TS005
Improved regeneration of mice full-thickness excisional wounds by human adipose stem cells cell-sheets

MT Cerqueira[1,2], TC Santos[1,2], RP Pirraco[1,2], AM Frias[1,2], AR Martins[1,2], RL Reis[1,2] and AP Marques[1,2]
[1]*3B's Research Group – Biomaterials, Biodegradables and Biomimetics, University of Minho, Headquarters of the European Institute of Excellence on Tissue Engineering and Regenerative Medicine, AvePark, Taipas, Guimarães, Portugal;* [2]*ICVS-3B's – PT Government Associate Laboratory, Braga/Guimarães, Portugal*

Stem Cells have emerged as a powerful element for generating skin tissue and for promoting enhanced wound healing through the differentiation into relevant skin cell lineages and/or by paracrine interactions. Adipose stem cells (hASCs) in particular, appear as an attractive cell source for skin regeneration, due to their natural abundance, relatively easy methodology of isolation and secretion of factors important for the restoration of healthy skin. Common approaches for stem cell delivery, comprehending the use of direct injection of single stem cell suspensions or the use of biomaterials-based strategies, comprise in some cases, poor engraftment of those cells or associated inflammatory processes that lead to a reduced effect over skin restoration. An innovative alternative comprehends the use of Cell Sheet (CS) engineering that, by taking advantage of temperature-responsive culture surfaces, allows the non-invasive harvest of cultured cells, as intact sheets, along with their deposited extracellular matrix, facilitating the direct transplantation to host tissues. This study exploited the potential of CS Engineering for fabricating 3-layered hASCs CS to fully regenerate mice full-thickness excisional wounds. The outcome of the transplanted cell machinery and the success of this technology were evaluated at relevant timepoints considering wound healing parameters such as re-epithelialization, angiogenesis, neotissue quality formation and hASCs contribution for the skin tissue regeneration. Overall, the created constructs showed good stability *in vitro*, were easily attached to the wound bed and showed to play a significant and specific role over epidermal regeneration through paracrine effects. *Acknowledgements* The authors would like to acknowledge for the financial support by Skingineering (PTDC/SAU-OSM/099422/2008), Portuguese Foundation for Science and Technology (FCT) funded project.

TS006
Fish scales patterning guiding hASC growth

J Moreira-Silva[1,2], D Afonso[1,2], TH Silva[1,2], F Volpato[3], A Motta[3], AP Marques[1,2], JF Mano[1,2], RL Reis[1,2] and C Migliaresi[3]
[1]*3B's Research Group – Biomaterials, Biodegradables and Biomimetics, University of Minho, Headquarters of the European Institute of Excellence on Tissue Engineering and Regenerative Medicine, AvePark, Taipas, Guimarães, Portugal;* [2]*ICVS/3B's – PT Government Associate Laboratory, Braga/Guimarães, Portugal,* [3]*Department of Materials Engineering and Industrial Technologies and BIOtech Research Centre, University of Trento, Trento, Italy*

Marine organisms and materials exhibit interesting properties for their use in biomedical applications, following biomimetic approaches [1,2]. For instance, the white seabass (*Lates Calcarifer*) scales exhibit a very interesting pattern, which inspire their use as a guiding platform for cellular growth, in a tissue regeneration approach. Moreover, fish scales are composed of hydroxyapatite and type I collagen fibrils, equivalent to the materials that one can find in human bone, as thus their use in bone tissue engineering is envisaged. The main goal of the present work was the assessment of fish scales, combining intrinsic features such as patterns, hydroxyapatite and collagen in different means, as cell culture supports aiming at guiding cell growth and extracellular matrix deposition and mineralization. In this sense, human adipose derived stem cells (hASCs) were cultured onto seabass scales, under osteogenic and non-osteogenic conditions. Fish scales supported cell adhesion and cytoskeleton organization defined by the surface patterning. Moreover, hASCs were able to proliferate along the time of culture and to differentiate towards the osteogenic lineage depositing and mineralizing the characteristic extracellular matrix. This work constitutes the first step to demonstrate the value of the intrinsic properties of seabass scales for exploitation in the biomedical field and in particular for bone tissue engineering.

References

1. TH Silva *et al.*, Materials of marine origin: a review on polymers and ceramics of biomedical interest, International Materials Reviews 2012, *in press*. DOI: 10.1179/1743280412Y.0000000002

2. TH Silva *et al.*, Biomaterials from Marine-Origin Biopolymers", in J.F. Mano (Ed.): Biomimetic Approaches for Biomaterials Development, Wiley-VCH, 2012, in press.