

Polymer and carbon fibers with HAp nanopowder: properties and biocompatibility of degradation products

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INTRODUCTION: Biomimetic fibrous biomaterials were used in reconstructions and replacement of ligaments, tendons, hard tissues and cartilage defects. Biomaterials made from polymers and carbon phases implanted into bone tissue are generally encapsulated with fibrous tissue and become insulated from surrounding bone. Among most of biomaterials only bioactive ceramics (Bioglass, hydroxyapatite) spontaneously bonds to bone and strongly integrates with the living tissue. The goal of this work was to manufacture and to investigate bioactive carbon fibers obtained from polyacrylonitrile polymer precursor containing nanoceramic particles of HAp [1-5].

METHODS: Morphology, microstructure and chemical analysis of polymer, carbon and ceramic nanopowder (HAp) were characterized by SEM, EDS microanalysis and FTIR method. *In vitro* bioactivity test of fibers containing HAp nanoparticles was performed in SBF solution buffered at physiological pH=7.4, at 37 °C. The samples of powdered carbon fibers modified with HAp were implanted into gluteal muscles of rats. Resulting tissue reaction to implant degradation products were estimated by studying the activity of three enzymes as a function of time, acid phosphatase, NADH dehydrogenase and cytochrome c oxidase. The presence of cells involved in immunological response (macrophage, mast cells, eosinophils, neutrophils) and cells of granulation tissue was assessed in sections stained by the Pappenheim method.

RESULTS: As a result of *in vitro* activity test indicates that the surface of HAp – modified carbon fibers stimulates biomimetic growth of apatite. With *in vivo* examination we have not observed toxic reactions from rat cells and tissues resulting from the presence of degradation products of HAp- modified carbon fibers.

CONCLUSIONS

It was shown that biomimetic material in the form of ceramic modified fibers is bioactive, and its degradation products are biocompatible.

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