

INTERACTIONS BETWEEN *TRICHOSTRONGYLUS*
COLUBRIFORMIS AND *TRICHOSTRONGYLUS*
VITRINUS.

A THESIS SUBMITTED FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

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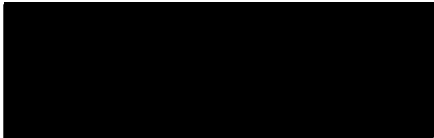
March 1997

Declaration

I certify that all the work reported in this thesis has not already been submitted for any degree and is not currently being submitted for any other degree.

I certify that to the best of my knowledge, all help received in preparing this thesis and all information from sources used, have been acknowledged.

Sections of this work have been submitted for publication through the course of my candidature and are listed.



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Submitted for Publication

Wooster M.J., Anderson N., LeJambre L.F. & Pope M. (submitted). Effect of anthelmintic treatment on species proportion in *Trichostrongylus* infection. *Australian Veterinary Journal*.

Acknowledgments

I am grateful to my supervisors, Dr. Leo Le Jambre and Prof. Klaus Rohde, for their invaluable assistance during the course of this work. I would like to thank CSIRO Division of Animal Health and CSIRO Division of Animal Production for allowing me to conduct my research at the Pastoral Research Laboratory. This work was funded by the International Wool Secretariat (CHP 431/CPB 571), for which I am grateful.

Thank you to Dr. Norm Anderson, Mr. Mike Pope, Dr. Maarten van Houtert, Mr. Ian Barger and Dr. John Steel for allowing me to work with them on experiments relating to anthelmintic resistance and protein supplementation for host animals.

For invaluable help with statistical analyses I would like to thank Dr. Ian Davies and Dr. Stuart Cairns. I thank Mr. Zoltan Enoch for assistance with photography and Mr. Ian Lenane, Mrs. Gill Whittington, Ms. Lisa Mascord and Dr. Peter Hunt for their technical assistance in other areas.

Lastly, I would like to express my deep appreciation for the support of my husband, Philip Wooster, who put up with me for the duration of my candidature and my parents, Chris and Lesley Johnston, who brought me up to believe I can do anything I set my mind to.

ABSTRACT

Trichostrongylus colubriformis and *T. vitrinus* are nematodes infecting the small intestine of ruminants, mainly sheep and goats. These species are closely related and can occur simultaneously in the same host. Despite such similarities anecdotal evidence suggests proportions of these two species tend to vary greatly between regions, between paddocks in the same region and between sheep in the same paddock. Of the two species, *T. vitrinus* is known to be more pathogenic making it desirable to know what influences differences in species proportion to possibly manipulate the environment and, therefore, species proportion, or to more accurately predict abundance of *T. vitrinus*. Factors considered were; anthelmintic treatment, host nutrition, host resistance status, interspecific competition and temperature.

In order to study factors affecting species proportion a reliable method of species identification was necessary to distinguish between the eggs, larvae and females of the two species. A variety of possible techniques were reviewed before a DNA based species identification technique, using the second internal transcribed spacer of ribosomal DNA, was chosen.

To investigate effects of anthelmintic treatment on species proportion, experiments were conducted on nematode populations from two properties. This work showed that after exposure to a range of anthelmintics, *T. colubriformis* and *T. vitrinus* can develop different levels of resistance to these anthelmintics. Results also confirmed that species proportion varied significantly between regions and between sheep in the same paddock.

An experiment examining anthelmintic treatment and protein supplementation of the host diet was conducted. Host nutrition was found not to significantly affect species proportion but a trend towards an increase in *T. vitrinus* was noted in protein supplemented animals.

Rams from two selection lines and a non-selected control line of the CSIRO *Haemonchus* selection flock were used to determine whether there is a relationship between host resistance status and *Trichostrongylus* species proportion. Results suggest that such a relationship did not exist.

Interspecific competition and population density in faecal culture were examined. Competition between *T. colubriformis* and *Haemonchus contortus*, *T. vitrinus* and *H. contortus* and *T. colubriformis* and *T. vitrinus* were examined over a range of population densities. Results at high population densities (>10 000 epg) showed *T. colubriformis* to be the better competitor in the

presence of *H. contortus*. However, *T. vitrinus* appeared the better competitor in cultures of *T. colubriformis* and *T. vitrinus*.

Two faecal culture trials were conducted to examine the effect of temperature on the development of eggs to third stage larvae (L3). The first examined cultures derived from a mixed paddock infection with *T. colubriformis*, *T. vitrinus* and *Teladorsagia circumcincta* present. The second examined cultures derived from artificial, single species infections of *T. colubriformis*, *T. vitrinus*, *Tel. circumcincta* and *H. contortus*. Results showed an inverse order of temperature preference. *T. colubriformis* developed to L3 at temperatures as high as 35°C, *T. vitrinus* and *Tel. circumcincta* develop to L3 at temperatures as low as 10°C while development of *H. contortus* was maximised at 27°C.

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