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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* > *Spiculoptera 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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Table of contents

ABSTRACT	III
ACKNOWLEDGEMENTS.....	IV
TABLE OF CONTENTS.....	VI
LIST OF FIGURES	XIII
LIST OF TABLES	XV
LIST OF ABBREVIATIONS	XVI
PREAMBLE.....	XVII
CHAPTER 1 LITERATURE REVIEW	1
1.1 Deer farming.....	1
1.1.1 Deer species and production around the world	1
1.1.2 Population and distribution in New Zealand	1
1.1.3 Venison “deer meat”	3
1.1.4 Velvet Antler	3
1.1.5 Deer seasonality	4
1.2 Nematodes.....	4
1.2.1 Introduction	4
1.2.2 Structure	5
1.2.3 Life Cycle	7
1.3 Nematodes in Deer	8
1.3.1 <i>Dictyocaulus</i> spp.....	8
1.3.2 <i>Varestrongylus sagittatus</i>	11
1.3.3 Gastrointestinal nematodes	12
1.4 Diagnostic Techniques for GIN.....	22

1.4.1	Morphological diagnostics	22
1.4.2	Molecular methods	27
1.5	Control.....	29
1.5.1	Anthelmintics:	29
1.5.2	Alternative methods	30
1.6	Summary	36

CHAPTER 2 ANALYSIS OF THE PATHOGENICITY AND DIAGNOSIS OF GI NEMATODE INFECTIONS IN YOUNG FARMED RED DEER – INITIAL STUDY ... 37

2.1	Introduction	37
2.2	Materials and methods	38
2.2.1	Experimental Design	38
2.2.2	Animals	39
2.2.3	Source of Larvae and treatments	39
2.2.4	Measurements	40
2.2.5	Identification of <i>Oesophagostomum sika</i>	42
2.2.6	Statistical Analyses	42
2.3	Results.....	42
2.3.1	Faecal Egg Counts	42
2.3.2	Worm Counts	43
2.3.3	Blood parameters	47
2.3.4	Liveweight gain.....	52
2.3.5	Voluntary Feed intake	53
2.4	Discussion	54
2.5	Acknowledgements	58

CHAPTER 3 ANALYSIS OF THE PATHOGENICITY AND DIAGNOSIS OF GI NEMATODE INFECTIONS IN YOUNG FARMED RED DEER – SUPPLEMENTARY FOLLOW-UP STUDY 59

3.1	Introduction	59
3.2	Materials and methods	59
3.2.1	Experimental Design	59
3.2.2	Animals and management	60

3.2.3	Source of Larvae.....	60
3.2.4	Measurements.....	61
3.2.5	Statistical Analyses.....	62
3.3	Results.....	63
3.3.1	Faecal Egg Counts.....	63
3.3.2	Worm Counts.....	63
3.3.3	Blood parameters.....	66
3.3.4	Liveweight gain.....	70
3.4	Feed intake.....	70
3.5	Discussion.....	71
3.6	Acknowledgements.....	73

CHAPTER 4 MOLECULAR IDENTIFICATION AND DISTRIBUTION OF GASTROINTESTINAL NEMATODES IN FARMED RED DEER IN NEW ZEALAND.

74

4.1	Introduction.....	74
4.2	Materials and Methods.....	75
4.2.1	Samples.....	75
4.2.2	PCRs.....	76
4.2.3	Statistical analysis.....	82
4.3	Results.....	82
4.3.1	Prevalence by species and farm type.....	82
4.3.2	Prevalence by farm.....	84
4.4	Discussion.....	86

CHAPTER 5 ESTABLISHMENT RATE OF SHEEP GASTROINTESTINAL NEMATODES IN FARMED RED DEER (CERVUS ELAPHUS).

5.1	Introduction.....	92
5.2	Material and Methods.....	93
5.3	Results.....	94
5.4	Discussion.....	96

5.5	Conclusions	98
5.6	Acknowledgements	98
CHAPTER 6 EVALUATION OF CROSS-GRAZING DEER WITH SHEEP OR CATTLE, AS A MEANS TO CONTROL GASTROINTESTINAL AND PULMONARY NEMATODES IN FARMED RED DEER IN NEW ZEALAND.....		99
6.1	Introduction	99
6.2	Materials and methods	100
6.2.1	Experimental design	100
6.2.2	Allocation and randomization of paddocks	101
6.2.3	Preparation of paddocks prior to the starting of the trial	102
6.2.4	Animals	102
6.2.5	Grazing Management	103
6.2.6	Anthelmintic treatment.....	103
6.2.7	Parasitological techniques	105
6.2.8	Statistical analysis	106
6.3	Results.....	107
6.3.1	Total Number of Anthelmintic Treatments (AT)	107
6.3.2	Time to Receive First and Second Anthelmintic Treatment.	108
6.3.3	Live weight and Liveweight gain:	109
6.3.4	Faecal Egg and Larval Counts	110
6.3.5	Tracer Deer Worm Counts	110
6.4	Discussion	114
CHAPTER 7 GENERAL DISCUSSION.....		119
3.3	Introduction	119
3.4	GIN in deer in New Zealand.	120
3.4.4	<i>Ostertagia</i> -type nematodes	120
3.4.5	<i>Oesophagostomum</i> spp.....	122
3.4.6	Abomasal <i>Trichostrongylus</i> spp.....	125
3.4.7	<i>Haemonchus contortus</i>	127
3.4.8	Small intestinal GIN.....	128
3.4.9	<i>Dictyocaulus</i> spp.....	128
3.5	Diagnostic Techniques for GIN	129

3.5.4	Nematode Burdens	129
3.5.5	Blood Parameters.....	130
3.5.6	Species Identification by PCR.....	131
3.5.7	The effect of variations in metabolic age.....	132
3.6	Control	133
3.6.4	Anthelmintics.....	133
3.6.5	Cross-grazing as an alternative control method.....	134
3.7	Future perspectives	135
3.8	Conclusion.....	137
REFERENCES		138
APPENDICES.....		153
APPENDIX 1 SUPPLEMENTARY INFORMATION FOR CHAPTER 1.		
LITERATURE REVIEW.....		153
1.1	Revision of scientific publication of cross- and co-grazing with ruminants.....	153
APPENDIX 2 SUPPLEMENTARY INFORMATION FOR CHAPTER 2. ANALYSIS OF THE PATHOGENICITY AND DIAGNOSIS OF GI NEMATODE INFECTIONS IN YOUNG FARMED DEER – INITIAL STUDY		
2.1 Data- Blood parameters.....		160
2.2 Data- Faecal egg counts and Liveweight.		171
2.3 Data-Feed intake.		184
2.4 Data- Nematode counts by genus and species.....		186
APPENDIX 3 SUPPLEMENTARY INFORMATION FOR CHAPTER 3. ANALYSIS OF THE PATHOGENICITY AND DIAGNOSIS OF GI NEMATODE INFECTIONS IN YOUNG FARMED DEER – SUPPLEMENTARY FOLLOW-UP STUDY.....		
1.1 Data- Blood parameters.....		188
1.2 Data- Faecal egg counts and Liveweight		191

1.3	Data- Feed intake.....	195
1.4	Data- Nematode counts by genus and species	196
APPENDIX 4 SUPPLEMENTARY INFORMATION FOR CHAPTER 4.		
IDENTIFICATION AND DISTRIBUTION OF GASTROINTESTINAL NEMATODES		
ON RED DEER IN NEW ZEALAND		
197		
4.1	Data- Identification of larvae spp. by farm, island, region, animal host spp. and season	197
APPENDIX 5 SUPPLEMENTARY INFORMATION FOR CHAPTER 5.		
ESTABLISHMENT RATE OF SHEEP GASTROINTESTINAL NEMATODES IN		
FARMED RED DEER (CERVUS ELAPHUS).....		
257		
5.1.	Data- Liveweight and Faecal egg counts.....	257
5.2.	Data- Individual dose of infective larvae	257
5.3.	Data- Individual Nematode burdens.	259
APPENDIX 6 SUPPLEMENTARY INFORMATION FOR CHAPTER 6. EVALUATION		
OF CROSS-GRAZING DEER WITH SHEEP OR CATTLE, AS A MEANS TO		
CONTROL GASTROINTESTINAL AND PULMONARY NEMATODES IN DEER ...		
260		
6.1.	Data- Liveweight and Anthelmintic Treatment	260
6.2.	Data- Faecal egg count and larval count Liveweight and Anthelmintic Treatment	273
6.3.	Data-worm burden	285
APPENDIX 7 STANDARD OPERATING PROCEDURES.....		
290		
7.1	SOP 1 Faecal Egg Count	290
7.2	SOP 2 Strongylid Larval Culture and Identification	293
7.3	SOP 3 Artificial infection of red deer with infective larvae (L3)	296
7.4	SOP 4 Trickle artificial infection of red deer with infective stage larvae	297
7.5	SOP 5 Henriksen’s modified Baermann’s technique for detecting the presence of lungworm larvae in faeces.....	299

7.6	SOP 6 Diagnostic gastrointestinal worm counting	301
7.7	SOP 7 Diagnostic Dictyocaulus spp. worm counting.....	305
7.8	SOP 8 PCR identification of parasitic nematode infective larvae.....	307
7.9	SOP 9 Cloning “DNA genetic characterization” of deer parasitic nematodes.....	311
	For the amplification.....	312
APPENDIX 8 PUBLICATION AND DRC 16.....		315

List of Figures









































Figure 1.1 The New Zealand farmed deer population 1981-2013.	2
Figure 1.2. Cephalic region – Oesophagostomum venulosum.	6
Figure 1.3. Male spicules and bursa – Trichostrongylus askivali	7
Figure 2.1 Least square means and 95% confidence interval of faecal egg counts from Day 1 (first treatment dose) to Day 29 according to Low Dose  , Medium Dose  and High Dose groups 	43
Figure 2.2 Large intestine and small intestine nodules and oedema from deer in the Medium Dose Group.....	46
Figure 2.3 Least square means (\pm SE) of serum albumin values (g/l) from Day -14 (pre-treatment) to Day 29 for the Control  , Low Dose  , Medium Dose  and High Dose groups  ...	48
Figure 2.4 Least square means (\pm SE) of serum globulin values (g/l) from Day -14 (pre-treatment) to Day 29 for the Control  , Low Dose  , Medium Dose  and High Dose groups  ...	49
Figure 2.5 Least square means (\pm SE) of serum albumin to globulin ratios from Day -14 (pre-treatment) to Day 29 for the Control  , Low Dose  , Medium Dose  and High Dose groups  .	50
Figure 2.6 Least square means (\pm SE) of eosinophil counts ($\times 10^9$ cells/l) from Day -14 (pre-treatment) to Day 22 for the Control  , Low Dose  , Medium Dose  and High Dose groups  ...	51
Figure 2.7 Least square means (\pm SE) of basophil counts ($\times 10^9$ cells/l) from Day -14 (pre-treatment) to Day 22 for the Control  , Low Dose  , Medium Dose  and High Dose groups  ...	52
Figure 2.8 Least square means (\pm SE) of the daily growth rate (kg/day) from the interval Day -14 (pre-treatment) to Day 1 (first treatment dose) up to the interval Day 15 to Day 22 for the Control  , Low Dose  , Medium Dose  and High Dose groups 	53
Figure 2.9 Least square means of daily intake (kg/head/day) from Day 0 (1 day pre-treatment) to Day 27 for the Control  , Low Dose  , Medium Dose  and High Dose  groups	54
Figure 3.1 : Least square means and 95% confidence interval of faecal egg counts from Day 1 to Day 36 in the Control group  .	63
Figure 3.2: Least square means (\pm SE) of serum albumin values (g/l) from Day 1 to Day 36, for the Control  and Lower Dose  treatment groups.....	66
Figure 3.3: Least square means (\pm SE) of serum globulin values (g/l) from Day 1 to Day 36, for the Control  and Lower Dose  treatment groups.....	67
Figure 3.4: Least square means (\pm SE) of serum albumin globulin ratio from from Day 1 to Day 36 for the Control  and Lower Dose  treatment groups.....	68
Figure 3.5: Least square means (\pm SE) of eosinophils counts ($\times 10^9$ cells/l) from from Day 1 to Day 36, for the Control  and Lower Dose  treatment groups.	68

Figure 3.6: Least square means (\pm SE) of basophils counts ($\times 10^9$ cells/l) from Day 1 to Day 36, for the Control  and Lower Dose  treatment groups.	69
Figure 3.7: Least square means (\pm SE) of liveweight gain from from Day 1 to Day 36 for the Control  and Lower Dose  treatment groups.	70
Figure 3.8: Least square means (\pm SE) of feed intake (kg DM/day) from Day 0 to Day 42, for the Control  and Lower Dose  treatment groups.	71
Figure 6.1 Experimental design of cross-grazing experiment between young red deer and young sheep or cattle.....	101
Figure 6.2 A box plot of the number of anthelmintic treatments given per animal by treatment group. DC = Deer with cattle; DD = Deer grazing alone; DS = Deer with sheep.....	108
Figure 6.3. Proportion of deer in each group to receive first anthelmintic treatment at each sampling period.....	109
Figure 6.4. Proportion of deer in each group to receive second anthelmintic treatment at each sampling period.....	109
Figure 6.5. Least square mean live weights for the different groups with SEM are shown.	110
Figure 6.6. Box plot of Ostertagia-type worm counts by group.....	111
Figure 6.7. Box plot of abomasal Trichostrongylus spp. count by group.	113
Figure 6.8. Box plot of Dictyocaulus eckerti count by groups	114

List of Tables

Table 1.1 Description of some relevant abomasal GIN of deer in New Zealand.....	14
Table 1.2 A selection of variations of Modifications of the McMaster technique by different authors.	23
Table 2.1 Schedule of treatment, management events and measurements.	38
Table 2.2 Treatment regime showing number of larvae per individual dose as given three times per week and the total number of larvae given during the experimental period.	40
Table 2.3 Least square means (and 95% confidence interval) of abomasal nematode counts	44
Table 2.4 Least square means (and 95% confidence interval) of the identified Ostertagia-type nematodes.	44
Table 2.5 Least squares means (and 95% confidence interval) of Oesophagostomum spp. worm counts in the large intestine.	45
Table 2.6 Number of doses, total number of larvae administered, and establishment rate (% worms counted/total larval dose until 12 days before slaughter), for each abomasum genera in each group.	46
Table 2.7 Number of doses, total larvae administered and establishment rate (% No worms counted/total larval dose until 21 days before slaughter) of Oesophagostomum spp.	47
Table 3.1 Schedule of events.	60
Table 3.2: Treatment regime showing number of larvae of each species per individual dose given 3 times per week and the total number of larvae during the whole period.	61
Table 3.3 Least square means ($\pm 95\%$ confidence interval) of abomasal nematode counts.	64
Table 3.4 Least square means ($\pm 95\%$ confidence interval) of the identified Ostertagia-type nematodes.	64
Table 3.5 Least squares means ($\pm 95\%$ confidence interval) of total Oesophagostomum spp. worm counts in the large intestine, and counts for each species.....	65
Table 3.6 Number of doses, total number of larvae administered, and establishment rate (% worms counted/total larval dose until 12 days before slaughter), for each abomasum genera in each group.	65
Table 3.7 Number of doses, total larvae administered and establishment rate (% No worms counted/total larval dose until 21 days before slaughter) of Oesophagostomum spp.	66
Table 4.1 PCRs primers used to identify GIN infective larvae in deer in New Zealand.	78
Table 4.2 Reactions order and primers used to identify the larvae.....	81
Table 4.3 Total, island, host species on farms, and season prevalence (%) of each nematode species, in deer 12-24 month of age.....	83
Table 4.4 Farm level (n=59) prevalence of each nematode species in deer	85
Table 5.1 Mean establishment rate of mixed challenge of nematodes to young sheep (n=5) and deer (n=5).	95

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