Therapeutic potential of mesenchymal stem cells from equine bone marrow

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Abstract

In horses, stem cell therapies are a promising tool to the treatment of many injuries, which are common consequences of athletic animals. Tendon injuries are the most common morbidities that often compromise the performance in all types of sport horses and the return to the same level of activity. Although tendon injuries occur spontaneously during exercise, they are preceded by progressive degeneration of the tendon matrix brought about by cumulative loading cycles, accelerated by competitive sports. Clinical injury results in a variable disruption of the tendon matrix, which induces an inflammatory response. This response is often short lived. Very soon after the injury, fibroplasia is initiated, resulting in the formation of scar tissue within the tendon. Because of the poor functionality of scar tissue, new treatments should aim at regenerating the tendon tissue. The aim of this study was to investigate the effect of the applications of allogenic adipose stem cells (ADSCs) in 16 horses affected by tendon injuries. Methods: The adipose tissue collected was isolated and the proliferative potential of the stem cells was evaluated. It was also assessed their ability to differentiate into osteogenic, chondrogenic or adipogenic. All animals with tendonitis received 1 x 107 ADSCs into the injured tissue with local anesthetic and ultrasonographic control. After one month, ultrasonographic control was performed again. All procedures were approved by horse owners with the approval of a veterinary service contract. The data showed that after stem cells from adipose tissue melt, they remained as "fibroblast-like" morphology. Osteogenic differentiation was evidenced by the mineralization of extracellular matrix at day 11, which became stronger at day 21 and by positive Von Kossa staining. After induction of adipogenic differentiation, the cells morphology changed within 24 hours from elongated fibroblastic cells to oval-shaped cells. After 4 days, vacuoles in the cytoplasm of the oval-cells were observed. At the day 6, it was observed an increased number of these cells by positive Oil Red O staining. Chondrogenic differentiation was observed 21 days after induction, visualized by the staining of the extracellular cartilage matrix proteoglicans. Our study was based on clinical cases and the animals were heterogenous for age, weight and sex, but all of them were athletic horses. One month after ADSCs application into the lesion, the formation of healthy tissue has been observed. All treated horses showed a functional recovery

and were able to return to their normal activity, without lesion recurred. This study demonstrated that in the case of tendon injury, the application of stem cell therapy in horses provided functional recovery of damaged tendons and the treated animals were capable of returning to their normal activity.

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