Defining a transcriptomic signature for equine recurrent laryngeal neuropathy

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Most, if not all, Thoroughbred horses are affected by a disease, known as ‘roaring’, that causes the death of nerve fibres that supply the horse’s larynx (‘voice boix’), primarily on the left side of a horse’s throat. Whilst most horses are not clinically affected, in the severest cases, horses cannot open their airway sufficiently when exercising due to the associated left sided larynx muscle weakness, meaning that their air intake is compromised and they perform poorly. These horses are either retired from racing, euthanased or they undergo surgical procedures artificially to tie open the airway, enabling sufficient air to enter the lungs during strenuous exercise. Unfortunately, the permanent alteration to the airway that results from this surgical procedure can result in food material entering the lungs during swallowing with associated lung infections and coughing. It is common also for the surgical procedure to fail. As such, roaring has substantial welfare and economic burden to horse racing worldwide.

Even though we have long recognised this disorder, there is remarkably poor understanding of the cause: genetic, environmental or acquired causes are all postulated. However defining the cause has proved exceptionally difficult due to anatomic and methodological constraints. We predict that improved understanding of the mechanisms that result in death of these nerve fibres will help in the search for the cause of the disease. Consequently, in this study we aim to shed light on the underlying mechanisms that result in cell stress within the very long nerves that supply the larynx by assessing the expression of genes within defined regions of the equine brain, where the nuclei of these nerve cells are located. We hypothesise that specific subsets of these nuclei, especially on the left side, express patterns of genes that will help define a disease mechanism for this enigmatic disorder. We will utilise a series of sophisticated molecular techniques examining tissues from horses with varying severities of the disorder with the aim, ultimately, of defining the reason why nerve cells die in affected horses; if successful, the results might then prompt investigation of alternative strategies for disease management, prophylaxis or treatment, with the ultimate goal of improving Thoroughbred welfare worldwide.