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Device-free generation of hydrogen peroxide for promoting angiogenesis by coupling Mg and Ti alloy

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It is well known that appropriate level of reactive oxygen species (ROS) can promote angiogenesis in biological systems. Although the application of ROS has been extensively studied *in vitro* and in vivo to stimulate the new vessel formation, those systems employ external stimuli such as light or electrical energy to produce ROS via photocatalytic or electrochemical reactions, which limits their clinical applications. Here, two different types of biocompatible metals were used to construct a novel device-free electrochemical system that can spontaneously generate H2O2 without any external light or electric current. The corrosion of Mg generates electrons which can be transferred to oxidized Ti in an energetically favorable process, and consumed for the generation of H2O2 in an oxygen reduction reaction (ORR). Combined spectroscopic and electrochemical analyses revealed the occurrence of ORR at the surface of titanium, the main materials of the conventional medical implants. The controlled generation of H2O2 noticeably enhanced *in vitro* angiogenesis even in the absence of growth factors. A prototype titanium-magnesium implant was suggested, and its potential for promoting *in vitro* angiogenesis was demonstrated.

Biography

Myoung-Ryul Ok has completed his PhD in 2013 from University of North Carolina at Chapel Hill (Materials Science) for his works covering softlithographic nano/micro patterning and solar energy harvesting. Since 2014, he has been investigating biomaterials and new biomedical devices at the Korea Institute of Science & Technology (KIST) as a Senior Research Scientist. He is pursuing new biomedical technologies by incorporating different fields, e.g. nanomaterials, energy systems, biodedical engineering, etc.

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