Design of scaffolds tailored on human adult stem cell for enhancing osteogenesis

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Design of suitable artificial biocompatible scaffolds that can host cells of different types is one of the most important issue regarding tissue engineering. The stiffness-dependent cell biology regulates the mechanical strength appropriate for application in cartilage /bone tissue enginering.

Scaffolds are three dimensional biocompatible structures which can mimic ExtraCellular Matrix biomechanical stimuli, thus supporting cell differentiation for bone tissue formation in vitro and in vivo.

Scaffolds differing for mechanical strength were designed and synthetized tuning parameters of the chemistry, pore size, pore volume, pore geometry to screen the most osteoinductive performance.

The final idea is to design a precise internal pore structure which offers micro and macro environments suitable for improving bone cell differentiation. The scaffolds were realized by means of a micro-stereolithography experimental setup using Polyethylene Glycol Diacrylate of low molecular weight (PEGDA 575) as photopolymerizable material.

Mechanical properties, cytocompatibility and manifacturability PEGDA scaffolds were screened on human cells from ostosarcoma tumor cell lines. The osteogenic differentiation and mineralization were followed from human adult stem cells from osteoporotic patients and healthy donors, measuring the biochemical markers of bone formation RANK ligand and its decoy receptor osteoprotegerin (OPG).