495e Using Bone-like Ecm Produced in Vitro to Influence Osteoblastic Differentiation of Marrow Stromal Cells

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Bone tissue engineering has been explored extensively as a potential therapy for the many people who are impacted each year by large bone defects resulting from injuries or birth defects. Our approach is to use progenitor cells, such as marrow stromal cells (MSCs) extracted from the marrow of bones, in conjunction with fibrous scaffolds. In this talk, we demonstrate the use of a flow perfusion bioreactor for the in vitro culture of MSCs seeded on porous titanium scaffolds. Following seeding of cells onto scaffolds, the cell/scaffold constructs were cultured in a flow perfusion bioreactor which forced flow through the scaffold providing nutrient transport and waste exchange. This in vitro culture resulted in the production of bone-like extracellular matrix (ECM) by the MSCs. We decellularized this ECM by rapid freeze-thaw cycling; these decellularized ECM/scaffold constructs were re-seeded with fresh MSCs and again placed in the perfusion bioreactor. The MSCs were cultured in vitro and the osteogenicity of these cells was measured by analyzing the alkaline phosphatase activity, osteopontin concentrations, and calcium content. The bone-like ECM/scaffold constructs produced through the in vitro culture of MSCs were shown to yield enhanced osteoblastic differentiation as compared to plain scaffolds using these markers of osteoblastic differentiation.