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EFFECTS OF *OSTERTAGIA CIRCUMCINCTA*  
LARVAE AND ADULT PARASITES ON  
ABOMASAL AND INTESTINAL TISSUES IN SHEEP

A thesis presented in partial fulfilment of the  
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**ABSTRACT**

*Ostertagia circumcincta* parasites infect the abomasum of sheep causing damage to the abomasal tissues and significant production losses to the sheep farming industry. Ingested larvae enter the gastric glands and emerge as adults which live in the abomasal lumen. The effect of adult parasites on the abomasum has not been systematically investigated. In the present study, sheep raised to be free of helminth parasites were given either adult *O. circumcincta* parasites *via* an abomasal cannula or larvae *per os*.

Adult as well as larval *O. circumcincta* parasites stimulate hypergastrinaemia, a decreased abomasal pH and elevated serum pepsinogen concentrations. While the concentration of G cells did not change in the larval parasite infected sheep compared with the non-infected control sheep, the total number of G cells was increased due to an increase in mucosal thickness. There appeared to be fewer G cells present in the adult parasite infected sheep compared with the non-infected control sheep, which was most likely due to a depletion of their gastrin content due to overstimulation. The hypergastrinaemia observed during ostertagiasis is not due to a change in the ratio of G:D cells.

The lumen dwelling adult *O. circumcincta* affect the mucosa of the abomasum resulting in an apparent inflammatory reaction, demonstrated by the presence of eosinophils and neutrophils in the lamina propria. Mucous production and/or secretion is also affected, shown by the presence of large mucus-secreting cells in the mucosa.

The total wet weight of the abomasum/kg body weight is increased in sheep infected with *O. circumcincta*, with an increase in the total size of the abomasum. The larval parasites evoke a hyperplasia in both the antral and body mucosae with little change in cell size. In sheep infected with adult parasites, the thickness of the abomasal mucosa is increased in the body, but not the antrum. This increase is most likely due to hypertrophy.

Either the larval *O. circumcincta* or the hypergastrinaemia have trophic effects on the upper duodenum, with an increased mucosal thickness which did not occur more

distally. This did not occur in the adult parasite infected sheep.

The larval parasites or hypergastrinaemia provoked a hyperplasia in the jejunal mucosa. This did not occur in the adult infected sheep.

The larvae and adult parasites did not appear to exert a hypertrophic or hyperplastic effect on the ileum, caecum or colon.

These results indicate that adult *O. circumcincta* parasites have substantial effects on the ovine abomasum.

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## TABLE OF CONTENTS

	page
<b>TITLE</b>	i
<b>ABSTRACT</b>	ii
<b>ACKNOWLEDGEMENTS</b>	iv
<b>TABLE OF CONTENTS</b>	v
<b>LIST OF FIGURES</b>	viii
<b>LIST OF TABLES</b>	x
<b>LIST OF ABBREVIATIONS</b>	xi
<b>CHAPTER 1 : LITERATURE REVIEW</b>	1
1.1. The Ruminant Stomach	1
1.1.1. Rumen and Reticulum	1
1.1.2. Omasum	4
1.1.3. Abomasum	5
1.1.3.1. Gross Anatomy	5
1.1.3.1.1. Blood Supply	7
1.1.3.1.2. Innervation	7
1.1.3.1.3. Microanatomy	8
1.1.3.2. Abomasal Secretions	11
1.1.3.2.1. Gastrin	13
1.1.3.2.2. Somatostatin	16
1.1.3.2.3. Other Secretogogues	19
1.2. <i>Ostertagia circumcincta</i>	20
1.2.1. Lifecycle	20
1.2.2. Local Effects	22
1.2.3. Systemic Effects on Sheep	24
1.2.4. Prevalence and Control in New Zealand	25
<b>CHAPTER 2 : ORGAN WEIGHTS, SERUM GASTRIN AND PEPSINOGEN CONCENTRATIONS AND ABOMASAL pH IN SHEEP INFECTED WITH ADULT OR LARVAL <i>OSTERTAGIA CIRCUMCINCTA</i></b>	28
2.1. Introduction	28
2.2. Methods	29
2.2.1. Preparation and Care of Experimental Animals	29
2.2.2. Preparation of Larval <i>O. circumcincta</i> Parasites	32
2.2.3. Preparation of Adult <i>O. circumcincta</i> Parasites	33
2.2.4. Treatment of the Larval Parasite Infected Group	34
2.2.5. Treatment of the Adult Parasite Infected Group	34
2.2.6. Treatment of the Non-infected Control Group	35
2.2.7. Collection of Samples	35
2.2.8. Radioimmunoassay of Serum Gastrin	36
2.2.9. Abomasal pH	36
2.2.10. Serum Pepsinogen Determination	36

	vi page
2.2.11. Postmortem Procedures	37
2.2.12. Statistics	38
2.3. Results	38
2.3.1. Confirmation of Infection	38
2.3.1.1. Faecal Egg Counts	39
2.3.1.2. Presence of Parasites in Abomasal and Intestinal Contents	39
2.3.1.3. pH of Abomasal Contents	39
2.3.1.4. Serum Gastrin Concentrations	41
2.3.1.5. Serum Pepsinogen Concentrations	42
2.3.2. Body and Organ Weights	43
2.3.3. Gross Morphology of the Abomasum	46
2.4. Discussion	48
2.5. Summary	51

**CHAPTER 3 : CHANGES IN ABOMASAL AND INTESTINAL WALL THICKNESS DUE TO INFECTION WITH ADULT OR LARVAL *OSTERTAGIA CIRCUMCINCTA*** 52

3.1. Introduction	52
3.2. Methods	53
3.3. Results	57
3.3.1. Histology	57
3.3.2. Morphometry	57
3.4. Discussion	69
3.4.1. Histology	69
3.4.2. Morphometry	76
3.5. Summary	80

**CHAPTER 4 : HYPERTROPHIC AND HYPERPLASTIC CHANGES IN THE GASTROINTESTINAL MUCOSA OF SHEEP INFECTED WITH ADULT OR LARVAL *OSTERTAGIA CIRCUMCINCTA*** 81

4.1. Introduction	81
4.2. Methods	83
4.2.1. Sample Collection	83
4.2.2. Methods of Biochemical Analysis	84
4.2.2.1. Protein Determination	86
4.2.2.2. RNA and DNA Extraction	86
4.2.2.3. RNA Quantification	87
4.2.2.4. DNA Assay	87
4.2.3. Cell Counts	88
4.2.4. Statistics	89
4.3. Results	89
4.4. Discussion	98
4.5. Summary	108

**CHAPTER 5 : ENDOCRINE CELLS IN THE ABOMASUM OF CONTROL SHEEP AND SHEEP INFECTED WITH LARVAE OF ADULT *OSTERTAGIA CIRCUMCINCTA***

5.1.	Introduction	110
5.1.1.	Chromogranin A	110
5.1.2.	Enteroglucagon	111
5.1.3.	Gastrin	112
5.1.4.	Somatostatin	112
5.1.5.	Gastrin-Releasing Peptide	113
5.2.	Methods	113
5.2.1.	Bouin's Fluid Fixed Tissues	114
5.2.2.	PLP-Fixed Tissues	114
5.2.3.	Immunocytochemistry	115
5.2.4.	Cell Counting	119
5.3.	Results	119
5.3.1.	Chromogranin A	119
5.3.2.	G Cells	122
5.3.3.	D Cells	127
5.3.4.	A Cells	131
5.3.5.	GRP Neurons	131
5.3.6.	Neutrophils	131
5.4.	Discussion	136
5.4.1.	Chromogranin A	136
5.4.2.	G Cells	139
5.4.3.	D Cells	142
5.4.4.	GRP neurons	145
5.4.5.	A Cells	146
5.5.	Summary	147

<b>CHAPTER 6 : GENERAL DISCUSSION</b>	148
6.1. Conclusions	154

<b>CHAPTER 7 : BIBLIOGRAPHY</b>	156
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## LIST OF FIGURES

Figure	page
1.1. Diagrammatic view of the sheep's stomach from the right side	2
1.2. The 3 regions of the abomasum	6
1.3. Tissue layers in the abomasal wall of the sheep	9
1.4. The control of gastric secretion by neural, hormonal and paracrine pathways in the gastric antrum and body	18
1.5. Lifecycle of the nematode parasite <i>Ostertagia circumcincta</i>	21
2.1. Diagram of the abomasal cannula	30
2.2. Mean number of <i>Ostertagia circumcincta</i> eggs per gramme (e.p.g.)	40
2.3. Body weight of sheep at the beginning and end of the experiment	44
2.4. Wet weights of the sheep organs at the conclusion of the experiment per kg body weight	45
2.5. Abomasum of a larval parasite infected sheep and non-infected control sheep. Mucosal folds with nodules from the body region of a larval parasite infected sheep	47
3.1. Mucous cells in the antral mucosa of an adult parasite infected sheep and a non-infected control sheep	58
3.2. Neutrophils and eosinophils in the antral mucosa of an adult parasite infected sheep and a larval parasite infected sheep	59
3.3. An <i>O. circumcincta</i> larvae coiled deep within the antral mucosa and an adult worm emerging from the antral mucosa	60
3.4. Globular leukocytes and mitotic figures in the antral mucosa of a larval parasite infected sheep.	61
3.5. Mucous-producing cells in the antral mucosa of a larval parasite infected sheep and a non-infected control sheep	62
3.6. Logarithm of body weight vs. logarithm of total wall thickness in the control sheep	63
3.7. Tissue thickness, pit depth and gland depth in the abomasal body	65
3.8. Tissue thickness, pit depth and gland depth in the abomasal antrum	66
3.9. Tissue thickness, crypt depth, villus height and villus width in the upper duodenum	67
3.10. Tissue thickness, crypt depth, villus height and villus width in the lower duodenum	68
3.11. Tissue thickness, crypt depth, villus height and villus width in the jejunum	70
3.12. Tissue thickness, crypt depth, villus height and villus width in the ileum	71
3.13. Tissue thickness in the caecum	72
3.14. Tissue thickness in the colon	73
4.1. Mucosal DNA, RNA and protein concentrations and RNA:DNA and protein:DNA ratios in the body region of the abomasum	90
4.2. Mucosal DNA, RNA and protein concentrations and RNA:DNA and protein:DNA ratios in the antral region of the abomasum	92

Figure		ix page
4.3.	Mucosal DNA, RNA and protein concentrations and RNA:DNA and protein:DNA ratios in the duodenum	93
4.4.	Mucosal DNA, RNA and protein concentrations and RNA:DNA and protein:DNA ratios in pancreatic tissue	94
4.5.	Mucosal DNA, RNA and protein concentrations and RNA:DNA and protein:DNA ratios in the jejunum	95
4.6.	Mucosal DNA, RNA and protein concentrations and RNA:DNA and protein:DNA ratios in the ileum	96
4.7.	Mucosal DNA, RNA and protein concentrations and RNA:DNA and protein:DNA ratios in the caecum	97
4.8.	Mucosal DNA, RNA and protein concentrations and RNA:DNA and protein:DNA ratios in the colon	99
4.9.	Number of cells/mm <sup>2</sup> in the mucosa of the abomasum, duodenum and intestines	100
5.1.	Distribution of chromogranin-immunoreactive cells in the abomasal mucosa of a non-infected control sheep	120
5.2.	Chromogranin-immunoreactive cells in the mucosa of the abomasal body of a non-infected control sheep	121
5.3.	Number of cells in the abomasal body immunocytochemically stained with antisera to chromogranin, gastrin, somatostatin and glucagon	123
5.4.	Number of cells in the abomasal antrum immunocytochemically stained with antisera to chromogranin, gastrin, somatostatin and glucagon	124
5.5.	Serial sections of the abomasal body of a non-infected control sheep	125
5.6.	Gastrin-immunoreactive cells in the antral mucosa of a control sheep	126
5.7.	Gastrin-immunoreactive cells in the antral mucosa of the abomasum	128
5.8.	Somatostatin-immunoreactive cells in the mucosa of the abomasal antrum of a non-infected control sheep	129
5.9.	Somatostatin-immunoreactive cells in the mucosa of the abomasa antrum	130
5.10.	Relationship between the number of D cells and the number of G cells immunocytochemically stained in the abomasal antrum	132
5.11.	Enteroglucagon-immunoreactive stained cells in the abomasal mucosa	133
5.12.	GRP-immunoreactive neurons in the lamina propria of the antrum of a non-infected control sheep	134
5.13.	GRP-immunoreactive neurons in the antrum of the antrum of a non-infected control sheep	135
5.14.	Neutrophils and endocrine cells in the antral mucosa of the abomasum of a larval parasite infected sheep	137

## LIST OF TABLES

Table	Page
2.1. Body weights of the sheep in each of the 3 experimental groups	32
2.2. Mean weekly pH of the abomasal contents of the parasitised and control sheep throughout the experiment	41
2.3. Mean weekly serum gastrin concentrations in the serum of the parasitised and control sheep before and during the experiment	42
2.4. Mean weekly pepsinogen concentrations in the serum of the parasitised sheep before and during the experiment	43
2.5. Ratio of abomasal weight to body weight of parasitised and non-parasitised sheep at the conclusion of the experiment	46
3.1. Regions of the digestive tract from which tissues were collected	53
3.2. Paraffin embedding schedule	54
3.3. Method for staining sections with heamatoxylin and eosin and alcian blue	55
3.4. Results from the test of the accuracy of the measurements	56
3.5. Percentage increase in abomasal wet weight and mucosal thickness in the adult and larval infected sheep relative to the control sheep	79
4.1. Sites from which mucosa was collected for DNA, RNA and protein assays	84
4.2. The effects of sonication amplitude and time on mucosal DNA and RNA concentrations	85
4.3. Inter- and intra-assay variations for the DNA, RNA and protein assays	89
5.1. Antisera dilutions and incubation times	116
5.2. Cells which stain for chromogranin A in various species	139
5.3. The concentration of G cells in the antral mucosa at the completion of the experiment and the average serum gastrin concentration during the experiment	142
6.1. Comparison of the changes occurring to the gastrointestinal tissues of sheep infected with adult and larval <i>O. circumcincta</i> parasites	149

## LIST OF ABBREVIATIONS

Abbreviation	=	
@	=	at
A cell	=	glucagon containing cells
API	=	adult parasite infected
BSA	=	bovine serum albumen
°C	=	degrees Celcius
CCK	=	cholecystokinin
D cell	=	somatostatin containing cell
DAB	=	diaminobenzidine
DNA	=	deoxyribonucleic acid
EC cell	=	enterochromaffin cell
ECL cell	=	enterochromaffin-like cell
EGF	=	epidermal growth factor
ED	=	external diameter
e.p.g.	=	eggs per gramme
g	=	grammes
g	=	gravity
G cell	=	gastrin containing cell
GRP	=	gastrin releasing peptide
<i>H. contortus</i>	=	<i>Haemonchus contortus</i>
hr	=	hour
HCl	=	hydrochloric acid
ID	=	internal diameter
IGF	=	insulin growth factor
kg	=	kilogramme
L	=	litre
LPI	=	larval parasite infected
m	=	metres
min	=	minute
mm	=	millimetres
mm <sup>2</sup>	=	square millimetres
mmol	=	millimoles
mol	=	moles
mRNA	=	messenger RNA
n	=	number
N	=	normality
Na <sub>2</sub> CO <sub>3</sub>	=	sodium carbonate
nm	=	nanometres
N.Z.	=	New Zealand
OD	=	optical density
<i>O. circumcincta</i>	=	<i>Ostertagia circumcincta</i>
/	=	per
%	=	percent
P	=	probability
PLP	=	phosphate-lysine-periodate
pmol	=	picamoles
RNA	=	ribonucleic acid

rRNA	=	ribosomal RNA
PBS	=	phosphate buffered saline
PLSD	=	probability of least significant difference
tRNA	=	transfer RNA
s.e.	=	standard error
SE	=	secretory-excretory
SOD	=	super oxide dismutase
µg	=	microgrammes
µm	=	micromoles
VFAs	=	volatile fatty acids

**ANIMAL ETHICS**

The protocols for the experiments described in this thesis have been approved by the Massey University Animal Ethics Committee.