

International Conference on Chronic Infectious Diseases and Vaccinations (ICCIDV 2025)

Conference Proceedings

February 06, 2025 - Singapore

Pilosomes as Nanodrug Carrier: A Novel Drug Delivery System

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One of the primary challenges in pharmaceutical dosage form development is the poor solubility of certain drugs, particularly those classified as Biopharmaceutics Classification System (BCS) Class IV. These drugs exhibit low solubility and permeability, resulting in suboptimal pharmacokinetics and limited bioavailability, which hinder their therapeutic potential and pharmaceutical development. This study focuses on developing a novel Pilosomes drug delivery system, termed PDDS, to encapsulate a BCS Class IV drug using a novel lipid derived from pilu oil. The Pilosomes were formulated using an emulsification-evaporation technique with specific modifications and were comprehensively characterized for their physicochemical properties, including average particle size, surface morphology, drug entrapment efficiency, drug loading capacity, in vitro drug release, and release kinetics. The prepared PDDS demonstrated an average particle size of 76.89 nm with a spherical morphology. The formulation achieved a percentage yield of 62.5%, drug entrapment efficiency of 90%, and drug loading capacity of 47.36%. In vitro drug release studies revealed that 24.27% of the drug was released within the first 2 hours, with a cumulative release of 75.18% over 12 hours. The release profile followed a zero-order kinetic model, indicating sustained and controlled drug release. These findings suggest that pilu oil serves as an effective novel lipid for the formulation of Pilosomes drug delivery systems, providing enhanced encapsulation efficiency, drug loading capacity, and sustained release for BCS Class IV drugs. This research highlights the potential of PDDS as a promising platform for improving the bioavailability and therapeutic efficacy of poorly water-soluble drugs. Future investigations may further validate the utility of pilu oil-based Pilosomes for broader pharmaceutical applications.