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Superficial nanostructures on titanium implant materials and their effect on stem cell attachment and bacterial contamination

Miklos Weszl
Budapest University of Technology, Hungary

During the past few decades a number of biomaterials have been developed as a potential implant material because of their high biocompatibility. There have also been many distinguished scientific achievements that have been translated to implant products, however, the improved biocompatibility of these implant products with stem cells has entailed them to an increased susceptibility to bacterial infections. Like in the case of any implant material biofilm formation poses a severe threat to the survival of the titanium dental implant once it has been contaminated with pathogenic bacteria. The current dental implants have a microporous surface pattern because it supports the attachment of mesenchymal stem cells (MSCs) that play a pivotal role in bone tissue formation. Our hypothesis which is based on both our and other research group's preliminary findings is that the increase of surface roughness on titanium materials to nano range may result in bactericidal attributes by contact interaction without any toxic effect on attaching MSCs. In our ongoing study we prepare nanosurfaces on various medical grade titanium materials by anodic oxidation and investigate the survival of MSCs along with the resistance the nanosurface provides against bacterial infections *in vitro*. As a result, we expect for a definite answer to the question whether medical grade titanium materials with higher surface roughness are subjected to the same risk of infection. A further result might be the determination of surface roughness needed on a titanium implant material that supports the viability of MSCs but decrease the risk of bacterial infections

Biography

Miklos Weszl has done researches in the field of bone tissue engineering for 5 years at Semmelweis University, Hungary. Recently, he is working at the Department of Material Science and Technology, Budapest University of Technology, and at the University of Szeged where he develops implant materials and biomaterials intended for bone replacement in maxillofacial surgery. Dr. Weszl is also working as a chief scientific officer for an R&D and manufacturer company that produces biomaterials for dental and maxillofacial restoration

miklos.weszl@gmail.com