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Advanced Transfersomal Carrier System for Transdermal Delivery of Charantin: Formulation, Optimization as Anti-diabetic Efficacy

Kamaldeep Singh, Anshika, Vijay Sharma*

Lala Lajpat Rai College of Pharmacy, Moga, University institute of Pharma Sciences and Research, Chandigarh University, SGT college of Pharmacy, SGT University, Gurugram

Email Id: serviceheb@gmail.com

Abstract

The present study was designed to develop antidiabetic formulation as transdermal drug delivery system (Transfersomes) loaded with charantin which act as potent antidiabetic agent. The IC50value of the drug was assessed b DPPH method and was found 69.53µg/ml. The dose of charantin was also calculated and optimized by OGTT studies on male Wistar rats (50mg/kg) and the manufacturing variables of transfersomes were optimized included sonication time (20 min),vortexing time (30min for the best EE) and the drug loading capacity of the vesicles i.e. 1%w/w. A total of 15 transfersomal formulations were developed using the optimized dose of charantin, using Box Behnken Design. The developed formulations were characterized for various pharmaco-technical parameters to get the optimized one. The polydispersity index was found in the range of 0.170 to 0.548, vesicle size 76.24 to 185.76±2.15nm exhibiting the zeta potential in range of -22.2 to -48.8 mVindicating the recommended the considerable physical characteristics of the formulation. Formulation TC9 was identified as optimized formulation and the obtained data was compared for independent and dependent variables. TC9 came out with the excellent outcomes with the deformability value of 136.02,entrapment efficiency of 95.89±2.39%, drug permeation ability of 90.12±1.65%, and the transdermal flux of 440.18±5µg/hr/cm^2. The Box- Behnken design was further validated by using statistical tests and TC9 was further subjected to animal studies on the streptozotocin induced diabetic male wistar ratsadministering different doses to identify the dose dependent response (if any)at the predetermined time intervals of 0,7,14 and 21 days. The formulation with 50mg/kg yields the remarkable results(156.53±2.12mg/dl of SGL)in comparison to standard (metformin; 123.14±1.04 mg/dl)and within the expected range.The formulation also helps in regeneration of damaged and inflammatory cells in kidney, repair and restore hepatic damage, and regenerate the injured or disrupted cells of pancreas caused by STZ.

Keywords: Antidiabetic formulation, Transdermal drug delivery, Transfersomes, Charantin, IC50 value, DPPH method, OGTT (Oral Glucose Tolerance Test), Box-Behnken Design

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