ALPHA 1 LABS

OPTIMIZE • REGENERATE • THRIVE

BIOMARKER REFERENCE GUIDE

Expanded Plain-English Edition

A premium, on-brand reference guide explaining what each biomarker means, why it matters in daily life, what high or low results can suggest, and practical next steps for lifestyle, nutrition, exercise and clinical follow-up.

Blood Sugar • Lipids • Liver • Kidney • CBC • Iron • Thyroid • Inflammation • Hormones • Prostate

For educational use only. Laboratory values must always be interpreted in clinical context.

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How to Read Each Marker Page

IN PLAIN ENGLISH
A nontechnical explanation of why the marker exists and why you would care about it.

COMMON DAY-TO-DAY EFFECTS
Symptoms people may notice when the underlying condition is significant - with the reminder that many abnormal labs cause no symptoms.

IF HIGH / IF LOW
Common interpretations, not automatic diagnoses. The rest of the panel, medications, timing and trends matter.

WHAT CAN HELP
Evidence-based lifestyle and medical approaches, including when GLP-1, TRT or hormone therapy may be clinically relevant - and when peptide use is not supported.

WHEN TO FOLLOW UP
Situations where repeating the lab or seeking clinical evaluation becomes more important.

IMPORTANT: An out-of-range lab result is not automatically something to "correct" directly. Results can be influenced by age, sex, menstrual timing, hydration, medications, recent exercise, illness, laboratory method and clinical history. This guide is educational and does not replace diagnosis or treatment by a licensed medical provider.

SECTION 1

Blood Sugar & Metabolism

Glucose control, insulin regulation, energy use and metabolic health.

This section contains 4 marker pages.

Biomarker Deep-Dive Section

BLOOD SUGAR & METABOLISM

Hemoglobin A1C (HbA1c)

WHAT IT MEASURES

Estimates average blood glucose over roughly 2-3 months by measuring glucose attached to hemoglobin.

IN PLAIN ENGLISH

Think of A1C as a roughly three-month report card for blood sugar. The higher it is, the more glucose has been circulating around your red blood cells over time. It smooths out the highs and lows of a single glucose check.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

High: often no symptoms when only mildly elevated. With more persistent hyperglycemia, people may notice thirst, frequent urination, fatigue, blurred vision, increased hunger, slow wound healing or recurrent infections. Low: a truly low average glucose can cause shakiness, sweating, confusion or weakness, but an unexpectedly low A1C can also come from shortened red-cell lifespan rather than low glucose.

IF HIGH

Higher than expected commonly reflects chronic hyperglycemia from prediabetes or diabetes. It can also be distorted by anemia, kidney/liver disease, hemoglobin variants or recent blood loss/transfusion.

IF LOW

Lower than expected may reflect genuinely low average glucose, but it may also be artificially low when red blood cells do not survive as long as usual.

WHAT CAN HELP

Build meals around minimally processed protein, vegetables, fiber-rich carbohydrates and appropriate portions; limit excess refined carbohydrate and sugary drinks; combine resistance training with regular aerobic activity; improve sleep; and reduce excess body fat when appropriate. For diagnosed diabetes or obesity, clinician-prescribed FDA-approved medication - including GLP-1 or GLP-1/GIP therapy when indicated - can improve the underlying disease. Treatment should target the condition, not merely the number. Peptides should not be used casually to chase a better-looking lab.

WHEN TO FOLLOW UP

Follow up when the abnormality is persistent, when glucose symptoms are present, or when values approach diagnostic thresholds for diabetes. Confirm unexpected A1C results when anemia, recent blood loss, transfusion, kidney disease or a hemoglobin disorder could distort the test.

Educational reference only. See clinical references near the end of this guide.

BLOOD SUGAR & METABOLISM

Estimated Average Glucose (eAG)

WHAT IT MEASURES

Translates A1C into an estimated average glucose value that is easier to compare with glucose readings.

IN PLAIN ENGLISH

eAG translates the A1C percentage into an estimated average glucose number that feels more like a glucose-meter reading. It does not add new information; it is another way to express the same long-term glucose picture.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

High: often no symptoms when only mildly elevated. With more persistent hyperglycemia, people may notice thirst, frequent urination, fatigue, blurred vision, increased hunger, slow wound healing or recurrent infections. Low: a truly low average glucose can cause shakiness, sweating, confusion or weakness, but an unexpectedly low A1C can also come from shortened red-cell lifespan rather than low glucose.

IF HIGH

High eAG means the A1C-derived average glucose is high.

IF LOW

Low eAG means the A1C-derived average is low; interpretation depends on whether A1C is reliable in that person.

WHAT CAN HELP

Build meals around minimally processed protein, vegetables, fiber-rich carbohydrates and appropriate portions; limit excess refined carbohydrate and sugary drinks; combine resistance training with regular aerobic activity; improve sleep; and reduce excess body fat when appropriate. For diagnosed diabetes or obesity, clinician-prescribed FDA-approved medication - including GLP-1 or GLP-1/GIP therapy when indicated - can improve the underlying disease. Treatment should target the condition, not merely the number. Peptides should not be used casually to chase a better-looking lab.

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BLOOD SUGAR & METABOLISM

C-Peptide

WHAT IT MEASURES

Reflects how much insulin the pancreas is producing because C-peptide is released when endogenous insulin is made.

IN PLAIN ENGLISH

C-peptide is released in equal amounts when your pancreas makes its own insulin. Measuring it helps answer a practical question: how much insulin is my body still producing on its own?

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

High: usually no unique symptom from C-peptide itself; symptoms come from the accompanying insulin resistance or hypoglycemia pattern. Low: if insulin production is inadequate, symptoms can include thirst, frequent urination, weight loss, fatigue and high glucose.

IF HIGH

High can accompany insulin resistance, use of insulin-stimulating medicines, or less commonly an insulin-producing tumor.

IF LOW

Low can reflect reduced pancreatic insulin production, including type 1 diabetes or advanced beta-cell failure.

WHAT CAN HELP

Build meals around minimally processed protein, vegetables, fiber-rich carbohydrates and appropriate portions; limit excess refined carbohydrate and sugary drinks; combine resistance training with regular aerobic activity; improve sleep; and reduce excess body fat when appropriate. For diagnosed diabetes or obesity, clinician-prescribed FDA-approved medication - including GLP-1 or GLP-1/GIP therapy when indicated - can improve the underlying disease. Treatment should target the condition, not merely the number. Peptides should not be used casually to chase a better-looking lab.

WHEN TO FOLLOW UP

Follow up when the abnormality is persistent, when glucose symptoms are present, or when values approach diagnostic thresholds for diabetes. Confirm unexpected A1C results when anemia, recent blood loss, transfusion, kidney disease or a hemoglobin disorder could distort the test.

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BLOOD SUGAR & METABOLISM

Triglycerides:HDL Ratio

WHAT IT MEASURES

A derived ratio that gives context about triglycerides relative to HDL and can reflect cardiometabolic risk.

IN PLAIN ENGLISH

This ratio compares a common blood fat, triglycerides, with HDL cholesterol. It is not a disease by itself, but an unfavorable ratio often travels with insulin resistance and a less healthy metabolic pattern.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

The ratio itself causes no symptoms. An unfavorable pattern can exist for years without a person feeling different. Any symptoms usually come from the underlying metabolic condition, such as high glucose, obesity, fatty liver or very high triglycerides.

IF HIGH

A high ratio often reflects high triglycerides, low HDL, or both. It can be seen with insulin resistance and metabolic syndrome.

IF LOW

A lower ratio is generally more favorable, but it should not be used as a stand-alone diagnosis or treatment target.

WHAT CAN HELP

Build meals around minimally processed protein, vegetables, fiber-rich carbohydrates and appropriate portions; limit excess refined carbohydrate and sugary drinks; combine resistance training with regular aerobic activity; improve sleep; and reduce excess body fat when appropriate. For diagnosed diabetes or obesity, clinician-prescribed FDA-approved medication - including GLP-1 or GLP-1/GIP therapy when indicated - can improve the underlying disease. Treatment should target the condition, not merely the number. Peptides should not be used casually to chase a better-looking lab.

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SECTION 2

Heart & Cardiovascular Risk

Cholesterol particles, vascular risk and long-term heart-health patterns.

This section contains 14 marker pages.

Biomarker Deep-Dive Section

HEART & CARDIOVASCULAR RISK

Total Cholesterol

WHAT IT MEASURES

The total cholesterol carried in LDL, HDL, VLDL and related lipoproteins.

IN PLAIN ENGLISH

Total cholesterol is the sum of cholesterol carried inside several particle types. It is useful as a summary, but it does not tell you whether the cholesterol is mostly in higher-risk or lower-risk particles.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Most lipid abnormalities are completely silent. You usually cannot feel a high LDL, ApoB or Lp(a). Symptoms occur only after complications develop, such as chest pressure, shortness of breath, stroke symptoms or leg pain from vascular disease. Very high triglycerides can raise pancreatitis risk and may cause severe upper-abdominal pain, nausea or vomiting.

IF HIGH

A high result or unfavorable ratio generally means more atherogenic particles, more triglyceride-rich particles, or a less favorable lipid balance depending on the test.

IF LOW

A low result can be favorable for LDL/ApoB/triglycerides, but low HDL or ApoA1 can be part of an unfavorable metabolic pattern. Very low cholesterol can also occur with illness, malnutrition or endocrine disease.

WHAT CAN HELP

Favor unsaturated fats, vegetables, legumes, whole grains and soluble fiber; reduce excess saturated fat, trans fat, refined carbohydrate and excess alcohol; exercise regularly; stop smoking; and reduce excess body fat when appropriate. Prescription lipid-lowering therapy can be far more effective than supplements when cardiovascular risk is elevated. Lp(a) is largely genetic, so the practical strategy is to manage all other modifiable risk aggressively. There is no established peptide protocol for fixing lipids.

WHEN TO FOLLOW UP

Discuss persistent abnormalities in the context of age, blood pressure, diabetes, smoking, family history and prior cardiovascular disease. Markedly high triglycerides or very high LDL/ApoB warrant prompt clinical review.

Educational reference only. See clinical references near the end of this guide.

HEART & CARDIOVASCULAR RISK

Calculated Total Cholesterol

WHAT IT MEASURES

A derived estimate of total cholesterol from measured lipid components.

IN PLAIN ENGLISH

This is a mathematically derived total-cholesterol value. In plain terms, it summarizes the amount of cholesterol circulating in several lipoprotein pools.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

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HEART & CARDIOVASCULAR RISK

LDL Cholesterol

WHAT IT MEASURES

Measures cholesterol carried in low-density lipoprotein particles, which contribute to atherosclerotic plaque formation.

IN PLAIN ENGLISH

LDL cholesterol is the amount of cholesterol riding inside LDL particles. Repeated exposure of arteries to LDL-containing particles is one of the main drivers of atherosclerotic plaque.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

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HEART & CARDIOVASCULAR RISK

Calculated LDL Cholesterol

WHAT IT MEASURES

An estimate of LDL cholesterol derived from other lipid values rather than directly measured.

IN PLAIN ENGLISH

This estimates LDL cholesterol from other lipid values rather than measuring it directly. It is interpreted like LDL-C, but certain triglyceride levels can make calculations less reliable.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

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HEART & CARDIOVASCULAR RISK

HDL Cholesterol

WHAT IT MEASURES

Measures cholesterol carried by high-density lipoproteins, which participate in cholesterol transport.

IN PLAIN ENGLISH

HDL is the cholesterol carried in high-density lipoproteins. HDL participates in cholesterol transport, but a high HDL number does not cancel out high LDL or ApoB, and extremely high HDL is not automatically protective.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Most lipid abnormalities are completely silent. You usually cannot feel a high LDL, ApoB or Lp(a). Symptoms occur only after complications develop, such as chest pressure, shortness of breath, stroke symptoms or leg pain from vascular disease. Very high triglycerides can raise pancreatitis risk and may cause severe upper-abdominal pain, nausea or vomiting.

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HEART & CARDIOVASCULAR RISK

VLDL Cholesterol (Calculated)

WHAT IT MEASURES

Estimates cholesterol carried in triglyceride-rich VLDL particles.

IN PLAIN ENGLISH

VLDL particles mainly carry triglycerides from the liver to tissues. A higher VLDL estimate often means the body is moving more triglyceride-rich particles through the bloodstream.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Most lipid abnormalities are completely silent. You usually cannot feel a high LDL, ApoB or Lp(a). Symptoms occur only after complications develop, such as chest pressure, shortness of breath, stroke symptoms or leg pain from vascular disease. Very high triglycerides can raise pancreatitis risk and may cause severe upper-abdominal pain, nausea or vomiting.

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Educational reference only. See clinical references near the end of this guide.

HEART & CARDIOVASCULAR RISK

Triglycerides

WHAT IT MEASURES

Measures circulating fats used for energy storage and transported in triglyceride-rich lipoproteins.

IN PLAIN ENGLISH

Triglycerides are the body's main storage form of fat. Blood triglycerides rise when the body is transporting excess energy, particularly after excess calories, alcohol, refined carbohydrates or in insulin resistance.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Most lipid abnormalities are completely silent. You usually cannot feel a high LDL, ApoB or Lp(a). Symptoms occur only after complications develop, such as chest pressure, shortness of breath, stroke symptoms or leg pain from vascular disease. Very high triglycerides can raise pancreatitis risk and may cause severe upper-abdominal pain, nausea or vomiting.

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Discuss persistent abnormalities in the context of age, blood pressure, diabetes, smoking, family history and prior cardiovascular disease. Markedly high triglycerides or very high LDL/ApoB warrant prompt clinical review.

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HEART & CARDIOVASCULAR RISK

Apolipoprotein B (ApoB)

WHAT IT MEASURES

Estimates the number of atherogenic lipoprotein particles because each major plaque-forming particle carries one ApoB molecule.

IN PLAIN ENGLISH

ApoB is a practical estimate of how many cholesterol-carrying particles can potentially enter the artery wall. Each major atherogenic particle carries one ApoB molecule, so ApoB often tells you particle number more directly than LDL cholesterol.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Most lipid abnormalities are completely silent. You usually cannot feel a high LDL, ApoB or Lp(a). Symptoms occur only after complications develop, such as chest pressure, shortness of breath, stroke symptoms or leg pain from vascular disease. Very high triglycerides can raise pancreatitis risk and may cause severe upper-abdominal pain, nausea or vomiting.

IF HIGH

A high result or unfavorable ratio generally means more atherogenic particles, more triglyceride-rich particles, or a less favorable lipid balance depending on the test.

IF LOW

A low result can be favorable for LDL/ApoB/triglycerides, but low HDL or ApoA1 can be part of an unfavorable metabolic pattern. Very low cholesterol can also occur with illness, malnutrition or endocrine disease.

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WHEN TO FOLLOW UP

Discuss persistent abnormalities in the context of age, blood pressure, diabetes, smoking, family history and prior cardiovascular disease. Markedly high triglycerides or very high LDL/ApoB warrant prompt clinical review.

Educational reference only. See clinical references near the end of this guide.

HEART & CARDIOVASCULAR RISK

Apolipoprotein A1 (ApoA1)

WHAT IT MEASURES

The principal protein in HDL particles and a marker of HDL particle biology.

IN PLAIN ENGLISH

ApoA1 is the main structural protein in HDL particles. It is best viewed as part of the overall lipoprotein pattern rather than a number that should be raised at any cost.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Most lipid abnormalities are completely silent. You usually cannot feel a high LDL, ApoB or Lp(a). Symptoms occur only after complications develop, such as chest pressure, shortness of breath, stroke symptoms or leg pain from vascular disease. Very high triglycerides can raise pancreatitis risk and may cause severe upper-abdominal pain, nausea or vomiting.

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A high result or unfavorable ratio generally means more atherogenic particles, more triglyceride-rich particles, or a less favorable lipid balance depending on the test.

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WHEN TO FOLLOW UP

Discuss persistent abnormalities in the context of age, blood pressure, diabetes, smoking, family history and prior cardiovascular disease. Markedly high triglycerides or very high LDL/ApoB warrant prompt clinical review.

Educational reference only. See clinical references near the end of this guide.

HEART & CARDIOVASCULAR RISK

ApoB:ApoA1 Ratio

WHAT IT MEASURES

Compares atherogenic ApoB-containing particles with ApoA1-containing HDL particles.

IN PLAIN ENGLISH

This ratio compares atherogenic particle protein with the main HDL protein. A higher ratio generally reflects a less favorable balance.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Most lipid abnormalities are completely silent. You usually cannot feel a high LDL, ApoB or Lp(a). Symptoms occur only after complications develop, such as chest pressure, shortness of breath, stroke symptoms or leg pain from vascular disease. Very high triglycerides can raise pancreatitis risk and may cause severe upper-abdominal pain, nausea or vomiting.

IF HIGH

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WHEN TO FOLLOW UP

Discuss persistent abnormalities in the context of age, blood pressure, diabetes, smoking, family history and prior cardiovascular disease. Markedly high triglycerides or very high LDL/ApoB warrant prompt clinical review.

Educational reference only. See clinical references near the end of this guide.

HEART & CARDIOVASCULAR RISK

Lipoprotein(a) [Lp(a)]

WHAT IT MEASURES

A largely genetically determined lipoprotein associated with cardiovascular and aortic valve risk.

IN PLAIN ENGLISH

Lp(a) is an LDL-like particle with an extra protein attached. Your level is mostly inherited. It matters because a high Lp(a) can add heart and stroke risk even when regular LDL cholesterol looks acceptable.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Most lipid abnormalities are completely silent. You usually cannot feel a high LDL, ApoB or Lp(a). Symptoms occur only after complications develop, such as chest pressure, shortness of breath, stroke symptoms or leg pain from vascular disease. Very high triglycerides can raise pancreatitis risk and may cause severe upper-abdominal pain, nausea or vomiting.

IF HIGH

High Lp(a) is usually genetic and adds independent atherosclerotic risk.

IF LOW

A low Lp(a) is generally favorable and usually requires no treatment.

WHAT CAN HELP

Favor unsaturated fats, vegetables, legumes, whole grains and soluble fiber; reduce excess saturated fat, trans fat, refined carbohydrate and excess alcohol; exercise regularly; stop smoking; and reduce excess body fat when appropriate. Prescription lipid-lowering therapy can be far more effective than supplements when cardiovascular risk is elevated. Lp(a) is largely genetic, so the practical strategy is to manage all other modifiable risk aggressively. There is no established peptide protocol for fixing lipids.

WHEN TO FOLLOW UP

Discuss persistent abnormalities in the context of age, blood pressure, diabetes, smoking, family history and prior cardiovascular disease. Markedly high triglycerides or very high LDL/ApoB warrant prompt clinical review.

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HEART & CARDIOVASCULAR RISK

LDL-C:ApoB Ratio

WHAT IT MEASURES

Compares cholesterol content of LDL particles with the number of ApoB-containing particles.

IN PLAIN ENGLISH

This ratio estimates how cholesterol-rich each ApoB-containing particle is. It is mostly a context tool and should not replace ApoB or LDL-C themselves.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

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A high result or unfavorable ratio generally means more atherogenic particles, more triglyceride-rich particles, or a less favorable lipid balance depending on the test.

IF LOW

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HEART & CARDIOVASCULAR RISK

LDL-C:HDL-C Ratio

WHAT IT MEASURES

A derived comparison of LDL cholesterol with HDL cholesterol.

IN PLAIN ENGLISH

This compares LDL cholesterol with HDL cholesterol. It can summarize the overall pattern, but treatment decisions are usually driven more by LDL/ApoB and total cardiovascular risk.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

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Favor unsaturated fats, vegetables, legumes, whole grains and soluble fiber; reduce excess saturated fat, trans fat, refined carbohydrate and excess alcohol; exercise regularly; stop smoking; and reduce excess body fat when appropriate. Prescription lipid-lowering therapy can be far more effective than supplements when cardiovascular risk is elevated. Lp(a) is largely genetic, so the practical strategy is to manage all other modifiable risk aggressively. There is no established peptide protocol for fixing lipids.

WHEN TO FOLLOW UP

Discuss persistent abnormalities in the context of age, blood pressure, diabetes, smoking, family history and prior cardiovascular disease. Markedly high triglycerides or very high LDL/ApoB warrant prompt clinical review.

Educational reference only. See clinical references near the end of this guide.

HEART & CARDIOVASCULAR RISK

Total Cholesterol:HDL Ratio

WHAT IT MEASURES

A derived ratio comparing total cholesterol with HDL cholesterol.

IN PLAIN ENGLISH

This compares total cholesterol with HDL cholesterol. It is a broad risk-context measure, not a stand-alone treatment target.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Most lipid abnormalities are completely silent. You usually cannot feel a high LDL, ApoB or Lp(a). Symptoms occur only after complications develop, such as chest pressure, shortness of breath, stroke symptoms or leg pain from vascular disease. Very high triglycerides can raise pancreatitis risk and may cause severe upper-abdominal pain, nausea or vomiting.

IF HIGH

A high result or unfavorable ratio generally means more atherogenic particles, more triglyceride-rich particles, or a less favorable lipid balance depending on the test.

IF LOW

A low result can be favorable for LDL/ApoB/triglycerides, but low HDL or ApoA1 can be part of an unfavorable metabolic pattern. Very low cholesterol can also occur with illness, malnutrition or endocrine disease.

WHAT CAN HELP

Favor unsaturated fats, vegetables, legumes, whole grains and soluble fiber; reduce excess saturated fat, trans fat, refined carbohydrate and excess alcohol; exercise regularly; stop smoking; and reduce excess body fat when appropriate. Prescription lipid-lowering therapy can be far more effective than supplements when cardiovascular risk is elevated. Lp(a) is largely genetic, so the practical strategy is to manage all other modifiable risk aggressively. There is no established peptide protocol for fixing lipids.

WHEN TO FOLLOW UP

Discuss persistent abnormalities in the context of age, blood pressure, diabetes, smoking, family history and prior cardiovascular disease. Markedly high triglycerides or very high LDL/ApoB warrant prompt clinical review.

Educational reference only. See clinical references near the end of this guide.

SECTION 3

Liver Health

Liver enzymes, protein production, bile flow and metabolic-processing capacity.

This section contains 9 marker pages.

Biomarker Deep-Dive Section

LIVER HEALTH

Alanine Aminotransferase (ALT)

WHAT IT MEASURES

A liver-enriched enzyme that rises when liver cells are injured.

IN PLAIN ENGLISH

ALT is an enzyme concentrated in liver cells. When liver cells are irritated or injured, ALT can leak into the bloodstream. It is a signal of liver-cell stress, not a direct measurement of how much liver function you have left.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Mild abnormalities are often symptom-free. More significant liver or bile-duct problems can cause fatigue, poor appetite, nausea, right-upper abdominal discomfort, itching, dark urine, pale stools, swelling or yellowing of the eyes/skin. Low albumin can contribute to leg or abdominal swelling.

IF HIGH

High ALT commonly reflects liver-cell injury from metabolic fatty liver, hepatitis, medications, alcohol or other causes; intense exercise can also affect it.

IF LOW

Low ALT is usually not clinically important by itself.

WHAT CAN HELP

Address the cause rather than trying to detox the number. Reduce or stop alcohol when relevant; improve insulin resistance and body weight; review prescription drugs, OTC pain medicines and supplements; avoid unnecessary liver-toxic exposures; and use regular exercise plus a Mediterranean-style eating pattern for metabolic fatty-liver risk. Persistent abnormalities, jaundice or marked elevations require clinician evaluation. No peptide is an established treatment for routine liver-enzyme abnormalities.

WHEN TO FOLLOW UP

Repeat and evaluate persistent liver abnormalities, especially if more than one marker is abnormal or symptoms such as jaundice, dark urine, severe abdominal pain or vomiting are present. Interpret AST carefully after hard training or muscle injury.

Educational reference only. See clinical references near the end of this guide.

LIVER HEALTH

Aspartate Aminotransferase (AST)

WHAT IT MEASURES

An enzyme found in liver, skeletal muscle and other tissues.

IN PLAIN ENGLISH

AST is found in the liver but also in skeletal muscle, heart and other tissues. A high AST can therefore come from liver injury or from muscle damage, including hard exercise.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Mild abnormalities are often symptom-free. More significant liver or bile-duct problems can cause fatigue, poor appetite, nausea, right-upper abdominal discomfort, itching, dark urine, pale stools, swelling or yellowing of the eyes/skin. Low albumin can contribute to leg or abdominal swelling.

IF HIGH

High AST may come from liver injury, muscle injury, strenuous exercise or other tissues.

IF LOW

Low AST is usually not clinically important by itself.

WHAT CAN HELP

Address the cause rather than trying to detox the number. Reduce or stop alcohol when relevant; improve insulin resistance and body weight; review prescription drugs, OTC pain medicines and supplements; avoid unnecessary liver-toxic exposures; and use regular exercise plus a Mediterranean-style eating pattern for metabolic fatty-liver risk. Persistent abnormalities, jaundice or marked elevations require clinician evaluation. No peptide is an established treatment for routine liver-enzyme abnormalities.

WHEN TO FOLLOW UP

Repeat and evaluate persistent liver abnormalities, especially if more than one marker is abnormal or symptoms such as jaundice, dark urine, severe abdominal pain or vomiting are present. Interpret AST carefully after hard training or muscle injury.

Educational reference only. See clinical references near the end of this guide.

LIVER HEALTH

AST:ALT Ratio

WHAT IT MEASURES

Compares two liver-associated enzymes and can provide pattern information.

IN PLAIN ENGLISH

This ratio compares two liver-associated enzymes. It can give clinicians a clue about the pattern of injury, but the ratio does not diagnose the cause by itself.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Mild abnormalities are often symptom-free. More significant liver or bile-duct problems can cause fatigue, poor appetite, nausea, right-upper abdominal discomfort, itching, dark urine, pale stools, swelling or yellowing of the eyes/skin. Low albumin can contribute to leg or abdominal swelling.

IF HIGH

A higher ratio can appear in several patterns, including alcohol-associated liver disease or when AST is coming from muscle; it is not diagnostic alone.

IF LOW

A lower ratio is also nonspecific and should be interpreted with the actual AST and ALT levels.

WHAT CAN HELP

Address the cause rather than trying to detox the number. Reduce or stop alcohol when relevant; improve insulin resistance and body weight; review prescription drugs, OTC pain medicines and supplements; avoid unnecessary liver-toxic exposures; and use regular exercise plus a Mediterranean-style eating pattern for metabolic fatty-liver risk. Persistent abnormalities, jaundice or marked elevations require clinician evaluation. No peptide is an established treatment for routine liver-enzyme abnormalities.

WHEN TO FOLLOW UP

Repeat and evaluate persistent liver abnormalities, especially if more than one marker is abnormal or symptoms such as jaundice, dark urine, severe abdominal pain or vomiting are present. Interpret AST carefully after hard training or muscle injury.

Educational reference only. See clinical references near the end of this guide.

LIVER HEALTH

Alkaline Phosphatase (ALP)

WHAT IT MEASURES

An enzyme associated mainly with bile ducts and bone.

IN PLAIN ENGLISH

ALP is made mainly in the bile ducts and bone. A high result asks a follow-up question: is this coming from the liver/bile system, or from bone turnover?

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Mild abnormalities are often symptom-free. More significant liver or bile-duct problems can cause fatigue, poor appetite, nausea, right-upper abdominal discomfort, itching, dark urine, pale stools, swelling or yellowing of the eyes/skin. Low albumin can contribute to leg or abdominal swelling.

IF HIGH

High ALP can reflect bile-duct obstruction/cholestasis or increased bone turnover.

IF LOW

Low ALP can occur with malnutrition, mineral deficiencies, hypothyroidism or rare genetic conditions.

WHAT CAN HELP

Address the cause rather than trying to detox the number. Reduce or stop alcohol when relevant; improve insulin resistance and body weight; review prescription drugs, OTC pain medicines and supplements; avoid unnecessary liver-toxic exposures; and use regular exercise plus a Mediterranean-style eating pattern for metabolic fatty-liver risk. Persistent abnormalities, jaundice or marked elevations require clinician evaluation. No peptide is an established treatment for routine liver-enzyme abnormalities.

WHEN TO FOLLOW UP

Repeat and evaluate persistent liver abnormalities, especially if more than one marker is abnormal or symptoms such as jaundice, dark urine, severe abdominal pain or vomiting are present. Interpret AST carefully after hard training or muscle injury.

Educational reference only. See clinical references near the end of this guide.

LIVER HEALTH

Gamma-Glutamyl Transferase (GGT)

WHAT IT MEASURES

An enzyme associated with liver and bile-duct function.

IN PLAIN ENGLISH

GGT is an enzyme associated with the liver and bile ducts. It is sensitive to several forms of liver stress, including alcohol and some medications, but it is not specific enough to diagnose the cause alone.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Mild abnormalities are often symptom-free. More significant liver or bile-duct problems can cause fatigue, poor appetite, nausea, right-upper abdominal discomfort, itching, dark urine, pale stools, swelling or yellowing of the eyes/skin. Low albumin can contribute to leg or abdominal swelling.

IF HIGH

High GGT can accompany bile-duct disease, alcohol exposure, metabolic fatty liver or medication effects.

IF LOW

Low GGT is usually not clinically concerning.

WHAT CAN HELP

Address the cause rather than trying to detox the number. Reduce or stop alcohol when relevant; improve insulin resistance and body weight; review prescription drugs, OTC pain medicines and supplements; avoid unnecessary liver-toxic exposures; and use regular exercise plus a Mediterranean-style eating pattern for metabolic fatty-liver risk. Persistent abnormalities, jaundice or marked elevations require clinician evaluation. No peptide is an established treatment for routine liver-enzyme abnormalities.

WHEN TO FOLLOW UP

Repeat and evaluate persistent liver abnormalities, especially if more than one marker is abnormal or symptoms such as jaundice, dark urine, severe abdominal pain or vomiting are present. Interpret AST carefully after hard training or muscle injury.

Educational reference only. See clinical references near the end of this guide.

LIVER HEALTH

Total Bilirubin

WHAT IT MEASURES

A breakdown product of old red blood cells that the liver processes and excretes.

IN PLAIN ENGLISH

Bilirubin is a yellow waste pigment produced when old red blood cells are broken down. The liver processes it and sends it into bile. Total bilirubin measures both processed and unprocessed forms.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Mild abnormalities are often symptom-free. More significant liver or bile-duct problems can cause fatigue, poor appetite, nausea, right-upper abdominal discomfort, itching, dark urine, pale stools, swelling or yellowing of the eyes/skin. Low albumin can contribute to leg or abdominal swelling.

IF HIGH

High total bilirubin can result from increased red-cell breakdown, impaired liver processing or impaired bile flow.

IF LOW

Low bilirubin is generally not clinically significant.

WHAT CAN HELP

Address the cause rather than trying to detox the number. Reduce or stop alcohol when relevant; improve insulin resistance and body weight; review prescription drugs, OTC pain medicines and supplements; avoid unnecessary liver-toxic exposures; and use regular exercise plus a Mediterranean-style eating pattern for metabolic fatty-liver risk. Persistent abnormalities, jaundice or marked elevations require clinician evaluation. No peptide is an established treatment for routine liver-enzyme abnormalities.

WHEN TO FOLLOW UP

Repeat and evaluate persistent liver abnormalities, especially if more than one marker is abnormal or symptoms such as jaundice, dark urine, severe abdominal pain or vomiting are present. Interpret AST carefully after hard training or muscle injury.

Educational reference only. See clinical references near the end of this guide.

LIVER HEALTH

Direct Bilirubin

WHAT IT MEASURES

Measures conjugated bilirubin after the liver has processed it.

IN PLAIN ENGLISH

Direct bilirubin is the form the liver has already processed for excretion into bile. A rise can point more toward impaired bile flow or liver handling.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Mild abnormalities are often symptom-free. More significant liver or bile-duct problems can cause fatigue, poor appetite, nausea, right-upper abdominal discomfort, itching, dark urine, pale stools, swelling or yellowing of the eyes/skin. Low albumin can contribute to leg or abdominal swelling.

IF HIGH

High direct bilirubin more often points toward impaired bile excretion or hepatobiliary disease.

IF LOW

Low direct bilirubin is usually not clinically significant.

WHAT CAN HELP

Address the cause rather than trying to detox the number. Reduce or stop alcohol when relevant; improve insulin resistance and body weight; review prescription drugs, OTC pain medicines and supplements; avoid unnecessary liver-toxic exposures; and use regular exercise plus a Mediterranean-style eating pattern for metabolic fatty-liver risk. Persistent abnormalities, jaundice or marked elevations require clinician evaluation. No peptide is an established treatment for routine liver-enzyme abnormalities.

WHEN TO FOLLOW UP

Repeat and evaluate persistent liver abnormalities, especially if more than one marker is abnormal or symptoms such as jaundice, dark urine, severe abdominal pain or vomiting are present. Interpret AST carefully after hard training or muscle injury.

Educational reference only. See clinical references near the end of this guide.

LIVER HEALTH

Albumin

WHAT IT MEASURES

The main blood protein made by the liver; helps maintain fluid balance and carries hormones, drugs and other molecules.

IN PLAIN ENGLISH

Albumin is the main protein in blood plasma. The liver makes it, and it helps keep fluid inside blood vessels while also carrying hormones, drugs and other substances.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Mild abnormalities are often symptom-free. More significant liver or bile-duct problems can cause fatigue, poor appetite, nausea, right-upper abdominal discomfort, itching, dark urine, pale stools, swelling or yellowing of the eyes/skin. Low albumin can contribute to leg or abdominal swelling.

IF HIGH

High albumin usually reflects dehydration.

IF LOW

Low albumin can reflect liver disease, kidney protein loss, inflammation, malnutrition or increased losses.

WHAT CAN HELP

Address the cause rather than trying to detox the number. Reduce or stop alcohol when relevant; improve insulin resistance and body weight; review prescription drugs, OTC pain medicines and supplements; avoid unnecessary liver-toxic exposures; and use regular exercise plus a Mediterranean-style eating pattern for metabolic fatty-liver risk. Persistent abnormalities, jaundice or marked elevations require clinician evaluation. No peptide is an established treatment for routine liver-enzyme abnormalities.

WHEN TO FOLLOW UP

Repeat and evaluate persistent liver abnormalities, especially if more than one marker is abnormal or symptoms such as jaundice, dark urine, severe abdominal pain or vomiting are present. Interpret AST carefully after hard training or muscle injury.

Educational reference only. See clinical references near the end of this guide.

LIVER HEALTH

Total Protein

WHAT IT MEASURES

Measures albumin plus globulins in the blood.

IN PLAIN ENGLISH

Total protein is albumin plus other blood proteins, especially globulins. It gives a broad clue about liver production, nutrition, hydration and immune-protein levels.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Mild abnormalities are often symptom-free. More significant liver or bile-duct problems can cause fatigue, poor appetite, nausea, right-upper abdominal discomfort, itching, dark urine, pale stools, swelling or yellowing of the eyes/skin. Low albumin can contribute to leg or abdominal swelling.

IF HIGH

High total protein can occur with dehydration or increased immunoglobulins.

IF LOW

Low total protein can reflect malnutrition, liver disease, kidney loss or protein-losing gastrointestinal conditions.

WHAT CAN HELP

Address the cause rather than trying to detox the number. Reduce or stop alcohol when relevant; improve insulin resistance and body weight; review prescription drugs, OTC pain medicines and supplements; avoid unnecessary liver-toxic exposures; and use regular exercise plus a Mediterranean-style eating pattern for metabolic fatty-liver risk. Persistent abnormalities, jaundice or marked elevations require clinician evaluation. No peptide is an established treatment for routine liver-enzyme abnormalities.

WHEN TO FOLLOW UP

Repeat and evaluate persistent liver abnormalities, especially if more than one marker is abnormal or symptoms such as jaundice, dark urine, severe abdominal pain or vomiting are present. Interpret AST carefully after hard training or muscle injury.

Educational reference only. See clinical references near the end of this guide.

SECTION 4

Kidney Function

Filtration, hydration status, waste removal and renal reserve.

This section contains 4 marker pages.

Biomarker Deep-Dive Section

KIDNEY FUNCTION

Creatinine

WHAT IT MEASURES

A muscle-metabolism waste product filtered by the kidneys and used to estimate kidney filtration.

IN PLAIN ENGLISH

Creatinine is a waste product generated mainly from normal muscle metabolism. The kidneys filter it out, so the blood level is an indirect clue to filtration - but muscularity, creatine use, meat intake, hydration and recent hard training can also affect it.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Early kidney dysfunction is commonly silent. More advanced problems can cause fatigue, swelling, nausea, itching, changes in urination, shortness of breath, muscle cramps or difficulty concentrating. Dehydration may cause thirst, dizziness and dark urine.

IF HIGH

High creatinine can reflect reduced kidney filtration, dehydration, greater muscle mass, creatine use, a recent meat meal or muscle injury.

IF LOW

Low creatinine often reflects lower muscle mass, small body size or reduced creatinine production rather than extra-good kidney function.

WHAT CAN HELP

Confirm hydration status and repeat testing when appropriate. Control blood pressure and glucose, avoid unnecessary NSAIDs or other kidney-toxic exposures, and review supplements and medications. Kidney disease may require individualized sodium, protein, potassium and medication guidance; simply drinking more water is not universally correct. Peptides are not an evidence-based way to raise eGFR or lower creatinine.

WHEN TO FOLLOW UP

A persistently reduced eGFR, rising creatinine, protein in the urine, swelling or major changes in urination warrant clinical follow-up. One abnormal result should be interpreted with prior values and urine testing.

Educational reference only. See clinical references near the end of this guide.

KIDNEY FUNCTION

Blood Urea Nitrogen (BUN)

WHAT IT MEASURES

Measures nitrogen waste generated from protein metabolism and removed through the kidneys.

IN PLAIN ENGLISH

BUN measures urea nitrogen, a waste product made when the body breaks down protein. The kidneys remove it, but hydration, protein intake and tissue breakdown can change BUN even when the kidneys are healthy.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Early kidney dysfunction is commonly silent. More advanced problems can cause fatigue, swelling, nausea, itching, changes in urination, shortness of breath, muscle cramps or difficulty concentrating. Dehydration may cause thirst, dizziness and dark urine.

IF HIGH

High BUN can occur with dehydration, reduced kidney filtration, high protein breakdown, GI bleeding or high protein intake.

IF LOW

Low BUN can occur with low protein intake, overhydration or impaired liver urea production.

WHAT CAN HELP

Confirm hydration status and repeat testing when appropriate. Control blood pressure and glucose, avoid unnecessary NSAIDs or other kidney-toxic exposures, and review supplements and medications. Kidney disease may require individualized sodium, protein, potassium and medication guidance; simply drinking more water is not universally correct. Peptides are not an evidence-based way to raise eGFR or lower creatinine.

WHEN TO FOLLOW UP

A persistently reduced eGFR, rising creatinine, protein in the urine, swelling or major changes in urination warrant clinical follow-up. One abnormal result should be interpreted with prior values and urine testing.

Educational reference only. See clinical references near the end of this guide.

KIDNEY FUNCTION

eGFR

WHAT IT MEASURES

Estimates how effectively the kidneys filter blood using creatinine and demographic variables.

IN PLAIN ENGLISH

eGFR is a calculated estimate of how much blood the kidneys filter each minute. It is more useful than creatinine alone because it translates the creatinine result into a kidney-filtration estimate.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Early kidney dysfunction is commonly silent. More advanced problems can cause fatigue, swelling, nausea, itching, changes in urination, shortness of breath, muscle cramps or difficulty concentrating. Dehydration may cause thirst, dizziness and dark urine.

IF HIGH

A persistently low eGFR can indicate chronic kidney disease, although age, body size and creatinine-related factors affect the estimate.

IF LOW

A high eGFR is usually not a problem by itself; unusually high filtration can sometimes occur early in diabetes or pregnancy.

WHAT CAN HELP

Confirm hydration status and repeat testing when appropriate. Control blood pressure and glucose, avoid unnecessary NSAIDs or other kidney-toxic exposures, and review supplements and medications. Kidney disease may require individualized sodium, protein, potassium and medication guidance; simply drinking more water is not universally correct. Peptides are not an evidence-based way to raise eGFR or lower creatinine.

WHEN TO FOLLOW UP

A persistently reduced eGFR, rising creatinine, protein in the urine, swelling or major changes in urination warrant clinical follow-up. One abnormal result should be interpreted with prior values and urine testing.

Educational reference only. See clinical references near the end of this guide.

KIDNEY FUNCTION

BUN:Creatinine Ratio

WHAT IT MEASURES

Compares BUN with creatinine to add context to kidney and hydration findings.

IN PLAIN ENGLISH

This ratio compares two waste products. It can sometimes suggest dehydration or other patterns, but it is a clue rather than a diagnosis.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Early kidney dysfunction is commonly silent. More advanced problems can cause fatigue, swelling, nausea, itching, changes in urination, shortness of breath, muscle cramps or difficulty concentrating. Dehydration may cause thirst, dizziness and dark urine.

IF HIGH

A high ratio may occur with dehydration, GI bleeding or high protein breakdown.

IF LOW

A low ratio can occur with low urea production, low protein intake, liver disease or relatively higher creatinine production.

WHAT CAN HELP

Confirm hydration status and repeat testing when appropriate. Control blood pressure and glucose, avoid unnecessary NSAIDs or other kidney-toxic exposures, and review supplements and medications. Kidney disease may require individualized sodium, protein, potassium and medication guidance; simply drinking more water is not universally correct. Peptides are not an evidence-based way to raise eGFR or lower creatinine.

WHEN TO FOLLOW UP

A persistently reduced eGFR, rising creatinine, protein in the urine, swelling or major changes in urination warrant clinical follow-up. One abnormal result should be interpreted with prior values and urine testing.

Educational reference only. See clinical references near the end of this guide.

SECTION 5

Blood, Anemia & Cell Counts

Red cells, white cells and platelets that support oxygen delivery, immunity and clotting.

This section contains 11 marker pages.

Biomarker Deep-Dive Section

Red Blood Cell Count (RBC)

WHAT IT MEASURES

Counts the number of red blood cells that carry oxygen.

IN PLAIN ENGLISH

RBC counts how many red blood cells are circulating. These are the cells that carry oxygen from the lungs to working tissues.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Low: fatigue, weakness, shortness of breath with activity, dizziness, headache, palpitations, pale skin or reduced exercise capacity. High: may cause no symptoms, but headache, dizziness, facial redness or a thick-blood feeling can occur; very high values can increase clotting concern.

IF HIGH

High can result from dehydration, altitude, smoking, sleep apnea, lung disease or testosterone-related erythrocytosis, among other causes.

IF LOW

Low usually points toward anemia from blood loss, iron/B12/folate deficiency, chronic disease, kidney disease or bone-marrow problems.

WHAT CAN HELP

Treat the cause rather than the CBC number. Add iron, B12 or folate only when deficiency is demonstrated. Review hydration, blood loss, altitude, smoking, sleep apnea, medications and hormone therapy. Resistance training and adequate protein support overall health but do not replace evaluation of anemia or abnormal cell counts. TRT can raise hematocrit, so elevated HCT during testosterone therapy requires prescriber review. Peptides are not routine treatment for CBC abnormalities.

WHEN TO FOLLOW UP

Promptly follow up for severe anemia symptoms, significant bleeding or bruising, very high hematocrit, markedly abnormal WBC or platelet counts, or persistent changes across repeat testing.

Educational reference only. See clinical references near the end of this guide.

Hemoglobin (HGB)

WHAT IT MEASURES

Measures the oxygen-carrying protein inside red blood cells.

IN PLAIN ENGLISH

Hemoglobin is the iron-containing protein inside red blood cells that actually binds and carries oxygen. It is one of the most useful numbers for determining whether anemia is present.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Low: fatigue, weakness, shortness of breath with activity, dizziness, headache, palpitations, pale skin or reduced exercise capacity. High: may cause no symptoms, but headache, dizziness, facial redness or a thick-blood feeling can occur; very high values can increase clotting concern.

IF HIGH

High can result from dehydration, altitude, smoking, sleep apnea, lung disease or testosterone-related erythrocytosis, among other causes.

IF LOW

Low usually points toward anemia from blood loss, iron/B12/folate deficiency, chronic disease, kidney disease or bone-marrow problems.

WHAT CAN HELP

Treat the cause rather than the CBC number. Add iron, B12 or folate only when deficiency is demonstrated. Review hydration, blood loss, altitude, smoking, sleep apnea, medications and hormone therapy. Resistance training and adequate protein support overall health but do not replace evaluation of anemia or abnormal cell counts. TRT can raise hematocrit, so elevated HCT during testosterone therapy requires prescriber review. Peptides are not routine treatment for CBC abnormalities.

WHEN TO FOLLOW UP

Promptly follow up for severe anemia symptoms, significant bleeding or bruising, very high hematocrit, markedly abnormal WBC or platelet counts, or persistent changes across repeat testing.

Educational reference only. See clinical references near the end of this guide.

Hematocrit (HCT)

WHAT IT MEASURES

Measures the percentage of blood volume made up by red blood cells.

IN PLAIN ENGLISH

Hematocrit is the percentage of your blood volume made up of red blood cells. It helps show whether the blood is too diluted, too concentrated, or whether red-cell mass is abnormal.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Low: fatigue, weakness, shortness of breath with activity, dizziness, headache, palpitations, pale skin or reduced exercise capacity. High: may cause no symptoms, but headache, dizziness, facial redness or a thick-blood feeling can occur; very high values can increase clotting concern.

IF HIGH

High can result from dehydration, altitude, smoking, sleep apnea, lung disease or testosterone-related erythrocytosis, among other causes.

IF LOW

Low usually points toward anemia from blood loss, iron/B12/folate deficiency, chronic disease, kidney disease or bone-marrow problems.

WHAT CAN HELP

Treat the cause rather than the CBC number. Add iron, B12 or folate only when deficiency is demonstrated. Review hydration, blood loss, altitude, smoking, sleep apnea, medications and hormone therapy. Resistance training and adequate protein support overall health but do not replace evaluation of anemia or abnormal cell counts. TRT can raise hematocrit, so elevated HCT during testosterone therapy requires prescriber review. Peptides are not routine treatment for CBC abnormalities.

WHEN TO FOLLOW UP

Promptly follow up for severe anemia symptoms, significant bleeding or bruising, very high hematocrit, markedly abnormal WBC or platelet counts, or persistent changes across repeat testing.

Educational reference only. See clinical references near the end of this guide.

HCT, Capillary (Calculated)

WHAT IT MEASURES

A calculated capillary estimate of hematocrit.

IN PLAIN ENGLISH

This is a calculated hematocrit from capillary measurements. It estimates the same basic thing as hematocrit: how much of the blood volume consists of red cells.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Low: fatigue, weakness, shortness of breath with activity, dizziness, headache, palpitations, pale skin or reduced exercise capacity. High: may cause no symptoms, but headache, dizziness, facial redness or a thick-blood feeling can occur; very high values can increase clotting concern.

IF HIGH

High can result from dehydration, altitude, smoking, sleep apnea, lung disease or testosterone-related erythrocytosis, among other causes.

IF LOW

Low usually points toward anemia from blood loss, iron/B12/folate deficiency, chronic disease, kidney disease or bone-marrow problems.

WHAT CAN HELP

Treat the cause rather than the CBC number. Add iron, B12 or folate only when deficiency is demonstrated. Review hydration, blood loss, altitude, smoking, sleep apnea, medications and hormone therapy. Resistance training and adequate protein support overall health but do not replace evaluation of anemia or abnormal cell counts. TRT can raise hematocrit, so elevated HCT during testosterone therapy requires prescriber review. Peptides are not routine treatment for CBC abnormalities.

WHEN TO FOLLOW UP

Promptly follow up for severe anemia symptoms, significant bleeding or bruising, very high hematocrit, markedly abnormal WBC or platelet counts, or persistent changes across repeat testing.

Educational reference only. See clinical references near the end of this guide.

BLOOD, ANEMIA & CELL COUNTS

Mean Corpuscular Volume (MCV)

WHAT IT MEASURES

Measures the average size of red blood cells.

IN PLAIN ENGLISH

MCV tells you the average size of a red blood cell. Small cells and large cells point toward different causes of anemia.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

These indices generally do not create symptoms themselves. Symptoms come from the underlying anemia or nutrient deficiency and can include fatigue, reduced endurance, breathlessness, dizziness, headaches or palpitations.

IF HIGH

High MCV can occur with B12/folate deficiency, alcohol use, liver disease, hypothyroidism or certain medicines.

IF LOW

Low MCV commonly occurs with iron deficiency or thalassemia.

WHAT CAN HELP

Treat the cause rather than the CBC number. Add iron, B12 or folate only when deficiency is demonstrated. Review hydration, blood loss, altitude, smoking, sleep apnea, medications and hormone therapy. Resistance training and adequate protein support overall health but do not replace evaluation of anemia or abnormal cell counts. TRT can raise hematocrit, so elevated HCT during testosterone therapy requires prescriber review. Peptides are not routine treatment for CBC abnormalities.

WHEN TO FOLLOW UP

Promptly follow up for severe anemia symptoms, significant bleeding or bruising, very high hematocrit, markedly abnormal WBC or platelet counts, or persistent changes across repeat testing.

Educational reference only. See clinical references near the end of this guide.

Mean Corpuscular Hemoglobin (MCH)

WHAT IT MEASURES

Measures the average amount of hemoglobin in each red blood cell.

IN PLAIN ENGLISH

MCH estimates how much hemoglobin is inside the average red blood cell. It helps classify anemia but is not usually interpreted alone.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

These indices generally do not create symptoms themselves. Symptoms come from the underlying anemia or nutrient deficiency and can include fatigue, reduced endurance, breathlessness, dizziness, headaches or palpitations.

IF HIGH

High values are less common and may accompany macrocytosis or certain red-cell disorders.

IF LOW

Low values often occur when red cells contain too little hemoglobin, commonly in iron deficiency.

WHAT CAN HELP

Treat the cause rather than the CBC number. Add iron, B12 or folate only when deficiency is demonstrated. Review hydration, blood loss, altitude, smoking, sleep apnea, medications and hormone therapy. Resistance training and adequate protein support overall health but do not replace evaluation of anemia or abnormal cell counts. TRT can raise hematocrit, so elevated HCT during testosterone therapy requires prescriber review. Peptides are not routine treatment for CBC abnormalities.

WHEN TO FOLLOW UP

Promptly follow up for severe anemia symptoms, significant bleeding or bruising, very high hematocrit, markedly abnormal WBC or platelet counts, or persistent changes across repeat testing.

Educational reference only. See clinical references near the end of this guide.

Mean Corpuscular Hemoglobin Concentration

WHAT IT MEASURES

Measures the concentration of hemoglobin inside red blood cells.

IN PLAIN ENGLISH

MCHC estimates how concentrated the hemoglobin is inside red blood cells. Low values often travel with iron-deficiency patterns.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

These indices generally do not create symptoms themselves. Symptoms come from the underlying anemia or nutrient deficiency and can include fatigue, reduced endurance, breathlessness, dizziness, headaches or palpitations.

IF HIGH

High values are less common and may accompany macrocytosis or certain red-cell disorders.

IF LOW

Low values often occur when red cells contain too little hemoglobin, commonly in iron deficiency.

WHAT CAN HELP

Treat the cause rather than the CBC number. Add iron, B12 or folate only when deficiency is demonstrated. Review hydration, blood loss, altitude, smoking, sleep apnea, medications and hormone therapy. Resistance training and adequate protein support overall health but do not replace evaluation of anemia or abnormal cell counts. TRT can raise hematocrit, so elevated HCT during testosterone therapy requires prescriber review. Peptides are not routine treatment for CBC abnormalities.

WHEN TO FOLLOW UP

Promptly follow up for severe anemia symptoms, significant bleeding or bruising, very high hematocrit, markedly abnormal WBC or platelet counts, or persistent changes across repeat testing.

Educational reference only. See clinical references near the end of this guide.

Red Cell Distribution Width (RDW)

WHAT IT MEASURES

Measures how much red blood-cell size varies.

IN PLAIN ENGLISH

RDW shows how much red blood cell size varies. A high RDW means the cells are more mixed in size, which can be useful when sorting out iron, B12/folate or mixed deficiencies.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

These indices generally do not create symptoms themselves. Symptoms come from the underlying anemia or nutrient deficiency and can include fatigue, reduced endurance, breathlessness, dizziness, headaches or palpitations.

IF HIGH

High RDW means red cells vary more in size and can support a diagnosis of nutritional deficiency or mixed anemia.

IF LOW

Low or normal RDW means cell size is relatively uniform and usually has little independent significance.

WHAT CAN HELP

Treat the cause rather than the CBC number. Add iron, B12 or folate only when deficiency is demonstrated. Review hydration, blood loss, altitude, smoking, sleep apnea, medications and hormone therapy. Resistance training and adequate protein support overall health but do not replace evaluation of anemia or abnormal cell counts. TRT can raise hematocrit, so elevated HCT during testosterone therapy requires prescriber review. Peptides are not routine treatment for CBC abnormalities.

WHEN TO FOLLOW UP

Promptly follow up for severe anemia symptoms, significant bleeding or bruising, very high hematocrit, markedly abnormal WBC or platelet counts, or persistent changes across repeat testing.

Educational reference only. See clinical references near the end of this guide.

White Blood Cell Count (WBC)

WHAT IT MEASURES

Counts immune-system white blood cells.

IN PLAIN ENGLISH

WBC counts immune cells in the blood. A rise can mean the immune system is responding to infection, inflammation, stress or medication; a low count can mean fewer infection-fighting cells are available.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

High: may accompany fever, chills, pain or other signs of infection or inflammation, but stress, smoking and medications can also raise it. Low: often no symptoms until infection occurs; recurrent fever, mouth sores or frequent infections may become clues.

IF HIGH

High WBC can reflect infection, inflammation, steroid effect, stress, smoking or less commonly a blood disorder.

IF LOW

Low WBC can reflect viral illness, medication effects, autoimmune disease, nutritional deficiency or bone-marrow suppression.

WHAT CAN HELP

Treat the cause rather than the CBC number. Add iron, B12 or folate only when deficiency is demonstrated. Review hydration, blood loss, altitude, smoking, sleep apnea, medications and hormone therapy. Resistance training and adequate protein support overall health but do not replace evaluation of anemia or abnormal cell counts. TRT can raise hematocrit, so elevated HCT during testosterone therapy requires prescriber review. Peptides are not routine treatment for CBC abnormalities.

WHEN TO FOLLOW UP

Promptly follow up for severe anemia symptoms, significant bleeding or bruising, very high hematocrit, markedly abnormal WBC or platelet counts, or persistent changes across repeat testing.

Educational reference only. See clinical references near the end of this guide.

BLOOD, ANEMIA & CELL COUNTS

Platelet Count (PLT)

WHAT IT MEASURES

Counts platelets, which are essential for blood clotting.

IN PLAIN ENGLISH

Platelets are small cell fragments that help stop bleeding by forming clots. The platelet count tells you whether enough - or too many - are circulating.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Low: easy bruising, nosebleeds, gum bleeding, prolonged bleeding or pinpoint red skin spots. High: often no symptoms, but depending on the cause can increase clotting risk or, paradoxically, bleeding.

IF HIGH

High platelets can be reactive to inflammation, infection or iron deficiency, or arise from a marrow disorder.

IF LOW

Low platelets can result from reduced production, immune destruction, medication effects, infection or increased consumption.

WHAT CAN HELP

Treat the cause rather than the CBC number. Add iron, B12 or folate only when deficiency is demonstrated. Review hydration, blood loss, altitude, smoking, sleep apnea, medications and hormone therapy. Resistance training and adequate protein support overall health but do not replace evaluation of anemia or abnormal cell counts. TRT can raise hematocrit, so elevated HCT during testosterone therapy requires prescriber review. Peptides are not routine treatment for CBC abnormalities.

WHEN TO FOLLOW UP

Promptly follow up for severe anemia symptoms, significant bleeding or bruising, very high hematocrit, markedly abnormal WBC or platelet counts, or persistent changes across repeat testing.

Educational reference only. See clinical references near the end of this guide.

Mean Platelet Volume (MPV)

WHAT IT MEASURES

Measures average platelet size and provides context about platelet production and turnover.

IN PLAIN ENGLISH

MPV tells you the average size of platelets. Larger platelets are often younger and more recently produced, so MPV can add context to the platelet count.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

MPV itself causes no symptom. It is a context marker interpreted with platelet count and the clinical picture.

IF HIGH

High MPV can suggest increased platelet turnover or production.

IF LOW

Low MPV can suggest smaller or older platelets or reduced production; it is not diagnostic alone.

WHAT CAN HELP

Treat the cause rather than the CBC number. Add iron, B12 or folate only when deficiency is demonstrated. Review hydration, blood loss, altitude, smoking, sleep apnea, medications and hormone therapy. Resistance training and adequate protein support overall health but do not replace evaluation of anemia or abnormal cell counts. TRT can raise hematocrit, so elevated HCT during testosterone therapy requires prescriber review. Peptides are not routine treatment for CBC abnormalities.

WHEN TO FOLLOW UP

Promptly follow up for severe anemia symptoms, significant bleeding or bruising, very high hematocrit, markedly abnormal WBC or platelet counts, or persistent changes across repeat testing.

Educational reference only. See clinical references near the end of this guide.

SECTION 6

Iron & Nutritional Status

Iron stores, B-vitamins, vitamin D and nutrition-dependent performance factors.

This section contains 8 marker pages.

Biomarker Deep-Dive Section

Iron

WHAT IT MEASURES

Measures circulating iron available for hemoglobin and other cellular functions.

IN PLAIN ENGLISH

Serum iron is the amount of iron circulating in the blood at that moment. It can change during the day, so it is most useful with ferritin, TIBC and iron saturation.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Low iron stores can cause fatigue, weakness, breathlessness, dizziness, restless legs, hair shedding, brittle nails, reduced exercise capacity or pica. Excess iron can cause fatigue, joint pain, abdominal discomfort, low libido or skin darkening, though early overload may be silent.

IF HIGH

High serum iron can occur with iron overload, excess supplements, hemolysis or liver disease.

IF LOW

Low iron can occur with iron deficiency, blood loss, low intake or impaired absorption.

WHAT CAN HELP

Use iron-rich foods when intake is low, but confirm deficiency before taking iron because iron overload can also be harmful. Look for heavy menstrual loss, GI blood loss, frequent donation or malabsorption when stores are low. Vitamin C can improve absorption of plant iron. Peptides do not correct iron deficiency or iron overload.

WHEN TO FOLLOW UP

Follow up when deficiency is symptomatic, severe or recurrent, or when ferritin or iron saturation suggest possible iron overload. Persistent B12-related neurologic symptoms or unexplained vitamin abnormalities deserve clinical evaluation.

Educational reference only. See clinical references near the end of this guide.

IRON & NUTRITIONAL STATUS

Ferritin

WHAT IT MEASURES

Measures stored iron and also rises as an inflammatory protein.

IN PLAIN ENGLISH

Ferritin is the body's main iron-storage protein. A low ferritin is one of the clearest clues that iron stores are depleted, while a high ferritin can mean iron excess or inflammation.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Low iron stores can cause fatigue, weakness, breathlessness, dizziness, restless legs, hair shedding, brittle nails, reduced exercise capacity or pica. Excess iron can cause fatigue, joint pain, abdominal discomfort, low libido or skin darkening, though early overload may be silent.

IF HIGH

High ferritin can reflect inflammation, liver disease, infection, metabolic disease or iron overload.

IF LOW

Low ferritin strongly supports depleted iron stores.

WHAT CAN HELP

Use iron-rich foods when intake is low, but confirm deficiency before taking iron because iron overload can also be harmful. Look for heavy menstrual loss, GI blood loss, frequent donation or malabsorption when stores are low. Vitamin C can improve absorption of plant iron. Peptides do not correct iron deficiency or iron overload.

WHEN TO FOLLOW UP

Follow up when deficiency is symptomatic, severe or recurrent, or when ferritin or iron saturation suggest possible iron overload. Persistent B12-related neurologic symptoms or unexplained vitamin abnormalities deserve clinical evaluation.

Educational reference only. See clinical references near the end of this guide.

IRON & NUTRITIONAL STATUS

Total Iron-Binding Capacity (TIBC)

WHAT IT MEASURES

Estimates the blood's capacity to bind iron via transferrin.

IN PLAIN ENGLISH

TIBC estimates how much iron the blood could carry if transferrin, its main transport protein, were fully loaded. The body often raises TIBC when it is searching for more iron.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Low iron stores can cause fatigue, weakness, breathlessness, dizziness, restless legs, hair shedding, brittle nails, reduced exercise capacity or pica. Excess iron can cause fatigue, joint pain, abdominal discomfort, low libido or skin darkening, though early overload may be silent.

IF HIGH

High TIBC is common in iron deficiency because the body increases iron-carrying capacity.

IF LOW

Low TIBC can occur with inflammation, liver disease, malnutrition or iron overload.

WHAT CAN HELP

Use iron-rich foods when intake is low, but confirm deficiency before taking iron because iron overload can also be harmful. Look for heavy menstrual loss, GI blood loss, frequent donation or malabsorption when stores are low. Vitamin C can improve absorption of plant iron. Peptides do not correct iron deficiency or iron overload.

WHEN TO FOLLOW UP

Follow up when deficiency is symptomatic, severe or recurrent, or when ferritin or iron saturation suggest possible iron overload. Persistent B12-related neurologic symptoms or unexplained vitamin abnormalities deserve clinical evaluation.

Educational reference only. See clinical references near the end of this guide.

IRON & NUTRITIONAL STATUS

Unsaturated Iron-Binding Capacity (UIBC)

WHAT IT MEASURES

Measures the unused portion of transferrin's iron-binding capacity.

IN PLAIN ENGLISH

UIBC is the unused portion of the blood's iron-carrying capacity - essentially how many transferrin seats are still empty.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Low iron stores can cause fatigue, weakness, breathlessness, dizziness, restless legs, hair shedding, brittle nails, reduced exercise capacity or pica. Excess iron can cause fatigue, joint pain, abdominal discomfort, low libido or skin darkening, though early overload may be silent.

IF HIGH

High UIBC often occurs when many transferrin binding sites are empty, as in iron deficiency.

IF LOW

Low UIBC can occur when transferrin is more saturated, including iron overload.

WHAT CAN HELP

Use iron-rich foods when intake is low, but confirm deficiency before taking iron because iron overload can also be harmful. Look for heavy menstrual loss, GI blood loss, frequent donation or malabsorption when stores are low. Vitamin C can improve absorption of plant iron. Peptides do not correct iron deficiency or iron overload.

WHEN TO FOLLOW UP

Follow up when deficiency is symptomatic, severe or recurrent, or when ferritin or iron saturation suggest possible iron overload. Persistent B12-related neurologic symptoms or unexplained vitamin abnormalities deserve clinical evaluation.

Educational reference only. See clinical references near the end of this guide.

IRON & NUTRITIONAL STATUS

Iron Saturation

WHAT IT MEASURES

Shows the percentage of transferrin binding sites occupied by iron.

IN PLAIN ENGLISH

Iron saturation is the percentage of transferrin carrying iron. It helps show whether iron transport is under-filled or overloaded.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Low iron stores can cause fatigue, weakness, breathlessness, dizziness, restless legs, hair shedding, brittle nails, reduced exercise capacity or pica. Excess iron can cause fatigue, joint pain, abdominal discomfort, low libido or skin darkening, though early overload may be silent.

IF HIGH

High saturation can suggest iron overload or excess iron exposure.

IF LOW

Low saturation supports iron deficiency or restricted iron availability.

WHAT CAN HELP

Use iron-rich foods when intake is low, but confirm deficiency before taking iron because iron overload can also be harmful. Look for heavy menstrual loss, GI blood loss, frequent donation or malabsorption when stores are low. Vitamin C can improve absorption of plant iron. Peptides do not correct iron deficiency or iron overload.

WHEN TO FOLLOW UP

Follow up when deficiency is symptomatic, severe or recurrent, or when ferritin or iron saturation suggest possible iron overload. Persistent B12-related neurologic symptoms or unexplained vitamin abnormalities deserve clinical evaluation.

Educational reference only. See clinical references near the end of this guide.

IRON & NUTRITIONAL STATUS

Vitamin B12

WHAT IT MEASURES

Needed for DNA synthesis, nerve function and normal red-cell production.

IN PLAIN ENGLISH

B12 is needed to build healthy red blood cells, make DNA and keep nerves working normally. A deficiency can affect the nervous system even before anemia becomes severe.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Low B12 can cause fatigue, weakness, numbness or tingling, balance problems, memory or concentration changes and a sore tongue. Neurologic symptoms can occur even without dramatic anemia.

IF HIGH

High B12 can occur from supplementation and can also accompany liver, kidney or blood disorders; the number alone is not a toxicity diagnosis.

IF LOW

Low B12 can result from low intake, pernicious anemia, stomach or intestinal disease, bariatric surgery or certain medicines.

WHAT CAN HELP

Increase B12-rich foods or use supplementation when deficiency is confirmed; injections may be appropriate when absorption is impaired. Review metformin, acid-suppressing medicines, gastrointestinal disease and dietary pattern if deficiency persists. Peptides have no established role.

WHEN TO FOLLOW UP

Follow up when deficiency is symptomatic, severe or recurrent, or when ferritin or iron saturation suggest possible iron overload. Persistent B12-related neurologic symptoms or unexplained vitamin abnormalities deserve clinical evaluation.

Educational reference only. See clinical references near the end of this guide.

IRON & NUTRITIONAL STATUS

Folate

WHAT IT MEASURES

Needed for DNA synthesis and normal blood-cell production.

IN PLAIN ENGLISH

Folate is needed for DNA synthesis and new cell production. Red blood cells are especially sensitive to deficiency because they are produced continuously.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Low folate can contribute to fatigue, weakness, shortness of breath and mouth or tongue soreness through macrocytic anemia.

IF HIGH

High folate usually reflects diet or supplement intake and is rarely a problem by itself.

IF LOW

Low folate can result from low intake, alcohol use, malabsorption, increased need or certain medications.

WHAT CAN HELP

Increase folate-rich foods or supplement when appropriate. If macrocytic anemia is present, evaluate B12 as well so folate treatment does not mask a B12-related neurologic problem. Peptides have no established role.

WHEN TO FOLLOW UP

Follow up when deficiency is symptomatic, severe or recurrent, or when ferritin or iron saturation suggest possible iron overload. Persistent B12-related neurologic symptoms or unexplained vitamin abnormalities deserve clinical evaluation.

Educational reference only. See clinical references near the end of this guide.

IRON & NUTRITIONAL STATUS

25-OH Vitamin D

WHAT IT MEASURES

The standard blood marker used to assess vitamin-D status and bone/mineral health.

IN PLAIN ENGLISH

25-OH vitamin D is the main blood-storage form used to judge vitamin D status. Vitamin D helps regulate calcium, bone mineralization and muscle function.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Low vitamin D may cause no symptoms. More significant deficiency can contribute to muscle weakness, bone or muscle aches and impaired bone mineralization. Excessive vitamin D from supplementation can cause nausea, thirst, weakness and kidney problems through high calcium.

IF HIGH

High levels are usually due to excessive supplementation and can produce high calcium.

IF LOW

Low levels can reflect low intake or sun exposure, malabsorption, obesity or other conditions.

WHAT CAN HELP

Use vitamin D supplementation and diet or sun exposure appropriate to the measured level and individual risk. Avoid megadosing without monitoring because excessive vitamin D can cause hypercalcemia and kidney injury. Resistance exercise plus adequate calcium and protein supports bone. Peptides are not first-line treatment for vitamin D status.

WHEN TO FOLLOW UP

Follow up when deficiency is symptomatic, severe or recurrent, or when ferritin or iron saturation suggest possible iron overload. Persistent B12-related neurologic symptoms or unexplained vitamin abnormalities deserve clinical evaluation.

Educational reference only. See clinical references near the end of this guide.

SECTION 7

Thyroid Function

Hormonal control of metabolic pace, temperature, energy and weight regulation.

This section contains 7 marker pages.

Biomarker Deep-Dive Section

THYROID FUNCTION

Thyroid-Stimulating Hormone (TSH)

WHAT IT MEASURES

Pituitary hormone that signals the thyroid to produce thyroid hormones.

IN PLAIN ENGLISH

TSH is the pituitary gland's thermostat signal to the thyroid. When thyroid hormone is too low, TSH usually rises to push the thyroid harder; when thyroid hormone is too high, TSH usually falls.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Underactive thyroid pattern: fatigue, cold intolerance, constipation, dry skin, slowed thinking, low mood, weight gain, hair changes or menstrual disruption. Overactive pattern: heat intolerance, sweating, tremor, palpitations, anxiety, frequent bowel movements, weight loss and insomnia. Positive antibodies can exist before obvious symptoms.

IF HIGH

High TSH most commonly suggests primary hypothyroidism when free T4 is low, although mild elevations require context.

IF LOW

Low TSH can indicate hyperthyroidism, excess thyroid medication or, less commonly, pituitary or hypothalamic disease.

WHAT CAN HELP

Adequate sleep, protein, calories and micronutrients support general health, but overt thyroid disease is not reliably corrected with a workout plan or thyroid-support supplement. Avoid indiscriminate iodine or glandular products. Hypothyroidism and hyperthyroidism often require specific medical treatment. Positive antibodies are managed by monitoring thyroid function and symptoms rather than trying to drive the antibody count to zero. Peptides have no established role in routine thyroid correction.

WHEN TO FOLLOW UP

Follow up when TSH, T4 or T3 are persistently abnormal, symptoms are substantial, a neck mass or goiter is present, or pregnancy or fertility is relevant. Severe palpitations, chest symptoms or marked hyperthyroid symptoms require prompt care.

Educational reference only. See clinical references near the end of this guide.

THYROID FUNCTION

Free Thyroxine (Free T4)

WHAT IT MEASURES

Measures unbound thyroxine available to tissues.

IN PLAIN ENGLISH

Free T4 is the main thyroid hormone available to tissues before conversion to T3. It shows how much circulating thyroid hormone is immediately available rather than protein-bound.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Underactive thyroid pattern: fatigue, cold intolerance, constipation, dry skin, slowed thinking, low mood, weight gain, hair changes or menstrual disruption. Overactive pattern: heat intolerance, sweating, tremor, palpitations, anxiety, frequent bowel movements, weight loss and insomnia. Positive antibodies can exist before obvious symptoms.

IF HIGH

High free T4 with suppressed TSH supports hyperthyroidism or excess replacement.

IF LOW

Low free T4 with elevated TSH supports primary hypothyroidism; low T4 with low or inappropriately normal TSH can suggest central disease or severe illness.

WHAT CAN HELP

Adequate sleep, protein, calories and micronutrients support general health, but overt thyroid disease is not reliably corrected with a workout plan or thyroid-support supplement. Avoid indiscriminate iodine or glandular products. Hypothyroidism and hyperthyroidism often require specific medical treatment. Positive antibodies are managed by monitoring thyroid function and symptoms rather than trying to drive the antibody count to zero. Peptides have no established role in routine thyroid correction.

WHEN TO FOLLOW UP

Follow up when TSH, T4 or T3 are persistently abnormal, symptoms are substantial, a neck mass or goiter is present, or pregnancy or fertility is relevant. Severe palpitations, chest symptoms or marked hyperthyroid symptoms require prompt care.

Educational reference only. See clinical references near the end of this guide.

THYROID FUNCTION

Free Triiodothyronine (Free T3)

WHAT IT MEASURES

Measures the unbound active thyroid hormone T3.

IN PLAIN ENGLISH

Free T3 is the more biologically active thyroid hormone. It helps regulate metabolic activity inside cells, but it is not usually interpreted without TSH and T4.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Underactive thyroid pattern: fatigue, cold intolerance, constipation, dry skin, slowed thinking, low mood, weight gain, hair changes or menstrual disruption. Overactive pattern: heat intolerance, sweating, tremor, palpitations, anxiety, frequent bowel movements, weight loss and insomnia. Positive antibodies can exist before obvious symptoms.

IF HIGH

High free T3 can occur in hyperthyroidism, including T3-predominant disease.

IF LOW

Low T3 can occur during serious illness, calorie restriction or hypothyroidism and is not diagnostic by itself.

WHAT CAN HELP

Adequate sleep, protein, calories and micronutrients support general health, but overt thyroid disease is not reliably corrected with a workout plan or thyroid-support supplement. Avoid indiscriminate iodine or glandular products. Hypothyroidism and hyperthyroidism often require specific medical treatment. Positive antibodies are managed by monitoring thyroid function and symptoms rather than trying to drive the antibody count to zero. Peptides have no established role in routine thyroid correction.

WHEN TO FOLLOW UP

Follow up when TSH, T4 or T3 are persistently abnormal, symptoms are substantial, a neck mass or goiter is present, or pregnancy or fertility is relevant. Severe palpitations, chest symptoms or marked hyperthyroid symptoms require prompt care.

Educational reference only. See clinical references near the end of this guide.

THYROID FUNCTION

Thyroperoxidase Antibody (TPOAb)

WHAT IT MEASURES

Detects antibodies against thyroid peroxidase and supports diagnosis of autoimmune thyroid disease.

IN PLAIN ENGLISH

TPO antibodies show that the immune system is reacting against a thyroid enzyme. They help identify autoimmune thyroid disease; the antibody number itself is not the treatment target.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Underactive thyroid pattern: fatigue, cold intolerance, constipation, dry skin, slowed thinking, low mood, weight gain, hair changes or menstrual disruption. Overactive pattern: heat intolerance, sweating, tremor, palpitations, anxiety, frequent bowel movements, weight loss and insomnia. Positive antibodies can exist before obvious symptoms.

IF HIGH

Positive or high TPOAb supports autoimmune thyroid disease such as Hashimoto's and can also occur in Graves' disease.

IF LOW

A negative result makes TPO-antibody-mediated autoimmunity less likely but does not rule out all thyroid disease.

WHAT CAN HELP

Adequate sleep, protein, calories and micronutrients support general health, but overt thyroid disease is not reliably corrected with a workout plan or thyroid-support supplement. Avoid indiscriminate iodine or glandular products. Hypothyroidism and hyperthyroidism often require specific medical treatment. Positive antibodies are managed by monitoring thyroid function and symptoms rather than trying to drive the antibody count to zero. Peptides have no established role in routine thyroid correction.

WHEN TO FOLLOW UP

Follow up when TSH, T4 or T3 are persistently abnormal, symptoms are substantial, a neck mass or goiter is present, or pregnancy or fertility is relevant. Severe palpitations, chest symptoms or marked hyperthyroid symptoms require prompt care.

Educational reference only. See clinical references near the end of this guide.

THYROID FUNCTION

Thyroglobulin Antibody (TgAb)

WHAT IT MEASURES

Detects antibodies to thyroglobulin and provides evidence of thyroid autoimmunity.

IN PLAIN ENGLISH

Thyroglobulin antibodies show immune activity against a thyroid protein. They support an autoimmune-thyroid diagnosis and can also interfere with some thyroglobulin measurements.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Underactive thyroid pattern: fatigue, cold intolerance, constipation, dry skin, slowed thinking, low mood, weight gain, hair changes or menstrual disruption. Overactive pattern: heat intolerance, sweating, tremor, palpitations, anxiety, frequent bowel movements, weight loss and insomnia. Positive antibodies can exist before obvious symptoms.

IF HIGH

Positive or high TgAb supports autoimmune thyroid disease and can interfere with thyroglobulin testing.

IF LOW

A negative result does not rule out all autoimmune thyroid disease.

WHAT CAN HELP

Adequate sleep, protein, calories and micronutrients support general health, but overt thyroid disease is not reliably corrected with a workout plan or thyroid-support supplement. Avoid indiscriminate iodine or glandular products. Hypothyroidism and hyperthyroidism often require specific medical treatment. Positive antibodies are managed by monitoring thyroid function and symptoms rather than trying to drive the antibody count to zero. Peptides have no established role in routine thyroid correction.

WHEN TO FOLLOW UP

Follow up when TSH, T4 or T3 are persistently abnormal, symptoms are substantial, a neck mass or goiter is present, or pregnancy or fertility is relevant. Severe palpitations, chest symptoms or marked hyperthyroid symptoms require prompt care.

Educational reference only. See clinical references near the end of this guide.

THYROID FUNCTION

TSH:T4 Ratio

WHAT IT MEASURES

A derived relationship between pituitary TSH and circulating T4.

IN PLAIN ENGLISH

This is a calculated relationship between the pituitary signal and circulating T4. It is a context metric, not a standard stand-alone diagnosis.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Underactive thyroid pattern: fatigue, cold intolerance, constipation, dry skin, slowed thinking, low mood, weight gain, hair changes or menstrual disruption. Overactive pattern: heat intolerance, sweating, tremor, palpitations, anxiety, frequent bowel movements, weight loss and insomnia. Positive antibodies can exist before obvious symptoms.

IF HIGH

A high ratio can occur when TSH is elevated relative to T4, but there is no universal treatment threshold for the ratio itself.

IF LOW

A low ratio can occur when TSH is suppressed relative to T4; interpret the actual TSH and free T4.

WHAT CAN HELP

Adequate sleep, protein, calories and micronutrients support general health, but overt thyroid disease is not reliably corrected with a workout plan or thyroid-support supplement. Avoid indiscriminate iodine or glandular products. Hypothyroidism and hyperthyroidism often require specific medical treatment. Positive antibodies are managed by monitoring thyroid function and symptoms rather than trying to drive the antibody count to zero. Peptides have no established role in routine thyroid correction.

WHEN TO FOLLOW UP

Follow up when TSH, T4 or T3 are persistently abnormal, symptoms are substantial, a neck mass or goiter is present, or pregnancy or fertility is relevant. Severe palpitations, chest symptoms or marked hyperthyroid symptoms require prompt care.

Educational reference only. See clinical references near the end of this guide.

THYROID FUNCTION

Free T3:Free T4 Ratio

WHAT IT MEASURES

A derived relationship between active T3 and T4.

IN PLAIN ENGLISH

This calculated ratio compares active T3 with its T4 precursor. It is sometimes used descriptively, but it does not independently prove a conversion problem.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Underactive thyroid pattern: fatigue, cold intolerance, constipation, dry skin, slowed thinking, low mood, weight gain, hair changes or menstrual disruption. Overactive pattern: heat intolerance, sweating, tremor, palpitations, anxiety, frequent bowel movements, weight loss and insomnia. Positive antibodies can exist before obvious symptoms.

IF HIGH

A high ratio can occur in T3-predominant states but is not diagnostic alone.

IF LOW

A low ratio can occur in illness or calorie restriction; it should not automatically trigger T3 therapy.

WHAT CAN HELP

Adequate sleep, protein, calories and micronutrients support general health, but overt thyroid disease is not reliably corrected with a workout plan or thyroid-support supplement. Avoid indiscriminate iodine or glandular products. Hypothyroidism and hyperthyroidism often require specific medical treatment. Positive antibodies are managed by monitoring thyroid function and symptoms rather than trying to drive the antibody count to zero. Peptides have no established role in routine thyroid correction.

WHEN TO FOLLOW UP

Follow up when TSH, T4 or T3 are persistently abnormal, symptoms are substantial, a neck mass or goiter is present, or pregnancy or fertility is relevant. Severe palpitations, chest symptoms or marked hyperthyroid symptoms require prompt care.

Educational reference only. See clinical references near the end of this guide.

SECTION 8

Inflammation

Systemic inflammatory tone and low-grade physiologic stress.

This section contains 1 marker page.

Biomarker Deep-Dive Section

INFLAMMATION

High-Sensitivity C-Reactive Protein (hs-CRP)

WHAT IT MEASURES

Measures very low levels of CRP, an inflammation protein; can also contribute to cardiovascular risk assessment.

IN PLAIN ENGLISH

hs-CRP measures a protein the liver makes in response to inflammation. It is sensitive enough to detect low-grade inflammation, so it can add cardiovascular-risk context when measured while you are otherwise well.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

The hs-CRP number itself causes no symptom. If it is elevated because of an acute infection or injury, fever, aches, swelling or fatigue may be present. Low-grade cardiometabolic inflammation may be completely silent.

IF HIGH

High hs-CRP means inflammation is present somewhere, but it does not tell you where or why. Infection, obesity, smoking, inflammatory disease, poor sleep and recent injury can all raise it.

IF LOW

Low hs-CRP generally means little detectable systemic inflammation at that moment.

WHAT CAN HELP

Repeat hs-CRP when you are not acutely ill. Address smoking, visceral fat, low activity, poor sleep, periodontal disease and uncontrolled chronic conditions. Regular aerobic and resistance exercise plus a minimally processed Mediterranean-style eating pattern can reduce cardiometabolic inflammatory burden. Unapproved peptides should not be used simply to lower CRP.

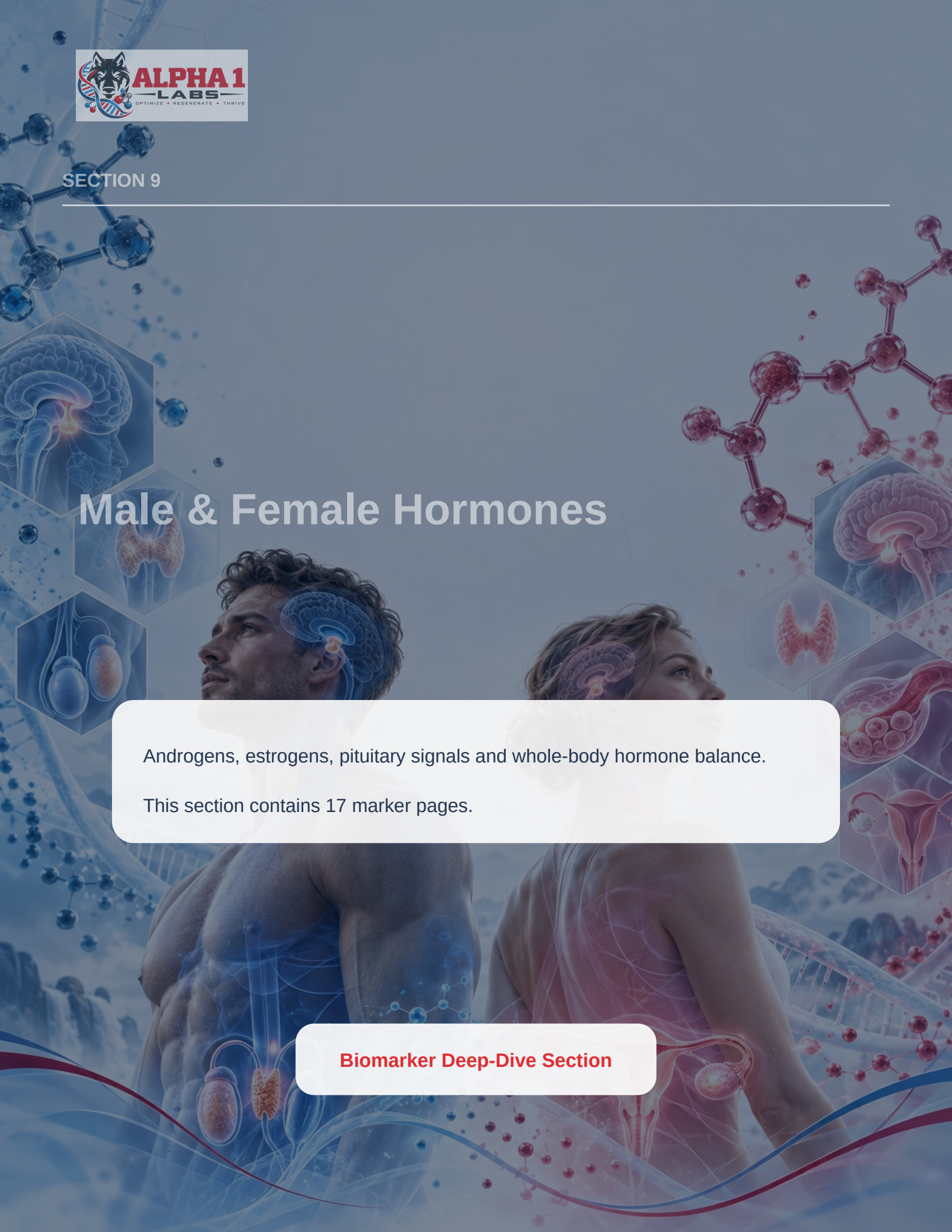
WHEN TO FOLLOW UP

A very high result, persistent unexplained elevation or elevation with fever, pain, weight loss or other systemic symptoms should be evaluated for an underlying cause.

Educational reference only. See clinical references near the end of this guide.

SECTION 9

Male & Female Hormones



Androgens, estrogens, pituitary signals and whole-body hormone balance.

This section contains 17 marker pages.

Biomarker Deep-Dive Section

MALE & FEMALE HORMONES

Testosterone, Total (Males)

WHAT IT MEASURES

Measures total circulating testosterone, including protein-bound and free hormone.

IN PLAIN ENGLISH

Total testosterone measures testosterone that is both protein-bound and free. In men, it is the standard starting test for suspected testosterone deficiency, but diagnosis requires symptoms plus consistently low, accurately measured values.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Low: reduced libido, fewer spontaneous erections, low energy, reduced muscle mass or strength, low mood, anemia or reduced bone density. High or excess treatment: acne, fluid retention, elevated hematocrit, reduced fertility and sometimes worsening sleep apnea.

IF HIGH

High may reflect prescribed testosterone, anabolic-androgenic steroid exposure, rare androgen-producing conditions or timing issues.

IF LOW

Low can reflect primary testicular disease, pituitary or hypothalamic disease, obesity, sleep problems, severe illness, energy deficit or medication effects.

WHAT CAN HELP

Optimize sleep, resistance training, energy balance, obesity treatment when appropriate, alcohol moderation and medication review. TRT should be used only when compatible symptoms or signs are paired with consistently low testosterone and the cause has been evaluated. TRT requires monitoring, including hematocrit and prostate-risk considerations, and it can suppress fertility. Do not use unapproved peptide or growth-hormone-secretagogue products as a shortcut to raise testosterone.

WHEN TO FOLLOW UP

Confirm suspected male hypogonadism with at least two appropriately timed early-morning tests and evaluate LH, FSH or other causes before treatment. Review fertility plans, hematocrit and prostate risk before TRT.

Educational reference only. See clinical references near the end of this guide.

MALE & FEMALE HORMONES

Testosterone, Total (Females)

WHAT IT MEASURES

Measures circulating testosterone in women.

IN PLAIN ENGLISH

Women produce much less testosterone than men, but it still contributes to libido, bone and muscle biology. The test is often used when androgen excess - such as acne, hirsutism or irregular cycles - is suspected.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Excess androgen effect in women can cause acne, increased facial or body hair, scalp hair thinning and irregular periods. Low androgen availability may be associated with reduced libido or energy, but those symptoms are nonspecific. In men, abnormal SHBG can change free testosterone even when total testosterone appears normal.

IF HIGH

High androgen availability may occur with PCOS, ovarian or adrenal androgen excess, anabolic steroid exposure or low SHBG.

IF LOW

Low androgen availability can occur with high SHBG, ovarian or adrenal insufficiency, aging or some medications; symptoms are nonspecific.

WHAT CAN HELP

Address the cause rather than simply raising or lowering testosterone. Body-composition management and insulin-sensitivity improvement can help some PCOS-related patterns. Review thyroid or liver disease and estrogen-containing medicines when SHBG is abnormal. Hormone treatment should be individualized; unapproved peptides are not a routine correction strategy.

WHEN TO FOLLOW UP

Follow up for rapidly progressive androgen symptoms, virilization, infertility, severe menstrual disturbance, or a large unexplained testosterone or DHEA-S elevation.

Educational reference only. See clinical references near the end of this guide.

MALE & FEMALE HORMONES

Testosterone, Free (Calculated)

WHAT IT MEASURES

Estimates the unbound fraction of testosterone available to tissues.

IN PLAIN ENGLISH

Free testosterone estimates the fraction not tightly bound to proteins and therefore more available to tissues. It can clarify symptoms when total testosterone is misleading because SHBG is high or low.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Excess androgen effect in women can cause acne, increased facial or body hair, scalp hair thinning and irregular periods. Low androgen availability may be associated with reduced libido or energy, but those symptoms are nonspecific. In men, abnormal SHBG can change free testosterone even when total testosterone appears normal.

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High androgen availability may occur with PCOS, ovarian or adrenal androgen excess, anabolic steroid exposure or low SHBG.

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WHEN TO FOLLOW UP

Follow up for rapidly progressive androgen symptoms, virilization, infertility, severe menstrual disturbance, or a large unexplained testosterone or DHEA-S elevation.

Educational reference only. See clinical references near the end of this guide.

MALE & FEMALE HORMONES

% Free Testosterone

WHAT IT MEASURES

Shows the percentage of total testosterone that is unbound.

IN PLAIN ENGLISH

This is the percentage of total testosterone calculated to be free. It helps show how strongly binding proteins are influencing hormone availability.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Excess androgen effect in women can cause acne, increased facial or body hair, scalp hair thinning and irregular periods. Low androgen availability may be associated with reduced libido or energy, but those symptoms are nonspecific. In men, abnormal SHBG can change free testosterone even when total testosterone appears normal.

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WHEN TO FOLLOW UP

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Educational reference only. See clinical references near the end of this guide.

MALE & FEMALE HORMONES

Sex Hormone-Binding Globulin (SHBG)

WHAT IT MEASURES

Protein made mainly by the liver that binds testosterone and estradiol.

IN PLAIN ENGLISH

SHBG is a liver-made protein that binds testosterone and estrogen. It acts like a transport and buffering system: higher SHBG usually means less free hormone is immediately available, and lower SHBG usually means more is available.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Excess androgen effect in women can cause acne, increased facial or body hair, scalp hair thinning and irregular periods. Low androgen availability may be associated with reduced libido or energy, but those symptoms are nonspecific. In men, abnormal SHBG can change free testosterone even when total testosterone appears normal.

IF HIGH

High androgen availability may occur with PCOS, ovarian or adrenal androgen excess, anabolic steroid exposure or low SHBG.

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WHEN TO FOLLOW UP

Follow up for rapidly progressive androgen symptoms, virilization, infertility, severe menstrual disturbance, or a large unexplained testosterone or DHEA-S elevation.

Educational reference only. See clinical references near the end of this guide.

MALE & FEMALE HORMONES

Free Androgen Index (FAI)

WHAT IT MEASURES

A calculated estimate of androgen activity based on testosterone and SHBG.

IN PLAIN ENGLISH

FAI is a calculation using total testosterone and SHBG to estimate androgen availability. It is used more often in women than in men and is a context tool, not a diagnosis.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Excess androgen effect in women can cause acne, increased facial or body hair, scalp hair thinning and irregular periods. Low androgen availability may be associated with reduced libido or energy, but those symptoms are nonspecific. In men, abnormal SHBG can change free testosterone even when total testosterone appears normal.

IF HIGH

High androgen availability may occur with PCOS, ovarian or adrenal androgen excess, anabolic steroid exposure or low SHBG.

IF LOW

Low androgen availability can occur with high SHBG, ovarian or adrenal insufficiency, aging or some medications; symptoms are nonspecific.

WHAT CAN HELP

Address the cause rather than simply raising or lowering testosterone. Body-composition management and insulin-sensitivity improvement can help some PCOS-related patterns. Review thyroid or liver disease and estrogen-containing medicines when SHBG is abnormal. Hormone treatment should be individualized; unapproved peptides are not a routine correction strategy.

WHEN TO FOLLOW UP

Follow up for rapidly progressive androgen symptoms, virilization, infertility, severe menstrual disturbance, or a large unexplained testosterone or DHEA-S elevation.

Educational reference only. See clinical references near the end of this guide.

MALE & FEMALE HORMONES

Estradiol (Sensitive)

WHAT IT MEASURES

Measures estradiol, the major biologically active estrogen, with an assay designed for lower concentrations.

IN PLAIN ENGLISH

Estradiol is the main biologically active estrogen. The sensitive assay is useful when estradiol levels are relatively low, such as in men or postmenopausal women.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Low estrogen in women can contribute to hot flashes, night sweats, vaginal dryness, sleep disruption, mood changes and bone loss. Higher-than-expected estrogen may be associated with breast tenderness, bloating or abnormal bleeding depending on context. In men, both unusually low and high estradiol can affect sexual function, bone and breast tissue.

IF HIGH

High estradiol may be normal depending on menstrual timing or pregnancy, or reflect exogenous estrogen, obesity, ovarian activity or altered metabolism.

IF LOW

Low estradiol is expected after menopause and can occur with hypothalamic suppression, ovarian insufficiency or some treatments.

WHAT CAN HELP

Interpret by sex, age, menstrual phase and symptoms. Adequate energy intake, sleep, resistance exercise and healthy body composition support endocrine health. For bothersome menopause symptoms, FDA-approved hormone therapy can be effective in appropriately selected patients after individualized risk assessment. Do not chase a single estradiol number with unapproved peptides.

WHEN TO FOLLOW UP

Abnormal bleeding, severe pelvic symptoms, fertility concerns, or unexpectedly extreme estradiol values should be evaluated clinically.

Educational reference only. See clinical references near the end of this guide.

MALE & FEMALE HORMONES

Progesterone

WHAT IT MEASURES

A reproductive hormone important for ovulation, the menstrual cycle and pregnancy.

IN PLAIN ENGLISH

Progesterone rises after ovulation and supports the uterine lining and pregnancy. In cycling women, the meaning of the result depends strongly on when in the cycle the sample was taken.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Symptoms depend on cycle timing and treatment status. Low progesterone in a cycling woman can accompany irregular bleeding or ovulatory problems. Higher levels can be normal after ovulation or pregnancy and may contribute to sleepiness, bloating or breast tenderness.

IF HIGH

High progesterone can be normal after ovulation or during pregnancy and can also reflect supplementation.

IF LOW

Low progesterone may simply mean the test was taken before ovulation; if appropriately timed, it can suggest absent or weak ovulation.

WHAT CAN HELP

Time the test correctly for the clinical question. Ensure adequate energy availability and avoid excessive training stress when menstrual function is disrupted. Progesterone therapy may be appropriate for specific reproductive or menopausal indications under medical supervision. Peptides are not a substitute.

WHEN TO FOLLOW UP

Follow up for infertility, recurrent pregnancy loss, persistent irregular bleeding or suspected ovulatory dysfunction.

Educational reference only. See clinical references near the end of this guide.

MALE & FEMALE HORMONES

Follicle-Stimulating Hormone (FSH)

WHAT IT MEASURES

Pituitary hormone that regulates ovarian follicle development and sperm production.

IN PLAIN ENGLISH

FSH is a pituitary signal that tells the ovaries to develop follicles and the testes to support sperm production. It helps show whether reproductive-hormone problems originate in the ovaries or testes or higher in the signaling system.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

FSH and LH themselves usually do not create symptoms. Symptoms come from the related hormone state - for example hot flashes, menstrual changes, infertility, low libido, erectile dysfunction or reduced testosterone.

IF HIGH

High FSH or LH can indicate reduced ovarian or testicular function because the pituitary is turning up the signal.

IF LOW

Low or inappropriately normal FSH or LH can suggest pituitary or hypothalamic suppression, energy deficit, severe illness or hormone treatment. The ratio itself is not diagnostic.

WHAT CAN HELP

Correct major energy deficiency, excessive training stress and underlying illness where relevant. Fertility or menopause treatment depends on the diagnosis, not the ratio alone. Avoid using peptide protocols to manipulate LH or FSH without a clear medical indication.

WHEN TO FOLLOW UP

Evaluate persistent abnormalities with sex hormones, menstrual or fertility history and, when appropriate, pituitary testing.

Educational reference only. See clinical references near the end of this guide.

MALE & FEMALE HORMONES

Luteinizing Hormone (LH)

WHAT IT MEASURES

Pituitary hormone that triggers ovulation in women and testosterone production in men.

IN PLAIN ENGLISH

LH is a pituitary signal that triggers ovulation in women and stimulates testosterone production in the testes. It is interpreted with sex hormones and FSH.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

FSH and LH themselves usually do not create symptoms. Symptoms come from the related hormone state - for example hot flashes, menstrual changes, infertility, low libido, erectile dysfunction or reduced testosterone.

IF HIGH

High FSH or LH can indicate reduced ovarian or testicular function because the pituitary is turning up the signal.

IF LOW

Low or inappropriately normal FSH or LH can suggest pituitary or hypothalamic suppression, energy deficit, severe illness or hormone treatment. The ratio itself is not diagnostic.

WHAT CAN HELP

Correct major energy deficiency, excessive training stress and underlying illness where relevant. Fertility or menopause treatment depends on the diagnosis, not the ratio alone. Avoid using peptide protocols to manipulate LH or FSH without a clear medical indication.

WHEN TO FOLLOW UP

Evaluate persistent abnormalities with sex hormones, menstrual or fertility history and, when appropriate, pituitary testing.

Educational reference only. See clinical references near the end of this guide.

MALE & FEMALE HORMONES

LH:FSH Ratio

WHAT IT MEASURES

A derived relationship between two pituitary reproductive hormones.

IN PLAIN ENGLISH

This ratio compares two pituitary reproductive signals. It can be descriptive in some conditions, but it is not a stand-alone diagnostic test for PCOS or other hormone disorders.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

FSH and LH themselves usually do not create symptoms. Symptoms come from the related hormone state - for example hot flashes, menstrual changes, infertility, low libido, erectile dysfunction or reduced testosterone.

IF HIGH

High FSH or LH can indicate reduced ovarian or testicular function because the pituitary is turning up the signal.

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WHAT CAN HELP

Correct major energy deficiency, excessive training stress and underlying illness where relevant. Fertility or menopause treatment depends on the diagnosis, not the ratio alone. Avoid using peptide protocols to manipulate LH or FSH without a clear medical indication.

WHEN TO FOLLOW UP

Evaluate persistent abnormalities with sex hormones, menstrual or fertility history and, when appropriate, pituitary testing.

Educational reference only. See clinical references near the end of this guide.

MALE & FEMALE HORMONES

Prolactin (PRL)

WHAT IT MEASURES

Pituitary hormone involved in lactation and reproductive signaling.

IN PLAIN ENGLISH

Prolactin is best known for stimulating breast milk production, but when elevated outside pregnancy it can suppress reproductive signaling and lower sex hormones.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

High prolactin can cause milk production outside pregnancy, menstrual changes, infertility, reduced libido, erectile dysfunction or low testosterone. Low prolactin is less often clinically important.

IF HIGH

High prolactin can occur with pregnancy, medications, hypothyroidism, chest-wall stimulation or a pituitary prolactinoma.

IF LOW

Low prolactin is usually less clinically important, though it can reflect pituitary dysfunction in the right context.

WHAT CAN HELP

Repeat a mildly elevated result under standardized conditions and review medications, thyroid status and pregnancy where relevant. Persistent elevation may need pituitary evaluation and specific medication. Diet, exercise and peptides are not reliable ways to normalize pathologic prolactin.

WHEN TO FOLLOW UP

Promptly evaluate persistent high prolactin with headaches, visual changes, galactorrhea, infertility or hypogonadal symptoms.

Educational reference only. See clinical references near the end of this guide.

MALE & FEMALE HORMONES

Dehydroepiandrosterone Sulfate (DHEA-S)

WHAT IT MEASURES

An adrenal androgen precursor produced mainly by the adrenal glands.

IN PLAIN ENGLISH

DHEA-S is a stable adrenal androgen marker. It is mainly useful for understanding how much androgen the adrenal glands are contributing, particularly in women with signs of androgen excess.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

High DHEA-S in women may contribute to acne, facial or body hair growth or menstrual irregularity. Low values are often age-related and may be symptom-free; fatigue or low libido are nonspecific.

IF HIGH

High DHEA-S suggests increased adrenal androgen production; marked elevations can require evaluation for adrenal disease.

IF LOW

Low DHEA-S often reflects age and can also occur with adrenal or pituitary problems; it is not a stand-alone diagnosis of adrenal fatigue.

WHAT CAN HELP

Treat the underlying endocrine condition if present. Avoid assuming that fatigue means DHEA deficiency, and avoid routine DHEA supplementation without a reason because it can worsen acne, hair growth and hormone-sensitive conditions. Peptides are not routine treatment.

WHEN TO FOLLOW UP

Marked elevations, rapid virilization or adrenal symptoms warrant endocrine evaluation.

Educational reference only. See clinical references near the end of this guide.

MALE & FEMALE HORMONES

Cortisol

WHAT IT MEASURES

Primary glucocorticoid hormone involved in stress response, blood pressure, metabolism and immune regulation.

IN PLAIN ENGLISH

Cortisol is an adrenal hormone that helps maintain blood pressure, glucose availability and the response to physical stress. It follows a daily rhythm, so timing matters.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Excess cortisol can be associated with sleep disruption, muscle weakness, easy bruising, mood changes, high blood pressure, central weight gain and higher glucose. Too little cortisol can cause fatigue, weight loss, nausea, dizziness, low blood pressure or salt craving.

IF HIGH

High cortisol can reflect normal stress, timing, medications or true cortisol excess such as Cushing syndrome.

IF LOW

Low cortisol can occur with adrenal insufficiency, pituitary disease or glucocorticoid withdrawal and can be dangerous when severe.

WHAT CAN HELP

Prioritize regular sleep, recovery, adequate energy intake and appropriate training load, but do not diagnose cortisol disorders from one random result. Suspected excess or deficiency requires specific confirmatory endocrine testing. Peptides are not an evidence-based cortisol-normalization strategy.

WHEN TO FOLLOW UP

Urgent evaluation is warranted for severe weakness, vomiting, low blood pressure or suspected adrenal crisis. Persistent abnormal cortisol needs appropriately timed or confirmatory testing.

Educational reference only. See clinical references near the end of this guide.

MALE & FEMALE HORMONES

Insulin-Like Growth Factor 1 (IGF-1)

WHAT IT MEASURES

A liver-produced hormone that reflects growth-hormone activity and supports growth and tissue metabolism.

IN PLAIN ENGLISH

IGF-1 is produced mainly by the liver in response to growth hormone. Because it changes less hour to hour than growth hormone, it is used as a screening marker of growth-hormone activity.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

Persistently high IGF-1 in the right clinical setting can accompany growth-hormone excess, with enlarged hands or feet, joint pain, sweating, headaches or sleep apnea. Low IGF-1 can occur with pituitary disease, malnutrition or liver disease and may be associated with reduced muscle or energy, but it is not diagnostic by itself.

IF HIGH

High age-adjusted IGF-1 can suggest growth-hormone excess and needs confirmation.

IF LOW

Low IGF-1 can reflect growth-hormone deficiency, malnutrition, liver disease, hypothyroidism or severe illness.

WHAT CAN HELP

Adequate calories, protein, sleep and resistance training support normal anabolic physiology. Persistently abnormal IGF-1 requires endocrine evaluation; do not use unapproved growth-hormone secretagogues or research peptides to optimize IGF-1.

WHEN TO FOLLOW UP

Persistent high IGF-1, progressive enlargement of hands or feet, jaw changes, headaches or suspected pituitary disease warrant endocrine work-up.

Educational reference only. See clinical references near the end of this guide.

MALE & FEMALE HORMONES

Testosterone:Cortisol Ratio

WHAT IT MEASURES

A derived comparison sometimes used to describe anabolic versus stress-hormone balance.

IN PLAIN ENGLISH

This is a derived comparison between an anabolic sex hormone and a stress hormone. It is sometimes used in sports contexts, but it is not a validated stand-alone medical diagnosis.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

The ratio itself causes no symptoms. Any symptoms come from the underlying hormone abnormality, illness, sleep disruption, calorie deficit, medication effect or training stress.

IF HIGH

A high ratio reflects the balance of the two underlying hormones, not a separate disease.

IF LOW

A low ratio likewise reflects the underlying hormones and should not be treated independently.

WHAT CAN HELP

Use the individual hormone results, symptoms, sleep, energy availability, training load and medical history rather than targeting the ratio. There is no validated peptide protocol for normalizing these derived ratios.

WHEN TO FOLLOW UP

If the underlying hormone values are abnormal or symptoms are significant, evaluate those directly rather than repeating the ratio alone.

Educational reference only. See clinical references near the end of this guide.

MALE & FEMALE HORMONES

Cortisol:DHEA-S Ratio

WHAT IT MEASURES

A derived comparison of adrenal glucocorticoid and androgen activity.

IN PLAIN ENGLISH

This compares two adrenal-related hormones. It can describe a pattern, but there is no universal medical target that should be optimized independently of the actual hormone values.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

The ratio itself causes no symptoms. Any symptoms come from the underlying hormone abnormality, illness, sleep disruption, calorie deficit, medication effect or training stress.

IF HIGH

A high ratio reflects the balance of the two underlying hormones, not a separate disease.

IF LOW

A low ratio likewise reflects the underlying hormones and should not be treated independently.

WHAT CAN HELP

Use the individual hormone results, symptoms, sleep, energy availability, training load and medical history rather than targeting the ratio. There is no validated peptide protocol for normalizing these derived ratios.

WHEN TO FOLLOW UP

If the underlying hormone values are abnormal or symptoms are significant, evaluate those directly rather than repeating the ratio alone.

Educational reference only. See clinical references near the end of this guide.

SECTION 10

Prostate

PSA monitoring and prostate-related screening context.

This section contains 1 marker page.

Biomarker Deep-Dive Section

PROSTATE

Prostate-Specific Antigen (PSA)

WHAT IT MEASURES

A protein made by prostate tissue and used as part of prostate evaluation and monitoring.

IN PLAIN ENGLISH

PSA is a protein made by prostate tissue. A small amount normally leaks into blood. The test is useful because changes in PSA can signal that the prostate needs a closer look, but PSA cannot by itself tell whether the cause is cancer, enlargement, infection or inflammation.

COMMON DAY-TO-DAY EFFECTS IF OUT OF RANGE

An elevated PSA often causes no symptom. Benign prostate enlargement can cause urinary frequency, urgency, weak stream or nighttime urination. Prostatitis may cause pelvic pain, fever or painful urination. Prostate cancer can also be asymptomatic.

IF HIGH

Higher PSA can occur with prostate cancer, benign enlargement, prostatitis, UTI, recent ejaculation or urinary or prostate procedures. The trend over time and clinical context matter.

IF LOW

A low PSA is generally reassuring but does not completely rule out prostate cancer.

WHAT CAN HELP

Do not try to treat the PSA number with diet, supplements or peptides. Confirm unexpected elevations and evaluate likely causes with the appropriate clinician. If someone is receiving TRT, PSA or prostate monitoring should follow the prescriber's protocol and age or risk-based screening guidance.

WHEN TO FOLLOW UP

Follow up for a confirmed PSA rise, urinary symptoms, blood in urine or semen, pelvic or back pain or an abnormal prostate exam. PSA screening decisions should be individualized.

Educational reference only. See clinical references near the end of this guide.

Clinical References

MedlinePlus - Hemoglobin A1C / Blood Glucose
https://medlineplus.gov/a1c.html

MedlinePlus - Cholesterol and Lipid Testing
https://medlineplus.gov/lab-tests/cholesterol-levels/

MedlinePlus - Liver Function Tests
https://medlineplus.gov/lab-tests/liver-function-tests/

MedlinePlus - eGFR / Kidney Function
https://medlineplus.gov/lab-tests/estimated-glomerular-filtration-rate-egfr-and-gfr-tests/

MedlinePlus - Complete Blood Count
https://medlineplus.gov/lab-tests/complete-blood-count-cbc/

MedlinePlus - Iron Tests and Ferritin
https://medlineplus.gov/lab-tests/iron-tests/

MedlinePlus - Vitamin D Testing
https://medlineplus.gov/lab-tests/vitamin-d-test/

MedlinePlus - TSH / Thyroid Testing
https://medlineplus.gov/lab-tests/tsh-thyroid-stimulating-hormone-test/

MedlinePlus - C-Reactive Protein
https://medlineplus.gov/lab-tests/c-reactive-protein-crp-test/

MedlinePlus - Hormones Overview
https://medlineplus.gov/hormones.html

MedlinePlus - PSA Test
https://medlineplus.gov/lab-tests/prostate-specific-antigen-psa-test/

Hormone, GLP-1 & Peptide Safety Notes

TESTOSTERONE THERAPY

Endocrine Society guidance supports diagnosing male hypogonadism only when compatible symptoms or signs are paired with unequivocally and consistently low testosterone, with repeat early-morning testing and evaluation of cause. TRT can raise hematocrit, suppress fertility and requires monitoring.

MENOPAUSAL HORMONE THERAPY

The Menopause Society describes hormone therapy as an effective treatment for bothersome menopausal symptoms in appropriately selected patients, with benefits and risks individualized to age, timing, history and symptom severity.

GLP-1 / GLP-1-GIP MEDICINES

FDA-approved GLP-1-class medicines can be appropriate for specific indications such as diabetes or chronic weight management. They should be used for the diagnosed condition, not solely because a biomarker is outside a preferred range.

COMPOUNDED / UNAPPROVED GLP-1 PRODUCTS

FDA states unapproved versions do not undergo FDA review for safety, effectiveness and quality. FDA recommends compounded products only when a patient's medical need cannot be met by an FDA-approved drug.

RESEARCH / UNAPPROVED PEPTIDES

FDA has identified safety concerns or insufficient human safety information for multiple peptide substances used in compounding. This guide therefore does not recommend unapproved peptide products as a routine way to normalize biomarkers.