Exercise-Induced Pulmonary Heomorrhage

By Dr Jane Groenendyk, BVSc (Hons) BSc

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History and presenting complaint

Poor athletic performance or expistaxis (bleeding from the nostrils) are the most common presenting complaints for horses with exercise-induced pulmonary heomorrhage or EIPH.

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EIPH is commonly attributed to racehorses who perform below their expected standard. Many horses with poor performance have cytologic evidence of EIPH on microscopic examination of tracheobronchial aspirates (cells extracted from the lower respiratory tract) or bronchoalveolar lavage fluid (fluid collected from the lung), or have blood evident on endoscopic examination of the tracheobronchial tree (the lower respiratory tract) performed 30 to 90 minutes after strenuous exercise or racing.

Severe EIPH undoubtedly results in poor performance and, on rare occasions, death of performance horses or racehorses.

Cause of EIPH

The cause of EIPH is rupture of alveolar capillary membranes with subsequent leakage of blood into interstitial and alveolar spaces. Rupture of the alveolar capillaries occurs secondary to an exercise-induced increase in transmural pressure (pressure difference between the inside of the capillary and the alveolar lumen). If the transmural stress exceeds the tensile strength of the capillary wall, the capillary wall ruptures.

Bleeding into the airways and interstitium leads to inflammation of both airways and interstitium (the small spaces between tissues) with the subsequent development of fibrosis (thickening and scarring of connective tissue) and alteration of tissue damage.

Diagnosis of EIPH

Endoscopic examination of the tracheo-bronchial tract: This is the most appropriate diagnostic tool to use if the horse is examined within 1-2 hours of exercise. An endoscope is passed through the nostrils, into nasopharynx and into the trachea. In most cases, the bronchial bifurcation (where the trachea bifurcates into the right and left lung sides) can be visualised.

Bronchio-alveolar lavage (BAL) fluid examination: This is a saline wash of the airways (broncho) and air sacs (alveolar) for recovery of inflammatory cells/blood cells. A BAL tube or endoscope is passed through the nostril into the nasopharynx. The BAL tube is then advanced into the trachea, quickly, but gently, to the point where slight resistance and bending of the tube is felt. The cuff on the BAL tube is then inflated and then approximately 250ml of sterile saline is infused into the BAL tube as rapidly as possible and is aspirated straight back, slowly. This sample of fluid that is aspirated back is then sent to the laboratory for further microscopic evaluation. Often horses who experience EIPH have quite milky red aspirate fluid.

Trans-tracheal wash (TTW) fluid examination: Usually performed under sedation, a catheter is placed through the skin, between the tracheal rings, and into the tracheal lumen. A 10cm^2 area of the upper trachea is clipped and aseptically

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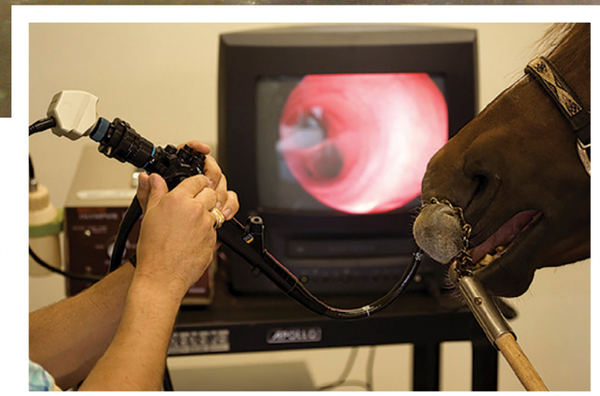
Rupture of the alveolar capillaries occurs secondary to an exercise-induced increase in transmural pressure. If the transmural stress exceeds the tensile strength of the capillary wall, the capillary wall ruptures. Photo courtesy WestVETS Animal Hospital and Reproduction Centre.



Endoscopic examination of the tracheo-bronchial tract. Photo courtesy Pegasus Magazine.

prepared, after a small bleb of local anaesthetic anaesthetises the area where the catheter will be passed through the skin and then between the tracheal rings. A catheter is passed to about the bronchial bifurcation and 30-60ml of sterile saline is infused through the catheter, and then rapidly aspirated back. This sample is then aseptically handled and sent to the laboratory for further cytological, culture and sensitivity testing. Airway washes (TTW, BAL) are the most appropriate if the examination is days to a week after strenuous exercise.

Radiography, pulmonary scintigraphy and lung function tests: These are useful in eliminating other respiratory diseases as a cause of poor performance, but are minimally useful in confirming a diagnosis of EIPH or in determining the severity of haemorrhage.

The use of these diagnostic tests varies and the choice of examination technique depends on the time between the horse performing/racing and the examination, and the desired sensitivity of the test.

Observation of blood in the trachea or large bronchi of horses 30-120 minutes after racing or strenuous exercise provides a definitive diagnosis of EIPH. The amount of blood in the airways varies from a few small specks on the airway walls to abundant blood covering the tracheal surface. Blood may also be present in the larynx and nasopharynx.

A grading system is used to estimate the severity of EIPH following bronchoscopic examination. A commonly used grading system has four levels from 0 (no haemorrhage visible) to 3 (streak of blood >5mm wide).

Treatment recommendations

Therapy is controversial in that many treatments are used, but none are backed by conclusive scientific evidence of efficacy in horses under field conditions, such as racing.

- **Furosemide (better known as Lasix, Salix):** administration as prophylaxis of EIPH is permitted in a number of racing jurisdictions worldwide. The efficacy of furosemide in treatment of EIPH is uncertain. Studies have shown that whilst it may not actually reduce the prevalence of EIPH, it has been demonstrated to reduce the severity of it.

- **Nitric Oxide:** This is a potent vasodilator in many vascular beds. It reduces pulmonary artery pressure of standing horses, but does not affect pulmonary artery pressure of horses during intense exercise.

- **Increasing alveolar inspiratory pressure (Flair strips, Nares):** application of nasal dilator bands (flair strips, nares) to reduce the nasal resistance by dilating the nasal valve.

- **Bronchodilators (Clenbuterol, Albuterol):** have not been shown to alter the haemodynamic relationships in the airways. Studies are still be undertaken to determine their efficacy in treating EIPH.

- **Reduce airway inflammation:** haemorrhage into interstitial tissues induces inflammation with subsequent development of fibrosis (hardening and scarring of the tissues) and bronchial artery angiogenesis (the formation of new blood vessels). Treatments to reduce inflammation and promote healing with minimal fibrosis have been proposed. Rest is an obvious recommendation and many racing jurisdictions have rules regarding enforced rest for horses with epistaxis.

- **Corticosteroids:** These are administered either by inhalation, enterally or parenterally, in an attempt to reduce pulmonary inflammation and minimise fibrosis.

The currently favoured treatment for EIPH is the administration of furosemide before intense exercise. Rest is an obvious recommendation for horses with EIPH, but haemorrhage (bleeding) is likely to recur when the horse is next strenuously exercised. The duration of rest and the optimal exercise program to return horses to exercise after EIPH is unknown.

Prognosis

The prognosis for EIPH is guarded because of the progressive nature of the disease. Horses that have experienced severe EIPH on one occasion are likely to do so again, regardless of treatment. However, the risk of horses experiencing a repeated bout of severe haemorrhage and the effect of EIPH on career longevity are unknown.

ABOUT THE AUTHOR: Jane graduated in 2008 from the University of Queensland and commenced an internship at the Randwick Equine Centre, Sydney. After wrestling racehorses, she moved back to her roots of Western Queensland, to St George, where she predominantly treated horses, but was otherwise a mixed practice Veterinarian. In 2010 she commenced work at the University of Melbourne Equine Centre, Werribee, as a surgical resident. She later accepted a job at the University of Queensland Equine Centre in 2011. Jane's experience in Veterinary Medicine in extensive; she has attended to daily stud work, ambulatory Equine practice as well as Small Animal Medicine and Surgery. While her passion lies with horse surgery, Jane joins the team at WestVETS as a mixed animal veterinarian at the new Marburg Hospital. In her spare time she enjoys riding and breeding Australian Stock Horses.