

EARLY ACCESS · SUMMER 2026

What Your Doctor Isn't Telling You *About Your Labs.*

The 9 biomarkers that map your PCOS pattern, and what optimal looks like for you.

SCIENCE BACKED

UPSTREAM DRIVERS

9 BIOMARKERS

"Standard reference ranges are built to catch disease in a population. They are not designed to tell you whether your body is in its most resilient state. For women with PCOS, the gap between 'not sick' and 'functioning at your best' is exactly where most of the suffering lives."

KASCADE HEALTH™

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You are not *imagining it.*

You have sat in that office, had your blood drawn, been handed a result sheet with "normal" next to every line, and then been sent home still exhausted, still struggling with your weight, still cycling unpredictably, still wondering what is actually going on.

Most doctors do not explain this: standard lab reference ranges are designed to catch disease in a large population. They are not designed to tell you whether your body is in its most protective and resilient state.

There is a real gap between "not sick" and **functioning at your best**. For women with PCOS, that gap is exactly where most of the suffering lives. It is also where this guide starts.

FOR EACH MARKER YOU WILL SEE:

01

The standard lab range

"normal" as defined by most panels

02

The functional target

a tighter range where women tend to feel and function best

03

Why it matters

the upstream driver it reflects

A NOTE ON FUNCTIONAL TARGETS

Functional targets are not official diagnostic cutoffs. They are practice targets drawn from research and clinical experience: the ranges where women tend to feel and function best. They aim for "optimal," not just "not diabetic." This guide is educational, not diagnostic. Bring it to your next appointment.

How to use this: pull up your most recent bloodwork and walk through each marker. The pattern across several markers, not any one single number, tells the real story.

Fasting Insulin

THE INSULIN RESISTANCE SIGNAL

PILLAR 01 · GLUCOSE

TYPICAL LAB RANGE

Up to ~25 $\mu\text{IU/mL}$
(often not even ordered)

FUNCTIONAL TARGET

Below 7 $\mu\text{IU/mL}$
fasting

OPTIMAL

STILL "NORMAL" ON STANDARD LABS



► Functional target · < 7 $\mu\text{IU/mL}$

Standard limit · ~25 $\mu\text{IU/mL}$

● WHY IT MATTERS

Insulin moves glucose from your blood into your cells. When insulin stays elevated long-term, it does far more than manage blood sugar. It signals the ovaries to produce more testosterone, disrupts the hormones that trigger ovulation, and drives the fat storage pattern so common in PCOS. Many standard panels check glucose and skip fasting insulin entirely, so early metabolic stress can go undetected for years.

● WHAT IT REVEALS

In PCOS research, fasting insulin above 7 $\mu\text{IU/mL}$ is where the early strain starts to show, even when fasting glucose still looks normal. The usual lab cutoff of 25 $\mu\text{IU/mL}$ catches only extreme cases, not whether your insulin is in a truly healthy zone. A functional target below 7 $\mu\text{IU/mL}$ reflects the range where insulin is less likely to drive androgen excess and ovulatory problems.

● THE UPSTREAM CONNECTION

In the most common PCOS phenotype, elevated insulin is a primary driver of androgen excess and ovulatory dysfunction. Addressing insulin resistance is not a side note. For many women, it is the single highest-leverage starting point for meaningful symptom relief.

IN HER WORDS

"My body doesn't react like a normal body would."

HOMA-IR

INSULIN RESISTANCE COMPOSITE SCORE

PILLAR 01 · GLUCOSE

TYPICAL LAB RANGE

Below 2.0–2.5
research IR cutoff

FUNCTIONAL TARGET

Below 1.5
metabolic medicine target

OPTIMAL

STILL "NORMAL" ON STANDARD LABS



► Functional target · < 1.5

Standard limit · 2.0–2.5

● WHY IT MATTERS

HOMA-IR combines fasting glucose and fasting insulin into one number reflecting your overall insulin sensitivity. Formula: fasting glucose (mg/dL) × fasting insulin (μIU/mL) ÷ 405. It often gives a clearer picture than either marker alone and is one of the most actionable numbers to track over time as you work on metabolic health.

● WHAT IT REVEALS

In many PCOS studies, a HOMA-IR of 2.0–2.5 or higher defines clinically meaningful insulin resistance, even when fasting glucose is still "normal." The functional target below 1.5 is a more protective goal used in metabolic medicine. It reflects a state where the insulin-androgen feedback cycle is under less strain.

● THE UPSTREAM CONNECTION

A high HOMA-IR tells you your body is working hard just to keep glucose steady. That workload fuels the loop between insulin, inflammation, and androgens. The relationship is bidirectional: insulin resistance increases stress hormone activity, and chronic stress worsens insulin sensitivity. Breaking the loop requires addressing both sides.

IN HER WORDS

"CICO hasn't been working for me. I finally understand why."

Fasting Glucose & HbA1c

BLOOD SUGAR REGULATION PICTURE

PILLAR 01 · GLUCOSE

TYPICAL LAB RANGE

Glucose: 70–99 mg/dL
HbA1c: below 5.7%

FUNCTIONAL TARGET

Glucose: 72–85 mg/dL
HbA1c: below 5.3%

OPTIMAL

UPPER "NORMAL" RANGE

Functional target · 72–85 mg/dL

Upper normal · 99 mg/dL

● WHY IT MATTERS

Fasting glucose is a single snapshot. HbA1c reflects a three-month average of blood sugar control. Both can look perfectly normal while insulin is already working overtime in the background to compensate. This compensated state is extremely common in PCOS and is easy to miss if glucose is the only thing ordered.

● WHAT IT REVEALS

Research links fasting glucose in the upper normal range (90+ mg/dL) to higher risk of future metabolic complications, especially when insulin or HOMA-IR are also trending up. A research target for HbA1c sits near 5.3%, tighter than the 5.7% prediabetes line, because in a young woman with PCOS an HbA1c drifting into the mid-5s is a metabolic signal, not reassurance. These functional targets are proactive benchmarks, not disease thresholds.

● THE UPSTREAM CONNECTION

Rapid blood sugar fluctuations are potent triggers for cortisol and adrenaline release. When blood sugar stays stable, stress hormones follow a calmer daily pattern, and that directly supports more consistent reproductive hormone signaling. Stable glucose is one of the deepest metabolic foundations for PCOS management.

IN HER WORDS

"My bloodwork is too clean to be prescribed anything."

Total Testosterone & SHBG

THE FULL ANDROGEN PICTURE · FAI

ANDROGEN · INSULIN-LINKED

TYPICAL LAB RANGE

Total T: 8–60 ng/dL
SHBG: 18–144 nmol/L

FUNCTIONAL TARGET

Total T: below 30 ng/dL
SHBG: above 70 nmol/L
FAI below 5 · FAI = (Total T ÷ SHBG) × 100

OPTIMAL

INVESTIGATE ABOVE 70



► Functional target · Total T below 30 ng/dL

Provider referral · above 70 ng/dL

● WHY IT MATTERS

Total testosterone is often reported as "normal" in PCOS, but two numbers decide how much androgen actually reaches your tissues: total testosterone and SHBG, the liver protein that holds testosterone inactive in the bloodstream. The Free Androgen Index (FAI) combines them into one number. When SHBG is low, more testosterone is biologically active even when the total looks fine on a standard report.

● WHAT IT REVEALS

Insulin directly suppresses SHBG production in the liver, so a low SHBG sitting under a "normal" total testosterone is a quiet sign of insulin's reach. Research targets run tighter than lab ranges: total testosterone below 30 ng/dL and SHBG above 70 nmol/L keep FAI under about 5, the range where androgen-driven symptoms like acne and unwanted hair growth tend to be less pronounced. Testosterone is most reliable by the LC-MS/MS method, since immunoassay is unreliable at female-range levels.

● THE UPSTREAM CONNECTION

Improving insulin sensitivity is one of the strongest ways to raise SHBG and lower FAI, without targeting testosterone directly. Work on the upstream metabolic signal and the downstream androgen symptoms often ease on their own. A total testosterone above 70 ng/dL is a provider conversation in its own right, to look beyond PCOS for the source.



IN HER WORDS

"No doctor was able to figure this out, and it was extremely frustrating."

DHEA-S

THE ADRENAL ANDROGEN SIGNAL

PILLAR 03 · ADRENAL / HPA

TYPICAL LAB RANGE

35–430 $\mu\text{g/dL}$

broad lab reference range

FUNCTIONAL TARGET

100–350 $\mu\text{g/dL}$

above 430 = provider referral

LOWER OUTPUT

ADRENAL-LED

► Functional target · 100–350 $\mu\text{g/dL}$

Provider referral · above 430 $\mu\text{g/dL}$

● WHY IT MATTERS

DHEA-S is an androgen made almost entirely by your adrenal glands, not your ovaries. That makes it the single marker that tells you whether part of your androgen load is coming from your stress-response system rather than your ovaries. Two women can share the same testosterone and have very different DHEA-S, and that difference points to very different starting places.

● WHAT IT REVEALS

In research, DHEA-S toward the upper end, and especially above about 350 $\mu\text{g/dL}$, is associated with a larger adrenal contribution to androgen excess, a pattern often seen alongside fatigue, stress sensitivity, and disrupted sleep. A value above 430 $\mu\text{g/dL}$ is a provider conversation on its own, to rule out non-PCOS adrenal sources. DHEA-S in the 100–350 range reflects an adrenal androgen output that is not adding fuel to the fire.

● THE UPSTREAM CONNECTION

DHEA-S sits downstream of the HPA stress axis, one of the three upstream drivers. When DHEA-S is elevated while your insulin markers stay calm, the research points toward an adrenal-led pattern, where sleep, circadian rhythm, and stress load tend to move the needle more than carbohydrate restriction does. The marker reflects the driver. It does not, by itself, define it.

IN HER WORDS

"I wake up every morning at 3am."

LH / FSH Ratio

OVULATORY DYSFUNCTION MARKER

PILLAR 03 · NEUROENDOCRINE

TYPICAL LAB RANGE

LH $\approx$ FSH (~1:1)

early follicular phase, days 2–4

FUNCTIONAL TARGET

LH/FSH below 2:1

values above 3:1 = common PCOS pattern

EVEN (~1:1)

COMMON PCOS PATTERN



► Functional target · below 2:1

Common in PCOS · above 3:1

● WHY IT MATTERS

LH and FSH work together to grow follicles and trigger ovulation. In many women with PCOS, LH runs chronically higher than FSH. That pattern disrupts follicle development and blocks the clean LH surge needed to release an egg. The ratio between the two hormones often tells you more than either number alone.

● WHAT IT REVEALS

An LH/FSH ratio above 2 suggests altered signaling between the brain and the ovaries, mainly driven by changes in GnRH pulse frequency and high AMH from the enlarged follicle pool. This explains irregular cycles and why ovulation induction can be more complex in PCOS. It is most useful when drawn early in the cycle (days 2–4) and less reliable if you are currently on hormonal birth control.

● THE UPSTREAM CONNECTION

Your reproductive axis does not exist in isolation from stress. Chronic HPA axis activation changes the environment around GnRH neurons and further disrupts healthy LH patterns. Studies consistently show women with PCOS mount a stronger cortisol response than women without. Calming the stress system is part of restoring ovulation.

IN HER WORDS

"Every birthday candle wish was for normal periods."

hsCRP

SYSTEMIC INFLAMMATION MARKER

PILLAR 02 · INFLAMMATION

TYPICAL LAB RANGE

Below 3.0 mg/L
standard lab threshold

FUNCTIONAL TARGET

Below 1.0 mg/L
ideally closer to 0.5 mg/L

OPTIMAL

STILL "NORMAL" ON STANDARD LABS



▶ Functional target · < 1.0 mg/L

Standard limit · 3.0 mg/L

● WHY IT MATTERS

hsCRP (high-sensitivity C-reactive protein) is a sensitive marker of low-grade, chronic inflammation. PCOS is now recognized as both a metabolic and an inflammatory condition, not only a hormone disorder. Chronic inflammation worsens insulin resistance, pushes androgen production higher, and weakens ovarian function, often driving all three processes at once.

● WHAT IT REVEALS

Multiple studies find elevated hsCRP in women with PCOS, including those who are normal weight, suggesting inflammation is not solely about body composition, though some studies do find that BMI explains part of the elevation. The functional target below 1.0 mg/L matches the American Heart Association definition of low cardiovascular risk and is a practical long-term metabolic goal. Tracking it over time is more informative than any single reading.

● THE UPSTREAM CONNECTION

Gut dysbiosis, blood sugar swings, poor sleep quality, and chronic psychological stress all raise inflammatory signaling over time. For many women with PCOS, bringing hsCRP down is the missing link between metabolic health, hormone regulation, and mood stabilization. Research suggests it responds meaningfully to sustained lifestyle changes, particularly improvements in sleep quality, blood sugar stability, and gut health.

IN HER WORDS

"I start the day flat, and by night I look six months pregnant."

Vitamin D

25-OH D3 · THE CELLULAR ENERGY MODIFIER

PILLAR 04 · CELLULAR ENERGY

TYPICAL LAB RANGE

Above 30 ng/mL
lab "sufficient"

FUNCTIONAL TARGET

40–60 ng/mL
deficiency flagged below 20

DEFICIENT

OPTIMAL (PCOS RESEARCH)



▶ Functional target · 40–60 ng/mL

Deficiency line · below 20 ng/mL

● WHY IT MATTERS

Vitamin D behaves more like a hormone than a vitamin. Its receptors sit in your ovaries, fat tissue, immune cells, and the cells that respond to insulin. Deficiency is near-universal in PCOS, with research putting it around 85 percent, and low levels are associated with worse insulin sensitivity and higher inflammation.

● WHAT IT REVEALS

A level the standard lab calls "sufficient," just above 30 ng/mL, can still sit below the range associated with stronger metabolic markers in PCOS research, which clusters around 40 to 60 ng/mL. Below 20 ng/mL is a flagged deficiency and a provider conversation, because correcting it is one of the simpler, higher-yield moves available to you.

● THE UPSTREAM CONNECTION

Vitamin D maps to the cellular energy pillar. It will not drive your PCOS on its own, and it should never be treated as the headline. Low vitamin D adds to the overall metabolic and inflammatory load, so moving it into the optimal range removes friction from every other pattern you are working on.

IN HER WORDS

"I feel lazy, but I know I'm not."

Thyroid Panel

TSH · FREE T3 · FREE T4

CROSS-PILLAR MODIFIER

TYPICAL LAB RANGE

TSH: 0.5–4.5 μ IU/mL

a TSH-only screen misses the full picture

FUNCTIONAL TARGET

TSH: 1.0–2.0 μ IU/mL

Free T3: upper third · Free T4: mid–upper half

OPTIMAL WINDOW

UPPER "NORMAL"



► Functional target · TSH 1.0–2.0

Upper normal · 4.5 μ IU/mL

● WHY IT MATTERS

Thyroid function and PCOS share a long list of overlapping symptoms: fatigue, weight gain, irregular cycles, hair changes, and mood shifts. They also interact through shared pathways, including insulin signaling and the HPA stress axis. A TSH-only screen routinely misses mild thyroid slowdowns. Free T3 and Free T4 are needed to see how well the thyroid is actually functioning.

● WHAT IT REVEALS

TSH values in the upper normal range (2.5–4.5 μ IU/mL) have been linked to worse insulin sensitivity, elevated prolactin, and a heavier PCOS symptom burden, even without meeting criteria for clinical hypothyroidism. Some women see significant improvement in stubborn symptoms when thyroid function is optimized within a tighter functional range. Thyroid is read as a modifier here, not a PCOS pattern on its own.

● THE UPSTREAM CONNECTION

Chronically elevated cortisol directly suppresses the thyroid axis: it reduces TRH signaling in the brain, lowers TSH output, and impairs conversion of T4 into active T3. The stress–thyroid connection is direct and bidirectional. Addressing chronic stress systematically supports thyroid health, even without changing medication.

IN HER WORDS

"In order to function I need at least ten hours of sleep."

PUTTING IT ALL TOGETHER

"No single number tells the whole story. The pattern across markers is the point."

When you see the cluster, elevated insulin, high HOMA-IR, low SHBG, elevated DHEA-S, LH above FSH, rising hsCRP, low vitamin D, glucose trending up, and a sluggish thyroid, you are looking at a set of **upstream drivers** working against each other and against you at the same time. Cascade™ was built specifically to map that cluster, identify which drivers are most active, and give you a clear educational starting point, without guesswork, generic protocols, or waiting six months for your next appointment.

THE THREE UPSTREAM DRIVERS

HPA AXIS & STRESS

Dysregulates GnRH pulsing, suppresses thyroid conversion, and amplifies adrenal androgen output while worsening insulin resistance, which compounds ovarian androgen excess.

INSULIN RESISTANCE

Drives androgen excess, directly suppresses SHBG, and creates the metabolic feedback loop central to all PCOS phenotypes.

INFLAMMATION

Worsens insulin signaling, disrupts the ovarian microenvironment, and bridges the gap between metabolic and mood symptoms.

THE UPSTREAM CASCADE

Chronic stress & HPA activation

→ Insulin resistance

→ Androgen excess

→ Hormonal disruption

→ Active symptoms

PCOS has real genetic and neuroendocrine origins. This is not something you caused. At the same time, when you address stress load and insulin resistance in parallel, androgen symptoms often shift meaningfully, even without targeting androgens directly.

This is the science Cascade™ is built on. The platform exists because the gap between "your labs are normal" and actually understanding your body should not require a PhD to navigate. Cascade makes the upstream approach accessible: **your data, interpreted through a lens that was designed for PCOS, not retrofitted from general metabolic medicine.**

EARLY ACCESS · SUMMER 2026

Be first inside *Kascade.*

Founding-tier pricing. PhD-designed AI lab interpreter.

Your data. Your patterns. Your decisions.

FOUNDING PRICING

AI LAB INTERPRETER

LAB TRACKER

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INSIDE THE APP · LAB TRACKER + PERSONALIZED LEARNING ROADMAP

STEP 01

Log Your Labs

Enter results from your own provider or a direct-to-consumer lab.

STEP 02

Patterns Identified

See which of the 4 pillars show patterns consistent with research.

STEP 03

Your Roadmap

Receive an educational guide tailored to your pattern, not a generic protocol.

STEP 04

Track Over Time

Log each quarter, watch your own trends, bring your data to every visit.

WHAT FOUNDING MEMBERS GET AT KASCADEHEALTH.COM

● Pattern Identification

Your labs mapped to the 4 PCOS pillars, not just a number dump.

● AI Lab Interpreter

PhD-designed AI reads your results and flags what actually matters.

● Lab Tracker

Log every quarter, watch your own trends, and carry your history into every provider visit.

● Provider Conversation Prep

A printable, plain-language guide with research-grounded questions to bring to your appointment.

Kascade Health™ is a health education and self-monitoring platform. The lab interpreter and roadmap features are for educational purposes only. Kascade does not diagnose, treat, or prescribe. Patterns identified are based on published research ranges, not clinical diagnosis. Always consult a qualified healthcare provider regarding your individual health decisions.