Development and Evaluation of Fexofenadine Dry Powder Inhalation

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ABSTRACT

Introduction: The aim of this study was to develop and evaluate nano-fexofenadine dry powder inhaler (DPI) and to characterize the physicochemical and aerodynamic properties.

Methods and Materials: Various excipients were employed to prepare suspensions of nanoparticles of fexofenadine, comprising ethanol, water, sodium lauryl sulfate, and Tween 80, using the antisolvent method. The DPI was formulated using the spray freeze-drying method, incorporating nanosuspension along with matrix formers such as mannitol, sorbitol, lactose, sucrose, maltodextrin, and PEG 400. The prepared DPI formulations were characterized using scanning electron microscopy, Fourier-transform infrared spectroscopy, differential scanning calorimetry, bulk and tapped density measurments, DLS, and dissolution tests. The aerosolization properties of the different formulations were evaluated using a twin impinger impactor, and the percentage of fine particle fraction (FPF) was determined.

Results: The results showed that the inclusion of matrix formers in the formulations enhanced the dissolution behavior of fexofenadine. The needle-shaped particle morphology of the spray freeze-dried nanoparticles containing mannitol was observed. These nanoparticles exhibited low density and extremely poor flowability properties (%CI_{40}), yet they resulted in the highest percentage of FPF (27.91%).

Conclusion and Discussion: DPI, as a route of drug administration, may offer several advantages, including ease of use, a high rate of bioavailability, and a reduction of systemic side effects.

Keywords: Fexofenadine, Inhalation, Lactose, Mannitol nanoparticles

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