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Development and Optimization of Nanostructured Lipid Carrier-Enriched Cream for Topical Delivery of Betamethasone Valerate

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Nanostructured lipid carriers (NLC) for topical delivery of betamethasone valerate (BMV) were designed by solvent diffusion technique using response surface methodology (with 3 level factorial design and quadratic model).In the present study, the selected independent variables were the lipid composition (ratio of glycerylmonostearate:oleic acid) and surfactant concentrationas formulation variable and sonication time as a process variable. The dependent variables were the drug entrapment efficiency and drug loading within NLCs. The physicochemical attributes of NLCs were assessed using transmission electron microscopy, scanning electron microscopy and differential scanning calorimetry. The resultant NLCs were also characterizedfor size, zeta potential, encapsulation efficiency and drug release profile. The optimized BMV NLCs were nearly spherical and smoothand a mean particle size of 390.8nm, zeta potential of 26.7 mV and entrapment efficacy of 86.84% were obtained for BMV-loaded NLC. The NLCs were incorporated in 0.1% w/w stearic acid cream base and in vitro skin deposition studies in goat ear skin were conducted. Significantly higher deposition of drug rate was found in goat ear skin from BMV NLC cream (32 µg) as compared to betamethasone valerate plain cream (20 µg). These findings provide supplementary evidences that nanolipidcarriers have a targeting and prolonged release profile that can findpotential applications in designing future BMV therapy strategies for skin diseases.

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