

In vitro study of salbutamol aerosol delivered during neonatal mechanical ventilation

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Introduction



Figure 1: Aeroneb Solo nebulizer

>> **Aeroneb® Solo is a new generation of single patient multi-use vibrating mesh nebulizer designed for use with mechanically ventilated patients.**

>> The Aeroneb® Solo Micropump Nebulizer represents a new standard in critical care nebulization for mechanically ventilated patients. Featuring the proven OnQ™ nebulization technology employed in the Aeroneb® Pro nebulizer, the Aeroneb® Solo is a compact, single patient use nebulizer that offers the care giver the added convenience and flexibility of continuous and/or intermittent nebulization. It can be powered by either the Aeroneb® Pro or the Aeroneb® Pro-X controller. Continuous nebulization is only available when the nebulizer is used in conjunction with the Aeroneb® Pro-X controller and for up to seven days.

>> **The aim was to compare the performance of this new nebulizer with other types of aerosol generators during simulated infant ventilation.**

Results

>> The **Aeroneb® Solo nebulizer** produced statistically the **highest** delivered mass of salbutamol : 53mg ± 6mg (p<0.00001), in comparison with Mistyneb® jet nebulizer: 7mg ± 2mg, and Ventoline®/Aerochamber®: 10mg ± 4mg). **Table 1.**

Experiment	Salbutamol delivered mass (µg)		
	Aeroneb® Solo, mesh nebulizer	Mistyneb®, jet nebulizer	Ventoline® pMDI with Aerochamber®
1	49	7	13
2	51	4	5
3	62	5	9
4	46	3	7
5	58	8	13
6	55	6	12
7	60	9	12
8	50	10	6
9	47	7	16
Mean ± SD	53 ± 6	7 ± 2	10 ± 4

Table 1: Salbutamol mass deposited into the lung model during neonatal mechanical ventilation. Nebulizers were filled with 2.5mg/2.5ml and pMDI delivered 400µg.

Material and methods

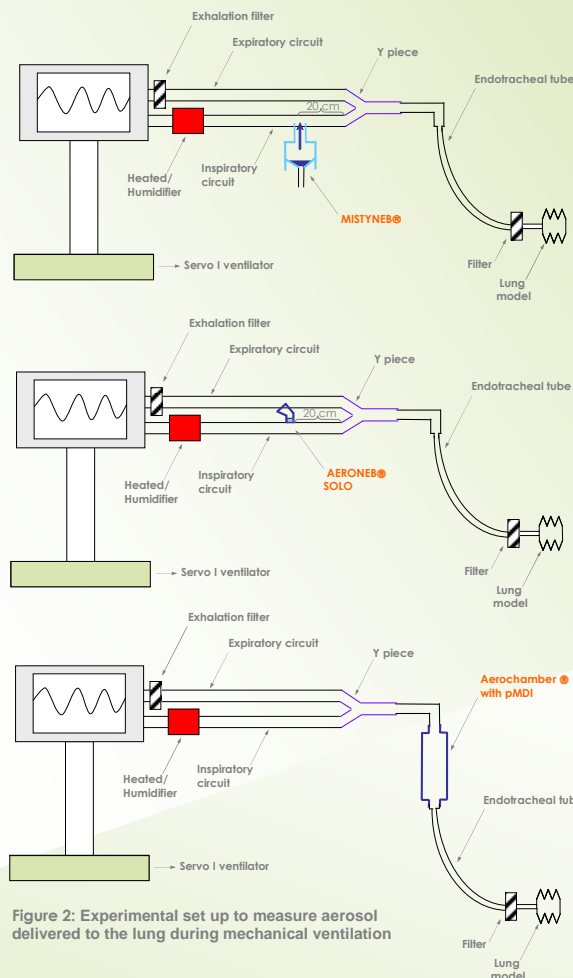


Figure 2: Experimental set up to measure aerosol delivered to the lung during mechanical ventilation

>> Three aerosol generators - the **Aeroneb® Solo**, an active vibrating mesh nebulizer (Aerogen Ltd, Ireland), the **Mistyneb®**, (Airlife, USA) a jet nebulizer operating at an airflow of 6L/min and the **Ventoline®, a pMDI** (GSK, France) with the Aerochamber® spacer (MV15®, Trudell Medical International, Canada) - were used to administer salbutamol in a model of neonatal mechanical ventilation.

>> A Servo I ventilator (Siemens, France) with a heated/humidified heated wire ventilator circuit, set up in controlled pressure (30 breath/min, 10ml, inspiratory time 0.7sec, pause time 0.1 sec) was connected to an endotracheal tube ETT (3mm) and then, to a filter (Respigard II, Vital sign) which was placed one cm from distal ETT. Finally, an infant lung model was connected to the filter. An exhalation filter (Respigard II, Vital sign) was placed down the expiratory circuit. **Figure 2.**

>> Aeroneb® Solo mesh nebulizer and Mistyneb® jet nebulizer were connected to the inspiratory limb 20cm from the Y piece, and were then filled with 2.5mg/2.5ml of salbutamol (Ventoline®, GSK). The Solo operated to end of nebulization and the Mistyneb® for 60 sec. after the onset of sputtering. The Aerochamber was connected between the Y piece and the ETT. Ventoline® pMDI delivering four 100µg/puff was tested for each experiment.

>> **Salbutamol deposited on inspiratory filter** was assayed by spectrophotometry method.

>> Each experiment was carried out three times with each of three devices, resulting in 9 values for each kind of aerosol generator for each patient model.

Conclusion

We conclude that during simulated infant mechanical ventilation, Aeroneb® Solo nebulizer delivered greater than 5 fold more salbutamol distal to the airway than either the pMDI or jet nebulizer.