Studying the influence of formulation and process variables on Vancomycin-loaded polymeric nanoparticles as potential carrier for enhanced ophthalmic delivery.

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Abstract

Ocular topically applied Vancomycin (VCM) suffers poor bioavailability due to its high molecular weight and hydrophilicity. In the present investigation, VCM-loaded polymeric nanoparticles (PNPs) were developed aiming to enhance its ocular bioavailability through prolonging its release pattern and ophthalmic residence. PNPs were prepared utilizing double emulsion (W/O/O), solvent evaporation technique. 23 Ĭ 41 full factorial design was applied to evaluate individual and combined influences of polymer type, EudragitÈ RS100, sonication time, and SpanÈ80 concentration on PNPs particle size, encapsulation efficiency, and zeta potential. Further, the optimized formulae were incorporated in 1% CarbopolÈ-based gel. In-vivo evaluation of the optimized formulae was performed via Draize test followed by microbiological susceptibility testing on albino rabbits. Results revealed successful formulation of VCM-loaded PNPs was achieved with particle sizes reaching 155 nm and up to 88% encapsulation. Draize test confirmed the optimized formulae as non-irritating and safe for ophthalmic administration. Microbiological susceptibility testing confirmed prolonged residence, higher Cmax. with more than two folds increment in the AUC(0.25ï24) of VCM-PNPs over control groups. Thus, VCM-loaded PNPs represent promising carriers with superior achievements for enhanced Vancomycin ophthalmic delivery over the traditional use of commercially available VCM parenteral powder after constitution into a solution by the ophthalmologists.

European Journal of Pharmaceutical Sciences 2017, March