

ARTERIAL BLOOD GAS ANALYSIS

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What is an ABG?

Arterial blood gas analysis is an essential part of diagnosing and managing the patient's oxygenation status, ventilation failure and acid base balance.

What Is An ABG?

pH [H⁺]

PaCO₂ Partial pressure CO₂

PaO₂ Partial pressure O₂

HCO₃ Bicarbonate

BE Base excess

SaO₂ Oxygen Saturation

pH classification

- ◉ 7.35-7.45 – Normal
- ◉ <7.35 – acidosis
- ◉ >7.45 - alkalosis

PaCO₂ assessment

- ◉ Normal 35-45 mmHg
- ◉ Respiratory acidosis >45
- ◉ Respiratory alkalosis <35

Metabolic assessment

| | Base excess | HCO ₃ |
|---------------|-------------|------------------|
| Normal | 0 ±2 | 24 ±2 |
| Met.acidosis | <-2 | <22 |
| Met.alkalosis | >+2 | >26 |

Anion gap: Plasma anions not measured by routine laboratory.

AG= (Na+K) – (Cl+HCO₃). Normal = 12 ± 4 mEq/L

Acid/Base Balance

- The pH is a measurement of the acidity or alkalinity of the blood.
- It is inversely proportional to the no. of (H⁺) in the blood.
- Changes in body system functions that occur in an acidic state decreases the force of cardiac contractions, decreases the vascular response to catecholamines, and a diminished response to the effects and actions of certain medications.
- An alkalotic state interferes with tissue oxygenation and normal neurological and muscular functioning.

Acid/Base Relationship



Acid-base Balance

Henderson-Hasselbalch Equation

$$\text{pH} = \text{pK} + \log \frac{[\text{HCO}_3^-]}{.03 [\text{PaCO}_2]}$$

pK=6.1 dissociation constant
.03= solubility co-efficient for Co2 (converts mmHg to mEq/L)

pH is inversely related to $[H^+]$; a pH change of 1.00 represents a 10-fold change in $[H^+]$

COMPONENTS OF THE ABG

pH: Measurement of acidity or alkalinity, based on the hydrogen (H⁺)
7.35 – 7.45

Pao₂ The partial pressure oxygen that is dissolved in arterial blood.
80-100 mm Hg.

PCO₂: The amount of carbon dioxide dissolved in arterial blood.
35– 45 mmHg

HCO₃
: The calculated value of the amount of bicarbonate in the blood
22 – 26 mmol/L

B.E:
The base excess indicates the amount of excess or insufficient level of bicarbonate. -2 to +2mEq/L
(A negative base excess indicates a base deficit in blood)

SaO₂:The arterial oxygen saturation.
>95%

Buffers

➤ There are two buffers that work in pairs

| | |
|---------------------------|------------------|
| ➤ H_2CO_3 | NaHCO_3 |
| Carbonic acid | base bicarbonate |

➤ These buffers are linked to the respiratory and renal compensatory system

BASE EXCESS

- It is an estimate of the amount of strong acid or base needed to correct the metabolic component of an acid base disorder (restore plasma pH to 7.40 at a PaCO_2 40 mmHg)

Formula

- With the base excess is -10 in a 50kg person with metabolic acidosis mM of Hco_3 needed for correction is:

$$= 0.3 \times \text{body weight} \times \text{BE}$$

$$= 0.3 \times 50 \times 10 = 150 \text{ mM}$$

Anion GAP

- $AG = (Na^+ + K^+) - (Cl^- + HCO_3^-)$
- * A change in the pH of 0.08 for each 10 mm Hg indicates an **ACUTE** condition.
- * A change in the pH of 0.03 for each 10 mm Hg indicates a **CHRONIC** condition.

THANK YOU