EPIDEMIOLOGY AND MORPHOLOGY OF LUNGWORM (DICTYOCAULUS VIVIPARUS), AND ITS ASSOCIATED LUNG PATHOLOGY IN CATTLE AND BUFFALOES IN PENINSULAR MALAYSIA

LAT LAT HTUN

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LAT LAT HTUN

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(DICTYOCALUS VIVIPARUS), AND ITS ASSOCIATED LUNG
PATHOLOGY IN CATTLE AND BUFFALOES IN PENINSULAR
MALAYSIA

By

LAT LAT HTUN

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,
in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

July 2007
DEDICATION

Dedicated with love and gratitude to my parents, U Thein Tun Oo and Daw Maing Saw Waing and gratitude to Dr. Saw Bawm and Moe Zaw Tun
Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

EPIDEMIOLOGY AND MORPHOLOGY OF LUNGWORM (Dictyocaulus viviparus), AND ITS ASSOCIATED LUNG PATHOLOGY IN CATTLE AND BUFFALOES IN PENINSULAR MALAYSIA

By

LAT LAT HTUN

July 2007

Chairman: Latiffah Hassan, PhD
Faculty: Veterinary Medicine

Bovine dictyocaulosis is an important parasitic disease of cattle and buffaloes and is caused by the lungworm, Dictyocaulus viviparus. The parasite is an important cause of lung infection especially in the temperate regions of the world. While the documentation on bovine lungworm is vast in the temperate, it is very sporadic and limited in the tropics. In Malaysia, a tropical country, the occurrence of lungworm infections in cattle and buffaloes has been anecdotal. The present study was carried out to detect the presence of lungworm infections in cattle and buffaloes, to determine the prevalence of lungworm infection in cattle and buffaloes, to identify the risk factors associated with bovine lungworm infection, to compare the morphology of egg, first stage larvae (L1) and adult stage of Malaysian bovine lungworm with those of D. viviparus from published reports and Sweden and to compare the histopathological lesions of lungs infected with Malaysian bovine lungworm and those of lungs infected with D. viviparus.
A retrospective examination of available records and data was carried out to investigate the presence of lungworm infections in Peninsular Malaysia. Two studies were carried out to address the objective. In the first study, an investigation on lungworm disease outbreak in a beef breeding farm was conducted. It was found that the yearly lungworm-infection mortality rate within the seven-year period was 0.31%. Among the cases, more than half (67%) were male and 33% were females. Seventy-five percent of lungworm infection deaths occurred in calves between the ages of six and 12 months, and 25% occurred in cattle aged 12 to 19 months. Most of the deaths occurred in November (19%) and May (17%). In the second study, data of condemnation of lungs and reasons of condemnation between 1998 and 2004 was collected at the Department of Veterinary Services Headquarters in Kuala Lumpur. Parasitic lung condemnation from all slaughtered animals was 0.11%. The prevalence of parasitic infection in the lungs was found much higher in buffaloes than in cattle ($t = -3.906, p = 0.002$).

A cross-sectional study was carried out in four large scale farms (Farms A, B, C and D) and three dairy smallholdings (Farm E) to detect and determine the prevalence of lungworm infection and to identify the risk factors. Blood and faecal sampling on each farm, except Farm E, was performed every two months for a period of seven months. Farm E was sampled only once. Questionnaires on individual animals, farm management and disease occurrence were developed and the data were collected at the time of blood and faecal sampling. Meteorological data was collected from the Climate Division, Malaysian Meteorological Service. The total blood and faecal samples collected from the farms were 602. Baermannisation was performed for parasitological diagnosis and enzyme-link-immunosorbent assay was conducted for
serodiagnosis. The prevalence of lungworm infection based on baermannisation was 4.7%. The highest prevalence was found in Farm E. Using binary logistic regression analysis, gender and the interaction between monthly temperature and monthly rainfall were identified as the statistically significant risk factors for bovine lungworm infection. The likelihood of lungworm infection was about four times greater when the monthly rainfall was >100 mm and the monthly temperature was >27°C to 29.1°C than when the monthly rainfall was <100 mm and when the temperature was <27°C (p = 0.002). Female animals were about 2.9 times less likely to be infected than male animals (p = 0.01).

Another cross-sectional study was carried out where 11 out of 25 abattoirs in Peninsular Malaysia were visited and slaughtered animals were examined. Animals slaughtered at Universiti Putra Malaysia (UPM) mosque during festivals were also examined. Among the total of 283 lungs from 260 cattle and 23 buffaloes sampled, lungworm was found in three Kedah-Kelantan (KK) cattle (1.1%). The morphological evaluation of egg, L1 and adult worm of the Malaysian bovine lungworm were conducted by comparing with those of D. viviparus from published reports and Sweden. Histopathological lesions of infected lungs were also examined. Based on the morphology of the lungworm and the histopathological changes of the affected lungs, the Malaysian bovine lungworm is believed to be most likely D. viviparus.

In conclusion, bovine lungworm infection in the Malaysian cattle and buffaloes can be detected and the prevalence is low. The disease occurrence was associated with the gender of the animals, and the climatic conditions. Based on the morphology of
the lungworm and the histopathological changes of the affected lungs, the Malaysian bovine lungworm is believed to be *D. viviparus*. 
Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

EPIDEMIOLOGI DAN MORFOLOGI CACING PEPARU (\textit{Dictyocaulus viviparus}), DAN PATOLOGI PEPARU YANG BERKAITAN PADA TERNAKAN LEMBU DAN KERBAU DI SEMENANJUNG MALAYSIA

Oleh

LAT LAT HTUN

July 2007

Pengerusi: Latiffah Hassan, PhD
Fakulti: Perubatan Veterinar


vii
Pemeriksaan retrospektif pada rekod dan data yang telah dijalankan untuk mengesan kejadian jangkitan cacing pe paru lembu di Semenanjung Malaysia. Dua kajian telah dijalankan untuk mencapai objektif. Kajian awal telah dijalankan dipusat pembiakan lembu pedaging untuk menyiasat wabak jangkitan cacing pe paru. Di dapati kadar kematian jangkitan cacing pe paru tahunan bagi tujuh tahun di ladang tersebut adalah bersamaan 0.31%. Lebih banyak kes di kesan berlaku pada lembu jantan (67%) berbanding lembu betina (33%). Tujuh puluh lima peratus dari kematian akibat cacing pe paru berlaku pada lembu yang berumur kurang daripada 12 bulan berbanding lembu berumur 12 hingga 19 bulan. Kebanyakan kematian ternakan lembu berlaku pada bulan November (19%) dan Mei (17%).

Pada kajian kedua, data penghapusan pe paru serta penyebab penghapusan diantara tahun 1998 dan tahun 2004 telah di ambil daripada Ibu Pejabat Jabatan Perkhidmatan Haiwan di Kuala Lumpur. Peratusan penghapusan pe paru berparasit yang diperolehi daripada semua sembelihan haiwan adalah bersamaan 0.11%. Kadar kelaziman jangkitan parasit pe paru lebih tinggi pada kerbau berbanding pada lembu (t = -3.906, p = 0.002).

Satu kajian keratan rentas telah dijalankan pada empat buah ladang (ladang A, B, C, D) bersama tiga ladang tenusu kecil (ladang E) untuk mengenalpasti dan menentukan kadar prevalens jangkitan cacing pe paru serta untuk mengenali faktor risiko. Sampel darah dan tinja najis telah diambil daripada setiap ladang setiap dua bulan selama tempoh lapan bulan. Hanya ladang E, sampel diambil sekali sahaja. Soal-selidik untuk setiap ekor haiwan, pengurusan ladang dan kejadian jangkitan dijalankan pada masa sampel darah dan najis diambil. Maklumat suhu dan hujan di perolehi daripada
Bahagian Kajicuaca, Jabatan Kajicuaca Malaysia. Sejumlah 602 sampel darah dan najs diambil daripada ladang tersebut. Teknik Baermann’s digunakan untuk pemeriksaan parasitologi dan *enzyme-link-immunosorbent assay* untuk pemeriksaan serologi. Hasil pemeriksaan menggunakan teknik Baermann’s mendapati, kadar prevalens jangkitan cacing peparu adalah bersamaan 4.7%. Ladang E menunjukkan kadar prevalens jangkitan yang paling tinggi. Dengan menggunakan analisis binari logistik regresi, jantina dan interaksi antara suhu bulanan dan taburan hujan bulanan telah menunjukkan keertian statistik sebagai faktor risiko jangkitan cacing peparu pada lembu. Kebarangkalian jangkitan cacing peparu bertambah empat kali ganda pada masa taburan hujan bulanan >100 mm dan suhu bulanan >27°C – 29.1°C berbanding dengan pada masa taburan hujan bulanan adalah <100 mm dan suhu bulanan <27°C. Haiwan betina didapati kurang 2.9 kali ganda peluang jangkitan berbanding haiwan jantan.

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I certify that an Examination Committee has met on 6th July 2007 to conduct the final examination of Lat Lat Htun on her Doctor of Philosophy thesis entitled “Epidemiology and Morphology of Lungworm (*Dictyocaulus viviparus*), and its Associated Lung Pathology in Cattle and Buffaloes in Peninsular Malaysia” in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

**Abd. Aziz Saharee, PhD**
Professor  
Faculty of Veterinary Medicine  
Universiti Putra Malaysia  
(Chairman)

**Saleha Abd. Aziz, PhD**
Professor  
Faculty of Veterinary Medicine  
Universiti Putra Malaysia  
(Internal Examiner)

**Shaik Amin Babjee, PhD**
Associate Professor  
Faculty of Veterinary Medicine  
Universiti Putra Malaysia  
(Internal Examiner)

**Pierre Dorny, PhD**
Professor  
Faculty of Veterinary Medicine  
Gent University, Belgium  
(External Examiner)

**HASANAH MOHD. GHAZALI, PhD**  
Professor / Deputy Dean  
School of Graduate Studies  
Universiti Putra Malaysia

Date: 3 AUGUST 2007
This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

**Latiffah Hassan, PhD**  
Lecturer  
Faculty of Veterinary Medicine  
Universiti Putra Malaysia  
(Chairman)

**Rehana Abdullah Sani, PhD**  
Associate Professor  
Faculty of Veterinary Medicine  
Universiti Putra Malaysia  
(Member)

**Dato’ Sheikh Omar Abd. Rahman, PhD**  
Professor  
Faculty of Veterinary Medicine  
Universiti Putra Malaysia  
(Member)

**AINI IDERIS, PhD**  
Professor and Dean  
School of Graduate Studies  
Universiti Putra Malaysia  

Date: 9 AUGUST 2007
DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.

_________________
LAT LAT HTUN

Date: 23 JULY 2007
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEDICATION</td>
<td>ii</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>iii</td>
</tr>
<tr>
<td>ABSTRAK</td>
<td>vii</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>xi</td>
</tr>
<tr>
<td>APPROVAL</td>
<td>xiv</td>
</tr>
<tr>
<td>DECLARATION</td>
<td>xvi</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>xxi</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xxiii</td>
</tr>
<tr>
<td>LIST OF ABBREVIATIONS</td>
<td>xxvi</td>
</tr>
</tbody>
</table>

## CHAPTER

1. **INTRODUCTION**  

2. **LITERATURE REVIEW**  
   2.1 The Organism and Disease  
   2.2 Morphology  
   2.3 Life Cycle  
   2.4 Pre-Parasitic Larval Stages  
   2.5 Epidemiology  
   2.5.1 Host Factor  
   2.5.2 Environmental Factor  
   2.6 Economic Importance of Bovine Dictyocaulosis  
   2.7 Diagnosis of Bovine Dictyocaulosis  
   2.7.1 Faecal Detection  
   2.7.2 Serology  
   2.7.3 Pathogenesis and Histopathological Lesions  
   2.8 Control of Bovine Dictyocaulosis  
   2.8.1 Treatment  
   2.8.2 Immunity and Vaccination  
   2.8.3 Grazing Management  

3. **MATERIALS AND METHODS**  
   3.1 Target and Study Population  
   3.2 Study Design  
   3.2.1 Sample Size  
   3.2.2 Farm A  
   3.2.3 Farm B  
   3.2.4 Farm C  
   3.2.5 Farm D  
   3.2.6 Farm E  
   3.3 Collection of Sample  
   3.3.1 Faecal Sample  
   3.3.2 Baermann Technique  
   3.3.3 Blood Sample  
   3.3.4 Enzyme-Link Immunosorbent Assay  
   3.3.5 ELISA Test Procedures
3.3.6 Calculation of Percent Positivity Values (PP) 53
3.3.7 Interpretation of The Percent Positivity 54

4 OUTBREAKS OF LUNGWORM DISEASE IN A BEEF FARM IN MALAYSIA BETWEEN 1994 AND 2000 55
4.1 Introduction 55
4.2 Materials and Methods 56
4.2.1 Farm Management and History 56
4.2.2 Collection of Data 57
4.2.3 Analysis of Data 58
4.3 Results 58
4.4 Discussion and Conclusion 61

5 CONDEMNATION OF LUNGS IN ABATTOIRS IN PENINSULAR MALAYSIA DUE TO PARASITIC INFECTION FROM 1998 TO 2004 65
5.1 Introduction 65
5.2 Materials and Methods 66
5.2.1 Source of Data 66
5.2.2 Data Management and Analysis 66
5.3 Results 66
5.3.1 Description of Data from Records 66
5.3.2 Condemnation of Lungs 71
5.3.3 Condemnation of Lungs due to Parasitic Infection 71
5.4 Discussion and Conclusion 74

6 PREVALENCE OF LUNGWORM INFECTION IN CATTLE AND BUFFALOES IN PENINSULAR MALAYSIA 78
6.1 Introduction 78
6.2 Materials and Methods 80
6.2.1 Determination of Prevalence Using the Parasitological Method and ELISA 80
6.2.2 Determination of Prevalence from Examination of Slaughtered Animals 80
6.2.3 Data Analysis 81
6.3 Results 81
6.3.1 Parasitological Prevalence 81
6.3.2 Serological Prevalence 82
6.3.3 Prevalence of Adult Lungworm at the Abattoirs 86
6.4 Discussion and Conclusion 87

7 IDENTIFICATION OF RISK FACTORS ASSOCIATED WITH BOVINE LUNGWORM INFECTION 92
7.1 Introduction 92
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.2</td>
<td>Materials and Methods</td>
<td>92</td>
</tr>
<tr>
<td>7.2.1</td>
<td>Questionnaire</td>
<td>93</td>
</tr>
<tr>
<td>7.2.2</td>
<td>Meteorological Data</td>
<td>93</td>
</tr>
<tr>
<td>7.2.3</td>
<td>Data Analysis</td>
<td>94</td>
</tr>
<tr>
<td>7.3</td>
<td>Results</td>
<td>94</td>
</tr>
<tr>
<td>7.3.1</td>
<td>Management of the Farms</td>
<td>94</td>
</tr>
<tr>
<td>7.3.2</td>
<td>Prevalence (%) and Meteorological Data from the Weather Stations Nearest to the Sampled Farms</td>
<td>97</td>
</tr>
<tr>
<td>7.3.3</td>
<td>Prevalence of Lungworm Infection</td>
<td>99</td>
</tr>
<tr>
<td>7.3.4</td>
<td>Univariate Analysis of Hypothesised Risk Factors of Age, Breed, Gender, Monthly Temperature, Monthly Rainfall and Grazing Management and Lungworm Infection</td>
<td>100</td>
</tr>
<tr>
<td>7.3.5</td>
<td>Logistic Regression Analysis</td>
<td>100</td>
</tr>
<tr>
<td>7.4</td>
<td>Discussion</td>
<td>102</td>
</tr>
<tr>
<td>7.4.1</td>
<td>Age</td>
<td>102</td>
</tr>
<tr>
<td>7.4.2</td>
<td>Gender</td>
<td>102</td>
</tr>
<tr>
<td>7.4.3</td>
<td>Monthly Rainfall and Monthly Temperature</td>
<td>103</td>
</tr>
<tr>
<td>7.4.4</td>
<td>Grazing Management</td>
<td>105</td>
</tr>
<tr>
<td>7.4.5</td>
<td>Breed</td>
<td>106</td>
</tr>
<tr>
<td>7.5</td>
<td>Conclusion</td>
<td>106</td>
</tr>
<tr>
<td>8</td>
<td>MORPHOLOGICAL EVALUATION OF THE MALAYSIAN BOVINE LUNGWORM AND THE HISTOPATHOLOGY OF INFECTED LUNG</td>
<td>107</td>
</tr>
<tr>
<td>8.1</td>
<td>Introduction</td>
<td>107</td>
</tr>
<tr>
<td>8.2</td>
<td>Materials and Methods</td>
<td>108</td>
</tr>
<tr>
<td>8.2.1</td>
<td>Sampling from the Abattoir</td>
<td>108</td>
</tr>
<tr>
<td>8.2.2</td>
<td>Morphology and Morphometry</td>
<td>109</td>
</tr>
<tr>
<td>8.2.3</td>
<td>Comparison of the Morphology of Egg, L1 and Adult of Malaysian Bovine Lungworm with <em>D. viviparus</em></td>
<td>110</td>
</tr>
<tr>
<td>8.2.4</td>
<td>Histopathological Evaluations</td>
<td>110</td>
</tr>
<tr>
<td>8.2.5</td>
<td>Statistical Analysis</td>
<td>111</td>
</tr>
<tr>
<td>8.3</td>
<td>Results</td>
<td>111</td>
</tr>
<tr>
<td>8.3.1</td>
<td>Descriptive Morphology and Morphometry of Adult, L1 and Egg of Malaysian Bovine Lungworms</td>
<td>112</td>
</tr>
<tr>
<td>8.3.2</td>
<td>Comparative Morphometry of Adult Male and Female Worms, Egg and L1 between Malaysian Bovine Lungworm and <em>D. viviparus</em> from Published Reports and Sweden</td>
<td>113</td>
</tr>
<tr>
<td>8.3.3</td>
<td>Taxonomic Summary</td>
<td>123</td>
</tr>
<tr>
<td>8.3.4</td>
<td>Macroscopic and Microscopic Findings of Infected Lungs</td>
<td>124</td>
</tr>
<tr>
<td>8.4</td>
<td>Discussion and Conclusion</td>
<td>127</td>
</tr>
<tr>
<td>8.4.1</td>
<td>Morphology and Morphometry of Malaysian Bovine Lungworm</td>
<td>127</td>
</tr>
</tbody>
</table>
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

REFERENCES

APPENDICES

A. Forms for Data Collection from Abattoir Managers 151
B. Questionnaires on Cross-sectional Study of Bovine Dictyocaulosis 155
C. Morphometric Definitions 166
D. Procedure for Staining 167

BIODATA OF STUDENT 170
LIST OF PUBLICATIONS 171
### LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Efficacy of current anthelmintics against <em>D. viviparous</em></td>
</tr>
<tr>
<td>3.1</td>
<td>Population of cattle and management of five farms during the period of sample collection</td>
</tr>
<tr>
<td>4.1</td>
<td>Number of deaths in cattle due to lungworm disease between 1994 and 2000 in a beef farm in Peninsular Malaysia</td>
</tr>
<tr>
<td>5.1</td>
<td>Total number, mean and standard deviation of cattle and buffaloes slaughtered in each of the 25 abattoirs in Peninsular Malaysia from 1998 to 2004</td>
</tr>
<tr>
<td>5.2</td>
<td>Total number, mean and standard deviation of cattle and buffaloes slaughtered per year in 25 abattoirs in Peninsular Malaysia from 1998 to 2004</td>
</tr>
<tr>
<td>5.3</td>
<td>Number and rate (%) of lungs condemned due to specific lung lesions from 25 abattoirs in Peninsular Malaysia from 1998 to 2004</td>
</tr>
<tr>
<td>6.1</td>
<td>Prevalence (%) of bovine lungworm parasitologically positive cases in four large scale farms and one dairy smallholding</td>
</tr>
<tr>
<td>6.2</td>
<td>Seroprevalence (%) of lungworm in all diagnosed sera from four large scale farms and one dairy smallholding based on three age groups</td>
</tr>
<tr>
<td>6.3</td>
<td>Cross tabulation between parasitological and serological (weak positive) results</td>
</tr>
<tr>
<td>6.4</td>
<td>Prevalence (%) of cattle infected with adult lungworm examined at 11 abattoirs and UPM mosque in Peninsular Malaysia</td>
</tr>
<tr>
<td>7.1</td>
<td>Management of five farms during the period of sample collection</td>
</tr>
</tbody>
</table>
7.2 Prevalence (%) of bovine lungworm infection and meteorological data from the nearest weather stations to the sampled farms during the sampling period

7.3 Distribution and association of risk factors for the prevalence of bovine lungworm infection in five farms based on parasitological diagnosis

7.4 Binary logistic regression of risk factors for bovine lungworm infection based on parasitological diagnosis in five farms

8.1 Number of worms found in three Kedah-Kelantan cattle at two abattoirs

8.2 Comparative morphometry of male worms between the Malaysian bovine lungworm and D. viviparus from the published reports. All measurements are in mm (unless stated otherwise).

8.3 Comparative morphometry of female worms between the Malaysian lungworm and D. viviparus from the published reports and Sweden. All measurements are in mm (unless stated otherwise).

A.1 Form for collection of records on condemnation of lungs from abattoirs in Peninsular Malaysia (1994-2004)

A.3b Borang maklumat haiwan ‘Projek cacing peparu didalam lembu dan kerbau"
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Friesian-Sahiwal Cross Calf in Farm A</td>
<td>45</td>
</tr>
<tr>
<td>3.2</td>
<td>Nelore Breed Cattle in Farm C</td>
<td>46</td>
</tr>
<tr>
<td>3.3</td>
<td>Kedah-Kelantan Breed Cattle in Farm D</td>
<td>47</td>
</tr>
<tr>
<td>3.4</td>
<td>Table Constructed for the Baermann Technique</td>
<td>49</td>
</tr>
<tr>
<td>3.5</td>
<td>ELISA Kit, Ceditest® <em>Lungworm</em> (Cedi-Diagnostics B.V., The Netherlands)</td>
<td>51</td>
</tr>
<tr>
<td>4.1</td>
<td>The Number of Deaths due to Lungworm Infection between 1994 and 2000</td>
<td>59</td>
</tr>
<tr>
<td>4.2</td>
<td>The Number of Deaths due to Lungworm Infection in Different Age Groups between 1994 and 2000</td>
<td>60</td>
</tr>
<tr>
<td>4.3</td>
<td>The Number of Cumulative Monthly Deaths due to Lungworm Infection between 1994 and 2000</td>
<td>61</td>
</tr>
<tr>
<td>5.1</td>
<td>Species-specific Parasitic Lung Condemnation in 25 Abattoirs from 1998 to 2004</td>
<td>72</td>
</tr>
<tr>
<td>5.2</td>
<td>Species-specific Proportional Lung Condemnation due to Parasitic Infection in 25 Abattoirs from 1998 to 2004</td>
<td>73</td>
</tr>
<tr>
<td>5.3</td>
<td>Parasitic Lung Condemnation Rate from 1998 to 2004 Based on the Location of Abattoirs</td>
<td>73</td>
</tr>
<tr>
<td>5.4</td>
<td>Cumulative Monthly Distribution of Lung Condemnation due to Parasitic Infection in 25 Abattoirs from 1998 to 2004</td>
<td>74</td>
</tr>
<tr>
<td>6.1</td>
<td>Pictographs of the First Stage Larvae of Malaysian Bovine Lungworm from Sampled Farms</td>
<td>82</td>
</tr>
</tbody>
</table>