Human platelety lysate improves bone forming potential of human progenitor cells expanded dynamically on microcarriers

Gupta, P.,[1,2] **Nilsson Hall, G.,**[1,2] **Geris, L.,**[1,3] **Luyten, F.P.,**[1,2] and **Papantoniou, I.**[1,2,4,#,*]

[1] Prometheus division of Skeletal Tissue Engineering, KU Leuven, Belgium

[2] Skeletal Biology & Engineering Research Centre, KU Leuven, Belgium

[3] University of Liege, Group of Biomechanics, Liege, Belgium

[4] Institute of Chemical Engineering Sciences, Foundation for Research and Technology (FORTH), Patras, Greece

Presenting author: Papantoniou Ioannis, email: ipapantoniou@ice-ht.forth.gr

* Corresponding author: Papantoniou Ioannis, email: ipapantoniou@ice-ht.forth.gr

ABSTRACT

Xenogeneic free media are required for translating advanced therapeutic medicinal products to the clinics. In addition process efficiency is crucial for ensuring cost efficiency for large scale production of mesenchymal stem cells (MSCs). Human platelet lysate (HPL) has been increasingly adopted as an alternative for Fetal Bovine Serum (FBS) for MSCs of different origin however its impact on their therapeutic potential and regenerative capacity in an in vivo setting is still largely unexplored.

Herein, we compare the effects of FBS and HPL supplementation in microcarrier-based dynamic expansion of human periosteum derived cells (hPDCs) while assessing their bone forming capacity by subcutaneous implantation in small animal models. We observed that the use of HPL resulted in 4 times faster cell proliferation, while cells maintained their viability and trilineage differentiation capability with a suppression of adipogenic differentiation potential. Differences in mRNA expression profiles were also observed between FBS and HPL on several markers, suggesting lower expression of extracellular matrix related genes and lesser degree of differentiation. When implanting these cells we observed a marked difference between the bone forming capacity of cells expanded in FBS and HPL. FBS expanded cells resulted in a fibrous tissue structure with very low amount of mineralisation. On the other hand, HPL supplementation resulted in extensive mineralised tissue formation which can be classified as newly formed bone verified by μCT and histological analysis.

This work provides important data and support towards the use of platelet lysate as a viable alternative to FBS in a scalable suspension cell culture set-up. In this study, strikingly hPDCs were seen to be able to form significantly higher amount of bone when implanted together with CaP carriers in small animal models. This capacity was linked to activation of WNT and BMP pathways associated with the osteogenic capacity of several progenitor cells.