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CALCULATION OF HI-OX 80 MASK FIO2 BY USING A MODIFIED VERSION OF THE ALVEOLAR AIR EQUATION

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Background: he Hi-Ox 80 Oxygen Mask (Cardinal Health, Yorba Linda, CA) is a disposable, portless mask with low resistance valves and reservoir bag. According to the manufacturer's website, it is capable of producing an FIO2 of 80% at 8 l/m of oxygen flow. In this study, we sought to verify that assertion by calculating the mean FIO2 produced by a Hi-Ox 80 Mask at 8 l/m using a modified version of the alveolar air equation.

Methods: We recruited 15 healthy adults with a mean age of 24 years into our study. All participants were required to be less than 35 years of age, undergo DLCO testing and have a DLCO value of 90% of predicted or greater, be a non-smoker, and have no history of lung disease. Individuals meeting these inclusionary criteria were then seated, placed on a tight-fitting Hi-Ox 80 Mask at 8 l/m, and were instructed to relax, breathe normally, and not talk for a period of 15 minutes. During the testing period, all subjects were observed to perform quiet, restful breathing. At the end of the fifteen minute period, we performed a radial artery blood gas and measured pH, PaCO2, and PaO2 using a GEM 3000 blood gas analyzer (Instrumentation Laboratories, Lexington, MA). No air bubbles were observed in any of the syringes and all samples were analyzed within five minutes. Assuming that our subjects had normal cardiopulmonary anatomy and physiology, we estimated alveolar PO2 by dividing arterial PO2 by a normal arterial to alveolar ratio of 0.9 to reflect a ten percent higher partial pressure of oxygen in the alveoli than in arterial blood. Knowing approximate alveolar PO2, we then calculated FIO2 by the following formula: FIO2 = [(arterial PO2 ÷ 0.9) + (arterial PCO2 x 1.20)] ÷ (PB - 47).

Results: The mean PaO2 produced by the Hi-Ox 80 Mask at 8 l/m in our study was 401 mmHg with a range of 294-521 mmHg. This resulted in a mean calculated FIO2 of 72% with a standard deviation of 11%. The range of calculated FIO2 was 55-91%. During the testing period, our subjects had a mean pH of 7.45 and a mean PaCO2 of 38 mmHg. The average DLCO of the fifteen participants was 115% of predicted.