

Mitochondria: The Tiny Organelles That Make A Big Impact On Your Health

If there was a single unifying factor behind most chronic illness, you'd have heard of it, right? Well, how much do you know about mitochondria?

What Are Mitochondria?

The word probably sounds familiar. Think back to sixth-grade science class. Mitochondria, often referred to as the body's "power plants," are structures within most cells (the exception being red blood cells) best known for their role in producing adenosine triphosphate (ATP)—the fuel that powers your body.

Think of ATP like the electricity in your house. Pretty much everything you do in your home—from turning on the lights and vacuuming to running that turbo-charged high-end Japanese coffee grinder—is powered by electricity.

Often called "energy currency," ATP can store and transport energy within cells and it's necessary for any cellular function that requires fuel, which is essentially all of them. ATP powers your skeletal muscles (their contraction and relaxation), plus your heart, brain, neurons, digestive system, immune functions... The list goes on.

And it's in the mitochondria that the food we eat is combined with the oxygen we breathe to create ATP.

While making ATP is mitochondria's best-known function, they do loads of other important things to support homeostasis (an SAT word for the balance of systems and processes that keep us healthy). Our cells are always seeking to maintain or regain homeostasis. The way we live either supports or detracts from this process of dynamic balance, in large part by how it affects our mitochondria (more on that below).

Beyond creating ATP, mitochondria play a critical role in ridding our cells of toxins. They also make an iron compound that allows red blood cells to transport oxygen to your body's tissues. They serve as an initial production site for hormones.

They store calcium ions, which helps cells maintain an ideal concentration of these critical electrolytes.

There's even new evidence suggesting that mitochondria impact how we process stress and how our bodies "store" emotion.

Nearly every process in your body is in some way linked to mitochondria. When they can't do their jobs, it's like trying to run a major city with a malfunctioning power grid. Eventually, things break down, and when they do, massive problems ensue.

Your Cells' Sanitation Workers

In addition to producing fuel, mitochondria remove toxins from your cells, including the byproducts of normal cellular metabolism, along with those you're exposed to in the environment, such as traces of mercury in food or lead in drinking water.

Like microscopic trash collectors, mitochondria help to get rid of substances such as reactive oxygen species (ROS). You've likely heard of "free radicals"—they're one type of ROS.

However, like pretty much every thing in the body, it's about balance. ROS aren't all bad. They're now understood to play key roles in cell signaling for functions including gene expression, cell growth and apoptosis (controlled cell death).

What's important is to have balance in levels of antioxidants and free radicals.

When mitochondria are impaired, they can't clean up free radicals. When we have too many free radicals in our cells, the cells can't function properly.

And when cells don't function properly, they produce even more cellular waste, and less ATP.

That not only makes you feel lousy, it can lead to serious health problems.

The Links Among Mitochondrial Malaise, Aging and Illness

Most of us struggle with low energy and persistent fatigue—they're among Americans' top health complaints. These symptoms are not only annoying, they're also indicators of mitochondrial dysfunction.

Early signs that your mitochondria are struggling include general fatigue and brain fog. As things worsen within your cells, you might notice pain in your joints, anxiety, sleeplessness, headaches, gastrointestinal bloating and sensitivity to certain foods or smells.

If left untreated, toxic accumulation can lead to severe difficulty overcoming colds or flu, chronic pain, irritable bowels and serious mental challenges (mitochondrial dysfunction has been linked to mental health disorders including schizophrenia and bipolar disorder).

Failure to correct mitochondrial dysfunction could lead to a cascade of additional health problems. Medications may be able to reduce toxic load temporarily, but those good old antibiotics could actually cause even more damage to your mitochondria.

Mitochondria are also major triggers of cellular "aging." A host of variables can damage mitochondria, causing them to age prematurely and malfunction. (This is one of the reasons long-term, heavy smokers and drinkers often look older than their chronological age, and frequently seem as if they've gotten younger after they quit.)

When mitochondria become inefficient or ineffective at their jobs, they signal for help with pro-inflammatory cytokines (signaling cells for your immune system). If these signals keep going off, inflammation continues.

Chronic low-level inflammation has been implicated as a common factor in major disease processes, and studies show that persistent accumulation of excess free radicals leads to premature aging, disease and eventually death.

For all these reasons and more, many researchers are now looking to mitochondria as the holy grail of aging. The theory is that if you can reverse mitochondrial damage, get rid of damaged mitochondria and/or produce more mitochondria, you can actually become more youthful.

Making More Mitochondria

The process through which your body makes more mitochondria is called “mitochondrial biogenesis.” We know that in most cases, exercise helps to increase your daily energy supply. That’s in part because it prompts mitochondrial biogenesis—the number of mitochondria in a cell—along with their effectiveness—increases in response to exercise.

High-intensity interval training (HIIT) has shown to be the most effective form of exercise for boosting mitochondrial biogenesis. But regular cardiovascular exercise (such as a long jog or bike ride) boosted mitochondrial production, as well.

As we begin to require more energy from the body, we also require an increased ability to process the byproducts of energy use (including those potentially pesky free radicals). Mitochondria do both.

How Mitochondria Can Age Us

The “mitochondrial theory of aging” has been around for some time, and it goes a little something like this:

- Over time, cellular production of two specific free radicals increases—superoxide anions and hydrogen peroxide. These free radicals attack mitochondria.

- Typically, antioxidants can play the role of bodyguard to mitochondria, preventing harmful effects from free radicals. But as we age, levels of antioxidants in cells decline. Antioxidants called free radical scavengers—which sound like something from *The Walking Dead*, and kind of are—roam the cells neutralizing free radicals. Typically they're part of mitochondria's arsenal of defenses. As we age, however, their numbers decline, leaving mitochondria high and dry.
- As mitochondria (and to some extent the surrounding cell) succumb to attacking free radicals, even more free radicals are released...and you know what happens then.

If we can interrupt this cycle by restoring the health of our mitochondria, increasing antioxidants to helpful levels and supporting other natural healing processes, we can revitalize the body and perhaps even reverse the aging process.

A Note About Free Radicals and Antioxidants

From many discussions of free radicals and antioxidants, you might get the impression that free radicals are bad and antioxidants are good. As mentioned earlier, free radicals perform some important functions, such as playing a role in cellular signaling. It's when they're present in excess that they become problematic.

Similarly, antioxidants aren't a miracle solution. While antioxidants are important to prevent an excess of free radicals, there is such a thing as overdoing it (and that's one reason all supplementation should be undertaken with caution).

Just as there can be "oxidative stress" caused by an excess of free radicals, "antioxidative stress" is also a thing. If you consume too many antioxidants—through food or supplementation—they may preempt your body's natural antioxidant-making mechanisms and wipe out free radicals before they get a chance to do the good things they do.

Now back to your mitochondria...

Trouble Losing Weight? It Could Be Your Mitochondria

Studies show that many people who are overweight or obese have problems with their mitochondrial function. In addition to helping to mobilize fat to be used as fuel, mitochondria play a role in skeletal muscle physiology. If you're trying to lose fat, gain muscle and boost your metabolism, you need their help.

For others, mitochondrial problems with weight loss are related to thyroid issues. The health of your thyroid relies on the health of your mitochondria and vice versa, and both play a big role in your metabolism. Low energy and fatigue are hallmarks of hypothyroidism precisely because the thyroid helps to regulate the production of ATP (the energy created by mitochondria).

Mitochondrial dysfunction can have long-term consequences for your thyroid. It's even been linked to chronic issues such as Hashimoto's disease.

Mitochondria and Digestive Issues

Even chronic digestive issues such as IBS and leaky gut could stem from your mitochondria.

Your intestinal wall is relatively thin, and energy produced by mitochondria helps to keep it in tact. When mitochondria underperform, your intestinal wall can become inflamed and more permeable.

Think of the Berlin Wall coming down, but not in a good way. All of the sudden, toxins and other contents of your intestines leak into your bloodstream (hence the name "leaky gut").

Mitochondrial dysfunction is a two-way street, so problems in the GI system can both stem from and contribute to poorly performing or overburdened mitochondria. Once toxins begin to run roughshod all over your systems, mitochondria shoulder even more of a burden trying to clean them up, and that can damage them even more.

What Causes Mitochondria to Malfunction

The health of your mitochondria is critical to your overall health. We've established that. But what causes damage to your mitochondria in the first place, and how can you prevent or reverse it?

Potential insults to mitochondria abound, even on your plate.

Even though mitochondria seem tough, producing power and fighting toxins as they do, each mitochondrion contains a copy of your DNA, and this delicate genetic material can sustain damage from a variety of sources.

These include:

- Heavy metals
- Exposure to pollution
- Bacteria and viruses
- Cigarette smoke (including e-cigarettes)
- Processed food additives and preservatives
- Sugar and artificial sweeteners
- GMOs
- Pesticides
- Antibiotics
- Pain relievers
- Statin medications
- Psychotropic medications
- Stress hormones

Looking at this list, it seems like everywhere you turn, your mitochondria are in danger. In some ways, they are.

Under a microscope, mitochondria look like tiny filters. Toxins, bacteria and other pathogens can clog the tiny machinery inside each mitochondrion, damaging the cells' DNA and causing a host of problems.

For example, accumulated heavy metals can starve cells of needed oxygen, rendering it impossible for the cells to maintain good health.

The Danger Of Stealth Pathogens

“Stealth pathogens” pose a particular threat to your mitochondria. They carry a low viral load, but are difficult to detect. Like your in-laws, stealth pathogens hang around and chip away at you bit by bit, and it’s very hard to get rid of them.

These pathogens go to work on the body well before they can be detected by laboratory surveillance. Once symptoms surface, the damage is already well under way.

Drugs’ Deleterious Effects On Mitochondria

Medications have emerged as a major source of damage to mitochondria, which could be the source of many of the drugs’ noted adverse effects. Psychotropic drugs, statin medications, pain relievers (including plain old acetaminophen) and many other drugs have been shown to have such detrimental effects on mitochondria that they’ve been linked to disease and even death.

And those antibiotics prescribed to help you feel better could actually be making things worse. Studies show that while they may cause a temporary decrease in symptoms, many commonly prescribed antibiotics, such as tetracycline, increase stress on mitochondria, causing them to malfunction.

The Perils On Your Plate

Evidence is accumulating that poor nutrition linked with mitochondrial dysfunction can lead to serious chronic illnesses, such as Parkinson’s disease and heart disease.

When we consume nutrient-poor foods—such as sugar, preservatives and processed foods—we require our mitochondria to manufacture energy using

“junk” materials. This generates excessive free radicals and inflammation, which contribute to disease.

Researchers have also observed diets high in unhealthy fats increase the production of free radicals, which are a major contributor to fatty liver disease. If mitochondria are already performing sub-optimally (due to any of the factors already listed), a high-fat diet can contribute to the production of even more free radicals, which can speed aging and disease processes.

However, if your mitochondria are healthy, you're better equipped to process fats, and in fact you need healthy unprocessed or minimally processed fats for fuel and to support optimal cellular function. (See below for more on healthy fats.)

How to Keep Your Mitochondria Happy

So what can we do to help our overburdened mitochondria?

As you just read, some foods enhance mitochondrial oxidative phosphorylation (that's a fancy term for the process through which our body makes energy), while others make it harder.

Here are five ways how what you put in your mouth can support your mitochondria:

1. Eat loads of fresh fruits and vegetables.

The reason fruits and veggies are so detox friendly is that they contain naturally occurring enzymes that act as catalysts to help mitochondria filter toxins from cells. Eating five to 15 servings per day of fresh fruits and vegetables pumps your mitochondria full of happy-making enzymes.

When it comes to all of your food, organic, non-GMO is best. Pesticides are one of mitochondria's worst enemies, plus organic foods tend to have more nutrients.

2. Keep processed foods and sugars to a minimum.

Your mitochondria work best when they have access to high-quality materials. Feeding your body lots of processed foods and sugar junks up the system. Eating more fresh or home-prepared foods ensures that you have access to the vital nutrients your mitochondria need to keep you healthy.

3. Eat healthy fats.

When it comes to your mitochondria, healthy fats are an important part of your diet.

Your cell membranes are made of phospholipids—essentially, fatty acids and proteins bind together to form a container around your cells. The phospholipids surrounding your mitochondria house fats and proteins that are critical to their metabolic and detoxification processes.

For years, we were told that fat is the enemy. As it turns out, healthy, naturally occurring fats—such as those found in avocados and avocado oil, coconut oil and olive oil—are some of our best friends. They contain specific vitamins and vitamin-like compounds that improve mitochondrial performance.

The fats to avoid are the hydrogenated oils in processed foods such as margarine, along with trans fats. Rule of thumb: If it's produced in a lab, it's probably not good for you.

4. Minimize high-glycemic foods.

Food that are described as “high-glycemic” raise blood glucose levels rapidly, and that's hard on your mitochondria because they have to process all of that glucose. That can wear out your mitochondria and intensify mitochondrial aging, and nobody wants that.

Low-glycemic foods tend to have more fiber and nutrient density, which slow the body's reaction to changes in your blood glucose.

5. Stay hydrated.

When there isn't enough water in your cells, enzymatic activity and mitochondrial detoxification processes slow down, allowing the buildup of free radicals. A good guideline is to drink three to four liters of high quality, pure water steadily throughout the day.

What's Missing Is Your Mitochondria

In many ways, mitochondria are the gatekeepers of health. However, traditional medical solutions seek only to suppress symptoms rather than tackle the underlying cause of disease. Some treatments make patients even sicker.

Once you understand the role of mitochondria in the disease process, it quickly becomes apparent that the only way to truly restore health is to address mitochondrial damage and dysfunction.

The [company name] was created to do just that.

About The [Company Name]

Content withheld from this version.