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STUDY OF ANTIBIOTICS RELEASE FROM THE TITANIUM SURFACE MODIFIED BY TITANIUM DIOXIDE NANOTUBES

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Introduction. When performing surgical interventions of varying complexity, implants based on titanium of the biocompatible grade VT 1-0 are often used [1]. However, as a result of operations, postoperative infections can occur, sometimes in a chronic form. This is one of the most frequent and serious problems in biomedical implantology. One of the options for solving this issue is the modification of titanium implants to create biocompatible coatings and upload various antibiotics. A model antibiotic, tetracycline, was used in the work. To create a prolonged release, layer-by-layer deposited polyelectrolyte membranes based on differently charged polymers are used [2].

Main part. Titanium surface modification was carried out by anodizing in ethylene glycol containing 0.25 wt.% ammonium fluoride. The second method was the ultrasonic treatment of titanium in 1M NaOH, resulting in the formation of a mesoporous titanium dioxide layer with an increased specific surface area, which contributes to a longer release of the substance. The nanotubes obtained by anodization have a more ordered structure and can release the antibiotic at a different rate. The loading of tetracycline was carried out from aqueous solutions of tetracycline with a concentration of 1 mg/ml for 24 h. The release kinetics was carried out under the action of ultrasound at a frequency of 35 kHz for 1–48 hours with the selection of aliquots, and the amount of the released substance was determined photocalorimetrically. It has been found that the antibiotic is released from the pores of nanotubes faster than mesoporous titanium dioxide.

Conclusions. The titania coatings with ordered and disordered morphology have been obtained. The tetracycline release kinetics was studied under the ultrasound action. The polyelectrolyte layers are found to prolong the tetracycline release from the modified titania.

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