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**A STUDY OF THE DISTAL HINDLIMB MUSCLES AND NERVES
IN NORMAL AND LARYNGEAL HEMIPLEGIC HORSES**

A Thesis Presented in Partial Fulfilment of the
Requirements for the
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ABSTRACT

Idiopathic laryngeal hemiplegia has long been recognised as a disease of horses which primarily affects the left recurrent laryngeal nerve, resulting in atrophy of the left intrinsic muscles of the larynx and subsequent left-sided laryngeal paralysis. Recent investigations, however, have resulted in classification of the disease as a distal axonopathy, so that in addition to the recurrent laryngeal nerves, other long nerves in the horse may be affected. This present study was undertaken in order to compare the distal hindlimb muscles and nerves in horses clinically free of neuromuscular disease, and in those suffering from idiopathic laryngeal hemiplegia.

A total of nineteen Thoroughbred horses and two ponies were used in this study. Endoscopic examination and the histological appearance of the left dorsal and lateral cricoarytenoid muscles, and the recurrent laryngeal nerve, were used to classify horses into clinical, subclinical and control groups. A number of samples were taken from multiple sites within several of the most distal hindlimb muscles, in both left and right hind legs. Those examined were the deep digital flexor, the cranial tibial, and the long, lateral and short digital extensor muscles. Histological and histochemical staining techniques were used, which allowed extensive morphologic and morphometric assessment of muscles. Morphometric analysis included calculation of the proportion of fibre types; measurement of fibre size; calculation of atrophy and hypertrophy factors; and histographic analysis of fibre diameter distribution.

The nerves examined were those supplying the lower hind limb muscles, and their distal continuations. These were the common and deep peroneal, tibial,

plantar, and plantar digital nerves. Samples taken from these nerves were embedded in resin and transverse sections examined under light microscopy, enabling an assessment of morphological abnormalities and measurement, using computer-assisted image analysis techniques, of fibre density, and the cross-sectional area of a large number of individual axons. Subsequently the mean and total cross-sectional axonal area were calculated and distribution histograms of cross-sectional axonal area were also established. In five horses teased fibre examination was undertaken to further define the nerve changes.

The results of examination of muscle revealed that abnormalities consistent with those of neurogenic disease were commonly present in the hindlimb in control horses and those affected by idiopathic laryngeal hemiplegia. In the latter group these abnormalities were of both greater frequency and severity, and, in the deep digital flexor muscle, were more severe distally.

Abnormalities were also commonly seen in the nerve samples in control, subclinical and clinical horses. These changes, which included regenerating clusters, thinly myelinated fibres, onion bulb formation, demyelination and remyelination, active axonal degeneration and fibre loss, were found to increase in severity from proximal to distal sites in the limb nerves. As was found in the muscle samples, clinical laryngeal hemiplegic horses were more frequently and more severely affected than control horses. The abnormalities were considered to be indicative of a distal axonopathy.

It was concluded that many apparently normal horses, possibly including smaller breeds, have changes in the hindlimb muscles and nerves, which are associated with peripheral nerve disease, and that the disease

process causing idiopathic laryngeal hemiplegia has an effect on distal hindlimb muscles and nerves.

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