ABSTRACT

Current metallic orthopedic implants include stainless steel, titanium, and cobalt-chromium based alloys. Although these materials are effective in securing fractures, they also possess many disadvantages. They can slowly break apart into toxic ions which can lead to local inflammation. Moreover, they require a second surgical procedure for removal after they have served their purpose. Magnesium (Mg) alloys are a great alternative to these metallic implants. They are biocompatible, biodegradable, and can promote new bone growth. Moreover, their light weight and mechanical resemblance to bone make them an ideal material for orthopedic implant applications. However, their rapid degradation in the physiological environment is a major obstacle. In this study, pure Mg, AZ31 (3% aluminum, 1% zinc), and Mg-4Y (4% yttrium) were tested to determine the rate of degradation. Each screw was submerged in 3mL of phosphate buffered saline (PBS). 1 x PBS was used for the first 15 days of the study. 10 x PBS was used from 17 days through 31 days. Of the three metals, Mg-4Y was the first to completely degrade. Large pieces began to break off making it the fastest degrading screw we tested. AZ31 showed the best improvement in degradation, followed closely by pure Mg.

MENiORS

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Our research goal is to develop fully biodegradable medical implants that will eliminate the need for secondary surgeries for implant removal, funded by a National Science Foundation BRiGE award. Tejas worked with my graduate student Maria Iskandar as a team to study the degradation of a group of novel magnesium-based resorbable interference screws in physiological fluids. His results provide implant guidelines for designing next-generation biodegradable implants. Tejas is self-motivated and determined to accomplish the project goal. I am impressed by Tejas’s research capability, hard work, and professional communication skills. He presented his research results at the UCR Symposium for Undergraduate Research, Scholarship, and Creative Activity, and his work will also lead to a research article to be published in a scientific journal. In my observation of Tejas, I know that his initiative, enthusiasm, and hard work prepares him well for success in future research. He asks important research questions, and thinks about them actively. He always participates our group meetings, and presents his research progress in a professional and scientific way. Tejas has learned the exciting aspects of scientific research and has decided to apply for graduate school.

A copy of this paper in its entirety can be found online at

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