

ARTERIAL BLOOD GAS ANALYSIS – ACID BASE

Normal values			Steps to analysis – Acid Base				
pH	> 7.45	Alkalaemia	1. pH	Determine primary disorder			
	7.36 – 7.44	Normal	2. Primary disorder	pH	PCO ₂	HCO ₃	Interpretation
	< 7.35	Acidaemia	<i>Look at PaCO₂</i> ROME R respiratory O opposite M metabolic E equal	↑	↓	↓	Respiratory alkalosis
PaCO ₂	> 45	High		↓	↑	↑	Respiratory acidosis
	35 - 45	Normal		↑	↑	↑	Metabolic alkalosis
	< 35	Low		↓	↓	↓	Metabolic acidosis
HCO ₃	> 26	High	3. Anion Gap (AG)	Na ⁺ – Cl ⁻	> 16	High	HAGMA
	24 +/- 2	Normal		– HCO ₃ ⁻	12 +/-4	Normal	NAGMA
	< 22	Low		< 8	Low	LAGMA	
Lactate	< 1.5- 1.6	Normal	AG corrected for albumin	= Observed AG + $\frac{(\text{normal albumin} - \text{serum albumin})}{4}$			
	> 2	High	Corrected Na ⁺ for AG in hyperglycaemia	Corrected Na ⁺ = Na ⁺ + $\frac{\text{glucose} - 5}{3}$			
4. Base Excess	BE ≈ 24.2 – serum bicarb		5. Mixed disorder?	$\Delta \text{AG} - \Delta \text{HCO}_3 =$ (AG – 12) – (24 – HCO ₃)	0	Pure HAGMA	
SBE	> 2	High	Delta gap (AKA delta-delta or delta difference)		> 6	Mixed disorder	
		Met alkalosis	Delta ratio (AKA gap: gap ratio)	$\frac{\Delta \text{AG}}{\Delta \text{HCO}_3} =$ $\frac{\text{AG} - 12}{24 - \text{HCO}_3}$	< 0.4	LAGMA or NAGMA	
Standardized Base excess	-2 to 2	Normal			0.4 – 0.8	NAGMA + HAGMA	
Standardized Base excess	< -2	Low			0.8 – 2.0	Pure HAGMA	
		Met acidosis			> 2.0	HAGMA + Met alkalosis	
5. Compensation rules							
Expected HCO ₃	Respiratory acidosis			Respiratory alkalosis			
	acute	chronic		acute	chronic		
	$24 + \left[\frac{\text{PaCO}_2 - 40}{10} \right] \times 1$	$24 + \left[\frac{\text{PaCO}_2 - 40}{10} \right] \times 4$		$24 - \left[\frac{40 - \text{PaCO}_2}{10} \right] \times 2$	$24 - \left[\frac{40 - \text{PaCO}_2}{10} \right] \times 5$		
Expected PaCO ₂	Metabolic acidosis			Metabolic alkalosis			
	PaCO ₂ = 1.5 x HCO ₃ + 8 (+/-2)			PaCO ₂ = 0.7 x HCO ₃ + 20 (+/-5)			

No compensation

Partial compensation

Full compensation

pH remains abnormal. "other" value remains normal + no attempt to normalise pH

pH still abnormal. "other" value is abnormal in an attempt to normalise pH.

pH is normal. "other" value is abnormal + has successfully normalised pH.