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Biocompatibility and biodegradation response of synthesized Mg-Zn-Ca alloys on viability of adipose derived mesenchymal stem cells

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Magnesium (Mg) based alloys have been extensively considered for their use as biodegradable implant materials. However, controlling their corrosion rate in the physiological environment of the human body is still a significant challenge. One of the most effective approaches to address this challenge is to carefully select alloying compositions with enhanced corrosion resistance when designing the Mg alloys. In this study ternary Mg-2 wt.% Zn-xCa (x=1, 2 and 3 wt.%) alloys as biodegradable magnesium alloys were studied. The microstructures of the alloys were examined with optical microscopy, Scanning Electron Microscopy (SEM), X-ray diffraction (XRD) examinations as well as potentiodynamic polarization (PDP). Biocompatibility of mentioned alloys performed with indirect MTT viability test according to ISO 10993-5:2009 standard. The microstructural examinations demonstrated that by addition of 1, 2 and 3 wt.% Ca, the grain size reduced from 807 μm for Mg-2Zn to 86, 36 and 17 μm , respectively. Mg-2Zn has the least corrosion potential and current density among all groups ($E_{\text{corr}} = -1.56$ and $i_{\text{corr}} = 152 \mu\text{A cm}^2$) due to well solubility of Zn; however, among Mg alloys which contain Ca content, the best corrosion properties related to Mg-2Zn-1Ca alloy ($E_{\text{corr}} = -1.57$ and $i_{\text{corr}} = 195 \mu\text{A/cm}^2$). The viability results indicate that Mg alloys extract have no significant toxicity effect on adipose derived mesenchymal stem cells (ASCs) viability; however the viability increased in Mg-2Zn-1Ca group. Also, direct ASCs culturing on the surface of Mg alloys represented good attachment and proliferation.

Biography

Kobra Tahermanesh has completed her Medical degree from Shiraz University of Medical Sciences and graduated first Fellowship of Minimally Invasive Gynecology Surgery from Tehran University of Medical Sciences, Iran. She is an Assistant Professor of Iran University of Medical Sciences and Director of a research team focusing on bio-instruments and biodegradable implants for tissue engineering. She has a knowledge-based company in field of biomedical and tissue engineering. She is interested to work on interdisciplinary basic sciences and bio-engineering researches and do her best to connect the medical and engineering scientists to each other.

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