Probing the effect of USP induction port geometry on aerodynamic performance of dry powder inhalers

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Introduction: Induction port (IP) geometry play an important role in aerodynamic assessment of dry powder inhalers (DPIs). **Research hypothesis:** The present study aims to probe the effect of two different USP IPs on aerosolization performance of fluticasone propionate (FP)-loaded DPIs. **Methods:** Lactose carrier (InhaLac® 160) and FP particles were thoroughly analyzed for physicochemical properties. Afterward, InhaLac® 160 and micronized FP were blended using a low shear Alphie® 3D shaker mixer (80 rpm). The powder blend equal to 100 µg of FP was manually filled in size 3 HPMC capsules and stored in polypropylene containers. The aerodynamic assessment was performed using the Andersen cascade impactor (ACI) equipped with two different USP IP namely, USP standard IP and USP modified IP at steady flow rate of 60 L/min using medium resistance Revolizer® inhaler. **Results:** Tomahawk-shaped, middle-sized InhaLac® 160 particles showed acceptable powder flow properties with particle size and surface roughness of 109.46 and 2.70 µm, respectively. Micronized FP showed particle size (3.35 µm) suitable for pulmonary delivery. During ACI analysis, both IPs showed a significant difference in powder retention within the IP. USP modified IP demonstrates superior % fine particle fraction ($p \leq 0.001$) as compared to USP standard IP. Additionally, in stage-wise grouping USP modified IP showed higher FP deposition in group 3 [Stage 1 to 4 (cut-off diameter of <5 µm)] as compared to USP standard IP. **Conclusion:** USP modified IP showed better aerodynamic performance as compared to USP standard IP however additionally analytical efforts may be required to cross-examining the reported results.