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Development and evaluation of cationic nanostructured lipid carriers forophthalmic drug delivery of besifloxacin

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Abstract

Besifloxacin hydrochloride (BSF) is a fourth-generation fluoroquinolone-type ophthalmic antibiotic for the treatment of bacterial conjunctivitis. However, its low water solubility limits its therapeutic efficacy. The objective of the study was to prepare, optimize and evaluate lipid based novel drug delivery system in order to enhance ocular bioavailability of BSF. Cationic nanostructured lipid carriers (CNLC) were prepared and optimized by Box-Behnken design of using Design Expert Software®. Effect of concentration of three independent variables namely Stabilizer (Gelucire 50/13), Solid lipid (Compritol 888 ATO) and Liquid Lipid (Labrafac PG) were studied on three dependent variables Particle size, Polydispersity Index (PDI) and zeta potential of the CNLC particles. The surfactant, hexadecyltrimethylammonium bromide (CTAB) was used to optimize the surface charge of the nano-particles. The developed besifloxacin hydrochloride loaded nano-particles, CNLC-BSF, were characterized for particle size and charge (via zeta potential), morphology (by confocal microscopy and transmission electron microscopy), BSF entrapment efficiency and composition (FTIR). Rhodamine B has been trapped to CNLC-BSF for convenient imaging. The cytotoxicity and intracellular, intercellular infiltration of CNLC-BSF were assessed by using 2D and 3D Tenon's capsule + conjunctival tissue model. It was revealed that the values of three dependent variables, particle size, PDI and zeta potential of the NLC were found in the range of 98.04 to 230.12 nm, 0.144 to 0.351 and 12.83 to 26.65 respectively with little or no variation of these parameters over a period of two week storage, which suggests good stability. The entrapment efficiency was found to be around 80% for optimum formulation. The in vitro study of the formulation revealed increase in cell internalization of CNLC because of increase in zeta-potential (from -7.9 mV to +23.9 mV) when CTAB concentration was increased in CNLC-BSF. Also, the formulation showed good penetration property through 3D tissue model. The cytotoxicity assessed by MTT assay showed to have minimum 60% cell viability on conjunctival fibroblast cell model for the optimized formula with inclusion of 0.06% BSF. Hence, CNLC was found to be promising novel ophthalmic drug delivery system

Biography:

Mr. **Mirza Salman Mirza Abid Baig** has completed his M.Pharm from Jamia Hamdard, New Delhiwhich is one of the top pharmacy school in India.. He is pursuing PhD in Pharmacy from Dr. Babasaheb Ambedkar Marathwada University at research centre "Y.B Chavan College of Pharmacy" Aurangabad (INDIA) under the supervision of Dr. Aquil-ur-Rahim Siddiqui (Associate Professor atShri Bhagwan College of Pharmacy, affiliated to Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, INDIA). Mirza is also serving as Assistant Professor in Pharmaceutics at Anjuman-I-Islam's Kalsekar Technical Campus(AIKTC), School of Pharmacy, affiliated to University of Mumbai, India. He has published a research paper in reputed journal.

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