

THE ABCs OF ABGs

Know the normal values for pH, P_{CO2}, and HCO₃⁻ from memory.

| | | | | | | | | |
|-------------------------------|---------------|------|---------------------|----------------------|-------------|-----------|-------|---------------|
| pH | 7----- | 7.35 | ----- | 7.4 | ----- | 7.45 | ----- | 7.8 |
| | uncompensated | | | Normal or | | | | uncompensated |
| | acidosis | | compensated | compensated | compensated | alkalosis | | alkalosis |
| | | | acidosis only if... | alkalosis only if... | | | | |
| P _{CO2} | ----- | 35 | ----- | 45 | ----- | | | |
| HCO ₃ ⁻ | ----- | 22 | ----- | 26 | ----- | | | |

Helpful Reminders:

1. pH is determined by the number of free H⁺ present.
2. A high P_{CO2} causes more free H⁺ to be present due to the reaction of CO₂+H₂O therefore ↓ pH.
3. HCO₃⁻ is a base/buffer because it binds with some of the free H⁺ when H⁺ is present in excess. Therefore a low HCO₃⁻ level means they have been used to “bind up” excess H⁺. In other words... they have been doing their job.

Step 1 - Look at the pH. Do we have uncompensated acidosis or alkalosis? _____

If yes, then write down the “first and last names” leaving a blank for the “middle name” and go to Step 2.

If not, (in other words pH is 7.35 – 7.45) then go to Step 3.

Step 2 - Look at the P_{CO2}. Recall the inverse relationship between pH and CO₂.

Does the P_{CO2} # *explain* the pH condition? _____

E.g. High P_{CO2} would cause a low pH but a high P_{CO2} would not cause a high pH.

If the P_{CO2} explains the pH, then the cause is respiratory (and that’s the middle name)

If the P_{CO2} does not explain the pH, then the cause is metabolic and the HCO₃⁻ # should be correspondingly low or high... indicating compensation. This is true in the short term (a few days) but perhaps not long term. And yes, it is possible for the cause to be a combination of both resp. and metabolic.

Step 3 - If pH value is normal (7.35 – 7.45) we label it “compensated” only if either the P_{CO2} and/or HCO₃⁻ values are not normal. Your respiratory system and/or buffers are working properly. They are compensating but your patient might still be in trouble. Watch ‘em closely.

Identify the cause as before. If compensation is occurring, the other value (P_{CO2} or HCO₃⁻) will shift *in the same direction* as the one identified as the cause... indicating compensation. This is true in the short term (a few days) but perhaps not in the long term.

If all 3 values are normal then your patient is fine. Leave ‘em alone.