ACID BASE SHEET

STEP I-GET LABS
Blood Gas (Art or Venous), Lactate, Albumin, Acetone, Chemistry Panel

STEP II-LOOK AT PH
If > 7.45 then patient’s primary problem is **alkalosis**
If < 7.35 then patient’s primary problem is **acidosis**

STEP III-LOOK AT BLOOD GAS CO2
If > 45 then **respiratory acidosis**
If < 35 then **respiratory alkalosis**

STEP IV-CALCULATE THE STRONG ION DIFFERENCE (SID)

**SID** = Na - Cl

**LOW SID IF <38**
This is a metabolic acidosis (Low SID acidosis); causes include:
**Fluid Administration**: Any fluid that has an SID of < 24 can cause acidosis (i.e. NS, ½ NS, D5W) 2 liters of NS in < 24 hours is enough to cause acidosis.
**Renal Tubular Acidosis**: Calculate Urine Anion Gap (Urine Na + K - Cl); if negative, not an RTA, consider other causes
Type I-Urine pH > 5.55 (auto-immune, sicklers, cirrhosis, idiopathic)
Type II-Urine pH < 5.55 (think myeloma, Wilson’s, Vit D deficiency, heavy metals)
Type IV-Hyperkalemic, Urine pH < 5.55; (aldosterone deficiency, diabetes)
**Diarrhea**

**HIGH SID IF >38**
This is metabolic alkalosis (High SID alkalosis); causes include:
Nasogastric Suction, Diuretics, hyperaldosteronism, volume depletion

STEP V-LOOK AT THE LACTATE
If > 2 then the patient has hyperlactatemia
If > 4 and the patient has an infection, **start EGDT**
If patient not infected, consider any other shock state, seizures, dead gut, hepatic failure, malignancies or just from hyperlactetemic state such as exercise or the use of b-agonists, or
**Toxicologic causes** of elevated lactate include Cyanide, Carbon Monoxide, Metformin, Didanosine, Stavudine, Zidovudine, Linezolid, Strychnine, Emtriva, Rotenone (Fish Poison), NaAzide (Lab Workers), Apap (if Liver Fx), Phospline (rodenticide), NaMonofluoroacetate (Coyote Poison-Give Etoh as antidote), Inh (if patient seizes), Hemlock, Depakote, Hydrogen Sulfide, Nitroprusside (If cyanide toxic), Ricin & Castor Beans, Propofol, Linezolid, Sympathomimetics (Cocaine, Methamphetamine), Jequirity peas (Abrus precatorius), Prunus Amygdalus Plants as well as Crab Tree Apple Seeds & Cassava (yucca).

Most of the toxins under SIG acidoses will also cause elevated lactate.

**Rare causes**: pyroglutamic acidemia (from taking tylenol in combination with severe sepsis, renal fx, or hepatic fx); Shoshin beri beri (from severe thiamine deficiency).
STEP VI-Calculate the Strong Ion Gap (SIG)

\[ \text{SIG} = (\text{Base Deficit}) + (\text{SID} - 38) + 2.5 (4.2 - \text{Albumin (g/dL)}) - \text{Lactate} \]

This can also be thought of as the corrected base deficit, or put a minus sign in front and it is the corrected base excess.

**IF SIG \( \geq 2 \), THIS IS A SIG METABOLIC ACIDOSIS**

- **Uremia, DKA, AKA**, 
- **Tox-ASA, ethylene glycol, methanol, propylene glycol (ativan, valium, dilantin infusions), iron, INH, & paraldehyde.** 
- **DLactic Acidosis**- from short gut/blind loop. Will not show on lactate assay

**NEGATIVE SIG**

- Hypercalcemia, Hypermagnesemia, Hyperkalemia, Immunoglobulins, Bromide, Nitrates, **Lithium Overdose**

STEP VII-THINK ABOUT COMPENSATIONS

If primary is respiratory and you feel it is chronic, you can calculate the expected metabolic compensation.

**Expected \( \Delta \) BE (or expected decrease of SID) = 0.4 x (Chronic Change in CO2)**

If the primary problem is metabolic acidosis

**Expected \( \downarrow \) CO2=Base Deficit

If the primary problem is metabolic alkalosis

**Expected \( \uparrow \) CO2=0.6 x Base Excess

**Old school formula may be useful for figuring out to correct PaCO2 in a COPD Patient**

0.08 decrease in pH = for every 10 mmHg increase in PaCO2 acutely

STEP VIII-OSMOLAR GAP

If elevated SIG without explanation, get osmolar gap

\[ \text{Osm Gap} = \text{Measured Osmol} - (2 \times \text{Na} + \text{Gluc}/18 + \text{BUN}/2.8 + \text{ETOH}/3.7) \]

Positive if osm gap \( \geq 10 \)

**Causes:** Methanol, Ethylene glycol, mannitol, isopropanol (isopropyl alcohol), propylene glycol, lithium

If Osm Gap is \( \geq 50 \), almost certainly toxic alcohol induced

Notes:

- **If no BD is available, 24.2 – serum bicarb can be used as a poor man’s substitute**
- The more complex but correct formula for SID is \( (\text{Na} + \text{K} + \text{Ionized Mg} + \text{ICal} - \text{Cl}) \). If this formula is used, then normal should be considered 42. In clinical practice, if the patient is not hyperkalemic, this more complex formula is not necessary.