

Tiny but potent

Lucy Graham and Kate Middleton of VetCell discuss the use and methodology of stem cell treatment

There is a high incidence of tendon injuries within all sectors of the equestrian world, with re-injuries occurring frequently. An understanding of the complete biomechanical, histological and morphological characteristics of normal, compared to healing and injured tendon, will aid in making the correct decisions for the treatment required. No matter which treatment is used, the rehabilitation and subsequent training of the horse is as important as the treatment itself. Prolonged immobilisation can have detrimental effects on the musculoskeletal system as a whole, as well as hindering the tendon healing. Immobilisation has been shown to decrease the water and proteoglycan content of tendons, as well as increasing the number of reducible collagen cross-links, thus reducing the tensile strength and elasticity of the tissue¹. Collagen fibrils that are not stressed/used during the proliferation and remodelling phases of repair tend to remain disorganised and sub-optimal, predisposing to re-injury.

One method of treatment which is becoming increasingly popular is the use of bone marrow-derived mesenchymal stem cells (MSCs) suspended in bone marrow supernatant. MSCs have been shown to improve the healing outcome in many damaged tissues². In combination with the many growth factors present in bone marrow supernatant, MSCs have been shown to halve the chance of re-injury over conventional treatments³. Developed over the last decade by VetCell, alongside Professor Roger Smith at the Royal Veterinary College, this patented technique has so far treated nearly 2000 horses. Treatment with MSCs aims to produce a superior quality of regenerative healing, with more normalised tissue structure and biomechanical properties, including 'crimp' pattern, low cellularity, high collagen type I to type III ratio, and normal collagen fibril alignment, giving as near to normal tendon tissue as possible.



In each case, a bone marrow sample is taken from the horse from either the sternum, or the tuber coxae under standing sedation at the clinic or the home yard. This sample is then sent to a specialised, licensed laboratory where the cells are cultured to reach a minimum of 10 million MSCs. Once cultured, the cells are re-suspended in the horse's own supernatant and supplied back for implantation. There are additional sources for stem cells, e.g. umbilical cord and adipose; however, peer-reviewed published research shows bone marrow derived cells to be superior for the treatment of musculoskeletal disorders in the equine⁴.

The cost of stem cell therapy is around £1000-2000 dependent on severity of the injury. Other costs, such as scans and call-out fees, are the same whatever treatment you choose to go for.

As well as tendon and ligament injuries, vets have been investigating other applications for MSCs including treating distal limb fractures, navicular bursae, laminitis, stifle defects and early stage osteoarthritis. The results are very promising, although only preliminary at this stage; more research is required before these alternative applications for bone marrow-derived MSCs have as much supporting evidence as those for tendon injuries. Stem cells may likely become increasingly common in both veterinary and human medicine over the next few years, possibly providing cures for a multitude of illnesses and injuries.

1 Riley 2004 (Rheumatology)

2 Noel 2002 (Curr Opin Investig Drugs), Dezaiva 2005 (Curr Neuropharmacol), Djouad 2010 (Stem Cell Research & Therapy)

3 Godwin 2011 (Equine Veterinary Journal)

4 Djouad 2010 (Stem Cell Research & Therapy)