

## **Co-infection of *Haemonchus contortus* and *Trichostrongylus* spp. among livestock in Malaysia as revealed by amplification and sequencing of the internal transcribed spacer II DNA region**

### **Abstract**

Background: *Haemonchus contortus* and *Trichostrongylus* spp. are reported to be the most prevalent and highly pathogenic parasites in livestock, particularly in small ruminants. However, the routine conventional tool used in Malaysia could not differentiate the species accurately and therefore limiting the understanding of the co-infections between these two genera among livestock in Malaysia. This study is the first attempt to identify the strongylids of veterinary importance in Malaysia (i.e., *H. contortus* and *Trichostrongylus* spp.) by amplification and sequencing of the Internal Transcribed Spacer II DNA region. Results: Overall, 118 (cattle: 11 of 98 or 11.2%; deer: 4 of 70 or 5.7%; goats: 99 of 157 or 63.1%; swine: 4 of 91 or 4.4%) out of the 416 collected fecal samples were microscopy positive with strongylid infection. The PCR and sequencing results demonstrated that 93 samples (1 or 25.0% of deer; 92 or 92.9% of goats) contained *H. contortus*. In addition, *Trichostrongylus colubriformis* was observed in 75 (75.8% of 99) of strongylid infected goats and *Trichostrongylus axei* in 4 (4.0%) of 99 goats and 2 (50.0%) of 4 deer. Based on the molecular results, co-infection of *H. contortus* and *Trichostrongylus* spp. (*H. contortus* + *T. colubriformis* denoted as HTC; *H. contortus* + *T. axei* denoted as HTA) were only found in goats. Specifically, HTC co-infections have higher rate (71 or 45.2% of 157) compared to HTA co-infections (3 or 1.9% of 157). Conclusions: The present study is the first molecular identification of strongylid species among livestock in Malaysia which is essential towards a better knowledge of the epidemiology of gastro-intestinal parasitic infection among livestock in the country. Furthermore, a more comprehensive or nationwide molecular-based study on gastro-intestinal parasites in livestock should be carried out in the future, given that molecular tools could assist in improving diagnosis of veterinary parasitology in Malaysia due to its high sensitivity and accuracy.

**Keyword:** Strongylid; *Haemonchus contortus*; *Trichostrongylus*; Infection rate; Livestock; Co-infection; Second internal transcribed spacer (ITS2) of ribosomal DNA