

Veterinary clinic

Stemming tendon



Alf has bounced back to his competitive best after undergoing stem cell therapy

New research shows that stem cell therapy can play an important role in treating certain tendon injuries. **Ellie Hughes** finds out who it has helped and why it has such potential

ANNIE INGS had just been invited on to the Endurance Great Britain (EGB) World Class start squad. Her then 13-year-old part-bred Arab Alpha had been going from strength to strength and Annie was looking forward to stepping up a level to compete in 120km competitive rides.

The pair were training at Wolverhampton racecourse in August 2009 when Annie first realised something was amiss. "We were on about mile six when I noticed that Alf was starting to sweat up more than usual. I brought him back to walk and he stumbled a bit, and then suddenly went lame," explains Annie.

The next day Annie noticed that Alf looked slightly awkward in his gait as he trotted across the field towards her. Although there was still no heat or swelling in his leg, she took him to Fyrnwy Equine Clinic in Shrewsbury for an examination, where Alf was diagnosed with a 17% lesion of his superficial flexor tendon.

Stem cells were taken from Alf's chest. Four weeks later, they had taken and were implanted

"I was talked through the treatment options, which included stem cell therapy," says Annie. "It wasn't a difficult decision. Alf is my horse of a lifetime and had shown real potential in progressing up the levels. I wanted to give him the very best chance possible for a complete recovery."

The gelding was referred to the Royal Veterinary College (RVC) where Prof Roger Smith, an adviser to stem cell company VetCell, assessed his injury.

Less than two weeks after Alf's injury was diagnosed, his treatment began. It started with stem cells being extracted from his chest. Four weeks later, when the cells had been successfully cultured, they were implanted into his damaged tendon.

Strict rehab

"I was told that Alf's recovery programme would last for up to 48 weeks and that it was crucial

WHERE'S THE EVIDENCE?

UNTIL recently, evidence that stem cell therapy works has been largely anecdotal. As no two horses will suffer exactly the same injury, evaluating success is problematic.

A recent study by the Royal Veterinary College and published in the *Equine Veterinary Journal* is the first to offer tangible proof of the long-term efficacy of this therapy in racehorses.

The study compared the reinjury rate of 141 racehorses treated with stem cell therapy with the reinjury percentages recorded in two existing published studies where other treatments had been used. Similar selection criteria and

that I followed it to the tee," says Annie. "It was important that Alf had controlled exercise, but that he didn't run around."

Complete box-rest was not an option for buzzy Alf, so Annie's husband Rod constructed a special pen. He used electric fencing arranged in a maze pattern to prevent the horse from moving around too much.

"I walked him in-hand for 10 minutes a day to start with," says Annie, "and increased this by five minutes every week."

At the beginning of November Annie took Alf back to the RVC for a follow-up scan.

"The scan showed that the injury site had filled with good-quality tendon tissue," says Annie, who was instructed to continue with Alf's slow exercise programme.

"I kept building up his in-hand walk work over the winter and



Cells being implanted into a tendon lesion



troubles



These scans show tendon repair from pre-implantation to four months (far right)

follow-up procedures were used.

The horses were followed for two years after they returned to full work and the results showed that the reinjury percentage of those that had been treated using stem cells therapy was 27.4% — considerably less than that for horses treated in other ways such as injecting substances, firing or superior check ligament desmotomy.

But while monitoring a sizeable group of racehorses with superficial digital flexor tendon injuries for a given period of time is feasible, carrying out the same study on a similar sized group of sport horses is logistically tough. For this reason, it is likely that evidence in support of stem cell therapy will remain anecdotal for the foreseeable future.



These stem cells are being prepared for cultivation. Not every sample will take

began riding him in February. By then I had introduced short trots."

Alf went for his final scan at the end of March, which showed he was in the clear.

The pair completed their first 40km competitive ride in the second week of April 2010.

"Alf returned to full fitness nearly a year after the injury and in September 2010 we completed the Robin Hood Challenge — an 80km CEI one-star ride," says Annie. She was invited back on to the World Class start squad this year and subsequently travelled to Belgium for the 120km FEI

two-star competition in Mont le Soie, which she successfully completed aboard Alf.

Annie's aim for 2012 is to step up to 160km, which will qualify her and Alf for a senior championship.

Annie admits going through the process has been a learning curve.

"The stem cell therapy and subsequent rehabilitation process has taught me a lot and I am now careful not to overtrain," says Annie. "I now follow a strict management protocol with Alf, which includes daily stretching exercises and careful monitoring of his tendons." H&H

Expert comment

The Royal Veterinary College's Prof Roger Smith, an adviser to stem cell company VetCell, explains how the therapy works and why its role in injury repair is becoming increasingly recognised

MANY of the long-term consequences of injury or disease occur because the body's structures cannot repair themselves. This is because cells can't adequately work out what to do or there has been a lack of a stem cell response. Therefore any repair of an injury may fail to replicate the normal structure.

Equine tendon injuries do heal slowly by producing scar tissue, which, while strong enough to allow some activity, is mechanically very different from a normal tendon. This is why horses that have sustained a tendon injury often reinjure the same place in the future.

Stem cells have a unique ability to change their function and take on different guises; they can become specialised cells of cartilage, bone, tendon, fat, muscle or nerves. By using stem cells, we can improve the quality of healing by providing cells that have the ability to recreate normal tendon tissue, rather than simply scar tissue.

Candidates for stem cell therapy are horses with overstrain injuries

where an ultrasound scan reveals a clearly defined hole in the tendon.

The first step is to extract the stem cells from a sample of the horse's bone marrow, which is taken either from the sternum (chest) or tuber coxae (near the point of the croup) under sedation and local anaesthesia.

The cells are then cultured, a process that takes an average of 18 days. Not every sample will yield a useable culture — and we are not exactly sure at this point why this is — but fortunately the majority do. The cultured cells are suspended in bone marrow supernatant (clear fluid) before being implanted several weeks later into the lesion in the tendon.

Stem cell surgery is by no means a quick fix. The horse

then has to undergo a carefully controlled rehabilitation programme, which takes approximately one year. It follows exactly the same lines as a programme for a horse not treated with this type of therapy.



Cultured stem cells in bone marrow fluid

ALPHA'S RECOVERY

2009

28 August

Annie first notices something is amiss while working Alf

8 September

Alf is diagnosed with a 17% lesion in his superficial flexor tendon

21 September

Prof Roger Smith extracts stem cells from Alf's chest to cultivate

13 October

Alf has the successfully cultivated stem cells implanted

November-December

Annie starts Alf's strict recovery programme, beginning with 10min

controlled walking every day, building up to 25min by the New Year

2010

27 January

Alf returns to the RVC for a first follow-up scan, which shows positive progress

February-March

Alf begins ridden work and Annie introduces short periods of trot, slowly building up the time spent in the saddle

29 March

Alf's final scan shows that the injury site had in-filled with good-quality tendon tissue. Two weeks later Annie and Alf complete their first competitive ride, in the Peak District