0164 A platelet lysate antibacterial bioactive patch for tendon repair

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Platelet lysate (PL) is a class of platelet-rich hemoderivatives produced by cryogenic disruption of platelet concentrates, originating a pool of supra-physiological concentrations of growth factors (GFs) that is being widely explored in the medical field, namely in sports medicine and orthopaedics. In this concern, patch augmentation strategies have been receiving increased attention as the basis for the development of novel biomaterials aiming at tendon regeneration. In the present work, we assessed PL-membranes as prospective bioinstructive patches under the hypothesis that tendon cells positively respond to PL-derived biochemical signals.

For this purpose, PL membranes were fabricated as previously described by Babo *et al*[1] and characterized in terms of degradation, PL-derived proteins and GF release profiles. Cell behaviour was studied in terms of metabolic activity and proliferation, as well as extracellular matrix (ECM) production by culturing human tendon-derived cells (hTDCs) up to 21 days. In addition, the potential of PL membranes as antibacterial surfaces for biomedical implants was evaluated against *Staphylococcus aureus* ATCC 29213 by determining the number of viable counts, as well as biofilm formation and distribution up to 72h, using PDMS films as controls.

Overall, our results showed that PL membranes remained stable for up to 30 days in PBS. In addition, PL-derived proteins, as well as specific GFs like basic fibroblast growth factor (bFGF) and platelet derived growth factor (PDGF)-BB followed a typical controlled release profile, as described by Babo *et al*[1]. Regarding the biological performance, PL-membranes were able to control the proliferation of seeded hTDCs, as demonstrated by maintenance of DNA content over 21 days of culture, in comparison to the controls in standard culture plastic. This result strongly suggests that PL-membranes can avoid an extensive proliferative phase, which *in vivo* is responsible for the formation of scar tissue, a major concern during tendon healing. These cells were metabolically active over time in culture and deposited tendon-related ECM proteins, including collagen types 1 and 3 and tenascin-C. Additionally, PL-membranes exhibited a significantly reduced number of viable counts of *S. aureus*, together with diminished bacteria adherence after 24h of incubation. No biofilm formation was observed in comparison to PDMS controls.

Altogether, our results demonstrate that these PL-membranes can modulate cellular activity *in situ*, acting as a reservoir of bioactive molecules derived from PL, which supports their application as bioinstructive and protective patches for tendon regeneration. Finally, exploring the multitude of features of crosslinked PL proteins can potentially uncover uncharted prospective applications in regenerative medicine.

References: 1. Babo P. Inflamm Regen. 2014; 34:33-44.

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