



# Stem cells in Veterinary Medicine

**Lydia Lock**

Year 12, Deyes High School

Stem cells are unspecialised cells that have the ability to continuously divide and to differentiate into specialised cells in the body. There are different types of stem cells, those including embryonic stem cells and adult stem cells. Embryonic stem cells are derived from embryos and have the potential to differentiate into many different types of cell, meaning they are pluripotent. Adult stem cells can only differentiate into a few different types of cells, so they are multipotent (1). As well as the many potential uses stem cells have in human medicine, researchers believe that stem cells have potential to treat a wide variety of conditions which currently have limited options in veterinary medicine (1).

Research has already been carried out into the impact stem cell therapy could have on tendon injury in horses. This injury can cause pain and lameness which especially in racehorses, often results in euthanasia (2). In a small study, 14 horses which were already destined for euthanasia due to tendon injuries were divided into two groups, one group receiving stem cells in their injured tendon, and the other group receiving saline (as a control) in their tendon. This was studied for six months before they were euthanised, and their tendons were analysed. The study showed that the tendons of the horses treated with stem cells had an improved quality of tissue compared to the horses treated with saline (2). In a much larger study, 113 racehorses with tendon injury were treated with stem cells derived from bone marrow, and after treatment the re-injury rate decreased from 50/60% to 27%. Further experiments on show jumping horses with ligament or tendon damage showed that after 2 years of allogeneic (from another individual of the same species) stem cell therapy, more than 80% of the horses returned to their previous level of performance, with re-injury rates at 18% rather than 44% for conventional treatments (3). Experiments like these have led to stem cell therapy being used commercially in the treatment of horses with tendon and ligament injuries and joint disease, improving the quality of life for racehorses in particular, which would otherwise be euthanised (4).

There have also been experiments into the usage of stem cells for treating osteoarthritis, a painful chronic condition where the surfaces of the joints wear down in dogs (5). In a study from 2014 to 2017, 130 dogs with osteoarthritis were treated with a stem cell injection in the affected joint. The outcome of this study was determined using orthopaedic examinations and owners' scores on improvement for six months. After just one month, 78% of the dogs had an improvement in the orthopaedic score, and after sixth months 88% of the dogs had improved. The owners' scores after six months had 92% of the dogs significantly improving, and 6% improving slightly. The results are promising for the future of stem cell usage, as no major adverse effects were recorded and the treatment seemed to be effective in the majority of dogs [6]. Stem cell therapy may also be favoured in the future as it is less invasive than standard procedures. The process is carried out in one surgical step, and the patient is able to go home on the same day as treatment (6).

Despite the promising future potential of stem cell therapy, there are ethical issues involved in experimentations and treatments. Whether stem cell therapy will be beneficial to a pet could be dependent on a number of factors such as age, breed, severity of injury, and anaesthesia risk, and there is no current way to predict which pets will benefit. As well as this, treatment may have to be repeated in cases where no improvement is made, which could be expensive for the owners (7). This may leave owners wondering if the stem cell treatment is worth the cost. It is however rare for treatment to have to be repeated and the cost of stem cell therapy is often much less than the cost of surgery, and could provide a treatment for conditions which currently have no permanent solutions such joint pain (8). In spite of the ethical issues stem cells have the potential to cure diseases such as spinal cord injury, heart diseases, and tissue regeneration and in researching stem cell uses in animals, researchers can learn more about how these treatments could be used in humans therefore research benefitting both veterinary and human medicine (2, 9).

## References

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