INFLUENCE OF FLOW RATE AND USAGE IN DRASTIC CONDITION ON THE AERODYNAMIC PERFORMANCE OF A FORMOTEROL DRY POWDER FORMULATION USING DIFFERENT KINDS OF CAPSULE

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RESULTS

AERODYNAMIC PERFORMANCE AND CAPSULE RETENTION

At optimal flow rate (100 L/min), significantly higher FPD (p ≤ 0.05, One Way ANOVA) and lower drug retention were observed for HPMC capsules (Quali-V®-I and Vcaps®) than for gelatin capsules (Quali-GTM and HGC) and 2nd generation HPMC capsules (Vcaps® Plus).

FPD – OPTIMAL FLOW RATE

At different flow rates, corresponding to 30 L/min (0.38 kPa), 60 L/min (1.32 kPa) and 100 L/min (3.60 kPa), only Quali-V®-I and Vcaps® (i.e. HPMC capsules) presented no significant differences (p > 0.05, One Way ANOVA) between 60 and 100 L/min for their FPD. In addition, only Quali-V®-I showed the lowest capsule retention at the different flow rates (below the limit of quantification for all of them).

FPD – GELATIN CAPSULES

In drastic conditions (4h at 40°C and 75%RH), the FPD was affected significantly (p < 0.001, three-way ANOVA) by the capsule type. However, the FPD was not affected significantly (p > 0.05, three-way ANOVA) by the manufacturer and there was no significant interfactorial interaction. The highest FPD was obtained with the HPMC capsules (Quali-V®-I and Vcaps®) exposed vs drastic conditions. The exposure of filled capsules for a short time (4 h) to drastic conditions decreased significantly the FPD, approximately 25% for both HPMC and gelatin capsules. In terms of capsule retention, the drastic conditions increased by about 2-3% the capsule retention of formoterol in Quali-V®-I and Vcaps® and decreased at most 0.5% the capsule retention of formoterol in Quali-GTM and HGC, being the Qualicaps® gelatin capsules retention below the LOQ.

CONCLUSIONS

The HPMC capsules evaluated, Quali-V®-I and Vcaps®, seem to be the best capsule type for inhalation in terms of aerodynamic performance, with lower dependency on airflow (between 60 and 100 L/min). In addition, Quali-V®-I showed the lowest formoterol retention in capsules at different flow rates for a dry powder blend composed of micronized formoterol and lactose carrier with a broad distribution. However, it is very important to avoid exposing the capsules to drastic conditions, which could affect significantly the aerodynamic performance of dry powder inhalers, independently of the type of capsule used.

REFERENCE


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