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Carbon Dioxide Testing and Airflow Efficiency

PURPOSE OF THE TEST: Tests were performed in order to determine if a significant build-up or accumulation of carbon dioxide occurred while using the XcapTM filter and WhiffsTM mask during strenuous exercise. The airflow efficiency of the filter was also tested.

TEST PROTOCOL: All tests were conducted in the pulmonary physiology laboratory at a regional medical and trauma center under the direction of a board certified pulmonary physician with extensive experience in exercise physiology. An MVMax Sensormedics Series 229 cardiosystem was used. The subject was a 53-year-old male, office worker.

Baseline determinations for VO₂—mL/kg/min, VCO₂ — L/min, VE (minute ventilation) heart rate and work watts while riding a Bicycle Ergometer (Ergometrics 800 manufactured by Ergoline) were made. A 15-watt ramp protocol was used. The baseline data was obtained during 12 minutes of work and 3 minutes of recovery. The workload increased from 15 watts to 175-200 watts. An arterial blood gas sample was obtained at peak exercise at 12 minutes. Arterial pH, pCO₂, and PO₂ were measured following exercise without the mask and filter. The subject was allowed to rest for 20 minutes following the baseline study.

Using the same bicycle and the 15-watt ramp test, the subject repeated the exercise protocol while wearing the mask and filter apparatus. At the 12 minute mark (peak exercise) a repeat arterial blood gas sample was obtained.

RESULTS:

Baseline Workout

FIO₂ 21%
PH 7.398
PCO₂ 42.2 mmHg
PO₂ 94.0 mmHg
Minute Ventilation — 48 L.
(steady state)
O₂ consumption — 24.0
ml/kg/min.
(steady state)

Mask & Filter Workout

FIO₂ 21%
pH 7.435
pCO₂ 44.4 mmHg
pO₂ 93.0 mmHg
Minute Ventilation — 49.8 L.
(steady state)
O₂ consumption — 25.3
ml/kg/min.
(steady state)

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INTERPRETATION:

There was no significant retention of carbon dioxide using the mask/filter apparatus following exercise. The work of breathing and oxygen consumption were essentially unchanged with use of the device. There was no impairment in oxygenation at peak exercise. Minute ventilation as a reflection of airflow resistance was essentially unchanged during mask/filter use.

This data is available for review. Please contact:

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