

## Biocompatible Beta Titanium Alloy Ti36Nb6Ta as a Suitable Material for Bone Regeneration

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**Abstract :** Proper bone implants should promote fast adhesion of cells, stimulate cell differentiation and support the formation of bone tissue. Nowadays titanium is used as a biocompatible material capable of bone tissue integration. This study was focused on comparison of bioactive properties of two titanium alloys - beta titanium alloy Ti36Nb6Ta and standard medical titanium alloy Ti6A14V. The advantage of beta titanium alloy Ti36Nb6Ta is mainly that this material does not contain adverse elements like vanadium or aluminium. Titanium alloys were sterilized in ethanol, placed into 48 well plates and seeded with porcine mesenchymal stem cells. Cells were cultivated for 14 days in standard growth cultivation media with osteogenic supplements. Cell metabolic activity was quantified using MTS assay (Promega). Cell adhesion on day 1 and cell proliferation on further days were verified immunohistochemically using beta-actin monoclonal antibody and secondary antibody conjugated with AlexaFluor®488. Differentiation of cells was evaluated using alkaline phosphatase assay. Additionally, gene expression of collagen I was measured by qRT-PCR. Porcine mesenchymal stem cells adhered and spread well on beta titanium alloy Ti36Nb6Ta on day 1. During the 14 days' time period the cells were spread confluent on the surface of the beta titanium alloy Ti36Nb6Ta. The metabolic activity of cells increased during the whole cultivation period. In comparison to standard medical titanium alloy Ti6A14V, we did not observe any differences. Moreover, the expression of collagen I gene revealed no statistical differences between both titanium alloys. Therefore, a beta titanium alloy Ti36Nb6Ta promotes cell adhesion, metabolic activity, proliferation and collagen I expression equally to standard medical titanium alloy Ti6A14V. Thus, beta titanium is a suitable material that provides sufficient biocompatible properties. This project was supported by the Czech Science Foundation: grant No. 16-14758S.

**Keywords :** beta titanium alloy, biocompatibility, differentiation, mesenchymal stem cells

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