Functional Lab Ranges

Blood Sugar Markers		
Test	**Optimal Range**	**Lab Information**
Fasting Glucose	**Optimal: 70-90 mg/dL** Normal: <100 mg/dL	Measures blood sugar levels after a 12-hour fast, providing insight into how well the body manages blood sugar at rest. Consistently high levels can signal early signs of insulin resistance or impaired glucose control.
Fasting Insulin	**Optimal: 3-8 mg/dL** *Standard: 2.0-24.9 uIU/mL*	Insulin is a hormone that facilitates the uptake of glucose from the bloodstream. Elevated insulin levels can signal early signs of poor glucose regulation and insulin resistance, which are linked to metabolic syndrome, hormonal disruptions, irregular menstrual cycles, and other health issues. Low insulin levels may suggest insufficient carbohydrate intake
Hemoglobin A1c	**Optimal: < 5.5%** *Normal: 4.8-5.6%* *Pre-Diabetes: 5.7-6.4%* *Diabetes: $\geq$ 6.5%*	A three-month average of blood sugar levels, offering a clearer picture of typical blood sugar control beyond daily fluctuations. This test is commonly used to diagnose and monitor diabetes and assess long-term blood sugar control.
HOMA- IR	**Optimal: 0.5 - 1.5** *Early IR: 1.6-2.5* *Significant IR: >2.5*	Calculation that measures insulin resistance (IR). The test reveals how much insulin your body needs to keep your blood sugar levels in check. ***HOMA-R = fasting insulin (microU/L) x fasting glucose (nmol/L)/405***
Waist Circumference	**Men: < 102 cm (40 in)** **Women: < 88 cm (35 in)**	Waist circumference reflects visceral fat, which is linked to insulin resistance. Visceral fat poses higher health risks than fat stored elsewhere in the body.
Triglyceride:HDL Ratio	**Optimal: $\leq$ 1.5** *Standard: $\leq$ 2.0*	The Triglyceride-to-HDL ratio helps assess insulin resistance and metabolic health, with a lower ratio suggesting better insulin sensitivity and reduced risk of cardiovascular issues.

Functional Lab Ranges

Cardiovascular Health		
Test	Optimal Range	Lab Information
Total Cholesterol	**Optimal: 150-200 mg/dL** *Normal: <200 mg/dL*	Total Cholesterol = HDL cholesterol level + LDL cholesterol level + 20% of triglyceride level
LDL Cholesterol	**Optimal: < 100 mg/dL** *Normal: < 100 mg/dL*	Known as “bad cholesterol” because it deposits cholesterol in your arteries, which can lead to a buildup of plaque and an increased risk of blood clots.
HDL Cholesterol	**Optimal: 55-70 mg/dL** *Normal Male: > 40 mg/dL* *Normal Female: > 50 mg/dL*	Known as “good cholesterol” because it transports cholesterol to your liver to be released from your body.
VLDL Cholesterol	**Optimal: < 30 mg/dL** *Normal: < 30 mg/dL*	Produced in the liver and released into the bloodstream to supply body tissues with Triglycerides.
Triglycerides	**Optimal: 50-80 mg/dL** *Normal: < 150*	Fats from the food we eat that are carried in the blood.
LDL Particle Size	**Pattern A: > 20.6 nm** **Pattern B: < 20.5 nm** ***Optimal Size: 21-27 nm*** ***Optimal Small LDL-P: < 600 nmol/L***	Smaller, more dense LDL particles are more easily oxidized, deposited as plaque, & more prone to rupture. Pattern A (larger particles) is NOT associated with an increased likelihood of atherosclerosis. Pattern B (smaller particles) is associated with atherosclerosis
LDL-P	**Optimal: < 935 nmol/L** *Normal: < 1,000* *Near normal: 1,101–1,399 nmol/L* *Borderline high: 1,400–1,799 nmol/L* *High: 1,800–2,100 nmol/L* *Very high: Greater than 2,100 nmol/L*	Refers to the number of LDL particles in the blood, which is different from a standard LDL test that measures the amount of cholesterol carried by LDL. While a regular LDL test provides the cholesterol concentration, LDL-P focuses on particle count, which is a more precise indicator of cardiovascular risk. High LDL particle numbers can increase the likelihood of plaque buildup in arteries, even if LDL cholesterol levels appear normal.

Functional Lab Ranges

Cardiovascular Health

Test	Optimal Range	Lab Information
Lp(a)	**Optimal: < 30 mg/dL** *Normal: < 30 mg/dL*	Lipoprotein (a) is a type of LDL. Lipoprotein (a) particles are stickier than other types of LDL particles, so they may be more likely to cause blockages and blood clots in your arteries.
ApoB	**Optimal: 40-70 mg/dL** *Normal*: 20-90 mg/dL *Increased Risk: > 120 mg/dL*	ApoB is the primary protein component of LDL particles. The apoB protein attaches to receptors on your cells, which allows the low-density lipoprotein, or bad cholesterol, into the cell.
ApoA1	**Optimal: 110-162 mg/dL**	Primary protein component of high-density lipoprotein (HDL). Elevated ApoB and decreased ApoA1 are associated with increased risk of cardiovascular disease.
PT/INR	**Optimal: 0.8-1.1**	Measures the time it takes for your blood to clot.
Omega-6:Omega-3 Ratio	**Optimal: 4:1**	Excess omega-6's cause inflammation.

Inflammation

Test	Optimal Range	Lab Information
CRP	**Optimal: < 10 mg/L** *Normal: < 10 mg/L*	CRP stands for C-reactive protein, a substance produced by the liver in response to inflammation.
hs-CRP	**Optimal: < 1 mg/L** *Normal: 0-3 mg/L*	Measures much lower levels of C-reactive protein. It is primarily used to assess the risk of cardiovascular disease, as even slight increases in hs-CRP can indicate chronic inflammation in blood vessels.
Homocysteine	**Optimal: 3-7 umol/L** *Normal: 0-10.3 mg/dL*	Homocysteine is an amino acid in the blood that is influenced by B vitamins (B6, B12, and folic acid) and plays a role in protein metabolism. Elevated levels can indicate deficiencies in these vitamins, as well as underlying inflammation, which may contribute to cardiovascular risk or other health concerns.
ESR	**Optimal: 0.0-5.0 mm/hr** *Normal: < 30 mg/dL*	ESR stands for Erythrocyte Sedimentation Rate, a blood test that measures how quickly red blood cells settle at the bottom of a test tube over a specified period, usually one hour. It's a nonspecific test often used to detect inflammation in the body.
8-OHdG (*urine*)	**Optimal: < 16 mcg/g Creatinine**	Measures oxidative stress in the body by detecting damage to DNA caused by free radicals. Elevated levels of 8-OHdG in urine indicate increased oxidative stress.

Functional Lab Ranges

Nutrients		
Test	Optimal Range	Lab Information
Vitamin A	**Optimal: 20-60 mcg/dL**	Fat-soluble vitamin essential for vision, immune function, skin health, and cellular growth. Low levels can lead to poor night vision, dry skin, increased susceptibility to infections, and delayed wound healing.
Vitamin D	**Optimal: 50-80 mg/dL** *Normal: 30-100 mg/dL*	Vitamin D deficiency can lead to bone weakness, fatigue, depression, and a weakened immune system. Common causes of low vitamin D include insufficient sunlight exposure, limited dietary intake, and malabsorption issues.
Vitamin B12	**Optimal: 500-1300 pg/ mL** *Normal: > 300 pg/mL* *Borderline: 200-300 pg/mL - check MMA* *Deficient: < 200 pg/mL*	Vitamin B12 deficiency can lead to fatigue, neurological symptoms, and anemia. Common causes of low B12 include poor dietary intake, malabsorption issues like pernicious anemia or gastrointestinal disorders, and long-term use of medications such as acid reducers or metformin.
Methylmalonic Acid	**Optimal: 87-318 mmol/L** *Elevated*: > 400 mmol/L	Measures the levels of MMA in your blood or urine to assess for Vitamin B12 deficiency. Elevated MMA levels can indicate a deficiency, as B12 is required to convert methylmalonyl-CoA to succinyl-CoA in metabolic processes. This test is particularly useful for diagnosing early or borderline B12 deficiencies, even when serum B12 levels appear normal.
Folate	**Serum:** • **Optimal: >5.4 ng/mL** • <3 ng/mL may indicate deficiency **RBC:** • **Optimal**: > 400 ng/dL • < 150 ng/dL may indicate deficiency	**Serum Folate**: Measures short-term folate status. Highly sensitive to folate intake and supplements. **RBC Folate**: RBC folate is a reliable long-term indicator of folate status, reflecting levels over the past 120 days (the lifespan of red blood cells). It measures the folate stored in red blood cells during their formation and closely correlates with daily folate intake and liver stores. RBC folate levels are typically higher in individuals who consume synthetic folic acid.
Homocysteine	**Optimal: 5-7 µmol/L** *Elevated: 12-15 µmol/L*	Homocysteine is a marker that reflects how well the body processes and recycles amino acids. **Elevated levels can indicate poor methylation, often due to low levels of B vitamins (B6, B12, and folate)**. It is commonly used to assess cardiovascular and brain health, as high homocysteine is linked to increased risk of heart disease, cognitive decline, and pregnancy complications.
FIGLU (Urine)	**Optimal: 0.1-2.2mcg/mg creatinine**	The FIGLU test is a diagnostic test that measures the amount of formiminoglutamic acid (FIGLU) excreted in the urine after ingesting a dose of histidine (an amino acid). This test helps assess the body's ability to metabolize histidine, which requires adequate levels of folate (vitamin B9).
RBC Magnesium	**Optimal: 5.0-6.0 mg/dL** *Normal: 4.2-6.8 mg/dL*	Supports stress hormones (like cortisol), insulin sensitivity, and the production of sex hormones

Functional Lab Ranges

Nutrients		
Test	Optimal Range	Lab Information
Selenium	**Optimal: 120-160 mcg/L**	Found in the highest concentration in the thyroid gland, where it's needed for optimal function
Zinc	**Optimal: 80-115 ug/dL**	Zinc deficiency can impact immune function, wound healing, and reproductive health. Abnormal zinc levels may contribute to impaired taste and smell, as well as compromised immune response. ***Note**: Serum zinc can be affected by inflammation, stress, and time of day, so repeat testing and checking zinc status in combination with symptoms*
Copper	**Serum: 62-140 mcg/dL** **Ceruloplasmin: 20-35 mg/dL**	Essential for enzyme activity in energy production and iron metabolism. Indirectly supports estrogen and thyroid hormone production. **Serum copper** measures the amount of copper in the blood, while **ceruloplasmin** measures the protein that binds and transports most of the copper. Low ceruloplasmin and serum copper levels may indicate copper deficiency or genetic conditions like Wilson's disease, where copper accumulates in tissues instead of being properly transported. Elevated levels of both can occur due to inflammation, infection, or pregnancy, as ceruloplasmin is an acute-phase reactant.
Iodine (Urine)	**Optimal: 100-199 mcg/L** *Severe Deficiency: < 20 mcg/L* *Suboptimal: <100 mcg/L* *Excess: >200 mcg/L*	A urine iodine lab test measures the concentration of iodine excreted in the urine, providing an estimate of recent iodine intake. Since iodine is essential for thyroid hormone production, this test helps assess iodine status and identify deficiencies or excess. A spot urine test reflects short-term intake, while a 24-hour collection gives a more comprehensive view of daily iodine levels..
Calcium	**Optimal: 8.5-10.5 mg/dL**	Crucial for signaling in hormone release, especially in the parathyroid gland and bone-related hormones.
COQ10 Ubiquinone	**Optimal: 0.43-1.49 mcg/mL**	Measures levels of coenzyme Q10, an antioxidant that plays a crucial role in energy production within the mitochondria and protects cells from oxidative damage. Low levels of CoQ10 can indicate mitochondrial dysfunction, nutrient deficiencies, or the effects of certain medications like statins.

Functional Lab Ranges

Nutrients - Iron Status

Test	Optimal Range	Lab Information
Ferritin	**Optimal: 45-150 ng/mL** ***Deficient**: 10-12 ng/mL* ***Potentially Symptomatic**: < 40 ng/mL* ***"Normal"**:* • *Adult Adult pre-menopausal women: 12-200 ng/mL* • *Adult men & postmenopausal females: 20-300 ng/mL* ***High Levels**:* • Adult pre-menopausal women: >200 ng/mL • Adult men and post-menopausal women: >300 ng/mL	Ferritin is a protein that stores iron in the body and is a key marker of iron status. It reflects the amount of iron stored in tissues. • ***Low ferritin***: Indicates depleted iron stores, often due to iron deficiency, leading to fatigue, weakness, and anemia. • ***High ferritin***: Can indicate iron overload (e.g., hemochromatosis) or increased iron storage. ***However, elevated ferritin levels may also be a sign of inflammation or infection.*** ***Additional considerations**:* • *Levels should be 30+ to prevent hair loss* • *Levels should be 70+ to promote hair regrowth* • *Levels should be 90+ for optimal thyroid health*
Iron	**Optimal (Females): ~100 mcg/dL** **Optimal (Males): ~ 120 mcg/dL** *Normal: 60-170 mcg/dL*	Iron is a mineral necessary for producing hemoglobin, which carries oxygen in the blood, and supports energy production and immune function. **Low levels can lead to iron-deficiency anemia**, causing fatigue, weakness, pale skin, and shortness of breath. Chronic low iron can also affect cognitive function and immune response.
Transferrin	**Optimal: ~300 mg/dL** *Normal: 200-350 mg/dL*	Transferrin is a protein that transports iron from tissues to the bloodstream for use in red blood cell production. The lab test measures the amount of transferrin in the blood, helping assess the body's ability to bind and transport iron. ***In iron deficiency,* transferrin levels are often elevated** as the body increases production to compensate for low iron availability.
Transferrin Saturation (% Sat)	**Optimal: 20-35%** *Normal: 15-50%*	Transferrin saturation measures the percentage of transferrin (an iron transport protein) that is bound with iron. • **Low transferrin saturation**: Indicates insufficient iron levels available for use, often associated with iron deficiency. • **High transferrin saturation**: May indicate iron overload, such as in conditions like hemochromatosis.
TIBC	**Optimal: 250-350 mg/dL** *Normal: 250-450 mg/dL*	**Total Iron-Binding Capacity (TIBC)** measures the blood's capacity to bind and transport iron, reflecting the availability of transferrin (the primary iron transport protein). **High TIBC levels often indicate low iron stores**, as the body increases transferrin production to capture more iron.
MCV	**Optimal: 80-100 fL**	MCV measures the average size of red blood cells and helps classify different types of anemia. ***Low MCV** i*ndicates microcytic anemia, often due to iron deficiency or chronic disease. ***High MCV** i*ndicates macrocytic anemia, commonly caused by vitamin B12 or folate deficiency, alcohol use, or liver disease.
Hemoglobin	**Optimal (Female): 13.5-14.5 g/dL** *Normal: 12.0-15.5 g/dL* **Optimal (*Male*): 14.0-15.0 g/dL** *Normal: 13.5-17.5 g/dL*	Hemoglobin is the oxygen-carrying protein in red blood cells, crucial for transporting oxygen from the lungs to tissues. **Low hemoglobin levels can indicate anemia**, often due to iron, B12, or folate deficiency, leading to fatigue, weakness, and shortness of breath.
Hematocrit	**Optimal (Female): 37-44%** *Normal: 34-47%* **Optimal (*Male*): 40-48%** *Normal: 36-50%*	Hematocrit measures the proportion of red blood cells in the blood, expressed as a percentage. **Low hematocrit can indicate anemia** or blood loss, leading to reduced oxygen-carrying capacity

Functional Lab Ranges

Thyroid		
Test	Optimal Range	Lab Information
TSH	**Optimal: 1.8 - 3.0 uU/mL** *Normal: 0.5-5.5 uU/mL*	TSH is a hormone released by the pituitary gland that signals the thyroid to produce thyroid hormones. Elevated TSH levels typically indicate an underactive thyroid (hypothyroidism), while low levels suggest an overactive thyroid (hyperthyroidism).
Free T3	**Optimal Range: 3-3.5 pg/mL** *Normal: 2.3-4.2 pg/mL*	Free T3 measures the active, unbound form of triiodothyronine circulating in the blood, which regulates metabolism, energy, and heart function. Low Free T3 levels may indicate poor thyroid hormone conversion, while high levels suggest excessive thyroid activity.
Total T3	**Optimal Range: 90-168 pg/mL** *Normal: 80-230 pg/mL*	Total T3 measures both the bound and free forms of T3 in the bloodstream. This test provides a fuller picture of circulating T3 levels but can be influenced by factors like protein binding and is less commonly used than Free T3 for thyroid function evaluation.
Free T4	**Optimal Range: 1-1.5 ng/dL** *Normal: 0.76-1.9 ng/dL*	Free T4 measures the unbound, active form of thyroxine, the primary hormone produced by the thyroid gland. It is converted into T3 in the body, and abnormal levels can indicate thyroid dysfunction, even if TSH is normal.
Total T4	**Optimal Range: 6.0-11.9 ug/dL** *Conventional Range: 4.5-12.0 ug/dL*	Total T4 measures both the bound and free forms of thyroxine. Like Total T3, it offers an overview of circulating T4 but may be affected by changes in protein levels that bind thyroid hormones.
Reverse T3	**Optimal Range: < 15 ng/dL** *Conventional Range: 10-25 ng/dL*	Reverse T3 (rT3) is an inactive form of T3 produced when the body converts T4 into a non-functional form of T3. It acts as a natural brake on metabolism, slowing things down during periods of stress, illness, or low-calorie intake. High rT3 levels can indicate poor thyroid hormone conversion, often linked to chronic stress, inflammation, or nutrient deficiencies.
Thyroid Peroxidase Antibody (TPOAb)	**Optimal: 0 IU/mL** *Normal*: 0-34 IU/mL	Thyroid peroxidase antibodies (TPOAb) target an enzyme involved in thyroid hormone production. High TPOAb levels indicate thyroid inflammation and are commonly associated with autoimmune thyroid disorders, especially Hashimoto's thyroiditis.
Thyroglobulin Antibody (TgAb)	**Optimal: 0 IU/mL** *Normal*: 0-40 IU/mL	Thyroglobulin antibodies (TgAb) are antibodies that attack thyroglobulin, a protein needed to produce thyroid hormones. Elevated TgAb levels are often seen in autoimmune thyroid conditions like Hashimoto's thyroiditis.

Functional Lab Ranges

Brain Health - Mood & Behavior		
Test	Optimal Range	Lab Information
BDNF (serum)	**Optimal: 18-26 ng/mL**	Brain-Derived Neurotrophic Factor (BDNF) is a protein that supports the growth, survival, and repair of neurons, playing a key role in brain function and mental health. Low serum BDNF levels have been associated with mood disorders, cognitive decline, and neurodegenerative diseases.
Homovanillic Acid (HVA)	**Optimal: 1.4-7.6mcg/mg creatinine**	Homovanillic Acid (HVA) is a metabolite of dopamine, a neurotransmitter involved in mood, motivation, and movement. Elevated or low HVA levels in urine can reflect imbalances in dopamine metabolism, often linked to neurological or psychiatric conditions.
Kynurenate (Urine Test)	**Optimal: <1.5 mcg/mg creatinine**	Kynurenate is a metabolite in the tryptophan metabolism pathway and is associated with neuroinflammation and neurotransmitter regulation. Elevated urine kynurenate levels may indicate inflammation, stress, or impaired tryptophan metabolism, which can affect mood and brain function.
Vanilmandelate (VMA)	**Optimal: 1.2-5.4mcg/mg creatinine**	Vanilmandelic Acid (VMA) is a primary metabolite of epinephrine (adrenaline) and norepinephrine. Urine VMA levels help assess the body's stress response and adrenal function, with elevated levels often linked to increased catecholamine production due to stress and anxiety.

Additional Functional Tests	
Functional Test	**Description**
DUTCH Hormone Test	The DUTCH (Dried Urine Test for Comprehensive Hormones) test uses urine and saliva to measure hormone levels and metabolites. It evaluates estrogen, androgen, progesterone, cortisol, and melatonin metabolites, providing insights into hormone balance. The test also measures oxidative stress markers, organic acids, and maps the daily cortisol pattern, including the cortisol awakening response (*add-on test*), making it a comprehensive assessment of adrenal and hormonal function.
DUTCH CAR (Cortisol Awakening Response)	The DUTCH CAR test specifically focuses on measuring cortisol levels during the first hour after waking to assess the body's stress response. This pattern reveals how the adrenal glands respond to daily stress and can provide insights into burnout, adrenal fatigue, or hyperactive stress responses, which affect energy levels, mood, and sleep.
GI-MAP Stool Test	The GI-MAP is an advanced stool test that uses quantitative polymerase chain reaction (qPCR) technology to detect DNA from parasites, bacteria, fungi, and viruses. It also measures markers of digestive function, intestinal inflammation, and gut barrier integrity ("leaky gut"). This test provides a detailed picture of gut health, helping identify imbalances that contribute to digestive and systemic issues.
MRT Food Sensitivity Test	Mediator Release Testing (MRT) is a blood test that measures the immune system's reaction to 176 different foods and food chemicals by detecting the release of inflammatory mediators, such as histamine, cytokines, and prostaglandins. These mediators can trigger a range of inflammatory symptoms, including digestive issues, migraines, joint pain, and skin conditions. By identifying which foods and chemicals cause immune activation, the MRT helps create a personalized diet plan to reduce inflammation and symptoms.
3x4 Genetics DNA Test	The 3x4 Genetics test analyzes genetic variants (SNPs) to assess how your genes influence key processes such as metabolism, inflammation, hormone regulation, and detoxification. By interpreting 36 pathways across various health categories, this test provides actionable insights into optimizing diet, exercise, and lifestyle based on your genetic blueprint.
NutrEval	NutrEval is a comprehensive blood and urine test that evaluates over 125 biomarkers to assess the body's functional need for key nutrients. It measures antioxidants, vitamins, minerals, essential fatty acids, amino acids, and digestive markers to provide a detailed analysis of nutritional status, oxidative stress, and metabolic function, guiding personalized nutrition and supplementation.
HTMA Test	Hair Tissue Mineral Analysis (HTMA) measures mineral and heavy metal levels in hair samples. It reflects long-term nutrient status and toxic exposure, as minerals and metals accumulate in hair over time. HTMA can provide insights into nutrient imbalances, detoxification capacity, and metabolic function, making it useful for assessing chronic stress, fatigue, and toxicity.