

## **Formulation and Characterization of Microemulsion Based Hydrogel for topical drug delivery system**

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### **Abstract**

The aim of the present investigation was to develop a microemulsion based hydrogel (MBH) formulation for topical delivery with an objective to increase the solubility and skin permeability of Nitrofurazone which is an antibacterial agent. The study was also undertaken to overcome the drawbacks associated with oral drug delivery systems such as poor solubility of drugs, drug degradation in gastric environment, hepatic first pass metabolism and gastrointestinal irritation. On the basis of solubility study, Isopropyl myristate, tween 80 and PEG 400 were selected as oil, surfactant and co-surfactant respectively for preparation of microemulsion. Pseudoternary phase diagrams were constructed at various tween 80 and PEG 400 ratios. The 3:1 ratio represented greater area of microemulsification. Hence, it was selected for preparation of microemulsion. The prepared microemulsion was optimized on the basis of droplet size, zeta potential, drug release. The optimized microemulsion was further evaluated for % transmittance, dilutability, pH, viscosity, conductivity, drug content and stability study. The HPMC (Hydroxy Propyl Methyl Cellulose) K100M (2%) was slowly mixed with optimized microemulsion under stirring for the preparation of MBH. The developed MBH contained Nitrofurazone (0.2%, 2 mg/gm), Iso propyl myristate (6.25%w/w), tween 80

and PEG 400 (55%w/w, 3:1), Water (38.75%w/w) and HPMC K100M (2%). The optimized MBH was evaluated for viscosity, spreadability, drug content, skin irritancy and skin permeability. The mechanism of drug release from MBH was observed to follow zero order kinetics on the basis of  $R^2$  value (Regression Coefficient) of various mathematical kinetic models.

The antibacterial activity of MBH was compared with marketed Nitrofurazone cream and it was found that the zone of inhibition for MBH was found to be comparable with marketed cream. Thus, the MBH was successfully formulated for topical delivery to treat bacterial skin infections.