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A study on some aspects of the
pathogenicity, diagnosis and
control of gastrointestinal
nematodes in deer

A thesis presented in partial fulfilment of the
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Abstract

The most important parasites in farmed red deer are *Dictyocaulus eckerti* and gastrointestinal nematodes (GIN). The overall aim of these studies was to develop an understanding about GIN parasites in red deer, including their pathogenicity, diagnosis, control and the risk of cross-infection with cattle/sheep. To understand the pathogenicity of GIN, young deer were trickle infected with a mixed culture of deer-origin infective larvae (L3). The infection comprised 40% *Ostertagia*-type and 53% *Oesophagostomum* spp. L3. As a result of the high proportion of *Oesophagostomum* spp. L3, the animals were clinically affected with large intestinal lesions and it was not possible to investigate the effect of *Ostertagia*-type parasites. *Oesophagostomum sika* was recognised in New Zealand for the first time in this study. A national survey of the prevalence of different GIN in deer utilised PCR-based methodology. From each of 59 deer farms around New Zealand faeces from an average of 19 deer/farm were cultured and 24 infective larvae were randomly selected and identified. The order of prevalence from high to low was *Oesophagostomum venulosum* > *Spiculopteragia asymmetrica* > *S. spiculoptera* > *Ostertagia leptospicularis*. This illustrated the importance of abomasal nematodes in the subfamily Ostertaginae. A study was conducted to determine the ability of sheep GIN to establish in deer. The highest establishment rates were *Haemonchus contortus* (10.5%), *Trichostrongylus axei* (12.2%) and *O. venulosum* (5.8%). However, these were all lower than in sheep. The effectiveness of cross-grazing system between deer and sheep (DS) or cattle (DC) compared to deer grazing alone (DD) was undertaken as a replicated study at two locations over two years. The key outcomes were that DC needed fewer anthelmintic treatments and still had higher live-weight than other groups. The DD group received more treatments and still had highest nematode counts for *Ostertagia*-type nematodes and *Dictyocaulus*. The DS group received a similar number of treatments to DD and had the highest burdens of *T. axei*. Cross-grazing offers advantages which varied between DC and DS with regards the level of control of GIN, however, both were effective in controlling lungworm infection. Deer in all groups still required anthelmintic treatment to maintain growth rates.

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List of Abbreviations

Abbreviation	Description
°C	Degree Celsius
µm	Micrometre
AT	Anthelmintic Treatment
BZ	Benzimidazoles
CI	Confidence Interval
CT	Condense Tannins
D	Deer only
DC	Deer and Cattle
DCS	Deer, Cattle and Sheep
DD	Deer only
DS	Deer and Sheep
FEC	Faecal Egg Count
FLC	Faecal Larval Count
g	Gram
GIN	Gastrointestinal Nematodes
HD	High Dose group
InvAgR	Invermay AgReseach
ITS	Internal Transcriber Spacer
kg	Kilogram
l	Litre
L1	First Stage Larvae
L3	Third Stage Larvae
LD	Low Dose group
LrD	Lower Dose group
LSM	Least Squares Means
LWG	Liveweight Gain
MD	Medium Dose group
mg	Milligram
ml	Millilitre
PCR	Polymerase Chain Reaction
PNMassey	Palmerston North Massey Deer Unit
qPCR	Real time PCR
rDNA	Nuclear Ribosomal DNA
SAS	Statistical Analysis System
SE	Standard error of the mean
SP	Deer only Supressive treated
Taq	Thermus Aquaticus
VFI	Voluntary Feed Intake
WAAVP	World Association for the Advancement of Veterinary Parasitology