

Stem Cells to the Rescue: Treating Chronic Laminitis

by Denise Steffanus of the Thoroughbred Times.

Two challenges veterinarians face when treating a horse with laminitis are relieving pain and encouraging new growth of the laminae, hoof wall, and sole. Stem cell treatment appears to offer a solution for both problems.

During the second annual conference of the North American Veterinary Regenerative Medicine Association (NAVRMA) held on June 2-4 in Lexington, a panel of practitioners who have had success in treating laminitis explained the practical application of this new technology.

Scott Morrison, D.V.M., a podiatry specialist at Rood & Riddle Equine Hospital in Lexington, uses a combination of surgery, stem cell injections, and therapeutic shoeing to treat horses with chronic laminitis. He reported good success with “sinkers,” horses whose damaged laminae—columns of cells that make up the membrane between the hoof wall and the coffin bone—do not support the coffin bone adequately and thus allows it to sink lower within the hoof capsule, with the tip of the coffin bone sometimes penetrating the sole of the foot.

The deep digital flexor tendon runs parallel to and behind the cannon bone and attaches to the back of the coffin bone. If the tension it exerts on the back of the coffin bone is not offset by the stability of healthy laminae, the tip of that bone will rotate downward. This is what happens when laminitis damages the lamellar membrane. A tenotomy, surgery to snip the deep digital flexor tendon at the mid-cannon bone level, relieves that tension and allows the coffin bone to assume a more natural position within the hoof capsule.

Stem cell treatment

Hoof growth originates at the coronary band, the hairline between the pastern and the hoof capsule. In laminitic horses, constriction at the coronary band and disruption of blood flow to the laminae, hoof capsule, and sole interrupts hoof growth and often causes portions of the horse’s hoof wall to die. Veterinarians must pare away the dead hoof wall, but in doing so they expose the sensitive inner surface.

Like a fingernail ripped out of its nail bed, this exposure causes severe pain for the horse. This is why many in the veterinary field regard laminitis as the most horrific disease a horse can get. In horses with chronic laminitis, abnormal and inadequate growth of the hoof capsule coupled

with damage to the sensitive laminae create pain and chronic lameness that often cause the horse to remain lying down much of the time and lose body condition.

Stem cells injected at the coronary band appear to provide significant and immediate pain relief to these horses through their anti-inflammatory properties. Other stem cell benefits include the ability of stem cells to become the same type of cells that have been destroyed by laminitis and the stimulation of the growth of new blood vessels to nourish the foot.

Stem cells also are thought to signal the horse's body to stimulate natural healing mechanisms at the site.

In some cases, Morrison said he uses regional limb perfusion to confine the stem cells to the affected foot. A tourniquet is placed on the upper part of the leg and the stem cells are injected intravenously. This method prevents the stem cells from migrating away from the site via the circulatory system. The tourniquet is kept in place for about 25 minutes after the injection.

Morrison gives a horse three doses of 20-million to 25-million stem cells at one-month intervals coordinated with the timing of cast changes and reshoeing. Typically, he uses donor (allogeneic) stem cells derived from umbilical cord blood and tissue.

After surgery and stem cell treatment, Morrison places the horse's foot in a cast up to the pastern and uses dental impression material for sole support. He glues on a special domed shoe that rolls in all directions to eliminate the sheer forces created when the horse twists that foot as it moves around its stall. This essentially immobilizes the foot and allows new hoof growth to form undisturbed.

Morrison estimates that before he began to use stem cell treatment for sinkers, his treatment success rate was a low 18%. With stem cells, that success rate has risen to about 88%.

Mountain lion peril

Doug Herthel, D.V.M., founder and chief of staff of Alamo Pintado Equine Medical Center in Los Olivos, California, said his goal is to find a cure for laminitis, not just palliate the disease. He combines bone-marrow-derived stem cell therapy, hyperbaric oxygen therapy, ice boots, supportive care, and nutritional support to treat acute laminitis.

"We do very little farrier work on these horses' feet," Herthel said.

One of Herthel's most challenging cases was an Arabian trail horse who broke away from its owner when it was chased by a mountain lion. The horse ran loose in a panic for 24 hours in 107° heat with no water before it was found. Soon after the ordeal, the horse developed severe laminitis in all four feet and was brought to Herthel's clinic.

"This horse had an extremely poor prognosis," Herthel said. "We couldn't move him without anesthetizing him, so we didn't put him in the [hyperbaric] chamber."

The horse remained in his clinic stall from August 16 to December 31 while being treated with stem cells. Herthel injected 100-million cells in the coronary band of each foot as the initial treatment.

"Within 48 hours, we saw tremendous pain relief and the horse's feet just looked better. Then we started to see new horn development."

Herthel described his first impression of the Arabian's laminitic hooves as cold, pale, and dead. After the first stem cell treatment, he said they became warm, pink, and viable.

Stem cell treatment was repeated when the horse showed discomfort, approximately at 30-day intervals, for a total of three treatments.

When its feet had ample new hoof growth, the Arabian was shod with wooden shoes and the soles packed with Equi-Pak for support.

"He may be a trail horse again," Herthel said of the successful outcome.

Thorn Song

In 2010, Herthel made national news when he saved the life of dual Grade 1 turf winner Thorn Song when the horse developed laminitis while recuperating from a severe tendon injury.

An independent veterinarian appointed by owner Ahmed Zayat's insurance carrier had recommended Thorn Song be euthanized because he was deemed to have no chance of recovery, and the horse was approved for humane euthanasia.

Herthel persuaded the underwriter to give Thorn Song one last chance by treating his laminitis with bone-marrow-derived stem cells, hyperbaric oxygen therapy, and nutritional support as part of a holistic regimen to repair Thorn Song's hoof and restore his quality of life.

“I thought there would still be less than a 10% chance for him, even if we tried stem cells,” Herthel said in 2010. “But within 48 hours, we saw a turnaround. There was a dramatic decrease in pain and swelling, and within two weeks, we started seeing amazing hoof growth. We were blown away. It went beyond our expectations. It may be the most exciting thing I have ever seen. Technology is moving forward.”

In his NAVRMA presentation, Herthel offered a case study of an unidentified stakes-winning stallion he had treated for laminitis, but despite the anonymity, the magnificent gray Thorn Song was unmistakable in the “after” video as he leaped and bucked in hand while being walked by an attendant. (Later, Herthel confirmed that the horse in the video was, indeed, Thorn Song.)

Thorn Song now lives in comfort and dignity in Coalinga, California, at Harris Farms, which acquired the millionaire stakes winner from the insurance company and included him on its stallion roster for 2011.

In February, owner John Harris wrote on the Harris Farms website, “Dr. Herthel deserves immense credit for his willingness to work with [Thorn Song] and has truly performed a miracle with this horse.”

Thorn Song’s first mares were confirmed in foal in March.

Pain relief

Chris Johnson, D.V.M., a surgeon at Woodford Equine Hospital in Versailles, Kentucky, said most of the horses with laminitis that he sees are brought to him when other treatments—medical, surgical, and mechanical—have failed to produce satisfactory pain relief.

“Radiographically they may look okay, but they are painful,” Johnson said. “And we get good pain relief with stem cell treatment.” The treatment also encourages hoof growth.

In a private discussion with Herthel at last year’s NAVRMA conference, Johnson told Herthel that he regrettably was faced with euthanizing his wife’s horse, which suffered from chronic laminitis. Herthel offered to send Johnson 100-million allogeneic stem cells to treat the horse, which at the time was considered a novel approach for chronic laminitis.

Johnson injected 50-million stem cells in each of the horse’s forefeet. Not only did he achieve good pain relief for the horse, but its hooves began to grow again dramatically. The novel treatment saved the horse’s life. Since then, Johnson has treated many chronic laminitic horses with stem cells and achieved good success.

One of the conference attendees complained to the panel about the diverse methods they used in treating laminitis and the lack of clinical trials to support specific treatment protocols.

“Who wants to create laminitis in a horse just to do a clinical trial?” Herthel said, adding that he would rather gather knowledge by helping horses that already had the devastating disease.