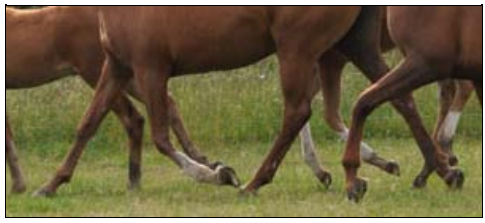
HEALTH

Blood test could hold key to preventing major injuries

December 27, 2008

by Neil Clarkson

Could a simple blood test one day help save high performance horses from catastrophic bone fractures?



The promise is held in research being conducted in the United States which has shown that many horses who suffered major fractures had preliminary signs of bone damage.

"We describe it as microdamage," says Professor Wayne McIlwraith, director of the Orthopaedic Research Centre at Colorado State University.

"It consists of microcracks, but there is also more diffuse breakdown in the substance of the bone with death of bone cells, as well as breakdown in the collagen framework," says the New Zealand-born equine surgeon.

Professor McIlwraith and others who have conducted research in the field feel "pretty confident" that this bone damage precedes several different kinds of common leg fractures, including humerus, condylar and sesamoid fractures - the last two in the fetlock joint.

"It's becoming clear," he says, "that detecting the presence of existing damage to the horse's musculoskeletal structure through early recognition techniques is critical to fracture prevention."

Bone scans will pick up microdamage, but it is not a practical option for the broader testing of equine athletes such as racehorses.

However, the discovery of biomarkers - chemicals released by the body in response to the microdamage - has opened the door to the possibility that a blood test could one day identify at-risk horses in all disciplines, from racing to endurance and eventing.

"The problem with scans is you are not going to get every horse getting it done. The idea behind biomarkers is that we could have a practical technique for identifying horses at risk and then horses with elevated biomarkers would get a scan."

Professor McIlwraith believes a blood test could be commercially available within 2-3 years. "We are working with a company in the States to develop a commercial panel."

He says research needs to focus on identifying further additions to the number of biomarkers for which testing can be undertaken. This would help improve the overall predictability.

"At the moment we are up to 70% predictability," he says, referring to the results of a yet-to-be-published study in Southern California.

The research was conducted by Dr Dave Frisbie and Professor McIlwraith in collaboration with racetrack veterinarians. "We now want to move from 70% to 95%-plus," he says.

The first person to look at chip fragments and recognised that they occurred in diseased (microdamaged) bone was Professor Roy Poole at the University of California, Davis.

However, it was Dr Chris Kawcak, working at Colorado State University, who showed this microdamage can develop with exercise and that it is always associated with the fracture line in catastrophic injuries.

Professor McIlwraith believes regular testing of racehorses would have a huge impact in reducing catastrophic injuries.

"The idea is that we could identify horses at risk, with biomarkers being a reflection of microdamage. We would then scan them to get an idea of how much damage was done.

"The beauty of all of this is that microdamage is reversible in many instances. The horses could be laid up and then go back into training in 2-3 months.

"The only area of microdamage that may be career-ending is palmar metacarpal disease in the fetlock joint. This is a particularly severe problem that occurs in the bottom-back part of the cannon bone where the sesamoids articulate. It arises in the bone and then can result in both pieces of bone breaking out," Professor McIlwraith says.

Some consider it a predisposing problem with condylar fractures, he adds.

Dr McIlwraith says the rate of serious injuries is a major issue in racing, but he cautions that biomarker testing should not be seen as a cure-all.

"Other factors, such as racing surfaces and training regimens, must be evaluated for their roles in catastrophic injury, and a screening test is no substitute for proper horse management.

"We also must examine other purported injury factors, such as durability, two-year-old racing, and medication. That said, an easy-to-use test is a significant step toward an injury-free horse."

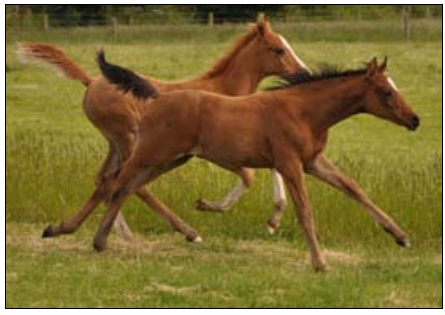
Such testing cannot come quickly enough for a racing industry under growing scrutiny over its safety record.

The high profile deaths in the United States of Barbaro from leg fractures suffered in the 2006 Preakness Stakes and Eight Belles in this year's Kentucky Derby has focused attention on what the US industry is doing to reduce the death toll and rate of serious injury.

Questions over racehorse durability have focused on whether breeding practices have played a part in the shortening of race careers.

Professor McIlwraith notes the efforts within US racing to improve safety. "The industry has certainly formed a number of committees to look at this issue. Some of their efforts have been hampered by individual states [with] individual rules, but this is improving" he says.

"It is the only major professional sport [in the US] that does not have a national authority." Such a goal is proving difficult to achieve.



Positive moves include the establishment of the Racing Medication and Testing Consortium (RMTC) that has stake holders from all segments of the industry and has been working since 2001 to establish uniform medication rules throughout the country.

The RMTC was established after a racing medication summit that was organised by the American Association of Equine Practitioners (AAEP) and chaired by Professor McIlwraith, who was president of AAEP at the time.

The industry has also seen tighter regulations over medication, including use of anabolic steroids; improvements to racetrack surfaces; and research support for further work on race surfaces and biomarkers.

"The thoroughbred racing industry has had two summits on welfare and safety of the racehorse in the past two years and there are strong working committees coming out of those summits," says Professor McIlwraith, who chairs the Race Track Surface committee.

The durability issue in racehorses will be difficult to tackle, he says. The main message from breeders is that if the market selected for durability, they would breed accordingly.

"The Jockey Club has started a durability index where the number of starts for progeny of a given stallion is evaluated. However, I feel people are still going to buy for the elite racehorse that they think is going to win a classic race for them.

"So the durability deal is a difficult situation to achieve."

However, the issue is coming under increasing scrutiny.

"I don't know if the industry ever bred for durability. But it is a recognised fact that the average number of starts is half of what they were 20 years ago so the industry is paying a price." That price, he suggests, results from the greater priority put on racing success than on durability.

"I think many people in the racing industry have got the message that we can't just carry on 'business as usual'.

"Things are never going to be the same regarding huge attendances at race tracks ... most of us can accept that getting people to the races was easy when it was only the legal method of gambling and that is not the case anymore.

"Many of the younger generation are not interested in horse racing. These are all factors in the continued viability of racing.

"Many people argue that we're breeding a more fragile horse because of injury-prone genetics or blood lines. I wouldn't say that, but I would say that for several hundred years, we've bred horses to be extremely fast.

"We've placed a priority on creating good racehorses based on speed, and over time, race horses have developed into very light-boned animals because they are more efficient at speed.

"I don't believe we simply must expand the gene pool of today's racing horses. We absolutely must place a value on a horse's durability and soundness.

"To consider durability - how well a horse can avoid or overcome an injury and how well it ages - and soundness, we must look at a horse's build, pedigree and how long it can race and remain healthy when considering selecting it as a racer."

Professor McIlwraith says he agrees with the US industry's move towards banning anabolic steroids but he doubts they have been a big factor in injury rates. "But with human sports such as baseball and cycling finally getting rid of them, the old adage of 'perception is reality' dictated elimination of anabolic steroid use - at least within 4-6 weeks of racing."

It was important, however, to distinguish them from the corticosteroids, which are an important medication in the treatment of joints.

However, not all corticosteroids are good for joints. Depo-Medrol, for example, should not be used in high-motion joints, he says. "We still have not gotten everybody educated on the good ones versus the bad ones.

"So, in that vein, one corticosteroid has been a factor in the injury rate, but other commonly used ones such as betamethasone esters (Celestone) and triamcinolone acetonide (Vetalog) have not been."

Professor McIlwraith and Professor Mick Peterson, a PhD engineer at the University of Maine, have published two papers on the objective evaluation of racetrack surfaces and the changes brought about by different maintenance regimens.

Their work resulted in the development of a machine to make the measurement. The plan is to build them and have them available at every race track in the US.

"Racetrack superintendents - at least with dirt and synthetics - want these day-to-day objective figures to help them maintain their tracks."

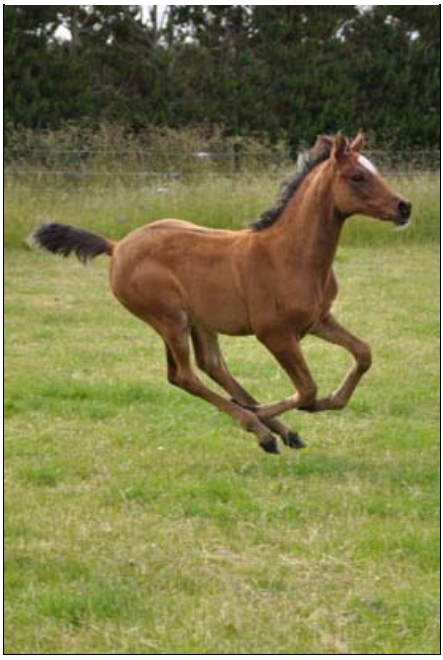
Professor McIlwraith says synthetic surfaces still require maintenance and while they may have played a part in lowering the catastrophic injury rate to 1.5 per 1000 starts, there is still a way to go.

On dirt, in the US, based on recent data (national data had been lacking up until 2 years ago) the average number of catastrophic injuries per 1000 starts is 2.0 on dirt and 1.5 on synthetic racetracks.

Track measurements have tended to focus on the impact of vertical impact forces.

The method developed by Professors McIlwraith and Peterson assesses the shear strength as well. This is a measurement of grip (lack of slide) and how the hoof holds the track. A high potential for such forces in a track poses a greater risk of catastrophic injuries in horses.

If the shear strength is higher than ideal the hoof will not slide when it goes into the track and there will be more jarring on the hoof. Alternatively, if the shear strength is too low, "cupping out" will occur, such as happens when



our foot slips when running up a sand hill.

"These things can be manipulated with dirt and synthetics," he says. "We haven't really got into turf tracks yet to decide what is optimal."

Differences in fatal injury rates around the world also warrant further investigation to identify the factors that may be at play, ranging from the durability issue in breeding, to different stances on medication and differences in track surfaces.

In the US, Professor McIlwraith believes the industry must take a hard look at the practice of claiming.

Claiming is the practice of racing where all the horses in the field are for sale. It has the potential to put unsound horses into racing, he says.

"Many of the races in the United States are claiming races, and therefore the majority of horses racing are 'claimers'.

"This means that the horse is for sale every time it races, and claiming a horse can be considered an easy way to get into the racehorse business - but it's also a way for owners to get rid of horses.

"Some horses in claiming races have musculoskeletal problems and don't always have the best care. In other countries, claiming doesn't occur at the level it does in the United States.

"There is no question that the level of claiming races in the United States impacts the number of injuries horses suffer during races because their health history is not disclosed to new owners."

The AAEP formed a Racing Taskforce, comprising 25 members veterinary equine practitioners involved in all aspect of the racing industry, after the catastrophic injury of Eight Belles in the last Kentucky Derby.

It was brought together to look at all issues, but particularly medication, as several accusations had been made that this was a major factor in injury.

Professor McIlwraith participated in the task force, which also looked at the issue of claiming. It has recommended a rule that would prohibit racing a claimed horse back too quickly. It has also suggested that the claiming price had to be higher (rather than lower) in the horse's first start after being claimed.