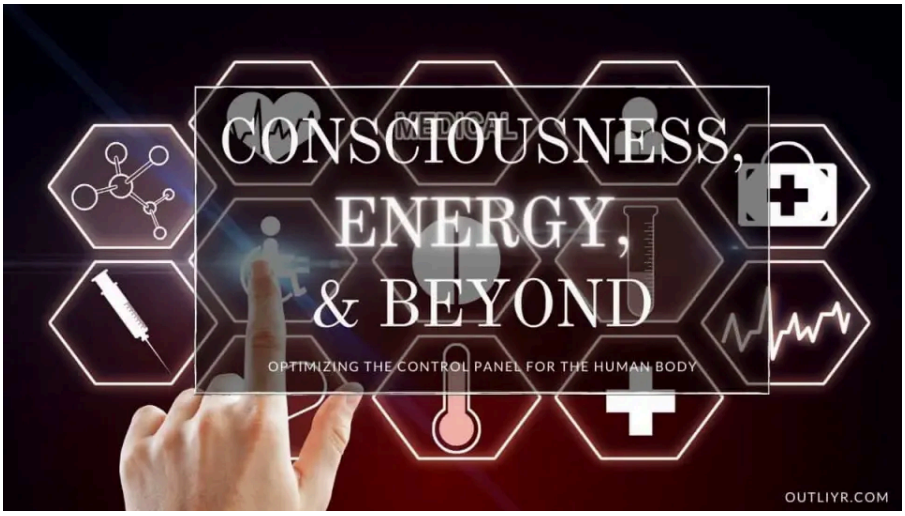
Biohacking Basics

37 Biohacks to Optimize Mitochondrial Health (Supplements, Diet, & Lifestyle)

by Nick | Updated: 05/09/2024 | 7 Minutes



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Mitochondria are the unsung heroes of human health, performance, and [illegible]tence.

They are the puppet masters of the body, directly influencing your thoughts, feeling, and actions.

Far more than the "power plant of the cell".

Brain power, energy, athleticism, longevity, and feeling amazing all require optimized mitochondria.

So much so that improving and supporting mitochondria has become a core focus among biohackers.

For the last few years, I've focused on optimizing the health of my mitochondria. **In this post, we'll explore the best mitochondria-boosting supplements, foods, and lifestyle habits.**

But first, you should understand the emerging paradigm of mitochondrial medicine.

Mitochondria-Centric Medicine

In the near future, your average doctor visit will include quantifying your mitochondrial health. From there, you'll receive risk scores for most degenerative diseases. And hopefully, steps you can take to improve them.

From here it helps to understand the power of mitochondria.

Every nerdy biochemistry class teaches the primary role of mitochondria — generating energy.

Power-hungry cells (like muscles and neurons) demand more energy and thus contain more mitochondria.

Mitochondria are key to converting food and oxygen into cellular ATP energy and generate CO_2 as a result. A form of free radicals—called Reactive Oxygen Species (ROS)—is another byproduct of energy generation.

Excess free radicals damage mitochondria and accelerate aging. Luckily, the mitochondria contain powerful antioxidants like glutathione and melatonin to shield them from damage.

Other important roles of mitochondrial include regulating the balance of calcium levels, and recycling or destroying faulty old cells.

But there's a new paradigm.

Mitochondria are also environmental sensors. They integrate information from your senses and propagate an action throughout the body. Your mitochondria decide whether to manufacture inflammatory molecules, proteins, or to make new mitochondria.

In a way, your mitochondria dictate your impulses and how you'll respond to a given situation.

Three Components of Mitochondrial Health & Performance

We care about efficiently meeting cellular power needs.

When looking to optimize mitochondrial health, focus on three parameters:

1. Increasing efficiency of existing mitochondria
2. Creating new mitochondria
3. Protecting and reparing

Increase any of these, and your performance will too.

You can build healthy, resilient mitochondria countless ways.

Lifestyle Practices to Optimize Mitochondria

In my research, I quickly discovered many "healthy habits" are also mitochondria-boosting health practices.

These are some of the top mitochondrial boosting therapies, modalities, and lifestyle habits:

- Light exposure
- Ketogenic diet
- Fasting
- Calorie restriction
- Cold exposure
- Sirtuin activation
- Sprinting (Here is a guide on sprinting, its benefits, and how it works)
- Super slow strength training
- Oxygen therapy
- Exogenous ketones
- Glycolytic inhibitors
- Glutamine inhibitors

The first thing to keep in mind is that your environment directly affects them. Food, water, air, skincare products, light, and chemicals. Your every day life and exposures alter mitochondrial function.

Light plays a major mitochondrial role. **Natural sunlight**, red light, and near infrared light improve mitochondrial capacity and **efficiency of energy production** by stimulating a molecule called Cytochome C Oxidase. This is a great first place to start. Get natural sunlight, and consider one of these **powerful red light therapy panels** for even stronger effects.

Diet helps optimize this organelle. Fasting, reducing caloric consumption, and following a ketogenic diet, all boost ketones and stimulate mitochondrial biogenesis. Additionally, these promote the cleaning up of mitochondria (called mitophagy).

Exercise is another powerful way to grow new mitochondria. Exercise requires energy, which burdens mitochondria. They increase their capacity by **building more mitochondria** and increasing metabolic activity. Sprinting and resistance training are my favorites.

Extreme temperatures like saunas or **cold showers trigger beneficial changes** throughout the body. Including **mitochondrially**. Shivering after an ice bath or cold exposure gets mitochondria to generate heat (indirectly). Both lead to mitochondrial biogenesis and increased mitochondrial activity.

Every one of these has a whole host of other health benefits too. That's why I am a huge fan of habit change.

Best Mitochondria Boosting Supplements

People often begin mitohacking with supplements and nutraceuticals.

I like them due to their ease of use, broad health benefits, and sometimes, noticeable effects.

The categories mostly boil down to:

- Antioxidants like polyphenols
- Essential nutrients
- Vitamins, minerals, and cofactors that fuel cellular energy generation

I've compiled a short list of some of the most interesting and promising ingredients. Click on the bolded word to get my recommended source.

The best mitochondria-improving supplements (ordered by health impact):

1. **Ubiquinone**. The optimized form of CoQ10 enhances ATP production and protects mitochondria from damage. This is perhaps the most popular mito supplement. Learn more about how extraordinary CoQ10 is in my review and unlock the healthy you.

2. **Chlorella**. Anything that contains chlorophyll upregulates cytochrome C oxidase in mitochondria which allows it to more efficiently produce energy.
3. **Methylene Blue.** An awesome and underutilized textile dye with ample research on protecting, upgrading, and repairing both healthy and damaged mitochondria.
4. **B Vitamins**. Many of the enzymatic processes require the B Vitamins (especially B1, B3, B5) to create energy.
5. **Turmeric**. An optimized form (CurcuWIN or Meriva) of the polyphenol curcumin increases the number and function of mitochondria.
6. **Creatine.** Protects, increases efficiency, and generates new mitochondria.
7. **PQQ**. A nutrient that supports CoQ10, regrows mitochondria, and was being studied as a potential new vitamin.
8. **D-ribose**. Bypasses steps to help cells generate more energy and enhance cardiac output.
9. **Omega-3**. Phospholipids like omega-3 can protect mitochondria in the brain and body from dysfunction.
10. **NAD+ boosters.** NMN and NR are two NAD boosting supplements showing promise to improve and regenerate mitochondria and improve cellular energy generation.
11. **Magnesium**. A core biohacking supplement, magnesium is vital to self-repair and increasing mitochondrial efficiency and density (especially among athletes).
12. **Spermidine.** Polyamines like spermidine help the body create, enhance, recycle, and repair mitochondria.
13. **Melatonin**. The body's most powerful antioxidant strongly protects mitochondria, increases efficiency of the energy generation process, scavenges toxins, and more.
14. **Quercetin.** Another polyphenol with antioxidant and anti-inflammatory properties studied to increase the creation of new mitochondria and energy.

15. **Fisetin**. A polyphenol that activates the mitochondrial repair process of mitophagy and apoptosis.
16. **Vitamin C & E.** The original antioxidants are well-studied to protect mitochondria from the damage of free radicals.
17. **Zinc**. Helps strengthen the cell and makes mitochondria work better.
18. **Urolithin-A**. Known for having a slight impact on mitochondrial function, but more so for increasing the genesis of new mitochondria.
19. **Resveratrol.** The primary bioactive constituent of red wine with antioxidant and anti-inflammatory properties and is well-studied to protect and improve the function of mitochondria.
20. **Piracetam.** The original nootropic also protects against mitochondrial damage and enhances metabolism.
21. **ALCAR.** Acetyl-L-Carnitine is a special form of carnitine that both provides a necessary raw ingredient (carnitine) and an acetyl group that keeps the mitochondria healthy and young.
22. **Carnitine**. If you can't get ALCAR, carnitine alone can also clean the mitochondria, shuttle more energy in, and increase overall efficiency.
23. **Sulforaphane.** This active ingredient in broccoli sprouts helps mitochondria produce energy more effectively and as well as increasing protection.
24. **Krill oil.** Stimulates the burning of dietary fats and uncouples mitochondria which leads to less oxidation.
25. **Growth Hormone Secretagogues.** Compounds that stimulate the body's natural growth hormone production generate new mitochondria, reduce oxidative stress, and improve many other parameters of mitochondrial health.
26. **Glutathione.** One of the body's core antioxidants well-studied to protect mitochondria from oxidative stress created through energy production from protein. Either consume the precursor NAC or liposomal glutathione.
27. **Ergothioneine**. A recently discovered amino acid that acts as a reservoir and protectant, providing mitochondria with required nutrients.

All kinds of ingredients show impressive mitochondria-boosting properties. Choose a few from this list to guide your research.

Many polyphenols, for example, have been mentioned above for their antioxidant properties. Polyphenol-rich foods are easy to incorporate into your diet, you might even already be consuming them regularly.

Check out my guide on why polyphenols are so underrated.

Often, if you're struggling with sub-optimal mitochondria function, supplementation can be the low-hanging fruit. Once you start feeling better and more energetic, then you can begin the powerful lifestyle habits.

Equally important are the things that we avoid.

Minimize Mitochondrial Disruptors

The best mitochondria support program does no good if you're constantly damaging them.

These foods, habits, and drugs damage mitochondria:

- Tetracycline, cholesterol medication, Tylenol, Tamoxifen, Nicotine
- Oxidized industrial seed oils
- High blood sugar
- Microbiome disruptors
- Stress

A long list of pharmaceutical medications has the unfortunate side effect of damaging mitochondria. Some are less clear. Conflicting research indicates that nicotine may worsen how well mitochondria function while other papers suggest that it may beneficially reduce oxidative stress and uncouple mitochondria.

dized, omega-6-rich PUFA fats replace healthy fats in the inner mitochond membrane. Shutting down the electron transport chain and causing energy

shortages throughout the body.

Sugar alters normal enzymatic function. It taxes the mitochondria, causing them to **produce more heat, become less efficient, and generate more damaging byproducts**. This oxidative stress damages blood vessels in the brain, eyes, kidneys, heart, and throughout the body.

The **Mitochondria-Microbiome Connection** explains how anything that's toxic to your microbiome likely also **poisons your mitochondria**. An unhealthy gut **generates reactive oxygen species and other molecules** that further damage mitochondria.

Finally, chronically elevated catecholamines (stress hormones) **alter DNA**, disrupt **enzyme activity**, and cause **mitochondrial dysfunction**.

How do you check the status of your mitochondria?

How to Test Your Mitochondrial Health

Mitochondria-based medicine is nascent but growing rapidly.

Until recently, you had to rely on proxies to assess your mitochondria.

Current forms of testing and assessing mitochondrial function include:

- Identifying symptoms
- Blood lab measurements (as proxies)
- Other measurements
- Dedicated testing services

When your mitochondria don't function optimally, cells and entire organ systems lack adequate power. Symptoms of this dysfunction appear.

Due to the energy demands and concentration of mitochondria, people first experience symptoms related to the brain, eyes, and heart. Most commonly,

fatigue, depression, and/or brain fog. Since energy-hungry muscle also contains a lot of mitochondria, sarcopenia and weakness can occur.

If you experience these symptoms, get extra validation.

A simple blood panel provides a good snapshot of your metabolic health. The three areas to consider are oxidation, inflammation, and glycation:

- **Oxidation**: Oxidized LDL
- **Inflammation**: HS-CRP
- **Glycation**: HbA1c

These are generally reported on your annual physical, but you can also get them separately for about $100.

The gold standard for mito assessment is to get a painful muscle biopsy.

Another service like the MitoSwab test (which I haven't used) and Viome (I have used) can also test the health of your mitochondria.

MitoSwab claims to get similar results but with a non-invasive cheek swab. However, some practitioners worry that their results are not too reproducible.

When I reviewed Viome's Health Intelligence program, I discovered that my mitochondria need work. In fact, my results inspired deeper research and my current supplement protocol. Viome uses a blood sample and AI to quantify the functionality of several organ systems, as well as mitochondria.

After working on improving mitochondrial health, these testing services should show an improvement.

Start Supporting & Improving Your Mitochondria Today

Mitochondria have their own DNA and likely came from ancient, single-celled organisms. Eventually, they formed a mutual partnership with humans to pro

energy in exchange for protection. Today, every cell in your body contains hundreds or thousands of these tiny but powerful energy generators.

Since this process uses oxygen, byproducts cause oxidative stress. Free radicals and cellular waste accumulate and damage the body. Cellular energy suffers, and biological systems go offline. And the result...

Up to 99 percent of chronic disease is metabolic. Not genetic, but metabolic. Largely caused by dysfunctional mitochondria that don't supply the body with enough power to run vital processes.

Common symptoms of mitochondria dysfunction first manifest in the brain, heart, and eyes. Some include **fatigue, brain fog, pain, weakness, vision problems, mood disorders, depression, anxiety, and inability to focus**.

You can also use a testing service like **Viome** (my preference) or MitoSwab. These help to pinpoint the cause of symptoms, or to spot problems before they arise.

But mitochondria do so much more than generate energy. They are both sensors and control centers.

They take in information from their environment, manufacture what they deem to be relevant biochemicals, and make you act in ways to better their chances of survival.

Think of them as a distributed network designed to keep you (and them) alive.

Certain lifestyle habits, therapies, and supplements help your mitochondria function better and provide the body with much-needed power.

Check out this SelfHacked article for their list of **33+ Natural Ways to Boost Your Mitochondria.**

Luckily, many of the popular principles of healthy living also benefit this vital organelle.

What are you doing to biohack your mitochondria and optimize your health?

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