IN VITRO EVALUATION OF A NOVEL AEROSOL CHAMBER FOR DELIVERY OF AEROSOLIZED MEDICATION TO THE MECHANICALLY VENTILATED PREMATURE INFANT

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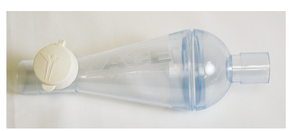
INTRODUCTION

- Delivery of inhaled medication for bronchodilatation of the mechanically ventilated premature infant is difficult because of the small size of the airway access, as well as the very low tidal volumes (V_t) that are encountered
- There is a need for a versatile, efficient Aerosol Chamber (AC) given the variety of treatment modalities

STUDY PURPOSE

- We report a study in which the delivery of a representative pressurized Metered Dose Inhaler (pMDI) delivered beta$_2$ adrenergic agonist was assessed using a newly designed small volume (110 ml) AC, optimized for HFA-based products and compatible with GSK canisters incorporating a dose counter compared to an existing device without these features

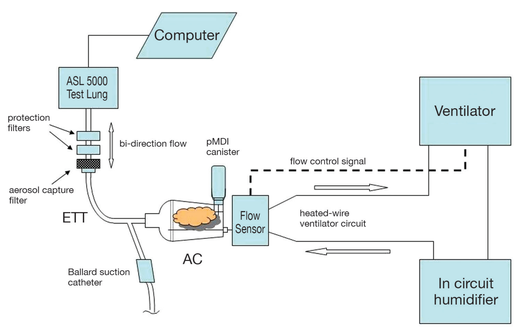
AeroChamber mini* AC
Trudell Medical International
London, Canada



ACE† Holding Chamber
DHD Healthcare
Wampsville, NY, USA

MATERIALS AND METHODS

- VHCs (n = 5 devices/group)
- Ventolin† HFA (GSK plc)
  - 100 µg salbutamol (albuterol) base equivalent per actuation ex metering valve
  - Widely prescribed beta$_2$ adrenergic agonist
- Anti-Static ***AeroChamber mini**** AC and **ACE**† Holding Chamber
- Each Chamber was attached via a 2.5 mm inner diameter neonatal endotracheal tube (ETT) to a lung model
  - ASL5000 (IngMar Medical, Pittsburgh, PA, USA)
- Lung operated in passive mode and driven by a Servo Ventilator 900C (Siemens-Elma, Sweden) simulating a mechanically ventilated, tidal breathing pre-term infant



- Breathing parameters:
  - V_t = 5 ml
  - 20% duty cycle
  - 60 breaths/min
- Aerosol reaching the distal end of the ETT was captured on a filter
- Salbutamol was subsequently recovered quantitatively and assayed by HPLC-UV spectrophotometry

PERFORMANCE METRIC

- Total Emitted Mass (TEM) salbutamol per actuation recovered after 6 consecutive breathing cycles

RESULTS

- TEM salbutamol with the ***AeroChamber mini**** AC-ETT was 8.8 ± 3.1 µg/actuation
- The **ACE**† AC-ETT combination provided 4.5 ± 2.2 µg/actuation
- Delivery of medication via the novel AC was significantly greater
  - Unpaired t-test, $p < 0.001$

CONCLUSIONS

- The novel ***AeroChamber mini**** AC offers the potential for improving treatment of premature infants with pMDI-based medications

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