TRANSITIONING TO A MORE PATIENT-FRIENDLY VERSION OF A VALVED HOLDING CHAMBER: MEETING THE CHALLENGE OF PROVIDING CONSISTENT IN VITRO PERFORMANCE FOR PATIENTS

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BACKGROUND
- There is an urgent need to address the problem of non-compliance with patients prescribed medication by inhalation.
- Training in the correct use of the inhaler and associated devices, such as a Valved Holding Chamber (VHC), is important.
- However, there is an increasing body of evidence that even with repeated training, patients often relapse into poor compliance.
- There is therefore increasing interest in addressing the patient-inhaler interface from the standpoint of the user.
- The key question now becomes: How to make the inhaler more patient/caregiver friendly?

In the past few years, there has been a concerted effort to make the AeroChamber Plus® family of VHCs more patient friendly:
- Electrostatic charge-dissipative components to avoid need for pre-washing.
- Flow-Vu® Inspiratory Flow Indicator (IFI) as feedback aid for inhalation valve operation.
- Critical to ensure no leakages if a facemask is used.
- Guides coordination of pMDI actuation to achieve optimum dose delivery.
- Inhalation valve assembly and body easily separated for routine cleaning.
- Robust construction and dishwasher compliant.

STUDY PURPOSE
- There are currently three generations of AeroChamber Plus® VHC in different territories with same chamber size and valve construction.
- The earlier versions (non-conducting without IFI [NC] and non-conducting with IFI [NC + IFI]) have comparable performance and have been well characterized with a range of pMDI products.
- This study was designed to demonstrate in vitro equivalence between the three products with widely prescribed beta-2 adrenergic agonist, Ventolin® (GSK).
- 100 µg/actuation salbutamol base equivalent.

STUDY DESIGN

NC = Reference Device
AeroChamber Plus® VHC – Mouthpiece

NC + IFI = Test (1) Device
AeroChamber Plus® VHC with Flow-Vu® - IFI – Mouthpiece

AS + IFI = Test (2) Device
AeroChamber Plus® Flow-Vu® Chamber – Mouthpiece

MATERIALS AND METHODS
- Measurements for NC and NC + IFI groups undertaken by Andersen 8-stage CI with USP/Ph.Eur. induction port.
- Measurements for AS group by abbreviated ACI validated as equivalent to full resolution ACI.
- Both apparatuses operated at 28.3 L/min ± 5%.
- Environmental conditions: 21±1°C, 38 to 43% RH.
- 5 VHCs in each group, 1 replicate per device.
- VHCs prepared in accordance with manufacturer instructions (NC-versions pre-washed; AS-versions used out-of-package).
- European-Sourced Ventolin®.
- pMDI canisters primed before use.
- 5 actuations into the CI per measurement.
- Each actuation 30-s apart.
- Canister shaken before each actuation.

EFFECT OF DELAY ON PERFORMANCE
- VHCs are prescribed for patients with less than perfect inhaler technique.
- Data were obtained with 2-s delay: between pMDI actuation and onset of sampling.
- Accords with guidance in CAN/CSA/Z264.1-2008

- Microphone starts timer on pMDI actuation.
- VHC located upstream of shutter.
- Aerosol not sampled during delay interval.
- Shutter falls away after delay, allowing aerosol to be sampled.

METRICS
- TEM: Total Emitted Mass, including coarse particle fraction not retained by the VHC.
- May be important in relation to systemic delivery.
- FPM<4.7µm: Fine Particle Mass most likely to deposit in Airways of lungs.
- Important in terms of product efficacy.
- EPM<1.1µm: Extra-Fine Mass.
- Has the highest potential to be exhaled without depositing in the lungs, especially if the patient does not breath-hold after inspiration.

RESULTS
- Mass recovery was within ±15% of label claim, based on system suitability testing for the pMDI without VHC present.
- In vitro performance measures were based on the following attributes.
- Total emitted mass (TEM) ex VHC mouthpiece
- Fine particle mass (FPM<4.7µm) < 4.7 µm aerodynamic diameter.
- Extra-fine particle mass (EPM<1.1µm) < 1.1 µm aerodynamic diameter.

CONCLUSIONS
- The introduction of charge dissipative materials, the patient-friendly IFI, as well as the capability to take apart the anti-static AeroChamber Plus® VHC for routine cleaning have not significantly affected the in vitro performance of this device for the delivery of Ventolin®.

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