

# Performance of a Valved Holding Chamber with Tracheostomy Adapter: Aerosol Delivery from Soft Mist Inhalers

M. Nagel<sup>1</sup>, R. Ali<sup>1</sup>, C. Doyle<sup>1</sup>, D.P. Coppolo<sup>2</sup>, J. Suggett<sup>1</sup>

<sup>1</sup>Trudell Medical International, London, Canada. <sup>2</sup>Monaghan Medical Corporation, Plattsburgh, NY, USA.

## RATIONALE

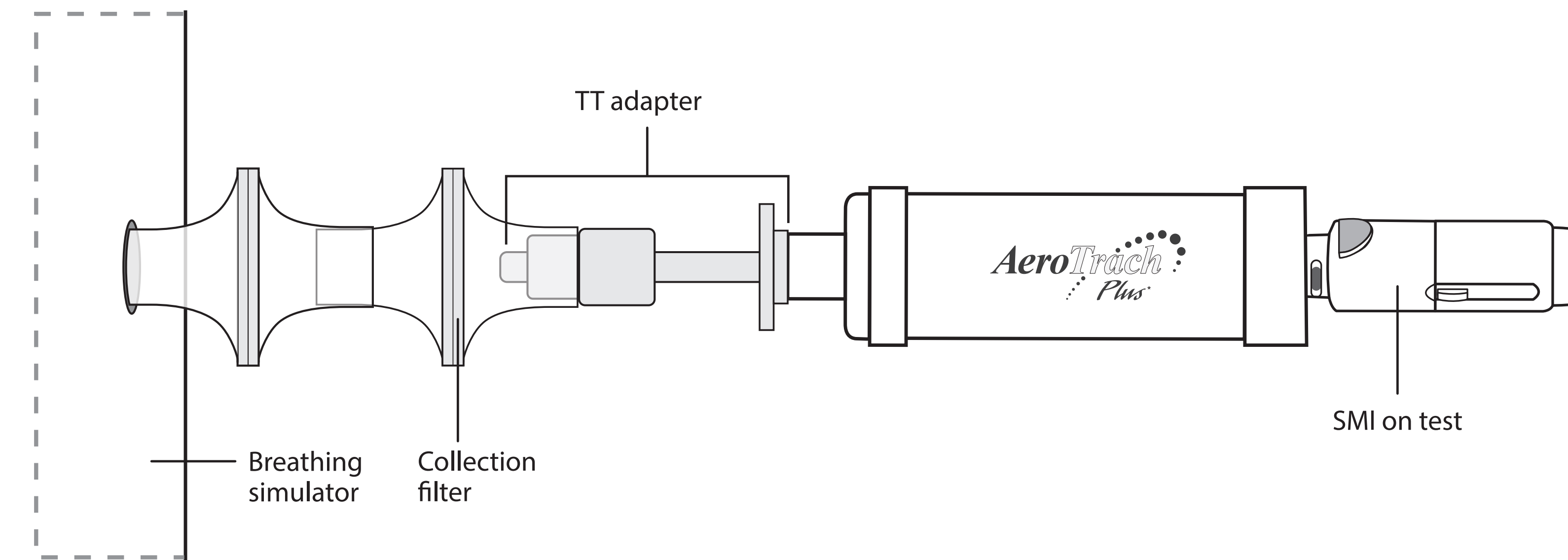
- Patients with asthma or obstructive airways disease who have a tracheostomy tube (TT) or tracheal stoma have difficulty using Metered Dose Inhalers (MDIs) because of a failure to achieve a good seal between the TT and delivery device.
- We report the outcome of a study that investigated aerosol delivery from Soft Mist Inhalers (SMI) to a breathing tracheostomy model via a Valved Holding Chamber (VHC) with tracheostomy adapter

## MATERIALS AND METHODS



**AeroTrach Plus<sup>®</sup> VHC**  
Trudell Medical International

### Respimat<sup>†</sup> Soft Mist Inhaler Formulations



- **AeroTrach Plus<sup>®</sup>** VHCs were evaluated for active pharmaceutical ingredients (API) from the 3 different SMI formulations.
  - $n=5$  replicates/device
- The tracheostomy adapter of the VHC was attached to the 15 mm adapter of the adult TT (6mm I.D., 70mm long Portex)
  - The cuff of the tube was used to seal the exit to a bacterial viral filter.
- The filter was in turn connected to a breathing simulator (ASL 5000, IngMar Medical) which was operated to simulate tidal breathing
  - Tidal Volume = 500 mL
  - 13 breaths per minute (bpm)
  - Inspiratory : Expiratory ratio of 1:2
- The SMI was placed in the adapter of the VHC and following actuation of the SMI, 5 breathing cycles were undertaken, following which the test apparatus was disassembled and the mass of API deposited on the filter assayed by HPLC.

## RESULTS

Soft Mist Inhaler Formulation	Active Ingredient (label claim, µg)	Dose Delivered to Distal End of Tracheostomy Tube (µg)
Spiriva <sup>†</sup> Respimat <sup>†</sup>	tiotropium bromide monohydrate (2.5 µg)	1.3 ± 0.2
Inspiroto <sup>†</sup> Respimat <sup>†</sup>	olodaterol hydrochloride (2.5 µg)	1.1 ± 0.2
	tiotropium bromide monohydrate (2.5 µg)	1.1 ± 0.2
Combivent <sup>†</sup> Respimat <sup>†</sup>	salbutamol (100 µg)	27.2 ± 5.3
	ipratropium bromide (20 µg)	4.9 ± 1.0

## CONCLUSIONS

- Based on these laboratory data, the VHC with tracheostomy adaptor appears to provide a reliable means of delivering SMI aerosols to patients with a tracheostomy tube or tracheal stoma.
- Further research is required to determine the clinical relevance of these *in vitro* findings.

