World Academy of Science, Engineering and Technology
International Journal of Biotechnology and Bioengineering
Vol:18, No:01, 2024

Development of capsaicin-loaded nanostructured lipid carriers for topical application

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Abstract : Capsaicin, a recently FDA-approved drug for the topical treatment of neuropathic pain, is associated with several side effects like burning sensation and erythema leading to severe skin irritation and poor patient compliance. These unwanted side effects are due to the rapid penetration of capsaicin into the epidermis and low permeation to the dermis layer. The purpose of this study was to develop nanostructured lipid carriers (NLCs) that entrapped capsaicin for reducing dermal irritation. Solid lipid (glyceryl monostearate (GM), cetyl palmitate (CP), cetyl alcohol (COH), stearic acid (SA), and stearyl alcohol (SOH)) and surfactant (Tween®80, Tween®20, and Span®20) were varied to obtained optimal capsaicin-loaded NLCs. The formulation using CP as solid lipid and Tween®80 as a surfactant (F2) demonstrated the smallest size, excellent colloidal stability, and narrow range distribution of the particles as being analyzed using Zetasizer. The obtained capsaicin-loaded NLCs were then characterized by entrapment efficiency (EE) and loading capacity (LC). The release characteristics followed Higuchi kinetics, and the prolonged capsaicin release may result in the reduction in skin irritation. These results could demonstrate the potentials of capsaicinloaded lipid-based nanoparticles for topical drug delivery.

Keywords : capsaicin, lipid-based nanoparticles, nanostructured lipid carriers, topical drug delivery system
Conference Title : ICNNS 2024 : International Conference on Nanopharmaceuticals and Nanoparticulate Systems
Conference Location : Tokyo, Japan
Conference Dates : January 11-12, 2024