Published January 9, 2026 by Dr. Daniel Thomas, DO, MS

Myokines: How Exercise Fights Cancer

For decades, researchers have observed that physically active individuals experience lower rates of cancer and better outcomes when diagnosed with the disease. While many theories have attempted to explain this relationship, emerging evidence indicates that muscles are not merely engines for movement but are active endocrine organs that release potent anti-cancer molecules during exercise. These molecules, called *myokines*, represent a promising frontier in understanding how physical activity protects against cancer and supports those fighting the disease.

Muscles as Medicine-Producing Organs

The traditional view of muscles focused exclusively on their mechanical function, namely, contracting to produce movement. However, research conducted over the past two decades has fundamentally changed this understanding. Scientists now recognize that skeletal muscle is the largest endocrine organ in the human body, secreting hundreds of signaling molecules that influence virtually every organ system.

When muscle fibers contract during physical activity, they release myokines into the bloodstream. These hormone-like molecules travel throughout the body, communicating with distant tissues and triggering a cascade of beneficial effects. Among the most studied myokines with documented anti-cancer properties are IL-6 (the exercise-induced, anti-inflammatory form), irisin, SPARC, and oncostatin M. Each plays a distinct role in the body's defense against malignant disease.

How Myokines Combat Cancer

The anticancer effects of exercise-induced myokines are mediated by multiple mechanisms.

Laboratory studies have demonstrated that these molecules can directly reduce cancer cell proliferation, essentially slowing the rate at which malignant cells divide and multiply. Perhaps more significantly, certain myokines induce apoptosis (programmed cell death) in cancer cells while sparing healthy cells. This selective targeting represents a form of natural chemotherapy produced by the body itself.

Beyond their direct effects on cancer cells, myokines enhance immune surveillance. The immune system continuously monitors for abnormal cells, and myokines appear to improve the efficiency of this surveillance, helping immune cells identify and eliminate nascent tumors before they can establish themselves. Research has also shown that myokines alter the tumor microenvironment (the complex ecosystem surrounding cancer cells), making it less supportive of tumor growth and more hostile to metastatic spread.

The Immediate and Cumulative Benefits

One of the most encouraging findings from recent research is that the anti-cancer effects of exercise begin almost immediately. Studies have demonstrated that even brief bouts of vigorous physical activity alter the molecular composition of blood in ways that suppress genes implicated in cancer growth, activate DNA repair pathways, and improve metabolic signaling. When researchers exposed cancer cells to post-exercise blood in the laboratory, the cells showed reduced growth rates and improved DNA stability.

The benefits also accumulate over time. In a study of breast cancer survivors, twelve weeks of structured exercise training increased circulating myokine levels by up to fifteen percent. More importantly, when researchers applied blood serum from these exercising individuals to metastatic breast cancer cells in laboratory models, the cells showed twenty-two to twenty-five percent reductions in growth compared to controls. This finding suggests that regular exercise creates a sustained anti-cancer environment within the body.

Exercise and Cancer Prevention

For individuals seeking to reduce their cancer risk, the myokine pathway offers a compelling biological rationale for regular physical activity. Many cancers develop and thrive in metabolic environments characterized by elevated blood glucose, high insulin levels, chronic systemic inflammation, and compromised mitochondrial function. Exercise-induced myokines directly counteract each of these conditions.

Regular physical activity improves insulin sensitivity, reducing the elevated insulin levels that have been linked to increased cancer risk. Myokines enhance mitochondrial metabolism, improving the cellular energy production that supports healthy tissue function. They reduce systemic inflammation, which is increasingly recognized as a driver of cancer development and progression. They also support DNA repair mechanisms, helping the body correct genetic damage before it can lead to malignant transformation. Collectively, these effects create an internal metabolic landscape that is fundamentally hostile to cancer initiation and growth.

Supporting Cancer Treatment and Survivorship

For those already diagnosed with cancer, exercise-induced myokines offer additional benefits that complement conventional treatment. Research has demonstrated that physical activity during cancer treatment can improve treatment tolerance, helping patients complete their prescribed regimens with fewer dose reductions or delays. The mechanisms underlying this benefit likely involve myokine-mediated improvements in immune function, tissue repair, and metabolic health.

Cancer survivors face an elevated risk of recurrence, and maintaining regular physical activity

appears to reduce this risk substantially. Reviews examining the role of myokines in cancer outcomes have highlighted their influence on immune cell infiltration into residual tumor sites, blood vessel formation, local inflammation, and cancer cell migration. By maintaining elevated myokine levels through regular exercise, survivors may be able to suppress the growth of any remaining cancer cells and reduce the likelihood of metastatic spread.

Exercise also helps counteract sarcopenia, the progressive loss of muscle mass that commonly accompanies cancer and its treatment. Because muscles produce myokines, preserving muscle mass maintains the body's capacity to generate these protective molecules. This creates a positive feedback loop in which exercise preserves muscle, muscle produces myokines, and myokines support better outcomes.

The Role of Resistance Training

While all forms of physical activity stimulate myokine release, research suggests that resistance-type movements may be particularly effective. Studies have found that resistance training activates certain myokines more robustly than aerobic exercise alone. This finding has important implications for exercise prescription, particularly for older adults, who appear to respond especially well to resistance-type movements for myokine production.

Resistance training does not require specialized equipment or gym memberships. Any movement that challenges muscles against resistance, including the resistance provided by one's own body weight, triggers the contraction-dependent release of myokines. This makes resistance-based exercise accessible to individuals across a wide range of fitness levels, health conditions, and resource constraints.

A Practical Strategy: Bodyweight Squats Throughout the Day

Understanding the science of myokines opens the door to practical strategies for maintaining elevated levels of these protective molecules. One of the most effective approaches involves distributing short bouts of resistance exercise throughout the day rather than concentrating all activity into a single session. This method, sometimes referred to as exercise snacking, maintains elevated myokine signaling throughout the waking hours.

The bodyweight squat represents an ideal movement for this purpose. A single squat engages a substantial amount of muscle mass simultaneously, activating the quadriceps, hamstrings, gluteal muscles, adductors, calves, and core stabilizers. This large-scale muscle recruitment provides exactly the stimulus needed for robust myokine secretion. Because the movement requires no equipment and minimal space, it can be performed virtually anywhere: at home, in an office, during breaks, or while traveling.

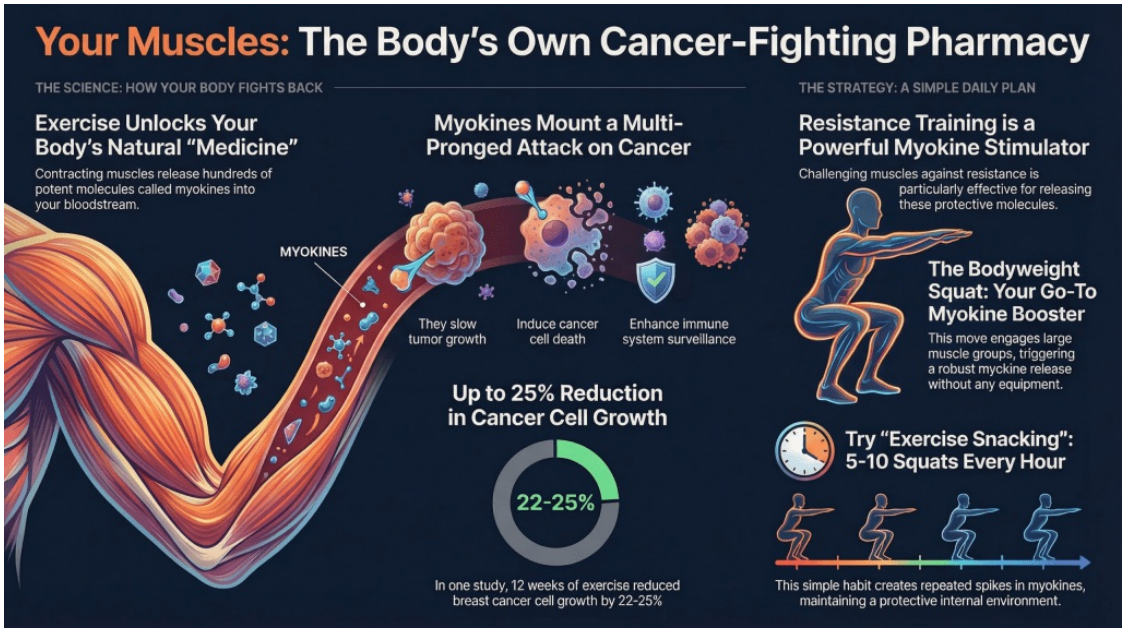
Research indicates that performing just five to ten bodyweight squats every hour throughout the day can meaningfully increase myokine signaling. This approach offers several advantages over traditional exercise prescriptions. It does not require dedicated workout time, making it easier to maintain consistently. It avoids the fatigue associated with longer sessions, which is particularly valuable for individuals undergoing cancer treatment. It provides repeated spikes in myokine release throughout the day, potentially maintaining a more consistently anti-cancer intracellular environment.

For individuals with mobility limitations or those new to exercise, modifications such as chair-assisted squats or partial-range movements can still elicit sufficient muscle activation to trigger myokine release. The key principle is muscle contraction against resistance, which remains present even in adapted versions of the movement. As strength and confidence improve, the depth and intensity of squats can be progressively increased.

Conclusion

The discovery that muscles function as endocrine organs that produce anticancer molecules has transformed our understanding of why exercise protects against malignant disease. Myokines represent a direct biological link between physical activity and cancer prevention, treatment support, and survivorship. They work immediately, accumulate with consistent training, and can be stimulated through accessible movements that require no special equipment or facilities.

Simple strategies, such as performing bodyweight squats throughout the day, provide a practical method for maintaining elevated myokine levels. Whether the goal is to reduce cancer risk, support treatment, or prevent recurrence, regular muscle contraction provides one of the most powerful and accessible tools available. The evidence is clear: when muscles contract, they produce medicine. Making that contraction a regular part of daily life may be one of the most important health decisions a person can make.



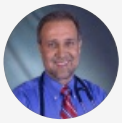
References

1. Aoi W, Naito Y, Takagi T, et al. A novel myokine, secreted protein acidic and rich in cysteine (SPARC), suppresses colon tumorigenesis via regular exercise. Gut. 2013;62(6):882-889.
2. Bettariga F, Taaffe DR, Crespo-Garcia C, et al. A single bout of resistance or high-intensity interval training increases anti-cancer myokines and suppresses cancer cell growth in vitro in survivors of breast cancer. Breast Cancer Res Treat. 2025;213(1):171-180.
3. Farley MJ, Boytar AN, Adlard KN, et al. Interleukin-15 and high-intensity exercise: relationship with inflammation, body composition and fitness in cancer survivors. J Physiol. 2024;602(20):5203-5215.
4. Gannon NP, Vaughan RA, Garcia-Smith R, Bisoffi M, Trujillo KA. Effects of the exercise-inducible myokine irisin on malignant and non-malignant breast epithelial cell behavior in vitro. Int J Cancer. 2015;136(4):E197-E202.
5. Hoffmann C, Weigert C. Skeletal muscle as an endocrine organ: the role of myokines in exercise adaptations. Cold Spring Harb Perspect Med. 2017;7(11):a029793.
6. Hojman P, Dethlefsen C, Brandt C, et al. Exercise-induced muscle-derived cytokines inhibit mammary cancer cell growth. Am J Physiol Endocrinol Metab. 2011;301(3):E504-E510.
7. Huang Q, Wu M, Wu X, Zhang Y, Xia Y. Muscle-to-tumor crosstalk: The effect of exercise-induced myokine on cancer progression. Biochim Biophys Acta Rev Cancer. 2022;1877(5):188761.
8. Kim JS, Taaffe DR, Galvao DA, et al. Acute effect of high-intensity interval aerobic exercise on serum myokine levels and resulting tumour-suppressive effect in trained patients with

advanced prostate cancer. Prostate Cancer Prostatic Dis. 2023;26(4):795-801.
9. McTiernan A, Friedenreich CM, Katzmarzyk PT, et al. Physical Activity in Cancer Prevention and Survival: A Systematic Review. Med Sci Sports Exerc. 2019;51(6):1252-1261.
10. Park SY, Hwang BO, Song NY. The role of myokines in cancer: crosstalk between skeletal muscle and tumor. BMB Rep. 2023;56(7):365-373.
11. Provatopoulou X, Georgiou GP, Kalogera E, et al. Serum irisin levels are lower in patients with breast cancer: association with disease diagnosis and tumor characteristics. BMC Cancer. 2015;15:898.
12. Tsiani E, Tsakiridis N, Kouvelioti R, Jaglanian A, Klentrou P. Current Evidence of the Role of the Myokine Irisin in Cancer. Cancers (Basel). 2021;13(11):2628.

Previous Post
Common Food Preservatives Linked to Higher Risk of Type 2 Diabetes in Large French Study

No Newer Posts
Return to Blog



Dr. Daniel Thomas, DO, MS

Dr. Thomas is a highly sought-after physician whose medical expertise has been forged through extensive education and refined over nearly 40 years of clinical practice. He has helped people worldwide by providing innovative solutions that not only address their immediate health concerns, but also lay lasting foundations for optimal wellness. His strength lies in his scientific curiosity, creative and analytical thinking, and practical application of cutting-edge research. Despite the demands of a busy medical practice, to stay at the forefront and continuously improve the care of his patients, Dr. Thomas devotes 20-30 hours a week to reviewing the latest scientific literature and consulting with leading scientists to identify potentially promising treatments. He shares his evidence-based insights at ThomasHealthBlog.com, where complex medical science becomes actionable health information.