



Visible bleeding from the nostrils is a severe form of exercise-induced pulmonary hemorrhage known as epistaxis.

JIM BRET CAMPBELL

*A new study researches furosemide's effect on exercise-induced pulmonary hemorrhage.*

**By Andrea Caudill**

# TREATING BLEEDERS

IT IS A PRETTY SAFE BET TO SAY THAT IF YOU OWN OR HAVE OWNED racehorses, then you have dealt with a horse who suffered from exercise-induced pulmonary hemorrhage (EIPH). Research pins more than 80 percent of racehorses with it, and it also shows up in other events where horses are asked for a sudden maximum effort, such as barrel racing or tie-down roping.

The affliction is most apparent in its severest form, when a horse bleeds from the nostrils after exercise, but less obvious episodes can be discovered when an endoscope is used. A much greater percent of runners suffer from blood in the lower airway or trachea.

There is a great deal of mystery surrounding EIPH, from the causes to the precise events that take place during an episode to the reason why medications used to treat EIPH work. It is believed that there are a number of factors that contribute to EIPH.

According to some, the prevalence of EIPH may indicate that the breeding selection of racehorses has developed the horse to the point where its heart and lung outputs are unable to keep up with the physical demand placed on the horse at top speeds. A system stressed to its maximum is more likely to fail, in this case, causing a horse to bleed. By

the same token, draft horses in pulling contests also experience EIPH, suggesting that exertion rather than speed may be a causative factor.

## **Pulmonary Capillary Stress Failure**

THE EXACT CAUSE OF EIPH IS UNKNOWN. HOWEVER, THE MOST widely believed theory on the cause of bleeding is known as pulmonary capillary stress failure.

Within a horse's lung, thousands of tiny air sacs called *avicoli* combine with blood capillaries to form what is known as the "blood-gas barrier." This delicate barrier – 1/15th the thickness of a piece of paper – allows oxygen and carbon dioxide to pass between the lungs and the bloodstream.

Research shows that a horse's blood pressure within the lung increases dramatically with exercise – two to three times higher than other mammalian species – and the harder a horse runs, the greater the pressure in the pulmonary capillaries which can cause them to rupture.

It is believed that the majority of bleeding comes from the upper rear portion of the lungs.

A study released last year by researchers at Michigan State University titled "Regional Pulmonary Veno-occlusion: A Newly Identified Lesion of Equine Exercise-Induced Pulmonary Hemorrhage" studied lung tissue from racehorses who suffered severely from EIPH. In addition to lesions on the lung that were thick with scar tissue, they discovered that the pulmonary veins had undergone significant change, becoming significantly narrowed. This is similar to what happens in humans, called pulmonary veno-occlusive disease, which leads to pulmonary hypertension.

The researchers were unable to determine if the narrowing of the veins was what caused bleeding to begin or vice versa, but concluded in either case that once the bleeding began, the remodeling of the veins would contribute to the condition becoming considerably more serious.

Scott Palmer, V.M.D., DABVP, is a former president of the American Association of Equine Practitioners and heads the New Jersey Equine Clinic at Millstone Township, New Jersey. He is currently the chairman of the AAEP Racing Committee.

"The gist of it is, the pulmonary vasculature ordinarily expands with increases in pressures," Palmer explained. "So a horse at rest has a fairly quiet blood pressure. Then he goes out and exercises, and that pressure builds up. When the pressure builds up, the blood vessels expand in order to accommodate that pressure. Over time, if there is leakage of blood from the capillaries in those vessels, you get an inflammatory change surrounding those vessels. That inflammation can lead to scar tissue formation, and you get an inflammatory collar, if you will, around that blood vessel. That limits the ability of the blood vessel to expand as it would normally with increased pressure. It's like an old garden hose. As long as you don't have a nozzle on the end of it, you can turn it on and the water comes out and everything's fine. But as soon as you put a nozzle on the end of that garden hose, water starts squirting out the back. That is an oversimplification, but the same principle applies – you are obstructing the outflow and it has got no place to go, so it bursts out through the walls."

## **Furosemide**

THE MOST COMMON MEDICATION USED TO CONTROL BLEEDING – one used by the vast majority of runners – is furosemide, more commonly called Salix and formerly known as Lasix.

The short-acting drug is a diuretic, which increases urine production and decreases blood volume, and also drops body weight – estimated at up to 20 pounds in a racehorse.

The precise reason furosemide helps lessen the effects of EIPH is unknown, although researchers believe it may help lower the pressure in the lungs below the threshold level where bleeding occurs.

"There may be another mechanism at work that we just don't know," Palmer said. "Other researchers don't believe that you can change the (lung) pressure enough with a diuretic to make that difference. So I think there are at least two schools of thought on that, and I think it would be fair to say we're not sure."

Others wonder if the drug has a performance-enhancing effect on a horse, pointing out that a horse carrying less weight generally runs faster.

## **Medication Usage**

PROLONGED USAGE OF FUROSEMIDE CAN CAUSE DEHYDRATION, electrolyte imbalance and reduced plasma volume. It can also lower a horse's potassium level, requiring supplementation, so those things should be monitored on a regular basis.

There are other medications that are used to treat EIPH, but none with scientific backing and none condoned by AAEP.

"There are scientific studies that have shown furosemide



More than 80 percent of racehorses sustain exercise-induced pulmonary hemorrhage.



Prevent damage to a horse's lungs by ensuring that his environment stays dust-free and well ventilated.

is effective in reducing the incidence and severity of EIPH,” Palmer said. “There is no science that shows any of the other medications do that. That’s important from a regulatory standpoint, and that’s why AAEP’s stand is furosemide only, because there’s no science to show the other medications work.”

Blood causes irritation and inflammation in the lungs, which can lead to scarring and weakening of the blood vessels. The changes, exacerbated by the intake of dust, can cause a cyclical problem where repeated injuries worsen EIPH over time, with little hope of repair once tissue has been excessively damaged.

Minimize the damage to a horse’s lungs by paying close attention to his respiratory environment. This includes making sure barns stay well-ventilated, bedding is of a low-dust material or has been watered to prevent dust, and the horse is fed high-quality, low-dust feed. Turnout can also improve a horse’s lung health. If a horse suffers a severe EIPH episode, the medical treatment often includes the use of antibiotics to help prevent bacterial pneumonia.

## Does Furosemide Help?

A GROUND-BREAKING 2008 STUDY CONDUCTED BY THREE UNIVERSITIES from three different countries – Australia, South Africa and the United States – was released in the July issue of the *Journal of the American Veterinary Medical Association* and looked to more definitively answer the question of if furosemide usage helps control EIPH.

The study, titled “Efficacy of furosemide for prevention of exercise-induced pulmonary hemorrhage in Thoroughbred racehorses,” used a controlled, double-blind crossover design experimental method with more than 150 Thoroughbred racehorses in South Africa. They were raced twice over a one-week period, once receiving a dose of furosemide before a race, and once receiving a placebo. Once the horses finished the race, they were brought to a saddling paddock, scoped and assessed.

The study found that horses were substantially more likely to develop EIPH following the placebo administration versus when dosed with furosemide. Approximately 55 percent of the horses studied developed EIPH after dosage with furosemide, while about 80 percent developed EIPH with the placebo. Additionally, of the horses who sustained EIPH after getting with the placebo, approximately 67 percent had a significant reduction in severity when treated with furosemide.

The researchers also noted that horses treated with

furosemide lost weight, but weren’t able to document a correlation between weight loss and prevention of EIPH.

The study, Palmer said, was important because it was the first of its unique experimental design. The crossover study design, combined with the large number of horses and blinded observers, gave it an unprecedented credibility.

“It was extremely powerful from a statistical standpoint, and extremely powerful from a design standpoint,” Palmer said. “Which makes it, I think, the only crossover field study that I’ve seen done in racing. Ever. It’s a phenomenal piece of work from that standpoint.”

“The most important aspect of the study is that it puts to rest the controversy of whether the furosemide works or not: It works,” Palmer continued. “The question some regulators pose at this point: OK, it works, but should we be using it? Is it good for racing? That’s a whole additional issue.”

## Drug or No Drug?

SOME FACTIONS IN RACING BELIEVE IN THE CREDO OF “HAY, OATS and water.” That is, horses should race without the use of drugs that might enhance their performance or mask pain or injury. Additionally, some believe furosemide provides an edge to horses, jumping up their ability on the track and providing them an unfair advantage.

While trainers used to have to prove that their horse had bled from the lung in order to race on furosemide, regulations have been loosened so any horse is allowed to race with it now in order to level the playing field.

Furosemide, Palmer argues, is not so much performance enhancing as it is performance optimizing. He compared it to reducing inflammation in an ankle by using ice, phenylbutazone or a poultice. If you take away the inflammation, the horse feels better and is likely to race better. The same is true for bleeding.

“It seems logical to me that if 80 percent of racehorses bleed and bleeding compromises their performance, then if you give them medication that decreases the prevalence of that bleeding, it’s likely to improve the performance,” he said. “I think it seems likely that’s what’s going on here. But there are folks that say it’s something more involved than that, that it steps a horse up. I don’t believe that, personally.”

The AAEP stand on furosemide usage, Palmer said, is looking out for the horse’s well-being.

“If you know he’s going to bleed and you don’t treat him, from a welfare standpoint that’s wrong,” Palmer said. “The other option is don’t race him. So the humane options are either don’t race him or give him the furosemide.”

The debate over furosemide will continue with both horsemen and regulators, especially in a social climate that is demanding increased focus on the safety and welfare of the horse.

“Whether you should use it or not is a philosophical question that is being debated,” Palmer said. “The AAEP, for example, operates under the assumption that what is good for the horse is good for racing. We feel as though that’s true, but there are folks saying what’s good for that horse as an individual may not be good for racing as an industry. That’s one of the core questions that needs to be resolved – what is the priority?”