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In vivo Study on Degradation Behavior and Histologic Response of Pure Magnesium in Muscles

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When an orthopedics device is implanted into bone injury site, it will contact the soft tissue (skeletal muscle, fascia, ligament etc.) except for bone. Magnesium based biodegradable metals are becoming an important research object in orthopedics due to their bioactivity to promote bone healing. In this study, pure Mg rods with and without chemical conversion coating were implanted into the muscle tissue of rabbits. Implants and their surrounding tissues were taken out for weight loss measurement, cross-sectional scanning electron microscopy observation, elemental distribution analysis and histological examination. The results showed that the chemical conversion coating would increase the in vivo corrosion resistance of pure Mg and decrease the accumulation of calcium (Ca) and phosphorus (P) elements around the implants. For the bare magnesium implant, both Ca and P contents in the surrounding tissues increased at the initial stage of implantation and then decreased at 12 weeks implantation, while for the magnesium with chemical conversion coating, Ca and P contents in the surrounding tissues decreased with the implantation time, but were not significant. The histological results demonstrated that there was no calcification in the muscle tissue with implantation of magnesium for up to 12 weeks. The chemical conversion coating not only increased the in vivo corrosion resistance of pure Mg, but also avoided the depositions of Ca and P in the surrounding tissues, meaning that pure magnesium should be bio-safe when contacting with muscle

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