# Acid/Base balance

Metabolic:
1. acidosis
2. alkalosis

Respiratory:
1. acidosis
2. alkalosis

Common causes of these four problems:

## Metabolic acidosis

a. decreased HCO3 and base excess
b. diabetic ketoacidosis
c. diarrhea
d. lactic acid / renal failure
e. poisoning
f. TPN - extended need
g. ostomy drainage

## Metabolic alkalosis

a. increased HCO3 and base excess
b. vomiting
c. nasogastric suctioning
d. diseases associated with decreased K+ and CL-
e. diuretic therapy ( e.g. lasix )
f. rapid correction of hypercapnea

## Respiratory acidosis

a. obstructive lung disease - chronic bronchitis, emphysema, sometimes with asthma in later stages.
b. sedation - from anesthesia or head trauma
c. neuromuscular disease - polio, myasthenia gravis, guillian barre' syndrome
d. increased work of breathing - respiratory failure, increased CO2

## Respiratory alkalosis

a. hypoxia - CHF, anxiety, pulmonary fibrosis, pulmonary embolus
b. pregnancy

c. hyperventilation with mechanical ventilation
d. fever
e. severe anemia
f. gram negative septicemia

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## Analyzing a blood gas

1. Look at the pH. Decide if it is acidosis or alkalosis.
2. Look at the PaCO2. Is it normal, increased, or decreased?
3. Look at the HCO3. Is it normal, increased, or decreased?
4. Look at the base excess or deficit.
5. Look at the PaO2 to determine if there is hypoxia.

Normal blood gas values:

pH: 7.35 - 7.45

PaCO2: 35 - 45

PaO2: 80 - 100 ( in infants normal PaO2: 60 - 80 )

HCO3: 20 - 24

Base excess: -/+ 2

Examples

Uncompensated respiratory acidosis:

7.15
62
67
-1
22

Uncompensated respiratory alkalosis:

7.57
27
101
+0
24

Uncompensated metabolic acidosis:

7.28
41
87

Uncompensated metabolic alkalosis:

7.54
38
140

-2 +2
21 34

*** Remember: the blood gas analyzer can only measure pH, CO2, and PO2. The Base excess and HCO3 are calculated from the pH and CO2.

*** When making the assessment of compensation, uncompensation, or partial compensation: Uncompensated the pH will be out of normal range; partial compensation the pH will be moving to near normal, compensated the pH will be normal but other values will be out of the
normal range.

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# NaHCO3 and THAM Calculations

Do not give naHCO3 if the CO2 is greater than 50 or if the patient is hypernatremic. A point to remember is the for each meq of NaHCO3, you are also giving 1 meq of Na+.

To calculate the amount of NaHCO3 to give:

desired HCO3 - actual HCO3 x .33 x wt. in kg = amount given

Give slowly and dilute in at least a 1:1 solution.
example: abg results: 7.12/ 34/ 67/ -7/ 16; pt wt. is 2.4kg
( 20 - 16 ) x .33 x 2.4 = 3 meq to be given

If you are concerned about the Na+ levels, THAM can be substituted.

Give 1cc/kg for each 0.1 pH you want to increase

example: 2kg baby has a pH of 7.0 and you desire a pH of 7.3. How much THAM is given?

2 x 3 = 6cc of THAM to be given