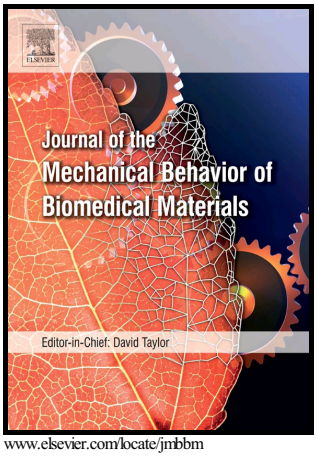

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Carbon dots intensified poly (ethylene glycol)/chitosan/sodium glycerophosphate hydrogel as artificial synovium tissue with slow-release lubricant

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The ultra-high molecular weight polyethylene (UHMWPE) and metal artificial joint pair is limited by wear debris and short service life. Here we report the development of a hydrogel which exhibits lubricant release to intensify the lubrication effect of artificial joints.This study adopted an injectable method to prepare carbon dots/poly (ethylene glycol)/chitosan/sodium glycerophosphate (CDs/PEG/CS/GP) composite hydrogel, and the carbon dots were used to intensify the rheological and mechanical properties. In addition, the composite hydrogel had slow-release properties, and the release solution contained CDs, PEG and GP has excellent lubrication effect. At last, the MTT assay, LIVE/DEAD staining, H&E staining results and safety evaluation in BALC/c mice proved that the hydrogels had good biocompatibilility and were safety for application in vivo.

Key words: carbon dots, lubricant, slow-release, fluorescent

1 Introduction

The arthroplasty brings the well-being to the patients, but the synovium tissue was removed after joint replacement surgery and the body fluid became the only lubrication solution which showed limited lubricating ability (Bruce and Walmsley, 1937). Ultra-high molecular weight polyethylene (UHMWPE) has been used in joint replacements as a bearing material for five decades (Deng and Xiong, 2015). However, the wear debris will be produced by the wear of UHMWPE, and more excessive microscopic wear debris will be generated by prosthetic joint into the joint space due to the poor lubrication effect of body fluid, and the UHMWPE wear debris further caused the inflammatory and osteolysis (Gupta et al., 2007; Jacobs et al., 2001; Muratoglu et al., 2005). In addition, the aseptic loosening phenomenon was triggered by the UHMWPE wear debris in artificial joint replacement (Collins et al., 2013; Guo et al., 2017; Jiang et al., 2013;

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