

IX КОНГРЕС ПО ФАРМАЦИЯ

С МЕЖДУНАРОДНО УЧАСТИЕ

PharmaceuticAI Science Revolution

30 ОКТОМВРИ | **2** НОЕМВРИ

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WITH INTERNATIONAL PARTICIPATION

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ed to continue to accelerate. These types of tools will find use in various processes: drug development, therapy monitoring, diagnosis, prevention and treatment of diseases, etc. Differences in regulatory frameworks can lead to difficulties in development.

Keywords: AI/ML-based tools; comparative analysis; regulatory framework.

FORMULATION AND PHYSICOCHEMICAL CHARACTERIZATION OF NANOSTRUCTURED LIPID CARRIERS (NLCs) LOADED WITH IBUPROFEN

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Objective: This study aimed to develop and characterize nanostructured lipid carriers (NLCs) loaded with 1% ibuprofen (IBU-NLC) to enhance skin penetration and enable localized treatment of inflammatory musculoskeletal conditions, such as osteoarthritis. The formulation was designed to overcome the limited skin permeability of conventional ibuprofen gels and provide a stable, controlled-release delivery system.

Methods: IBU-NLCs were prepared using a homogenization followed by ultrasonication. The lipid and aqueous phases were separately heated to 75°C, then emulsified using an ULTRA-Turrax to form a microemulsion, followed by sonication using a SONICS VibraCell to generate a nanoemulsion. The resulting formulation was cooled and characterized using dynamic light scattering (DLS) to determine hydrodynamic particle size, polydispersity index (PDI), and zeta potential (ZP) for surface charge. High-performance liquid chromatography was used to determine encapsulation efficiency (%EE). Transmission electron microscopy (TEM) was performed using morphological analysis. Stability was evaluated after one week of storage at 6°C.

Results: The freshly prepared IBU-NLCs showed a mean particle size of 93.15 nm, PDI of 0.135, and ZP of -20.56 mV, indicating a good size and homogeneous formulations. After one week, the NLCs retained stability with minor changes: particle size of 100.26 nm, PDI of 0.198, and ZP of -18.89 mV. TEM analysis confirmed spherical morphology and corroborate the data of DLS. The encapsulation efficiency of ibuprofen was 11.15%.

Conclusion: Stable IBU-NLCs were successfully developed, demonstrating suitable particle size, surface charge, and spherical morphology. Further formulation optimization is recommended to improve drug loading, conduct extended stability and release studies.

Keywords: drug delivery systems, skin penetration, ibuprofen, nanostructured lipid carriers.

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