

Vent Flow System Development For Continuous Breath by Breath Analysis Of Pulmonary Mechanics

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Objectives- To develop a new mask system, which would allow accurate measurements of pulmonary mechanics, oxygen consumption, and carbon dioxide production on a breath by breath basis during equine exercise at varying intensities. Our system would result in greater versatility and less mask “effect” on equine performance than in similar currently available commercial systems.

Animals- 4 healthy and fit thoroughbred horses with carotid loops surgically relocated to a subcutaneous position on the upper left side of the jugular groove were used in this study.

Procedure- Horses were instrumented with an 18 gauge catheter in the carotid loop to draw arterial blood into heparinized syringes for blood gas and pH analysis. A Swan-Gantz catheter with a thermistor was passed into the right jugular vein to measure mixed venous blood temperature for blood gas corrections. Subjects were weighed pre and post-run. The subjects performed two incremental runs to VO_2max . One run in the morning and one run four hours later with either the traditional Open Flow mask or the new Vent Flow mask in a randomized order to prevent possible mask wearing order effects on performance.

Results- During exercise, changes in pH, pCO_2 , and pO_2 were significant, showing that the Open Flow system was more compatible to performance for each of these three variables compared to the Vent Flow system. Heart rate did not result in significant differences between the two systems. In terms of resistance, it was shown that in comparison to current commercially available systems, the resistance was reduced by half at flow rates of 30L/s and reduced by a quarter for flow rates of 90L/s.

Conclusion- Although our hypothesis was not supported, we were able to gain valuable information on how to improve the system and pursue our course toward a finished product.