25th Euro Dentistry Congress

September 20-21, 2017 Dublin, Ireland

Preparation and structure analysis of agarose/hydroxyapatite composites to be used as scaffold and drug release material in dental bone regeneration

Markus Witzler
Bonn-Rhein-Sieg University of Applied Sciences, Germany

The treatment of dental bone defects requires individually designed scaffolds, which should not only fill the bone void restoring at least partial stability but should preferably also induce new bone formation. Therefore, scaffolds could carry both stem cells with the capability to differentiate into osteoblasts and growth factors that induce and/or conduct osteogenic differentiation. Current approaches in scaffold engineering include composite materials consisting of both, polymers (e.g. collagen, polycaprolactone, chitosan or polysaccharides) and inorganic ceramic constituents (e.g. hydroxyapatite (HA), beta tricalcium phosphate (ß-TCP) or bio-glass). While polymers help forming light and porous biocompatible structures, ceramics improve mechanical stiffness and cell attachment. Most recent research activities include scaffolds promoting human mesenchymal stem cell (MSC) differentiation into osteoblasts incorporating various growth factors directly into the scaffolds. Additionally, purinergic receptors (P2X and P2Y) have been found to have a significant influence on the osteogenic linage commitment. Thus, osteogenic differentiation can be guided by addition of corresponding receptor ligands. The topic of this contribution is the facile scaffold preparation of natural polysaccharide agarose hydrogel and *in situ* precipitated hydroxyapatite. Agarose hydrogels are biodegradable, biocompatible and non-cytotoxic, have high water content and show high porosity. HA resembles original bone composition and provides both mechanical strength and osteo-conductivity to the agarose hydrogel. Fabricated scaffolds have been characterized via X-ray diffraction, FTIR spectroscopy and electron microscopy (SEM). Furthermore, porosity, drying and swelling behavior have been evaluated. Results of mechanical stability and first release experiments will be presented.

Notes: