BIOACTIVITY SAMPLES WITH SiO_2-Y_2O_3 CERAMIC LAYERS PRODUCED BY SOL-GEL METHOD

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Introduction
316L stainless steel is widely used in implantology, although biological complications may result from its insufficient mechanical properties and low corrosion resistance in the human body. In order to improve the corrosion resistance of 316L steel and its bioactivity, coatings are applied, e.g. ceramic layers that can improve the proliferation of living cells and barrier protection in the human body [1,2].

Materials and Methods
14.8 mm diameter samples of 316L stainless steel were used as a substrate. The application of the layers was based on the sol-gel technique. The coating solutions were obtained from tetraethoxysilane (TEOS) and yttrium(III) nitrate. As the solvent, butanol was used. Acetic acid and nitric acid were used to accelerate the reaction. The coatings were deposited using the immersion method. They were deposited in various sequences on 316L steel.
The thickness of the oxide layers was measured using SEM/Ga-FIB scanning microscope. The surface topography and shape were analyzed by SEM and also the same for distribution and morphology of MG-63 cells in the surface after 24 and 96 hours. In additionally, the proliferation analysis was carried out by using cell counting every 24 hours. However, the cytotoxicity effect was analyzed by using MTT assay every 24 hours to determine the toxicity effect of coatings to MG-63 adherent cells.

Results and Discussion
The photos showed correct morphology for MG-63 cells and their distribution was regular. The MTT test showed differences in cell proliferation on individual samples. Samples are not cytotoxic and have a good effect on cell proliferation. Electrochemical tests performed in SBF solution proved that the corrosion resistance of samples coated with SiO_2 and Y_2O_3 increased compared to uncoated 316L steel.

Conclusions
The produced sol-gel coatings of SiO_2-Y_2O_3 on 316L steel increase the barrier properties and bioactivity.

References
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