Complete Delivery of Medication from a Valved Holding Chamber is Affected by Chamber Capacity

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RATIONALE

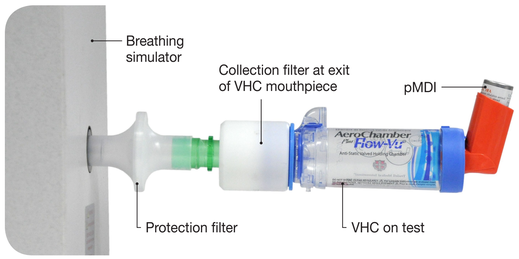
- Valved Holding Chambers (VHCs) are often prescribed to optimize fine particle delivery of inhaled corticosteroid medication, to the lungs.
- Large volume VHCs have capacities greater than can be emptied in a single breath.
- This laboratory based study compared a widely prescribed large and small volume VHC, for the delivery of Pressurized Metered Dose Inhaler (pMDI)-delivered Fluticasone Propionate (FP).

MATERIALS AND METHODS

Volumatic† VHC with mouthpiece
Large volume 750 mL

***AeroChamber Plus* Flow-Vu** Antistatic VHC with mouthpiece**
Smaller volume 149 mL

- *n* = 3 devices/group; 3 replicates/device
- VHCs were prepared per instructions for use
  - Volumatic† — wash in mild detergent, rinse, drip-dry
  - ***AeroChamber Plus* Flow-Vu**** VHC — no preparation required
- Each VHC was connected to a breathing simulator (ASL 5000, Pittsburgh, PA) mimicking a tidally breathing adult
  - Tidal volume = 500 mL
  - Rate/min = 13
  - Inspiratory : Expiratory ratio; 1:2
- Aerosol filter collected the medication delivered at the exit of the VHC



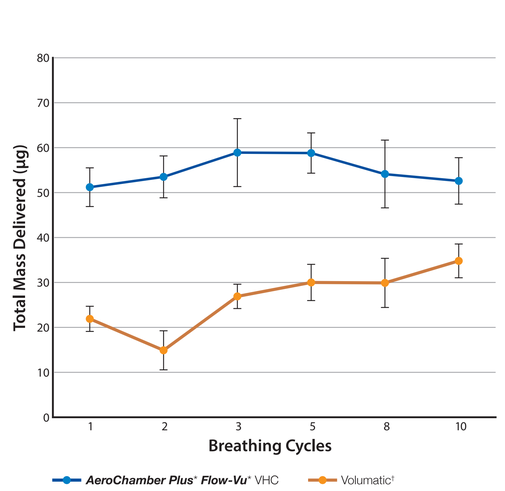
- 1 actuation of FP (125 µg) was delivered to the VHC
- Mass collected on the filter after 1 complete breathing cycle (*n* = 5 replicates) was assayed by HPLC
- The procedure was repeated after 2, 3, 5, 8 and 10 breathing cycles

RESULTS

Table 1: Total Mass of pMDI-Delivered FP Recovered

mean ± SD

Breathing Cycles	Volumatic† VHC	*AeroChamber Plus* Flow-Vu** VHC
1	21.9 ± 2.9	51.2 ± 4.5
2	14.9 ± 4.4	53.5 ± 4.9
3	26.9 ± 2.8	58.9 ± 7.8
5	30.0 ± 4.2	58.8 ± 4.7
8	29.9 ± 5.6	54.1 ± 7.8
10	34.8 ± 3.9	52.6 ± 5.4



DISCUSSION

- Differences in particle transport through the two different sizes of VHC investigated may have been partly responsible for the observed behavior.
- Another possible explanation for the lower and erratic performance with the Volumatic† VHC relates to the likely presence of electrostatic charges acquired on the internal surface of that VHC through normal handling even though pre-washing was undertaken.
- Other potential reasons for variability in data may relate to inhalation valve performance.

CONCLUSIONS

- This study highlights that not all chambers perform the same and may deliver different amounts of medication.
- Clinicians should be aware that the volume of a VHC has a marked effect on the delivery of medication.
- An effective VHC should be able to maintain the availability of medication for inhalation in cases where multiple inhalations (and therefore more time) may be required to empty.

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