

Comparing Breath Actuated and Breath Enhanced Jet Nebulizers for the Delivery of Tobramycin

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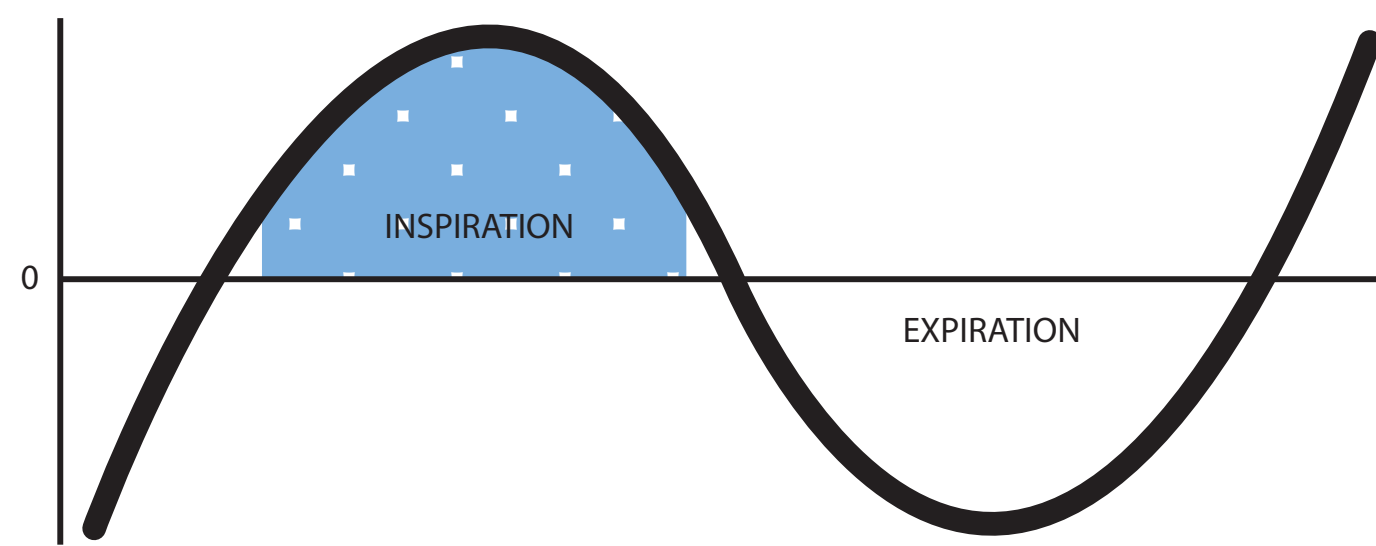
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RATIONALE

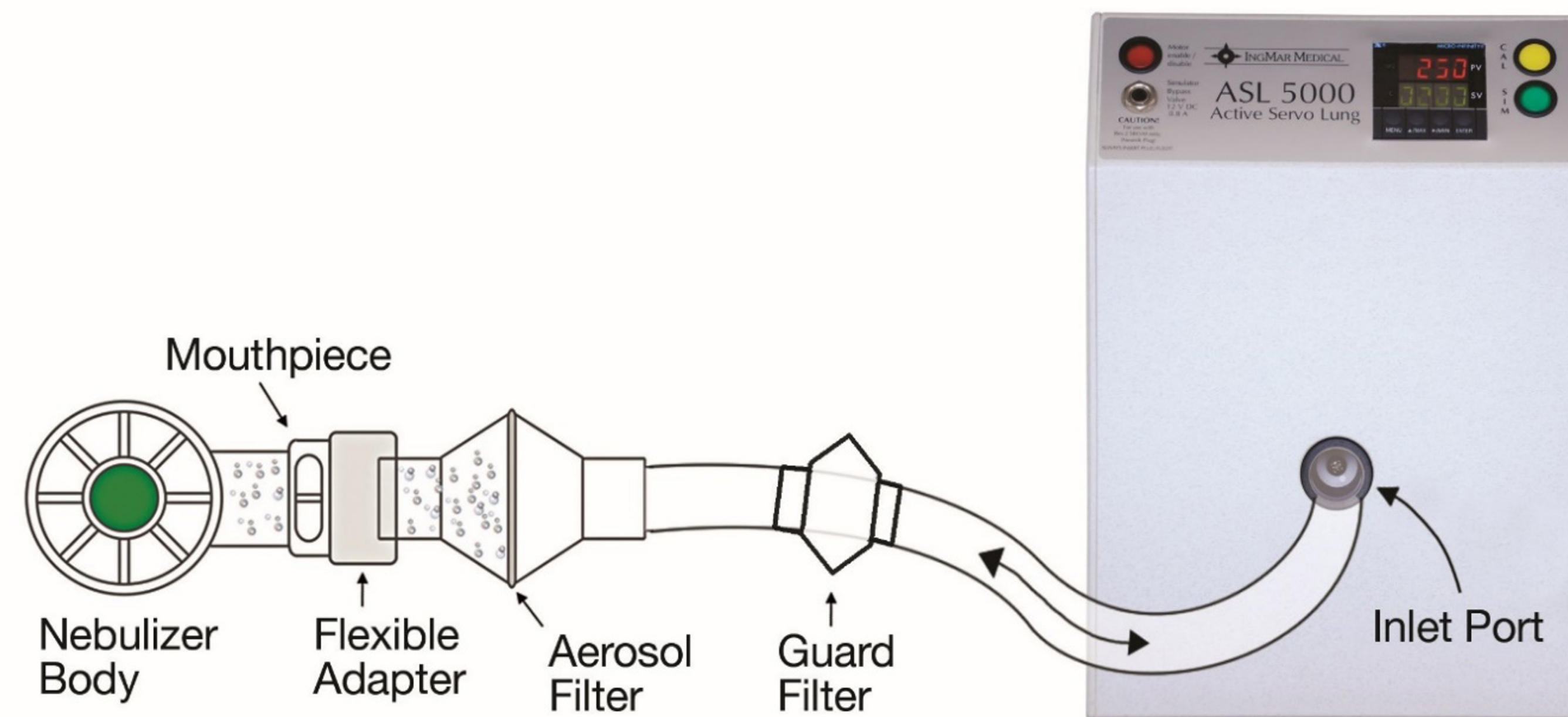
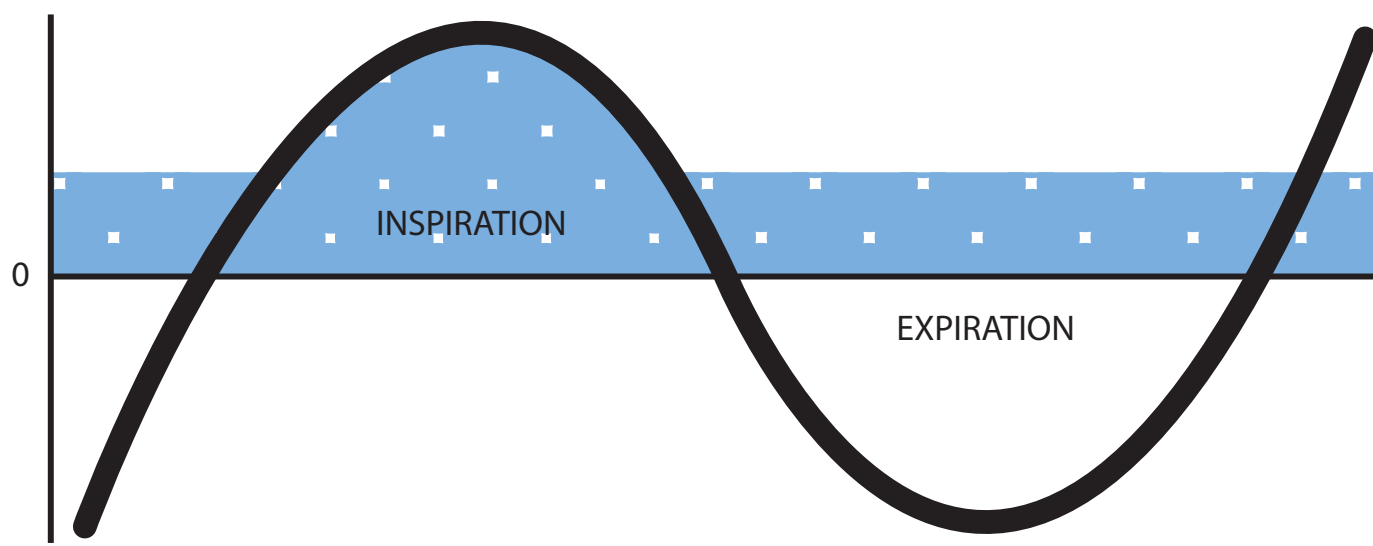
Nebulization is the mainstay of care for patients requiring inhaled antibiotic therapy in association with pulmonary diseases such as cystic fibrosis (CF), bronchiectasis and chronic obstructive lung disease (COPD).

Breath actuated (BA) technology offers more consistent dose delivery¹ and the reduction of fugitive emissions² into the care environment. This *in vitro* study was undertaken to determine delivery of tobramycin using a BA nebulizer/compressor system and two breath enhanced (BE) nebulizer/compressor systems.

BREATH ACTUATED NEBULIZER



BREATH ENHANCED NEBULIZER



METHODS



AeroEclipse[®] XL BAN[™] Nebulizer with **Ombra[®]** Table Top Compressor



PARI LC PLUS⁺ with DeVilbiss⁺ Pulmo-Aide⁺ Compressor



PARI LC PLUS⁺ with PARI Vios⁺ Compressor

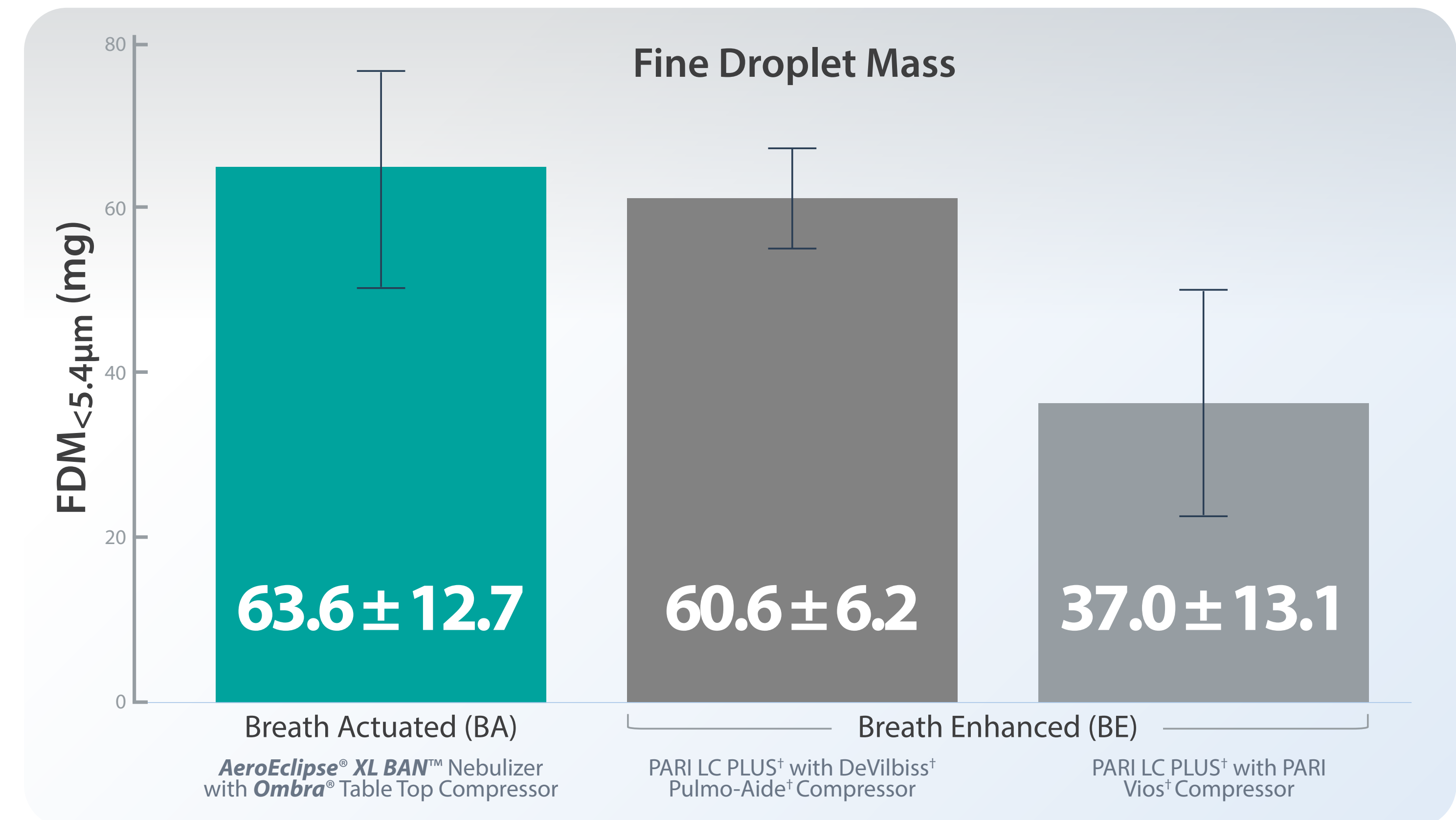
AeroEclipse[®] XL BAN[™] Nebulizer (BA) with **Ombra[®]** Table Top Compressor (Trudell Medical International) was evaluated with 300 mg tobramycin (5 mL, Teva-Tobramycin) and an adult tidal breathing waveform (tidal volume = 500 mL; duty cycle = 33%; breaths/minute = 13) delivered by breathing simulator (ASL 5000, IngMar Medical). An electret filter at the nebulizer mouthpiece captured emitted aerosol at minute intervals until onset of sputter. Total mass delivered (TM) was determined. Average delivery rate/min (DR_{min}) was calculated after assaying for tobramycin by a validated HPLC-based procedure. Parallel measurements of fine droplet fraction $<5.4\mu m$ diameter ($FDF_{<5.4\mu m}$) were made with each nebulizer, sampling the emitted aerosol via a chilled Next Generation Pharmaceutical Impactor at 15 L/min.

Fine droplet mass delivery/min ($FDM_{<5.4\mu m/min}$) was determined as the product of DR_{min} and $FDF_{<5.4\mu m}$. Fine droplet mass ($FDM_{<5.4\mu m}$) was determined as the product of TM and $FDF_{<5.4\mu m}$. Similar measurements were undertaken with PARI LC PLUS⁺ (BE) with DeVilbiss⁺ Pulmo-Aide⁺ compressor and PARI LC PLUS⁺ (BE) with PARI Vios⁺ compressor.

RESULTS

$FDM_{<5.4\mu m/min}$ data was similar for the BA/compressor system and one of the BE/compressor systems. However, $FDM_{<5.4\mu m}$ for the BA/compressor system was higher than both BE/compressor systems. (mean \pm SD; $n=5$ devices/group)

	Breath Actuated (BA)	Breath Enhanced (BE)	
	AeroEclipse[®] XL BAN[™] Nebulizer with Ombra[®] Table Top Compressor	PARI LC PLUS ⁺ with DeVilbiss ⁺ Pulmo-Aide ⁺ Compressor	PARI LC PLUS ⁺ with PARI Vios ⁺ Compressor
TM (mg)	106.4 \pm 18.9	100.6 \pm 10.9	64.1 \pm 20.1
DR_{min} (mg/min)	5.5 \pm 1.3	5.9 \pm 0.5	3.5 \pm 1.4
$FDF_{<5.4\mu m}$ (%)	63.1 \pm 2.6	60.6 \pm 3.8	59.3 \pm 4.0
$FDM_{<5.4\mu m/min}$ (mg/min)	3.3 \pm 0.9	3.6 \pm 0.3	2.0 \pm 0.9



CONCLUSIONS

The breath actuated system performs similarly or better than both breath enhanced systems. The more significant difference in fine droplet mass delivered between the two BE systems may be due to the compressor. On the basis of this study, clinicians could select **AeroEclipse[®] XL BAN[™]** Nebulizer with **Ombra[®]** Table Top Compressor for tobramycin delivery, with the added value of a breath actuated device offering improved dosing consistency¹ and low fugitive emissions²