LabSmarts™
Bio-individual Blood Work Interpretation Software

The Functional Blood Work Map™

150 Unique Blood Biomarkers

The Functional Blood Work Map™ organizes every biomarker by the body system or process it reflects, a framework for reading blood work as connected patterns rather than isolated values. It uses The 5-System Method: five high-level functional groups, then body systems and processes, and finally individual markers.

Part 1 · The Functional Blood Work Map

The five high-level functional groups that organize every body system and process in the software.

1. Energy & Metabolic Function — *Fuel & Energize*

Body Systems & Processes: Blood Oxygen · Iron Status · Glucose · Lipids · Thyroid

The Energize group shows how well the body delivers oxygen, uses fuel, and sustains steady energy. It groups systems and processes related to oxygen delivery, iron utilization, glycemic regulation, insulin response, lipid metabolism, and thyroid-related metabolic pacing — helping organize patterns that may affect cellular energy production and metabolic regulation.

2. Digestion, Nutrients, & Building Blocks — *Digest & Build*

Body Systems & Processes: Digestive & Gut Health (coming soon) · Proteins · Nutrients

The Build group shows how well the body breaks down, absorbs, and uses the raw materials needed to function, repair, and regulate. It groups systems and processes related to digestion, protein status, vitamin and mineral availability, and nutrient-related building blocks — helping organize patterns that may affect tissue repair, enzyme activity, hormone production, immune function, detoxification, and metabolic resilience.

3. Immune, Inflammation, & Repair — *Defend & Repair*

Body Systems & Processes: Immune · Inflammation · Blood Clotting

The Defend & Repair group shows how the body is responding to inflammation, immune activity, oxidative stress, and tissue repair demands. It groups systems and processes related to immune activity, inflammatory signaling, oxidative stress, clotting, and repair-related physiology — helping organize patterns that may reflect defense activity, inflammatory burden, tissue response, clotting demand, and recovery needs.

4. Detoxification & Elimination Function — *Detoxify & Eliminate*

Body Systems & Processes: Liver · Kidney · Electrolytes

The Eliminate group shows how well the body filters, clears, and eliminates waste while maintaining acid-base balance. It groups systems and processes related to liver function, kidney function, electrolyte balance, waste clearance, detoxification, renal handling, and acid-base regulation — helping organize patterns that may affect processing, filtration, clearance, elimination, and fluid-electrolyte balance.

5. Hormonal & Endocrine Health — *Signal & Regulate*

Body Systems & Processes: Stress & Adrenals · Hormones · Prostate Function

The Signal & Regulate group shows how the body communicates and regulates stress response, reproductive hormones, sex-specific markers, and metabolic signaling. It groups systems and processes related to adrenal signaling, stress response, reproductive hormone balance, sex-specific markers, and endocrine regulation — helping organize patterns that may affect stress adaptation, hormone communication, metabolic signaling, and reproductive physiology.

Part 2 · Body Systems & Processes within Each Group

Energy & Metabolic Function — Fuel & Energize

Blood Oxygen & Red Blood Cell Function. Shows markers and pattern insights related to oxygen delivery, red blood cell production and quality, and the body's ability to support steady energy production.

Iron Status & Utilization. Shows markers related to iron availability, storage, transport, and how iron supports red blood cell function and oxygen delivery.

Glucose Regulation & Metabolic Function. Shows markers and pattern insights related to blood sugar regulation, insulin response, pancreatic output, lipid-related metabolism, and metabolic stability.

Lipid Balance. Shows markers related to lipid transport, cholesterol balance, triglyceride regulation, lipoprotein particle number and size, and broader cardiometabolic function.

Thyroid Function. Shows markers related to thyroid signaling, hormone production, conversion, transport, and metabolic pace.

Digestion, Nutrients, & Building Blocks — Digest & Build

Digestive & Gut Health *(coming soon)***.** Shows markers related to digestion, gut barrier function, microbial balance, and the body's ability to break down and absorb nutrients.

Protein Status. Shows markers related to protein reserves, protein metabolism, tissue repair capacity, and nutritional building blocks.

Nutrient Status. Shows markers related to vitamin and mineral availability that support enzyme activity, nutrient-dependent metabolic processes, and tissue function.

Immune, Inflammation, & Repair — Defend & Repair

Immune Activity. Shows markers and pattern insights related to white blood cell activity, immune cell distribution, and immune response.

Inflammation & Oxidative Stress. Shows markers related to inflammatory activity, oxidative stress, and systemic repair demands.

Blood Clotting & Flow. Shows markers related to platelet activity, clotting balance, vascular integrity, and repair-related physiology.

Detoxification & Elimination Function — Detoxify & Eliminate

Liver Function. Shows markers related to liver enzymes, bile flow, protein synthesis, detoxification, and metabolic clearance.

Kidney Function. Shows markers related to kidney filtration, waste clearance, and renal handling.

Electrolyte Balance. Shows markers related to sodium, potassium, chloride, CO_2, anion gap, fluid balance, nerve signaling, and acid-base regulation.

Hormonal & Endocrine Health — Signal & Regulate

Stress & Adrenal Balance. Shows markers related to adrenal signaling, the stress response, cortisol rhythm, the adrenal regulation of sodium and potassium, and the body's ability to adapt to stress.

Hormone Balance. Shows markers related to reproductive and sex hormone signaling, hormone metabolism, and broader endocrine communication.

Prostate Function. Shows markers related to prostate-specific markers and related androgen context.

Part 3 · Biomarkers within Each Body System & Process

Cross-referenced markers (shown in smaller grey text) appear where clinically relevant but are counted in their primary system or process.

Energy & Metabolic Function — Fuel & Energize

Blood Oxygen & Red Blood Cell Function

1. RBC
   Measures the number of red blood cells in the blood. Red blood cells carry oxygen to tissues and help return carbon dioxide to the lungs.
2. Hemoglobin (HGB)
   The oxygen-carrying protein inside red blood cells.
3. Hematocrit (HCT)
   Measures the percentage of total blood volume made up of red blood cells. It often trends with RBC count and hemoglobin.
4. MCV
   Measures the average size of red blood cells and helps describe whether cells are generally small, normal-sized, or large.
5. MCH
   Measures the average amount of hemoglobin each red blood cell carries.
6. MCHC
   Measures the average hemoglobin concentration within red blood cells.
7. RDW
   Measures variation in red blood cell size. Higher variation can suggest mixed red blood cell populations or changing red blood cell production.
8. Reticulocyte Count*
   Estimates how many immature red blood cells the bone marrow releases after correcting for anemia. It helps show whether the marrow is responding appropriately.
9. RPI*
   Refines the reticulocyte count by adjusting for anemia severity and early release of immature red blood cells. It helps assess whether red blood cell production matches the level of anemia.

Iron Status & Utilization

10. Iron
    The amount of iron circulating in the blood at the time of the draw. It can fluctuate and is best interpreted with ferritin, transferrin/TIBC, and % saturation.
11. TIBC
    Estimates how much transferrin capacity is available to bind and carry iron. It helps show whether the body is trying to transport more or less iron.
12. % Saturation
    Shows the percentage of transferrin that is currently loaded with iron. It helps estimate whether circulating iron delivery is low, appropriate, or high.
13. Ferritin
    Reflects stored iron. Ferritin can also rise with inflammation, infection, liver stress, or tissue injury, so it should be interpreted with the rest of the iron panel and inflammatory context.
14. Transferrin*
    Measures the main protein that transports iron through the blood. Transferrin helps move iron to tissues and bone marrow for red blood cell production.

Bar graphs for the markers below appear here because copper and vitamin A work closely with iron, even though each is counted in its own system or process. Copper — carried by ceruloplasmin — helps load iron onto its transport protein, so copper status (ceruloplasmin, serum and red-cell copper, and free copper) shapes how iron moves and gets used. Vitamin A helps the body release stored iron and build healthy red blood cells.

- Ceruloplasmin *(Nutrient Status)*
- Copper, RBC *(Nutrient Status)*
- Copper, Serum *(Nutrient Status)*
- Free Copper (%) *(Nutrient Status)*
- Vitamin A *(Nutrient Status)*

Glucose Regulation & Metabolic Function

15. Glucose
    Measures blood glucose at the time of the draw. Fasting glucose shows how well the body regulates blood sugar between meals.
16. Hemoglobin A1c*
    Estimates average blood sugar exposure over about 2–3 months by measuring how much glucose has attached to hemoglobin in red blood cells.
17. Insulin*
    A hormone made by the pancreas that helps move glucose from the blood into cells. Fasting insulin can show how much insulin the body uses to maintain blood sugar balance.
18. C-peptide*
    A protein released in equal amounts with insulin. Because C-peptide has a longer half-life than insulin, it provides a more stable estimate of how much insulin the pancreas produces.
19. Amylase
    A digestive enzyme made mainly by the pancreas and salivary glands that helps break down carbohydrates. It provides context for pancreatic digestive enzyme activity and carbohydrate digestion.
20. Leptin
    Leptin is a hormone released mainly by fat tissue that signals how much stored energy is available. The brain uses that signal to help regulate appetite, energy expenditure, and thyroid and reproductive activity. Because leptin tracks fat mass, results are interpreted alongside body mass index, and both unusually high and unusually low values indicate energy-balance information.

Bar graphs for the markers below appear here because each connects to glucose and metabolic regulation, though they are counted in their primary system or process.

- Triglycerides/HDL Ratio — *a practical surrogate for insulin resistance* *(Lipid Balance)*
- LP-IR Score — *a lipoprotein index linked to insulin resistance* *(Lipid Balance)*
- Triglycerides — *tend to rise when insulin isn't managing fat metabolism well* *(Lipid Balance)*
- HDL — *often runs low when insulin resistance is present* *(Lipid Balance)*
- LDL — *shifts with insulin-driven lipid metabolism* *(Lipid Balance)*
- ALT — *rises with fatty-liver changes linked to metabolic dysfunction* *(Liver Function)*
- AST — *reflects liver involvement in metabolic and fatty-liver patterns* *(Liver Function)*
- Cortisol, AM — *a stress hormone that raises blood sugar* *(Stress & Adrenal Balance)*
- Cortisol, PM — *a stress hormone that raises blood sugar* *(Stress & Adrenal Balance)*
- NLR — *an inflammation ratio associated with insulin resistance* *(Immune Activity)*
- hs-CRP — *inflammation that tracks with metabolic dysfunction* *(Inflammation & Oxidative Stress)*
- Carbon Dioxide — *shifts with the acid–base changes of metabolic imbalance* *(Electrolyte Balance)*
- BUN — *influenced by protein metabolism and hydration tied to glucose status* *(Kidney Function)*
- Potassium — *moves into cells under insulin's action* *(Electrolyte Balance)*
- Calcium — *involved in insulin secretion and signaling* *(Nutrient Status)*
- Vitamin B6 — *a cofactor in glucose and amino-acid metabolism* *(Nutrient Status)*

Lipid Balance

21. Cholesterol, Total
    Reflects the total amount of cholesterol carried across all lipoprotein particles. Cholesterol is used for cell membranes, bile acids, vitamin D, and steroid hormone production.
22. Triglycerides
    Reflects triglycerides, the main form of fat stored in the body and transported in the blood. Triglycerides are influenced by energy balance, carbohydrate intake, alcohol, insulin signaling, and liver metabolism.
23. HDL
    Reflects cholesterol carried by HDL particles. HDL particles help move cholesterol away from tissues, support reverse cholesterol transport, and play roles in immune signaling, antioxidant activity, and lipid metabolism.
24. LDL
    Reflects cholesterol carried by LDL particles. LDL particles deliver cholesterol and fat-soluble compounds to tissues, but higher LDL-C does not always reflect the number of LDL particles present.
25. VLDL Cholesterol
    Reflects cholesterol carried by VLDL particles, the triglyceride-rich particles the liver releases to move fat to tissues. Most labs print it as a calculated value rather than measuring it directly, taking total cholesterol minus HDL minus LDL.

26. Cholesterol/HDL Ratio*
    Compares total cholesterol to HDL cholesterol. It provides a broad view of the cholesterol pattern and can help show whether total cholesterol is proportionally higher relative to HDL.
27. Triglycerides/HDL Ratio*
    Compares triglycerides to HDL cholesterol. It can provide indirect context for insulin sensitivity and metabolic health because reduced insulin sensitivity often increases triglyceride production and is commonly associated with lower HDL.
28. Apolipoprotein A-1
    Reflects the main protein found on HDL particles. Apo A-1 provides context for HDL particle structure, cholesterol transport, and HDL-related metabolic function.
29. Apolipoprotein B
    Reflects the number of lipoprotein particles that can build up in artery walls, including LDL, VLDL, IDL, and Lp(a). If LDL-C is the amount of cholesterol cargo, ApoB is more like the number of vehicles carrying it.
30. Apo B/Apo A-1 Ratio*
    Compares ApoB to Apo A-1. It provides context for the balance between particles that can build up in artery walls and HDL-related transport capacity.
31. Lipoprotein(a)*
    Reflects lipoprotein(a), an LDL-like particle that is largely genetically determined and tends to be more “sticky” or clot-promoting than standard LDL. It can add cardiovascular and clotting-risk context beyond a standard lipid panel.
32. LDL Particle Number (LDL-P)*
    Reflects how many LDL particles are circulating, rather than how much cholesterol those particles carry. Two people with the same LDL cholesterol can carry very different particle counts. Labcorp reports LDL-P in nmol/L against a reference population of 5,362 adults not taking lipid medication: Low is under 1000 (below the 20th percentile), Moderate is 1000 to 1299 (20th to 50th), Borderline-High is 1300 to 1599 (50th to 80th), High is 1600 to 2000 (80th to 95th), and Very High is above 2000 (above the 95th).
33. Small LDL Particle Number (Small LDL-P)*
    Reflects how many of the LDL particles fall in the small, dense subclass. Labcorp reports this in nmol/L against the same reference population, with the quartiles marked: Low is under 117 (below the 25th percentile), Below Average is 117 to 527 (25th to 50th), Above Average is 528 to 839 (50th to 75th), and High is above 839 (above the 75th). The printed reference of 527 is the population midpoint rather than an upper limit of normal, so half the reference group sits above it.
34. LDL Particle Size*
    Reflects the average diameter of LDL particles in nanometers. The report describes a larger average as Pattern A and a smaller average as Pattern B, with the boundary between them at 20.5 to 20.6 nanometers. An average describes the particles as a group, so it can look reassuring while the number of small particles is still raised.
35. HDL Particle Number, Total (HDL-P)*
    Reflects the total number of HDL particles, rather than the cholesterol they carry. HDL particles support the movement of cholesterol away from tissues, and the particle count can differ from HDL cholesterol in the same way LDL particle number can differ from LDL cholesterol.
36. Large HDL Particle Number (Large HDL-P)*
    Reflects how many HDL particles fall in the large subclass. Large HDL particles are the more mature, cholesterol-loaded end of the HDL range, and this count gives context for how much of the HDL pool is in that form. It is one of the six measurements that feed the LP-IR Score.
37. HDL Particle Size*
    Reflects the average diameter of HDL particles in nanometers. Average HDL size tends to shift lower alongside higher triglycerides, and it is one of the six measurements that feed the LP-IR Score.
38. Large VLDL Particle Number (Large VLDL-P)*
    Reflects how many large, triglyceride-rich VLDL particles are circulating. VLDL particles are released by the liver to carry triglycerides to tissues, and this count tends to rise with triglyceride production. It is one of the six measurements that feed the LP-IR Score.
39. VLDL Particle Size*
    Reflects the average diameter of VLDL particles in nanometers. A larger average generally accompanies a higher triglyceride load per particle, and it is one of the six measurements that feed the LP-IR Score.
40. LP-IR Score (Lipoprotein Insulin Resistance Index)*
    Reflects a 0 to 100 index calculated from six lipoprotein measurements: large VLDL particle number, VLDL size, LDL size, small LDL particle number, large HDL particle number, and HDL size. Labcorp reports it under its own heading as a marker associated with reduced insulin sensitivity, and marks the quartiles at 27, 45, and 63. It is a calculated index rather than a measured concentration, and the report notes it is accurate only on a fasting sample.

Thyroid Function

41. TSH
    A pituitary signaling hormone that tells the thyroid how hard to work. TSH shows how strongly the brain stimulates the thyroid, but it is not a thyroid hormone itself.
42. T4 Total*
    Reflects total thyroxine, including both protein-bound and free T4. T4 is the thyroid's main hormone and serves mostly as a storage (prohormone) form that can be converted to active T3.
43. Free T4*
    Reflects unbound thyroxine, the available form of T4 in circulation. Free T4 helps indicate thyroid hormone output and the amount of hormone available before conversion to the more active T3.
44. T3 Total*
    Reflects total triiodothyronine, including both protein-bound and free T3. T3 is the more active thyroid hormone and has stronger effects on metabolism, energy production, temperature regulation, heart rate, and cellular activity.
45. Free T3*
    Reflects unbound triiodothyronine, the active form of thyroid hormone available to tissues. Free T3 helps show thyroid hormone activation and conversion from T4 in the tissues.
46. Reverse T3*
    An inactive thyroid hormone made from T4. Reverse T3 can help explain thyroid hormone conversion patterns during illness, stress, under-eating, inflammation, or other metabolic strain.
47. TPO Antibodies*
    Antibodies directed against thyroid peroxidase, an enzyme that makes thyroid hormone. TPO antibodies provide context for autoimmune thyroid activity, especially Hashimoto’s-pattern thyroid autoimmunity.
48. Thyroglobulin Antibodies*
    Antibodies directed against thyroglobulin, a protein involved in thyroid hormone production and storage. Tg antibodies provide additional context for autoimmune thyroid activity.
49. TBG*
    The main blood protein that carries thyroid hormone. TBG changes can shift total T4 and T3 levels because total hormone includes protein-bound hormone, while free hormone levels may stay normal or change depending on thyroid output and medication context.
50. T3 Uptake*
    An older thyroid test that indirectly reflects available thyroid hormone binding sites, mainly related to TBG. It does not measure actual T3.
51. Free T4 Index*
    A calculated estimate of free thyroid hormone based on total T4 and T3 uptake. It helps adjust total T4 interpretation for the effects of thyroid-binding protein.

Digestion, Nutrients, & Building Blocks — Digest & Build

Digestive & Gut Health *(coming soon)*

Markers to be added.

Protein Status

52. Protein, Total
    Measures the total of albumin and globulin in the blood. It gives a broad view of protein status but is less useful than looking at albumin and globulin separately.
53. Albumin
    A major liver-made blood protein that helps carry hormones, nutrients, and fluids throughout the body and helps maintain fluid balance.
54. Globulin
    A group of blood proteins involved in immunity, transport, and clotting. It includes antibodies.
55. Albumin/Globulin Ratio
    Compares albumin to globulin. Less important than the individual markers, but it can show whether the pattern is weighted more toward dehydration, liver stress, or immune activation.

Nutrient Status

56. Calcium
    Reflects tightly regulated circulating calcium status. Calcium supports nerve signaling, muscle contraction, heart rhythm, clotting, enzyme activity, and bone structure.
57. Ceruloplasmin
    The main copper-carrying protein in the blood. It supports copper transport, antioxidant enzyme activity, and iron handling.
58. Copper, RBC*
    Reflects copper inside red blood cells, which may provide context for longer-term or intracellular copper status. Copper supports iron metabolism, antioxidant defense, connective tissue integrity, and energy production.
59. Copper, Serum
    Reflects copper circulating in the serum. Copper supports iron metabolism, antioxidant defense, connective tissue integrity, immune function, and energy production.
60. Copper/Zinc Ratio*
    Compares copper to zinc. This ratio can provide context for the balance between two minerals involved in immune activity, antioxidant defense, inflammation, connective tissue health, and metabolism.
61. Free Copper (%)*
    Estimates copper that is not bound to ceruloplasmin. It can provide additional context when copper and ceruloplasmin patterns do not align.
62. Folate, RBC*
    Reflects folate stored inside red blood cells and generally provides a longer-term view of folate status than serum folate. Folate supports DNA synthesis, methylation, red blood cell production, and cell division.
63. Folate, Serum*
    Reflects folate circulating in the blood and is more influenced by recent intake than RBC folate. Folate supports DNA synthesis, methylation, red blood cell production, and cell division.
64. Magnesium, RBC*
    Reflects magnesium inside red blood cells and may provide context for intracellular magnesium status. Magnesium supports energy production, muscle and nerve function, glucose metabolism, blood pressure regulation, and hundreds of enzyme reactions.
65. Magnesium, Serum*
    Reflects magnesium circulating in the serum. Magnesium supports energy production, muscle and nerve function, glucose metabolism, blood pressure regulation, and hundreds of enzyme reactions, but serum levels may not fully reflect intracellular status.
66. Phosphorus*
    Reflects circulating phosphate status. Phosphorus supports cellular energy (ATP) production, cell membranes, DNA and RNA, acid-base balance, and bone structure.
67. Vitamin A
    Reflects circulating vitamin A as retinol. Vitamin A supports vision, immune function, skin and lining tissue health, antioxidant defense, thyroid signaling, and iron utilization.

68. Vitamin B6
    Reflects circulating vitamin B6 status. Vitamin B6 supports amino acid metabolism, neurotransmitter production, hemoglobin synthesis, methylation-related pathways, and glycogen metabolism.
69. Vitamin B12
    Reflects circulating vitamin B12 status. Vitamin B12 supports red blood cell production, nerve function, methylation, DNA synthesis, and energy metabolism.
70. Vitamin D (25-OH)
    The best routine blood marker for vitamin D status. It reflects vitamin D stores from sun exposure, food, and supplements and supports calcium balance, bone health, immune regulation, and muscle function.
71. Vitamin D (1,25-OH2)*
    The active form of vitamin D. It is tightly regulated and is not the best marker of vitamin D stores, but it can provide context for vitamin D activation, calcium regulation, kidney/parathyroid signaling, and immune activity.
72. Zinc, RBC*
    Reflects zinc inside red blood cells, which may provide context for longer-term or intracellular zinc status. Zinc supports immune function, antioxidant defense, wound healing, enzyme activity, hormone signaling, and protein synthesis.
73. Zinc, Serum
    Reflects zinc circulating in serum or plasma. Zinc supports immune function, antioxidant defense, wound healing, enzyme activity, hormone signaling, and protein synthesis, but serum/plasma levels can be influenced by recent intake, inflammation, and shifts in blood proteins.

Immune, Inflammation, & Repair — Defend & Repair

Immune Activity

74. WBC
    Measures the total white blood cell count — the overall number of immune cells circulating in the blood.
75. Neutrophils (%)
    White blood cells that respond quickly to infection, inflammation, tissue injury, and acute physiological stress. They are especially associated with acute bacterial infection and are read alongside total WBC, lymphocytes, medications, symptoms, and other signs of inflammation.
76. Lymphocytes (%)
    White blood cells involved in viral immune defense, immune memory, antibody signaling, and immune regulation.
77. Monocytes (%)
    White blood cells that clear cellular debris, participate in inflammatory and immune responses, and can mature into tissue macrophages.
78. Eosinophils (%)
    White blood cells involved in allergic, asthmatic, parasitic, and eosinophil-driven inflammatory responses, including some gastrointestinal, skin, and respiratory immune conditions.
79. Basophils (%)
    White blood cells involved in histamine release, hypersensitivity reactions, and allergic-type immune signaling.
80. Neutrophils, Absolute
    Measures actual neutrophil count, not the percentage of total WBC. Useful when the percentage looks optimal, but total WBC is shifted, because it shows whether neutrophils are truly high or low.
81. Lymphocytes, Absolute
    Measures actual lymphocyte count, not the percentage of total WBC. Useful when the percentage looks optimal, but total WBC is shifted, because it shows whether lymphocytes are truly high or low.
82. Monocytes, Absolute
    Measures actual monocyte count, not the percentage of total WBC. Useful when the percentage looks optimal, but total WBC is shifted, because it shows whether monocytes are truly high or low.
83. Eosinophils, Absolute
    Measures actual eosinophil count, not the percentage of total WBC. Useful when the percentage looks optimal, but total WBC is shifted, because it shows whether eosinophils are truly high or low.
84. Basophils, Absolute
    Measures actual basophil count, not the percentage of total WBC. Useful when the percentage looks optimal, but total WBC is shifted, because it shows whether basophils are truly high or low.
85. NLR
    A calculated CBC ratio comparing neutrophils to lymphocytes. It is used as a non-specific marker of systemic inflammation, immune activation, and physiological stress.

Bar graphs for the markers below are shown here because they relate to the immune system, but are counted in their primary system or process.

- Globulin *(Protein Status)*
- Alk Phos (ALP) *(Liver Function)*
- Zinc, RBC *(Nutrient Status)*
- Zinc, Serum *(Nutrient Status)*

Inflammation & Oxidative Stress

86. Homocysteine*
    An amino acid intermediate tied to methylation. Homocysteine depends heavily on B12, folate, B6, riboflavin, kidney function, and overall metabolic health, and can provide context for oxidative stress and vascular inflammation.
87. hs-CRP
    A more sensitive version of CRP often used to track low-grade inflammation and cardiovascular risk. It reflects inflammatory signaling but does not identify the source of inflammation on its own.
88. ESR*
    Measures how quickly red blood cells settle in a tube. Faster settling usually reflects higher levels of inflammatory proteins in the blood, making ESR a broad, nonspecific marker of inflammation.

Bar graphs for the markers below are shown here because they can indicate inflammation or oxidative stress, but are counted in their primary system or process.

- Albumin *(Protein Status)*
- Bilirubin *(Liver Function)*
- Ceruloplasmin *(Nutrient Status)*
- Ferritin *(Iron Status & Utilization)*
- Fibrinogen *(Blood Clotting & Flow)*
- GGT *(Liver Function)*
- GlycA *(MVX Plus)*
- HDL *(Lipid Balance)*
- TIBC *(Iron Status & Utilization)*
- Transferrin *(Iron Status & Utilization)*
- Uric Acid *(Kidney Function)*

Blood Clotting & Flow

89. Platelets
    Measures the number of platelets in the blood. Platelets are cell fragments involved in blood clotting, tissue repair, inflammation, and vascular health.
90. MPV
    Measures the average size of platelets. Larger platelets are generally younger and more reactive, so MPV can add context to platelet production and activation patterns.
91. D-Dimer
    Measures fragments produced when fibrin clots are broken down. D-dimer reflects recent or ongoing clot formation and breakdown, but it is non-specific and should be interpreted alongside symptoms and history.
92. Fibrinogen*
    Measures fibrinogen, a liver-made protein used to form blood clots. Fibrinogen also rises with inflammation.

Detoxification & Elimination Function — Detoxify & Eliminate

Liver Function

93. Bile Acids*
    Reflects bile acids circulating in the blood. The liver makes bile acids, stores them in the gallbladder, and uses them to digest fats, absorb fat-soluble nutrients, and eliminate cholesterol and certain waste products.
94. Bilirubin, Total
    A breakdown product of old red blood cells that the liver processes and excretes in bile. Total bilirubin includes both the processed (conjugated) and unprocessed (unconjugated) forms, and can provide context for red blood cell turnover, liver processing, and bile flow.
95. Bilirubin, Direct*
    The conjugated form of bilirubin, meaning the liver has processed it to make it more water-soluble for excretion into bile. It helps provide context for bile flow and liver excretion.
96. Bilirubin, Indirect*
    The unconjugated form of bilirubin, produced before the liver conjugates it for excretion into bile. It helps provide context for bilirubin production, the liver's processing capacity, and red blood cell turnover.
97. Alk Phos (ALP)
    An enzyme found in liver and bile duct tissue, bone, intestine, and placenta. In this section, it mainly provides context for bile flow and liver and bile duct patterns, while recognizing that bone and other tissues can also contribute.
98. AST
    An enzyme found in liver, muscle, heart, and other tissues. It can rise when cells are stressed or damaged and release the enzyme into the blood, so it is useful but not liver-specific.
99. ALT
    An enzyme found mostly in the liver. It is often more liver-specific than AST and can provide context for liver cell stress or injury.
100. GGT*
    An enzyme involved in glutathione handling and bile flow. It can provide context for liver-biliary stress, oxidative stress, alcohol exposure, medication effects, and toxin-processing demand.
101. Lactate Dehydrogenase (LDH)
    A widely distributed enzyme involved in energy metabolism. It can rise when cells are damaged or stressed, but it is not specific to any one organ or system.

Kidney Function

102. BUN
    Reflects a waste product made when the body breaks down protein and clears nitrogen through the kidneys. It provides context for kidney filtration, hydration status, protein intake, and protein breakdown.
103. Creatinine
    A waste product of muscle metabolism that is cleared by the kidneys. It is commonly used to estimate kidney filtration, but it can also be influenced by muscle mass and recent physical activity.
104. eGFR
    A calculated estimate of how well the kidneys are filtering blood. It is derived mainly from creatinine and helps screen for reduced kidney filtration.
105. BUN/Creatinine Ratio
    Compares BUN to creatinine to help interpret whether changes reflect hydration status, changes in kidney filtration, protein intake, or altered protein breakdown.
106. Uric Acid*
    A waste product formed when the body breaks down purines. It provides context for kidney clearance, purine metabolism, fructose metabolism, oxidative stress, and gout risk.

Electrolyte Balance

107. Sodium
    Reflects sodium circulating in the blood. Sodium helps regulate fluid balance, blood pressure, nerve signaling, muscle function, and kidney-adrenal fluid regulation.
108. Potassium
    Reflects potassium circulating in the blood. Potassium supports heart rhythm, muscle contraction, nerve signaling, cellular fluid balance, and nutrient movement into cells.
109. Chloride
    Reflects chloride circulating in the blood. Chloride works closely with sodium and bicarbonate to help maintain fluid balance, stomach acid production, and the body's acid-base balance.
110. Carbon Dioxide
    Mostly reflects bicarbonate, a major blood buffer that helps keep pH stable. It provides context for how the kidneys and lungs are helping regulate acid-base balance.
111. Anion Gap (without K)
    A calculated value that shows whether unmeasured acids may be contributing to an acid-base imbalance. It is most useful when CO2/bicarbonate is low or when an acid-base problem is suspected.
112. Anion Gap (with K)
    A version of the anion gap calculation that includes potassium. It provides similar acid-base context, including potassium when electrolyte shifts matter.

Hormonal & Endocrine Health — Signal & Regulate

Stress & Adrenal Balance

113. Cortisol, AM
    Morning cortisol reflects early-day adrenal output and circadian rhythm. It shows whether cortisol rises appropriately at the start of the day.
114. Cortisol, PM*
    Later-day cortisol helps show whether cortisol is dropping appropriately as the day goes on. It provides context for adrenal rhythm and evening stress signaling.
115. DHEA-Sulfate
    An adrenal androgen and hormone precursor. DHEA-S is more stable than DHEA and provides context for adrenal androgen output and steroid hormone production.
116. Pregnenolone
    A steroid hormone precursor used to make progesterone, DHEA, cortisol, and other steroid hormones. It provides broad context for upstream steroid hormone production.
117. Sodium/Potassium Ratio (Na/K Ratio)
    Compares sodium to potassium, a useful window into adrenal regulation, since adrenal hormones help the body hold sodium and release potassium.

Bar graphs for the markers below appear here because the adrenal glands help regulate sodium and potassium, though each is counted in its primary system or process.

- Sodium *(Electrolyte Balance)*
- Potassium *(Electrolyte Balance)*

Hormone Balance

Hormone blood levels reflect a single point in time and can vary with time of day, menstrual cycle phase, pregnancy status, medication use, and hormone therapy. They are best interpreted alongside timing and symptoms.

118. AMH
    A hormone produced by ovarian follicles that indicates ovarian reserve and follicle activity. AMH is often used in fertility evaluation and tends to decline as ovarian reserve decreases.
119. DHT*
    A potent androgen produced from testosterone by the enzyme 5-alpha-reductase. DHT can strongly affect skin, scalp hair, body hair, and prostate tissue.
120. Estradiol (E2)
    The main biologically active estrogen during the reproductive years. Estradiol influences the brain, bones, blood vessels, skin, metabolism, connective tissue, reproductive tract, and pregnancy-related tissue changes.
121. Estriol (E3)*
    A weaker estrogen that rises substantially during pregnancy and is produced partly through the placenta. Estriol can provide context for pregnancy-related estrogen activity and estrogen metabolism.
122. Estrogens, Total
    Reflects the combined estrogen signal rather than a single estrogen fraction. It can provide broad estrogen context but does not show which estrogen form is driving the result.
123. Estrone (E1)
    A weaker estrogen that becomes more prominent after menopause. Estrone is partly made by converting androgens in fat tissue and can help explain postmenopausal estrogen patterns.
124. FSH
    A pituitary hormone that signals the ovaries or testes to work. In women, FSH rises when ovarian estrogen feedback is lower and helps stimulate follicle development; it is often used to assess ovarian function and menopausal transition patterns.
125. hCG*
    A pregnancy-related hormone made after implantation that supports progesterone production early in pregnancy. hCG is commonly used to confirm pregnancy and monitor early pregnancy or fertility-treatment response.
126. IGF-1
    A hormone-like growth factor influenced by growth hormone, nutrition, liver function, insulin signaling, and overall nutritional and growth status. IGF-1 provides context for growth hormone activity and tissue-building signals.
127. LH
    A pituitary hormone involved in ovulation, corpus luteum function, testosterone production, and sex hormone regulation. In women, an LH surge helps trigger ovulation; in men, LH stimulates testosterone production.

128. Progesterone
    A steroid hormone important for the luteal phase, pregnancy support, sleep, mood, nervous system regulation, and balancing estrogen effects in many tissues.
129. 17-OH-Progesterone
    A steroid intermediate used in adrenal and sex hormone pathways. It is commonly used to assess adrenal steroid production and screen for congenital adrenal hyperplasia.
130. Prolactin
    A pituitary hormone best known for stimulating breast development and milk production. Prolactin also affects ovulation, menstrual cycling, and reproductive hormone signaling.
131. Prolactin, Lactating*
    A prolactin measurement interpreted in the context of lactation or breastfeeding. The biology is the same as prolactin, but levels are expected to be higher during lactation.
132. SHBG
    The main binding protein for testosterone and estradiol. SHBG influences how much hormone is bound versus free and available to tissues.
133. Testosterone, Bioavailable*
    Reflects the portion of testosterone available to tissues, including free testosterone plus testosterone loosely bound to albumin.
134. Testosterone, Bioavailable (%)*
    Shows the percentage of total testosterone that is bioavailable. It helps clarify whether available testosterone is proportionally low, appropriate, or high relative to total testosterone.
135. Testosterone, Free (Calc)
    A calculated estimate of unbound testosterone based on total testosterone and binding proteins. It helps estimate the testosterone fraction most available to tissues.
136. Testosterone, Free (Direct)
    A direct free testosterone measurement that estimates unbound testosterone available to tissues. Method accuracy can vary, especially at lower levels in females.
137. Testosterone, Total
    Reflects total testosterone in the blood, including both bound and unbound hormone. It provides overall androgen context but does not show how much testosterone is free or bioavailable.
138. Testosterone, Total (LC/MS)
    A mass-spectrometry measurement of total testosterone. It is often preferred when testosterone levels are low, such as in many female-range results, because it is more specific than many standard immunoassay methods.

Prostate Function

139. PSA, Total*
    Reflects total prostate-specific antigen in the blood. PSA is made by prostate tissue and can provide context for prostate size, irritation, inflammation, recent prostate stimulation, and prostate cancer screening, but it is not cancer-specific.
140. PSA, Free*
    Reflects the portion of PSA circulating freely rather than bound to blood proteins. Free PSA can add context when total PSA is elevated or borderline.
141. PSA, % Free*
    Compares free PSA to total PSA. A lower percent free PSA can be associated with higher prostate cancer risk, while a higher percent free PSA is more often seen with benign prostate enlargement, but interpretation depends on total PSA, age, exam findings, and clinical context.

Metabolic Vulnerability Index (MVX) Plus

MVX Plus measures cellular health, not disease. The six NMR markers behind the score describe how well-nourished and well-fueled the cells are, and how much inflammatory burden they are carrying, rather than naming a condition.

142. MVX (Metabolic Vulnerability Index)*
    A composite score from 1 to 100 that summarizes near-term metabolic resilience, read by NMR from six blood markers and combined into two sub-scores: inflammation (IVX) and metabolic strain (MMX). A lower score reflects greater resilience; a higher score reflects more vulnerability.
143. IVX (Inflammation Vulnerability Index)*
    One of the two MVX sub-scores. It reflects how much inflammation or hidden infection the body is carrying, drawn from GlycA and small HDL particle number. A lower value reflects less inflammatory burden.

144. MMX (Metabolic Malnutrition Index)*
    One of the two MVX sub-scores. It reflects whether the cells are well-nourished and well-fueled for energy, drawn from citrate and the branched-chain amino acids. A lower value reflects better cellular nourishment and energy supply.
145. GlycA*
    Measures the N-acetyl methyl groups on the sugar chains of several acute phase proteins made by the liver. Because it rises with both the amount of these proteins and the branching of their sugar chains, it reflects longer-term, low-grade inflammatory signaling and tends to be more stable from test to test than hs-CRP.
146. Small HDL-P (Small HDL Particle Number)*
    Measures the number of small HDL particles in the blood. An adequate level is considered supportive here; low levels can accompany toxic burden, impaired detoxification, or active inflammation drawing these particles down.
147. Citrate*
    A marker tied to mitochondrial function and cellular energy production. It reflects how steadily the cells' energy pathways are turning over, and is read alongside the amino acids as part of the metabolic sub-score.
148. Valine*
    One of the three branched-chain amino acids (with leucine and isoleucine). It reflects protein and nutrient status and how the body builds and uses amino acids. Values within the optimal band reflect balanced handling, while both very low and very high values can reflect metabolic strain.
149. Leucine*
    One of the three branched-chain amino acids (with valine and isoleucine). It supports muscle protein and energy metabolism and reflects protein and nutrient status. Values within the optimal band reflect balanced amino-acid handling.
150. Isoleucine*
    One of the three branched-chain amino acids (with valine and leucine). It reflects protein and nutrient status and amino-acid metabolism. Values within the optimal band reflect balanced amino-acid handling.

*** No pediatric reference range available for this biomarker.**