J Control Release. 2016 Nov 28;242:16-24. doi: 10.1016/j.jconrel.2016.09.007. Epub 2016 Sep 14.

Improved topical delivery of tacrolimus: A novel composite hydrogel formulation for the treatment of psoriasis.

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Abstract

We have developed a composite hydrogel for improved topical delivery of the poorly soluble drug Tacrolimus (TAC) to psoriasis lesions. TAC is efficiently solubilized in methoxy poly-(ethylene glycol) hexyl substituted poly-(lactic acid) (mPEGhexPLA) based nanocarriers. For convenient and patient-friendly topical administration, TAC loaded polymeric nanocarriers were incorporated in a Carbopol® based hydrogel, to yield a composite hydrogel formulation (TAC composite hydrogel). TAC composite hydrogel was designed to have superior pharmaceutical formulation properties, delivery efficiency and local bioavailability, compared to currently available paraffin-based TAC ointments. Composite hydrogel formulations had good local tolerance and showed no signs of immediate toxicity after repeated topical administration in healthy mice. Skin delivery of TAC composite hydrogel in an imiquimod-induced psoriasis mouse model was found to be twice as high as for the commercial formulation Protopic™, used as benchmark. TAC composite hydrogel showed significant improvement in the in vivo and histopathological features of the imiquimod-induced psoriasis model.