Arterial Blood Gas (ABG) Interpretation

Suspected blood acid-base disorder?
Read ABGs: pH/pCO2/pO2/HCO_3

Normal values: 7.40/40/80/24
(stick w/ above #s for calculations)
pH: 7.35-7.45
pCO2: 37-42
pO2: 80-100
HCO3: 22-26

*1. Look at **pH**. What is the acid/base disturbance?*

- **Acidemia pH < 7.35**
- **Normal pH (7.35-7.45)**
  - → *Normal ABGs*
  - → *Mixed Acid-base disorder*
- **Alkalemia pH > 7.45**

*2. Look at **pCO2** & **HCO_3^-**. Which element is driving the pH?*

- **HCO_3^- < 24 mmol/L → *Metabolic Acidosis***
- **pCO2 > 40mmHg → *Respiratory Acidosis***
- **HCO_3^- > 24 mmol/L → *Metabolic Alkalosis***
- **pCO2 < 40mmHg → *Respiratory Alkalosis***

*3. Is there a **compensation**? If so, what is it?*
(ratios = **appropriate** compensation; *inappropriate* comp'n = 2^0 process!)

Lungs expel CO2
ΔHCO_3^- : Δ pCO2
↓10 : ↓ 12
Calculate Anion Gap using electrolytes!

Law of mass action / *Kidneys retain HCO3-*

Acute	**Chronic**
ΔHCO_3^- : Δ pCO2	ΔHCO_3^- : Δ pCO2
↑1 : ↑10	**↑3 : ↑10**

Lungs retain CO2
Δ HCO_3^- : Δ pCO2
↑10 : ↑ 7

Law of mass action / *Kidneys expel HCO3-*

Acute	**Chronic**
ΔHCO_3^- : Δ pCO2	ΔHCO_3^- : Δ pCO2
↓2 : ↓10	**↓ 4 : ↓ 10**

*4. What **caused** this acid-base disorder?*

(see if the cause correlates with the clinical picture! I.e. COPD pts usually have resp acidosis)

High (>12) ***(acid gain)***
- → **A**cetylsalicylic acid
- → **M**ethanol (alcohols)
- → **U**remia
- → **D**iabetic ketoacidosis
- → **P**ropylene glycol
- → **I**soniazid, Iron
- → **L**actic acidosis
- → **E**thylene glycol

Normal (9-12) ***(HCO_3- loss, replaced by Cl^-)***
- → *Renal loss* (RTA, intersitial nephritis)
- → *GI loss* (i.e. diarrhea)

Hypo-ventilation
- → Central causes (drugs, coma, hypo-thryoid)
- → Damaged lung tissue (COPD, asthma, interstitial lung dx)
- → Chest wall defects (kypho-scoliosis)
- → Neuromuscular defects

H+ loss
(kidneys unable to secrete HCO3-)
- → *Renal excretion* (loop diuretics, excess aldosterone)
- → *GI excretion* (vomiting, antacids, diarrhea)
- → *Hypokalemia*
- → *Conn's Syndrome*

Hyper-ventilation, etc
(rarer than Resp Acidosis, b/c hypoventilation due to damaged lungs = more common)

***Anion Gap** = Na–(HCO3+Cl)*
High Anion gap = buffering of abnormal acid w/ HCO3-

Δ Anion Gap (AG–12) should = consumption of HCO3 (24–HCO3)
Δ Anion gap < Δ HCO3- means anion gap + non-anion gap acidosis (i.e. bicarb loss)
Δ Anion gap > Δ HCO3- means anion gap acidosis + metabolic alkalosis

Notes:
→If *chronic* compensation is incomplete, could mean mixed acid-base disturbances!
→Easier to lower than to raise pCO2 or HCO3-. In resp compensation, pCO2 is lowered more than it's raised. In metabolic compensation, HCO3- is lowered more than its raised.

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