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Electrically assisted transdermal drug delivery of Ovalbumin

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The poor oral bioavailability of proteins requires that they be administered mainly by parenteral routes. Moreover, the short plasma half-lives of these drugs means they typically require repeated injection, leading to poor patient compliance. These factors have lead to the search for novel delivery methods, such as transdermal administration through intact skin. Skin is an appealing site for systemic delivery of active pharmaceutical ingredients. However, the stratum corneum, which is the outermost layer of the skin, acts as the principal barrier for penetration of most drugs. Therefore, microneedle (MN) arrays will be combined with iontophoresis (IP) in order to enhance delivery of drugs across the skin. The primary aim of this study was to evaluate the ability of super swelling hydrogel MN arrays coupled with IP to facilitate the transdermal delivery of a model protein, OVA from electro-responsive patch. Super swelling hydrogel forming MN arrays, containing aqueous blends of 20% w/w Gantrez® S97 and 7.5% w/w PEG 10,000 were prepared by diluting the 40% w/w Gantrez® S97 stock solution and mixing it with the required amount of PEG 10,000 solution and subsequently 3% w/w Na_2CO_3 added. Electro-responsive patches containing OVA were prepared using a casting method, from aqueous blends containing 10% w/w Gantrez® AN139 and 5% w/w tripropylene glycol methyl ether (TPM). The drug reservoir film mediated electrically responsive drug delivery was physically and electrically characterized using a suite of techniques, such as thermal analysis (mDSC), tensile testing (texture analyzer). Altering patch formulation e.g. changing the casting gel pH produced substantial alteration in physicochemical properties of films. The feasibility of super swelling hydrogel MN arrays to deliver OVA form electro-responsive patch was evaluated *in-vitro*. *In-vitro* OVA delivery experiments were performed using the Franz cell apparatus. All samples were analysed using ELISA. The *in-vitro* OVA permeation experiments indicated that super swelling hydrogel MN arrays with electro-responsive OVA loaded patch capable of providing a sustained transdermal OVA delivery over a 24 hours period. Furthermore, the synergistic effect of MN and iontophoresis arrays led a two-fold enhancement in the cumulative amount of insulin permeating across neonatal porcine skin after 6 hours. In addition, it was found that the electrically responsive nature of these super swelling hydrogel MN and patches led to a dramatic increase in OVA transport when such systems were combined with IP.

Biography

A Zaidalkilani is an Assistant Professor at Faculty of Pharmacy, Zarqa University, Zarqa, Jordan. Now, she is a Head of pharmaceutical science department. She completed her PhD in drug delivery and pharmaceutical technology at the Faculty of Pharmacy, Queen's University of Belfast, Belfast, UK in October 2013. She has published more than 6 papers in reputed journals.

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