EXHALATION VALVE LEAKAGE MEASURED BY A NEGATIVE PRESSURE FIT TEST METHOD AND ITS EFFECT ON THE MEASUREMENT OF HUMAN SUBJECTS FIT FACTORS

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Studies comparing condensation nuclei counter and dynamic negative pressure methods have found that the negative pressure method consistently measures lower and less variable fit factors. It has been suggested that this is in part due to the negative pressure method measuring exhalation valve leakage in addition to faceseal leakage. To test this premise leakage through exhalation valves from three brands of halfmask respirators was measured with a commercially available dynamic negative pressure fit tester. The valves were fitted to a sealed canister and thirty tests performed at each challenge pressure of -0.99 -1.47 -1.96 and -2.21 mm H_2O programmed in the device corresponding to work rates of 100 200 300 and 350 kcal hr^{-1}. Average leak rates were found to be 1.2 0.9 0.9 and 0.8 ml min^{-1} at the respective challenge pressures. These leak rates accounted for an average of between 1.6 x 10^{-3} and 3.6 x 10^{-3} percent of the corresponding programmed inspiratory flows. When the average valve leakage at 200 kcal hr^{-1} (normal work rate) was subtracted from the total leakage measured by the negative pressure method in a human subjects fit test study it was found that the adjusted fit factors only increased by an average of 1.2 % and did not account for the difference between particle counter fit factors. The results of this study indicate that the leakage measured by the negative pressure device on these valves was extremely low and their effect on overall fit factors was negligible.