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“Blood Gases: The Essentials” *DID YOU KNOW?*

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Obtaining and interpreting blood gas samples can be essential in the management of many veterinary patients. Blood gases offer information about the acid/base status as well as the function of the respiratory system.

Acid-base alterations are common in critically ill patients, and can lead to altered cardiovascular function, changes in the neurologic status of the patient, respiratory function, and even the response to various drug therapies. In addition to identifying and addressing underlying problems, metabolic derangements can often be corrected through the appropriate use of IV fluids and, in severe cases, drugs such as sodium bicarbonate. Respiratory derangements are usually corrected with the use of positive pressure ventilation and/or oxygen supplementation.

The signs of acid/base disturbances are usually vague and are difficult to detect clinically, making blood gas analyses essential. Blood gas instruments measure the pH (H⁺ concentration), the partial pressure of carbon dioxide (PCO₂) and the partial pressure of oxygen (PO₂). With this information the analyzer can calculate bicarbonate and base excess (HCO₃⁻ & BE) as well as the percent hemoglobin saturation with oxygen (SO₂). The pH, HCO₃⁻ & BE and the PCO₂ all serve to determine the acid-base status. The two basic categories of acid-base derangements are metabolic and respiratory. Unless the patient has evidence of low peripheral perfusion (e.g. circulatory shock), venous samples can be adequately used to assess acid- base status.

Respiratory function can be evaluated as to the patient's ability to oxygenate (PO₂) and ventilate (PCO₂). Hypoxemia (PaO₂ of < 80 mm Hg) may be detected through the use of pulse oximetry (SpO₂), but arterial blood gas analysis remains the gold standard. Arterial blood gas analyses allow us to accurately assess respiratory function just as bile acids assess liver function and fractional shortening quantifies cardiac function.

The most useful calculation used in determining the source of hypoxemia is the alveolar to arterial oxygen gradient (A-a gradient). The A-a gradient helps isolate the location of the problem as either intrapulmonary or extra-pulmonary. It does so by accounting for the effects of altitude (i.e. barometric pressure), inspired oxygen percentage (the FiO₂), and ventilation (PCO₂) on the patient's arterial oxygenation (PaO₂).

If we can help you with your cases don't hesitate to call 24/7!!