Conductive vancomycin-loaded mesoporous silica polypyrrole-based scaffolds for bone regeneration - DTU Orbit (26/10/2018)

Conductive vancomycin-loaded mesoporous silica polypyrrole-based scaffolds for bone regeneration

Bone tissue engineering is considered an alternative approach for conventional strategies available to treat bone defects. In this study, we have developed bone scaffolds composed of hydroxyapatite (HAp), gelatin and mesoporous silica, all recognized as promising materials in bone tissue engineering due to favorable biocompatibility, osteoconductivity and drug delivery potential, respectively. These materials were coupled with conductive polypyrrole (PPy) polymer to create a novel bone scaffold for regenerative medicine. Conductive and non-conductive scaffolds were made by slurry casting method and loaded with a model antibiotic, vancomycin (VCM). Their properties were compared in different experiments in which scaffolds containing PPy showed good mechanical properties, higher protein adsorption and higher percentage of VCM release over a long duration of time compared to non-conductive scaffolds. Osteoblast cells were perfectly immersed into the gelatin matrix and remained viable for 14 days. Overall, new conductive composite bone scaffolds were created and the obtained results strongly verified the applicability of this conductive scaffold in drug delivery, encouraging its further development in tissue engineering applications.

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