

got milk?[®]



Milk provides the fuel athletes need to be active and the fluids, nutrients and protein to help refuel after exercise.

Learn more about the research supporting milk as a fitness and post-exercise drink.

got milk?[®]

got milk?[®]

THE WORKOUT'S FINISHED. BUT THE BODY ISN'T.

Strengthen Your Student Athletes' Recovery Routine With **Chocolate Milk**.

Whether you're a high school athletic director, coach or PE teacher, we know you're giving your student athletes the tools they need to achieve success on the playing field, but could they be doing more off the field to refuel their bodies post-workout? When it comes to performing at the highest level, an athlete's post-game recovery routine is just as important as their pre-game prep.



Research shows there's a two-hour recovery window when the real work begins – refueling, building and repairing muscles. That takes protein, and lowfat chocolate milk is a natural source of high quality protein. Plus, it's packed with essential nutrients not typically found in other sports drinks including calcium and vitamin D, which can help prevent stress fractures and broken bones.

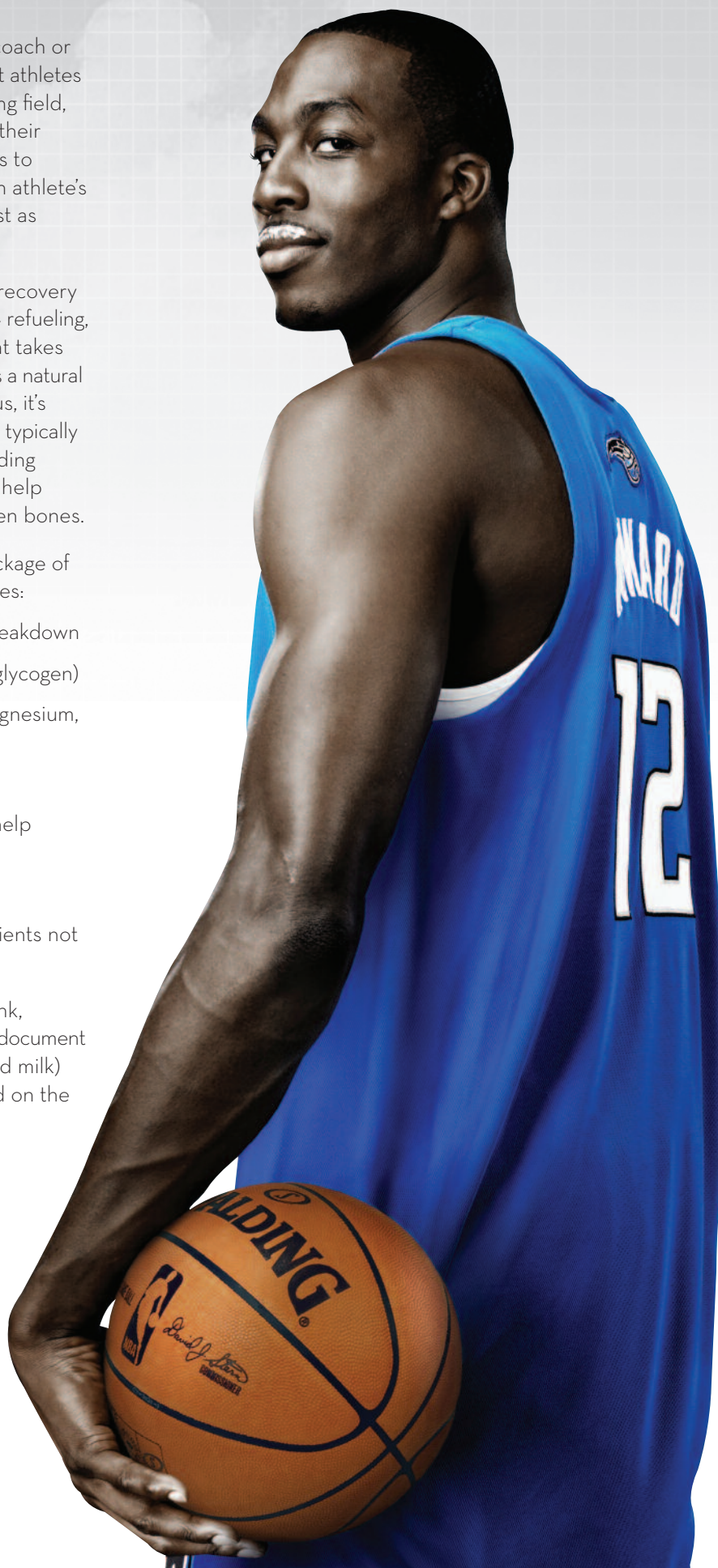
Take a look at how the unique package of nutrients in milk can benefit athletes:

- **Protein** to help build muscle and reduce muscle breakdown
- **Carbohydrates** to refuel muscles (restore muscle glycogen)
- **Electrolytes**, including calcium, potassium and magnesium, to replenish what is lost in sweat
- **Fluids** to help rehydrate the body
- **Calcium and vitamin D** to strengthen bones and help reduce the risk of stress fractures
- **B vitamins** to help convert food to energy
- **Nine essential nutrients**, including additional nutrients not typically found in traditional sports drinks

There's been growing interest in milk as a fitness drink, especially after exercise. Researchers are beginning to document the multiple ways milk (including regular and flavored milk) can benefit active people.¹ The studies have focused on the following areas:

- Chocolate milk's role in helping athletes **refuel** muscles after a workout
- Regular and chocolate milk's impact on **reducing exercise-induced muscle damage** and **building muscle** after exercise
- How milk compares to other drinks for **hydration** after exercise, and its ability to replenish needed electrolytes and fluids

got milk?[®]



LOWFAT CHOCOLATE MILK AS A POST-EXERCISE RECOVERY AID

Chocolate milk may be just as effective as certain commercial sports drinks in helping athletes refuel muscles after a workout.

Chocolate milk's combination of carbohydrates and protein first made researchers take notice of a potential exercise benefit. A study conducted at Indiana University found that endurance-trained cyclists who drank lowfat chocolate milk after an intense period of cycling were able to workout longer and with more power during a second workout compared to when the same athletes drank a commercially available carbohydrate replacement drink, and just as long as when they consumed a traditional fluid replacement drink.²

In the study, nine endurance athletes exercised to exhaustion and then were immediately given one of the three beverages. After a two-hour recovery period, participants were given another equal serving of the beverage, rested for an additional two hours and then cycled to exhaustion during a second bout of exercise. The results showed that the time to exhaustion and total work performed during the second round of cycling were significantly greater after chocolate milk was consumed compared to the carbohydrate replacement drink, indicating that chocolate milk may help athletes recover faster after a workout session, which could lead to enhanced performance. Chocolate milk was just as effective as the fluid replacement drink.

The researchers conclude that “chocolate milk, with its high carbohydrate and protein content, may be considered an effective alternative to commercial fluid replacement drinks and carbohydrate replacement drinks for recovery from exhausting, glycogen-depleting exercise.”

A similar study of male cyclists was conducted by researchers in the U.K.³ This investigation examined the effect of chocolate milk and two commercially available sports drinks on endurance performance following glycogen-depleting exercise. After a recovery period, participants were able to cycle 51% and 43% longer after drinking chocolate milk than after drinking the carbohydrate replacement drink (with the same number of calories) and fluid replacement drink (with the same amount of fluid as the carbohydrate drink), respectively.

MILK'S HIGH-QUALITY PROTEIN HELPS BUILD AND REPAIR MUSCLES

Regular and chocolate milk may reduce exercise-induced muscle damage and may have an advantage when it comes to building muscles after exercise.

Milk contains high-quality protein and essential amino acids that may be particularly beneficial in building and maintaining muscle mass when combined with exercise.

Several recent studies suggest milk after exercise can help increase lean muscle, improve body composition and reduce muscle damage from exercise.

Canadian researchers found that active adults who drank milk after resistance exercise experienced greater support for muscle gain compared to the same adults who drank a soy protein beverage.⁴ The beverages included the same amount of calories and macronutrients, and while both beverages promoted muscle maintenance and gain, muscle promotion occurred more rapidly and in greater amounts when milk was drank.

A second study conducted by the same research team found that healthy, untrained participants who consumed fat-free milk after exercise gained more muscle and lost more body fat at the end of the 12-week training program compared to those who drank a soy protein beverage or a beverage containing only carbohydrates. All three beverages had the same amount of calories. Milk and the soy beverage also had the same macronutrient profile. The researchers suggest milk's advantage may be due to unique properties of milk proteins which may cause differences in the speed of digestion and absorption.⁵

Drinking milk after resistance exercise has been shown to help with protein metabolism.⁶ Athletic men and women who drank milk one hour after a leg resistance exercise routine experienced a significant increase in the measured amino acids (phenylalanine and threonine), which is representative of net muscle protein synthesis. Other research suggests drinking milk after resistance training may help improve body composition by increasing lean muscle tissue.^{7,8}

A study conducted in the U.K. found that research subjects who drank reduced-fat regular or flavored milk after a strenuous muscle workout experienced less exercise-induced muscle damage than those who drank water or typical sports drinks – an important finding since this type of muscle damage can lead to future impairments in muscle performance, which could affect future exercise bouts.⁹



Ana Ivanovic
Professional
tennis player

MILK HELPS REPLENISH FLUIDS AND ELECTROLYTES

Milk may be an equivalent or better choice for hydration after exercise compared to certain beverages, replenishing needed electrolytes and fluids.

Drinking milk after exercise not only provides the carbohydrates and protein to refuel muscles, it also helps replenish fluids and electrolytes that are lost in sweat. Some research suggests milk may be especially effective as a post-exercise rehydration drink due to the mix of nutrients found in milk. According to the National Athletic Trainers' Association, rehydration beverages should include water, carbohydrates and electrolytes – a nutrition profile that closely matches milk.¹⁰

Researchers in the U.K. found that milk restored hydration better than other popular post-exercise beverages.¹¹ The study compared the rehydration effectiveness of four beverages: lowfat milk, lowfat milk with added sodium, water and a sports drink. Healthy male and female volunteers completed an exercise session in a warm climate. Twenty minutes later, they were given one of the four test beverages. Fluid loss was monitored for four hours following the experiment. They

repeated the trials with each of the other test beverages, at least seven days apart. Results showed significantly more urine excretion after drinking water or sports drink compared to milk or milk with added sodium, suggesting that milk may be more effective than water or sports drinks at restoring normal hydration status after exercise.

The researchers believe the results may be due to milk's electrolyte content and energy density. Energy-dense liquids empty from the stomach at a slower rate

than water and sports drinks, which may affect the overall fluid balance. In a subsequent study, the same researchers found that drinking fat-free milk after a period of exercise-induced dehydration restored fluid balance better than a commercial sports drink.¹²



Ryan Sheckler
Skateboarder

Drinking milk after exercise can also help replace electrolytes including potassium, magnesium and calcium that are lost in sweat.¹³⁻¹⁵ In fact, some research suggests rigorous exercise could cause substantial losses of calcium, which may increase the risk of stress fractures.¹⁶ Drinking milk after a workout is an effective way of replenishing this bone-strengthening mineral.

MILK AND EXERCISE

More research may be needed to fully understand the role of milk in exercise recovery, but the evidence is promising. Milk contains protein, carbohydrates, fluids and electrolytes like some commercial sports drinks, yet it offers a distinct advantage. Penny-for-penny, no other post-exercise drink contains the full range of vitamins and minerals found in milk. Plus, milk is something most people already have in their refrigerator. Milk provides essential nutrients in a convenient, great-tasting and affordable package.

Encourage your student athletes to log on to www.bodybymilk.com to check out exclusive recovery tips and videos featuring NBA players, trainers and coaches!

References

1 Roy BD. Milk: the new sports drink? A review. *Journal of the International Society of Sports Nutrition*. 2008;5:15.

2 Karp JR, Johnston JD, Tecklenburg S, Mickleborough TD, Fly AD, Stager JM. Chocolate milk as a post-exercise recovery aid. *International Journal of Sport Nutrition and Exercise Metabolism*. 2006;16:78-91.

3 Thomas K, Morris P, Stevenson E. Improved endurance capacity following chocolate milk consumption compared with 2 commercially available sport drinks. *Applied Physiology, Nutrition and Metabolism*. 2009;34:78-82.

4 Wilkinson SB, Tarnopolsky MA, MacDonald MJ, MacDonald JR, Armstrong D, Phillips SM. Consumption of fluid skim milk promotes greater muscle protein accretion after resistance exercise than does consumption of an isonitrogenous and isoenergetic soy-protein beverage. *American Journal of Clinical Nutrition*. 2007;85:1031-1040.

5 Hartman JW, Tang JE, Wilkinson SB, Tarnopolsky MA, Lawrence RL, Fullerton AV, Phillips SM. Consumption of fat-free fluid milk following resistance exercise promotes greater lean mass accretion than soy or carbohydrate consumption in young novice male weightlifters. *American Journal of Clinical Nutrition*. 2007;86:373-381.

6 Elliot TA, Cree MG, Sanford AP, Wolfe RR, Tipton KD. Milk ingestion stimulates net muscle protein synthesis following resistance exercise. *Medical Science in Sports and Exercise*. 2006;38:667-674.

7 Rankin JW, Goldman LP, Puglisi MJ, Nickols- Richardson SM, Earthman CP, Gwazdauskas FC. Effect on the post-exercise supplement consumption on adaptations to resistance training. *Journal of the American College of Nutrition*. 2004;22:322-330.

8 Phillips SM, Hartman JW, Wilkinson SB. Dietary protein to support anabolism with resistance exercise in young men. *Journal of the American College of Nutrition*. 2005;24:134S-139S.

9 Cockburn E, Hayes PR, French DN, Stevenson E, St Clair Gibson A. Acute milk-based protein-CHO supplementation attenuates exercise-induced muscle damage. *Applied Physiology, Nutrition and Metabolism*. 2008;33:775-783.

10 Casa DJ, Armstrong LE, Hillman SK, Montain SJ, Reiff RV, Rich BS, Roberts WO, Stone JA. National Trainers' Association Position Statement: Fluid Replacement for Athletes. *Journal of Athletic Training*. 2000; 35:212-224.

11 Shirreffs SM, Watson P, Maughan RJ. Milk as an effective post-exercise rehydration drink. *British Journal of Nutrition*. 2007;98:173-180.

12 Watson P, Love TD, Maughan RJ, Shirreffs SM. A comparison of the effects of milk and a carbohydrate-electrolyte drink on the restoration of fluid balance and exercise capacity in a hot, humid environment. *European Journal of Applied Physiology*. 2008;104:633-642.

13 Martin BR, Davis S, Campbell WW, Weaver CM. Exercise and calcium supplementation: effects on calcium homeostasis in sports women. *Medicine and Science in Sports and Exercise*. 2007; 39:1481-1486.

14 Sawka MN, Montain SJ. Fluid and electrolyte supplementation for exercise heat stress. *American Journal of Clinical Nutrition*. 2000;72:564S-72S.

15 Klesges RC, Ward KD, Shelton ML, Applegate WB, Cantler ED, Palmieri GM, Harmon K, Davis J. Changes in bone mineral content in male athletes. Mechanisms of action and intervention effects. *Journal of the American Medical Association*. 1996;276:226-230.

16 Lappe J, Cullen D, Haynatzki G, Recker R, Ahlf R, Thompson K. Calcium and vitamin D supplementation decreases incidence of stress fractures in female navy recruits. *Journal of Bone and Mineral Research*. 2008;23:741-749.