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ROLE OF OSTEOCLASTS IN THE BIOCORROSION OF METAL IMPLANTS

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Mini implants (MIs), typically composed of stainless steel (SS) or titanium alloy (Ti), have recently emerged as superior alternatives to traditional dental and orthopedic implants. When a metal implant is inserted into bone, a process called bone remodeling is triggered near the implant. Bone remodeling involves the activity of osteoblasts (OBs), which produce new bone tissue, and osteoclasts (OCs), which degrade and digest bone. OCs degrade bone by acidifying the extracellular environment and secreting hydrolytic enzymes that degrade the extracellular matrix. However, the acidification of the extracellular environment can potentially lead to the biological corrosion of metal implants after implantation. This may have important consequences such as cell toxicity, decreased osseointegration of the implant, and implant loosening. The objective of this study is to determine if implants made from Ti are more resistant to OC-mediated biocorrosion than stainless steel (SS) implants. We hypothesize that biocorrosive activity by OCs will be greater on SS than titanium. To assess the biocorrosive effects of OCs on SS and Ti, the top face of 150 µm thick sections of each metal were scanned using a Proscan 2000 Scantron to provide accurate three dimensional surface measurements of the metals before introduction of OCs. OC precursors were isolated from the bone marrow of C57/bl6 mice and differentiated with macrophage colony stimulating factor and receptor activator of NF-kappaB ligand for 7 days in the presence of either SS or Ti metals. The metals discs were then removed and rescanned with the Proscan Scantron and changes in the surface measurements before and after OC growth was calculated. OCs were fixed and stained for tartrate-resistant acid phosphatase, a marker of mature OCs, and counted. Our preliminary findings revealed that the surface roughness of SS was reduced to a greater extent than Ti metals. OC number was also reduced in cultures containing SS compared with Ti. These findings suggest SS may be more susceptible to OC-mediated biocorrosion than Ti-based metal implants. Although the physiological implications are unclear, we speculate that sustained corrosion of SS can negatively affect the long-term stability of implants *in vivo*.

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