

Milk and sport

Milk: the substance behind athletic style

by Jeffrey J Zachwieja and Gregory D Miller

As the world's best athletes meet in London this summer, no doubt there will be an uptick in reports about the work, sweat and tears that go into preparing athletes for optimal performance. Given that tenths or even hundredths of a second could mean the difference between winning and not winning a medal, athletes also use dietary strategies to gain an edge over their opponents. While everyday exercise enthusiasts may not have a gold medal on the line, they too, are often interested in which foods can help the body withstand frequent exercise and improve results.

Two types of activities exercise enthusiasts typically pursue are weight training to increase muscle size and cardio workouts to build endurance and burn fat. Intuitively, it may seem that a single food could not support both forms of exercise, but milk is emerging as a contender for providing key nutrients that facilitate adaptations to weight as well as endurance exercise training. This area of research has been a priority for the **Dairy Research Institute**, a research organisation established under the leadership of US dairy farmers.

While mostly known for providing calcium and vitamin D for bone health, milk also provides high quality protein which is needed to effectively build muscle when weight training. For example, greater rates of muscle protein building have been observed after a single bout of weight training when consuming fat-free milk versus a calorie and macronutrient matched soy protein beverage¹.

When fat-free milk was consumed throughout a 12-week weight training study, muscle fibre size increased more and greater gains in lean body mass were observed compared to matched soy protein intake². These findings may not be limited to milk that is fat free. In one study whole milk was found to be as, if not more, effective than fat-free milk at stimulating muscle protein building after weight training. This difference was still evident when consuming

more total fat-free milk (and more protein) to account for the calorie difference between the two³.

Years of sports nutrition research have identified three primary nutritional requirements for effective recovery after endurance exercise. The first is rehydration, to fully replace the fluids and minerals lost from sweating during exercise. The second is carbohydrate. Dietary carbohydrates help replace glycogen, the stored form of carbohydrate in muscles used up during exercise for energy. The third is protein. Dietary protein helps aid repair of protein structures in muscle so that it can adequately withstand subsequent bouts of exercise.

Effective post-work beverage

Milk provides fluid and minerals for rehydration⁴, casein and whey proteins for muscle repair and a low glycemic carbohydrate (lactose). Additionally, chocolate milk has added high glycemic carbohydrates such as sucrose and/or glucose-fructose syrups. All of these carbohydrates are sufficient to replenish used up glycogen stores. Thus it's not a surprise that since the mid 2000's, research results have supported chocolate milk's billing as an effective post-workout beverage⁵.

More recently, this was affirmed by researchers at the University of Connecticut which had college-age athletes run on



Jeffrey J Zachwieja, PhD, is senior vice president of nutrition research at the Dairy Research Institute



Gregory D Miller, PhD, is president of the Dairy Research Institute and executive vice president of the National Dairy Council, Rosemont, Illinois.

a treadmill at a fast pace for 45-minutes on two separate occasions. After one occasion they consumed fat-free chocolate milk and after the other they consumed a calorie-matched carbohydrate-only beverage. Each time, following a three hour rest, the participants sprinted on the treadmill to exhaustion. After consuming chocolate milk, time to exhaustion was 23% longer, indicating a more effective recovery from the initial bout of exercise⁶.

What's even more exciting is that when previously untrained individuals consumed chocolate milk after workouts during a 4.5 week cardio training programme, they achieved greater gains in

aerobic fitness than those who consumed either a calorie-matched beverage containing carbohydrate and fat or a zero-calorie control beverage⁷.

In an age where 'new' or 'unique' often translates into better, it is important to reestablish that common foods can provide compelling functional benefits beyond calories. There's no better example than milk, which has been evaluated scientifically to provide gold medal muscle building and recovery benefits for athletes, exercise enthusiasts or those back on the road to fitness.

Milk is nature's sports drink. ■

1. Wilkinson SB, MA Tarnopolsky, MJ MacDonald, JR MacDonald, D Armstrong, SM Phillips. Consumption of fluid skim milk promotes greater muscle protein accretion after resistance exercise than does consumption of an isonitrogenous and isoenergetic soy-protein beverage. *Am. J. Clin. Nutr.* 85:1031-40, 2007.
2. Hartman JW, JE Tang, SB Wilkinson, MA Tarnopolsky, RL Lawrence, AV Fullerton, SM Phillips. Consumption of fat-free milk after exercise promotes greater lean mass accretion than does consumption of soy or carbohydrate in young, novice, male weightlifters. *Am. J. Clin. Nutr.* 86:373-81, 2007.
3. Elliot TA, MG Cree, AP Sanford, RR Wolfe, KD Tipton. Milk ingestion stimulates net muscle protein synthesis following resistance exercise. *Med. Sci. Sports Exerc.* 38:667-74, 2006.
4. Shirreffs SM, P Watson, RJ Maughan. Milk as an effective post-exercise rehydration drink. *Br. J. Nutr.* 98:173-180, 2007.
5. Saunders M.J. Carbohydrate-Protein intake and recovery from endurance exercise: Is chocolate milk the answer? *Current Sports Medicine Reports.* 10:203-9, 2011.
6. WR Lunn, SM Pasiakos, MR Colletto, KE Karfonta, JW Carbone, JM Anderson, NR Rodriguez. Chocolate milk and endurance exercise recovery: Protein balance, glycogen and performance. *Med. Sci. Sports Exerc.* 44:682-691, 2012.
7. Ferguson-Stegall L, E McCleave, Z Ding, PG Doerner, Y Liu, B Wang, M Healy, M Kleinert, B Dessard, DG Lassiter, L Kammer, JL Ivy. Aerobic exercise training adaptations are increased by post-exercise carbohydrate-protein supplementation. *J. Nutr. Metab.* 2011;2011:623182. Epub 2011 Jun 9.