

Methacholine Guideline Recommendations¹ and the *AEROECLIPSE*[®] II Breath Actuated Nebulizer



1999 Guidelines²

PC₂₀ – The provocative concentration at which the patient's FEV₁ drops 20% from their baseline measure.

2017 Guidelines¹

PD₂₀ – The provocative dose delivered that results in a 20% drop in the patient's FEV₁ from their baseline measure.

Why the Change?

- Nebulizers have evolved to offer more reproducible delivery profiles, without the need for calibration
- Nebulizer efficiency is much greater than in 1999, requiring less time to deliver the same dose
- Concentration prescribed a specific delivery profile, not common across devices making substitution of nebulizers difficult
- Dose is easy to calculate and allows use of different devices or protocols with the same end result

As a high efficiency nebulizer, the *AEROECLIPSE*[®] II Breath Actuated Nebulizer (BAN) should be used with a shorter nebulization time or lower initial concentration or both.¹

Published Values for the *AEROECLIPSE*[®] II BAN³

- Rate of output = 2.70 ± 0.22 mg/min (@ 16 mg/mL)
- Respirable Fraction = 76% < 5 µg

Calculation of Delivered Dose for Methacholine

For 20 seconds of tidal breathing using the *AEROECLIPSE*[®] II BAN, the delivered dose would be:

$$\left(\begin{array}{l} 2.70 \text{ mg/min} \\ \text{Published delivery} \\ \text{rate for 16 mg/mL} \\ \text{concentration}^3 \end{array} \right) \times \left(\begin{array}{l} 0.76 \\ \text{\% of particles} \\ \text{sized < 5 } \mu\text{m}^3 \end{array} \right) \times \left(\begin{array}{l} 20/60 \text{ secs} \\ \text{Takes the number} \\ \text{from one minute to} \\ \text{20 seconds} \end{array} \right) = \left(\begin{array}{l} 0.68 \text{ mg (680 } \mu\text{g)} \\ \text{Total dose delivered in} \\ \text{20 seconds} \end{array} \right)$$

Example Calculation of Delivered Dose

To determine the dose for other dilutions, the delivered dose would be:

$$\left(\begin{array}{l} [\text{Conc(mg/mL)/16 mg/mL}] \\ \text{New dilution concentration} \\ \text{divided by the known 16 mg/mL} \end{array} \right) \times \left(\begin{array}{l} 680 \mu\text{g} \\ \text{Known dose delivered} \\ \text{in 20 seconds} \end{array} \right)$$

Calculate Your Delivered Dose

$$\frac{\text{Your Drug Concentration Here}}{16 \text{ mg/mL}} \times 680 \mu\text{g} = \text{Delivered dose in 20 seconds}$$

Use the calculation above to determine the delivered doses for the concentrations before and after the patients' 20% drop in FEV₁. These values can then be entered into the PD₂₀ calculation (see Appendix E').

¹ Coates AL, Wanger J, Cockcroft DW, et al. ERS technical standard on bronchial challenge testing: general considerations and performance of methacholine challenge tests. Eur Respir J 2017; 49:1601526. ² Crapo RO, Casaburi R, Coates AL, et al. Guidelines for methacholine and exercise challenge testing – 1999. Am J Respir Crit Care Med 2000; 161:309–329. ³ Coates AL, Leung K, Dell SD. Developing alternative delivery systems for methacholine challenge tests. J Aerosol Med Pulmon Drug Deliv 2014; 27:66–70. 105211-001 Rev A. *trade marks of Trudell Medical International. Copyright © Trudell Medical International 2017. All rights reserved.

