Welfare and Safety of the Racehorse Summit

Sponsored by the Grayson-Jockey Club Research Foundation

Issue 1
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Horsemen's Update

Numerous members of the Thoroughbred breeding and racing community assembled in October of 2006 at the Welfare and Safety of the Racehorse Summit. The Summit was coordinated and underwritten by The Jockey Club and Grayson-Jockey Club Research Foundation and was held at Keeneland Race Course in Lexington, Ky.

Since October, separate committees have met regularly to address the major issues identified during the summit as points of concern in the Thoroughbred industry.

This newsletter will be published periodically to provide progress updates from each of those committees as they strive to improve the welfare and safety of racehorses.

Lameness, nutrition, soundness, racing surfaces, medication, and racing or training schedules are all critically important issues in the racing industry and thus are also important in the research field.

One of the goals of this newsletter is to reach and inform the people actually "in charge" of the safety and health of the racehorses — those who work with horses on a daily basis.

Each newsletter will focus on a key aspect of equine health and welfare. We welcome your feedback and encourage you to visit the Welfare and Safety of the Racehorse Summit sections of the Grayson-Jockey Club Research Foundation website (www.grayson-jockeyclub.org).

This Issue's Feature: Fractures

Fractures are among the most common injuries affecting the racehorse, and in the United States, more than 80 percent of horses that suffered fatal injuries had a fracture.

Fractures are the major cause of severe injuries and death or euthanasia for racehorses.[2] While it often seems as if these injuries occur instantly, research supports the idea that many fractures affecting racehorses are in fact the final stage of a long-term, less-obvious injury.

> More than 80 percent of horses that suffered fatal injuries had a fracture.[1]

Because the outcome (fracture) is so damaging to the racehorse and the industry, this month's focus is on understanding, identifying, preventing, and treating conditions that predispose a horse to serious injury on the track.

In This Issue:

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Interview with Dr. Stover

A professor at the University of California, Davis School of Veterinary Medicine, Dr. Susan Stover has dedicated much of her professional career to the study of the racehorse as an equine athlete. For many years, she has worked on projects funded by the Grayson-Jockey Club Research Foundation.

In her research, Dr. Stover has found stress fractures predispose a horse to major failure. In the following interview for this newsletter, Dr. Stover answers some important questions about the basics of understanding racehorse fracture injuries.

Could you explain how you developed the insight that many racehorse injuries are related to pre-existing or undetected conditions, despite the fact that they may appear to be spontaneous?

Dr. Stover: Postmortem examination of fractured humeri (the bone between the shoulder and elbow joints) from Thoroughbred racehorses demonstrated 1) the same fracture pattern over and over again in each horse that suggests a common cause of the fracture and 2) new bone formation on opposing surfaces of the fracture (called periosteal callus) in the same location for each bone. The characteristics of the new bone (fresh, woven, highly vascularized) had to have been formed in the couple of weeks or months preceding the catastrophic complete fracture.

Can you elaborate on the notion that stress fractures precipitate catastrophic fractures, and/or that a correlation exists between high intensity exercise training or racing schedules and eventual lay-up or significant injury?

Dr. Stover: A stress fracture is a site where the rate of accumulation of damage due to repetitive loading exceeds the rate at which the horse's body can repair the damage. At a microscopic level, damaged bone must be replaced or the whole bone will eventually fail as more damage is acquired. Normally, damaged bone is rapidly removed by cells called osteoclasts. Then, cells called osteoblasts slowly replace the removed damaged bone with new healthy bone. When the bone has not been completely replaced, there are open spaces (porosites) within the bone material that make the whole bone susceptible to complete fracture under otherwise normal exercise (loading) conditions.

The relationship of exercise intensity to the likelihood for injury is related to the competing rates of damage accumulation (due to exercise intensity) and damage repair (due to the innate ability of horses to lay down new bone after damaged bone removal). When the rate of exercise damage exceeds the rate of repair, injury (whether catastrophic or mild) often occurs.

Is it valid to speak, in general, of a percentage or percentage range of racehorse injuries in which pre-existing conditions are present? Are there relevant facts/figures available?

"...well over 90 percent of catastrophic injuries have evidence of pre-existing injury..."

Dr. Stover: I estimate from the (hundreds of) bones I have looked at that well over 90 percent of catastrophic injuries have evidence of pre-existing injury at the site of complete fracture.

Often, when a horse is injured, the visual effect is that something suddenly went wrong. Jockeys are known to report something like their horse seeming to "step in a hole" because of how the injuries feel to the rider. Are there certain injuries that do tend to happen spontaneously, and, if so, which are the most common?

Dr. Stover: Certainly, there are some spontaneous fractures. I have not noted evidence of pre-existing pathology on femur fractures and proximal phalangeal comminuted fractures, although we have not looked specifically at these injuries. However, my bias is that the skeleton is well-built (actually overbuilt) for physiological loading conditions (including healthy athletes).

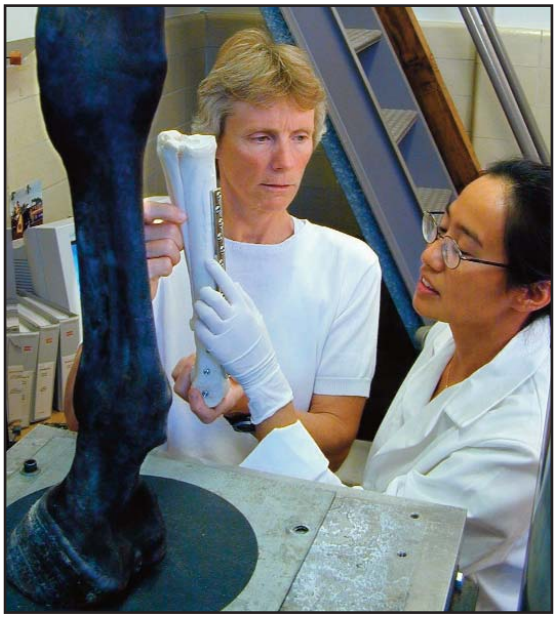
In my experience most injuries are preceded by pre-existing pathology that serves as a stress riser or critical flaw and serves as the site of fracture initiation.

Returning to pre-existing conditions, what are the most common of these injuries, and of the pre-existing conditions, which might be said to lead to the ultimate injuries?

Dr. Stover: Humerus: proximocaudal stress fracture. Cannon Bone: 1) distolateral stress fracture, 2) mid-dorsal stress remodeling, 3) lateral condylar fracture due to palmar osteochondrosis of the distal end of the cannon bone. Vertebrae: articular facets stress fracture. Scapula (shoulder blade): distal end of spine stress fracture. Tibia: stress fractures proximolateral, caudal and distocaudal. Third carpal bone: subchondral osteolysis.

In your work, have you seen any indication that regimes used today to medicate or treat these pre-existing conditions may in fact lead to further deterioration and, thus, contribute to eventual injury?

Dr. Stover: Not my area of expertise, but I speculate that the use of analgesic medication for training and racing allows horses to exercise more intensely than they otherwise would, and this high exercise intensity is associated with injury.



Dr. Susan Stover, left, examines a horse's cannon bone

As an aside, we attempted to perform an epidemiology study about seven years ago looking at the effects of phenylbutazone and flunixin meglumine on the likelihood for injury. We did the study, but ended up not having a control group for comparison because almost all horses were on medication. (We also have one piece of unpublished evidence that anabolic steroids increased risk for injury in high intensity exercising male horses. We need to do more work there to refute or substantiate that.)

Do you have observations or suggestions about medication or treatment regimes that should be used instead in order to help a trainer keep a horse sound and healthy?

"...a large percentage of horses with signs of mild injury left racing within three months..."

Dr. Stover: While there is no scientific data, my gut feeling is that we should not be training horses on analgesic medication.

In your work with musculoskeletal injuries, do you know of sites that a trainer can watch for or sites that a vet can examine as part of their pre-race inspection? Are there "hot spots" that can be checked to prevent a lasting, potentially catastrophic or fatal injury from occurring?

Dr. Stover: Unfortunately, signs are not always detectable in early stages of developing injury. That's why it is so important to understand the factors that increase risk for injury, so they can be minimized for injury prevention.

However, a beautiful piece of work in Kentucky demonstrated that signs of fetlock breakdown could be detected on pre-race examination. We found similar findings in a study of suspensory apparatus injury in California.

Because relatively few horses with signs of fetlock injury subsequently die in a race in Kentucky, it was concluded that pre-race examination findings were not useful for excluding horses from races (because horses that would not breakdown would not be allowed to race).

I disagree with those conclusions because of later work that demonstrated that, although horses may not die in the associated race, a large percentage of horses with signs of mild injury left racing within three months (presumably due to injury in most instances).

So, racing horses with mild injuries results in large racehorse attrition as well as catastrophic injuries.

Ongoing research might eventually provide a warning by the use of serum markers. We have seen developing strategies such as this aimed at preventing the development of a serious musculoskeletal injury.

In your opinion, which is the most useful prevention method (scientific or routine) in the case of pre-existing conditions precipitating more significant or detrimental injuries? More frequent X-rays? Scintigraphy? More stringent pre-race inspection?

Dr. Stover: In my opinion:
1) Monitoring exercise intensity to identify a high risk group of horses that should undergo additional scrutiny that might include MRI, scintigraphy, and radiography,

2) Stringent pre-race inspection and disallowing horses to race with mild/moderate injuries,

3) Disallowing analgesic and anabolic steroid medications for training and racing purposes and allowing the medication only for treatment of disease,

4) Uniformity in racing surfaces, and

5) Eventually, tailoring horseshoes for race surfaces (requires more data). This is the same theory behind a football player wearing different cleats/shoes for natural and synthetic surfaces.

In the meantime, what might a trainer do to give him/her the best chance of realizing a condition is developing that would indicate treatment or rest is needed? If a condition, such as stress fracture or soft tissue damage is, in fact, developing, then what is the best method of diagnosis?

Further, what are the best steps to take in terms of treatment/repair so that these conditions will not be such contributing factors to an ultimate, potentially catastrophic injury?

Dr. Stover: Observe and monitor the horse for any unusual sign (in addition to overt lameness), such as laying ears back in the stall, reticence to enter the starting gate, laying down for prolonged periods of time in the stall, lack of appetite — anything that displays a change in attitude or an unwillingness to perform.

Any of these signs could be related to bone, ligament, and/or tendon soreness (as well as respiratory infection or any other medical condition). We know from studies of human athletes and military recruits that stress remodeling can occur without awareness or with minimal clinical signs. It's important to pay attention to the subtle signs. If lameness is evident, pursue diagnostics.

Attention to Detail: What to Look for

Dr. Rick Arthur, equine medical director, California Horse Racing Board, past president of the American Association of Equine Practitioners, and a longtime practitioner on the southern California circuit, discusses the basics of keeping a racehorse sound and healthy.

Many injuries are avoidable through close attention and keen awareness of the horse. Trainers must be aware of this and develop barn management strategies to prevent the injuries from becoming something serious.

Some suggestions for avoiding injury:

- Check and examine horses daily.
- Be aware of changes in the condition of the horse (e.g., heat, lameness, inflammation, filling, and even behavioral changes). Even minor changes, such as those in the branches of the suspensory ligament, can be significant and could indicate a condition exists that puts the horse at risk.
- Treat problems as if they are guilty until proven innocent; perform adequate diagnostic work on a problem to see if it is serious.
- Each condition is different, but "without diagnosis, medicine is poison and surgery is trauma." If a problem is serious, contact your veterinarian right away. Even if it seems minor, don't disregard it. Be aware that the problem might be a sign and watch how it progresses with time. It is simple to consult a veterinarian, and this should be done to ensure the problem does not persist or lead to more serious injury.

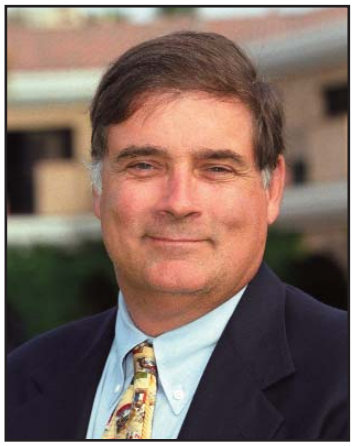


Photo: Benoit Photo

High Demand, High Risk

As with any elite athlete, Thoroughbred racehorses place great demands on their musculoskeletal systems on a regular basis.

While their bodies are able to adapt to the strain of such rigorous exercise,[3] if the physical stress of racing and training routines is greater than a horse's structure can tolerate, the results can be devastating.

Timing is Everything

Bone responds to exercise (loading) conditions by remodeling and modeling; damaged bone tissue is replaced and new, healthy tissue is formed. There are limits to the amount of loading the bone can adapt to, however.

If the degree of deformation is too high, irreversible damage can be caused.[1] In a syndrome known as monotonic fracture, a bone loaded beyond its ultimate strength will fail.

On the other hand, repeated loads, even if they are not excessive on their own, can result in cumulative fatigue damage, which can cause stress fractures and eventually a catastrophic injury.

A bone subjected to persistent loading undergoes a fatigue process of repairing damaged bone. If the rate of damage accumulation is rapid, the bone may be too weak to stand its normal daily routine.[1] While damaged bone tissue is removed often within days by body cells called osteoclasts, the reformation of healthy bone tissue may take months to accomplish, which results in a weak period for bone structure and leaves the bone susceptible to injury and complete fracture.[2]

A Long Time Coming: What Research Shows

To examine these types of injuries, researchers study the bones of horses that sustained fatal fracture injuries for evidence of a pre-existing condition (sometimes shown by stages of bone modeling or remodeling). These pre-existing conditions are associated with the development of an incomplete stress fracture that later became the site of a complete and possibly fatal fracture.[4]

Although fractures seem spontaneous by observation, many fractures occur without the incidence of a traumatic event and share characteristics that indicate a pre-existing condition has been around for some time.

For example, they occur in horses involved in intense race training, are found in the same locations in equine bone, and show long-term pathology around the fracture site.[1] Thus, research indicates that complete fractures are often associated with pre-conditions in race training or racing.

What can be Done?

Developing management techniques for the recognition and prevention of fracture should reduce the cases of milder injuries that interfere with daily routine and develop into a complete fracture.[2]

Because the pre-existing conditions can occur over weeks or months, there is time and opportunity to interrupt the damage. Training routines can be improved to create a sturdy frame able to avoid injury. This is because bone, especially in young Thoroughbreds, will respond to regular exercise by "adapting its strength and architecture according to the loads it must tolerate."[5]

...the reformation of healthy bone tissue may take months to accomplish...

With racehorses in training, the bone repair process is continual, and after lameness, rest is especially important. Horses exercised before the bone repair is completed are at greater risk of sustaining a stress fracture or major injury.[1]

To reduce the risk of injury down the road, some specialists recommend targeting the training regime of the racehorse to its specific needs: "cutting the extent of low-speed work and increasing short-interval high-speed work-outs can stimulate the bone response with minimal risk of fatigue damage."[1] Avoiding excessive high-speed workouts over short periods of time, recognizing and treating horses with mild injuries, and avoiding the use of toe grabs are also suggested.[2]

Johar's Story

Hall of Fame trainer Richard Mandella recalls the case of Johar as an illustration of the phenomenon of developing problems and the importance of detecting them. A few days following victory in a winter race, Johar showed what appeared to be a problem in the left front.

The degree of lameness did not seem serious, and "in a couple of weeks would probably have gone away," Mandella recalled. However, the trainer took the precaution of a scintigraphy scan and "it lit up a small stress fracture in the shoulder. If I had raced him, he probably would have suffered a serious fracture."

The onset of a process leading toward major injury had been put into motion; however, the process was abrogated, and rather than suffering serious injury, Johar developed into a Breeders' Cup Turf winner by year's end.

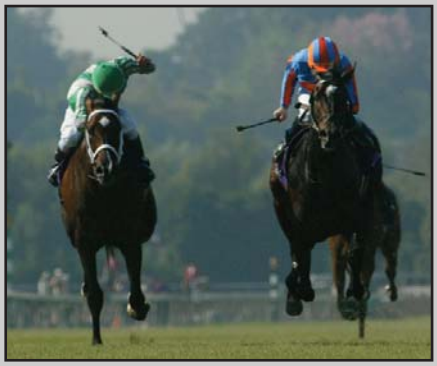


Photo: Horsephotos.com/NTRA

Johar (left) and High Chaparral finish in a dead heat in the 2003 Breeders' Cup Turf

Be Prepared: What to do if Fracture Occurs*

As stated by an equine orthopedic specialist, "What transpires in the first 30 minutes after a fracture often determines the final outcome of the case, in spite of what happens later."

When a fracture occurs, bone is often damaged beyond the initial injury because the broken bones are not stable. This is especially true if the horse continues or tries to continue to bear weight on the injured limb. So, if you suspect a fracture, keep your horse calm and still until the limb in question is stable in a splint. Recommended supplies to have on hand in case a fracture occurs include bandaging, sterile wound dressings, and splints.

If the skin is broken, clean the wound with water (no ointments or medications) until a veterinarian can treat your horse. If necessary, apply pressure directly to a bleeding wound with bandaging before splinting the injured limb. Be careful to do the minimum in order to keep your horse calm and stable until a veterinarian arrives, because using first aid in the wrong manner can be devastating to the horse and have long-term harmful effects on how the fracture heals.

Because it is so crucial to act quickly and appropriately in the first moments following an injury such as fracture, the moral of the story is simple: for your horse's sake, be prepared.

**Cited with permission from the Horse Report, Center for Equine Health, School of Veterinary Medicine, University of California, Davis*[6]

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