Mito

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Mitochondrial Analysis

Transform Your Cellular Health at the Source

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Name:
Sarah Smith

Date of Birth:
09/27/1988

Client ID:
MITO-7845

Biological Sex:
Female

Report for Sarah Smith

Date Received:
10/19/2025

Complex I	Complex II	Complex II + III	Complex IV	Citrate Synthase
Low	Low-Normal	Low	Normal	High
27%	52%	9%	94%	212%

Results Summary

[redacted]

You may benefit from supporting your body with key nutrients such as CoQ10, vitamin C, vitamin K2 (in the form of MK-4), riboflavin, iron, sulfur, and sulfur amino acids. Additionally, methylene blue and near-infrared light (700-1000 nm) may offer support. It's also important to minimize inhibitors of mitochondrial complexes I, II, and III in your diet, lifestyle, and medications. You may also benefit from a high-carb, low-fat diet, as well as supplemental glycine.

Your detailed action plan is found on page 18. In the next few pages, we explain your results in more detail.

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Methods Used to Measure Your Respiratory Chain Activities

Buccal cells were isolated from your oral mucosa and analyzed for the enzymatic activities of citrate synthase, complex I, complex II, complex II + III, and complex IV of the mitochondrial respiratory chain. Citrate synthase is the first enzyme in the citric acid cycle, which operates inside the mitochondrion but is not part of the respiratory chain. These assays use standard spectrophotometric procedures to test the ability of substrates to be processed by these enzymes and electrons to flow to their proper targets.

All values were first expressed as **nanomoles per minute per milligram buccal protein**. Citrate synthase activity was then expressed as a percentage of control means. Citrate synthase can act as a marker of mitochondrial density but can also be upregulated in response to the cell's perception of a respiratory chain deficit. In the latter case, the balance between the respiratory chain and citrate synthase is often more informative than the absolute activity of the respiratory chain enzymes. Therefore, **respiratory chain enzymes were then normalized to citrate synthase activity** and then expressed as a percentage of control means.

The table below gives normal ranges based on 95% confidence intervals in control samples. Your percentages listed on the previous page are a percentage of the mean control. For example, if your citrate synthase was "100%," you can derive its activity in nanomoles per minute per milligram buccal protein by multiplying 100% times 12.1 in the below table, meaning it was operating at 12.1 nanomoles per minute per milligram buccal protein. You can then compare that to the normal range and conclude that it is normal.

Due to the lack of large sample sizes and associated statistical precision in these normal ranges, the Mitome analysis categorizes results as a percentage of control means into normal (70-140%), low (≤ 50%), high (≥ 200%), or low or high normal between these ranges, based on standardized cutoffs for the sake of optimal pattern analysis. This is the basis for the descriptors you see on the previous page and for any patterns we derive from those descriptors.

Enzyme Normal Ranges and Mean Activities

Activity Name	Normal Range	Mean ± SD
Citrate Synthase (CS)	4.4-22	12.1 ±5.1
Complex I (normalized to CS)	3.4- 11.9	6.8 ±2.0
Complex II (normalized to CS)	0.03-0.35	0.194 ±0.08
Complex II + III (normalized to CS)	0.032-0.152	0.092 ±0.03
Complex IV (normalized to CS)	0.15- 0.6	0.31 ±0.1

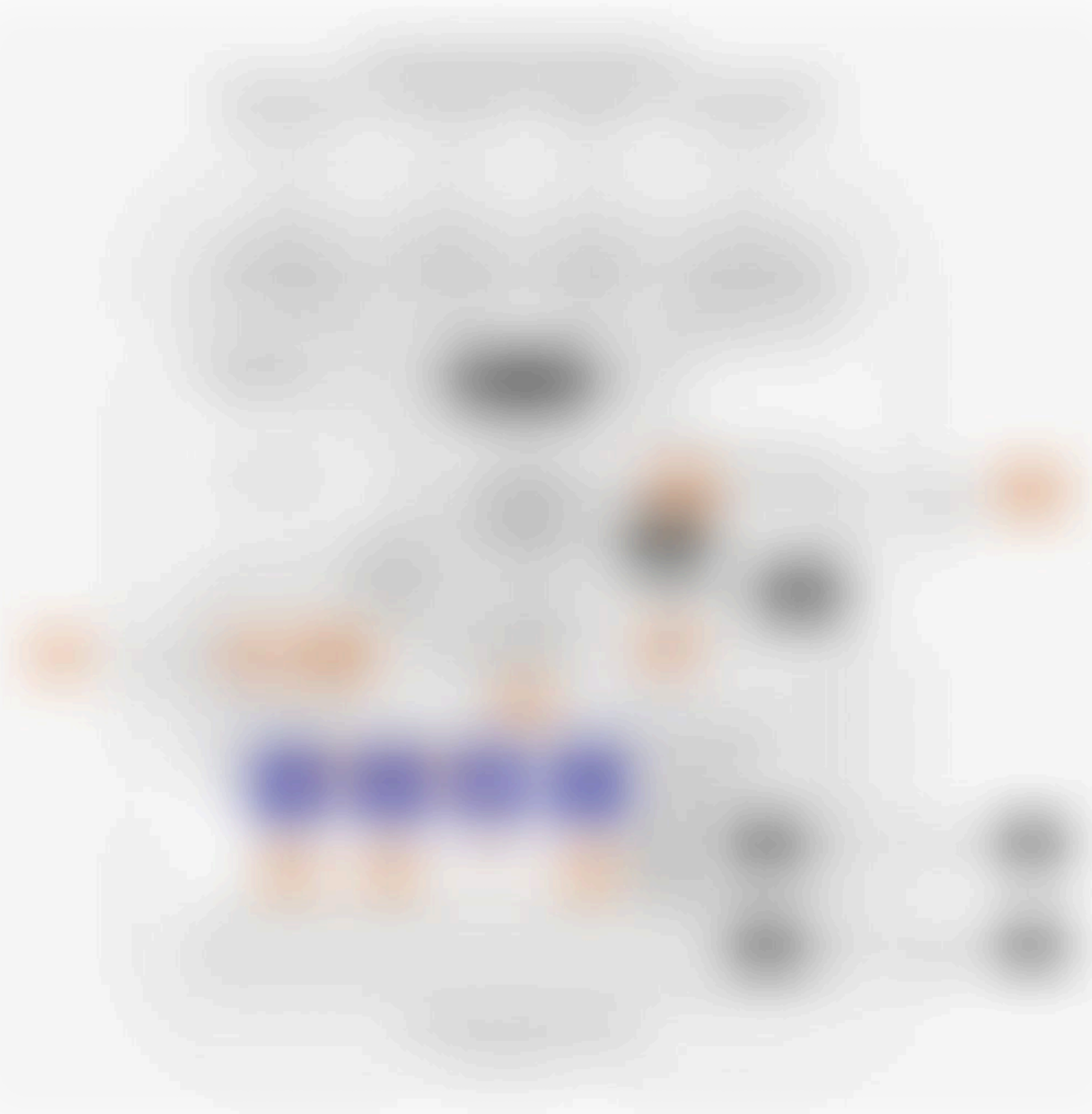
How We Interpret Citrate Synthase Activity

An Overview of Mitochondrial Energy Metabolism

Food is broken down into molecules such as amino acids, fatty acids, pyruvate, and ketone bodies that provide usable energy. These enter the mitochondria and are primarily converted to acetate, which is joined to coenzyme A (CoA) a derivative of the B vitamin pantothenic acid (vitamin B5), to form acetyl CoA. This acetyl CoA then enters the citric acid cycle, where the acetyl group is broken down into smaller components. Most of the usable energy is extracted as high-energy electrons that are carried away on NADH, a derivative of the B vitamin niacin (vitamin B3), which delivers them to complex I of the mitochondrial respiratory chain.

A portion of the high-energy electrons are sent to the respiratory chain as succinate, which delivers them to complex II, becoming fumarate with the help of FAD, a derivative of the B vitamin riboflavin (vitamin B2) which transfers them within complex II by interconverting with FADH2. The carbons of the acetyl group are released as carbon dioxide The respiratory chain is where we make 90% of our ATP, the main energy currency of the cell. We breathe in oxygen from the air, which draws electrons through the chain as it is converted to water. Electrons flow from complex I or II through complexes III and IV, using coenzyme Q10 (Q) and cytochrome C (C) as intermediaries. Complexes I, III, and IV use this energy to pump hydrogen ions (H+), which are used by ATP synthase to power ATP production.

How Your Mitochondria Metabolizes Food to Energy



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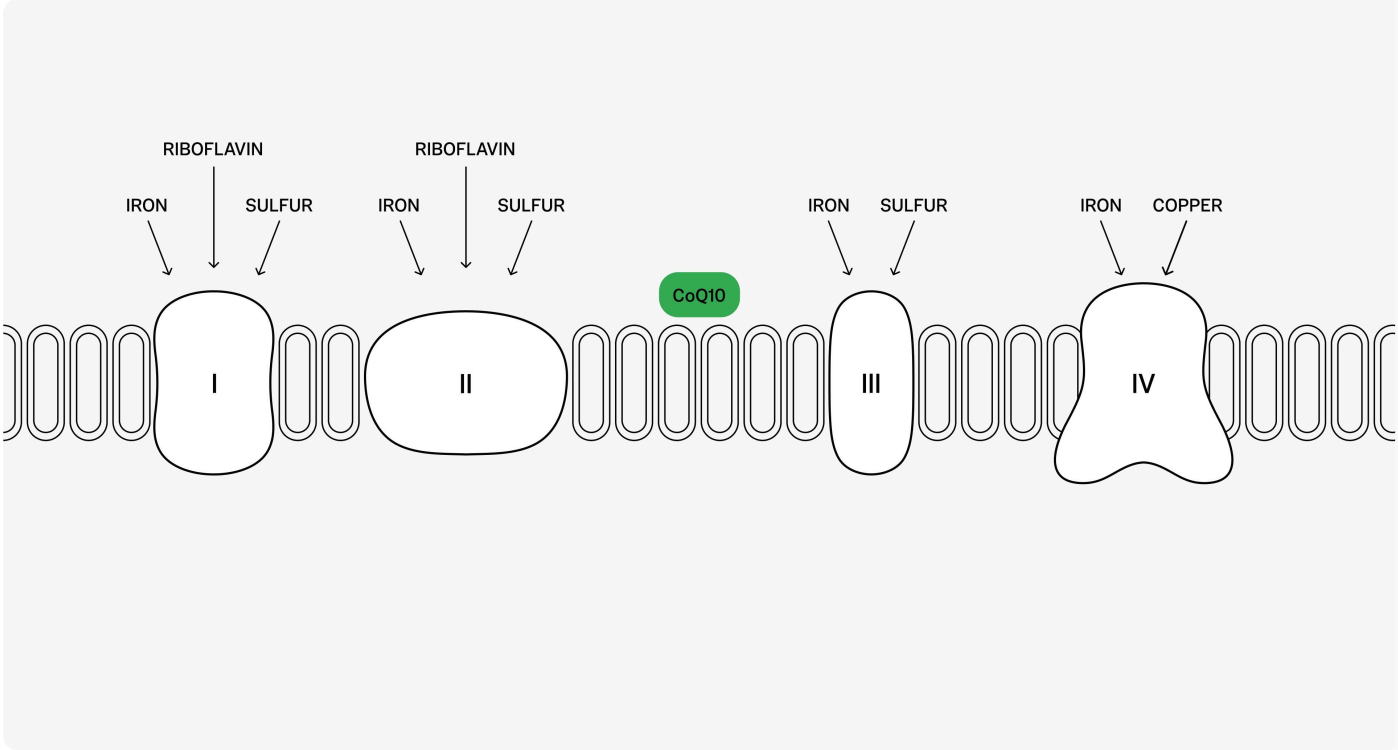
Interpreting Your Results

Nutritional Support for Mitochondrial Complexes

Each complex has unique nutrients that serve as cofactors to power the complex.



Impairments in Mitochondrial Function

Your test results reveal reduced complex I, II, and II + III activity, a critical finding that demands attention.

Complex I, II, and II + III dysfunction are primary drivers of mitochondrial inefficiency and have profound implications for cellular energy production, oxidative stress management, and long-term health outcomes.

As shown in the figure above, the complex II + III step measures everything between complex II and III, including the vitamin-like substance CoQ10 that bridges the gap between the two complexes. This measurement may have came in low simply because you need more CoQ10.

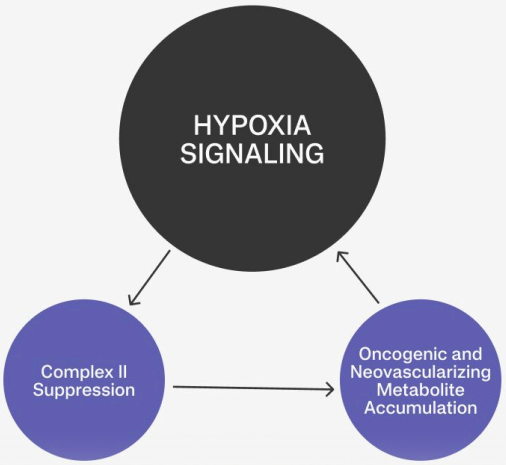
Potential Roles of Hypoxia in Suppressing Complex II

Excessive Hypoxia Signaling

A deficit in complex II can be genetic or nutritional but is often due excessive hypoxia signaling.

This suppresses complex II in order to increase the accumulation of metabolites that will lock in the hypoxia response when the cell perceives that the hypoxia is chronic.

Chronic excessive activation of this response can promote the growth of cancers and the excess formation of blood vessels, which can lead to abnormalities visible from the skin, such as petechiae, purpura, and varicose veins.



Impairments in Mitochondrial Function

Block in Complex III Function

The low complex II + III result may be due to a CoQ10 deficit or to a block at complex III. If complex III is blocked, supplements of vitamin C, sulfur amino acids (methionine and cysteine), and infrared light could help you, because these all bypass the first three complexes and feed energy directly into complex IV.

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Optimizers & Bottlenecks

Your Bottleneck	Things That Hurt	Things That Help

Complex II

[redacted]

Complex I

Complex I functions as the critical supercharger of your respiratory chain. When dysfunctional, your cells produce 40% less ATP from the same food intake—dramatically reducing your energy output and metabolic efficiency.

This substantial energy deficit not only manifests as daily fatigue but compromises your body's ability to perform essential maintenance and repair functions necessary for optimal health and longevity.

Addressing **low complex I** activity is therefore a non-negotiable priority for restoring full mitochondrial capacity and ensuring your cells can generate maximum energy for both immediate performance and long-term cellular health. We want 100% of the ATP we can make.

The three nutrients most important to complex I are **riboflavin, iron,** and **sulfur.**

Riboflavin: Sources of riboflavin are listed in the previous section on Complex II.

Iron: Sources of iron are listed in the previous section on Complex II + III.

Sulfur: Sources of sulfur are listed in the previous section on Complex II + III.

Metformin and **berberine** are two common supplements that hurt complex I activity. Caprolactam is a complex I inhibitor that can leach from **nylon clothing** while sweating. A larger list of inhibitors can be found in the table on page 9. If you are using any of these for medical purposes, you may want to discuss their use with your doctor.

Your Personal Protocol

The protocol we have put together for you below is meant to be streamlined and simplified, giving you the highest-impact strategies curated for their ability to synergize together and address your specific bottlenecks, and assembled to be implemented **one at a time in the specific order they are given for maximal effect**.

In order to simplify and streamline the protocol, we have to assume that you're already optimized on all the basics. Therefore, before trying to implement your protocol, we ask that you run through the checklist below to make sure you're hitting all the General Mitochondrial Health points.
If not, stop and try to implement them, take some time to stabilize on your new normal, and then implement your Personal Protocol.

The Supplements are Unique to You

The Mitome report does not focus on generic recommendations for mitochondrial support.

This is not primarily a test of whether your mitochondrial function is good or bad.

It is a test of what the specific, limiting bottleneck in your mitochondrial function is, and the resulting protocol is uniquely tailored to you and not expected to be generalized to most people around you.

The Amount and Step-by-Step Order of Your Protocol are Critical

You may already be taking a supplement that is recommended in your protocol. If you are, compare it to the amount range given. The doses are selected based on a synthesis of the human trial literature, case reports, and Dr. Masterjohn's prior experience with clients. If you are already exceeding the top of the amount range, you can skip that step in the protocol. If you are not, however, you should use that step as an opportunity to experiment with the amount you are using.

The order of the protocol is highly curated to avoid stimulating pathways that will run into downstream energetic blocks. It is critical to implement each step one at a time and in the order provided.

Setting Up Your Tracking

Protocol Snapshot

Complex I, II and III Inhibitors: Remove Unnecessary Exposures | Altitude and Oxygen Adjustment | Assess Manganese Overload | Iron | Vitamin C | Alpha-Ketoglutaric Acid | Ubiquinol | Riboflavin | Sulfur/Cysteine | Vitamin K2 (MK-4) | Near Infrared Light | Medications | Low-Fat, High-Carbohydrate Diet | Glycine | Adjust Your Carbohydrate Intake | Methylene Blue

Your Protocol Recommendations

03 Assess the Possibility of Manganese Overload and Detox If Necessary

04 Iron

Suggested Range:
Proferrin Clear, 1–4 capsules per day, taken with meals.

Before supplementing, you can try increasing your intake of red meat and decreasing your intake of plant foods.

If you are a vegetarian, you can try increasing your intake of greens. If you are open to eating egg yolks, shellfish, or fish, eating these alongside greens will improve iron absorption.

If the foods do not optimize your labs, find the lowest dose of the supplement that does.

Ideally this step is optimized by running several labs: an iron panel (serum iron, unbound and total iron-binding capacity [UIBC and TIBC], iron saturation %, transferrin, ferritin, and soluble transferrin receptor. Calculate the transferrin saturation by dividing serum iron by transferrin and multiplying it by 0.709. Aim to keep iron saturation and transferrin saturation in the 30-40% range and soluble transferrin receptor under 3 mg/L. Cut back on iron if iron or transferrin saturation run consistently above 40% while soluble transferrin receptor is simultaneously under 3 mg/L.

If ferritin is above 200 ng/mL while iron and transferrin saturation are below 30% and/or soluble transferrin receptor is above 3 mg/L, try bringing ferritin down with one or two scoops of whey protein, 1000 milligrams per day of curcumin, and 1000 milligrams once or twice per day of black seed oil.

If your complete blood count (CBC) shows you are anemic despite these labs being optimized, work with your doctor to find the cause of anemia and resolve it.

Once your labs are fully optimized, you can move on to step 5.

05 Vitamin C

[illegible]

06 Alpha-Ketoglutaric Acid

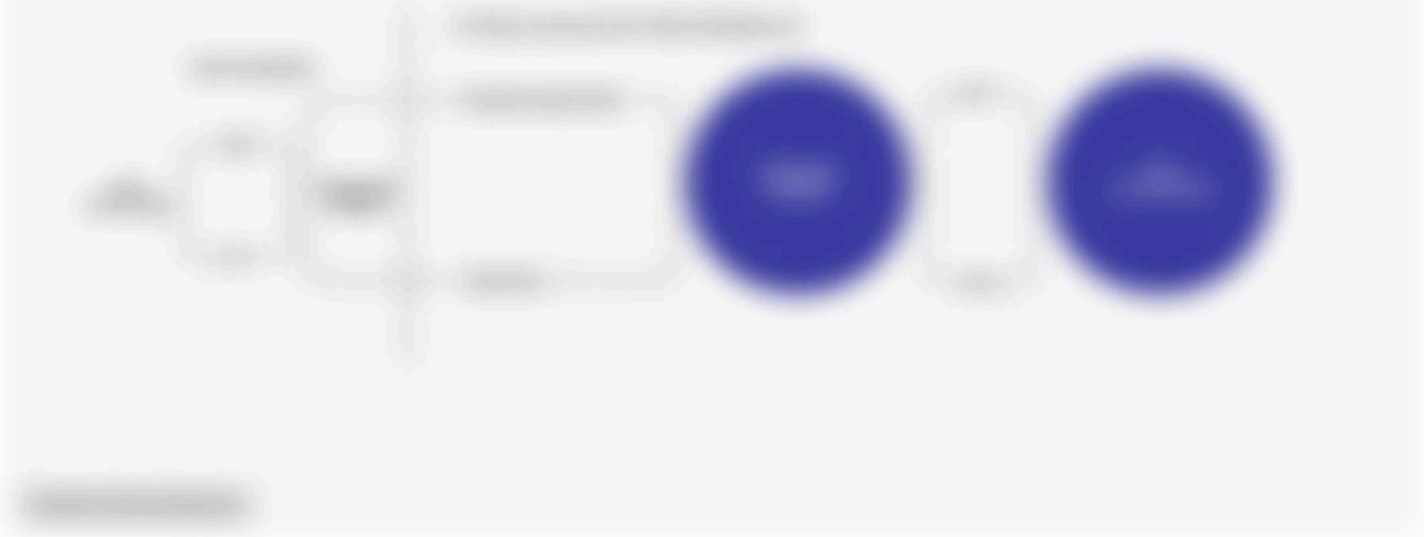
Suggested Range: 1000-4000 milligrams of alpha-ketoglutaric acid.

Alpha-ketoglutaric acid cannot be obtained from specific foods in defined amounts due to large variability and poor database coverage, so supplements are the only option for this step.

See the discussion on the right side, however, for whether this supplement is needed.

[illegible]

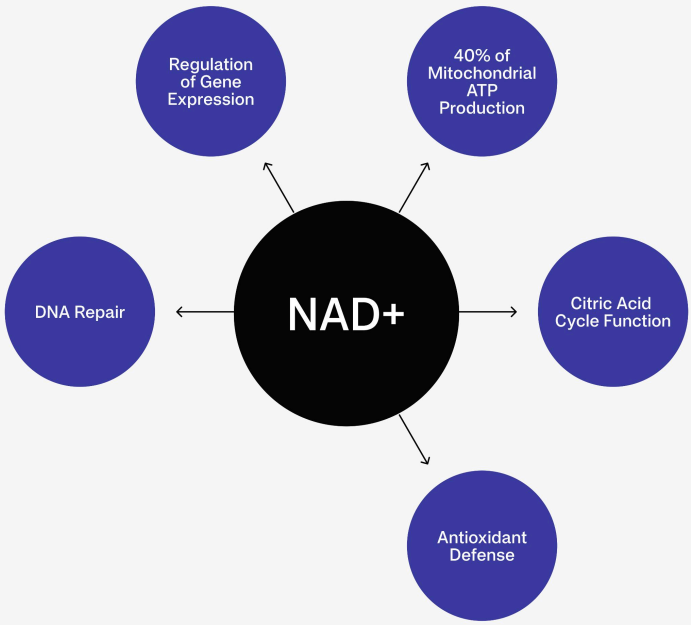
Additional Mitochondrial Support Strategies



NAD+

Suggested Range:
Tru Niagen, 300 milligrams per day.

Many mitochondrial problems are due to genetic deficiencies in replicating or repairing mitochondrial DNA. These often respond to supplementation with NAD+ precursors such as nicotinamide riboside.



NAD+ Role in Mitochondrial Function

Fasting-Feeding Reset

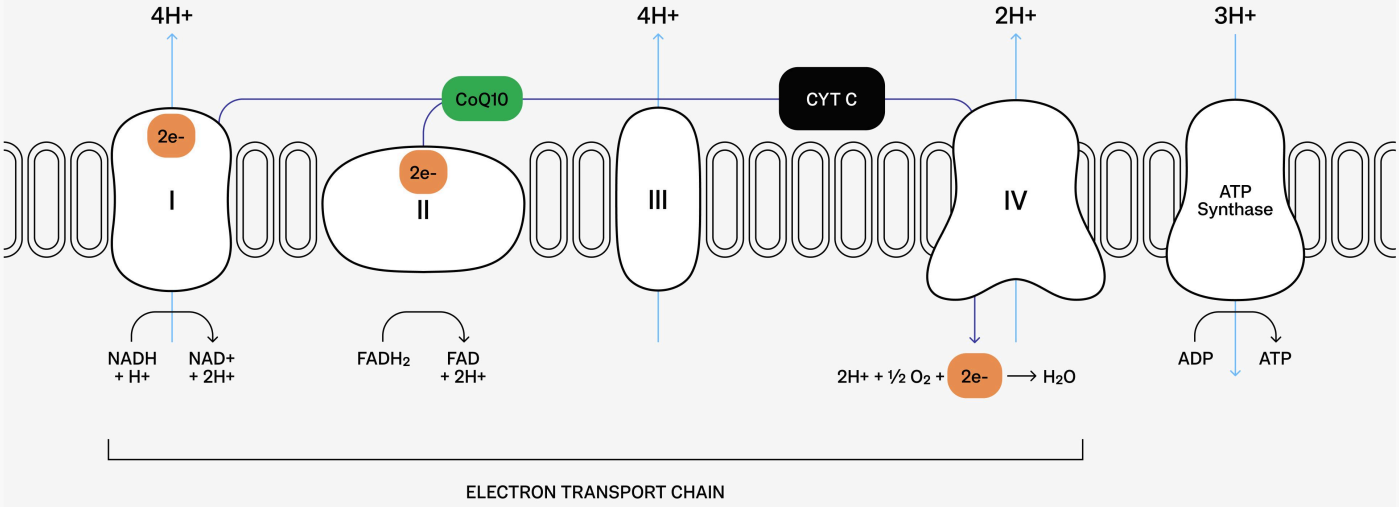
The Research Backing Your Protocol

We analyzed the four major respiratory chain complexes within your mitochondria and categorized you into one or more of twelve distinct patterns. This breakthrough analysis represents a fundamental advancement in longevity, as mitochondrial function is now recognized as one of the primary drivers of biological aging. By identifying your specific bioenergetic profile, we've pinpointed exactly what you should be focused on for optimizing not just your daily energy production, but the cellular mechanisms that determine your health trajectory over decades. Email us to join our waitlist for how to take your Mitome results to the next level with whole genome sequencing for even further individualization and optimization.

The science behind the underlying lab test includes hundreds of papers on the utility of testing respiratory chain results in biopsies and skin fibroblasts, and the studies showing the correlation between cheek swab and muscle biopsy results.

Mitome is an proprietary interpretive algorithm built on the base layer of the respiratory chain testing that is based on Dr. Masterjohn's unique analysis of the published literature as well as an in-house sample of over 150 clients analyzed over the past two years where respiratory chain analysis was cross-referenced to whole genome sequencing and testing of amino acids, organic acids, vitamin concentrations inside and outside cells, acylcarnitine and acylglycine profiles, complete blood counts, metabolic panels, and assorted other biochemical markers, as well as client responses to protocols derived from this data.

Mitome synthesizes the unique pattern analysis generated from this dataset with published biochemical literature and insights from case reports of respiratory chain disorders to produce a unique protocol for each person.



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The supplement suggestions and dosage guidelines included in this report are based on our proprietary analysis of mitochondrial function, interpreted from your cheek swab sample and current scientific literature. These recommendations are provided for general informational and educational purposes only.

This report is not intended to diagnose, treat, cure, or prevent any disease, and is not a substitute for professional medical advice, diagnosis, or treatment. The content has not been reviewed or approved by the U.S. Food and Drug Administration (FDA).

Interpretation of results may be affected by sample quality, laboratory variability, and the evolving nature of mitochondrial science. The findings presented here are not intended for clinical or diagnostic use.

Always consult a licensed healthcare professional before beginning any supplement protocol, making dietary changes, or taking action based on this report. Individual responses and needs may vary.

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