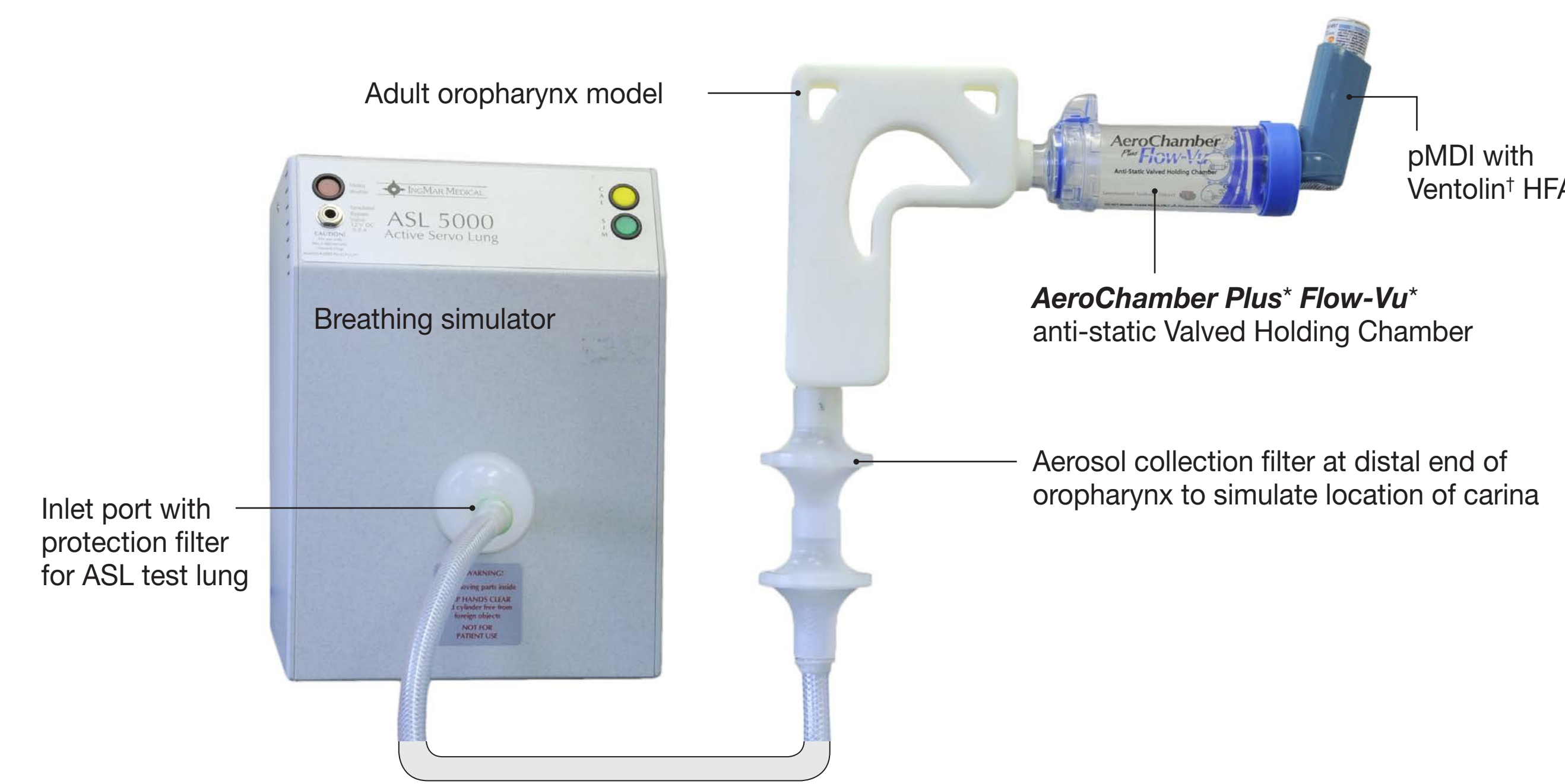


The Impact of Delay to Inhalation on Drug Delivery: A Laboratory Study Comparing Metered Dose Inhaler and Metered Dose Inhaler/Valved Holding Chamber Systems

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RATIONALE

- Evaluations of inhaler use have demonstrated that mishandling of Metered Dose Inhalers (MDI) is commonplace.
- One of the most common errors is the failure to coordinate inhalation with actuation of the MDI. One of the reasons why Valved Holding Chambers (VHC) are often prescribed, is to reduce the severity of this error.
- This laboratory-based study compared the potential oropharyngeal and carina delivery of MDI-delivered albuterol using an anatomically correct modelled adult airway.



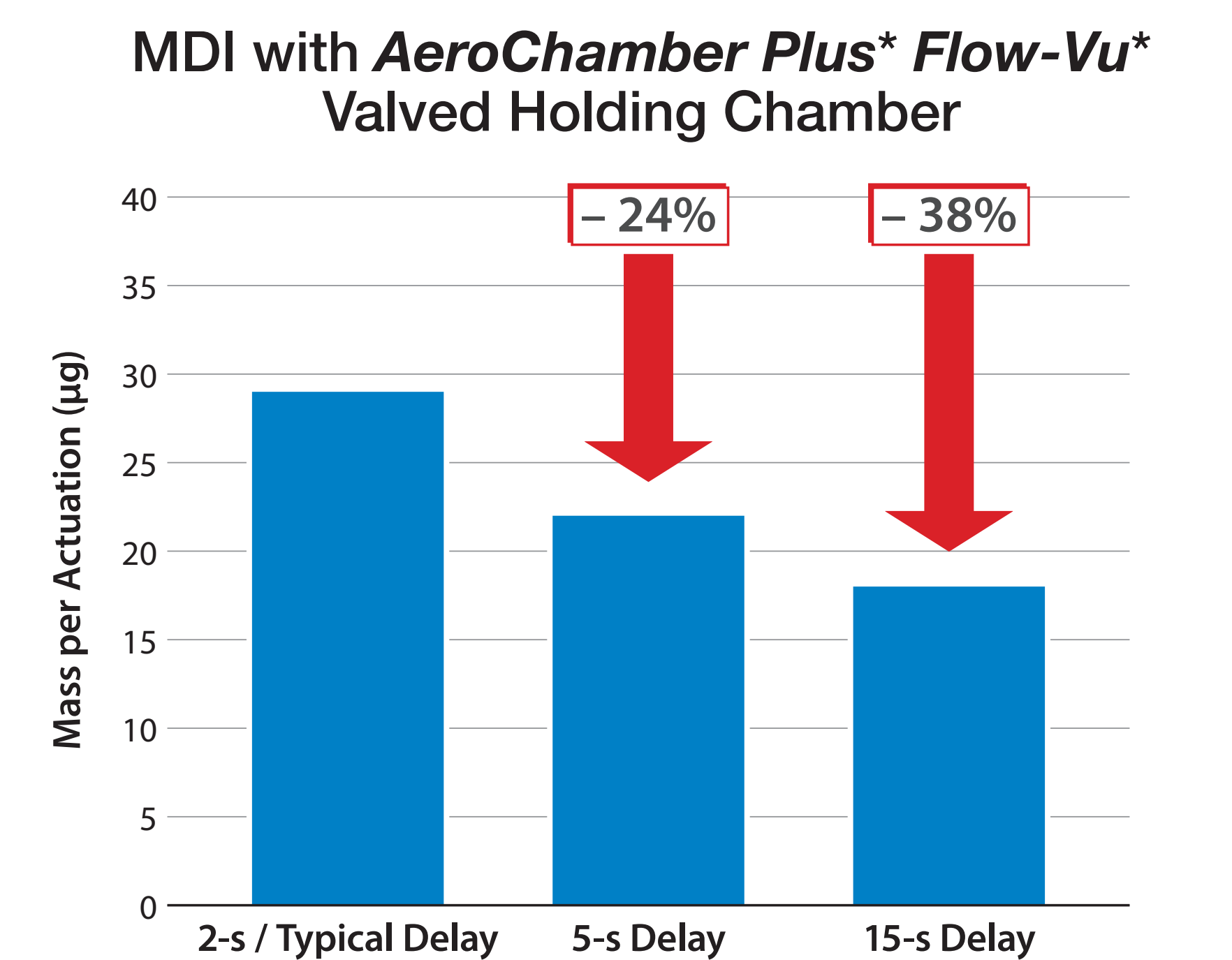
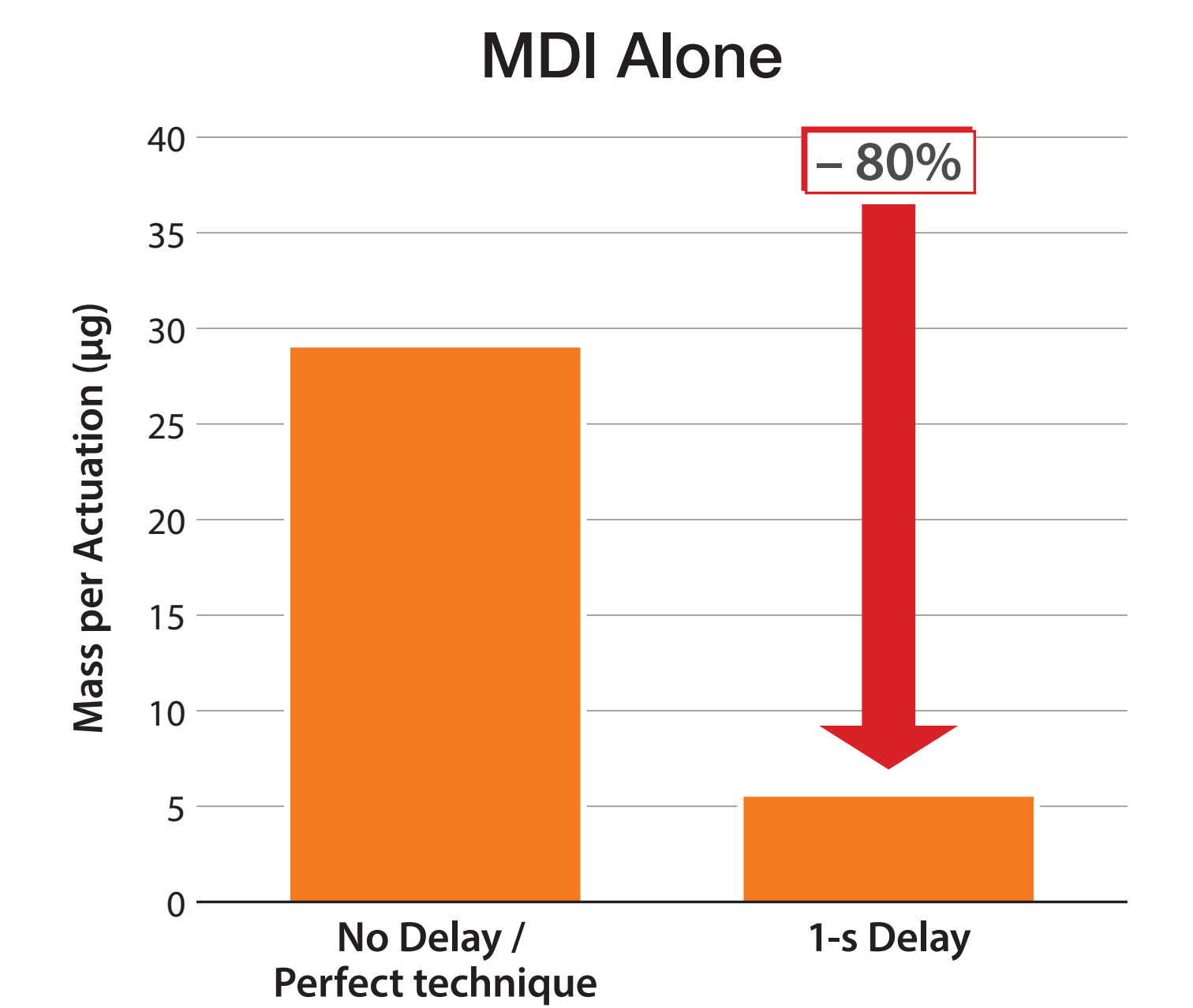
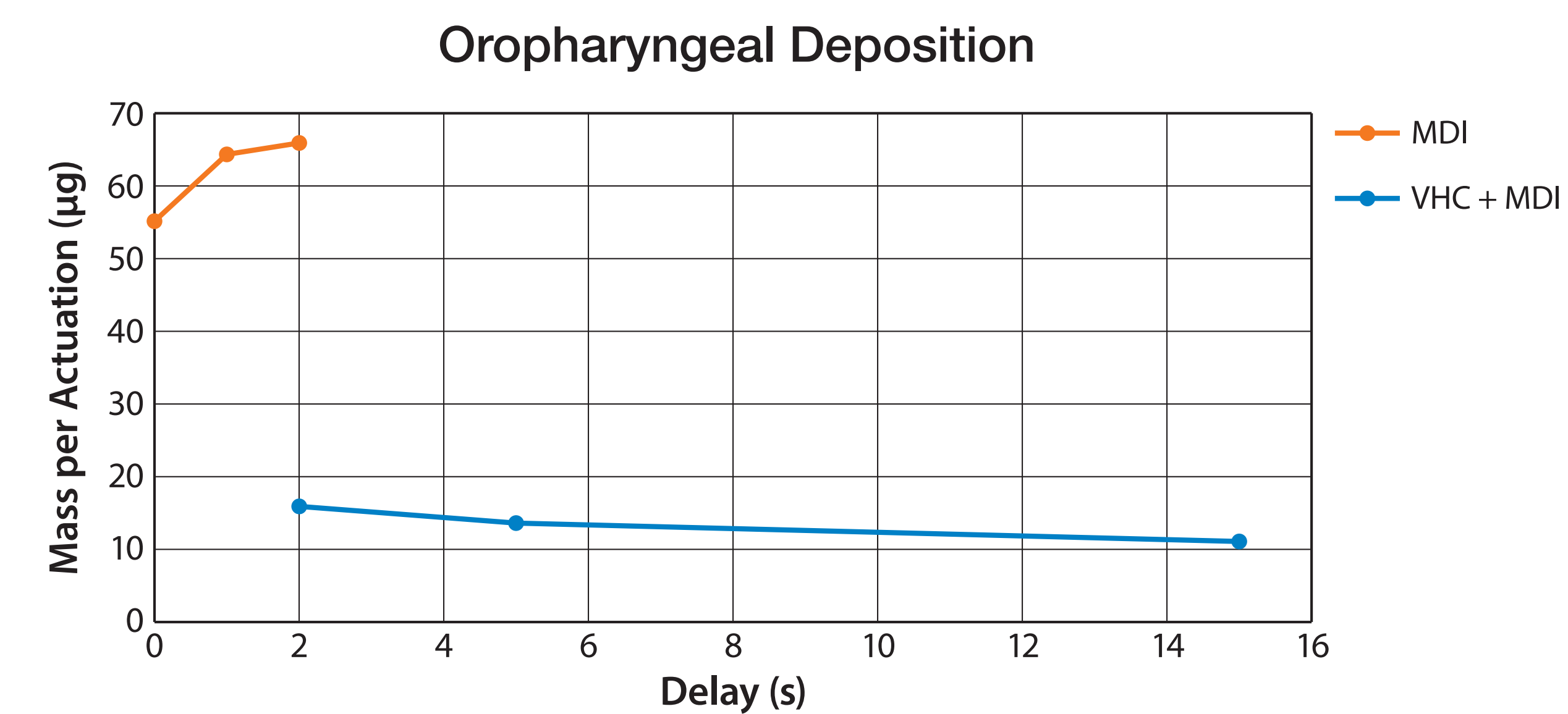
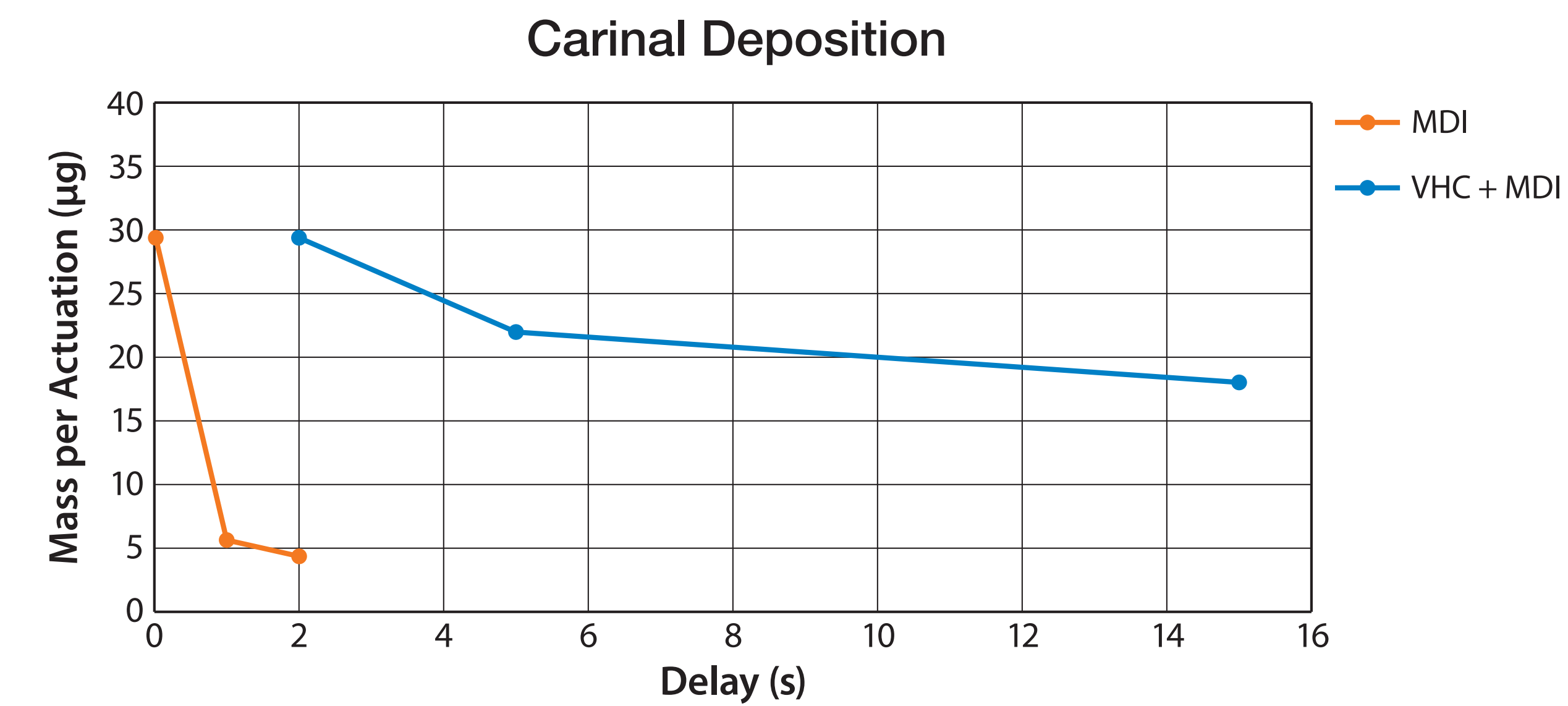
Experimental arrangement showing adult oropharyngeal inlet. The same configuration was utilized for evaluation of MDI alone or with VHC present

MATERIALS AND METHODS

- The large adult Aerosol Delivery to an Anatomic Model (ADAM) oropharyngeal airway was used to determine the deposition of MDI-delivered albuterol (Ventolin⁺ HFA, 100 µg salbutamol base equivalent/actuation).
- AeroChamber Plus^{*} Flow-Vu^{*}** antistatic VHC with mouthpiece was used as the test VHC
 - $n=3$ devices
 - 1 measurement per device
- For the MDI alone, in addition to a 0-s delay (perfect technique), inhalation delays of 1 and 2 seconds were evaluated.
- For the MDI + VHC system, in addition to the assumed typical 2-s delay, inhalation delays of 5 and 15 seconds were evaluated.

RESULTS

- With the MDI + VHC system a typical (2-s) delay resulted in similar carina delivery to the MDI alone with perfect technique (no delay, 0-s), and even after a 15-s delay, the reduction was less than 40%.
- Simulated oropharyngeal deposition increased from 55 µg to 65 µg for the MDI alone (0 to 2-s delay) and was reduced from 16 µg to 11 µg for the VHC + MDI (2 to 15-s delay).
- With MDI alone, delaying inhalation by as little as 1 second resulted in a decrease in carina (lung) delivery of 80%.



CONCLUSIONS

- The use of the **AeroChamber Plus^{*} Flow-Vu^{*}** VHC maximized the lung delivery of MDI medication, even after considerable inhalation delays.
- VHC use significantly reduced the amount of medication deposited in the oropharynx.
- When the MDI is used alone (without a VHC) it is important that actuation of the inhaler coincides with inhalation since even a 1-second delay can reduce medication delivery to the lungs by 80%.

