

Benefits of Pulse Oximetry over Blood Gas Measurements in Small Animal Research

29 Nov 11

Blood gas and pulse oximetry are two types of measurements that provide insight into blood gas exchange. There are significant differences in how each is measured.

Blood gases are measured by removal of a small sample of blood, which is then delivered into a device that measures parameters directly from the blood. Blood gas machines conduct basic measurements on 3 parameters:

- Dissolved oxygen
- Dissolved carbon dioxide
- pH

Pulse oximetry on the other hand, measures the amount of oxygen attached to hemoglobin. Because 97% of oxygen carried to tissues is attached to hemoglobin, this measurement effectively records the total content of oxygen in the blood. It does not provide insight into the level of arterial carbon dioxide or pH, so if knowledge of these is required, a blood gas becomes necessary.

The real advantage to pulse oximetry however is that it is completely non-invasive. It can be measured with a simple clip that attaches to an appendage on the animal's body. The advantages of pulse oximetry over blood gas measurements are as follows:

- Completely non-invasive
 - no adhesives
 - no needle sticks
 - no catheters
 - no IVs
 - no surgery
- Pulse-ox is a continuous monitoring modality
 - no intermittent samples
 - can be monitored continuously
 - can be repeated as often as desired
 - can monitor from newborn through adulthood
 - no catheter to outgrow or clog
- No need for individual animal housing so that catheters are not chewed or otherwise disturbed by other housed animals
- No special care for catheters (e.g., inserting anti-coagulant gels, care of transcutaneous wounds, etc.)
- No disturbance of subject physiology
 - no change in fluid volume by removal of blood sample (blood gas sample represents relatively large percent of total blood volume in a mouse)
 - no implanted catheter that restricts or occludes blood flow
 - no complications from surgery
 - no change in subject hematocrit
- Can conduct serial measurements from the same animal throughout its life
 - reduces the total number of animals needed for experiments
 - eliminates unnecessary statistical analysis since the same animals can be used throughout an experiment

- No need to administer anti-clotting agents
- No risk of morbidity or mortality to the animal
- Inexpensive
 - Low-cost hardware
 - No maintenance or upkeep on primary measuring device
 - No service contracts
 - No consumable items
 - pipettes
 - cal fluids/gases
 - syringes
 - anesthesia
 - surgical supplies
 - catheter care materials
 - Sensor is only semi-consumable item – 100 hours use per sensor
- No calibration necessary
 - No expensive calibration fluids or gas tanks
 - No daily, weekly or monthly cal procedures