time—line

Immune Aging and the Role of Mitochondria

Overview

Immune, muscle and brain function are key drivers of aging and healthspan. One key factor that impacts these systems is mitochondrial health.

The immune system is highly metabolically demanding — a significant amount of energy is needed to create healthy immune cells.

The immune system depends on mitochondrial integrity to deliver the energy needed to fuel its energy-demanding tasks.

Mitochondria become less efficient with age, and mitophagy, the process that clears out damaged mitochondria, slows down.

Mitochondrial dysfunction contributes to immune cell issues. Damaged mitochondria themselves may play a role in chronic low-grade inflammation (also known as inflammaging).

Stimulating mitophagy helps maintain mitochondrial quality and healthy immune cell activity.

The Science

3 Hallmarks of Immune Aging

Immune Cells Shift
Lymphocytes, leukocytes and naive CD8+ T cells naturally decline with age, and the thymus gland reduces the body's ability to make new naive T cells.

Inflammaging
Occurs when the immune system stays activated for a prolonged period of time.

Mitochondrial Dysfunction
Occurs when mitochondria do not work optimally — immune cells may have less activity to carry out their normal functions.

Immune Fitness Depends on Healthy Mitochondria



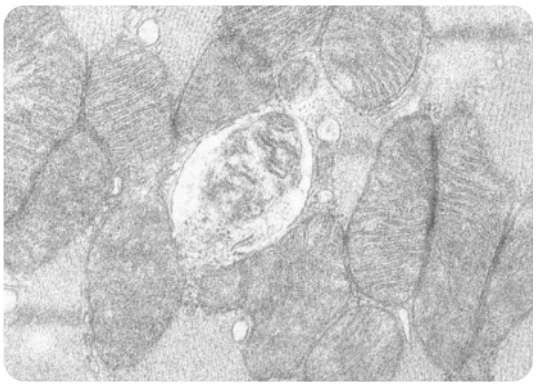
1. Mitochondrial function declines with age
2. Mitophagy slows & damaged mitochondria accumulate
3. Immune cells lose their ability to respond effectively
4. Cellular energy production slows & inflammaging occurs

Stimulating Mitophagy Helps Address Immune Aging

Mitophagy targets a root cause of immune aging: the accumulation of dysfunctional mitochondria.

Stimulating mitophagy is foundational; it activates the cleanup process that repairs and clears damaged mitochondria. This allows energy production and biogenesis to work effectively, making room for healthy mitochondrial production.

Urolithin A is clinically proven to stimulate mitophagy, making Mitopure® a foundational mitochondrial supplement.*



Key Takeaways

The immune system becomes less adaptable with age. Immune cells lose energy and repair slows with mitochondrial dysfunction.

Even subtle changes to the immune system impacts aging, influencing cellular energy and overall balance across the body.

Supporting mitochondrial health with Mitopure can promote immune fitness by rejuvenating immune cells.†*

time—line

MitoImmune Study At-A-Glance

Overview

Background
Mitopure, a pure and patented form of Urolithin A, has been shown to safely benefit the mitochondria and muscle health, making it a candidate for immune fitness.

Study Partners
Dr. Dominic Denk; Prof. Florian Greten at the Georg-Speyer-Haus Institute for Tumor Biology and Experimental Therapy; Dr. Eric Verdin at the Buck Institute for Research on Aging.

Publication
October 31, 2025 in nature aging

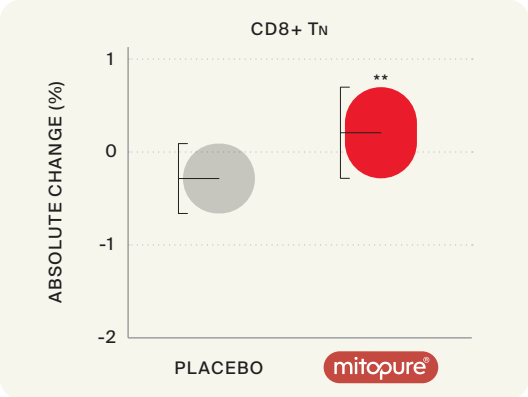
Hypothesis
Mitopure can help keep the aging immune system healthier by improving mitochondrial function.

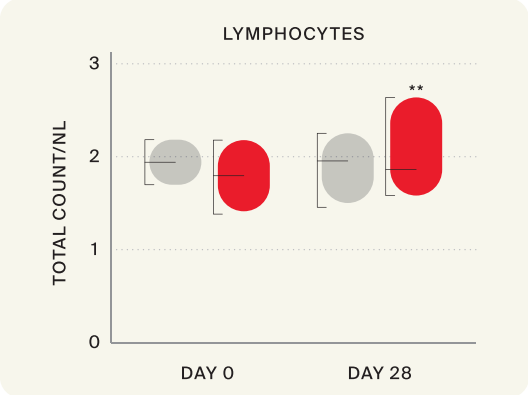
Participants
50 healthy adults aged 45–70 years with an average age of 53; 60% female and 40% male.

Study Design
Randomized, double-blind, placebo-controlled trial where participants either supplemented daily with 1000 mg Mitopure or a placebo for 28 days.

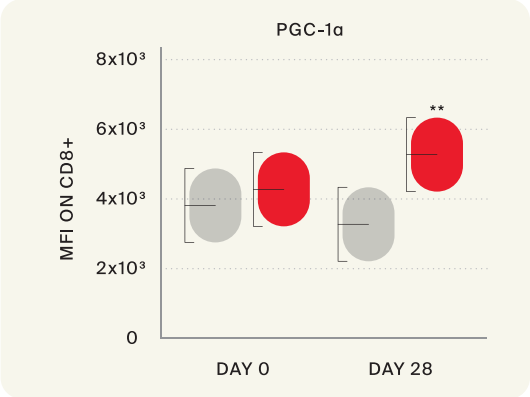
Study Findings

Rejuvenated Immune Vitality was seen as the number of naive CD8+ T cells increased. These cells showed less exhaustion, making them more ready to fight infections. Lymphocyte count also increased, representing a positive shift in immune cell populations.





Improved Mitochondrial Biogenesis was shown by an increase in PGC-1α, a key signal for mitochondrial growth. The creation of new, healthy mitochondria is a downstream effect of mitophagy in the majority of immune cell populations.



Innate Immune Vitality Improved as normal immune cell activity, including natural killer (NK) cells involved in the innate immune system, increased.

Energy Metabolism Improved as immune cells shifted toward cleaner fuel sources like fatty acids and amino acids, instead of relying on glucose in those taking Mitopure, supporting a more efficient metabolism.

Healthier Immune Cell Activity occurred when challenged ex vivo. Immune cells from participants taking Mitopure cleared *E. coli* particles more effectively, supporting a more youthful immune cell profile associated with healthy aging.

Clinical Relevance

Daily supplementation with Urolithin A may help support immune fitness by promoting mitochondrial health. Mitopure targets key drivers of immune aging, namely by increasing the number of early-responding immune cells, improving mitochondrial function in these cells, and supporting their energy metabolism — all of which support immune fitness.*†

Read the Full Study

Effect Of The Mitophagy Inducer Urolithin A On Age-Related Immune Decline: A Randomized, Placebo-Controlled Trial

*These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure or prevent any disease.

†Our randomized, placebo-controlled clinical study showed that supplementation with Mitopure® 1,000mg for 4 weeks was associated with improvements in mitochondrial health of immune cells, favorable shifts in T-cell populations (including naïve cells), and markers of healthy immune function, in healthy, middle-aged adults.

** P<0.05

POWERED BY mitopure