ACID BASE SHEET

STEP I-GET LABS

Blood Gas (Art or Venous), Lactate, Albumin, Beta-HydroxyButyrate, 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 (or pt's current SID) can cause acidosis (i.e. NS, ½ NS, D5W, water)
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 severe sepsis treatment**
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), Phospine (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), Jequirty 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)

SIG = (Base Deficit) + (SID – 38) + 2.5 (4.2 - Albumin (g/dL)) – 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>2, THIS IS A SIG METABOLIC ACIDOSIS

Uremia, DKA, AKA, (Note: Beta-Hydroxybutyrate [BHB] can be subtracted directly from the SIG, Acetoacetate is still unquantified)
Tox-ASA, ethylene glycol, methanol, propylene glycol (ativan, valium, dilantin infusions), iron, INH, & paraldehyde.
D-Lactic Acidosis-from short gut/blind loop & propylene glycol. 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 Δ BE (or expected decrease of SID) = 0.4 x (Chronic Change in CO2)

If the primary problem is metabolic acidosis

Expected ↓ CO2=Base Deficit

If the primary problem is metabolic alkalosis

Expected ↑ 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
Osm Gap=Measured Osmal – (2 Na + Gluc/18 + BUN/2.8 + ETOH/3.7)
Positive if osm gap >10
Causes: Methanol, Ethylene glycol, mannitol, isopropanol (isopropyl alcohol), propylene glycol, lithium
If Osm Gap is >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 (Na + K + Ionized Mg + ICal – 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.