

Canine Blood Gas Analysis – A Review

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Abstract: *Canine blood gas analysis deals with the analysis and interpretation of dissolved gaseous status and acid base level of blood. It helps with the determination of oxygen and carbon dioxide, the two important gases which deals with human and animal life. Blood gas analysis in canines has not become as popular as in medical field. A thorough knowledge in this field will help as explore a lot and opens a new level in monitoring veterinary anesthesia, proper diagnosis of various disease conditions and selection of a precise and meticulous treatment protocol.*

Key words: acidosis, alkalosis, arterial blood, blood gas, venous blood

1. Introduction

Nothing helps more in understanding the acid base status of the blood rather than using a blood gas analyzer which properly determines the dissolved gaseous level and pH of the blood. Analysis does not require any specialist equipments and can be handled easily, even on the bed side of the patient. This review helps in the proper understanding of blood gas analyzers and interpretation of data obtained on blood gas analysis for better patient care and support, especially in critical care and management.

2. Sample Collection

Arterial or venous blood collected from patients is the sample used for blood gas analysis. Arterial blood in dogs can be collected from dorsal pedal artery, femoral artery or lingual artery whereas venous blood from jugular, saphenous or cephalic vein. Blood should be collected aseptically by arterial or venous puncture and should be analyzed immediately since delay in time taken can alter the results obtained (McMillan, 2010). If it is to be analyzed later the most suitable anticoagulant is heparin. Arterial puncture is difficult than venipuncture but skill can be developed on practice and knowledge of proper anatomy of canine body.

3. Variables Analyzed

The parameters analyzed on blood gas analyzer vary with the make of the machine. Irrespective of the machine, the common variables studied includes pO_2 , pCO_2 and pH. Other parameters include sodium, potassium, calcium, glucose and lactate. Calculated variables include hematocrit, hemoglobin level, HCO_3^- , SO_2 , TCO_2 , base excess of blood and extracellular fluid. From these values anion gap and acid base balance of the blood can be estimated which provides an insight into the condition of animal body, probable sight of origin of the disease process and treatment modality to be adopted.

4. Uses

Blood gas analysis can be used for the estimation of various parameters. Acid base balance of the animal can be analyzed which helps to determine whether animal is in a state of metabolic acidosis or alkalosis. Metabolic acidosis is

characterized by a decreased bicarbonate level whereas respiratory acidosis is characterized by an increased partial pressure of carbon dioxide (pCO_2). Similarly metabolic alkalosis is characterized by an increase in bicarbonate level and respiratory alkalosis by decreased partial pressure of carbon dioxide. Normal pH of canine blood is 7.36-7.44, which also serves as an indicator of acid-base balance of the blood (Rozanski, 2009). Base excess of blood and extracellular fluid also provides an idea of acid-base status. Since base excess calculation involves normalization of $PaCO_2$, this value represents the true metabolic acid base status (Pettifer, 2003)

Anion gap can be estimated by subtracting the level of major anions from the major cations ($(Na^+ + K^+) - (HCO_3^- - Cl^-)$). This helps to determine the electrolyte disturbances and evince body's response to underlying disease process.

Ventilation level of the animal can also be assessed by noting hyperventilation indicated by decreased partial pressure of carbon dioxide in arterial blood ($PaCO_2$) and hypoventilation characterized by increased $PaCO_2$, the normal level being 35-45mmHg. Lactic acid level demonstrates the perfusion rate and is a reliable indicator of anaerobic metabolism taking place in the critically ill animal. Normal lactate level is less than 2.6 mmol/l (Thorneloe *et al.*, 2007), prognosis of dogs with levels above 5mmol/l is considered grave.

Arterial and venous level of oxygen and carbon dioxide are also important in the monitoring of animals under anaesthesia and also critically ill patients. Other variables like hematocrit and hemoglobin level can also be estimated by some machines.

5. Scope of the study

Analysis of blood gas levels along with electrolytes and acid-base balance increases the scope of disease diagnosis and treatment. This review will provide the veterinarians an awareness about the use of blood gas analyzers, their importance and increases the accuracy of their diagnostic skill and increases recovery rate.

6. Conclusion

Blood gas analysis using hand held analyzers helps to analyze the condition of the animals and to reach a conclusion pretty earlier. The machine is actually a boon to emergency and critical care units. Also it helps to confirm the prognosis of an injured or diseased animal. Previously the use of blood gas analyzers were restricted to large hospitals but now with the arrival of hand held and patient side analyzers its use has been increased tremendously and is used even by individual doctors. The cost of each test is negotiated by the rapidity and sharpness with which the results are obtained.

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Author Profile



Manju K Mathew received her Veterinary science graduation and postgraduation from College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University. Presently she is working as research associate in an Outreach programme on ethno veterinary medicine.

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