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Advancements in formulation and investigation of innovative foam-based *in situ* film-forming systems

Fanni Falusi, Szilvia Berkó, Anita Kovács

Institute of Pharmaceutical Technology and Regulatory Affairs, University of Szeged, Szeged, Hungary

In pharmaceutical development, various dermal formulations, including innovative formats like foams and *in situ* film-forming systems, are available. These systems can be employed in different forms, composed of both volatile and non-volatile components. Upon application, the formulation comes into contact with the skin, with the volatile component evaporating, leaving an in situ-formed film on the skin surface. Their application is aesthetic, featuring good adhesion without stickiness or greasy sensation on the skin, enhancing patient adherence [1].

In our work, among the initial drug forms, the preference lies with the foam formulation due to its numerous advantageous properties, such as rapid and convenient application, suitability for extensive or hair-covered areas, and applicability on sensitive and wounded skin surfaces. Foams exhibit excellent spreading capability on the skin, eliminating the need for intensive rubbing [2].

This research aimed to formulate innovative, dermally applied, foam-based *in situ* film-forming systems, studying their physicochemical properties, and determining drug release and skin permeation for the formulation containing diclofenac sodium.

The testing methods included the study of film flexibility, skin adhesion, and burst strength using a texture analyzer. Within the biopharmaceutical studies, a closed Franz diffusion cell was used to determine the drug release *in vitro* and then Raman spectroscopy was applied to investigate the presence of diclofenac sodium in different layers of the skin *ex vivo*.

The rise in chronic skin diseases underscores the need for innovative dermal forms, where foam-based film systems hold significant potential for both pharmaceutical and cosmetics industries.

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