

# Tenogenic induction of equine mesenchymal stem cells by means of growth factors and low-level laser technology

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Received: 7 September 2015 / Accepted: 5 January 2016 / Published online: 13 January 2016

# Springer Science+Business Media Dordrecht 2016

## Abstract

Tendons regenerate poorly due to a dense extracellular matrix and low cellularity. Cellular therapies aim to improve tendon repair using mesenchymal stem cells and tenocytes; however, a current limitation is the low proliferative potential of tenocytes in cases of severe trauma. The purpose of this study was to develop a method useful in veterinary medicine to improve the differentiation of Peripheral Blood equine mesenchymal stem cells (PB-MSCs) into tenocytes. PB-MSCs were used to study the effects of the addition of some growth factors (GFs) as TGF $\beta$ 3 (transforming growth factor), EGF2 (Epidermal growth factor), bFGF2 (Fibroblast growth factor) and IGF-1 (insulin-like growth factor) in presence or without Low Level Laser Technology (LLLT) on the mRNA expression levels of genes important in the tenogenic induction as Early Growth Response Protein-1 (EGR1), Tenascin (TNC) and Decorin (DCN). The singular addition of GFs did not show any influence on themRNA expression of tenogenic genes whereas the specific combinations that arrested cell proliferation in favour of differentiation were the following: bFGF2 + TGF $\beta$ 3 and bFGF2 + TGF $\beta$ 3 + LLLT. Indeed, the supplement of bFGF2 and TGF $\beta$ 3 significantly upregulated the expression of Early Growth Response Protein-1 and Decorin, while the use of LLLT induced a significant increase of Tenascin C levels.

In conclusion, the present study might furnish significant suggestions for developing an efficient approach for tenocyte induction since the external administration of bFGF2 and TGF $\beta$ 3, along with LLLT, influences the differentiation of PB-MSCs towards the tenogenic fate.