Metabolomics, Simply Put

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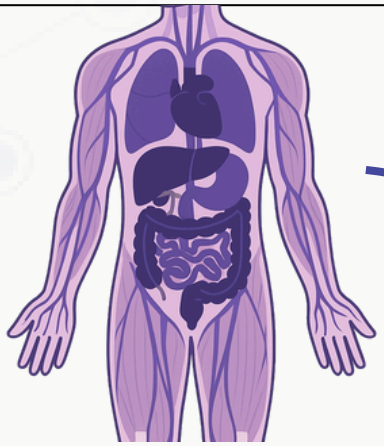

Your body has major systems, like the brain, liver, muscles, and heart

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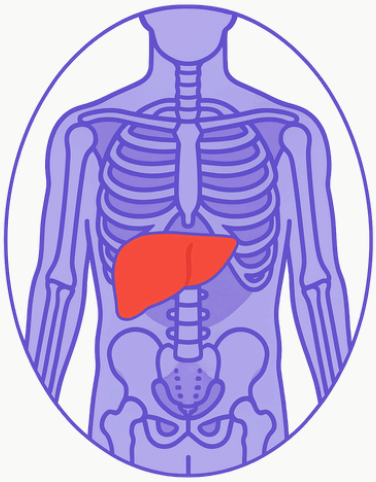

Each system is made of billions of cells. The liver alone has over 240 billion.

3

Inside every cell, billions of chemical reactions happen every second.

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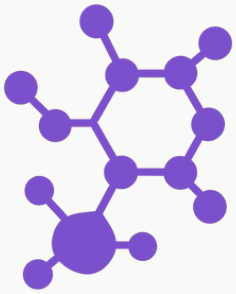

These reactions run on metabolites, the small molecules that fuel and build your body.

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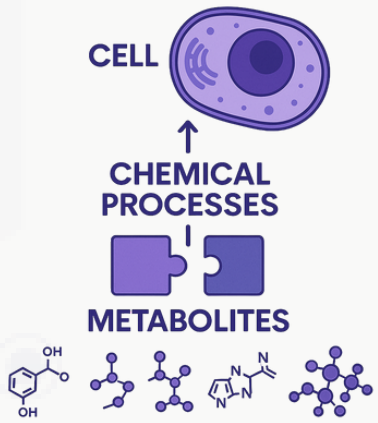


Metabolomics measures the ecosystem of metabolites your body uses to function, adapt, and rebuild, not just calorie burn.

Metabolomics takes an "-omic" view, mapping your whole metabolic system, not just a few markers.

Metabolomics requires a new way of thinking.

You've seen it before.

The patient has symptoms: fatigue, joint pain, inflammation. A few markers are abnormal, but there's still no clear diagnosis.

More tests are run. Patterns are considered. Still, the picture is fragmented.

That's the challenge of isolated data, looking at a dynamic system through disconnected snapshots.

Most clinical reasoning relies on interpreting one marker at a time, like glucose, CRP, or TSH, to piece together a larger story.

But metabolism doesn't work that way. It's dynamic, interconnected, and always adapting.

Until AI-enabled pattern recognition, there was no way to see how hundreds of metabolites interact in concert or how interventions affect the entire system.

That's why metabolomics isn't just more data. It's a new framework.

Imagine your body as an orchestra:

Most tests hear solo instruments, one at a time.

Clinicians learn to piece those notes together and imagine how the whole system might be functioning.

Metabolomics listens to the full orchestra.

It reveals how the body's systems are interacting in real time, providing clarity that supports, validates, and strengthens clinical insight.

Univariate Markers vs. Pathway Modeling

Most Tests

Is this high or low?

LDL

ALT

GGT

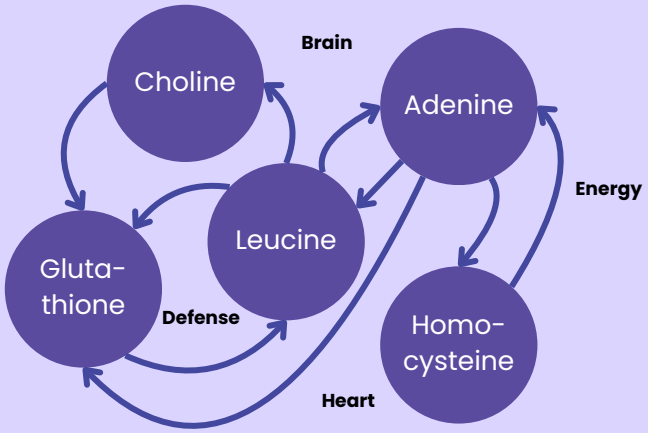
- Looks at markers independently
- Prone to missing early dysfunction

There is no context for what drives the imbalance

Pathway Modeling

(Theriome)

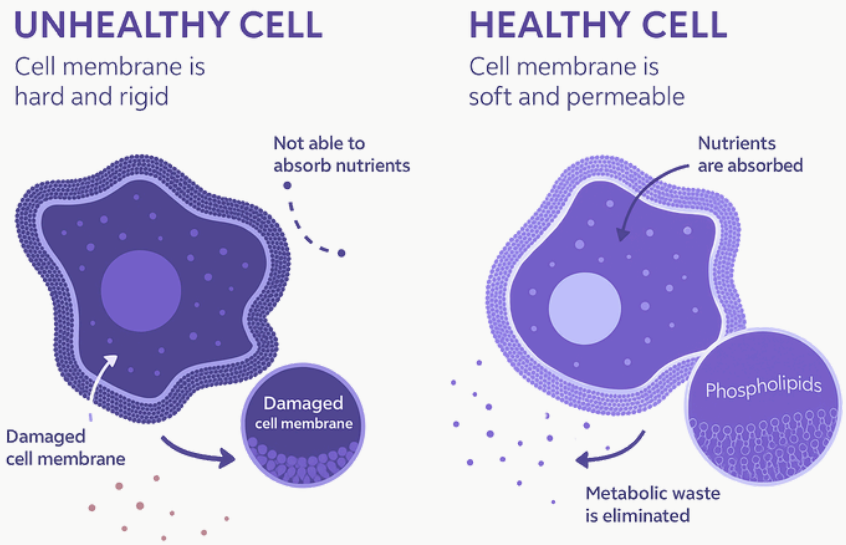
What's happening in the system?



We map how markers interact to understand your cellular function and how to improve it.

Metabolomics shows how your body is functioning as a whole, in real time. Metabolomics doesn't just listen to one instrument at a time, it hears the entire symphony.

This lets us assess your cellular health, not just your lab numbers.



Molecular Imbalance | **Cellular Stress** | **Tissue Disruption** | **Organ/System Dysfunction** | **Clinical Disease**

Early Functional Markers
What is starting to go wrong?

Late-Stage Indicators
What has already gone wrong?

Function Before Failure

See dysfunction early. Understand it deeply. Intervene with clarity.
In longevity or chronic disease care, early functional markers let you intervene before damage occurs, target root dysfunction, and track progress before symptoms or labs shift.

Metabolomics does this by measuring hundreds of metabolites to show how your body is producing energy, clearing toxins, and managing inflammation. It gives you a real-time read on how the system is adapting, so you can guide care proactively, not reactively.

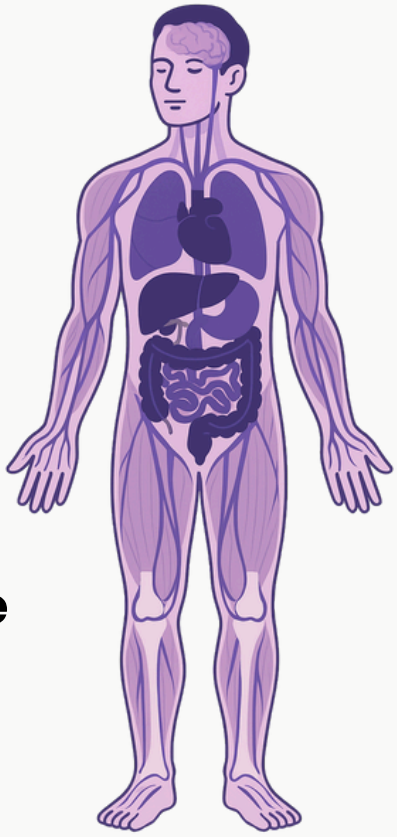
Traditional Labs

- Detect disease
- Flag late-stage issues
- React to problems

Theriome Metabolomics

- Detect dysfunctions
- Use early signals
- Guide next steps
- Prevent + optimize

Your metabolism turns what you eat, feel, and breathe into biology.



Food. Sleep. Exercise. Medications. Supplements. Stress. Screen time. Sunlight.

All of it affects your chemistry and it shows up in your metabolism.

That's what makes metabolomics powerful: it shows how your body responds to your lifestyle, not just what's wrong.

Your lifestyle, measured in real time

Your metabolism is where genes and lifestyle meet.

Genetics drives about 20% of your health.

The other 80% comes from your choices, and metabolomics shows their impact.

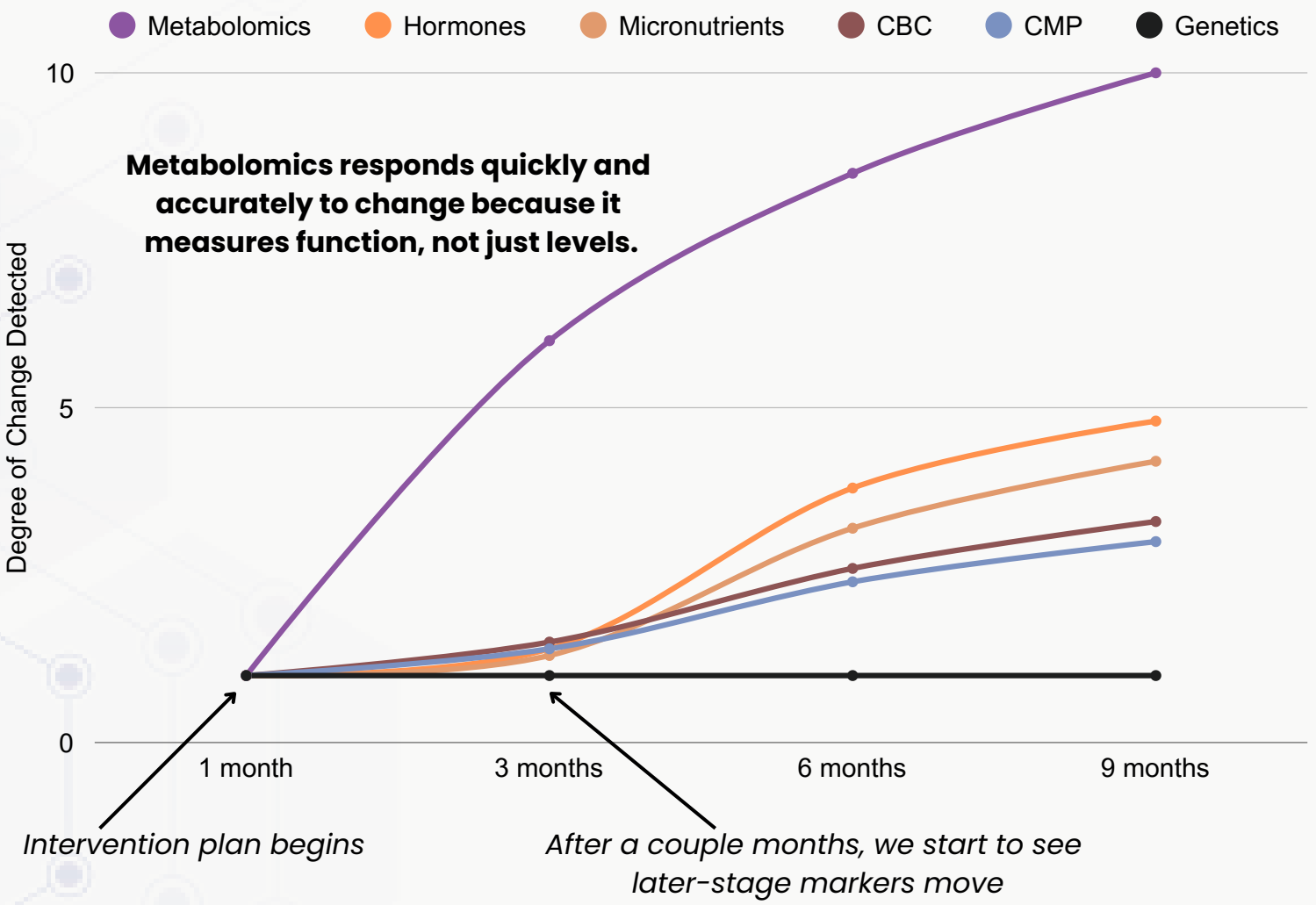
Your lab said 'normal', but your cells say otherwise.

- Genetics shows what might happen, not how you're doing now
- Most blood panels only detect problems after they've already developed.
- Metabolomics shows how your body is adapting, often before symptoms appear.

Better lens, better decisions

It's about understanding your body so you can make smarter decisions. We assess how the system is working, not just measure molecules.

Function Before Outcome



1) Quickly see if the protocol is effective

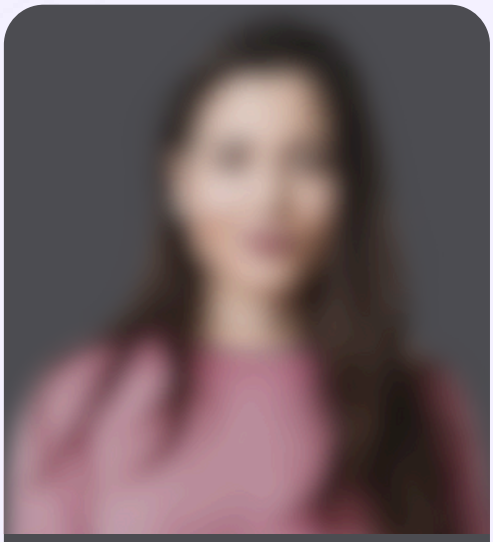
Metabolites shift quickly with changes in lifestyle, supplements, and stress, making metabolomics more responsive than traditional labs. This lets you assess treatment impact within quicker cycles, enabling faster adjustments and more personalized care.

2) The patient sees measurable progress early

Patients can see specific markers improve quickly, such as better energy metabolism, reduced oxidative stress, or improved detox. This builds patient trust and compliance because they receive clear, early evidence that the plan is working.

Mohr, A.E.; Ortega-Santos, C.P.; Whisner, C.M.; Klein-Seetharaman, J.; Jasbi, P. Navigating Challenges and Opportunities in Multi-Omics Integration for Personalized Healthcare. Biomedicines 2024, 12, 1496. https://doi.org/10.3390/biomedicines12071496

Sensitive? Yes. But that's why it works.



Low sensitivity
Only sees major issues when they're already obvious

High sensitivity
Reveals subtle dysfunctions before they become visible elsewhere

Increasing Resolution

High sensitivity doesn't mean volatility. It means resolution, and resolution reveals patterns.

Metabolomics detects biological change in near real time, but that doesn't make it unreliable. It means you're watching physiology respond.

We track patterned shifts across multiple pathways over time. We're not focused on isolated data points. We're reading systems.

That's why it's useful for catching dysfunction early and adjusting treatment rapidly.

When health, lifestyle, and environment remain stable, so does metabolism. A study published in Cancer Epidemiology found that metabolite patterns stayed consistent within individuals over a 10-year period, demonstrating long-term stability when no major changes occurred.

Metabolomics is functional data. You're not measuring one number. You're watching the system adapt.

Metabolomics: The Next Era of Medicine

2004 - 2014
~1,000 publications

Early interest in pathway mapping and newborn screening

2015 - 2020
Exponential Growth

Used in nutrition, cardiovascular risk, oncology, neurodegeneration

2021 - 2025
~17,000 studies

Precision care, progression toward multi-omic integration, and real-world treatment impact

*"Metabolomics, an emerging but **powerful tool for precision medicine**"*

Clay Clish, PhD
Metabolomics Director at the Broad Institute of MIT and Harvard

BROAD INSTITUTE

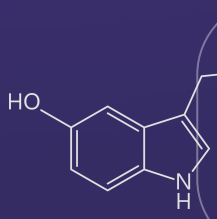
Massachusetts Institute of Technology

HARVARD UNIVERSITY

*"The narrow range of chemical analyses in current use by the medical community **will be replaced** in the future by analyses that reveal a far more comprehensive metabolic signature."*

David Wishart, PhD
Spearheaded The Human Metabolome Project

hmdb
The Human Metabolome Database

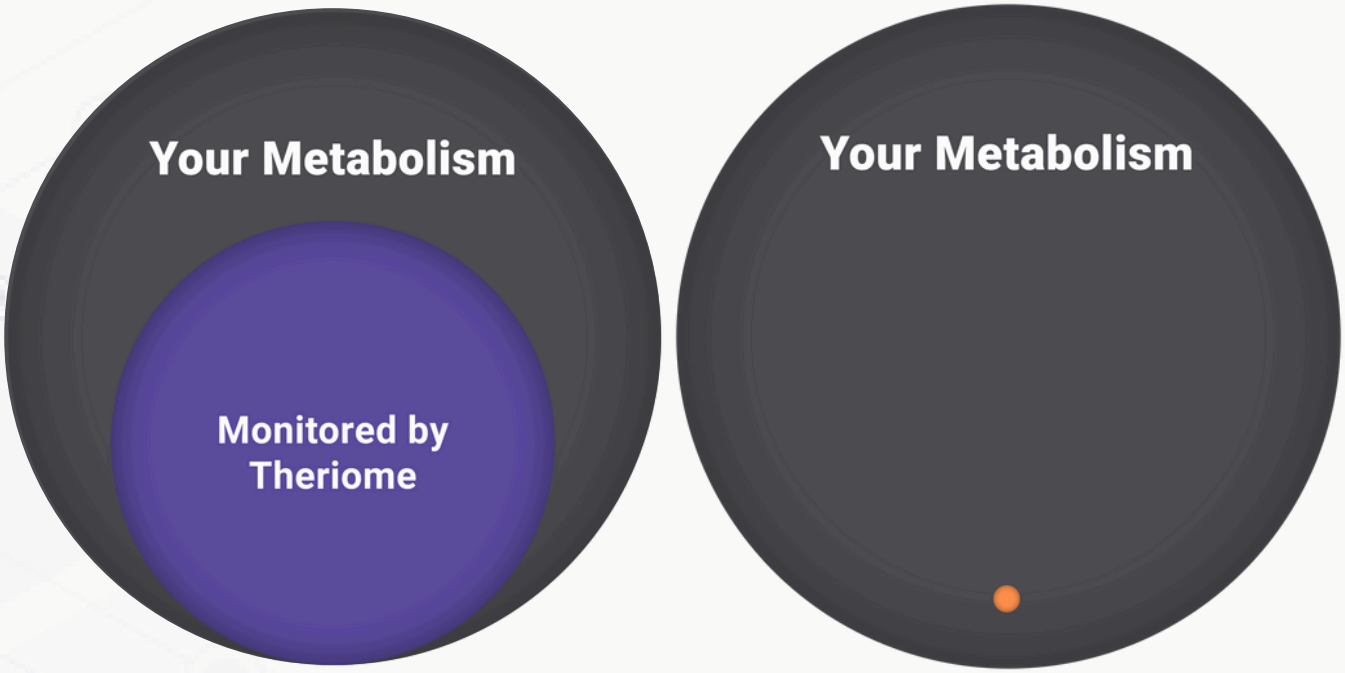


*"Precision medicine [is] made possible with metabolomics... Metabolomics is becoming a **core element in defining the blueprint** of human health."*

Metabolon
ENLIGHTENING LIFE

MAYO CLINIC

We Measure More



Monitored by "comprehensive" metabolic panel (CMP)

Beyond standard labs: How we see more

We're able to measure far more than a standard "comprehensive metabolic panel" because of the advanced technology we use.

At Theriome, we use liquid chromatography–mass spectrometry (LC-MS), a powerful tool typically reserved for high-end research. It's complex, expensive, and requires PhD-level expertise to operate — which is why most labs don't use it.

What makes us different is that we've made this research-grade technology practical for everyday clinical use. Our team of scientists and clinicians translate this complex data into clear, actionable insights. We are continually advancing the science through ongoing research and publications.

Publications from our team

Fred Hutch Cancer Center

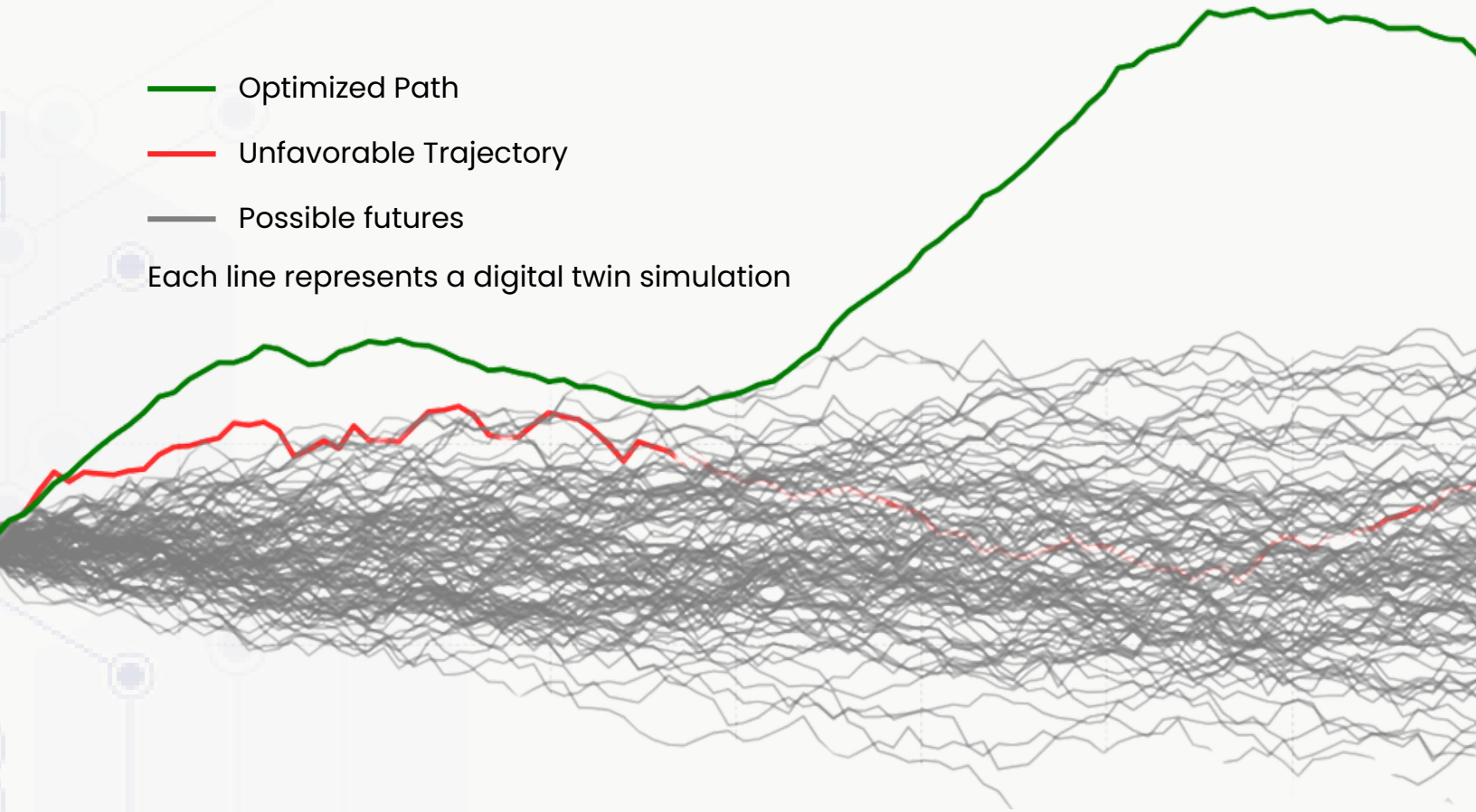
USC

MAYO CLINIC

MIT

Digital Twinning

Simulate before you intervene.



What is digital twinning?

A digital twin is a model of your metabolism built from real data, not estimates. We simulate thousands of interventions on that model, 1,000 times each. Each simulation varies the time of day, frequency, dosage, and interventions to see how your biology might respond before you try anything. This lets us identify what's most likely to work for the individual's unique biology, not just for the average person. For example, if we simulated a glutathione supplement, we can see how it affects the whole individual, not just glutathione levels.

Why it matters

- **Reduce trial-and-error** and choose what fits patient biology best.
- **Avoid interventions** that are unlikely to help or may worsen imbalance.
- **See which route** leads toward better function before symptoms even shift.
- **Adjust treatment** before the patient feels worse or stalls.

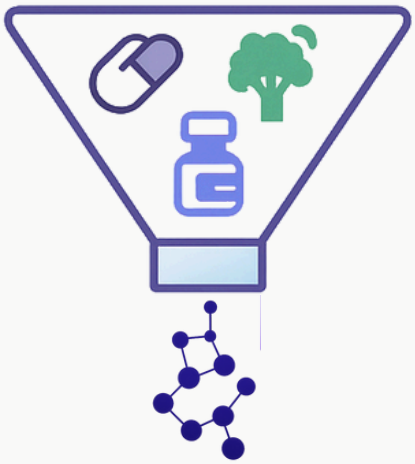
How the Protocol is Created

Step 1: Digital Twin

We create a digital replica of you

Step 2: Simulation

We simulate thousands of dietary, lifestyle, medications, supplements, and therapeutic modalities on your digital twin to see what works best for you.



Step 3: Protocol

After thousands of simulations, we identify the protocol that best fits your unique metabolism.

Step 4: Report

This becomes your personalized Theriome metabolomic report.

See the System, Not Just the Markers

Inflammatory Markers

Good for detecting active inflammation.

Misses what's causing it or how it's affecting the body.

Metabolomics shows upstream stress and systemic immune response.

Genetics

Good for showing predispositons.

Misses what is happening now.

Metabolomics shows how genes are being expressed.

CBC

Good for identifying anemia, infection, or immune cell changes.

Misses metabolic causes behind immune or blood cell changes

Metabolomics reveals stress and nutrient demand behind blood cell changes.

Metabolomics

Where stress and adaptation converge

Hormones

Good for circulating hormone levels.

Misses how the body is responding, clearing, or compensating.

Metabolomics shows hormone impact - stress, detox load, and receptor response.

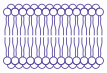
CMP

Good for detecting late-stage dysfunction.

Misses early changes and system-level trends.

Metabolomics reveals functional stress before labs shift.

Lipid Panel



Good for measuring cholesterol and triglyceride levels**.**

Misses why lipids are out of range or how they're being used.

Metabolomics reveals lipid metabolism, transport, and inflammation.

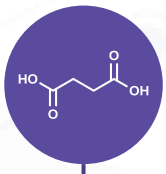
You don’t stop using your diagnostic tools.
Metabolomics tells you where they matter most.

Tests We Can Replace

Full Replacement		
Organic Acids Test	Replaces	Broader, clearer, blood-based insight into detox, neurotransmitters, energy
Mitochondrial Panels	Replaces	Tracks dozens of metabolites across redox and energy metabolism
Detox Panels	Replaces	Captures real-time stress and pathway load (glutathione, methylation, etc.)
Sometimes Replaced		
Micronutrient Panels	Sometimes	Metabolomics is stronger if the concern is utilization or demand — not just levels
Inflammatory Markers	Sometimes	Picks up immune stress early; doesn't replace acute-phase cytokine panels
Used Alongside		
Hormone Panels	Use alongside	Needed for quantitative hormone levels
GI Panels	Use alongside	Flora/pathogen identification still requires stool-based testing. Our metabolomics panel includes dietary metabolites, due to gut breakdown.
Genetic Panels	Use alongside	Still useful for long-term risk and trait profiling but metabolomics monitors output (ex. methylation).
CBC (Complete Blood Count)	Use alongside	Metabolomics explains shifts, but doesn't measure cell counts directly
CMP (Comprehensive Metabolic Panel)	Use alongside	Detects structural damage; metabolomics reveals upstream stress earlier
Lipid Panel	Use alongside	Useful for risk thresholds; metabolomics shows functional lipid handling

Tests We Can Replace

Not everything is captured by metabolomics.
But some tests we fully encompass.



1. Organic Acids Test (OAT)

Why: We encompass everything on an OAT test + more.

Replacement Rationale: Metabolomics provides a broader and blood-based readout of many of the same pathways (e.g., energy, detox, neurotransmitter intermediates).

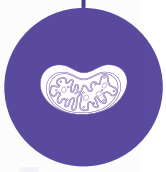
OAT might show elevated quinolinic acid, low B6, and mild oxalates, raising concern for mitochondrial strain or neuroinflammation, but interpretation remains speculative. Aristotle goes further by quantifying NAD+/NADH ratios, glutathione redox, methylation dynamics, and inflammatory tone, while also capturing how energy, detox, and amino acid systems are adapting in real time. It moves you from guesswork to functional clarity.

2. Basic Detox Panels

Why: Detox panels often infer liver stress through enzymes or phase I/II conjugation products.

Replacement Rationale: Metabolomics can track glutathione demand, methylation stress, urea cycle disruption, bile acid metabolism, and more — with broader scope and nuance.

A patient presents with fatigue, headaches, and chemical sensitivity. A standard detox panel might flag poor glucuronidation and suggest a general detox protocol. But metabolomics shows elevated pyroglutamate (glutathione demand), low glycine with ornithine/citrulline buildup (urea cycle strain), and disrupted bile acid clearance alongside inflammatory markers, pointing to gallbladder-related congestion. Instead of guessing, I now know exactly where to intervene.



3. Mitochondrial Function Panels

Why: Many tests marketed to assess mitochondria look at 5–10 metabolites or inferred ratios.

Replacement Rationale: Metabolomics gives a richer view of energy production, redox balance, and mitochondrial stress.

A patient presents with fatigue, muscle weakness, and poor sleep. A basic mitochondrial panel shows elevated lactate and low CoQ10, suggesting dysfunction and prompting general support. But Aristotle reveals a NAD+/NADH imbalance, TCA cycle slowdown, amino acid overload, and neuroinflammation, allowing for targeted support of energy production, redox balance, and inflammatory load in a coordinated, system-level approach.

Tests We Can Replace (sometimes)

Depending on the situation, metabolomics may be better suited in these cases

1. Micronutrient Panels

Where Micronutrient Panels Help: Sometimes useful for confirming nutrient deficiencies, absorption issues, or repletion success, especially when gut dysfunction or high-dose therapies are involved.

When to Use Metabolomics Instead: Use metabolomics when you want to assess nutrient function, not just nutrient presence. Metabolomics shows how nutrients are being used. It reveals cofactor demand, pathway strain, and system-level bottlenecks across detox, methylation, energy, and more.

A patient presents with chronic fatigue and poor recovery despite taking a multivitamin and magnesium. A micronutrient panel flags low vitamin E, borderline selenium, and low magnesium. It doesn't explain how these deficiencies are affecting the system. It tells you what's present, but not whether those nutrients are being used effectively or which pathways are under strain.

Metabolomics reveals low TCA intermediates like succinate and alpha-ketoglutarate, indicating sluggish mitochondrial throughput and reduced energy production capacity. Impaired glutathione recycling suggests that antioxidant defenses are overwhelmed, not just that glutathione is low. This means oxidative stress is building systemically. Elevated inflammatory lipid metabolites point to an unresolved inflammatory tone that could be driving further mitochondrial dysfunction and recovery resistance. This shifts you from general support to a targeted plan

2. Some Inflammatory Panels (e.g., cytokines, hsCRP, LPS)

Where Inflammatory Panels Help: Tests like hsCRP, cytokines, or LPS are useful in acute illness, autoimmune flares, or post-infection when inflammation is clear and needs to be quantified. But they offer limited insight into what is driving the inflammation or how the body is responding.

When to Use Metabolomics Instead: Metabolomics reveals early inflammatory stress through oxidative burden, inflammatory lipids, and immune strain. It also shows how inflammation affects energy, detox, and recovery in real time.

For example, a patient with post-viral fatigue and brain fog may show only mildly elevated CRP and normal cytokines. Metabolomics, however, reveals high quinolinic acid, low tryptophan, redox imbalance, and mitochondrial slowdown, indicating chronic immune activation. This gives you a precise therapeutic direction rather than relying on general anti-inflammatory support.

Testimonies

Robert Talac, MD, PhD

"So many tests, you get a score, and then you're left to, 'Okay, well what am I going to do about it?'"

"This test actually gives me the information of what can I do specifically with this patient that is going to move the needle for them. It's not guessing. Everything is science."

Gail King, MD

"Other tests gave limited direction."

"This test gives both information and action, rooted in science."

Gus Vickery, MD

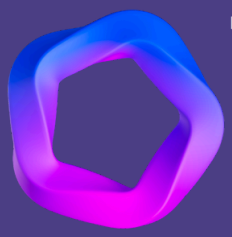
"We used a lot of tests... but it still left us with blind spots"

"Metabolomics is now included in every patient's plan. It gives me confidence we're on the right track. Now I'm being led to the specific intervention we need to use, not just relying on intuition and experimentation."

Adrijana Kekic, PharmD, Mayo Clinic

"When we do the genetic testing, we kind of get an insight into how your body's built, the foundation of it."

"But what we oftentimes don't know, which is what metabolomics testing can help us with, is where are you at at this moment in time?"



Theriome

The Science of You

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