

**Effects of infectious bronchitis virus
on the oviduct of laying hens**

by

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I certify that the substance of this thesis has not already been submitted for any degree and is not currently being submitted for any other degree or qualification.

I certify that any help received in preparing this thesis and all sources used have been acknowledged in this thesis



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Table of contents

Table of contents	i
List of Tables	x
List of Figures	xiii
List of Plates	xiv
Acknowledgements	xix
Abbreviations	xxi
Abstract	xxiii
Chapter 1 Review of literature	1
1.1 Introduction.....	1
1.2 Oviduct.....	4
1.2.1 Infundibulum.....	5
1.2.2 Magnum.....	6
1.2.3 Isthmus.....	8
1.2.4 Tubular shell gland.....	9
1.2.5 Shell gland pouch.....	10
1.3 Formation of the egg and cellular changes during egg formation.....	11
1.4 Infectious bronchitis virus (IBV).....	14
1.4.1 Growth and cultivation of virus.....	15
1.4.2 Virus replication and transmission.....	16
1.4.3 Host range.....	18
1.4.4. Strain variation in pathogenicity.....	19
1.5 Tissue tropism of IBV.....	21
1.5.1 Harderian gland.....	22
1.5.2 Trachea.....	23
1.5.3 Kidney.....	24

1.5.4 Intestine.....	26
1.5.5 Muscle.....	27
1.5.6 Oviduct.....	27
1.6 Effects of IBV on male reproductive system.....	32
1.7 IBV vaccines and oviduct.....	32
1.8 Egg quality and production during IBV infection.....	35
1.9 IBV in Australia.....	37
1.10 Economic impact of IBV on layer industry in Australia.....	44
1.11 Detection techniques for IBV.....	45
1.11.1 Cell culture.....	45
1.11.2 Serological tests.....	46
1.11.3 RNA isolation for IBV detection.....	47
1.12 Introduction to current study.....	49
Chapter 2 Materials and methods.....	50
2.1 Virus.....	50
2.2. Bleeding and blood analysis.....	50
2.3 Histopathology.....	50
2.3.1 Tissue fixation and processing.....	51
2.3.2 Embedding.....	51
2.3.3 Sectioning.....	51
2.3.4 Staining.....	52
2.3.5 Microscopy.....	52
2.3.6 Histopathological lesion scoring and statistical analysis.....	52
2.4 Transmission electron microscopy (TEM).....	53
2.4.1 Tissue fixation and washing.....	53
2.4.2 Tissue Cutting and Processing.....	53
2.4.3 Embedding.....	53
2.4.4 Sectioning and staining.....	54
2.5 Scanning electron microscopy (SEM).....	54
2.6 Egg production and quality.....	55
2.7 ELISA.....	56
2.8 Kidney weights.....	56

2.9 Statistical analysis.....	56
2.10 Virus isolation.....	57
2.11 Extraction of viral RNA from allantoic fluid.....	57
2.12 Primers.....	58
2.13 Single step reverse transcription polymerase chain reaction.....	58
2.14 Agarose gel electrophoresis.....	59

Chapter 3 Preliminary studies on comparative

histopathology of two serotypes of infectious

bronchitis virus (T & N1/88) in White Leghorn

hens and cockerels..... 60

3.1 Introduction.....	60
3.2 Materials and Methods.....	60
3.2.1 Chickens.....	61
3.2.2 Experiment 1.....	61
3.2.3. Experiment 2.....	61
3.3 Results.....	62
3.3.1 Harderian gland.....	62
3.3.2 Trachea.....	67
3.3.3 Kidney.....	70
3.3.4 Caecum.....	70
3.3.5 Oviduct.....	74
3.4 Discussion.....	78

Chapter 4 Preliminary studies on histopathology of

two serotypes of infectious bronchitis virus in laying

hens vaccinated in the rearing phase..... 81

4.1 Introduction.....	81
4.2 Materials and methods.....	81
4.3 Results.....	82
4.3.1 Harderian gland.....	82
4.3.2 Trachea.....	83

4.3.3 Kidney.....	83
4.3.4 Oviduct.....	83
4.4 Discussion.....	84

Chapter 5 Physiological and histopathological observations during infection of Isa Brown laying hens

with two strains of infectious bronchitis virus.....	90
5.1 Introduction.....	90
5.2 Materials and methods.....	91
5.2.1. Experimental chickens.....	91
5.2.2. Housing.....	91
5.2.3. Experimental procedure.....	92
5.3 Results.....	93
5.3.1 Clinical findings.....	93
5.3.2 Body and kidney weights.....	93
5.3.3 ELISA antibody titre.....	94
5.3.4 Blood analysis.....	94
5.3.5 Histopathology.....	99
5.3.5 (i) Harderian gland.....	99
5.3.5 (ii) Trachea.....	99
5.3.5 (iii) Kidney.....	105
5.4 Discussion.....	110

Chapter 6 Ultrastructural changes in the oviduct of the laying hen during the laying cycle.....

laying hen during the laying cycle.....	113
6.1 Introduction.....	113
6.2 Material and methods.....	114
6.2.1 Histology and electron microscopy.....	114
6.3 Results.....	114
6.3.1 Changes in infundibulum.....	115
6.3.2 Changes in magnum.....	118
6.3.3 Changes in isthmus.....	123
6.3.4 Changes in tubular shell gland and shell gland pouch.....	124

6.4 Discussion.....	132
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Chapter 7 Comparative histopathology and cytopathology of two strains of infectious bronchitis virus in the albumen-forming regions of the oviduct of Isa Brown laying hens.....	135
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7.1 Introduction.....	135
7.2 Materials and Methods.....	136
7.3. Results.....	136
7.3.1 Autopsy findings of the oviduct.....	136
7.3.2 Changes in infected cells of infundibulum.....	136
7.3.3. Changes in infected cells of magnum.....	144
7.4 Discussion.....	156

Chapter 8 Ultra structural observations on effects of infectious bronchitis virus in egg shell-forming regions of the oviduct of the commercial laying hen.....	160
--	------------

8.1 Introduction.....	160
8.2 Materials and Methods.....	160
8.3 Results.....	161
8.3.1 Changes in Isthmus.....	161
8.3.2 Changes in tubular shell gland (TSG) and shell gland pouch (SGP).....	167
8.4 Discussion.....	173

Chapter 9 Egg and egg shell quality in Isa Brown laying hens during infection with Australian strains of infectious bronchitis virus.....	176
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9.1 Introduction.....	176
9.2 Material and Methods.....	177
9.3 Results.....	178
9.3.1 Clinical findings regarding egg quality.....	178
9.3.2 Egg quality during main trial.....	182

9.3.2 (i) Prior to challenge.....	182
9.3.2 (ii) Post-challenge.....	182
9.3.3 Egg quality during the follow-up trial.....	191
9.4 Discussion.....	199

Chapter 10 Isolation of infectious bronchitis virus from different tissues and faecal samples after

experimental infection in laying hens.....	202
10.1 Introduction.....	202
10.2 Materials and Methods.....	203
10.3 Results.....	203
10.4 Discussion.....	206

Chapter 11 Detection of infectious bronchitis virus from the oviduct of laying hens by virus isolation and

RT-PCR.....	209
11.1 Introduction.....	209
11.2 Materials and Methods.....	209
11.3. Results and discussion.....	210
11.3.1 Detection of IBV by virus isolation.....	210
11.3.2 Comparison of virus isolation and RT-PCR.....	210
11.3.3 Comparison of ultra structural findings and RT-PCR.....	213
11.3.4 Comparison of Australian and overseas strains with respect to uterotropism.....	213
11.4. Conclusion.....	214

Chapter 12 General discussion and conclusions.....

References.....

Appendix.....

Appendix 1.....	260
Appendix 2.....	269
Appendix 3.....	273

Appendix 4.....	277
Appendix 5.....	279

List of Tables

Table 1.1	The length and time spent by egg in different parts of the oviduct.....	5
Table 1.2	Titres and distribution of infectious bronchitis virus in different organs of chicks.....	27
Table 1.3.	Details of infectious bronchitis virus isolated in Australia.....	40
Table 3.1	Lesions scored for each tissue examined following infection with T and N1/88 strain of IBV.....	62
Table 3.2	Comparative histopathology of Harderian gland in hens infected with T and N1/88 strain of IBV.....	65
Table 3.3	Comparative histopathology of Harderian gland in cockerels infected with T and N1/88 strains of IBV.....	66
Table3.4	Comparative histopathology of trachea in hens infected with T and N1/88 strain of IBV.....	68
Table 3.5	Comparative histopathology of trachea in cockerels infected with T and N1/88 strains of IBV.....	69
Table 3.6	Comparative histopathology of kidney in hens infected with T and N1/88 strain of IBV.....	72
Table 3.7	Comparative histopathology of kidney in cockerels infected with T and N1/88 strains of IBV.....	73
Table 3.8	Comparative histopathology of magnum in hens infected with T and N1/88 strain of IBV.....	76
Table 3.9	Comparative histopathology of TSG and SGP in hens infected with T and N1/88 strain of IBV.....	77
Table 5.1	Lesions scored from each tissue examined following infection with T and N1/88 strains of infectious bronchitis virus.....	93
Table 5.2	Effect of IBV on kidney weights over 4 weeks post-infection.....	95
Table 5.3	Effect of IBV on plasma electrolytes over 10 weeks post-infection.....	96

Table 5.4	Comparative histopathology of trachea in hens infected with T or N1/88 strain of IBV.....	104
Table 5.5	Comparative histopathology of kidneys from hens infected with T and N1/88 strains of IBV.....	109
Table 6.1	The hens killed at different egg positions and placed in groups.....	114
Table 7.1	Comparative histopathology of infundibulum of hens infected with T and N1/88 strains of IBV.....	139
Table 7.2	Comparative histopathology of magnum of hens infected with T and N1/88 strains of IBV.....	147
Table 8.1	Lesion score in the Isthmus of hens infected with T and N1/88 strains of IBV.....	163
Table 8.2	Lesion score in tubular shell gland (TSG) and shell gland pouch (SGP) of hens infected with T and N1/88 strains of IBV.....	168
Table 9.1	Significant effects on egg parameters before challenge during the main experiment.....	181
Table 9.2	Effects of infectious bronchitis virus strains on egg weight, breaking strength and deformation of unvaccinated laying hens during the main experiment.....	184
Table 9.3	Effects of infectious bronchitis virus strains on egg shell weight, shell thickness and percentage shell of unvaccinated laying hens during main experiment.....	185
Table 9.4	Effects of two strains of IBV on egg production during the follow-up trial.....	192
Table 9.5a	Effects of two strains of IBV on shell reflectivity and egg weight during the follow-up trial.....	193
Table 9.5b	Effects of two strains of IBV on albumen height and Haugh units during the follow-up trial.....	194
Table 9.5c	Effects of two strains of IBV on shell breaking strength and deformation during the follow-up trial.....	195
Table 9.5d	Effects of two strains of IBV on yolk colour score and percentage shell during the follow-up trial.....	196
Table 9.5e	Effects of two strains of IBV on shell weight and shell thickness during the follow-up trial.....	197
Table 10.1	Isolation of T strain infectious bronchitis virus at different	

	time intervals post-infection.....	204
Table 10.2	Isolation of N1/88 strain of infectious bronchitis virus at different time intervals post-infection.....	205
Table 10.3	Comparative pattern of isolation of infectious bronchitis virus from faeces of infected laying hens.....	206
Table 11.1	Detection of T and N1/88 strain of IBV from oviduct samples at different days post infection by chicken embryo inoculation and RT-PCR.....	211

List of Figures

Figure 5.1	Body weight of Isa brown hens over 10 weeks post-infection.....	97
Figure 5.2	Antibody titres of the control and infected hens across the period of infection.....	98
Figure 9.1	Weekly egg production during the main trial before and across the 10 weeks post-infection.....	179
Figure 9.2.	Feed intake before and across 4 weeks post infection with regards to treatment groups and weeks post infection.....	180
Figure 9.3	Albumen height before infection and for 10 weeks post-infection for the three IBV treatment groups.....	186
Figure 9.4.	Hugh units before infection and for 10 weeks post-infection for the three IBV treatment groups.....	187
Figure 9.5	Yolk score before infection and for 10 weeks post-infection for the three IBV treatment groups.....	188
Figure 9.6	Shell reflectivity before infection and for 10 weeks post-infection for the three IBV treatment groups.....	189
Figure 9.7.	Shape index from 6 to 10 weeks post infection for the three IBV treatment groups during the main experiment.....	190
Figure 9.8	Shape index for three weeks post infection for the three IBV treatment groups during the follow-up trial.....	198

List of Plates

Plate 1.1	Structure of the oviduct and developmental stages of the egg.....	3
Plate 1.2	Schematic diagram showing the structure of infectious bronchitis virus particle.....	15
Plate 1.3	Schematic diagram showing the susceptible organs in hen's body likely to be affected by various strains of IBV.....	21
Plate 3.1:	Globular leukocytes in Harderian gland of T strain infected hen.....	64
Plate 3.2	Lymphocyte infiltration in kidney (arrow) of N1/88 strain infected hen.....	71
Plate 3.3	Magnum of N1/88 strain infected hen. Alcian blue stain showing unstained epithelial cells and dilatation of glands.....	75
Plate 3.4:	Shell gland pouch of T strain infected hen showing loss of cilia infiltration of lymphocytes and glandular dilatation.....	75
Plate 4.1	Trachea of HyLine hen from control group with intense thickening of tracheal mucosa along with the lymphocyte nodule...	86
Plate 4.2	Magnum of N1/88 infected Hyline hen.....	87
Plate 4.3	Magnum of control HyLine hen.....	87
Plate 4.4	Shell gland pouch of T infected HyLine hen with lymphocyte infiltration in lamina propria.....	88
Plate 5.1	Harderian gland of hen from control group at 4 days p.i.....	100
Plate 5.2	Harderian gland of hen from T infected group at 4 days p.i.....	100
Plate 5.3	Harderian gland of hen from N1/88 infected group at 4 days p.i.,...	101
Plate 5.4	Harderian gland of hen from T infected group at 10 days p.i.....	101
Plate 5.5	Trachea of hen from control group at 4 days p.i.....	103
Plate 5.6.	Trachea of hen from N1/88-infected group at 6 days p.i.....	103

Plate 5.7	Kidney of hen from control group at 8 days p.i.....	106
Plate 5.8	Kidney of hen from T strain-infected group at 8 days p.i.....	106
Plate 5.9.	Kidney of hen from N1/88 strain-infected group at 8 days p.i.....	107
Plate 5.10	Kidney of hen from T strain-infected group at 12 days p.i.....	107
Plate 5.11	Kidney of hen from control group with normal Bowmans capsule at 8 days p.i.....	108
Plate 5.12	Kidney of hen T strain infected group with oedema in Bowmans capsule at 8 days p.i.....	108
Plate 6.1	Transmission electron micrograph (TEM) of proximal infundibulum.....	116
Plate 6.2	Scanning electron micrograph (SEM) of distal infundibulum lined by ciliated and non ciliated cells.....	116
Plate 6.3	SEM of distal infundibulum covered with secretion.....	117
Plate 6.4	TEM of infundibulum.....	117
Plate 6.5	SEM of ciliated and non ciliated cells of the magnum.....	119
Plate 6.6	SEM of glandular opening of magnum with secretory granules at the glandular openings.....	119
Plate 6.7	SEM of mid magnum covered with secretion.....	119
Plate 6.8	The secretory granules separating from the granular cells of mid magnum.....	120
Plate 6.9	The empty pockets in the granular cells of mid magnum after emptying secretory granules in the lumen.....	120
Plate 6.10	The gland cell type A in the lower magnum.....	120
Plate 6.11	The gland cell type C from the mid magnum.....	121
Plate 6.12	Wide spread reticular endoplasmic reticulum with the spreading Golgi complex in type C gland cell of the mid magnum.....	121
Plate 6.13	The type B gland cell in the magnum.....	121
Plate 6.14	Ciliated and non ciliated cells of the isthmus.....	126
Plate 6.15	SEM of the secretion on the surface on non-ciliated cell	

	in the isthmus.....	126
Plate 6.16	Blebbing of non-ciliated cells in the isthmus with bulging mitochondrial cell in the lumen.....	126
Plate 6.17	Release of secretory blebs from granular cells of isthmus.....	127
Plate 6.18	Reticular endoplasmic reticulum in the form of short cords in type 2 gland cells of the isthmus.....	127
Plate 6.19	TEM of gland cell of tubular shell gland with the glycogen deposits.....	128
Plate 6.20	TEM of surface epithelium of shell gland pouch.....	128
Plate 6.21	TEM of non-ciliated cell of the shell gland showing shedding of the secretory granule in the vacuole.....	129
Plate 6.22	Tem of vacuole in the non-ciliated cell of the shell gland pouch. Note the disintegrated material.....	129
Plate 6.23a	SEM of ciliated and non-ciliated cells of the shell gland. Note the ciliated cells embedded in non ciliated cells.....	130
Plate 6.23b	SEM of ciliated and non-ciliated cells of the shell gland. Note the prominent ciliated cells against non ciliated cells.....	130
Plate 6.24	SEM of the shell gland. Note the white flakes on the surface.....	131
Plate 6.25	TEM of gland cell of the shell gland pouch with the membrane bound granules with granular material.....	131
Plate 7.1	Anterior segment of infundibulum of control hen.....	140
Plate 7.2	Anterior segment of infundibulum of T strain infected hen.....	140
Plate 7.2	Anterior segment of infundibulum of N1/88 infected hen on day 24 p.i. Note the fibrosis in the lamina propria region.....	141
Plate 7.4	Scanning electron micrograph of anterior segment of infundibulum of T-strain infected hen at 10 days p.i.....	141
Plate7.5	Transmission electron micrograph of mid infundibulum of control hen with normal cilia.....	142
Plate7.6	Transmission electron micrograph of mid infundibulum of T-strain infected hen at 10 days p.i.showing cilia loss of cilia.....	142
Plate7.7	Transmission electron micrograph of glandular cell	

	of infundibulum of T strain infected hen at 30 days p.i. showing the increased RER deposits.....	143
Plate 7.8	Virus particles in dilated cisternae of granular cell of infundibulum (arrow) of T-strain infected hen at 10 days p.i.....	143
Plate 7.9	Magnum of hen from control group	148
Plate 7.10	Magnum of hen from T strain-infected group at 30 days p.i showing dilated tubular glands.....	148
Plate 7.11	Magnum of hen from control group stained with Alcian blue.....	149
Plate 7.12	Magnum of hen from T strain infected group at 16 days p.i. showing loss of mucopolysaccharides from surface epithelial cells.....	149
Plate 7.13	Scanning electron micrograph of magnum of control hen showing ciliated and non-ciliated cells.....	150
Plate 7.14	Scanning electron micrograph of magnum of T-strain infected hen at 30 days p.i. showing loss of cilia and intact microvilli.....	150
Plate 7.15	Scanning electron micrograph of magnum of control hen.....	151
Plate 7.16	Scanning electron micrograph of magnum of a hen infected with N1/88 strain of IBV at 12 days p.i. showing patchy loss of cilia.....	151
Plate 7.17	Transmission electron micrograph of magnum of control hen.....	152
Plate 7.18	Transmission electron micrograph of magnum of T-strain infected hen showing the loss of cilia from surface epithelium and change in morphology of surface epithelium.....	152
Plate 7.19	Endocytosis of virus particle in granular cell of magnum of N1/88 infected hen.....	153
Plate 7.20	Virus particles in dilated Golgi saccules of granular cell of magnum.....	153
Plate 7.21	Degeneration of mitochondria in cell of tubular gland type A of magnum of T-strain infected hen.....	154
Plate 7.22	Inactive Golgi complex of granular cell of T-strain infected hen.....	154

Plate 7.23	Degeneration of plasma cell in the magnum of T strain infected hen.....	155
Plate 8.1	Isthmus of T strain infected hen at 12 days p.i. showing dilatation of tubular glands.....	164
Plate 8.2	Isthmus of T strain infected hen at 30 days p.i. showing severe lymphocyte infiltration and loss of cilia.....	164
Plate 8.3	Scanning electron micrograph of isthmus of hen from control group.....	165
Plate 8.4	Scanning electron micrograph of isthmus of hen from T strain-infected group at 12 days p.i. showing loss of cilia.....	165
Plate 8.5	Transmission electron micrograph of isthmus of T strain-infected hen at 30 days p.i.....	166
Plate 8.6	Scanning electron micrograph of tubular shell gland of hen from control group.....	169
Plate 8.7	Scanning electron micrograph of isthmus of hen from T strain-infected group.....	169
Plate 8.8	Light micrograph of shell gland of hen from control group.....	170
Plate 8.9	Shell gland of T strain-infected hen showing loss of cilia from epithelium and change in architecture of surface epithelium.....	170
Plate 8.10	Scanning electron micrograph tubular shell gland of hen from control group.....	171
Plate 8.11	Scanning electron micrograph of shell gland of hen from T strain-infected group.....	171
Plate 8.12	Transmission electron micrograph of shell gland of control hen.....	172
Plate 8.13	Shell gland pouch of hen from T strain-infected group.....	172
Plate 11.1	PCR products of infectious bronchitis virus detected from allantoic fluid at different days p.i.	212

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Abbreviations

IBV	Infectious bronchitis virus
IB	Infectious bronchitis
N1/88	N1/88 strain of infectious bronchitis virus
T	T strain of infectious bronchitis virus
PCR	Polymerase chain reaction
RT-PCR	Reverse transcriptase polymerase chain reaction
RFLP	Restriction fragment length polymorphism
TSG	Tubular shell gland
SGP	Shell gland pouch
EID ₅₀	Embryo infective dose
ELISA	Enzyme linked immunosorbent assay
IDEXX	IDEXX Pty Ltd.
AGPT	Agar gel precipitation test
HA	Haemagglutination
HI	Haemagglutination inhibition
H & E	Haematoxylin and Eosin
TEM	Transmission electron microscope
SEM	Scanning electron microscope
ML	Millilitres
μL	Microliters
pg	Picogram
Egg wt	Egg weight
BSN	Breaking strength
DFU	Egg Deformation
HU	Haugh units
Alb ht	Albumen height
SN	Serum neutralization test
IgA	Immunoglobulin A
IgG	Immunoglobulin G

Na	Sodium
K	Potassium
DNA	Deoxyribonucleic acid
RNA	Ribonucleic acid
Hct	Haematocrit
Ca	Calcium
CO ₂	Carbon dioxide
UTR	Untranslated region
EDT	Ethylenediaminetetraacetic acid
TE	Tris EDTA buffer
RER	Reticular endoplasmic reticulum
PI	Post infection
CSIRO	Commonwealth Scientific and Industrial Research Organisation

Abstract

The research described in this thesis was conducted to study the pathogenesis of Australian strains of infectious bronchitis virus (IBV) on the oviduct of laying hens and also to the study whether the Australian strains of IBV have negative effects on egg production and quality. All the trials were conducted using two strains of IBV, T and N1/88. The two strains have been placed in different groups, based on their genotypic variation of which T is highly nephropathogenic and N1/88 is a respiratory strain.

A range of experiments has been conducted. In the preliminary trial, the histopathology of IBV was studied in unvaccinated White Leghorn hens and cockerels. IBV appeared to be pathogenic for all parts of the oviduct of White Leghorn hens at 65 weeks of age and hens were more severely affected than cockerels. Both the strains of IBV can induce pathology in the trachea and kidney of hens and cockerels. Based on the histopathological findings, it was concluded that rearing phase vaccine offers limited protection in HyLine Grey hens of 110 weeks of age.

In IB antibody-free Isa Brown hens of 30 weeks of age, in addition to the trachea and kidney, T and N1/88 strains of IBV multiply chiefly in parts of the upper reproductive tract; infundibulum and magnum. Both the strains of IBV can induce severe pathology in the infundibulum and magnum. The shell forming regions were the least affected and there was no drop in egg production. Both T and N1/88 strains of IBV affect egg internal quality in terms of albumen height, Haugh units and yolk score. The effects on egg internal quality could be due to the severe cytopathology in the albumen-forming regions of the oviduct. Shell quality was affected only in terms of shell colour and shape index. The soft or thin-shelled eggs reported earlier in the literature were not observed during this trial. There was variation in the incidence and extent of clinical symptoms amongst the infected hens.

Virus isolation studies indicated that both strains of IBV have wide tissue tropism. T strain of the virus can be isolated from the oviduct up to 30 days and from faeces up to 9 weeks post-infection. Such hens could act as persistent virus shedders amongst the

flock. When compared, both the techniques, virus isolation by chicken embryo inoculation and RT-PCR were equally sensitive for virus detection from the oviduct.

Both T and N1/88 strains are uterotropic and have a predilection for the albumen-forming regions of the fully functional oviduct of Isa Brown hens. However, these strains of IBV are not responsible for drops in egg production or for production of thin or soft-shelled eggs. This could be attributed to the age and breed of birds or the strains of virus used in this study. As the IBV strains used from two different groups are both uterotropic, it is possible that all other existing IBV strains in Australia have varying degrees of uterotropism.