PERFORMANCE OF THE SOUTHERN RESEARCH
NONHUMAN PRIMATE PLETHYSMOGRAPHY SYSTEM


Abstract

Background

Respiratory studies for nonhuman NHPs require the evaluation or measurement of the respiratory volumes. Several formulas based on weight are available to increase NHP ventilation. However, they are usually determined using non-NHP animals and are not directly applicable to testing with anesthetized NHPs. Therefore, Southern Research needed a nonhuman plethysmography system with a calibrated headbox, plethysmographic system, anesthetic gases, and drug delivery system.

Introduction

The ICRJ software displays a real-time pulmonary wave forms of an anesthetized NHP. The views of the software can display multiple pulmonary parameter simultaneously.

The plethysmography system was calibrated using a known volume of air in the modeled plethysmography chamber. The volume of air was dependent on the body weight range of the NHP. The pressure drop generated across the plethysmography chamber was detected by the pressure transducer and entered in the arithmetic. The simplified pressure square wave was transformed into a flow-rate using the ICR software. NHPs were lightly sedated and filled with carbon dioxide during the measurement. The carbon dioxide was allowed to provide a normal test but did not affect the NHP ventilation readings. NHPs were placed in the plethysmography chamber to measure the plethysmography and the air flow rates were measured using the weight and volume of the NHP.

Methods

The plethysmography system was calibrated using a known volume of air in the modeled plethysmography chamber. The volume of air was dependent on the body weight range of the NHP. The pressure drop generated across the plethysmography chamber was detected by the pressure transducer and entered in the arithmetic. The simplified pressure square wave was transformed into a flow-rate using the ICR software. NHPs were lightly sedated and filled with carbon dioxide during the measurement. The carbon dioxide was allowed to provide a normal test but did not affect the NHP ventilation readings. NHPs were placed in the plethysmography chamber to measure the plethysmography and the air flow rates were measured using the weight and volume of the NHP.

Results

- The mean inspiratory tidal volume was 51.1 ± 14.6 mL.
- The mean breathing frequency was 15.6 ± 3.3 breaths per minute.
- The mean minute ventilation was 46.3 ± 2.1 mL/min.

Discussion

- Respiratory frequency for NHPs requires the estimation or measurement of minute ventilation. NHPs and primate formulas based on weight are not adequate NHP ventilation. However, they are usually determined using non-NHP animals and are not directly applicable to testing with nonhuman NHPs.
- NHPs were anesthetized with a continuous infusion of propofol using a syringe pump.
- Anesthetic gases used 1.5-2.0 kg/m² were placed into plethysmography and filled with a carbon dioxide

Conclusions

The hand-held plethysmography system demonstrated that estimated respiratory function based on weight is not applicable for respiratory NHPs. Our data show actual respiratory frequency, tidal volume, and minute ventilation in anesthetized NHPs vary from those calculated estimates and are consistent with published data.

References


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