PULSED ELECTROMAGNETIC FIELD ACTUATED BIOMATERIALS FOR INFLAMMATION REGULATION IN TENDONS

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Inflammation is an important process of tendon healing. However, excessive, persistent or unresolved inflammation may result in impaired healing, ultimately leading to degeneration and loss of functionality. Pulsed electromagnetic field (PEMF) has shown potential to reduce inflammation and increase tissue healing rates, being a FDA approved therapy for orthopaedics. Previously, we reported that PEMF actuated membranes holding magnetic responsiveness have potential to modulate inflammation *in vivo*. However, the cellular mechanisms involved were not properly understood.

Thus, in the present study, we propose to investigate the influence of PEMF actuation provided by a magneto therapy device (Globus) on the behaviour of human tendon derived cells (hTDCs) cultured onto magnetic membranes, exploring their modulatory role under an inflammatory environment induced by IL-1β. Magnetic membranes were produced by solvent casting, incorporating iron oxide magnetic nanoparticles into a blend of starch/polycaprolactone (SPCL).

Under a PEMF actuation, magnetic membranes moderated cell mediated inflammatory reactions *in vivo* while *in vitro* hTDCs treated with IL-1β and cultured on magnetic actuated membranes showed an attenuated protein and gene expression of inflammatory associated markers, such as IL-6, TNF-α, and MMPs, assessed by ELISA assays and real time RT-PCR analysis.

Collectively, these results illustrate the beneficial synergistic effect of magnetic biomaterials and PEMF in modulating cell responses to inflammatory cues, contributing for the resolution of inflammation in tendon healing.