DESCRIPTION FOR THE GENERAL PUBLIC

The aim of the project is to determine the effect of surface features of titanium material on the susceptibility to multiplication and growth of fibrous connective tissue cells. Modifications to the surface of biomaterials now offer enormous possibilities for obtaining a stable combination of the biomaterial-tissue system. The phenomenon of bone tissue accretion has already been well understood and described in the literature and has been used in clinical practice. **There is no data on the phenomenon of connective tissue accretion to the biomaterial surface and studies describing the effect of the biomaterial surface topography features on this phenomenon.**

The modification of the biomaterial surface, titanium alloy Ti6Al7Nb, will be carried out using plasma spraying technology, by applying titanium powder CP-Ti. Three sizes of grains will be used, including spherical diameters and crystal dimensions in the range of 50 μm, 100 μm, 150 μm, two types of titanium powder - regular grain spheres and irregular crystals. The use of electron microscopy and atomic forces and a contact profilometer will fully characterize and describe the mathematically obtained surface.

A cytotoxicity study of the obtained biomaterials before and after surface modification will be carried out to verify the effect of the biomaterial surface topography on the survival of fibrous connective tissue cells. This study aims to check how the material tested affects living cells and will be the basis for further in vitro studies on modified surfaces. Next, the connective tissue cells will be applied and cultured on the modified biomaterials surface to perform a comparative analysis of the modified surfaces in terms of susceptibility to cell proliferation and growth. The control of the number of living and dead cells will be performed by their chemical dyeing and analysis using fluorescence microscopy. This test will be carried out for three time moments adjusted on the basis of preliminary tests in the range of 1 to 14 days. Another issue will be to investigate the strength of the growth of the formed cell layer to the metal substrate of the sample. The test will be carried out for selected three time moments under the conditions of dynamic washing of samples in the mixer. The strength of cell growth will be determined as the decrease in the number of cells per area unit as a function of the time of sample washing at constant rotational speed. The final stage of the research will be the creation of a mathematical model by logistic regression method, which will allow to describe how the type of titanium surface affects its colonization with connective tissue cells. The number of samples not less than 100pcs is required to be applied for the said method. The project will use two types of grains in three different sizes and three time moments, which, after including the control group, makes the final number of 309 samples. The number of samples provided in the project is therefore sufficient to create a reliable mathematical model of the phenomenon under investigation.

The obtained research results will allow to determine, in quantitative and qualitative terms, the influence of individual biomaterial surface features on their susceptibility to implantation, multiplication and growth of connective tissue cells, which will contribute to the deepening of the knowledge about the processes of ingrowing titanium biomaterials. There are cases where inhibited healing processes cause inflammations and, as a result, they may lead to loosening of the titanium implant or even its rejection.