

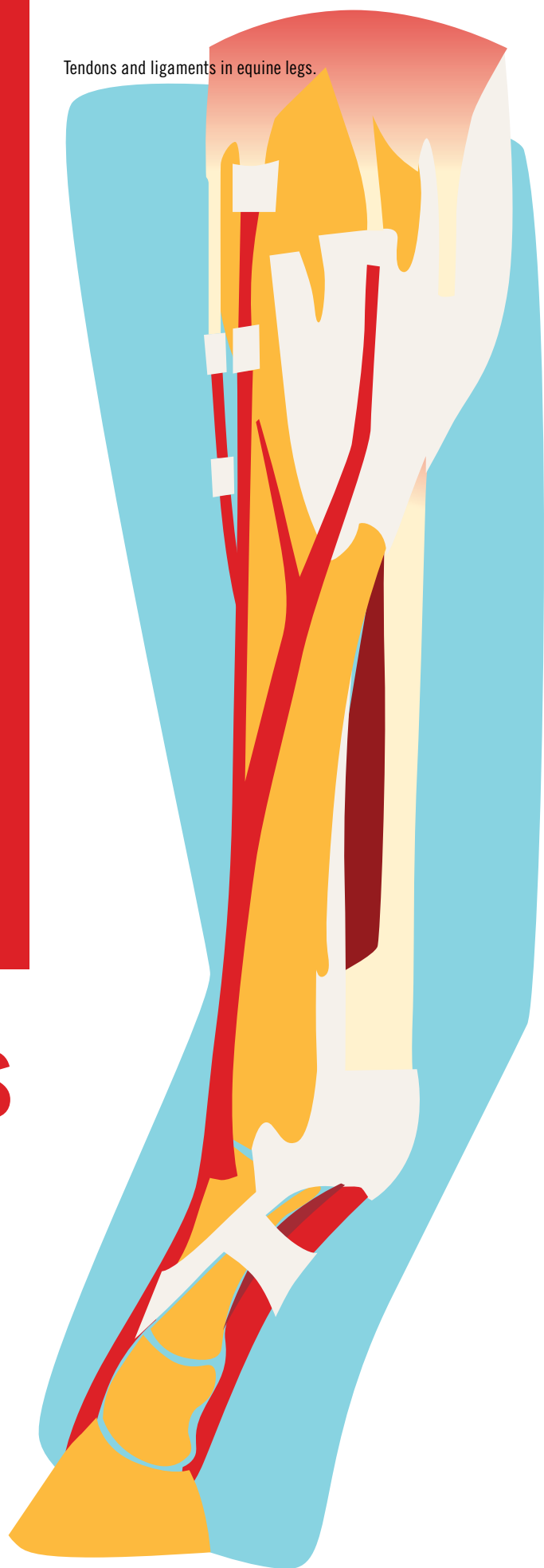
TENDON TRANSPLANTS SHOW PROMISE IN RETURNING INJURED HORSES TO RACING

By Kimberly French

Shortly after his promising fourth place finish in the December 2006 Inter Dominion Trotting Series, five-year-old trotter Calder Sensation, or “Ricky,” was diagnosed with such a severe suspensory injury that one veterinarian recommended putting the son of S Js Photo down.

“All three tendon branches below the fetlock had significant tears,” remembered Dr. Patrick Casey, a scientist and veterinary reproductive specialist from Auckland, New Zealand. “It was a very serious situation.”

Tendons and ligaments in equine legs.





Calder Sensation, or "Ricky"

Four months later, Rick Burchell, the gelding's owner, discovered an experimental tissue transplantation treatment at the Geelong Veterinary Hospital with Dr. James Vanner. Although it was expensive (about \$20,000), he decided to give it a try.

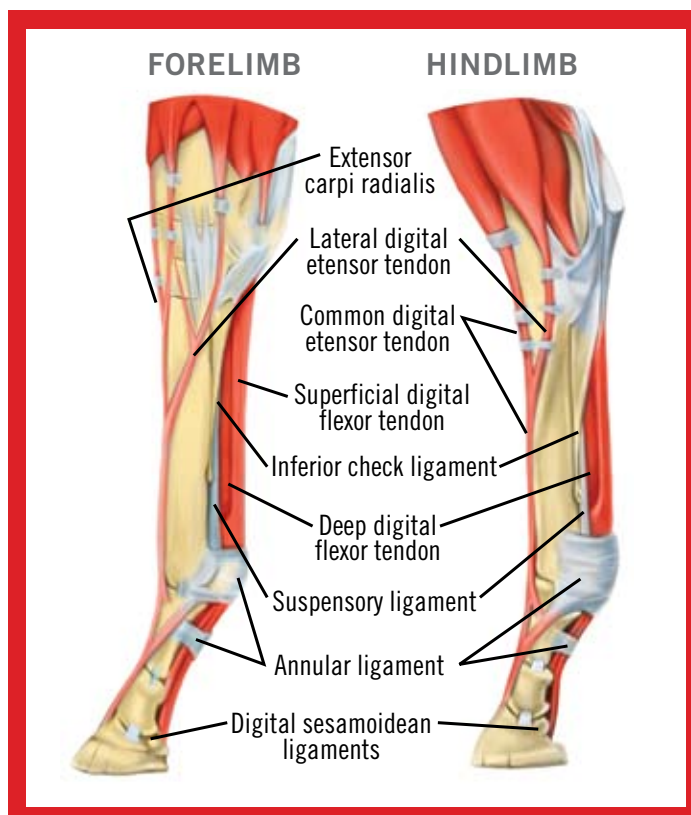
The procedure, developed by Casey and his company, Therapy Cells Ltd., after eight years of research, involves extracting tendon cells – or tenocytes – from a ligament in the horse's neck through a special spring-loaded biopsy method, culturing them for two weeks until they revert to their embryonic state, and then injecting the new cells into the tendon lesion to promote growth.

Both the collection and reintroduction techniques are completed while the horse is under sedation and local anaesthetic. There is no hospital stay.

Casey, who owns several Standardbred racehorses, and his colleagues, Vanner, Richard Fry, and Mont Liggins, conducted their first trial in 2006 and received safety approval by the Australian veterinary surgeon council that same year. They hope to open clinics around the world, including one in California.

"We are able to grow tendon cells in 10 to 14 days," Vanner explained. "That means we're putting cells back into the damaged tendon much quicker,

before scar tissue has an opportunity to develop. When we come back to scan a month after treatment, what we're seeing are beautiful tendon cells, all growing in straight lines as they should be."



"From a clinical point of view, we are seeing a return to normal tendon size and function," he continued. "From a practical point of view, we are getting horses back into work and back into racing."

A torn or ruptured tendon is one of the most common and confounding soft tissues injuries in all equine disciplines throughout the world. Although confirmed figures are not available, it is estimated that more than 30 percent of all sport horses in the United Kingdom and a bit less than that in the United States sustain some sort of tendon injury during their career.

Over the last several decades, medical technology has made large strides, yet only 20 to 30 percent of horses that injure their tendons ever return to their prior form, and normally only after at least six to 12 months of rehabilitation. Even if a horse does successfully return to competition, there is close to an 80 percent chance that it will be back in the barn with a another injury to the same tendon in short order.

"We really have a significant problem in resolving tendon injuries," said Linda Dahlgren, DVM, PhD., ACVS, of Virginia-Maryland Regional College of Veterinary Medicine at the 2005 American Association of Equine Practitioner's Convention. "The tendon is usually slow to heal. When it does heal, we are getting mostly scar tissue, and there is reduced elasticity."

Tendons are primarily composed of durable, elastic, collagen fibers that are packed tightly together. They connect muscles to bones and absorb some of the stress placed on a horse's musculoskeletal system. In most instances, they can stretch up to three-to-five times their original length, but if the tendons elongate beyond eight to 12 percent, the fibers tear instead of snapping back into place.

The superficial digital flexor tendons (SDFT) in a horse's front legs are injured the most frequently. The SDFT traverses the length of the cannon bone from the knee or hock to the coffin bone and is the closest structure to the skin.

Since the SDFT protects only a very small location behind the mid-cannon bone, that area often sustains damage. A rupture or strain, however, can emerge anywhere along the tendon.

Any horse can suffer from a tendon injury, but some are in greater jeopardy than others. Risk factors include age, level of fitness, poor conformation, gender, and if racing, the distance traveled.

Damaged tendons are notoriously tricky to repair because a horse lacks musculature below the knee, and there is not enough blood flow to promote quality healing. Also, the torn tissue is replaced instead of regenerating new collagen fibers.

"The tendon's natural way of healing is slow, and generally scar tissue or inferior collagen predominates so they lose elasticity," Dr. Wesley Sutter, DVM, DACVS, of Ocala Equine Hospital in Ocala, Florida, said. "That's why horses that heal naturally usually don't re-injure at the exact injury site but just above it or below it. This scarring creates mismatch of elasticity modulus, so you get a weak spot right at the junction of the normal and scarred tendon."

Horsemen have tried a myriad of therapies, including stem cells, yet none have seemed to provide a solution. It can be challenging to transform non-differentiated stem cells into tenocytes, and although many in the scientific community felt replicating and dividing adult cells was impossible, Casey thought this technique could be the answer.

"The thinking was once we could get the cells restarted, they would elongate along with the other cells so they become parallel cells," he explained. "If you can put tenocytes in there (the lesion), you are going to beat that scar tissue."

Ricky was the first horse ever treated with Casey's procedure, and the 42-year-old scientist was not overly optimistic the treatment would yield positive results.

"It wasn't an ideal situation because normally scar tissue has already formed that long after an injury," he said. "We scanned him and saw the lesions had not filled in, so we gave it shot."

About 100 tenocytes were taken from Ricky's neck, and after they were re-injected, Ricky was stall rested for nine months, ultrasounded regularly, and then walked. When the gelding was returned to his trainer, John Caldwell, he was walking 10 kilometers daily.

"They need at least a month of stall rest and then a gradual return to full exercise," Casey said. "The recovery period is the same for any tendon injury."

On May 25, 2007, nearly 17 months after his initial injury, Ricky captured a 2,575 meters race at Moonee Valley in Australia. The gelding trotted in last place for most of the contest before flying home fastest of all.

"The owner was over the moon," said Casey, who flew in to watch Ricky's return. "To date we have treated almost 20 more horses, including polo ponies, Thoroughbreds, jump horses and Standardbreds. So far, 10 of the 14 horses we have treated are back in training and/or competition."


The three-year-old Australian pacing star Gotta Go Collect, along with two other Standardbreds and two Thoroughbreds, was treated the last week of January for a bowed superficial digital flexor tendon in his right foreleg. The son of Christian Cullen, who has a career record of 8-5-3-0, originally injured the tendon last March, but had won a race on November 28 and finished second on December 12 and 19 before reinjuring the same tendon.

"This is the leg that had a long but fine lesion some months ago, and the body healed with scar tissue very quickly. The scar tissue ends up like a 'boxer's eye' and is always a point of weakness to pull apart, which happened to the horse right around Christmas-New Year," Casey told Harnesslink on February 2. "The procedure went very well, and we will monitor the horse's tendon closely."

Casey also hopes to use his technique in human medicine for Achilles tendon injuries and torn rotator cuffs.

"Before the rotator cuff goes, we would be able to put tenocytes back into the tear to help it heal," he said. "Our first target is to hopefully gain FDA approval and, in short order, have human applications in human tendons."

While this breakthrough is exciting, Casey admits there is still much more research to complete, and there are some injuries that may not respond to treatment. Once the cells are injected, they must remain in the lesion to promote healing instead of gravitating to other areas of the body. Also, the message sent to the cell that causes it to proliferate must be terminated once the cell has completed its task.

"This treatment could definitely revolutionize how tendon injuries are treated and, in Calder Sensation's case, it worked beautifully, but it is not a miracle cure," Casey cautioned. "There will always be some tendon injuries that simply cannot be repaired, but I think this method could have a very brilliant future." 

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