

Mitochondria and NAD⁺

If you've ever wondered why we slow down as we get older and become more prone to illness and injury, it's time to consider NAD⁺ and what it can do for you. Nicotinamide adenine dinucleotide (NAD⁺) is a vitally important molecule that hundreds of chemical reactions and processes within each cell rely on to work correctly. NAD⁺ works as a coenzyme, directly and indirectly affecting metabolism, DNA health and repair, cellular aging, and the proper functioning of the immune system.

As we age, NAD⁺ production declines steeply, causing the cellular repair systems that rely on it to accumulate damage that doesn't get fixed correctly, if at all. As this deep cellular damage builds up, our cells become increasingly [less able to rejuvenate themselves](#). Basic chemical reactions that produce energy inside our tissues also slow down when NAD⁺ supplies drop off.

How Does NAD⁺ Work?

NAD⁺ works by enabling the chemical and biological processes that regulate [hundreds of functions in each cell](#). It's found in most of the cells in the body, located within the interior fluids of cells (cytoplasm), the storage site of cellular genetic material (the nucleus), and the mitochondria, each cell's center of energy production.

NAD⁺ is required by the mitochondria of every cell to produce and use adenosine triphosphate, the most basic fuel needed by each cell of the body. Inadequate amounts of NAD⁺ cause cells to become sluggish, inefficient, and in cases of severe NAD⁺ deficiency, to die prematurely, accelerating the aging process. Without ATP, all life functions of every cell in your body would halt within minutes, but that's not all NAD⁺ does.

NAD⁺ as a Cofactor

NAD⁺ is a coenzyme, a [type of cofactor](#). Cofactors help enzymes work by turning them off or on and modulating how rapidly they work. Cofactors like NAD⁺ aren't part of the chemical reactions themselves; instead, they control when and how the reactions take place. Without NAD⁺, many biological processes would either not work at all or would work at the wrong speed. Its extreme versatility makes NAD⁺ one of the most important cofactors in the body,

responsible for controlling over 500 biological functions, including cell aging, cellular metabolism, tissue repair, and DNA repair.

Low NAD⁺ is associated with numerous [illnesses and health issues](#), such as type II diabetes, chronic inflammation, chronic fatigue, insulin resistance, degenerative disorders of the brain, and many diseases and conditions associated with aging. Low NAD⁺ is also partially responsible for the loss of elasticity in facial tissues, wrinkles, and aged-looking skin.

The Roles of NAD⁺

Mitochondrial NAD⁺ does the following:

- **Activates Sirtuins**

Sirtuins are proteins that manage cellular aging, repair DNA, regulate the creation of mitochondria, regulate glucose metabolism within the cells, and inhibit inflammation.

Sirtuins control how long cells live and how active they are during their lifespan, which has led researchers to focus on them as major factors in [human aging](#). Plentiful NAD⁺ is a requirement for activating all of the sirtuins. Put simply, without NAD⁺, sirtuins won't work at all and all the functions that rely on them will fail.

- **Supports Brain Tissue Health**

Brain tissue demands more of the body's energy and nutrients than any other organ in the body but making use of those nutrients calls for plentiful amounts of NAD⁺. A lack of healthy levels of NAD⁺ reduces the activity of brain cells and makes them less able to send and receive signals from each other. In fact, poor NAD levels are associated with brain fog, poor concentration, impaired memory, and poor mental focus. Low NAD⁺ is also correlated with several neurodegenerative disorders and [dementia](#), such as Alzheimer's.

Getting enough NAD⁺ is also required for the production of dopamine, serotonin, and norepinephrine, neurotransmitters that are necessary for a [stable mood](#), our ability to feel pleasure and manage pain, as well as creating memories and retrieving them. These neurotransmitters also control our circadian rhythm, our ability to focus and concentrate, as well as [dozens of other critical body functions](#).

- **Boosts Immune System Health**

NAD⁺ can modulate the [functioning of the immune system](#) by controlling inflammation and prompting the activation of sirtuins, particularly [SIRT6](#). NAD⁺ also helps improve the immune system's effectiveness by increasing the amount of T-cells during illness. T-cells fight infections and also attack cancer cells.

- **Supports Muscle Health**

NAD⁺ helps muscle cells regenerate after exercising, allowing muscle tissue to [grow stronger](#). This same process allows muscles to heal after injuries. Because muscles use a great deal of energy during exercise or vigorous activity, they must have large amounts of NAD⁺ to properly use glucose and other nutrients to contract and expand correctly.

- **Improves Weight Loss**

Healthy levels of NAD⁺ help cells produce energy. Inadequate levels of NAD⁺ cause a person's metabolism to slow down dramatically. Because NAD⁺ is necessary for cells to break down and use glucose, not getting enough NAD⁺ causes blood sugar levels to rise, causing system inflammation, while putting metabolism into a crash dive. By restoring NAD⁺ levels to their optimum, it becomes easier to lose weight.

- **Fights Fatigue**

Because NAD⁺ is required for cells to produce energy correctly, it makes sense that low amounts of NAD⁺ lead [to fatigue](#).

Where Do We Get NAD⁺?

Some foods can increase your NAD⁺ supplies. They include:

- Mushrooms
- Green vegetables
- Whole grains
- Foods made from yeast
- Fish (sardines, tuna, salmon)

Other ways to increase your NAD⁺ include fasting and exercise, which are healthy habits.

However, fasting and exercise take time to start delivering benefits. The most rapid and convenient way to experience the vast benefits of improved NAD⁺ levels that you need is through supplementation, which can be in the form of oral supplements or IV therapy.

Not only is NAD⁺ supplementation the most convenient way to increase your NAD⁺, but it delivers higher levels of NAD⁺ than diet, exercise, or fasting can.

Resources

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