

Milk and Dairy Foods Can Help Enhance Physical Fitness and Athletic Performance



Overview

Dairy foods, including milk, cheese and yogurt, contain a variety of essential nutrients and offer active individuals and athletes a unique nutrition package that can support exercise performance, recovery and overall health. Dairy foods provide high-quality proteins (whey and casein) that contain all essential amino acids to stimulate muscle protein synthesis and promote lean body mass. In addition, dairy milk, including plain, lactose-free and flavored varieties, provides fluid, electrolytes, carbohydrates and protein that can support glycogen replenishment, muscle repair and fluid replacement after exercise. Authoritative guidance from organizations such as the Academy of Nutrition and Dietetics and the American College of Sports Nutrition recognize the role that dairy's high-quality protein can play in physical fitness and performance, with evidence supporting their benefits for post-exercise recovery, lean mass maintenance, and training adaptation.

Dairy foods can provide balanced nutrition for active lifestyles

Proper nutrition is critical for active individuals and athletes to maximize the benefits of training and exercise programs.^{1,2} Dairy foods, including milk, cheese and yogurt, can play an important role in balanced eating patterns by helping meet nutrient needs while supporting exercise performance, recovery and overall health.³ For a modest amount of calories, dairy foods contain several essential nutrients, with dairy milk delivering 13 essential nutrients, including high-quality protein, calcium, vitamin D, potassium, vitamin B12, zinc and selenium,⁴ which can be difficult to replace with other foods and are especially important for bone strength, immune function and muscle repair.⁵⁻⁷

At the macronutrient level, dairy foods (i.e., milk, cheese and yogurt) can provide a combination of carbohydrates, high-quality proteins and fats for people with active lifestyles.^{1,6,8,9} Dairy milk contains both whey and casein proteins that provide all essential amino acids needed for muscle recovery and growth.^{1,10,18} Whey protein is rapidly absorbed and can support immediate muscle repair, while casein digests more slowly, providing a steady release of amino acids for sustained recovery.^{11,12} The combination of carbohydrates and proteins in milk may promote post-exercise recovery,^{6,13} helping to replenish glycogen stores with carbohydrates while protein supports tissue repair and adaptation.¹² Research suggests that flavored milk, such as chocolate milk, can also deliver this balance, making it an effective and accessible recovery option for athletes.^{14,15}

Beyond their nutritional profile, dairy foods have a unique food matrix that may work together with essential nutrients to impact health.^{16,22,24} For example, dairy milk contributes to hydration, providing not only water (87%¹⁷), but also key electrolytes such as calcium, potassium, sodium and magnesium, that can help restore fluid balance after activity.¹⁴ Some bioactive compounds found in dairy foods include bioactive proteins, such as immunoglobulins, alpha-lactalbumin and lactoferrin, as well as bioactive lipids and prebiotics.^{18,49,50} An emerging body of mechanistic research links these nutrients and components with potential benefits for immune defense,⁵ gut health, bone health and overall growth.^{5,18,49,50} Together, these qualities indicate the benefits of incorporating dairy foods into the diets of athletes and active individuals seeking to optimize performance, recovery and long-term health.

Dairy food matrix components and their role in physical fitness

Dairy proteins ^{1,10,18} (<i>Casein and whey</i>)	Casein and whey are the two major dairy proteins that are considered beneficial for athletic performance. Casein and whey are considered high-quality proteins, because they provide the essential amino acids required for muscle repair and growth after exercise. Casein is slowly digested, whereas whey is rapidly absorbed and can help support immediate muscle recovery.
Carbohydrates ^{10,46-48}	Carbohydrates can help replenish glycogen stores post-exercise. Dairy foods and beverages vary in carbohydrate content. Depending on the level of physical activity, there are different dairy foods to choose from to support unique fitness needs.
Water and electrolytes ^{14,19-21}	Milk is hydrating because it contains water (87% ¹⁷) and provides key electrolytes such as calcium, potassium, sodium and magnesium required for fluid balance, as well as protein and fat (unless choosing fat-free options). The presence of these nutrients in combination with carbohydrates and protein may delay gastric emptying, promoting a sustained fluid balance over time.
Bone and Immune-Supportive Nutrients ^{5,7}	Dairy milk provides more bone-beneficial nutrients per unit of energy than any other food group, including: high-quality protein, calcium, vitamin D, potassium, magnesium, phosphorus, iodine and zinc. Dairy milk also contains nutrients that can support immune health, including: high-quality protein, zinc, selenium, vitamins A, D and B12.

Milk and dairy foods can help active individuals meet protein requirements

Milk and other dairy foods provide high-quality protein, containing all essential amino acids in a readily digestible form.¹⁸ In particular, dairy foods (i.e., milk, cheese and yogurt) are an important source of leucine, an amino acid essential for muscle protein synthesis and supporting muscle repair.¹⁸ Expert groups have highlighted dairy proteins as particularly effective for meeting these needs.^{1,23}

Evidence-based protein intake recommendations for athletes from leading expert organizations

Resource and Supporting Organization	Recommendation
Position of the Academy of Nutrition and Dietetics, Dietitians of Canada, and the American College of Sports Medicine: Nutrition and Athletic Performance (2016)¹ The Academy of Nutrition and Dietetics, Dietitians of Canada, and The American College of Sports Medicine	• Athletes require 1.2-2.0 g/kg protein daily. Higher intakes may be indicated for short periods during intense training or when reducing energy intake. • Dairy proteins can be hard to match due to their leucine content and the digestion/absorption kinetics of branched-chain amino acids in fluid-based dairy.
The International Olympic Committee Consensus Statement on Sports Nutrition (2011)⁸ International Olympic Committee	• Athletes should consume protein in daily amounts greater than those recommended for the general population. • Foods that contain high-quality protein should be consumed regularly throughout the day as part of total protein intake. • Consuming foods or drinks with protein after each training session can maximize the synthesis of proteins.
International Society of Sports Nutrition Position Stand: Protein and Exercise (2017)²³ The International Society of Sports Nutrition Expert Working Group	• To build and maintain muscle mass, an overall daily protein intake in the range of 1.4-2.0 g/kg per day is sufficient for most exercising individuals. • Higher protein intakes (2.3-3.1 g/kg per day) may be needed to maximize retention of lean body mass in resistance-trained individuals, especially during hypocaloric periods. • Acute protein doses should aim to have 0.7-3 g of leucine and/or a higher relative leucine content, while balancing a diverse array of essential amino acids; dairy proteins are an important source of leucine.

Because of the demands of training, athletes who train regularly can often require more protein in their diet compared to the average adult.^{1,8,23} Evidence-based recommendations estimate that athletes require protein consumption between 1.2-2.0 g/kg daily¹, with some suggesting 1.4-2.0 g/kg daily for exercising individuals who are working to build or maintain muscle mass.^{8,23} Experts also recommend even higher protein intakes of 2.3-3.1 g/kg daily to help maximize the retention of lean body mass in resistance-trained athletes.²³ To maximize effectiveness, various expert groups emphasize not only the total amount of protein consumed, but also protein quality and the timing and distribution of protein consumed across the day. For most athletes, targeting 20-30 grams of high-quality protein or more, at main meals and after workouts, is a strategy shown to support muscle recovery and adaptation.^{1,8,23}

Dairy foods like milk and yogurt are linked with benefits for body composition

Body composition is important for health because the ratio of fat to muscle in the body affects physical function, while also influencing risk of chronic diseases.²⁶ Physically active adults and athletes may also strive for a healthy body composition to better support performance. In order to improve body composition and gain lean body mass, the combination of resistance exercise and high-quality protein consumption is recommended.²³ While endurance trainers may use protein differently compared to resistance trainers, a balanced diet with adequate protein is needed for both exercise modalities. Endurance and resistance trainers may also require more protein intake compared to the average adult.

In terms of resistance exercise studies, one longitudinal study in 56 healthy, active men (18-30 years old) examined the impact of consuming fat-free milk following resistance exercise for 5 days a week for 12 weeks in duration.²⁸ Compared to a fat-free soy protein or carbohydrate beverage, those consuming fat-free dairy milk had a greater increase in lean mass, muscle fiber size and improvements in body composition.²⁸ In a randomized controlled trial (RCT) with 8 healthy men who regularly engaged in resistance training, consuming a milk beverage after completing a resistance exercise bout stimulated a greater muscle protein synthesis response in comparison to men who consumed a soy-based beverage post-workout.⁴⁵ Similarly, results from a RCT enrolling 19 young adults who consumed either a protein blend of soy, casein and whey proteins (19 g) or whey protein isolate (18 g) one hour after high-intensity resistance exercise indicated the whey protein isolate was equally as effective as the protein blend in increasing muscle protein synthesis.²⁹ Whey protein has been studied extensively in the context of resistance exercise and has been shown to support muscle protein synthesis following a single bout of exercise,³⁰⁻³² as well as supporting gains in muscle and improvements in body composition with routine training.^{33,34}

One RCT in 14 healthy, young male runners found consumption of fat-free chocolate milk during a recovery period from a 45-minute bout of endurance exercise improved markers of protein turnover and recovery from exercise in comparison to a sweetened, grape-flavored drink.²⁷ Elliot et al.³⁵ conducted a RCT with 24 healthy, recreationally active adults who consumed one of three milk drinks 60 minutes following resistance exercise (fat-free milk, whole milk and isocaloric fat-free milk). Whole milk consumption resulted in a greater uptake of key amino acids, like phenylalanine and threonine, which are essential for muscle protein synthesis. Other dairy foods, like Greek yogurt, may also support muscle health, although more research is needed. One study enrolling 30 healthy young

Dairy foods are important sources of leucine, the key amino acid for muscle protein synthesis

Dairy foods including milk, cheese and yogurt contain an essential amino acid required for muscle protein synthesis called leucine.¹⁸ In terms of how much leucine athletes should consume, experts recommend that athletes aim for ~2.5 g of leucine after workouts.¹⁸ Leucine is widely available in different dairy foods (with milk estimated to have approximately 0.78-0.85 g of leucine per 1 cup serving²⁵), making dairy foods a practical and easy choice to incorporate into the diets of physically active individuals.

males examined the impact of consuming fat-free plain Greek yogurt daily – 20 g protein dose per 200 g (just over 1 serving of yogurt) three times per day on training days and 150 g (just under 1 serving of yogurt) two times per day on non-training days – compared to a placebo pudding (0 g protein) for muscle strength, thickness and body composition. After 12 weeks, consuming the Greek yogurt resulted in improved total strength, muscle thickness and reduce body fat percentage compared to the placebo.³⁶

Dairy milk can help replace fluid loss during exercise

Rehydration and appropriate nutrient intake are key components of exercise performance and recovery. Six clinical studies conducted in youth athletes, as well as healthy young men and women, have found that drinking milk was more effective for rehydration compared to water or a carbohydrate- and electrolyte-enriched beverage.^{19–21,43,44,51} One acute study in 38 heat-acclimated children (7–17 years old) tested the effect of several beverages in replacing fluid losses following exercise in the heat.¹⁹ Researchers found that the amount of the ingested beverage retained at two hours of recovery was greater with consumption of fat-free milk compared to water or a carbohydrate and electrolyte beverage, suggesting that fat-free milk was more effective for rehydration after exercise.¹⁹ A 2025 clinical trial conducted in 12 healthy young men and women found greater rehydration following exercise with a milk permeate based sports drink compared to other leading sports drinks.⁵¹ Similarly, Desbrow et al.²¹ reported that milk-based drinks were more effective rehydration options compared with traditional sports drinks in 15 adult male cyclists.

Chocolate milk after a workout may help improve recovery and limit exercise-induced muscle damage

Chocolate milk provides fluids and an affordable package of 13 essential nutrients that may promote post-exercise recovery.¹⁴ Clinical studies in healthy young men suggest that chocolate milk is just as effective, or more effective, as an isocaloric carbohydrate containing beverage during intense training in between intense workouts or after prolonged endurance exercise.^{15,37–40} Two randomized clinical studies in healthy young men and women have also linked chocolate milk consumption after intense or strenuous exercise with delayed muscle soreness and exercise-induced muscle damage.^{41,42}

Conclusion

Dairy foods (i.e., milk, cheese and yogurt) provide a unique combination of high-quality protein and essential nutrients within a unique food matrix that may work together to support performance and recovery in active individuals and athletes. Research links dairy foods like milk with benefits for muscle synthesis, post-exercise recovery and body composition. Authoritative guidance from expert organizations also recognize the role that dairy's high-quality protein can play in physical fitness and performance for athletes. Dairy foods like milk are a nutritious choice for individuals seeking to optimize fitness, recovery and overall health.

Key Takeaways for Health & Wellness Professionals

- **Dairy's nutrition can support physical fitness, athletic performance, post-exercise recovery and overall health.** Milk, cheese and yogurt provide a powerful combination of nutrients that help fuel activity and support training adaptations to promote long-term health in active individuals.^{3-13,18,25}
- **The unique and high-quality protein found in dairy foods benefits muscle growth and repair.**^{1,10,18} Whey and casein are considered beneficial for athletic performance – they provide all essential amino acids and are rich in leucine, a key amino acid necessary for muscle protein synthesis.^{1,8,18,25}
- **Dairy foods like milk can help improve body composition and nourish muscle mass.** Research links consuming dairy milk and whey protein, particularly when combined with resistance training, with increased muscle synthesis and improved ratios of fat to muscle in the body.^{28-34,45}
- **Milk offers a balanced nutrient package that supports active lifestyles.** The combination of carbohydrates, protein, fluids and electrolytes work together within the milk matrix to support rehydration and muscle repair after exercise.^{1,6,8-10,12,14,17,18}
- **Milk is a strong and accessible rehydration option after exercise.** Studies indicate milk and milk-based beverages may be more effective than water or traditional sports drinks when it comes to restoring fluid balance following physical activity.^{19-21,43,44,51}
- **Dairy foods can provide a practical, food-first strategy for meeting athletes' protein needs.** Leading sport and nutrition organizations recognize dairy foods as top nutrient-dense sources of high-quality protein to support training and recovery.^{1,8,23}

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