

# ACID BASE SHEET

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## STEP I-GET LABS

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Blood Gas (Art or Venous), Lactate, Albumin, Acetone, Chemistry Panel

## STEP II-LOOK AT PH

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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 CO<sub>2</sub>

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If  $>45$  then **respiratory acidosis**

If  $<35$  then **respiratory alkalosis**

## STEP IV-CALCULATE THE STRONG ION DIFFERENCE (SID)

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**SID=Na-Cl**

### LOW SID IF $<38$

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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,  $\frac{1}{2}$  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  $<5.55$

Type II-Urine pH  $>5.55$

Type IV-Hyperkalemic; from aldosterone deficiency, diabetes,

**Diarrhea**

### HIGH SID IF $>38$

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This is metabolic alkalosis (High SID alkalosis); causes include:

Nasogastric Suction, Diuretics, hyperaldosteronism, volume depletion

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## STEP V-LOOK AT THE LACTATE

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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,

**Toxicologic causes** of elevated lactate include Cyanide, Carbon Monoxide, Metformin, Didanosine, Stavudine, 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, Propofol, & Jacori Bean

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).

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## STEP VI-CALCULATE THE STRONG ION GAP (SIG)

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**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

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### IF SIG $>2$ , THIS IS A SIG METABOLIC ACIDOSIS

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**Uremia, DKA, AKA,**

**Tox-ASA,** ethylene glycol, methanol, propylene glycol (ativan, valium, dilantin infusions), iron,, INH, paraldehyde,

**D-Lactic Acidosis**-from short gut/blind loop. Will not show on lactate assay

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### NEGATIVE SIG

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

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## STEP VII-THINK ABOUT COMPENSATIONS

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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 CO<sub>2</sub>)**

If the primary problem is metabolic acidosis

**Expected  $\downarrow$  CO<sub>2</sub>=Base Deficit**

If the primary problem is metabolic alkalosis

**Expected  $\uparrow$  CO<sub>2</sub>=0.6 x Base Excess**

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### STEP VIII-OSMOLAR GAP

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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, isopropanolol, propylene glycol, lithium

If Osm Gap is >50, almost certainly toxic alcohol induced

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**If no BE 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.

