**Topical Nano Hydrogel of Apremilast for Psoriasis Therapy: A Novel Drug Delivery Approach**

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**Abstract:** Psoriasis, a chronic autoimmune skin condition, affects millions globally. Topical therapies are preferred due to localized action and reduced systemic side effects. Apremilast, a PDE4 inhibitor, is effective in managing psoriasis but has limited skin permeability and poor solubility. This study explores nano formulations-nano emulsions and nanostructured lipid carriers (NLCs)-to enhance topical delivery of Apremilast. Optimized formulations were evaluated for size, stability, entrapment efficiency, and in vitro drug release. Incorporating these into hydrogels resulted in effective, stable topical systems with enhanced drug retention. This approach offers a promising alternative to oral Apremilast therapy [[1]](Pradhan%20M%20et%20al.,%20“Calcipotriol-loaded%20Nanostructured%20Lipid%20Carrier%20Gel%20for%20Topical%20Treatment%20of%20Psoriasis,”%20Drug%20Delivery,%202017.).

**1. Introduction:** Psoriasis is characterized by hyperproliferative keratinocytes and inflammation. Existing therapies have limitations including systemic toxicity and poor patient compliance [[2].](file:///Agrawal%20Y%20et%20al.,%20“Methotrexate-loaded%20Nanostructured%20Lipid%20Carrier%20Gel/%20Formulation%20and%20Evaluation,”%20Journal%20of%20Drug%20Delivery%20Science%20and%20Technology,%202020) Apremilast is currently administered orally, causing gastrointestinal and psychiatric side effects. A topical nano drug delivery system (NDDS) can potentially enhance efficacy and reduce adverse events [[3].](Rapalli%20VK%20et%20al.,%20“Formulation%20of%20Curcumin%20Loaded%20Nanostructured%20Lipid%20Carriers%20for%20Topical%20Treatment%20of%20Psoriasis,”%20Drug%20Development%20and%20Industrial%20Pharmacy,%202019.)

**2. Materials and Methods:** Apremilast-loaded nano emulsions were prepared using spontaneous emulsification, and NLCs using melt emulsification with sonication [[4].](Viegas%20JS%20et%20al.,%20“Co-delivery%20of%20Tacrolimus%20and%20siRNA%20Using%20Multifunctional%20NLC%20for%20Psoriasis%20Therapy,”%20European%20Journal%20of%20Pharmaceutics%20and%20Biopharmaceutics,%202021.) Optimizations were carried out using D-optimal and Box-Behnken designs. Formulations were assessed for particle size, zeta potential, drug content, and in vitro release. Selected formulations were incorporated into hydrogels and evaluated for viscosity, spread ability, skin retention, and stability [[5].](Gupta%20A%20et%20al.,%20“Hydrogel%20Incorporating%20Methotrexate-loaded%20Nanostructured%20Lipid%20Carrier%20for%20Anti-psoriatic%20Activity,”%20Journal%20of%20Pharmaceutical%20Sciences,%202018.)

**3. Results and Discussion:** Optimized nano emulsion and NLC formulations showed desirable physicochemical properties: nano-range particle size, good entrapment efficiency, and sustained drug release [[6].](Celgene%20Corporation.%20Otezla®%20(Apremilast)%20Prescribing%20Information.%20U.S.%20FDA.) Hydrogels containing these nano formulations exhibited improved skin retention and stability under accelerated conditions [[7].](National%20Psoriasis%20Foundation.%20Treatment%20Options%20for%20Psoriasis.%20www.psoriasis.or)

**4. Conclusion:** Topical nano hydrogel formulations of Apremilast represent a viable approach for psoriasis treatment, addressing solubility and permeability challenges. This strategy offers enhanced drug localization, patient compliance, and minimized systemic exposure.

**5. References:**

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