Hydrocortisone Nanosuspensions for Ophthalmic Delivery: A Comparative Study between Microfluidic Nanoprecipitation and Wet Milling

Hany S.M. Ali1,2, Peter York1, Ahmed M.A. Ali3, Nicholas Blagden1

Abstract:

Recently, drug nanosuspensions have shown a potential for ophthalmic delivery. In this study, a hydrocortisone (HC) nanosuspension (NS) was developed using microfluidic nanoprecipitation as a recent, simple and cost-effective bottom-up technique of drug nanonization. For comparison, a second HC NS was prepared by top-down wet milling procedures. The produced nanosuspensions were characterized for particle size, shape and zeta potential. HC nanosuspensions of approximately 300 nm particle size were produced by adjusting experimental conditions of the two processing techniques. Results of X-ray diffraction and differential scanning calorimetry revealed that HC maintained the crystalline structure upon milling, while predominant amorphous particles were generated after precipitation. Ocular bioavailability of HC nanosuspensions was assessed in albino rabbits using HC solution as a control. A sustained drug action was maintained up to 9 h for the nanosuspensions compared to 5 h for the drug solution. The precipitated and milled NS achieved comparable AUC0–9h values of 28.06 ± 4.08 and 30.95 ± 2.2, respectively, that were significantly (P

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