A STUDY OF SOME MUSCLES OF THE EQUINE LARYNX AND
SOFT PALATE

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requirements for the degree of
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by

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ABSTRACT

The purpose of this study was to determine the age of onset, incidence and severity of neurogenic disease in the intrinsic laryngeal muscles of a single breed of competitive horse, the New Zealand Thoroughbred. Some palatal muscles from these horses were also studied to ascertain whether neurogenic disease occurred in them.

The left and right dorsal cricoarytenoid, lateral cricoarytenoid, transverse arytenoid, ventricular, vocal, cricothyroid, hyoepiglottic, palatopharyngeal, palatine levator, palatine, and palatine tensor muscles were collected from some or all of 53 Thoroughbred horses. Forty-six of the horses had no history of upper respiratory tract abnormalities, six had suffered from idiopathic laryngeal hemiplegia and one from laryngo-palatal dislocation. For comparative purposes similar muscles from three ponies were also studied.

The muscles were weighed and then frozen sections were prepared from them. Some of these were stained with haematoxylin and eosin and others to demonstrate the activity of myosin adenosine triphosphatase, succinate dehydrogenase and glycogen phosphorylase. These sections were then studied to determine the muscle fibre types present and their proportions. The mean sizes of the groups of myosin adenosine triphosphatase low reacting fibres were measured as were the mean cross sectional areas of the fibres. Abnormal staining characteristics of the fibres were noted along with histological signs of denervation and reinnervation. Where possible this information was analysed to determine the significance of the differences observed between the measured mean values.

A difference in weight between some of the left and right laryngeal muscles was found to be very common in Thoroughbred horses with no history of upper respiratory tract abnormalities. The left lateral cricoarytenoid muscle was lighter than the right in approximately half of these horses. This difference was significant between the muscles of these horses over three years of age and was most obvious in the muscles of the geldings. The left and right dorsal cricoarytenoid muscles showed similar but not such marked differences. These differences were more obvious in the laryngeal hemiplegic horses.
The fibres of the intrinsic laryngeal muscles were predominantly highly reactive for the enzyme myosin adenosine triphosphatase with the ventricular and vocal muscles having the highest proportions of these fibres and the cricothyroid and hyoepiglottic muscles the lowest. Glycogen phosphorylase reactivity in these muscles was again predominantly high, and the fibres were almost exclusively, highly reactive for succinate dehydrogenase. Neurogenic disease appeared to have an influence on the proportions of fibre types present in affected muscles.

The incidence of larger groups of myosin adenosine triphosphatase low reacting fibres in some of the left than right intrinsic laryngeal muscles was also very common in Thoroughbred horses with no history of upper respiratory tract abnormalities. Eighty percent of these horses over three years of age had larger groups in their left than right lateral cricoarytenoid muscles and the youngest horse where this difference was noted was six weeks old. The adductor muscles showed more evidence of this side difference in group size than the abductor muscles.

The mean cross sectional area of the fibres of the intrinsic laryngeal muscles studied increased till approximately the end of the third year of a horse's life. Neurogenic disease eventually reduced the cross sectional area of the fibres of affected muscles but early in its course it may have produced an increase in the mean cross sectional area of fibres. This increase occurred in mildly affected and also in some unaffected muscles. The latter may have been required to increase their activity to compensate for inefficient function in atrophied muscles.

The histological signs of denervation and reinnervation were also very common in the intrinsic laryngeal muscles supplied by the left recurrent laryngeal nerve. These signs were noted in almost 70% of the left lateral cricoarytenoid muscles from horses over one year of age, with no history of upper respiratory tract abnormalities. The incidence of these signs in the dorsal cricoarytenoid muscle was lower but they appeared suddenly and severely in the left muscles of horses during adolescence and early adult life. In the cricothyroid muscle which is not supplied by the recurrent laryngeal nerve, the only histological signs of this nature appeared in the muscles of
a few of the aged horses.

In the palatal muscles examined there was no evidence of a difference in weight between the left and right muscles and most of their fibres were highly reactive for the three enzymes studied. There was no evidence of fibre type grouping resulting from denervation and reinnervation and none of the other histological signs resulting from severe neurogenic disease were noted.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>TABLE OF CONTENTS</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>1</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>2</td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>5</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>11</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>13</td>
</tr>
<tr>
<td>CHAPTER 1</td>
<td></td>
</tr>
<tr>
<td>1.1 Idiopathic Laryngeal Hemiplegia</td>
<td>17</td>
</tr>
<tr>
<td>1.2 The Anatomy of Some Equine Laryngeal Muscles</td>
<td>19</td>
</tr>
<tr>
<td>1.2.1 Dorsal Cricoarytenoid Muscle</td>
<td>20</td>
</tr>
<tr>
<td>1.2.2 Lateral Cricoarytenoid Muscle</td>
<td>20</td>
</tr>
<tr>
<td>1.2.3 Transverse Arytenoid Muscle</td>
<td>20</td>
</tr>
<tr>
<td>1.2.4 Thyroarytenoid Muscles</td>
<td>20</td>
</tr>
<tr>
<td>1.2.5 Cricothyroid Muscle</td>
<td>21</td>
</tr>
<tr>
<td>1.2.6 Hyoepiglottic Muscle</td>
<td>21</td>
</tr>
<tr>
<td>1.3 Laryngo-palatal Dislocation</td>
<td>22</td>
</tr>
<tr>
<td>1.4 The Anatomy of Some Equine Palatal Muscles</td>
<td>23</td>
</tr>
<tr>
<td>1.4.1 Palatopharyngeal Muscle</td>
<td>23</td>
</tr>
<tr>
<td>1.4.2 Palatine Levator Muscle</td>
<td>24</td>
</tr>
<tr>
<td>1.4.3 Palatine Muscle</td>
<td>24</td>
</tr>
<tr>
<td>1.4.4 Palatine Tensor Muscle</td>
<td>24</td>
</tr>
<tr>
<td>CHAPTER 2</td>
<td></td>
</tr>
<tr>
<td>2.1 Horses Used in the Study</td>
<td>26</td>
</tr>
<tr>
<td>2.2 Tissue Collection</td>
<td>26</td>
</tr>
<tr>
<td>2.3 Processing of Muscle Samples</td>
<td>28</td>
</tr>
<tr>
<td>2.4 Data Collection</td>
<td>30</td>
</tr>
<tr>
<td>2.5 Data Processing</td>
<td>32</td>
</tr>
<tr>
<td>CHAPTER 3</td>
<td></td>
</tr>
<tr>
<td>3.1 Introduction</td>
<td>37</td>
</tr>
<tr>
<td>3.2 Materials and Methods</td>
<td>38</td>
</tr>
</tbody>
</table>
3.3 Results

3.3.1 Weight Differences Between Left and Right Intrinsic Laryngeal Muscles
3.3.1.1 Dorsal Cricoarytenoid Muscle
3.3.1.2 Lateral Cricoarytenoid Muscle
3.3.1.3 Transverse Arytenoid Muscle
3.3.1.4 Ventricular Muscle
3.3.1.5 Cricothyroid Muscle

3.3.2 The Analysis of the Difference Between Mean Weights of Some Intrinsic Laryngeal Muscles
3.3.2.1 Dorsal Cricoarytenoid Muscle
3.3.2.2 Lateral Cricoarytenoid Muscle
3.3.2.3 Transverse Arytenoid Muscle
3.3.2.4 Ventricular Muscle
3.3.2.5 Cricothyroid Muscle

3.4 Discussion

<table>
<thead>
<tr>
<th>Chapter 4</th>
<th>The Histochemistry of Some Equine Laryngeal Muscles</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 Introduction</td>
<td></td>
</tr>
<tr>
<td>4.1.1 The Motor or Muscle Unit Concept</td>
<td></td>
</tr>
<tr>
<td>4.1.2 Fibre Types</td>
<td></td>
</tr>
<tr>
<td>4.1.2.1 Some Systems of Typing Muscle Fibres</td>
<td></td>
</tr>
<tr>
<td>4.1.2.2 Physiological Influences on Fibre Type</td>
<td></td>
</tr>
<tr>
<td>4.1.3 Histochemical profiles</td>
<td></td>
</tr>
<tr>
<td>4.1.3.1 Myosin Adenosine Triphosphatase (Myosin ATPase)</td>
<td></td>
</tr>
<tr>
<td>4.1.3.2 Succinate Dehydrogenase (SDase)</td>
<td></td>
</tr>
<tr>
<td>4.1.3.3 Glycogen Phosphorylase (GPase)</td>
<td></td>
</tr>
<tr>
<td>4.1.4 Fibre Types Observed in Equine Muscles and Laryngeal Muscles of Other Species</td>
<td></td>
</tr>
<tr>
<td>4.1.5 The Effect of Denervation on Fibre Type and Fibre Architecture</td>
<td></td>
</tr>
</tbody>
</table>

4.2 Materials and Methods

4.3 Results

4.3.1 The Predominant Fibre Types Found and Their Proportions
4.3.1.1 Dorsal Cricoarytenoid Muscle
- 4.3.1.1.1 "Normal" Horses
- 4.3.1.1.2 Abnormal Horses

4.3.1.2 Lateral Cricoarytenoid Muscle
- 4.3.1.2.1 "Normal" Horses
- 4.3.1.2.2 Abnormal Horses

4.3.1.3 Transverse Arytenoid Muscle
- 4.3.1.3.1 "Normal" Horses
- 4.3.1.3.2 Abnormal Horses

4.3.1.4 Ventricular Muscles
- 4.3.1.4.1 "Normal" Horses
- 4.3.1.4.2 Abnormal Horses

4.3.1.5 Vocal Muscle

4.3.1.6 Cricoarytenoid Muscle
- 4.3.1.6.1 "Normal" Horses
- 4.3.1.6.2 Abnormal Horses

4.3.1.7 Hyoepiglottic Muscle

4.3.2 Other Fibre Types

4.3.3 Other Staining Characteristics and Changes in Fibre Architecture

4.4 Discussion
- 4.4.1 Preparation of Muscle Blocks
- 4.4.2 Fibre Types in Equine Laryngeal Muscles
- 4.4.3 Changes in the Proportion of Fibre Types Observed in the Different Groups of Horses
  - 4.4.3.1 The Proportion of AH:AL Fibres
  - 4.4.3.2 The Proportions of SH and PH Fibres
- 4.4.4 Changes in Fibre Architecture
- 4.4.5 Concluding Comments

CHAPTER 5 THE HISTOPATHOLOGY OF SOME EQUINE LARYNGEAL MUSCLES

5.1 Introduction
- 5.1.1 Fibre Type Grouping in Equine Intrinsic Laryngeal Muscles
- 5.1.2 The Significance of Fibre Type Grouping
5.1.3 Fibre Size

5.1.3.1 Factors Influencing the Size of Muscle Fibres 85
5.1.3.2 Fibre Size in Equine Laryngeal Muscles 87

5.1.4 Histological Features of Normal and Denervated Muscle

5.1.4.1 The Normal Histological Features Observed in Transverse Sections of Skeletal Muscle 89
5.1.4.2 The Histology of Denervated Muscle 91
5.1.4.3 Other Histological Changes Observed in Equine Intrinsic Laryngeal Muscles 93

5.2 Materials and Methods 94

5.3 Results 95

5.3.1 Size of Groups of AL Fibres

5.3.1.1 Dorsal Cricoarytenoid Muscle 95
5.3.1.2 Lateral Cricoarytenoid Muscle 97
5.3.1.3 Transverse Arytenoid Muscle 99
5.3.1.4 Ventricular Muscle 99
5.3.1.5 Cricothyroid Muscle 100
5.3.1.6 Hyoepiglottic Muscle 101

5.3.2 Fibre Cross Sectional Area

5.3.2.1 Dorsal Cricoarytenoid Muscle 101
5.3.2.2 Lateral Cricoarytenoid Muscle 103
5.3.2.3 Transverse Arytenoid Muscle 104
5.3.2.4 Ventricular Muscle 104
5.3.2.5 Cricothyroid Muscle 105
5.3.2.6 Hyoepiglottic Muscle 106

5.3.3 Histological Features Noted in This Study

5.3.3.1 Histological Features of Juvenile Muscle 107
5.3.3.2 Histopathological Changes Characteristic of Denervation Noted in This Study 107

5.3.3.2.1 Dorsal Cricoarytenoid Muscle 108
5.3.3.2.2 Lateral Cricoarytenoid Muscle 109
5.3.3.2.3 Transverse Arytenoid Muscle 109
5.3.3.2.4 Ventricular Muscle 110
5.3.3.2.5 Cricothyroid Muscle 110
5.3.3.2.6 Hyoepiglottic Muscle 111

5.3.3.3 Other Features Noted During Histological Examination of Muscles 111
5.4 Discussion

5.4.1 Size of Groups of AL Fibres
5.4.2 Fibre Cross Sectional Area
5.4.3 Histological Features of Juvenile Muscle
5.4.4 Histopathology
5.4.5 Sarcosporidiosis
5.4.6 Concluding Comments

CHAPTER 6 THE PALATAL MUSCLES

6.1 Introduction
6.2 Materials and Methods
6.3 Results
6.3.1 Palatal Muscle Weights
   6.3.1.1 Palatine Levator Muscle
   6.3.1.2 Palatine Tensor Muscle
6.3.2 The Predominant Fibre Types Found and Their Proportions
6.3.3 Other Fibre Types
6.3.4 Other Staining Characteristics and Changes in Fibre Architecture
6.3.5 Size of Groups of AL Fibres
6.3.6 Fibre Cross Sectional Area
6.3.7 Histochemical and Histological Features of Palatal Muscles
6.3.8 Sarcosporidiosis
6.4 Discussion
6.4.1 Palatal Muscle Weights
6.4.2 The Fibre Types Observed in Palatal Muscles
6.4.3 Fibre Type Grouping in Palatal Muscles
6.4.4 Fibre Cross Sectional Area in Palatal Muscles
6.4.5 Histological Features of Palatal Muscles
6.4.6 Sarcosporidiosis
6.4.7 Concluding Comments

7. 1-12 CONCLUSIONS

REFERENCES

APPENDIX 1 Davies' and Gunn's modification of the method of Padykula and Herman for demonstrating the activity of myosin adenosine triphosphatase
<table>
<thead>
<tr>
<th>APPENDIX 2</th>
<th>Nachlas et al.'s method for demonstrating the activity of succinate dehydrogenase</th>
<th>155</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPENDIX 3</td>
<td>Takeuchi's modification of the method of Takeuchi and Kuriaki for demonstrating the activity of glycogen phosphorylase</td>
<td>156</td>
</tr>
<tr>
<td>APPENDIX 4.1</td>
<td>Example of the data collected illustrating its arrangement for analysis</td>
<td>157</td>
</tr>
<tr>
<td>APPENDIX 4.2</td>
<td>The data from the muscles studied</td>
<td>158</td>
</tr>
<tr>
<td>APPENDIX 5</td>
<td>Example of the Genstat analysis used in this study</td>
<td>173</td>
</tr>
<tr>
<td>APPENDIX 6-12</td>
<td>Published work</td>
<td>175</td>
</tr>
</tbody>
</table>
LIST OF TABLES

TABLE 1  HORSES WITH NO HISTORY OF UPPER RESPIRATORY TRACT ABNORMALITIES ("NORMAL" HORSES) 34
TABLE 2  HORSES WITH CLINICALLY ABNORMAL UPPER RESPIRATORY TRACTS (ABNORMAL HORSES) 35
TABLE 3  MUSCLES EXAMINED IN HORSES STUDIED 36
TABLE 4  THE MEAN WEIGHTS (GRAMS) OF EQUINE DORSAL CRICOARYTENOID MUSCLES 41
TABLE 5  THE MEAN WEIGHTS (GRAMS) OF EQUINE LATERAL CRICOARYTENOID MUSCLES 42
TABLE 6  THE MEAN WEIGHTS (GRAMS) OF EQUINE TRANSVERSE ARYTENOID MUSCLES 43
TABLE 7  THE MEAN WEIGHTS (GRAMS) OF EQUINE VENTRICULAR MUSCLES 43
TABLE 8  THE MEAN WEIGHTS (GRAMS) OF EQUINE CRICOThYROID MUSCLES 44
TABLE 9  SUMMARY OF THE PROPERTIES OF MUSCLE FIBRES 54
TABLE 10  THE FIBRE TYPES IN SOME EQUINE LIMB MUSCLES 63
TABLE 11  THE NUMBER OF HORSES FROM WHICH MUSCLES WERE STUDIED HISTOCHEMICALLY 68
TABLE 12  FIBRE TYPE PROFILES OF LARYNGEAL MUSCLES FROM HORSES WITH NO HISTORY OF UPPER RESPIRATORY TRACT ABNORMALITIES 69
TABLE 13  THE MEAN NUMBER OF AL FIBRES PER GROUP OBSERVED IN THE DORSAL CRICOARYTENOID MUSCLES 96
TABLE 14  THE MEAN NUMBER OF AL FIBRES PER GROUP OBSERVED IN THE LATERAL CRICOARYTENOID MUSCLES 97
TABLE 15  THE MEAN NUMBER OF AL FIBRES PER GROUP OBSERVED IN THE TRANSVERSE ARYTENOID MUSCLES 99
TABLE 16  THE MEAN NUMBER OF AL FIBRES PER GROUP OBSERVED IN THE CRICOTHYROID MUSCLES

TABLE 17  THE MEAN CROSS SECTIONAL AREAS (\(\mu m^2\)) OF AH AND AL FIBRES IN THE DORSAL CRICOARYTENOID MUSCLES

TABLE 18  THE MEAN CROSS SECTIONAL AREAS (\(\mu m^2\)) OF AH AND AL FIBRES IN THE LATERAL CRICOARYTENOID MUSCLES

TABLE 19  THE MEAN CROSS SECTIONAL AREAS (\(\mu m^2\)) OF AH AND AL FIBRES IN THE CRICOTHYROID MUSCLES

TABLE 20  THE MEAN CROSS SECTIONAL AREAS (\(\mu m^2\)) OF AH AND AL FIBRES IN THE HYOEPIGLOTTIC MUSCLES

TABLE 21  THE NUMBER OF HORSES FROM WHICH PALATAL MUSCLES WERE STUDIED

TABLE 22  THE MEAN WEIGHTS (GRAMS) OF EQUINE PALATINE LEVATOR AND PALATINE TENSOR MUSCLES FROM HORSES WITH NO HISTORY OF UPPER RESPIRATORY TRACT ABNORMALITIES

TABLE 23  THE PERCENTAGE OF FIBRE TYPES PRESENT IN THE PALATAL MUSCLES FROM HORSES WITH NO HISTORY OF UPPER RESPIRATORY TRACT ABNORMALITIES

TABLE 24  THE MEAN NUMBER OF AL FIBRES PER GROUP IN THE PALATAL MUSCLES FROM HORSES WITH NO HISTORY OF UPPER RESPIRATORY TRACT ABNORMALITIES

TABLE 25  THE MEAN CROSS SECTIONAL AREAS (\(\mu m^2\)) OF AH AND AL FIBRES IN THE PALATAL MUSCLES OF HORSES WITH NO HISTORY OF UPPER RESPIRATORY TRACT ABNORMALITIES
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURE</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIGURE 1</td>
<td>The anatomical relationships between the equine intrinsic laryngeal and hyoepiglottic muscles and the laryngeal cartilages and hyoid bone</td>
<td>19-20</td>
</tr>
<tr>
<td>FIGURE 2</td>
<td>The left and right dorsal cricoarytenoid muscles</td>
<td>20-21</td>
</tr>
<tr>
<td>FIGURE 3</td>
<td>The left and right lateral cricoarytenoid muscles</td>
<td>20-21</td>
</tr>
<tr>
<td>FIGURE 4</td>
<td>The left and right transverse arytenoid muscles</td>
<td>20-21</td>
</tr>
<tr>
<td>FIGURE 5</td>
<td>The left and right ventricular muscles</td>
<td>21-22</td>
</tr>
<tr>
<td>FIGURE 6</td>
<td>The left and right cricothyroid muscles</td>
<td>21-22</td>
</tr>
<tr>
<td>FIGURE 7</td>
<td>The anatomical relationships of equine palatal muscles</td>
<td>23-24</td>
</tr>
<tr>
<td>FIGURE 8</td>
<td>The left and right palatopharyngeal muscles</td>
<td>24-25</td>
</tr>
<tr>
<td>FIGURE 9</td>
<td>The left and right palatine levator muscles</td>
<td>24-25</td>
</tr>
<tr>
<td>FIGURE 10</td>
<td>The left and right palatine tensor muscles</td>
<td>24-25</td>
</tr>
<tr>
<td>FIGURE 11</td>
<td>Some of the intrinsic laryngeal and palatal muscles and the hyoepiglottic muscles from a &quot;normal&quot; horse</td>
<td>28-29</td>
</tr>
<tr>
<td>FIGURE 12</td>
<td>The sites in the muscle bodies from which the samples for processing were cut</td>
<td>28-29</td>
</tr>
<tr>
<td>FIGURE 13</td>
<td>Some of the equipment used for freezing and mounting the muscle blocks</td>
<td>29-30</td>
</tr>
<tr>
<td>FIGURE 14</td>
<td>The microprojector and tracing table used during this study</td>
<td>29-30</td>
</tr>
<tr>
<td>FIGURE 15</td>
<td>The relationship between age (years) and the mean weights of the left and right dorsal cricoarytenoid muscles of the &quot;normal&quot; horses</td>
<td>40-41</td>
</tr>
<tr>
<td>FIGURE 16</td>
<td>The weights of the left dorsal cricoarytenoid muscles plotted against the weights of the right muscles</td>
<td>40-41</td>
</tr>
</tbody>
</table>
The relationship between age (years) and the mean weights of the left and right lateral cricoarytenoid muscles of the "normal" horses

The weights of the left lateral cricoarytenoid muscles plotted against the weights of the right muscles

The relationship between age (years) and the mean weights of the left and right cricothyroid muscle of the "normal" horses

The weights of the left cricothyroid muscles plotted against the weights of the right muscles

Transverse serial sections of the right dorsal cricoarytenoid muscle from a "normal" horse, showing myosin ATPase, SDase and GPase activity

Transverse serial sections of the left cricothyroid muscle from a "normal" horse, showing myosin ATPase, SDase and GPase activity

Transverse sections of the left and right lateral cricoarytenoid and transverse arytenoid muscles from a laryngeal hemiplegic horse. Sections stained to demonstrate the activity of SDase and GPase

A transverse section of the left dorsal cricoarytenoid muscle of a laryngeal hemiplegic horse. Section stained to demonstrate the activity of SDase

A transverse section of the left ventricular muscle from a laryngeal hemiplegic horse. Section stained to demonstrate the activity of SDase

A transverse section of the left transverse arytenoid muscle of a two year old laryngeal hemiplegic horse. Section stained to demonstrate the activity of SDase

A transverse section of the left dorsal cricoarytenoid muscle of a laryngeal hemiplegic horse. Section stained to demonstrate the activity of myosin ATPase

A transverse section of the left cricothyroid muscle of an aged "normal" horse. Section stained to demonstrate the activity of SDase

A section of the left lateral cricoarytenoid muscle from a "normal" horse. Section stained with haematoxylin and eosin
Subtle pathology illustrated in transverse sections of the right dorsal cricoarytenoid muscle of a laryngeal hemiplegic horse

Moderate pathology illustrated in transverse sections of the right lateral cricoarytenoid muscle of a laryngeal hemiplegic horse

Marked pathology illustrated in transverse sections of the lateral cricoarytenoid muscle of a laryngeal hemiplegic horse

Severe pathology illustrated in transverse sections of the left dorsal cricoarytenoid muscle of a laryngeal hemiplegic horse

The relationship between age (years) and the mean cross sectional areas of the AH and AL fibres in the dorsal cricoarytenoid muscles from the "normal" horses

The relationship between age (years) and the mean cross sectional areas of the AH and AL fibres in the lateral cricoarytenoid muscles from the "normal" horses

The relationship between age (years) and the mean cross sectional areas of the AH and AL fibres in the transverse arytenoid muscles from the "normal" horses

The relationship between age (years) and the mean cross sectional areas of the AH and AL fibres in the ventricular muscles from the "normal" horses

The relationship between age (years) and the mean cross sectional areas of the AH and AL fibres in the cricothyroid muscles from the "normal" horses

Transverse sections of juvenile left dorsal cricoarytenoid muscles. Sections stained with haematoxylin and eosin

A transverse section of the hyoepiglottic muscle from a "normal" horse

A sarcocyst in a transverse section of the cricothyroid muscle from a "normal" horse
FIGURE 43 The relationship between age (years) and the mean weights of the left and right palatine levator muscles of the "normal" horses

FIGURE 44 The weights of the left palatine levator muscles plotted against the weights of the right muscles

FIGURE 45 The relationship between age (years) and the mean weights of the left and right palatine tensor muscles of the "normal" horses

FIGURE 46 The weights of the left palatine tensor muscles plotted against the weights of the right muscles

FIGURE 47 Transverse serial sections of the palatine muscle of a "normal" horse stained to demonstrate the activity of myosin ATPase, SDase and GPase

FIGURE 48 Transverse serial sections of the palatine tensor muscle of a "normal" horse stained to demonstrate the activity of myosin ATPase and SDase

FIGURE 49 The relationship between age (years) and the mean cross sectional areas of the AH and AL fibres in the palatopharyngeal muscles from the "normal" horses

FIGURE 50 The relationship between age (years) and the mean cross sectional areas of the AH and AL fibres in the palatine levator muscles from the "normal" horses

FIGURE 51 The relationship between age (years) and the mean cross sectional areas of the AH and AL fibres in the palatine muscles from the "normal" horses

FIGURE 52 The relationship between age (years) and the mean cross sectional areas of the AH and AL fibres in the palatine tensor from the "normal" horses

FIGURE 53 A transverse section of the palatine levator muscle from a "normal" horse, stained to demonstrate the activity of myosin ATPase

FIGURE 54 A transverse section of the palatine muscle from a "normal" horse, stained with haematoxylin and eosin

FIGURE 55 Transverse sections of the left palatine levator muscles from a "normal" horse, stained with haematoxylin and eosin