

BIOCOMPATIBILITY OF SCAFFOLD COMPONENTS AND HUMAN BONE FETAL CELLS

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INTRODUCTION: Bone is the most commonly replaced tissue of the body, with over 450'000 bone repair procedures performed per year in the United States alone¹. For clinical bone transplantations, tissue engineering techniques based on the delivery of cells to the defect through the use of 3-D scaffold materials, are currently investigated.

As part of the bone tissue engineering project developed in Lausanne, two bioresorbable polymers (PLA, Boehringer Ingelheim and PLGA 85/15, Pürac Biochem) were used to create a structure that could guide bone formation by facilitating cell migration, proliferation and differentiation. The 3-D foam morphology could be modified varying the processing conditions. In addition, the possibility of integrating ceramic materials into the polymer matrix might improve its mechanical properties. Hydroxyapatite (HA) and β -tricalciumphosphate (β -TCP) were chosen for this purpose due to their capacity to stimulate natural bone repair and for their stability².

For this project, we choose to use fetal bone cells that, in comparison to adult cells, show a higher proliferation capacity, are less differentiated into mature osteoblasts and present less immunological compatibility issues if used as tissue grafts³. The aim of this study was to investigate the possibility of associating fetal bone cells with a biodegradable scaffold for tissue repairing *in vivo*.

METHODS: Bone fetal cells were cultured in 75 mm² flasks, and collected by trypsinization and centrifugation just before use. Cells were seeded in the presence of PLA, PLGA, HA, β -TCP on 6 cm Petri dishes at density of 10⁵ cells/dish. In parallel, skin fetal cells were tested to check for a possible difference in behavior. During two weeks, cells were observed for their ability to grow in the immediate neighborhood of the compounds. The medium was changed once, after the first week of culture. At this intermediate time and at the end of the experiment, pictures from each well were taken.

DISCUSSION & CONCLUSIONS: During the two weeks of culture, bone and skin fetal cells were able to proliferate in all groups. The copolymer with PLGA 85/15 was totally surrounded by cells that seem to anchorage to it (Fig. 1).

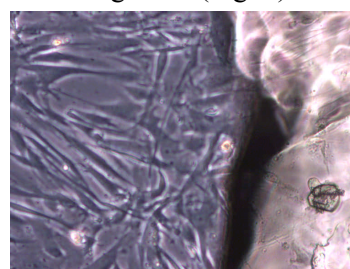


Fig. 1: Proliferation of bone fetal cells around the PLGA 85/15 copolymer

In the presence of ceramics, the cells proliferation was not disturbed (Fig. 2). Further investigations will be necessary to understand if these particles are ingested by the cells or if they are stuck on the membrane.

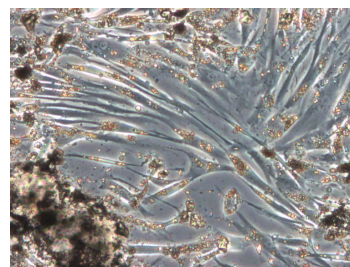


Fig. 2: Proliferation of bone fetal cells in the presence of β -TCP

In this preliminary study, we show that the chosen compounds are biocompatible with bone fetal cells. We are currently further investigating the behavior of the cell-scaffold construct.

REFERENCES: ¹Langer R et al. Tissue Engineering. *Science*. 1993: 260:920-926. ²Bohner M. Calcium orthophosphates in medicine: from ceramics to calcium phosphate cements. *Injury, Int. J. Care Injured*. 2000: 31: 37-47. ³Fauza DO. Fetal Tissue Engineering in *Prin Tissue Eng 2nd Ed*, Academic Press. 2000: 353-68.