

Injectable nano-amorphous calcium phosphate based in-situ gel systems for treatment of periapical lesions

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Abstract

Nonsurgical local treatment of a periapical lesion arising from trauma or bacterial infection is a promising innovative approach. The present study investigated the feasibility of developing injectable amorphous calcium phosphate nanoparticles (ACP NPs) and ACP NPs loaded with an anti-inflammatory drug; ibuprofen (IBU-ACP NPs) in the form of thermoreversible in situ gels to treat periapical lesions with the stimulation of bone formation. NPs were produced by a spray-drying technique. Different formulations of Poloxamer 407 were incorporated with/without the produced NPs to form injectable gels. A drug release study was carried out. A 3 month in vivo test on a dog model also was assessed. Results showed successful incorporation of the drug into the NPs of CP during spray drying. The particles had mean diameters varying from 100 to 200 nm with a narrow distribution. A drug release study demonstrated controlled IBU release from IBU-ACP NPs at a pH of 7.4 over 24 h. The gelation temperature of the injectable in situ gels based on Poloxamer 407 was measured to be 30 °C. After 3 months of implantation in dogs, the results clearly demonstrated that the inclusion of ACP NPs loaded with IBU showed high degrees of periapical bone healing and cementum layer deposition around the apical root tip.

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