captive equines living in German zoos will be compared to see if the host species affects the cyathostomin species spectrum. The PhD student will be trained in state of the art molecular, proteomic and bioinformatic methods and be involved in a versatile multi-disciplinary scientific network.