

A VERY BASIC APPROACH TO BLOOD GAS ANALYSIS

BLOOD GASES TYPICALLY PRESENTED AS

pH / PaCO₂ / PaO₂ / bicarb / base excess or deficit (BE/BD)

Values for these are:

	Normal	Acidotic	Alkalotic
pH	7.40	<7.40	>7.40
PaCO ₂	40 mm Hg	>40	<40
PaO ₂	100 mm Hg		
HCO ₃	24 mEq/L	<24	>24
BE/BD	0 mEq/L	<0 (BD)	>0 (BE)

A normal gas would be 7.40/40/100/24/0.

STEPS TO ANALYSIS

1. Look at pH. Alkalemic or acidemic?

If alkalemic, then alkalosis is primary. If acidemic, acidosis is primary.

2. Look at components.

PaCO₂ (respiratory component) - alkalotic or acidotic?

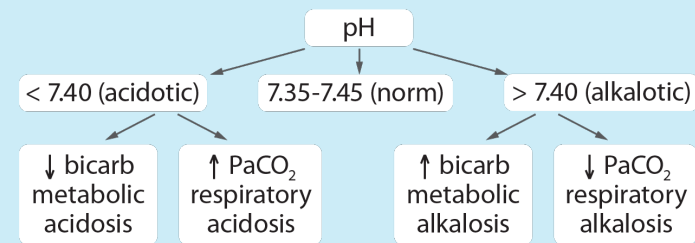
HCO₃/BE/BD (metabolic component) - alkalotic or acidotic?

3. Which component agrees with pH?

Whichever agrees with pH (respiratory or metabolic) is "primary".

If the other component is in the other direction, it is "secondary".

If they both agree, then it is "combined".



A QUICK ASIDE ABOUT BICARB & BE/BD

- Bicarb on blood gases isn't measured, it's calculated.
- In practice, not much difference between two values.
- Base excess/deficit ≈ Difference from bicarb of 24
 - Bicarb of 21 ≈ Base deficit of -3
 - Bicarb of 27 ≈ Base excess of +3

WHAT ABOUT ARTERIAL VS VENOUS GASES?

- When determining acid/base balance, difference is negligible.
- Can adjust venous PaCO₂ by 5 (normal venous PaCO₂ = 45) and venous pH by 0.05 (normal venous pH = 7.35).
- However, when assessing oxygenation, need arterial blood gas!

ASSESSING OXYGENATION

• PaO₂/FiO₂ ratio

- Quickest method. Used as a criteria for ARDS severity.
- Normally, should be 500. On room air, normal PaO₂ = 100. So, 100/0.21 = 500.
- PaO₂/FiO₂ between
 - 200-300 = Mildly diminished oxygenation
 - 100-200 = Moderately diminished oxygenation
 - <100 = Severely diminished oxygenation

• Oxygenation index (OI)

- Accounts for ventilation needs. Used for criteria for ECMO.
- Higher the OI, the worse it is (>20 is bad, >40 consider ECMO).
- **OI = Mean airway pressure x FiO₂ x 100/PaO₂.**