

# COMBINING INHALATION BY A BREATH ACTUATED NEBULIZER WITH EXHALATION WITH OSCILLATING POSITIVE EXPIRATORY PRESSURE DEVICE OFFERS POTENTIAL FOR SIMULTANEOUS THERAPY: A LABORATORY STUDY

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## RATIONALE

- Secretion mobilization by Oscillating Positive Expiratory Pressure (OPEP) is often given separately to inhaled medication
- Combining a nebulizer with OPEP, both therapies can be delivered simultaneously
  - **AeroEclipse\*** II Breath Actuated Nebulizer (BAN), Trudell Medical International, London Canada
  - **Aerobika\*** OPEP device, Trudell Medical International, London Canada
- We investigated to see if the stand-alone BAN output is affected by use with the **Aerobika\*** device, or by substituting another OPEP product
  - acapella<sup>†</sup> OPEP device, Smiths Medical North America, Norwell, MA, USA



**Aerobika\*** OPEP – **AeroEclipse\*** II BAN

## METHODS

- A Next Generation Cascade Impactor (NGI) operated at 15 L/min was used to make droplet size measurements of the BAN-aerosol operated by compressed air at 50 psig in accordance with United States Pharmacopeia (USP) <1601> 'Products for Nebulization'
- Each BAN (3 x 3 replicates/device) was
  - Operated by compressed air at 50 psig
  - Filled with 4x1-mL ipratropium bromide (IPR) anticholinergic bronchodilator solution
    - 0.5 Mg/ml (TEVA Canada, Mirabel, QC)
- The mouthpiece of the BAN was initially connected directly to the USP induction port
- The measurements were repeated
  - With the **Aerobika\*** OPEP device inserted between the BAN and induction port
  - Substituting the acapella<sup>†</sup> OPEP device
- The BAN was run to sputter, and the therapeutically beneficial fine particle mass < 5.4 µm diameter (FM<sub>ipr</sub>) determined
  - This size limit represents an approximation to the mass of therapeutically beneficial medication capable of reaching the receptors in the airways of the lungs
- The BAN was run to sputter to assess the total mass IPR per 4-mL fill

### Devices



## RESULTS

Device Combination	Mean ± SD
	FM <sub>ipr</sub>
<b>AEROECLIPSE*</b> II BAN alone	452 ± 28
<b>Aerobika*</b> OPEP – BAN combination	426 ± 27
acapella <sup>†</sup> OPEP – BAN combination	177 ± 21

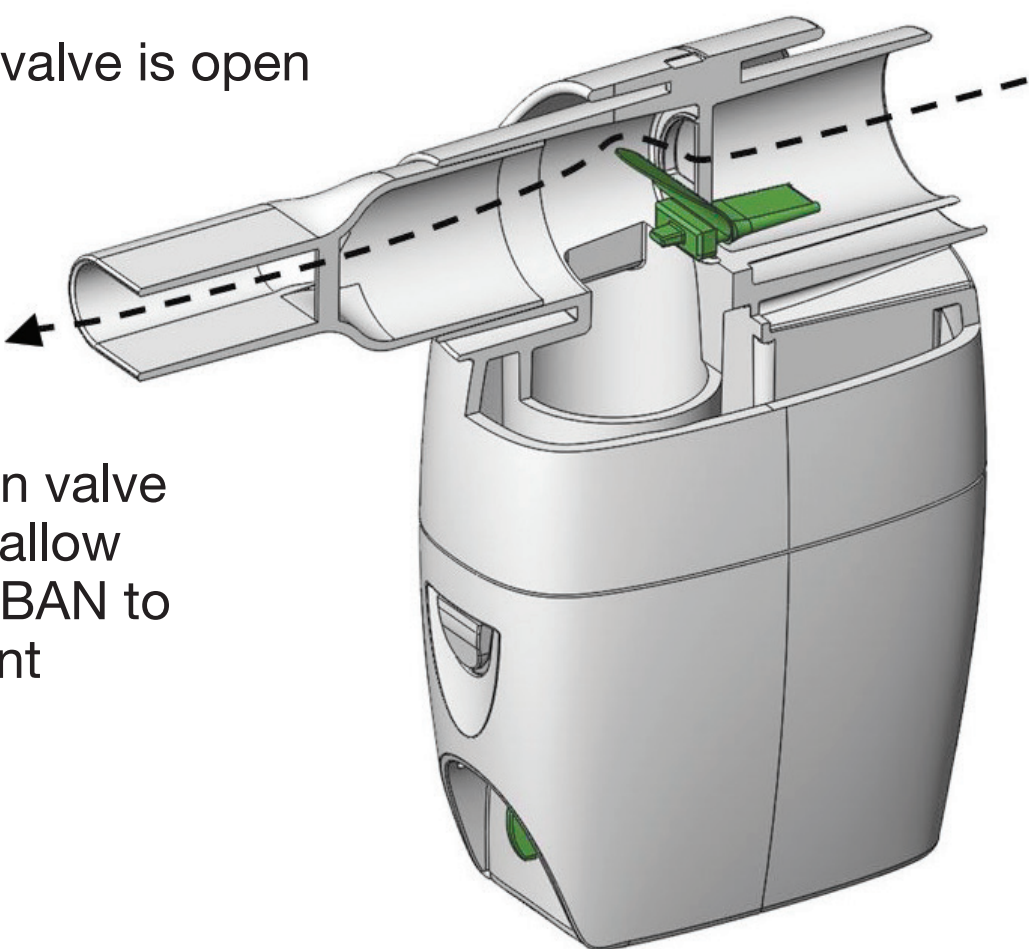
- The **Aerobika\*** OPEP – BAN combination reduced delivery by a marginal 6%, whereas the acapella<sup>†</sup> – BAN configuration resulted in substantial delivery losses (61% or 10x greater loss) (p =< 0.001)

## CONCLUSION

- The **Aerobika\*** OPEP – **AeroEclipse\*** II BAN combination offers combined aerosol/OPEP therapy with minimal medication loss
  - This outcome is the result of careful design that minimizes obstructions in the aerosol pathway during inhalation from the nebulizer
- Combined aerosol/OPEP therapy with the acapella<sup>†</sup> OPEP resulted in substantial reduction in medication delivery from the BAN that may have adverse clinical implications
- Clinicians should be aware of these differences when considering prescribing these devices for combined therapy

### **Aerobika\*** OPEP Device – Inhalation

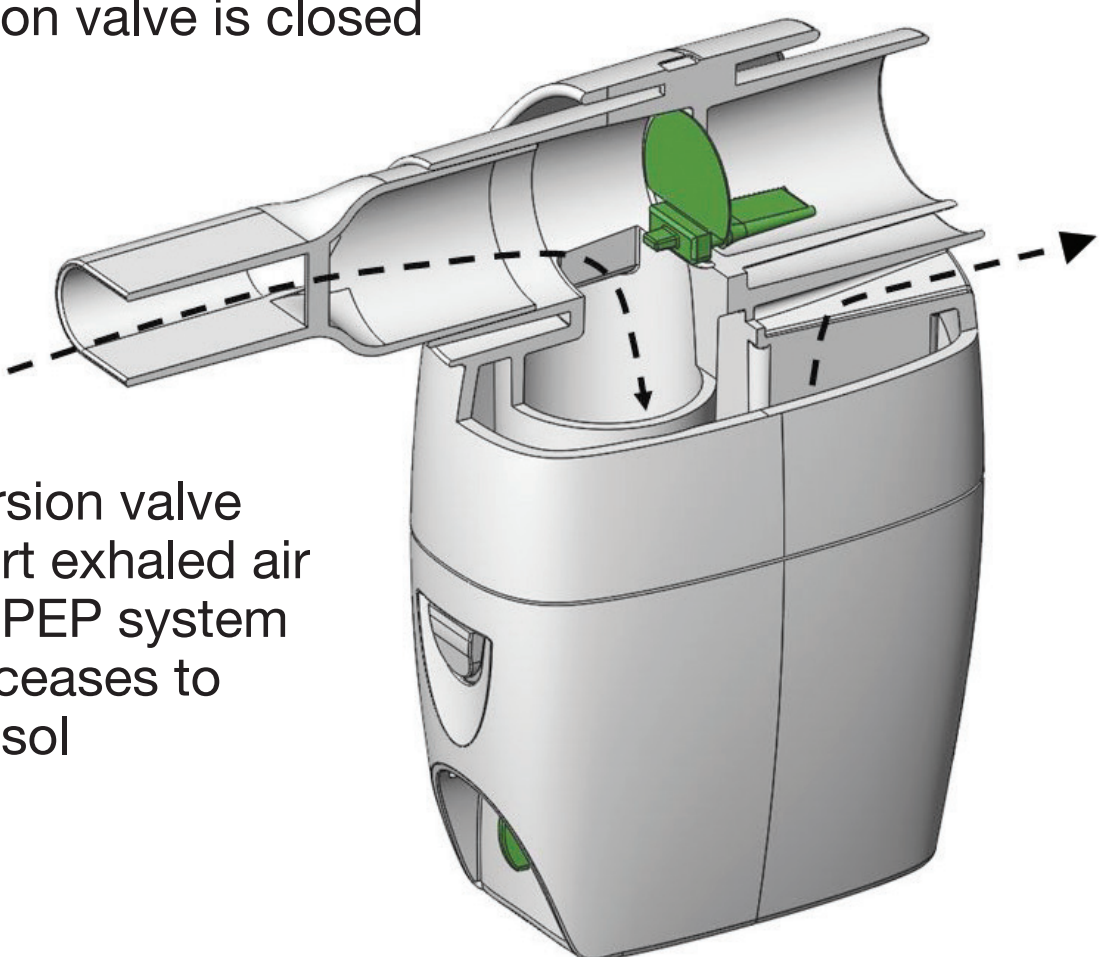
Green inhalation valve is open



The flow diversion valve (green) opens to allow aerosol from the BAN to pass to the patient

### **Aerobika\*** OPEP Device – Exhalation

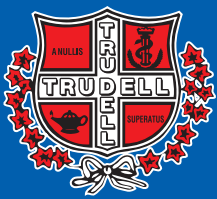
Green inhalation valve is closed



The flow diversion valve closes to divert exhaled air through the OPEP system and the BAN ceases to generate aerosol



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