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Biological Evaluation of Some Modern Titanium Alloys for Dental Implants

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Abstract : In an attempt to find titanium alloys that fulfill the requirements for mechanical and biological compatibility, laboratory and material related tests were performed during the years, as well as preclinical and clinical trials. The multidisciplinary scientific research facilitates the global evaluation of biocompatibility and osseointegration regarding the dental implant alloys. The aim of this study was to determine the in vitro biocompatibility of three modern titanium alloys: Ti-31.7Nb-6.21Zr-1.4Fe-0.16O (wt%), Ti-36.5Nb-4.5Zr-3Ta-0.16O (wt%) and Ti-20Nb-5Ta (wt%), in order to establish whether the use of these titanium alloys can have any toxic or injurious effects on biological systems. The commonly used Ti-6Al-4V alloy was investigated as a reference material. The behavior of MC3T3-E1 pre-osteoblasts on all these four metallic surfaces was evaluated. The tests of immunofluorescence, cytotoxicity and cellular proliferation lead to the conclusion that the newly-developed titanium alloys elicit a good cellular response in terms of cellular survival, adhesion, morphology and proliferative potential as well.

Keywords : biocompatibility tests, dental implants, titanium alloys, biomedical engineering
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