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Scleral ossicles as natural biomaterials on which vascular-like network is promoted from Mouse Aortic Endothelial cells (MAECs): preliminary results

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When a severe fracture is difficult to self-recovered, it is defined as "critical-size" bone defect. Till now, many efforts have been made by the tissue engineering (TE) to generate scaffolds suitable for recovering of this type of fracture, but the main obstacle remains the lack of an appropriate vascularization of the scaffolds. In the field of the regenerative medicine, the TE has developed many different biomaterials, with various features and peculiar functions, to be used in combination with cells and growth factors, in the generation of specialized constructs. Our proposal of natural scaffolds useful to obtain complex constructs concerns peculiar bony chips extracted from the eye bulb of adult chickens: the scleral ossicles (SOs). This proposed model is interesting because once SOs reach the definitive size in the adult animal, they are devoted only to mechanical stereotyped stress for their lifetime so that the activation of the bone remodelling should be avoided and, to do this, the osteocytes undergo massive apoptosis, making the ossicles like decellularized bones [1]. The novelty of our proposal is that the scaffolds do not require surface treatment (like further matrix deposition on the SO surface) since they are characterized, like all bones, by the well-known organic components such as type I-collagen fibres, proteoglycans and glycoproteins. The latter, for example, play the role of adhesion proteins and therefore can mediate the adhesion of the endothelial cells that should develop the vascular network. Our final goal is to obtain an *in vitro* 3D-vascularized natural constructs, from scaffolds easily available in nature to use *in vivo* for the healing of "critical-size" bone defeats. Previously [2] we identified the best preparation methods to obtain suitable SO surface for cell culture. Recently, we have performed a series of *in vitro* experiments to test the biocompatibility properties of the support; then, cell adhesion tests, viability and proliferation assay were carried out. Further, we tried to induce a vascular-like network organization of Mouse Aortic Endothelial Cells (MAECs) directly on the SOs surface, stimulating the cells with a known angiogenic factor, the Vascular Endothelial Growth Factor (VEGF), getting encouraging preliminary results.

References

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Keywords

Scleral ossicles, mouse aortic endothelial cells, vascularization, critical-size bone defects, bone scaffolds