Hydrogel-forming microneedle arrays: Potential for use in minimally-invasive lithium monitoring

Eyman Mohamed Eltayib[1,2], **Ryan F Donnelly**[3] and **James C McElnay**[3]
[1]Ahfad University for Women, Sudan
[2]Alneelain University, Sudan
[3]Queen's University Belfast, United Kingdom

This work describes hydrogel-forming microneedle (s) (MN) arrays for minimally-invasive extraction and quantification of lithium *in vitro* and *in vivo* for the first time. MN arrays, fabricated from aqueous blends of hydrolyzed poly (methyl-vinyl ether-co-maleic anhydride) and crosslinked by poly (ethyleneglycol), imbibed interstitial fluid (ISF) upon skin insertion. Such MN were always removed intact. In vitro, mean detected lithium concentrations showed no significant difference following 30 min MN application to excised neonatal porcine skin for lithium citrate concentrations of 0.9 and 2 mmol/l. However, after 1 h application, the mean lithium concentrations extracted were significantly different, being appropriately concentration-dependent. In vivo, rats were orally dosed with lithium citrate equivalent to 15 mg/kg and 30 mg/kg lithium carbonate, respectively. MN arrays were applied 1 h after dosing and removed 1 h later. The two groups, having received different doses, demonstrated no significant difference between lithium concentrations in serum or MN. However, the higher dosed rats demonstrated a lithium concentration extracted from MN arrays equivalent to a mean increase of 22.5% compared to rats which received the lower dose. Hydrogel-forming MN clearly have potential as a minimally-invasive tool for lithium monitoring in outpatient settings. Future research will focus on correlation between serum and MN lithium concentrations.

Biography

Eyman Mohamed Eltayib is Assistant Professor of Pharmaceutics at School of Pharmacy, Ahfad University for Women and Head of Pharmaceutics Department Faculty of Pharmacy, Alneelain University. She has received her Bachelor in Pharmacy from Faculty of Pharmacy, University of Khartoum (2004) and Master's degree in Clinical Pharmacology from Faculty of Pharmacy, University of Medical Sciences and Technology (2008). Her PhD in Pharmacy from School of Pharmacy, Queen's University of Belfast (2016) under the supervision of Professor Ryan F Donnelly.

eeltayib01@qub.ac.uk

Notes: