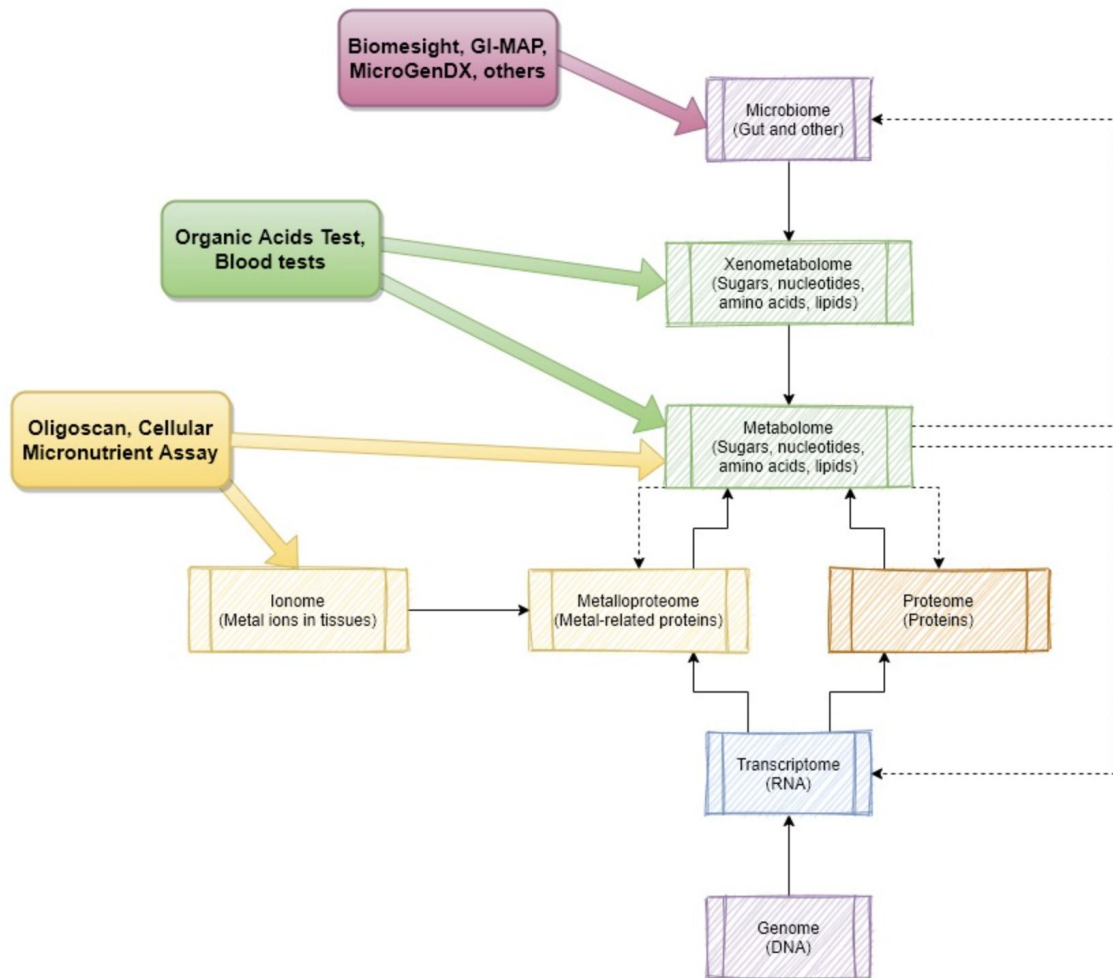


Testing for the metabolic model



Step 1 - Collecting data

1. Basic blood work

- a. Blood type - You may already know, you can get a blood draw, finger stick
https://www.amazon.com/Eldoncard-Blood-Type-Test-Complete/dp/B00JFTSPMW/ref=sr_1_6?crid=24HY4LL2JDYAY&dib=eyJ2IjojMSJ9.sUjO38c5d6oxaPANJ25iHGAyvvQeKZYZoRQe6GLcPJcTG3VLolyJ9RLCOB5On-UZR3gBDcc04E-BiG0vANDWy25KGqIQHT4zIIMpQMF1Teo88wgKSWS3TRqOylso4qxFsza65xJJGskgeetI7_6HJKSu4eOCJjpaDrPuj0OREEyK8NnQPhLpLaKaOTszv_mUyYHYqLJBOsCdns7B2IKUk6AgBZyfG0jaDzBiRMqAG3x7CAh3Q1SizR2VuHXFK_yepTQxLbNJfJfNoi-zIJSZmAleSMHzE6H1Tn5ewdERII.KYaXaqEfZNFqnbnkMSomcaeD9vzdDDxMJcL6Lg5-t7o&dib_tag=se&keywords=blood+type+test+kit+at+home&qid=1792516477&srefix=blood+type%2Caps%2C231&sr=8-6
 - i. Evexia/Labcorp - \$10
 - ii. Amazon card - \$10

Other basic blood work

- CBC
- CMP
- Lipid panel
- LDH Isoenzymes (\$15 labcorp)
- Iron studies (iron, transferrin, transferrin saturation, ferritin)
- Thyroid markers (TSH, fT3, fT4)
- Vitamin B6 (\$25)
- Vitamin D (\$18)

What do these labs help with?

- They give us some inputs into the protocol
- Elevated B6, vitamin A and LDL are all potential signs/markers for hepatic ALDH2 inhibition, via NAD redox impairment - indicating mitochondrial dysfunction.
- LDL - less affected by diet - is the most reliable.
- Serum B6 elevation is also influenced by Zn and Mg-ATP insufficiency, inhibiting pyridoxal kinase.
- Insufficient thyroid - can inhibit gluconeogenesis.
 - Affected by tyrosine, iodine, selenium, electrolytes.
 - Selenium status is affected by silver and mercury toxicity

LDH Isoenzymes

Lactate dehydrogenase (LDH) is an enzyme involved in converting pyruvate to lactate (and vice versa)

It has 5 isoenzymes (LDH1-LDH5), each consisting of different combinations of 2 subunits. H: Heart M: muscle

These isoenzymes have specific roles/functions.

LDH - metalloenzyme, affected by zinc status and $\text{NAD}^+:\text{NADH}$ ratio.

LDH isoenzymes are distributed across various tissues based on their metabolic needs.

LDH

The terms H (heart) and M (muscle) - given based on the tissues these subunits were first observed in high concentrations.

H - 1st identified in the heart - which relies on aerobic metabolism

M - discovered in skeletal muscle - often utilizes anaerobic glycolysis, especially in high activity.

So if there is elevation of a specific isoenzyme or pattern of elevations is present, that can suggest a particular tissue is experiencing energy metabolism dysregulation, and/or upstream influences affecting energy metabolism.

LDH

Ex -

If LDH-4 and LDH-5 (more M subunits and characteristic of anaerobic glycolysis) are elevated - it can be indicative of reduced oxygen availability or prolyl hydroxylase inhibition for other reasons (oxidative stress, Low Fe/Si, low Zinc, low α -ketoglutarate, elevated succinate).

These 2 are more prevalent in tissues that rely on anaerobic metabolism, such as muscle and liver

LDH Isoenzyme	Subunit Composition	Main Tissues (not exhaustive)	Notes
LDH-1 (H4)	HHHH	Heart, red blood cells, brain, kidney	Primarily in aerobic tissues. Inhibited by oxalate and oxamate.
LDH-2 (H3M1)	HHHM	White blood cells, brain, heart, kidney, lymph nodes	Moderate anaerobic glycolysis.
LDH-3 (H2M2)	HHMM	Lungs, spleen, pancreas, brain, endocrine tissues	Engages in both aerobic and anaerobic glycolysis.
LDH-4 (H1M3)	HMMM	Skeletal muscle, liver, lungs	Found in tissues with higher anaerobic activity.
LDH-5 (M4)	MMMM	Liver, skeletal muscle, gastrointestinal tract, astrocytes	High expression in anaerobic tissues, including astrocytes.

LDH Isoform		Main Tissues (not exhaustive)	Notes
LDH-A	-	Liver, skeletal muscle, kidneys, testes, certain cancers	Converts pyruvate to lactate, crucial in anaerobic glycolysis. Also converts glyoxylate to oxalate.
LDH-B	-	Heart, brain, kidneys, red blood cells	Converts lactate to pyruvate, crucial in aerobic tissues.
LDH-C	-	Testes	Specialized for energy metabolism in sperm cells, supports spermatogenesis.

Intracellular minerals/metals

Debate on the most accurate way to test this

Serum: Primarily tells us what is circulating outside cells at the time of collection.

For many minerals - serum concentrations are tightly regulated and can remain normal despite substantial intracellular depletion or tissue redistribution.

RBC's: Intracellular measurement, but erythrocytes are highly specialized cells. Mature RBC have no mitochondria and participate extensively in buffering and transporting circulating elements. Their mineral content can therefore diverge from that of the tissues such as liver, brain, kidney, muscle and bone marrow.

Intracellular minerals/metals

WBC's: metabolically more representative cells and can sometimes provide a more useful intracellular proxy. However, they still represent a specific circulating cell population rather than the organs we ultimately want to understand. Commercial intracellular assays tend to provide little or no useful info about toxic-metal accumulation.

Whole Blood: Combines plasma, RBC, WBC and platelets. This can be useful for certain questions, particularly exposure assessment. But it produces a composite signal that can obscure redistribution between extracellular and intracellular.

Intracellular minerals/metals

Urine: Primarily tells us what is being excreted. A low urinary concentration may indicate low body burden, poor mobilization, low exposure, altered renal handling or impaired excretion. And there is not way to tell which is happening.

Hair: Provides a longer-term record of material incorporated into growing tissue. It can be useful for identifying patterns over time, but it is still an excretory and peripheral tissue measurement. Hair forming cells do not participate in inflammatory redistribution in the same manner as the liver, brain, kidney, spleen or bone marrow. Can be considered a longer-duration average of what has been available to peripheral tissue - but not a measure of metabolic organs.

Validated tests

Many test are “validated” for the specimen they measure. However - that does not make them valid measurements of total-body status or concentrations inside a particular organ.

A normal result can be falsely reassuring when the biological question is whether an element has been depleted from, redistributed into, or accumulated with another tissue.

Oligoscan

Oligoscan - same fundamental limitation.

Measurements derived from skin and should be treated as an inference about systemic mineral and metal status, not as a direct measurement of the organs.

Toxic-metal accumulation may differ substantially between these tissues and the skin.

This distinction is especially important during depletion and repletion. Minerals and metals do not distribute uniformly across the body. Different tissues accumulate, release and retain individual elements at different rates.

Protocol

For this reason - the protocol does not treat any single mineral or metal test as definitive.

Results are interpreted as a compartment-specific observation and are compared to

- Other measurements
- Clinical context
- Metabolic pathway data from OAT or Theriome.

Best to repeat certain measurements over time.

Testing

The objective is not to identify a perfect test - it doesn't exist.

- It is to understand what each test is actually measuring
- Recognize what a specific test cannot tell us
- Use the combined pattern to make a more defensible inference about intracellular and tissue mineral status.

Oligoscan

Oligoscan has been found to be one of the more useful tools for pattern recognition, provided some algorithmic errors are corrected before interpreting the results.

So what you see on the initial results is not what we use.

Has to be done with a practitioner.

Map for those not near Glenwood

Severe patients - a home kit may be available.

Need: Blood type, Height and Weight

Oligoscan

Not claiming to directly measure minerals and metals in the skin. It captures patterns in the skin colouring data - which is algorithmically matched against a large database.

The testing shows a clear pattern of deficiencies in ME/CFS, Long COVID, CIRS... with minor variability, which was not observed in controls.

Follow up oligoscan reports also matched supplements taken and previous results.

Notes and limitations

- Iron is compartmentalized. Skin data should not be used to infer systemic iron status.
 - a. Serum is the best confirmation.
 - b. Low manganese may provide a hint for low iron.
- Calcium - interpreted cautiously or disregarded.
 - a. Most calcium is stored in bones and serum calcium tightly regulated.
 - b. Also makes serum calcium insensitive.
 - c. Because strontium and calcium can substitute for each other - using strontium as a proxy for calcium may be possible.
 - d. Tremors or palpitations, especially in response to taurine or mg could indicate low calcium
 - e. Low phosphorus may indicate low calcium

Notes and limitations

- Copper and zinc appear to be over-estimated in some cases.
- Due to an unusual quirk in methodology/reporting, highly elevated minerals need to be re-interpreted as highly deficient.

Oligoscan is not known to be affected by the inflammatory cascade - so these can give us an actionable set of objective markers to use when choosing mineral replacements.

Toxic metals are also reported. These are targeted in the protocol. Any with high ranges should be monitored.

Due to redistribution, heavy metals in the skin often go up in the first stage of the protocol and then decline.

OAT testing

Currently supported tests (specimen, number of analytes)

Genova NutraEval - Urine/plasma 51/115

Mosaic Dx OAT - Urine 77

US Biotek Organic Oat mapping - Urine 115

OMX Organic Metabolomics - urine/plasma 114

Theriome Aristotle - Dried blood spot 126, Theriome Plus 296

Vibrant Wellness OAT - urine 77

Microbiome Testing

Dysbiosis and biofilms in the various microbiomes sits at the root of this disease model.

A common progression would be an early childhood infection/biofilm formation in the ears, nose, throat, sinuses that progresses to the gut (and sometimes lungs), before translocating to sex organs and urinary tract.

Skin microbiome dysbiosis - eczema, acne, dandruff, fungal nails, etc...is also common

Microbiome

Certain gut microbiome tests can help get a rough understanding of the species present in your GI tract (focus on the large intestine), along with the metabolites they consume/produce and if any of these are toxic/relevant to your metabolic alterations.

No single perfect test. There are a range of tests with strengths and weaknesses.

Microbiome testing

Biomesight

For diversity/abundance testing and recommendations around dietary changes.

Allows export for further detailed analysis which can be useful information to make decisions around interventions.

Downside - no fungal species reported.

Use coupon code RemissionBiome

<https://shop.biomesight.com/collections/frontpage/products/gut-microbiome-test-snapshot?variant=32130724364420>

Other microbiome testing

GI-Map

For enhanced pathogen testing, GI related markers, this can be a nice test. But it lacks the detailed species diversity information provided by Biomesight.

Other microbiome testing

Other: Sinuses, oral, lung, urinary tract, and sex organ

Can be done if you have a known or suspected infection in any mucosal tissue - testing with qPCR and NGS to help identify species present - can help with decision making around remediation and treatment.

MicroGenDX

Other testing

- Tick borne illness

Elimination of intracellular species has additional challenges
Getting the immune system restored to normal functionality and ongoing use of circulating biofilm breakers is a key part to resolve these infections.

Specific anti-microbials can be used to manage and accelerate this process.

Microbiome testing

Biomesight:

<https://bornfree.life/learn/2-1-5-microbiome-testing/>

Cronometer

<https://cronometer.com>

Free premium app which can visualize the performance of your current eating strategy/habits/restrictions and allow you to make positive changes.

Mobile app for data collection and basic reporting.

Desktop allows access to richer reporting options and diary view.

Cronometer

Logging at least a few days can be very helpful for identifying problems and also help rebuild/restore you relationship with food, especially as sensitivities are reduced/resolved over the duration of the protocol.

I would suggest at least a week of data.
People often find this eye opening.

When selecting food items to enter - choose NCCDB or USDA listed food items for better micronutrient data.

<https://bornfree.life/learn/2-1-4-cronometer/>

