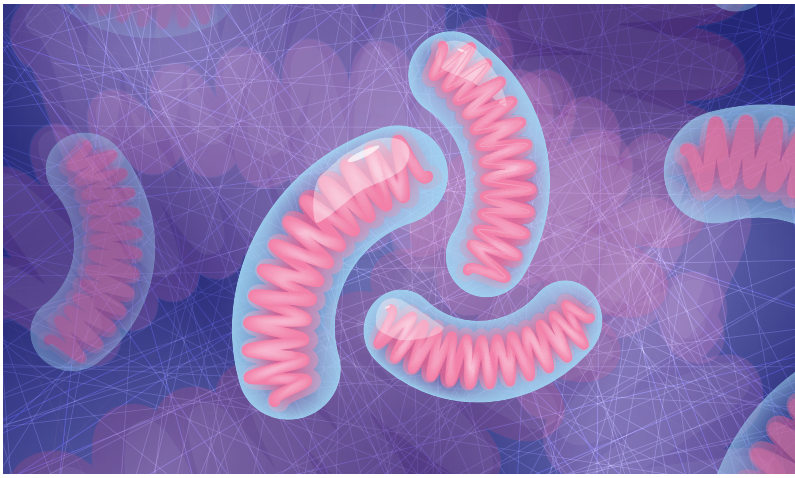
MITOCHONDRIA 101:
The Basics You Need To Know

WHAT ARE MITOCHONDRIA?



Mitochondria are well-known as the powerhouses of the cell and are found within almost all living cells in varying numbers. They are small organelles floating freely through the cell that act like a digestive system, taking in nutrients, breaking them down, and creating energy-rich molecules (ATP) for the cell. These processes of the cell are known as cellular respiration. [1]

Multiple reactions involved in cellular respiration occur in the mitochondria. Mitochondria are the organelles that keep the cell fueled with energy. Furthermore, mitochondria are unusual in that they have their own DNA and ribosomes (vital organelles that manufacture proteins) floating in their inner matrix. Mitochondria play a critical role in activities that enable cells to function and help to maintain a healthy body, including:

- Production of ATP (ATP is the energy-carrying molecule found in cells)
- Regulation of Innate Immunity
- Calcium Homeostasis
- Programmed Cell Death
- Stem Cell Regulation [2]

In the past two decades, mitochondria have been identified as signaling organelles that contribute to cell proliferation, death, and differentiation. Mitochondria can switch from being organelles which primarily produce ATP (the fuel source for cells) to organelles that produce both ATP and the building blocks for macromolecule synthesis. This switch enables them to meet the metabolic demands of various immune cells.

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MITOCHONDRIA AND THE IMMUNE SYSTEM

As you can see, healthy mitochondria are crucial for many processes. However, only recently have the mitochondria's significant role in the immune system and cellular defense come to light. When there is an infection, the mitochondria help to direct and activate the immune system.

Take, for example, a situation where you have a cold or the flu. There is typically a fatigue component of the infection—you're tired and want to rest. When the body is under threat of infection, the mitochondria are shifting from energy/ATP production over to an immune role where they can handle the infection. So, while they are focusing on their immune function, the mitochondria are making less ATP. Hence, the infected person is tired.

Now, think about people who are stuck in a state of chronic infection or chronic illness. These people are chronically fatigued for a couple of reasons:

① The mitochondria aren't working well, so energy production and other vital processes are reduced.
② The mitochondria have shifted their main focus toward immune support in an effort to control the infection.

This shows just how essential it is to support your mitochondria as you start to heal from chronic illness, while you are recovering from chronic illness, in the end stages of healing, and even moving forward, to maintain the health of the body.

Here is another consideration regarding maintaining mitochondrial health long-term:

When toxicity and pathogen loads build up in the body contributing to chronic illness, those burdens will need to be reduced for healing to happen. Thrown into the mix is the thought that if the level of mitochondrial function doesn't remain high (if the mitochondrial level doesn't remain higher than the toxin and pathogen levels), people will get sick again.

So, you aim to bring the toxin and pathogen loads down and lift the mitochondria level up above those burdens. Then, that situation can become the standard operating procedure in the body, and it will be able to ward off the toxins and pathogens that it is exposed to naturally. But again, if the mitochondria level stays too low compared to the burden of toxins and pathogens, then people can become ill again.

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RESTORE HEALTHY MITOCHONDRIAL FUNCTION WITH A NUTRIENT-RICH DIET

A diet full of refined sugars, processed foods, and other inflammatory foods can lead to mitochondrial problems, oxidative stress, and disease. Adopting a nutrient-rich nutrition strategy can improve your mitochondrial function while lowering inflammation, decreasing oxidative damage, and reducing your risk of chronic health problems.

Avoid inflammatory foods, such as refined sugar and carbs, casein, poor quality fats, and artificial ingredients in your diet. Eat plenty of nutrient-rich greens, vegetables, fruits, herbs, and fruits in multiple colors, which are laden with vitamins, minerals, and antioxidants. Focus on healthy fats, such as grass-fed butter, coconut oil, avocados, ghee, MCT oils, and organic pasture-raised eggs.

If you eat meat, choose clean proteins, such as grass-fed beef, pasture-raised poultry, wild-caught salmon, and even wild game. Additionally, consuming organ meats, such as liver, kidney, bones, heart, tongue, intestines, brain, and tendons can be beneficial for mitochondrial health.

Notably, heart meat has plentiful CoQ10 enzymes which are especially beneficial to the mitochondria, as they reduce oxidative stress and improve energy production. You may wish to consider adding a CoQ10 supplement to your regimen to support your mitochondria as well.

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A KETOGENIC DIET IMPROVES MITOCHONDRIAL HEALTH

The much-touted ketogenic (keto) diet can provide potent health benefits. This core of this diet is consuming high levels of fat and low levels of carbs. Eating in this way shifts the body's preferred fuel to ketones, instead of glucose. Altered eating patterns such as fasting and intermittent fasting will cause your body to use ketones as a fuel source as well.

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A ketogenic diet also can slow the progression of mitochondrial disease, providing you with more energy, slowing the aging process, and reducing the risk of chronic diseases. [4]

INTERMITTENT AND EXTENDED FASTING IMPROVE MITOCHONDRIAL HEALTH

As discussed briefly above, intermittent and extended fasting can significantly improve your mitochondrial health. When you fast, damaged mitochondria are purged through a process called autophagy. Autophagy plays an essential role in maintaining the mitochondria. The process of autophagy helps mitochondria to remove damaged and unwanted debris, accumulated reactive oxygen and nitrogen species, and harmful unfolded proteins. [5] Fasting also promotes mitophogy, another process which selectively degrades damaged mitochondria.

Research has also associated caloric restriction and fasting with improved mitochondrial function, better health, and increased longevity. Fasting can reduce the byproducts of oxidative stress and increase oxygen efficiency while maintaining vital ATP production. [6]

Some people find extended fasting uncomfortable, and it could even be harmful in cases of hypoglycemia. Intermittent fasting may be a better option for some individuals. Intermittent fasting is an altered eating pattern that employs a period of eating (say, an 8-hour window), followed by a period of fasting (say, a 16-hour window), typically within the same 24-hour time frame.

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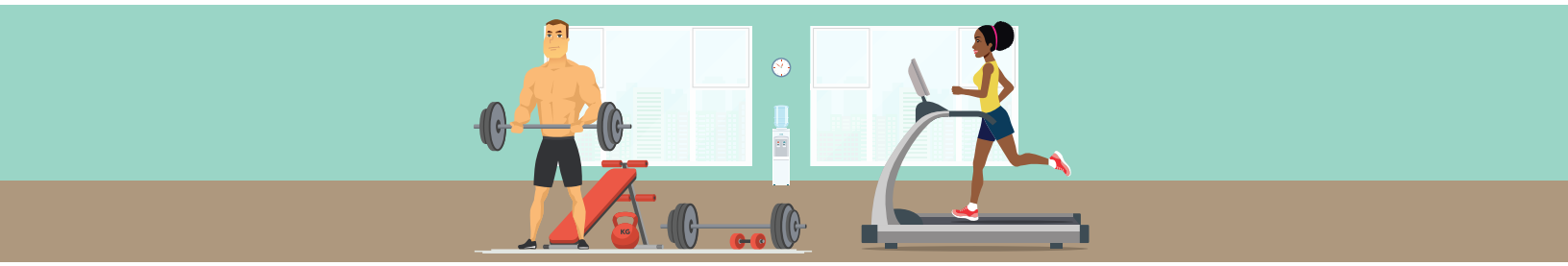
OTHER WAYS TO SUPPORT YOUR MITOCHONDRIA



REGULAR EXERCISE IMPROVES MITOCHONDRIAL HEALTH

More research comes out daily confirming the harmful effects of a sedentary lifestyle and praising exercise and movement. So, it's no surprise that regular exercise can improve mitochondrial health. Aerobic exercise, in particular, can help change the shape of mitochondria, aid in their repair, and promote mitochondrial balance.

Studies demonstrate that exercise can slow the aging process and improve mitochondrial function, even later in life. [7]

REDUCING STRESS AND GETTING QUALITY SLEEP CAN IMPROVE MITOCHONDRIAL HEALTH

People who have mitochondrial problems will typically experience fatigue. Reducing stress and sleeping better are critical if you are experiencing issues related to mitochondrial function. Persistent stress can lead to increased inflammation, reduced immune function, and more fatigue.

Research shows that less than seven hours of sleep per night can lead to reduced mitochondrial DNA in the blood. Sleep deprivation, even for short periods, can result in mitochondrial dysfunction and increased oxidative stress. For the sake of your mitochondria, get 7 to 8 hours of sleep per night or more on a regular basis. [8]

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NUTRIENTS AND SUPPLEMENTS CAN IMPROVE MITOCHONDRIAL HEALTH

Mitochondria-Supportive Nutrients

The nutrients in certain mitochondria supportive products can help to supercharge your energy levels. Harnessing the benefits of specific fulvic acid extracts, these supplements are usually formulated to enhance mitochondrial function and upregulate ATP production. As they increase your energy levels, they also improve your ability to detoxify to maximize your health protocols. These highly specialized formulas promote cellular renewal and help mitochondria in their immune system role.

Look for supplements that contain specifically chosen extracts of fulvic acid, combined with polyelectrolytes to support your mitochondria and maximize their ATP production. You'll want specific minerals, electrons, and polysaccharides that your precious power generators need to not only support energy creation, but to enhance your immune response, and help to protect you from DNA damage as well.

Other helpful mitochondrial support nutrients include:

- CoQ10
- B vitamins
- Magnesium
- Resveratrol
- Alpha-lipoic acid
- Creatine
- Curcumins
- D-Ribose

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