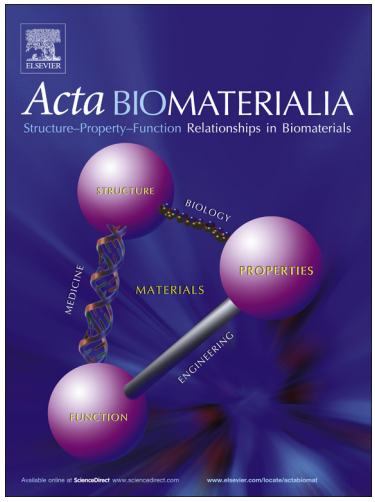

Full length article

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Injectable *in situ* forming gel based on lyotropic liquid crystal for persistent postoperative analgesia

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Abstract

Local anesthetics have been widely used for postoperative analgesia. However, multiple injections or local infiltration is required due to the short half-lives of local anesthetics after single injection, which results in poor compliance and increasing medical expense. In this study, an *in situ* forming gel (ISFG) based on lyotropic liquid crystal was developed to deliver bupivacaine hydrochloride (BUP) for long-acting postoperative analgesia. BUP-ISFG was designed to be administrated as a precursor solution which would spontaneously transform into gel with well-defined internal nanostructures for sustained drug release at the site of administration when exposed to physiological fluid. A lamellar-hexagonal-cubic phase transition occurred during the *in situ* gelation. The lamellar phase of the precursor solution endows it with low viscosity for good syringeability while the unique nanostructures of hexagonal and cubic phases of the *in situ* gel provide sustained drug release. Persistent analgesia effect *in vivo* was achieved with BUP-ISFG, and the plasma BUP concentration was found to be steadier compared to commercially available BUP for injection. In addition, the ISFG displayed acceptable biocompatibility and good biodegradability. The findings are positive about ISFG as a sustained release system for persistent postoperative analgesia.

Key words

Lyotropic liquid crystal; *in situ* forming gel; phase transition; postoperative analgesia; local anesthetics.