

An update on “Bleeders” and EIPH

Defining a “bleeder”.

There are slight differences in the definition of a “bleeder” in various racing jurisdictions throughout the world. **In Australia, bleeding is defined as the appearance of blood at both nostrils, irrespective of the quantity, after exercise, unless in the opinion of the Stewards such bleeding was caused by external trauma (AR53A (1)).** In some racing jurisdictions such as the HKJC, a horse bleeding from one nostril after exercise is also reported as a bleeder if it is shown that the bleeding is from the lung. (Refer also to AR 53A (6) and (7) for the regulations regarding the appearance of blood in one nostril in Australia.)

Regardless of what is specified in the rules, regulatory veterinarians and stewards may consider the possibility of bleeding from the nose due to head trauma in certain circumstances (as may occur if the horse had fallen or reared in the barrier). An endoscopic examination may be required to determine the origin of the bleeding, especially if there is any doubt as to whether the horse has bled from its lungs as a consequence of exercise.

How common is bleeding from the lungs in racehorses and how is it diagnosed?

Bleeding in the lungs (termed exercise-induced-pulmonary-haemorrhage, or 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. In Victoria, **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%). This is comparable to**

that reported in Japan, Britain and South Africa, and less than that reported in Singapore, Hong Kong and the USA.

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 recent study conducted on Victorian racecourses, 55.3% of starters had some degree of EIPH on post-race endoscopic examination. A similar prevalence was seen subsequently in South Africa by the same team of researchers. As it may take some time for the normal clearance mechanism of the respiratory tract to move blood into the trachea from the lungs, endoscopy may not reveal haemorrhage unless it is performed 60 minutes or more after exercise. In some cases, EIPH is not evident on endoscopy and laboratory analysis of a bronchoalveolar lavage sample (BAL or ‘lung wash’) is necessary to demonstrate its occurrence.

BAL provides a very useful means to quantify the severity of EIPH, to determine the possible duration of the problem and, to monitor the progression and/or resolution of the condition.

What risk factors have been identified for this condition?

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 in one study but not another.

In contrast, in studies conducted by Hinchcliff et al in Victoria and South Africa, they could not identify any differences in the prevalence and/or severity of EIPH based on age when measured using endoscopy.

Why do horses bleed from their lungs?

Although EIPH is common, we do not fully understand its cause. Proposed mechanisms include stress failure of the smallest vessels (the capillaries) in the lung, pulmonary fibrosis (pre-existing scarring within the lung tissues) and small airway disease (inflammation triggered by viral infection or the inhalation of stable dust and other foreign particles).

Currently, the most accepted theory is that of exercise induced pulmonary hypertension resulting in alveolar capillary stress failure. The interface of the small air spaces (alveoli) and smallest blood vessels (capillaries) in the lungs has to be extremely thin to allow the exchange of respiratory gases (oxygen and carbon dioxide). Accumulating evidence suggests that EIPH is caused by mechanical failure of this barrier when the internal pressure rises to a very high level. 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. Therefore to some extent, EIPH is an inevitable consequence (some might say physiological) of the extremely high cardiac output required by racehorses. Furthermore, the large negative inspiratory pressure in the airways that is created in order to achieve high airflow contributes to the pressure differences placed on the capillary walls. Any upper respiratory

tract obstruction (such as laryngeal hemiplegia/‘roaring’) or airway disease in the lungs may therefore exacerbate the large negative pressure and potentially at least, contribute further to EIPH.

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. Although 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 the observation that horses can bleed when swimming, an exercise that quite obviously does not induce ground-strike impact.

Very recent research proposes that increased pressure within the veins in lung tissue may result in veno-occlusive 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.

Better understanding of the cause of this important condition continues to be sought in the hope that it will lead to improved means of prevention of EIPH.

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 (in a process called macrophage phagocytosis). These cells are evident on microscopic examination of a BAL (lung wash) sample and are called haemosiderophages. The presence and number of these cells can therefore 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 that results from repeated episodes of haemorrhage and the development of small airway disease.

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. Grades of EIPH 2 and greater are positively associated with reduced to poor 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.

Therefore, EIPH is a serious condition in racehorses and prevention or reduction of its incidence is an important issue.

The safety and welfare issues and review of the bleeding rule.

So, how many horses die as a result of bleeding? 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 ('bleeding'), a small percentage are due to cardiovascular disease, whereas 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, necropsy 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 vessel, and in one case, the causes could not be determined. Furthermore, we can consider that of the 218 bleeders reported after racing during this same period, only 3 died.

Horses that suffer a severe or fatal bleed during exercise typically weaken and stumble before they 'pull up' or collapse usually allowing time for the jockey to jump off in many cases. Serious injuries to riders are more likely to be associated with catastrophic musculoskeletal injuries and other accidents when a horse falls or veers suddenly and unexpectedly.

Rules regarding “bleeders” vary world wide from no or limited action to banning horses from racing after the second episode. Although individuals may differ slightly in their opinions, overall, the parties concerned (trainers, owners, jockeys, vets and stewards) seem generally satisfied with the current rules.

The pre-race administration of frusemide (‘lasix’) is permitted in some states in the USA but not elsewhere. Although trainers may want frusemide permitted, there are important reasons why it is not and these will be discussed later in this article.

In the United Kingdom, there are no specific rules relating to horses exhibiting blood at the nostrils after exercise. From a regulatory perspective, each occurrence is dealt with on a case by case basis.

In many jurisdictions the problem tends to be self regulating, with many trainers voluntarily retiring most horses that repeatedly bleed. However, this does not obviate the need for regulation.

The Rules of Racing in Australia are designed to significantly protect the health and welfare of both horses and jockeys.

In California, the administration of frusemide (‘lasix’) is permitted for horses on the ‘bleeder list’ (a list of horses reported to have blood at the nostrils or in the trachea on endoscopic examination after racing or training). If the horse is observed by officials to have bled from one or both nostrils after exercise or post-race, the following restrictions apply: 1st episode-placed on ‘bleeder list’ and banned from racing for 14 days; 2nd episode-banned from racing 30 days; 3rd episode-banned from racing 180 days; 4th episode-banned from competition for life.

There is to the author’s knowledge, no apparent explanation as to the rationale behind the various lengths of time applied to periods of stand down prescribed in the U.S. under the bleeder rules. Also, they appear to vary considerably from state to state for reasons that are not readily evident.

In South Africa the rule stipulates: 1st episode-banned from racing for 3 months; 2nd episode-banned from racing for 6 months; 3rd episode-banned for life.

Under the Rules of the Malayan Racing Association (which includes Singapore), a horse declared a ‘bleeder’ must not be cantered or galloped on the main training tracks for 2 months, or start in any race for 3 months, and only then after completing a 1000m trials gallop with bleeding. If the horse then races 3 times without bleeding it will revert to non-bleeder status. If the horse does bleed again before achieving this, it must not be cantered or galloped on the main training tracks for 2 months or start in a race for 6 months, and only then after completing a 1000m trial gallop without bleeding. Again, if the horse then races 3 times without bleeding it will revert to non-bleeder status. The horse is permanently banned if it suffers a 3rd bleeding attack without having reverted to non-bleeder status.

The regulations for bleeders are stricter in Australia, New Zealand and Hong Kong. In Australia and NZ, horses reported by officials to have blood in both nostrils (unless in the opinion of the Stewards such bleeding was caused by external trauma) may not be exercised on any racecourse for 2 months or start in any race for 3 months, and only then after a satisfactory gallop of at least 1,000m in the presence of a Steward. If the horse bleeds on a second occasion, it is banned for life.

In Hong Kong, a bleeder is defined as a horse with pulmonary haemorrhage evident at one or both nostrils and the rule states: 1st episode-banned from the training track for 2 months and from racing for 3 months and only after passing a barrier trial; 2nd episode-banned for life.

If the incidence of a fatal episode of bleeding is so low, why ban bleeders from racing?

In 1998-1999 an extensive review of the bleeding rule was under-taken in Australia to evaluate whether the rule was resulting in un-necessary and excessive wastage of horses. It was also conducted to establish whether the rule was too harsh in light of 'softer' rules (and experiences thereunder) elsewhere and the improved knowledge of this condition in recent years. Consideration was also given to whether use of preventative treatment of bleeders (i.e. pre-race frusemide) should be permitted. Of the main industry groups involved in the debate, the NSW Jockey's association, and the NSW Racehorse Owners were opposed to any softening of the bleeder rule. The Australian Trainers' Association (NSW branch) called for the racing ban to be implemented after a third rather than a second bleeding attack and, for therapeutics that may reduce the possibility of bleeding to be permitted prior to racing. The Australian Equine Veterinary Association provided an extensive scientific and statistical review of this condition. As a result, the Australian Racing Board elected not to change the rules.

From a legal perspective, there could be potentially serious repercussions if it was perceived that any change to the rules led to the injury or death of a jockey, or horse.

Support for the current bleeding rules also comes from scientific evidence that the lung needs time to clear the

blood and to heal from the consequential effects of a bleeding attack (of three weeks duration at the least). This has also been supported by statistics from centres such as Singapore and Australia which indicate that first time bleeders have a 25% chance of bleeding again, and that second time bleeders are considerably more likely to bleed again.

Can bleeding be prevented or managed?

Because haemorrhage into the lung can create severe and continuing pathological reactions, it is well worth while investigating possible predisposing causes of the EIPH in any individual horse and, to implement strategies to reduce the occurrence and severity of this condition where possible.

There are currently no methods and treatments which directly prevent the occurrence of EIPH, however, certain treatments and management strategies can assist in **reducing the severity of haemorrhage** and therefore reduce the ongoing repetitive lung damage.

Any underlying inflammatory airway disease (IAD) should be diagnosed in the first instance, treated and managed appropriately thereafter. This usually requires collection of a 'lung wash' (BAL), which is probably best performed several weeks after the bleeding episode.

Ideally, treatment includes management of the damage already present in the lung by providing the lungs with sufficient time to clear blood and to heal. **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. These horses should be and usually are retired.

Management of horses with EIPH is aimed at reducing bleeding. Frusemide ('Lasix') used before strenuous exercise may decrease the severity of EIPH, but it does not prevent it from occurring. When given 90min to 4 hr before exercise, this diuretic drug produces a decrease in pressures within the blood vessels in the lung. Because of its diuretic effect, horses treated with this drug lose significant amounts of water, weigh less and may race faster. For this reason, together with the unwanted effects on detection of other drugs and, the fact that frusemide is not effective in preventing EIPH, most racing authorities do not allow the use of this drug prior to racing.

Equine Nasal Strips have been shown to reduce the severity of EIPH and consideration of their use in training in the management of horses with this condition may be considered. Their use is not currently permitted on raceday in Australia

Although many 'supplements' and 'treatments' that claim to treat bleeding are marketed to trainers, none have been scientifically proven to be of benefit.

It is hoped that in the future, alternative drugs will be developed that reduce pulmonary capillary pressure without reducing cardiac output or having other unwanted side effects. However, the use of any drugs in treating and managing horses for EIPH will always need to be done with due regard for the rules controlling the detection of prohibited substances in racing horses.

In summary, EIPH is best managed by:

- Ensuring good stable management practices. This is essential for the maintenance of

respiratory health and considerations should include the design of stables which provide good ventilation, provision of dust-free feed and bedding, feeding horses off the ground where possible and, allowing as much paddock time as possible.

- Employing sound training practices which include the appropriate conditioning of horses, training with a knowledge of the factors which may increase the risk of bleeding (for example, strenuous exercise on an inclined treadmill may increase the risk for bleeding) and, training in such a way that these factors impact less on 'at risk' horses where identified.
- Diagnosing small airway disease where it exists as a predisposing cause (BAL is often required to do this) and treating this condition appropriately. Depending on the circumstances and diagnosis in each case, therapy with appropriate corticosteroids and/or bronchodilators amongst other things may be prescribed by the veterinarian to treat the underlying condition.
- Diagnosing and treating any conditions causing upper respiratory tract obstruction (such as dorsal displacement of the soft palate).
- Use of Equine Nasal Strips in training only.
- For 'at risk' horses, administering frusemide ('lasix') 90 to 240 min before training only.
- Ideally, resting horses for an appropriate period of time following an episode of EIPH to provide the opportunity for blood to clear and the lungs to heal.

This article was prepared by Dr Cate Steel, BVSc FACVSc.

References are available on request