

# Blood Chem Basics Review

## BASIC PRINCIPLES OF FUNCTIONAL BLOOD CHEMISTRY:

1. Patterns are typically much more important than individual markers.
  - a. Evaluate individual blood chemistry markers in the context of other markers to determine the presence of a functional imbalance, pathology, or disease.
2. In some cases, additional markers will need to be ordered to clarify the pattern or diagnosis.
3. Blood chemistry should never be used in isolation. It should always be combined with a thorough medical history, including current symptoms, diet and lifestyle, medications and supplements review, and, if you do this in your practice, a physical examination.
  - a. For example, a patient's test results show elevated serum B12 levels.
    - i. Are they supplementing with B12? If they are, the elevation is simply a sign of that, and it's nothing to worry about.
    - ii. If they aren't, it can be a sign of impaired B12 metabolism and methylation, and you'd want to order additional testing to clarify.
4. The reference ranges that we use to interpret results in functional blood chemistry are often, but not always, different than the reference ranges that are used in conventional medicine and printed on the lab results. Conventional ranges are designed to diagnose disease. The functional ranges are designed to diagnose imbalances or pathologies before they progress to full-blown disease.
5. It is important to re-test after you've addressed the imbalances or conditions you identified with the comprehensive screening panel. Test, don't guess.

## LAB RANGES

- Ancient Chinese proverb, "The wise physician treats disease before it occurs."
- The conventional medicine reference range is typically constructed using a bell curve of results from a reference sample of a population. However, an accurate range is dependent on the sample population used, and this can be an issue.

## FUNCTIONAL RANGE

- In some cases, the functional range is determined by organizations that embrace functional or at least preventative medicine.
- In other cases, the functional ranges are established by individual clinicians or groups of researchers based on extensive review of the published scientific literature.
  - For example, most recent studies where they took more measures to eliminate people who had hypothyroidism and autoimmune hypothyroidism found that the range of TSH for someone with a completely normally functioning thyroid gland is probably 0 to 2.

- Finally, in some cases, functional ranges have been created simply by shrinking the conventional range by 20 to 30 percent.

The initial functional blood chemistry panel is a screening tool where the goal is to be thorough and cost efficient. I start with markers that I feel are most important and are most likely to reveal underlying patterns that need to be addressed or need to be followed up on with additional testing.

### COMPREHENSIVE METABOLIC PANEL (WITH ADD-ONS)

Glucose	Magnesium
Sodium	Total protein
Potassium	Albumin
Chloride	Globulin
Carbon dioxide	Albumin/Globulin ratio
Blood urea nitrogen (BUN)	Total bilirubin
Creatinine	Alkaline phosphatase
BUN/Creatinine ratio	AST
eGFR	ALT
Calcium	

- GGT
- Parathyroid hormone
- Phosphorus
- High-sensitivity C-reactive protein (hs-CRP)

### ADDITIONAL METABOLIC MARKERS

- Hemoglobin A1c
- Uric Acid
- Lactate dehydrogenase (LDH)
- Insulin

### IRON PANEL PLUS FERRITIN

- There are over two billion people in the world who suffer from iron deficiency, and iron overload is a much more common condition than is typically recognized. Iron is an absolutely crucial nutrient. It's essential for life, and yet it can be deadly when it is elevated. It is a contributing factor in many health conditions.

- Serum iron
- Total iron binding capacity (TIBC)
- Unsaturated iron binding capacity (UIBC)
- Iron saturation (%)
- Ferritin

## OTHER IMPORTANT NUTRIENTS

- B12 deficiency is not uncommon, even in omnivores, due to low stomach acid, digestive issues, and autoimmune conditions such as pernicious anemia. Serum B12 is not always accurate, and it misses a lot of people who are deficient, so I add serum methylmalonic acid.
- Serum copper and serum zinc: An altered serum copper-zinc ratio is associated with immune and inflammatory issues, more so than it is with dietary or supplemental intake of copper and zinc, as we'll discuss.
- Vitamin D is one of the most common deficiencies that we'll see.
  - Vitamin B12
  - Serum folate
  - Serum methylmalonic acid (MMA)
  - Homocysteine
  - Serum copper
  - Serum zinc
  - Calcitriol (1, 25-dihydroxyvitamin D)
  - Vitamin D (25-hydroxyvitamin D)

## STANDARD LIPID PANEL

- More advanced testing is often necessary in someone with abnormal lipid values but you can get a surprisingly useful amount of info just from this standard lipid panel. For example, it turns out that the total cholesterol-to-HDL ratio correlates very well with LDL particle number, which is probably one of the more important lipid markers. Don't totally ignore this. It's still an important part of a basic blood panel.
  - Total cholesterol
  - LDL cholesterol
  - VLDL cholesterol
  - HDL cholesterol
  - Triglycerides
  - TC-to-HDL ratio
  - LDL-to-HDL ratio

## THYROID PANEL

- Thyroid stimulating hormone (TSH)
- Total thyroxine (T4)
- Total triiodothyronine (T3)
- Free T4
- Free T3
- T3 uptake
- Reverse t3
- Thyroid peroxidase antibodies (TPO Ab)
- Thyroglobulin antibody (TGA)

## COMPLETE BLOOD COUNT (CBC)

- The CBC helps identify conditions such as anemia, infection, inflammation, autoimmunity, bleeding disorders, and cancer. Platelet count and differential are often added. I do this in my panel. This gives you additional information that can be useful. The differential identifies and counts the number of white blood cells that are present.

<b>WBC</b>	Lymphocytes (%)
<b>RBC</b>	Monocytes (%)
<b>Hemoglobin</b>	Eosinophils (%)
<b>Hematocrit</b>	Neutrophils (absolute)
<b>MCV</b>	Lymphocytes (absolute)
<b>MCH</b>	Monocytes (absolute)
<b>MCHC</b>	Eosinophils (absolute)
<b>RDW</b>	Immature granulocytes (%)
<b>Platelets</b>	Immature granulocytes (absolute)
<b>Neutrophils (%)</b>	