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An endoscopic and immunopathological study of respiratory tract disorders in Thoroughbred racehorses

By

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Thesis Summary

AN ENDOSCOPIC AND IMMUNOPATHOLOGICAL STUDY OF RESPIRATORY TRACT DISORDERS IN THOROUGHBRED RACEHORSES

By

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Promoter: Prof. J. Godfroid

Co-promoters: Dr. D. Sutton, Profs. A. Leisewitz, K. Hinchcliff, and P. Stadler

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Much of the impetus for this research can be attributed to Kenneth W. Hinchcliff, who has studied exercise-induced pulmonary haemorrhage (EIPH) extensively. This thesis focused on EIPH in Thoroughbred racehorses competing in South Africa. Using tracheobronchoscopy, the prevalence and severity of EIPH and the association with racing performance was determined. Thereafter, the prevalence of other respiratory tract disorders and their association with racing performance is reported. This is followed by a

study assessing interobserver variability using grading systems in the detection of respiratory tract disorders. Finally, there is a report on the immunopathogenesis of EIPH.

Using tracheobronchoscopy after racing, the prevalence and severity of EIPH was assessed in 1,005 racehorses competing at high altitude (> 1,400 meters above sea level) and at sea level in a racing jurisdiction that does not allow the use of furosemide and nasal dilator strips. The prevalence and severity of EIPH was affected by altitude as racing at sea level was associated with a higher prevalence and greater severity of EIPH. Results also suggested that EIPH was associated with superior performance in South African Thoroughbred racehorses.

Upper and lower respiratory tract disorders identified following tracheobronchoscopic examination included left arytenoid asymmetry, left laryngeal hemiplegia, epiglottic deformity, epiglottic entrapment, subepiglottic cysts, dorsal displacement of the soft palate, pharyngeal lymphoid hyperplasia (PLH), laryngeal and tracheal dirt, tracheal mucous (TM), tracheal stenosis and tracheal cartilage ring spikes in Thoroughbred racehorses after racing. Overall, there was a low prevalence of grade 2 and 3 arytenoid cartilage asymmetry, left laryngeal hemiplegia, epiglottic entrapment, subepiglottic cysts and epiglottic deformity, while more severe grades of PLH, laryngeal debris, tracheal debris, TM and tracheal cartilage ring spikes had a higher prevalence. An association with sex was identified as tracheal cartilage ring spikes occurred more often in male racehorses. Superior racing performance was identified in racehorses with grade 3 tracheal mucous and tracheal cartilage ring spikes.

Endoscopic grading of EIPH, PLH, arytenoid cartilage movement (ACM), and TM was performed by 3 observers that were blinded to each racehorse's identity and race day performance using previously established grading criteria. Excellent interobserver reliability was seen using the EIPH grading system, while the weighted kappa for PLH, ACM and TM was lower. The study demonstrated sufficient reliability for the use of the EIPH, PLH, ACM and TM grading systems in racehorses competing in South Africa. The study concluded that tracheobronchoscopy seemed to be a practical screening technique that may have prognosticative validity and clinical dependability and that would allow safe and quick assessment of the respiratory tract of a large number of racehorses in field conditions.

Venous blood was collected from 10 horses in each EIPH grade classification (grade 0 to 4) following tracheobronchoscopic examinations for the determination of the presence and severity of EIPH. Following RNA isolation and cDNA synthesis, real-time PCR was used to detect equine cytokine-specific mRNA for interleukin (IL) -1, -6, -10, interferon (INF) -γ, and tumor necrosis factor (TNF) -α. Results of this study indicated that increased IL-6, and -10 mRNA production was associated with more severe forms of EIPH. Also, there was greater expression of IL-6 mRNA at sea level and TNF-α mRNA at high altitude. This study concluded that although it was unclear whether the inflammatory response observed in the study was due to pre-existing pulmonary inflammation or as a direct consequence of pulmonary bleeding, the study demonstrated a systemic correlation to pulmonary inflammation.

The research reported in this thesis has contributed substantially to the determination of the prevalence, severity and affect on racing performance of respiratory tract disorders in Thoroughbred racehorses competing in South Africa. Also, determination of an association between EIPH and inflammation at a molecular level may assist future researchers in anti-cytokine therapies which may help reduce the prevalence and severity of EIPH.

Key words: altitude, arytenoid cartilage asymmetry, epiglottic deformity, epiglottic entrapment, exercise-induced pulmonary haemorrhage, grade scale, interleukin (IL)-1, IL-6, IL-10, interferon-γ, interobserver reliability, laryngeal debris, mRNA, pharyngeal lymphoid hyperplasia, race performance, real-time polymerase chain reaction, sea level, subepiglottic cysts, tracheal cartilage ring spikes, tracheal debris, tracheal mucous, tracheobronchoscopy, tumor necrosis factor-α.