

Functional vs. Conventional Lab Testing

Comprehensive Blood Panel Lesson

The comprehensive blood panel is a screening tool that allows practitioners to assess the function of several of the most important body systems, identify current areas of concern, and detect potential problems and imbalances that could worsen in the future.

Conventional lab ranges are designed to detect disease, whereas functional lab ranges are designed to indicate optimal function and detect imbalance or pathologies that ***precede disease***. Early detection and intervention enables practitioners to prevent a condition that would become very difficult to manage if it is not diagnosed until much later.

It is outside the scope of practice of health coaches to interpret lab tests like blood chemistry panels and to make diagnoses and treatment suggestions based on the results of blood testing. The purpose of this handout lesson is twofold: 1) to familiarize you with the types of lab testing that Functional Medicine clinicians use in their practice so that you can communicate and collaborate more effectively with them, and 2) to give you a comparison of the type of testing that a conventional doctor might order so you can better understand the Functional Health viewpoint. We will discuss this in more detail in your upcoming TA session.

Let's review a comprehensive blood panel from both the functional and conventional health perspective, in its different sections, using a case we commonly see:

CASE SUMMARY

Maria is a 64-year-old female with chief complaint of fatigue and cognitive issues. She began noticing cognitive deficits around age 59. She went through menopause early, at around 38 years old. Maria eats a low-carbohydrate diet; she is not sure how else to eat but has lost about 30 pounds with that approach. Her gastrointestinal symptoms include very little bloating, minimal constipation, and slow transit time. Marie eats very few vegetables, which she thinks might be related. Sleep is rough, with terrible nightmares that lead her to jump out of bed. She is taking Zoloft and Tegretol for mood. She had a brain hemorrhage in 1986, gallbladder removed, hysterectomy due to a tumor of uncertain etiology, and is currently doing mindfulness-based stress reduction classes for stress management.

Functional Health Perspective

COMPREHENSIVE LAB VALUES (CMP)				
Marker	Value	Functional Range	Lab Range	
Glucose	79	75 – 90	65	- 99
Hemoglobin A1c	5.9	4.4 – 5.4	4.8	- 5.6
Uric Acid	2.8	3.2 – 5.5	2.5	- 7.1
BUN	14	13 – 18	8	- 27
Creatinine	0.70	0.7 – 1.0	0.57	- 1.00
BUN/Creatinine Ratio	20	9 – 23	9	- 23
Sodium	141	135 – 140	134	- 144
Potassium	4.2	4.0 – 4.5	3.5	- 5.2
Chloride	100	100 – 106	97	- 106
C02	25	25 – 30	18	- 29
Calcium	8.9	9.2 – 10.1	8.7	- 10.2
Phosphorus	4.0	3.0 – 4.0	2.5	- 4.5
Magnesium	2.3	2.0 – 2.6	1.6	- 2.6
Protein, total	6.7	6.9 – 7.4	6.0	- 8.5
Albumin	4.2	4.0 – 5.0	3.6	- 4.8
Globulin	2.5	2.4 – 2.8	1.5	- 4.5
A/G ratio	1.7	1.5 – 2.0	1.1	- 2.5
Bilirubin, total	0.3	0.1 – 1.2	0.0	- 1.2
Alkaline Phosphatase	115	42 – 107	39	- 117
LDH	166	140 – 180	119	- 226
AST	14	0 – 23	0	- 40
ALT	12	0 – 20	0	- 32
GGT	21	0 – 21	0	- 60

Comprehensive Metabolic Panel (CMP) Summary:

With this lab chart, please note that no color means the marker is normal, within the functional range. Yellow means it is above or below the functional range (either functionally low or functionally high). And red means that it is outside the conventional lab range.



- Fasting glucose is normal.
- Hemoglobin A1c is lab and functional high at 5.9.
 - Note that she does have some markers of functional anemia, so it is possible that the A1c is not accurate (*see her low hemoglobin in the CBC section on page 5*).
 - Her practitioner would want to do some post-meal blood sugar testing, fructosamine, fasting insulin, and possibly a True Health Diagnostics advanced metabolic panel.

IRON PANEL PLUS FERRITIN VALUES					
Marker	Value	Functional Range	Lab Range		
TIBC	248	275 – 425	250	-	450
UIBC	163	175 – 350	150	-	375
Iron	85	40 – 135	40	-	155
Iron saturation	34	17 – 45	15	-	55
Ferritin	166	30 – 100	15	-	150

Iron Panel with Ferritin Summary:

- Ferritin is lab and functional high at 166.
 - This could mean excess iron storage.
 - It could also be related to inflammation because CRP-hs is lab high at 6.14 (*see page 6*). Ferritin is an acute phase reactant that can be temporarily elevated due to inflammation or injury. Her practitioner will retest the iron panel and include soluble transferrin receptor to clarify that. If her ferritin is truly elevated on its own, her provider will test her for possible hemochromatosis using a genetic test.
- Other iron markers are fairly normal except TIBC, which is lab and functional low.



LIPID PANEL VALUES				
Marker	Value	Functional Range	Lab Range	
Cholesterol, total	291	150 – 230	100	- 199
Triglycerides	81	50 – 100	0	- 149
HDL	84	55 – 85		> 39
LDL	191	0 – 140	0	- 99
T. Chol/ HDL Ratio	3.5	< 3	0	- 4.4
Truglycerides/ HDL Ratio	0.96	< 2		< 3.8

Lipid Panel Summary:

- Total cholesterol is lab and functional high at 291.
 - This level is up in the possible familial hypercholesterolemia range. Her practitioner should order advanced lipid testing such as an expanded lipid panel, referred to as a VAP or NMR, to explore this further.
- LDL is lab and functional high at 191.
- HDL is normal at 84.
- Total cholesterol-to-HDL ratio is functionally high at 3.5 because of the lab high total cholesterol of 291.

THYROID PANEL VALUES				
Marker	Value	Functional Range	Lab Range	
TSH	0.994	0.5 – 2.0	0.45	- 4.500
T4, total	5.8	6.0 – 12	4.5	- 12.0
T3 Uptake	25	28 – 35	24	- 39
T3, total	94	100 – 180	71	- 180

Thyroid Panel Summary:

- TSH is optimal at 1.
- Total T4, total T3, and T3 Uptake are all functionally low.
 - Given the TSH value of 1, this is probably not significant, but her practitioner would want to get a free T4, free T3, and probably thyroid antibodies to look a little deeper into this. The practitioner would also review a list of symptoms associated with possible thyroid dysfunction with Maria.



COMPLETE BLOOD COUNT (CBC)				
Marker	Value	Functional Range	Lab Range	
WBC	4.4	5.0 – 8.0	3.4	- 10.8
RBC	4.10	4.4 – 4.9	3.77	- 5.28
Hemoglobin	11.7	13.5 – 14.5	11.1	- 15.9
Hematocrit	37.1	37 – 44	34	- 46.6
MCV	91	85 – 92	79	- 97
MCH	28.5	27.7 – 32.0	26.6	- 33.0
MCHC	31.5	32 – 35	31.5	- 35.7
RDW	13.6	11.5 – 15.0	12.3	- 15.4
Platelets	312	150 – 379	150	- 379
Neutrophils	61	40 – 60		
Lymphocytes	33	25 – 40		
Monocytes	5	4.0 – 7.0		
Eosinophils	1	0.0 – 3.0		
Basophils	0	0.0 – 3.0		

Complete Blood Count (CBC) Summary:

- White blood cell (WBC) is functionally low.
- Neutrophils are only one point above the functional range.
 - Her WBC and neutrophils should be monitored over time with future blood testing.
- Red blood cells, hemoglobin, and MCHC are all functionally low.
- MCV is high normal. It is not out of the functional range, but it is getting close to that.
 - This would be more suggestive of B12 or folate-deficient anemia, especially because homocysteine is high at 13.3.
 - Her practitioner should look at FIGLU and urine MMA on an organic acids panel and then probably the HDRI advanced methylation panel if those are normal.



OTHER LAB VALUES (NUTRIENTS AND INFLAMMATORY MARKERS)					
Marker	Value	Functional Range	Lab Range		
Vitamin B-12	493	450 – 2000	211	-	946
Vitamin D, 25-hydroxy	32	35 – 60	30.0	-	100.0
Copper	113	81 – 157	72	-	166
Zinc	123	64 – 126	56	-	134
Zinc/ Copper Ratio	1.09	> 0.85			
Serum Methylmalonic Acid (MMA)	177	< 300	0	-	378
CRP-hs	6.14	< 1.0	0.00	-	3.00
Homocysteine	13.3	< 7.0	0.0	-	15.0

Other Lab Values Summary:

- Maria's 25(OH)D is functionally low at 32.
 - We don't have her PTH, but her calcium is low (*see page 2*), almost out of the lab range, so that makes us suspicious that this does represent vitamin D deficiency.
 - She could just supplement, or her practitioner could order a PTH to clarify. If the practitioner recommends a supplement, it is a good idea to retest vitamin D levels in three months.
- CRP-hs is lab high at 6.14, which means there is inflammation.
- Homocysteine is functionally high at 13.3. This is another marker of inflammation. Factors that promote high homocysteine include vitamin B deficiencies, hypothyroidism, and genetics.
 - Homocysteine may be high due to B12 or folate deficiency, but note that serum MMA is normal, which requires an active B12-dependent enzyme for its conversion, suggesting that B12 is sufficient.
 - Urinary MMA is a more sensitive marker than serum MMA and is preferred over serum when gut dysbiosis is suspected.
 - Homocysteine could be high due to a genetic mutation to one or both of Maria's MTHFR genes. The practitioner might decide to test her MTHFR genetic status.

Conventional Health Perspective

If Maria's conventional doctor ordered her labs, they probably would have told her that they were normal. Also, the set of lab values would likely be one-third to one-half shorter. Her RBC, hemoglobin, and hematocrit all would need to be outside the standard lab range before her doctor would diagnose anemia. Without the anemia diagnosis, and since her serum B12 is within lab range, her conventional doctor probably would not have advised her to improve her B12. Note that B12 is a vital nutrient for healthy cognition, brain function, and energy production. Her total cholesterol was 291 and her LDL was 191. Her doctor would likely recommend a statin, with many possible side effects, instead of running an expanded lipid panel and/or looking further for the underlying cause.

Summary:

One of the primary differences between functional and conventional medicine is where we intervene on the spectrum of disease development. In Functional Medicine, we focus on prevention of disease before it occurs. In conventional medicine, the intervention often does not take place until the disease has fully manifested and progressed to a chronic state. At that point, it is much more difficult and expensive to reverse, which is why we are seeing so much chronic disease today.

If Maria followed the conventional model, she may have taken a statin and progressed to anemia. If she followed the functional model, she would have received the additional testing while following a personalized care plan.

Questions:

Please come to your TA session prepared to discuss the following questions:

1. Why are there different lab reference ranges?
2. When a person's vitamin D is low, conventional doctors usually recommend supplementation but do not run labs again until the following year. Is this okay?
3. Maria's nightmares cause her to jump out of bed. What do you think is happening here?
4. What do you think of Maria's carbohydrate intake?
5. List items you would like to discuss further and need additional explanation about related to this lesson on lab data.