ABSTRACT

Saylam, N. (2026). Development of Topical Gel Formulations Containing Ivermectin-Loaded Microemulsions for Psoriasis and Evaluation of Their In Vitro Efficacy. İstanbul University, Institute of Health Science, Department of Pharmaceutical Technology. PhD Thesis. Istanbul.

Psoriasis is a chronic inflammatory skin disease that significantly impairs patients' quality of life, while current therapeutic options have notable limitations. In this thesis, the topical therapeutic potential of ivermectin, an agent with anti-inflammatory properties, was investigated, and microemulsion-loaded gel formulations were developed to enhance its effectiveness. First, an analytical HPLC method for ivermectin was developed and validated. The solubility of ivermectin in various formulation components was evaluated, and optimal microemulsion regions were identified using the phase titration method. Microemulsion formulations were prepared, loaded with ivermectin, and characterized in terms of physicochemical properties, including pH, electrical conductivity, particle size, and stability. Selected microemulsions were incorporated into a hydrogel matrix to obtain topical gel systems. In vitro release studies demonstrated controlled release behavior. The formulations exhibited nanometer-sized droplets, low polydispersity indices, and skin-compatible pH values, while the gels showed pseudoplastic flow behavior and suitable mechanical properties for topical application. *In vitro* cytotoxicity studies revealed no toxic effects on HaCaT cells, and a significant reduction in TNF-α expression was observed in an LPS-induced psoriasis model. *Ex vivo* skin permeation studies confirmed that ivermectin did not reach systemic circulation and achieved targeted accumulation within skin layers. Dermal irritation tests indicated that the formulations were non-irritant. Stability studies demonstrated that refrigerated conditions were the most appropriate storage environment, under which the formulations maintained their physicochemical stability. Overall, this study presents a safe, effective, and stable microemulsion-loaded gel system and supports its potential as a novel topical therapeutic approach for psoriasis.

Key Words: Psoriasis, Ivermectin, Microemulsion, Topical gel, Skin penetration

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