

# BLOOD CHEMISTRY RATIOS

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The following information has been excerpted from the Applied Clinical Nutrition Workshop series, sessions covering Applied Blood Chemistry Interpretation. These sessions are all currently available on cassette tape. Each session (there are 4 in all) provides 7 hours of detailed information on Applied Blood Chemistry Interpretation. This is not intended to be a college course, but provides the listener with useful information in designing individualized nutrition regimens based, in part, on blood chemistry findings. I say in part because blood chemistry is a tool that is best used with other tools available to the doctor, such as symptom assessment, patient history, physical examination, hormone studies, etc.

## **ANION GAP--**

If increased (>12), with a decreased CO<sub>2</sub> (<24), thiamine need is probable. If glucose is also increased, the probability for thiamine need is almost certain.

The correct formula for calculating the Anion Gap is:

$$(NA + K) = X$$

$$(CO_2 + Cl) = Y$$

Subtract Y from X = the Anion Gap. Optimum range is 7 - 12 mmol/L.

(NOTE: Many labs figure the Anion Gap incorrectly by omitting the potassium value from the calculation. The resulting calculation is known as the "electrolyte balance".)

Laboratory books tell us that the Anion Gap is a means of assessing lactic acidosis in an alcoholic. If we leave out the alcoholic part of the statement, we find the anion gap is a means of assessing LACTIC ACIDOSIS, period, alcoholic or not. In the carbohydrate consuming, carbohydrate sensitive, vitamin deficient culture we live in, lactic acidosis is everywhere! Here is an excellent tool for identifying lactic acidosis, and therefore thiamine need in your patients. Combined with the subjectivity of the patient and a current diet survey, an intelligent determination can be made for treatment, a determination that can be supported by the FACTS.

Common indicators of thiamine need:

MUSCLE CRAMPS ON EXERTION

SLEEPY AFTER MEALS, ESPECIALLY CARBOHYDRATE MEALS

SIGH FREQUENTLY

SWOLLEN ANKLES, ESPECIALLY IN THE EVENING

UNWARRANTED FEAR OF IMPENDING DOOM

LOW BLOOD PRESSURE

MOOD SWINGS, CYCLIC PERSONALITY

HYPOGLYCEMIA

CARBOHYDRATE SENSITIVITY

CHRONIC NEED FOR HYDROCHLORIC ACID

ADDICTIVE PERSONALITY/EXCESSIVE USE OF ALCOHOL, DRUGS, ETC.

Thiamine pyrophosphate (food grade thiamine), is also known as **CO**carboxylase, this is a co-enzyme. (A good source of food grade thiamine is **Bio 3B-G** from BRC). Essential fatty acids are needed to build the substrates to allow cocarboxylase to function as a co-enzyme. All patients presenting need for thiamine should also be evaluated for EFA need. (BRC provides many sources of EFA's, they are; **Mixed EFA's** Omega 3, 6, 9,; **Flax Seed Oil** Omega 3, 6, 9,; **Biomega 3** Omega 3; **Black Currant Seed Oil** source of GLA).

#### SUPPLEMENTAL FEEDING:

**Bio 3B-G** 3 - 6 tablets with each meal. Dose dependant on severity of need.  
**Mixed EFA's, Biomega 3, Flax Seed Oil, etc**, essential fatty acids if needed.  
**Hydrozyme** 2 - 3 tablets with each meal if hypochlorhydric, which many are.

Patient should avoid refined sugars, refined carbohydrates, alcohol, etc.

#### SODIUM--

If increased with other electrolytes normal, suspect the use of a water softener.

If increased with decreased potassium, adrenal HYPERfunction is probable. Suggest adrenal saliva hormone study to confirm or rule-out.

If increased with an increase of chloride and an increase of HGB, HCT or albumin, dehydration is probable. Ask the patient how much WATER they drink daily. NOT coffee, tea, juice or soft drinks--WATER!

If decreased with increased potassium, adrenal HYPOfunction is probable. Suggest adrenal saliva hormone study to confirm or rule-out.

#### POTASSIUM--

If increased with a normal or decreased sodium or chloride, adrenal HYPOfunction is probable. Suggest adrenal saliva hormone study to confirm or rule-out.

If increased with an increase in alpha 1 or alpha 2 globulin, tissue destruction is probable.

If decreased with sodium increased, adrenal HYPERfunction is probable. Suggest adrenal saliva hormone study to confirm or rule-out.

#### SUPPLEMENTAL FEEDING:

##### ADRENAL INSUFFICIENCY

**Hydrozyme** 2 tablets with each meal if hypochorhydric.

**Cytozime AD** 1 - 2 tablets with each meal. Source of neonatal adrenal tissue.

**Bio 3B-G** 2 - 3 tablets t.i.d., especially if patient presents with low blood pressure.

Indicators of adrenal insufficiency--

Positive Ragland sign, i.e., decrease in systolic blood pressure when patient moves from recumbent to standing position.

Sensitive to bright light, usually sun light. Does not remove sunglasses until after they are in your office. *Patients presenting with this symptom should be tested to confirm or rule-out neurological problems before beginning treatment for adrenal insufficiency.*

Chronic illness

Difficulty recovering from colds, flu, etc.

Carbohydrate sensitivity

Ligament instability or weakness.

Can't go to bed at night, can't get up in the morning.

#### SUPPLEMENTAL FEEDING:

##### **ADRENAL HYPERCORTICAL**

**Hydrozyme** 2 tablets with each meal if hypochlorhydric.

**ADHS** 1 tablet with breakfast and lunch.

**Cytozyme PT/HPT** 2 tablets with each meal, supports feed back loop to pituitary.

**Glucobalance** 2 capsules with each meal, if triglycerides > 110; HDL < 50.

#### **CHLORIDE--**

If increased with other electrolytes increased and/or BUN and Creatinine increased, renal dysfunction is probable.

If increased with other electrolytes normal, suspect excessive use of salicylates (aspirin).

If decreased with sodium normal to decreased, suspect the patient is following a low or no salt diet.

If decreased below 100 with total globulin <2.4 or >2.8, and the serum phosphorus is <3.0, the probability of hypochlorhydria is extremely high.

#### SUPPLEMENTAL FEEDING:

##### **HYPOCHLORHYDRIA**

**Hydrozyme** 2 - 3 tablets with each meal.

Evaluate patient for thiamine need (inc. anion gap, dec. CO<sub>2</sub>); zinc need (zinc taste test, see E-bytes Issue 2); sodium and chloride need (no low or no salt diet, serum sodium and chloride values). Supplement as needed, thiamine, zinc, etc. Evaluate serum gastrin, if decreased below 45, patients ability to produce HCl physiologically is diminished. Supplement with **Hydrozyme** or **Betaine Plus HP**.

Evaluate patients consumption of pure water on a daily basis. Water is a necessary component of HYDROchloric acid. Nuff said?

##### **RENAL DYSFUNCTION**

**Renal Plus** 4 tablets t.i.d.

**Argizyme** 2 capsules t.i.d. Provides the enzyme Arginase with nitric oxide.

**Cytozyme KD** (neonatal kidney tissue) 1 tablet t.i.d. (Do not use with neoplastic kidney problems.)

### **ASPIRIN USE**

Patients in pain who use aspirin to excess should be evaluated for EFA need as well as thiamine need. If positive for EFA need consider **Mixed EFA's** 2 tablespoons daily; or **Flax Seed Oil** 2 capsules t.i.d., w/meals; or **Biomega 3** 3 - 6 capsules twice daily. Advise the patient regarding elimination of "junk" fats from their diet, i.e., margarine, shortening, most peanut butters, french fries, potato chips, onion rings, etc, and including essential fats in their diet, i.e., dark green leafy vegetables, eggs, butter, raw seeds and nuts and fresh, cold pressed oils. Thiamine need, consider **Bio 3B-G** 3 - 4 tablets t.i.d. Advise the patient regarding limiting or avoiding refined sugar and refined carbohydrates.

### **LOW OR NO SALT DIET**

Patients should use **REAL** salt, not one of the aluminum salts on the market today (read label, sodium silico aluminate should be avoided). Some patients may be following a low or no salt diet on the advise of a doctor due to hypertension. In consulting with many physicians regarding hypertensive patients, I have seen a number of cases where the patient presented with decreased potassium, which tends to have an inhibitory effect on the autonomic nervous system, the endocrine system, etc. They are presenting with need for one essential mineral, I fail to see the logic behind depriving them of another essential mineral. It would seem to make more sense to **PROVIDE** the needed mineral, which for the above reasons could resolve the hypertension. If it does not, we can consider another essential element that may not be present in adequate amounts--**WATER!** Of course there are many other possible causes of hypertension which are beyond the scope of this paper.

### **CO2**

If increased with other electrolytes normal, suspect fever.

If decreased with anion gap increased, thiamine need is probable.

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In this issue of E-Bytes we have covered blood chemistry ratios related to the Anion Gap and related tests, i.e., sodium, potassium, chloride and CO2. This is a small fraction of the information I have available relating to this diagnostic tool. I encourage you to consider ordering the Applied Clinical Nutrition Workshop series on Applied Blood Chemistry Interpretation available on cassette tape. If you really want to learn blood chemistry interpretation, here is a series to consider.