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DELIVERY OF NANOSUSPENSIONS INTO THE SKIN USING NEEDLE-FREE JET INJECTOR

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Needle-free liquid jet injectors (NFI) are devices that use a high-speed stream of fluid to deliver pharmaceutical molecules across the skin into the intradermal, subcutaneous or intramuscular region without the use of a needle [1]. The nanocrystal technology can be used to improve local bioavailability and efficacy of poorly water soluble drugs, minimizing the side effects. Nanocrystals can be defined as nanoparticles of pure drug without any matrix material with an average diameter below 1 µm, suspended in a water and/or water-miscible solvent phase and stabilized using surfactants or polymers [2]. The aim of the present study was to investigate the ability of the NFI to deliver drug nanocrystals across the skin. Diclofenac acid (DCF), one of the most powerful and commercially successful non-steroidal antinflammatory drugs, was used as a model poorly water-soluble drug. The formulations were prepared using a wet ball media milling technique, using Poloxamer 188 as stabiliser. Characterisation was carried out by dynamic light scattering (DLS), Environmental Scanning Electron Microscope (ESEM) and high pressure liquid chromatography (HPLC). Solubility studies and in vitro release studies were carried out after injecting the formulation across newborn pig skin, in order to study any changes in the physicochemical properties of the DCF nanocrystals and their release profile. DCF nanocrystals exhibited a mean diameter of approximately 360 nm and a low polydispersity index (~0.21). The formulation was successfully delivered into the skin using a NFI. In vitro studies revealed that the increased solubility of the DCF nanocrystals was not influenced by the injection, providing a prolonged release in the subcutaneous district for 24 hours. This study showed that NFI might be used to deliver drug nanosuspensions across the skin, without affecting their morphology, properties, and release profile.

References:

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