DESCRIPTION FOR THE GENERAL PUBLIC

Implantology and material engineering are the science that has become a very important branch of the biomedical industry over the past few decades. Thanks to the fact that every year new and better biomaterials are being developed, many diseases and injuries are no longer dangerous enough to permanently exclude a sick patient from social life. The ubiquitous in our lives plastic and synthetic polymers also have many applications in medicine. Not every one of us is aware of the fact that they save thousands of lives every day. Currently, polymeric biomaterials are used in plastic surgery and reconstruction surgery, they are also used as vascular prostheses and surgical sutures, intraocular lenses and surgical meshes. In addition, they also are elements of the artificial heart, catheters, head and acetabulum endoprosthesis. However, despite the many advantages that can be attributed to surgical treatment where polymeric biomaterials are used or implants are implanted, they are also related with big risk of infection within the operated site. It is important to emphasize the fact that implanted prostheses are devoid of a natural protective barrier on our immune system and are particularly susceptible to infections caused by pathogenic bacteria or bacteria that accompany the natural human skin microflora (mainly *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Escherichia coli*, *Pseudomonas* sp., *Klebsiella* sp., *Enterobacter* sp., *Bacteroides* sp. and *Candida albicans*). In such cases, the use of traditional antibiotic therapy is ineffective, and the lack of proper treatment may lead to the need for reoperation of the implant or even death of the patient. In order to increase the aseptic potential of biomaterials used in the biomedical market, prostheses coated with silver nanoparticles or antibiotics were introduced. But even they do not give full certainty that it is possible to avoid infection of the implanted biomaterial.

Due to the described problem, the aim of this project is to **obtain biomaterials whose surface will be modified by proteolytic enzyme inhibitors**, using various immobilization techniques. Selected by us molecules of protease inhibitor have confirmed antimicrobial activity and may contribute to the inhibition of bacterial and fungal proteolytic enzymes that are responsible for the vital functions of the pathogens and are their virulence factors. Scheduled in this project tasks will allow to learn about changes in the surface structure of modified biomaterials (AFM microscopy, XPS spectroscopy, TOF-SIMS), determination of kinetics of inhibitor release from biomedical materials and their stability under various environmental conditions, cytotoxicity and anti-inflammatory properties, antimicrobial potential and analysis of the formation of bacterial biofilm on their surface. The implementation of these experiments will bring us closer to understanding how immobilized proteolytic enzyme inhibitors work and whether they can become an alternative to currently used biologically active substances.