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Question about the "CO2" level on a BMP/ Chem 6

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Aug 3, '11 by IheartICUNursing

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I hope this isn't a silly question, but I'm a new grad on orientation in an ICU and I am having trouble understanding this concept. So the CO2 level that is given on a BMP isn't actually a measure of CO2, its an indirect measure of bicarb? Why is this? why aren't the CO2 on an ABG and the CO2 on a BMP the same thing? I tried looking this up but I haven't found anything so I hope someone here can explain to me. Thanks so much 😊

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Aug 4, '11 by GoldenFire5

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<http://www.lakesidepress.com/pulmona.../venousCO2.htm>

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Aug 4, '11 by BTBALL

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This will be a short answer. This question comes up often...

Put on your chemistry hats...

- Carbon dioxide enters the RBC and does two things:
 - combines with hemoglobin $CO_2 + Hgb \Rightarrow HgbCO_2$
 - combines with water $CO_2 + H_2O$ to form carbonic acid (H_2CO_3) this process is then enhanced by an enzyme within the RBC called carbonic anhydrase (CA) . $CO_2 + H_2O + CA \Rightarrow H_2CO_3$
- The carbonic acid from step b disassociates into a bicarbonate ion and a hydrogen ion $H_2CO_3 \rightleftharpoons HCO_3^- + H^+$
- The bicarbonate ion leaves the RBC and enters the plasma, allowing the chloride ion to enter the RBC.



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4. The hydrogen ion from step 2 binds with hemoglobin H + Hgb => HHgb

To summarize. CO₂ is a cellular waste product. When it's dissolved in water and not directly taken care of by the lungs (which 70% of the CO₂ is) it forms carbonic acid. This process is quickened by carbonic anhydrase. Once carbonic acid is formed it immediately breaks down into a bicarbonate ion that floats around extracellularly and a hydrogen ion. Using the measure of bicarbonate ion we can deduce a CO₂ "value".



Aug 4, '11 by [detroitdano](#)

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A great deal of your CO₂ in your blood is carried as bicarb, HCO₃, because CO₂ is readily converted to bicarb. Something on the order of 80% or so if I remember correctly. A BMP measures the bound CO₂, which is really bicarb.

ABG's measure unbound CO₂ as well as bicarb.

The BMP measure of bicarb is quite useful. There have been a handful of times I've drawn a BMP on someone and noted it was high and assumed some acidosis, and when I drew an ABG I was spot on. You can also look at it for trends in your CO₂ retainer populations (COPD, PF, sarcoidosis).

On another note, do you also understand why etCO₂ is lower than CO₂ from an ABG?



Aug 4, '11 by [IheartICUnursing](#)

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No 😞 Could you please explain to me? I thought that the etCO₂ was supposed to be the same or very close to the PAO₂.

I really appreciate everyones answers and help!



Aug 5, '11 by [BTBALL](#)

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Quote from [IheartICUnursing](#)

No 😞 Could you please explain to me? I thought that the etCO₂ was supposed to be the same or very close to the PAO₂.
I really appreciate everyones answers and help!

Yes the etCO₂ and PaCO₂ are very close. But the etCO₂ is usually 3-5mmHg less than PaCO₂. Therefore norm PaCO₂ 35-45, norm etCO₂ 30-40 or so.

This happens because the total level of CO₂ within the body measured by a PaCO₂ takes into consideration the CO₂ bound up as bicarbonate ions. The etCO₂ looks only at exhaled CO₂ levels and does not measure bicarbonate ions so you get a lower but still a very useful value.



Aug 5, '11 by [detroitdano](#)

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I was going to go with the fact exhaled CO₂ is mixed with other gases in anatomical dead space (oro/hypopharynx, trachea), and in alveolar dead space not all alveoli are constantly perfused so they can hang on to more CO₂, therefore less is exhaled.

It's what I've always been taught by CRNA's I've shadowed and my own research seems to agree with it.

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Aug 7, '11 by IheartICUnursing

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