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EIPH

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What is EIPH?

Exercise induced pulmonary haemorrhage (**EIPH**), also known as "bleeding", refers to the presence of blood in the airways of the lung in association with exercise. It is very common and almost thought of as an occupational hazard in racehorses! It has also been reported in human athletes, racing camels and racing greyhounds. Horses that experience EIPH may also be referred to as "bleeders". In the majority of cases EIPH is not apparent unless an **endoscopic examination** of the airways is performed following exercise. However, a small proportion of horses may show bleeding at the nostrils after exercise, which is known as **epistaxis**.

How common is EIPH?

EIPH during strenuous exercise is common in racehorses. However, blood (haemorrhage) appears at the nostrils (referred to as 'epistaxis') in only a small percentage of cases. The prevalence of horses bleeding for the first-time as defined as the appearance of blood at both nostrils after exercise is approximately **1.5 per 1000 starters(or 0.15%)**. Although blood appearing at the nostrils is relatively uncommon, data from large surveys performed in a number of areas around the world indicate that some degree of EIPH may occur in up to 75% of runners. Blood may be present in the trachea alone and therefore may only be evident on endoscopic examination after exercise. In a study performed here in South Africa, approx 55% of starters were found to have some degree of EIPH on a post race endoscopic evaluation.

How do we diagnose EIPH?

EIPH has 5 grades. Only a grade 5 bleed will be visible at the nostrils. For the remainder, an endoscopic examination (scope) is required, and occasionally a transtracheal wash (TTW) or bronchoalveolar lavage (BAL) may be required. The best time to scope is between 30 mins and 2 hours post exercise, but is also key to try to maintain consistency in this time.



Grade 2 bleed-view of trachea



Grade 3



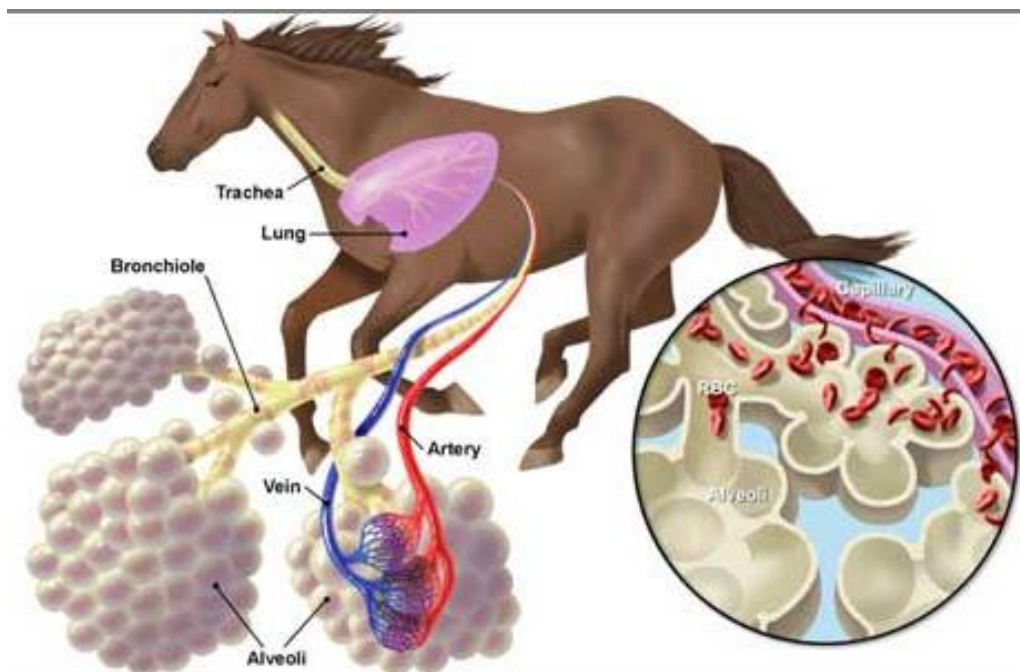
Grade 4



Grade 5

Why does EIPH happen?

Currently, the most accepted theory is that of **exercise induced pulmonary hypertension** resulting in alveolar capillary stress failure. Exchange of respiratory gases (oxygen and carbon dioxide) occurs across the very thin interface between the small air sacs (alveoli) and the smallest blood vessels (capillaries). The capillaries are a high pressure system, when the horse is under maximal exertion. When galloping, racehorses have a very high cardiac output that pushes blood through the pulmonary circulation. This creates very high pressure in the pulmonary capillaries whereby they may rupture releasing blood into the alveoli of the lung. The airspaces are a negative pressure system as the horse breathes in. This is required to achieve high volumes of airflow. Thus there is a huge pressure difference across this interface causing massive tension on the fragile capillary walls.



Accumulating evidence suggests that EIPH is caused by mechanical failure of this barrier when the internal pressure in the capillaries rises to a very high level. To some extent, EIPH is an inevitable physiological consequence of the extremely high cardiac output required by racehorses. Therefore factors exacerbating either the negative airflow or increasing the blood pressure has the possibility to increase the chances of bleeding. Any upper respiratory tract obstruction (such as **laryngeal hemiplegia/‘roaring’**) or airway disease (**IAD**) in the lungs may therefore exacerbate the large negative pressure. Fibrosis or remodeling of the pulmonary capillaries due to damage from previous EIPH or other lung insults will increase the pressure, potentially leading to bleeding.

Another hypothesis put forward as a contributing factor to EIPH may be **impact-induced injury** to the lung caused by ground-strike pressures during galloping. These impacts produce pressure waves that are transmitted through the forelimbs, via the shoulder blades to the rib cage and lung. Some studies suggest that EIPH occurs more frequently on harder tracks, other studies have not found this to be a risk factor. Further evidence that this phenomenon is unlikely to be central to the problem is that horses can bleed when swimming, an exercise that does not induce ground strike impact. Very recent research proposes that increased pressure within the veins in lung tissue may result in venoocclusive remodeling and narrowing of the lumen of the veins in a similar fashion to that which occurs in pulmonary veno-occlusive disease (PVOD) in humans.

Certain heart conditions, especially **atrial fibrillation**, can be associated with bleeding. This is due to ‘back damming’ of blood in the pulmonary circulation, causing increased pressure in the capillaries. There is also evidence for a **genetic** component to bleeders and even **jockey related factors**.

What risk factors are associated with EIPH?

The prevalence of epistaxis is higher in **older** horses (accumulated years spent racing increases the risk), in **hurdle or steeplechase** races compared to flat races, and may be

higher in **winter/spring**. **Track surface** may also have an effect. For example, in Singapore the prevalence of bleeding (epistaxis) is higher on fiber-sand than turf. The effect of 'going' is variable with increasing track hardness identified as a risk.

What are the consequences of EIPH?

Blood in the airspaces of the lung can **impair the exchange of oxygen** and carbon dioxide. For several days after an episode of EIPH, the mucociliary clearance mechanism (made up of specialized cells lining the respiratory tract that act like an escalator to remove mucous, bacteria, cells and foreign debris) acts to clear blood. Residual haemorrhage is removed subsequently by cells (called macrophages) that 'ingest' blood over a period of months. These cells are evident on microscopic examination of lung wash sample and are called haemosiderophages. The presence and number of these cells can reveal some information on the duration and extent of haemorrhage. **Blood in the air spaces is irritant and stimulates an inflammatory response in the lung.** In areas where persistent or repetitive bleeding occurs, fibrosis and chronic inflammation develop, contributing to further haemorrhage. The prevalence of epistaxis tends to increase with age, probably due to progressive lung damage resulting from repeated episodes of haemorrhage and the development of inflammatory airway disease.

How does EIPH affect performance?

Horses that bleed from the nose and 'pull up' in a race clearly have a reduction in performance. Indeed, **most horses with blood at both nostrils finish worse than mid-field, and about half of these horses finish last.** The effect of EIPH on performance is probably related to the volume of haemorrhage. A small amount of pulmonary haemorrhage may or may not significantly reduce performance, but a larger amount of bleeding can. Indeed, large studies recently conducted in Melbourne and in South Africa have also confirmed that lesser degrees of EIPH (Grades 0 and 1, often without blood appearing from the nostrils) are not generally associated with impaired performance. ***These studies showed that for horses that have a grade 1 bleed or less, the horse is likely to finish 1.8metres ahead of a horse with a grade 2 or above bleed. They are also 4 more times likely to win and 1.8 times more likely to finish in the top three.***

For each grade of bleeding above 0, the horse will be one length behind the winner.

Grades of EIPH 2 and greater are associated with reduced performance. Furthermore, the effects of bleeding are likely to be progressive and **lung damage cumulative, ultimately leading to significant decreases in performance.** This is likely because blood in the lung causes pulmonary inflammation (for at least three weeks following each episode), red cells are cleared slowly, and repeated bouts of exercise may result in repeated episodes of EIPH.

The safety and welfare issues of EIPH

Do horses die as a result of EIPH? The answer is **very few**. A review of causes of death in horses at several centres in Australia and the USA reveals that less than 2% of deaths are due to severe EIPH, a small percentage are due to cardiovascular disease, where as the majority of fatalities are as a result of serious musculoskeletal (mainly leg)injury. Between mid 1999-

2005, 6 horses collapsed and died during racing in Singapore for reasons other than musculoskeletal injury. Of these, a post mortem examination confirmed 3 horses to have died due to severe EIPH(i.e. **3 cases in over 30,000** runners during this period), one due to heart failure, one due to rupture of a major internal blood vessel, and in one case, the causes could not be determined. Furthermore, that of the 218 bleeders reported after racing during this same period, only 3 died.

In South Africa the racing rules stipulate that: 1st episode of a bleed, the horse is banned from racing for 3months; 2nd episode, banned from racing for 6 months; 3rd episode banned for life.

How do we manage and treat EIPH?

Every effort should be made to minimize EIPH. Neglecting to diagnose, treat and monitor low grade bleeders will only result in allowing them to progress and become severe. EIPH is a progressive condition, so should be acknowledged and treated throughout the horses training regime and not just into races.

EIPH is best managed by **controlling and treating any underlying causative factors**, one of the most common being inflammatory airway disease (IAD):

Ensure **good stable management** practices by providing stabling with good ventilation, dust free bedding and feed, avoid feeding directly off the ground, ensure the horse is not in the box when mucked out, don't stable down wind of the hay storage/ muck heap etc etc. Allow as much turnout time as possible.

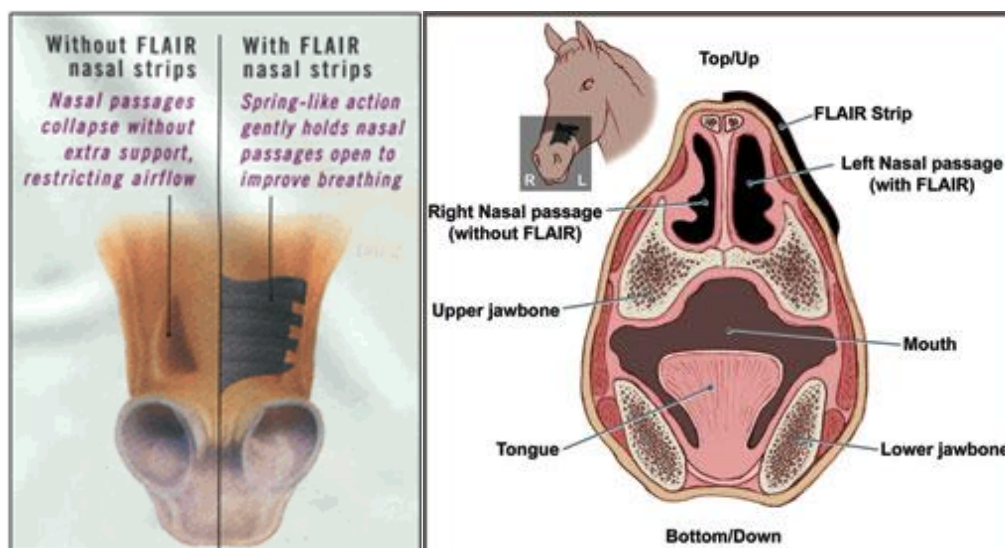
Get an **accurate diagnosis for IAD**. This involves taking a tracheal wash and sending it to the lab for analysis. IAD treatment will then involve a combination of injectable cortisones, mucolytics and bronchodilators, inhaled cortisones and bronchodilators and the use of antimicrobials if secondary bacterial infection is present.



Diagnose and address any upper airway obstructive conditions, e.g. laryngeal paralysis, dorsal displacement of the soft palate (DDSP), epiglottal entrapment.

Identify the cases the horses that are having grade 4 or less bleeds by post exercise endoscopy.

Make use of the **Equine Nasal Strips**, not just when racing but when doing fast work in training also.



Training with the **knowledge** of the factors which may affect bleeding yet allowing appropriate conditioning, should be employed:

Decrease the speed of exercise

Do 2 smaller workouts per day rather than one larger workout

Avoid cold air-pull out known bleeders in the last string

Avoid hard tracks

Avoid steep inclines on treadmill work

For severe bleeders consider training at altitude (fewer incidences of bleeding at altitude? Although there is conflicting evidence for this).

Rest. A minimum time of 1 month is likely to be needed to recover from a single acute episode of EIPH. A longer period is required in many cases where chronic lesions are present. Despite months of rest and treatment, some horses do continue to bleed when faster exercise resumes.

Ultrasonography may be useful in assessing the lungs after a bleed and the resolution of fluid within the alveoli.

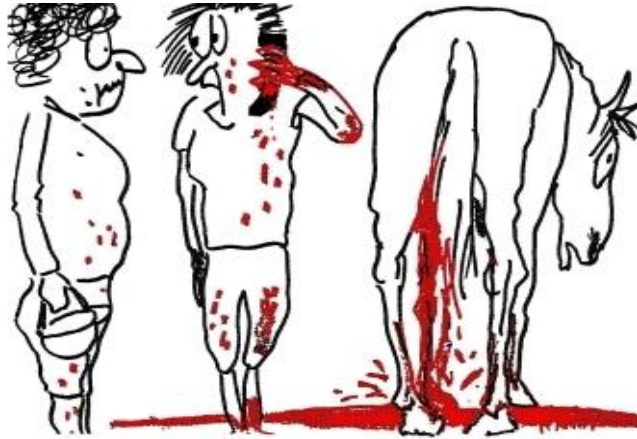
The use of **Furosemide** ('Salix') has been proven to;

Decrease the chance of EIPH by 4

Decreases the chance of a grade 3 or above bleed by 7-11 times.

If salix is administered, 7 out of 10 horses that are known to be bleeders will have a one grade improvement in severity.

The full mechanism of action of Salix is unclear. The drug is a diuretic, therefore reducing blood pressure and also reducing the horse's body weight. There is now also a huge amount of evidence in human studies to prove furosemide as a potent bronchodilator.



“The vet said not to panic as horses have lots of blood.....”

If you have any further questions, please do not hesitate to call the practice, 021 5523450.