

## **Muscle: The Organ that Powers Vitality**

*In this series, discover how skeletal muscle, the body's largest organ, impacts health and longevity. From regulating hormones and blood sugar to boosting brain health, muscles are far more than just a source of strength.*

*By [Sheramy Tsai](#) (Epoch Health / The Epoch Times) August 7, 2024 Updated: August 7, 2024*

### **Part 4**

# **4 Ways Building Muscle Boosts Your Immune System**

**Research shows that exercise boosts immune cell production and increases anti-inflammatory cytokines.**

How ready is your immune system to fend off illnesses? Many know vitamin C, a balanced diet, sufficient sleep, and regular exercise can improve immune function, but fewer understand the importance of muscle.

Muscles are now recognized as organs due to their vital roles in regulating metabolism, producing hormones, and communicating with other organs.

Dr. Sandeep Palakodeti, an internal medicine doctor and founder of Rebel Health Alliance, told The Epoch Times that this reclassification helps us appreciate muscles' extensive functions, not just in movement but also in regulating overall body health, including the immune system.

“Healthy skeletal muscles boost immunity by reducing inflammation and improving immune cell function,” Dr. Palakodeti said.

As the many roles of muscles become clear, it's evident that increased muscle mass can significantly boost your immune system's strength and resilience.

## **Muscles and Immunity**

Muscles are often viewed primarily as contributors to movement and metabolism, but recent studies show that muscles also enhance immune function.

[A 2022 study](#) in *Experimental Gerontology* shows that resistance exercise, such as weightlifting, boosts immunity by activating key immune pathways and reducing inflammation. Reviewing 30 studies, researchers found that just one

session of resistance exercise can enhance immune cell function, but regular workouts over weeks are needed for lasting benefits.

A [Journal of Immunology Research study](#) demonstrated that strength training induces significant changes in physiological and immunological biomarkers. Even a single strength training session increased the number of white blood cells and other immune cells, directly enhancing immune function.

Dr. Ryan Steele, assistant professor at Yale School of Medicine, said that [strength training boosts](#) the immune system by reducing inflammation. “Strength training also exerts a potent anti-inflammatory effect immediately after a training session,” he said.

Strength training changes the levels of proteins called cytokines, which help control immune responses. It also increases regulatory T cells, which keep the immune system in balance and prevent it from attacking the body’s own tissues.

## **Muscles and Immunity: A 2-Way Street**

The relationship between muscles and the immune system is reciprocal. Muscles support immune function, and the immune system aids muscle repair and growth. When muscles are damaged from exercise or injury, immune cells rush to clear debris and initiate muscle regeneration.

[A 2022 study](#) in PeerJ showed that macrophages, a type of immune cell, are crucial for muscle repair. Initially, they create an inflammatory environment to remove damaged cells and pathogens. Later, they transition to an anti-inflammatory role, releasing growth factors and signals that promote tissue repair and growth. This dual function ensures efficient muscle recovery and adaptation, leading to stronger, more resilient muscles.

This dynamic interplay between muscle tissue and the immune system underscores the importance of maintaining muscle mass—not just for physical strength but for overall immune health.

As Dr. Gabrielle Lyon notes in her book “Forever Strong,” muscle is the organ of longevity and vitality. Its health and function are essential for overall well-being, including the immune system. This insight makes it clear: Building muscle is a crucial strategy for a healthier, more resilient life.

“Research clearly shows that skeletal muscle plays a role in regulating a healthy immune system,” Dr. Lyon wrote. “The condition of your muscle tissue can heighten disease processes or correct metabolism as well as the underlying disease.”

## **Muscles Secrete Myokines**

Every time muscles contract during exercise, they release proteins called myokines, a type of cytokine. These proteins act as messengers, regulating various body functions, including the immune system.

According to [a 2021 study](#) published in *Endocrine Reviews*, “Recent advances show that skeletal muscle produces myokines in response to exercise, which allow for crosstalk between the muscle and other organs, including [the] brain, adipose tissue, bone, liver, gut, pancreas, vascular bed, and skin, as well as communication within the muscle itself.”

Two crucial myokines released during exercise are interleukin-6 (IL-6) and interleukin-15 (IL-15). IL-6 is released during aerobic exercise, such as running, and helps regulate inflammation, boosting the immune response.

According to the [National Institute of Health](#), IL-15, released during resistance training such as weightlifting, supports the growth and function of T cells and natural killer cells, which are vital for fighting infections and cancer.

In addition to IL-6 and IL-15, exercise triggers the release of other important myokines, such as interleukin-7 (IL-7) and myostatin.

Donald Layman, a metabolism expert with a doctorate in nutrition science, told *The Epoch Times*, “IL-15 and IL-7 enhance the immune system by boosting the development of T-cells and B-cells, which are crucial for fighting infections.”

Normally, IL-6 is linked to inflammation, especially when paired with another protein called TNF- $\alpha$ , he said. However, when muscles release IL-6 during exercise, it does not cause this harmful inflammation. Instead, it helps strengthen the immune system without any inflammatory damage.

[A 2024 study](#) published in *Frontiers in Immunology* found that acute exercise significantly increases circulating IL-15 levels, enhancing immune function. The study showed that IL-15 levels rise within one hour of exercise.

“Typically, muscle’s effects on the immune system go unseen,” Dr. Lyon wrote in her book. “We are looking into ways to analyze blood markers to gauge the effectiveness of skeletal muscle as an organ system.”

## **Muscles Produce Glutamine**

Glutamine, a nonessential amino acid, is crucial for muscle function and immune health. According to [a study](#) in *Nutrients*, about 80 percent of the body’s glutamine is stored in skeletal muscles, where its concentration is 30 times higher than in the blood. “The body’s glutamine availability and metabolism are directly associated with the skeletal muscle tissue,” the authors note.

Mr. Layman told *The Epoch Times* that the body releases glutamine into the blood to support immune cells such as leukocytes and macrophages. “Glutamine is a primary fuel for immune cells,” he said.

He said that muscles produce glutamine from branched-chain amino acids (BCAAs). As muscles metabolize BCAAs, they create glutamine, which is then released into the bloodstream. However, high glucose levels, common in high-carbohydrate diets or diabetes, reduce glutamine production. He emphasized the vital role of muscle-derived glutamine in maintaining a robust immune system.

[A study](#) in *Frontiers in Physiology* reinforces this idea. “Studies have shown the importance of a healthy, in constant contraction skeletal muscle to keep glutamine at optimal levels to assist the immune response,” the authors stated. Regular exercise helps maintain these levels, ensuring robust immune function.

## **Muscles Improve Circulation**

Muscle mass plays a crucial role in maintaining a robust immune system through its impact on circulation. When muscles contract during physical activity, they help move lymph and blood throughout the body. This movement is vital for the immune system as it ensures that immune cells are effectively distributed and can reach infection sites quickly.

The lymphatic system is a network of tissues and organs that help rid the body of toxins and waste. It is a key component of the immune system.

Unlike the cardiovascular system, the lymphatic system does not have a pump (like the heart) to move lymph fluid. Instead, it relies on muscle contractions to

push the lymph through lymphatic vessels. Regular muscle activity can enhance this process, promoting better immune surveillance and response.

“Muscles are intricately tied to the movement of fluid in your body. They are the second pump to your heart and one of the only movers of your lymphatic fluid,” Beret Loncar, a licensed massage therapist in New York City, told The Epoch Times. “And because they are tied to your lymphatic fluid, they are also tied to your immunity in a passive way.”

## **Muscle Activity Reduces Chronic Inflammation**

Chronic inflammation can weaken the immune system and lead to various health issues, including autoimmune diseases and chronic conditions. Regular exercise and muscle contractions release anti-inflammatory myokines such as IL-10 and IL-37, which help regulate the body’s inflammatory response.

A mouse-model study conducted by researchers at Harvard Medical School and published in *Science Immunology* demonstrated that exercise-induced muscle activity mobilizes T regulatory cells (Tregs). These Tregs play a significant role in reducing exercise-induced inflammation and improving muscle metabolism and overall endurance.

More specifically, immune cells prevent muscle damage by decreasing concentrations of interferon, a signaling protein that mediates inflammatory disease, chronic inflammation, and aging.

Reducing chronic inflammation helps the immune system function more efficiently and prevents it from constantly fighting unnecessary inflammation.

“Our research suggests that with exercise, we have a natural way to boost the body’s immune responses to reduce inflammation,” study author Diane Mathis said in a statement. “We’ve only looked in the muscle, but it’s possible that exercise is boosting Treg activity elsewhere in the body as well.”

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