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PERSPECTIVES AND POTENTIAL IN MEDICINE OF CHITOSAN/HYDROXYAPATITE COMPOSITES AS SELF-ASSEMBLED NANO-STRUCTURAL BONE REPAIR

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The chitosan/hydroxyapatite scaffolds could be used in bone regeneration in case the application of auto- or allografts is impossible [1J. In the present study, a series of chitosan/hydroxyapatite composites has been synthesized in the aqueous medium from the chitosan solution and soluble precursor salts by a one step co-precipitation method. The resulting material is a nano-structural material which comprises nanocrystallites of hydroxyapatite (a crystallochemical analog of the main mineral constituent ofhuman and anima! skeletal tissues) uniformly distributed in the fibers of chitosan. Structurally, it resembles the dense human or animal bone tissue. The advantage of the one-step method of synthesis is its simplicity. The bone-like structure is being self-assembled and its properties can be adjusted by varying the organic/inorganic component ratio and aging time. Macro- and mesoporosity can be also caused in the materials, which is essential if one uses these composites as bone scaffolds. Physico-chemical characterization of the materials obtained was performed using SEM, XRD and other techniques to check the morphology and crystal structure of nano-si^ed hydroxyapatite moiety. A study of in vivo behavior of the materials was then performed using model linear rats. The cylindrical-shaped rods made of the chitosan/hydroxyapatite composite materia! were implanted into tibial bones of the rats. After 5. 10. 15 and 24 days of implantation, the histological and histo-morphometric analyses of decalcified specimens were performed to evaluate the stages of the biodegradation processes. The calcified specimens were examined by scanning electron microscopy with X-ray microanalysis to compare the elemental composition and morphological characteristics of the implant and the bone during integration. The porous chitosan/hydroxyapatite scaffolds have shown osteoconductive properties and have been replaced in the in vivo experiments by the newly formed bone tissue.

1. B.M. Chesnutt et al. J. Biomed. Mate. Res. Part A, 88, 491 (2009)