Microscopy of Nanoobjects
Study of biomorphic ceramics based on silicon carbide by scanning electron microscopy

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At this stage of Oral and Maxillofacial Surgery the successful treatment of defects and deformities of the cranial-facial bones is inextricably linked to active use of various types of material non-biological origin as implants. In this aspect the great interest to study of the possibility using biomorphic ceramics based on silicon carbide (SiC), developed at the Lashkaryov Institute of Semiconductor Physics NAS of Ukraine.

This material has a range of physical and mechanical properties that can be used in surgery, including major - high mechanical strength [1, 2, 3] and pass-through system channel pore size of 20 to 100 microns, which is enough to contain blood elements and regenerative cells.

An experiment was conducted on 20 white laboratory rats weighing 120-140 g.

The animals formed bone defect size 0,5×0,3 cm, into which placed implant. The animals were taken out of the experiment in terms of 7 and 30 days by an overdose of ether. These preparations were prepared by the standard method for further study by scanning electron microscopy (SEM).

Results.

Scanning electron microscopy performed 7 days after implantation demonstrated attachment of regenerative cells and blood cells on a frame biomorphic silicon carbide. This indicates the absence of cytotoxicity of material and the possibility of safe location in living tissues.

Upon completion of 1 month after implantation in bone tissue of the investigated material is determined by the full colonization of its carcass and pore a dense layer of cells of the body. This picture is proof of biocompatibility of the studied ceramics. However, the active migration to the surface of material shows that there are environment for adhesion of cells and their subsequent reproduction. In parallel, was observed infiltration of cells into the pores of the material. This is a prerequisite for the dense integration of material in bone tissue.

SEM sections the bone on the verge of contact with biomorphic silicon carbide shows the absence of its rejection and proves the integration of the investigated

material with bone tissue. In the images sometimes difficult to trace the line between biomorphic ceramics and bone. This is important because in the experiment the samples of ecoceramics specifically did not have the relevant size and forms of the defect. These same results give reason to believe about active regeneration of bone in the presence of silicon carbide.

With an increase of 200 μm is observed the similarity morphology of the material from the bone tissue, resulting in developed system of channel pore, the linear structure of the fibers.

Conclusions.

1) According to the data of SEM the biomorphic ceramics based on silicon carbide was proved bioinert and capable of colonization of living cells at implantation in bone tissue.

2) For this material is characterized by the integration from the bone tissue with no signs of rejection and distinct of the demarcation line in terms of observation 1 month.

3) In the study on the nanoscale of silicon carbide revealed the similarity to its architectonics with structural organization of bone tissue.

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2. *Zawrah M.F., El-Gazery M.* Mechanical properties of SiC ceramics by ultrasonic nondestructive technique and its bioactivity // Materials chemistry and physics. – 2007.-106.-P. 330-337.