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MicropatchTM solid dose skin delivery system

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VERSION

AM (Accepted Manuscript)

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Cheung, Karmen, Dewan F. Chowdhury, and Diganta Bhusan Das. 2015. "Micropatchtm Solid Dose Skin Delivery System". figshare. <https://hdl.handle.net/2134/18598>.

MICROPATCH™ SOLID DOSE SKIN DELIVERY SYSTEM

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Abstract - The Micropatch™ solid dose skin delivery device combines the use of a solid stainless steel microneedle and the insertion of a solid drug loaded pellet which is inserted into the skin to the desired depth. Results showed that the solid dose injector is an efficient method to allow complete release of diclofenac sodium after 10 minutes

INTRODUCTION

The administration technique of the Micropatch™ allows a drug dosage form ranging from several hundred microns to several millimetres to be inserted into the skin in a rapid user-independent manner [1]. The principle of the device is based upon the initial insertion of a super sharp stainless steel needle to breach the tough outer barrier of the skin, followed by a secondary drug carrier which contains the drug dosage form. The device allows the drug formulation to be inserted efficiently into the skin at any specified depth. The Micropatch™ device differs to conventional microneedle technology techniques such as the 'poke and patch', 'coat and poke' or biodegradable microneedles and can overcome the disadvantages and limitations associated with these techniques [2-5]. This includes the ability of the Micropatch™ to deliver a defined drug loading in to the skin, eliminating the poor reproducibility of dosing associated with large array microneedle patches. The instantaneous administration of the drug minimises the residual time required for the needles to be inside the skin, and therefore can lead to less irritation and therefore reduced user discomfort.

MATERIALS AND METHODS

Diclofenac sodium was used as the model drug to be used in conjunction with the Micropatch™ device has been developed in conjunction with Nemauro Pharma Limited (Loughborough, UK). A diclofenac sodium pellet was inserted into full thickness porcine skin using the Micropatch™ device and a series of images taken (Fig. 1). Dissolution of the pellet was also conducted.

RESULTS AND DISCUSSION

The results (Fig. 1) show that the Micropatch™ was able to successfully insert the pellet to a penetration depth of 2 mm from the base of the Micropatch™. The porcine skin was shown to reseal after 30 minutes (as shown in Fig. 1. Image H). The dissolution study showed that a total drug release of diclofenac sodium occurred after 10 minutes (Fig. 2).

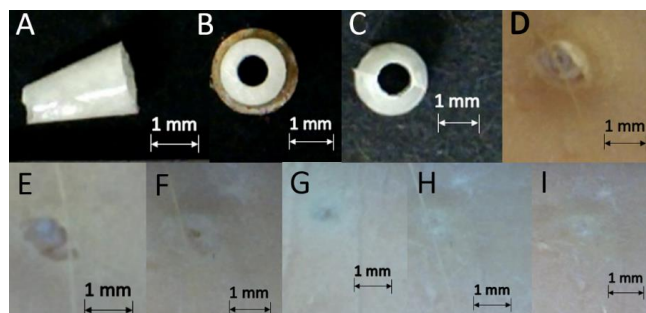


Fig. 1. A shows the side view of the pellet, length: 2.35 mm, B: Top view (wall thickness at maximum: 0.4 mm) and C: underside of the tip. D: Insertion depth of 1 mm from Micropatch™ base, E: Insertion depth of 1.5 mm from Micropatch™ base, F: Image of skin after 10 minutes at a total insertion depth of 2 mm from Micropatch™ base, G: insertion after 20 minutes, H: after 30 minutes (closure of skin) and I after 1 hour, using a USB microscope.

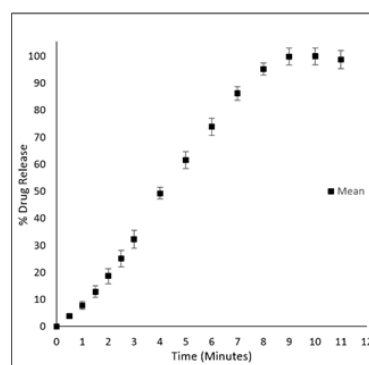


Fig. 1. Dissolution showing 100% drug release after 10 minutes

CONCLUSIONS

The results indicated that the Micropatch™ can be used as a new delivery system for diclofenac sodium and other biotherapeutics. The delivery of various sized pellets can also be conducted by tailoring the Micropatch™ device.

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