IMPACT OF CAPSULE TYPE ON THE AERODYNAMIC PERFORMANCES OF A FLUTICASONE PROPIONATE-BASED DRY POWDER UNDER OPTIMAL AND SUBOPTIMAL INHALATION FLOW RATES

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INTRODUCTION

In the case of capsule-based DPIs, the capsule is an important parameter, not only in the packaging of the formulation, but also in the powder aerosolisation and the dispersion of the micronised drug from the carrier during inhalation [1]. Performing studies on low drug-dosage dry powders (i.e. a binary blend with cold and thermal-gelled HPMC capsules (p < 0.05, one-way ANOVA) with non-significant differences between HPMC capsules (p > 0.05, one-way ANOVA). However, thermal-gelled HPMC capsules showed a significantly higher fluticasone propionate retention in the capsules than gelatin and cold-gelled HPMC capsules (p < 0.05, one-way ANOVA), with significant differences between them (p < 0.05, one-way ANOVA) Fig. 1C.

RESULTS AND DISCUSSION

Under optimal airflow (i.e. 100 L/min)

DDs, Figs. 1Aa and FPDs, Fig. 1Ba were significantly lower with gelatin capsules than with cold and thermal-gelled HPMC capsules (p < 0.05, one-way ANOVA). Moreover, in suboptimal conditions, cold-gelled HPMC capsules (p < 0.05, one-way ANOVA) showed less impact on FPD at suboptimal airflows (i.e. suboptimal inhalation flow rates).

EXPERIMENTAL METHODS

Blend production

Package and storage

Aerodynamic performances evaluation

Fig. 1A. Uniformity of the delivered dose (DD) (n=10) filled in different capsules: gelatin Quali-G®-I and Vcaps® Plus at 30 L/min.

Fig. 1B. Uniformity of the delivered dose (DD) (n=10) filled in different capsules: gelatin Quali-G®-I and Vcaps® Plus at 100 L/min.

CONCLUSIONS

Cold-gelled HPMC capsules (Quali-V®-I and Vcaps®) showed the best results in terms of DD, FPD and capsule retention at optimal airflows in comparison to gelatin and thermal-gelled HPMC capsules in the cases of a low drug dosage dry powders using formoterol fumarate dihydrate and a higher drug dosage dry powder using Fluticasone propionate. Moreover cold-gelled HPMC capsules showed less impact on FPD at the suboptimal airflow usually performed by asthma and COPD patients in a similar low-resistance device (i.e. 100 and 60 L/min, respectively), in comparison to gelatin (thermal-gelled HPMC capsules were not tested). After exposure to a humidified environment, the FPD drastically decreased for each capsule type tested (cold-gelled HPMC and gelatin capsules).

REFERENCES


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