Depot-Forming Dissolving Microarray Patches for the Non-invasive Delivery of a Model Hydrophobic Drug

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Background: Prolonged release dosage forms are becoming increasingly attractive to scientists due to their ability to provide continuous release of medications following their administration. This increases patients' compliance to their treatment regimens and thus improve their quality of life. However, to achieve prolonged release over more than 24 hours, injections or implants are required. Those techniques are invasive and difficult to terminate upon the development of toxic or adverse events. Therefore, in this project, microarray patches (MAPs) containing a model hydrophobic drug; atorvastatin (ATR), are being developed to deposit a therapeutic dose intradermally to provide a sustained release over a prolonged period.

Methods: Dissolving MAPs were fabricated in a bilayer-casting technique. The first layer consisted of ATR-containing Poly(vinylalcoho)l (PVA) 9-10 K and Poly(vinylpyrrolidone) (PVP) 29-32 K blends. The second layer comprised of PVP K 90 and glycerol. Those MAPs were firstly characterised in terms of their mechanical strength, drug content, and *in situ* insertion efficiency. Afterwards, *ex-vivo* skin deposition studies for 4 & 24 hours was conducted using Franz-cells set up to quantify ATR amount deposited in the skin after using those MAPs.

Results: MAPs were found to contain a mean of 5.15 ± 0.4 mg of ATR/MAP. Their tips were able to dissolve within 60 minutes *in situ* and were completely inserted into porcine skin. Skin deposition studies showed that 1.3 ± 0.1 mg ATR was deposited in the skin 24 hours after MAPs application. Furthermore, 0.8 ± 0.4 mg ATR was quantified in the receiver compartment of Franz-cells. Therefore, the total amount of ATR delivered was found to be 2.0 ± 0.33 mg after 24 hours, which represents 38.7 ± 6.7% of the initial amount loaded per MAP

Conclusions: Those findings demonstrate the efficiency of MAPs to successfully deposit hydrophobic ATR intradermally for its subsequent release. Oral bioavailability of ATR after 40 mg oral dose was found to be 14%, thus, the amount delivered from one MAP over 24 hours transdermally might be therapeutically sufficient. Future *in vivo* study to be conducted to evaluate ATR delivery over two weeks