Milk What is in it for the athlete?

MILK in SPORT

Milk is a liquid food that includes protein, carbohydrates, fat, vitamins and minerals.

A litre of milk contains approximately 36 g protein. That means approximately 600 ml milk should be sufficient for maximising muscle protein synthesis.

Milk contains all the essential amino acids and has an abundant amount of branched-chain amino acids, especially leucine.

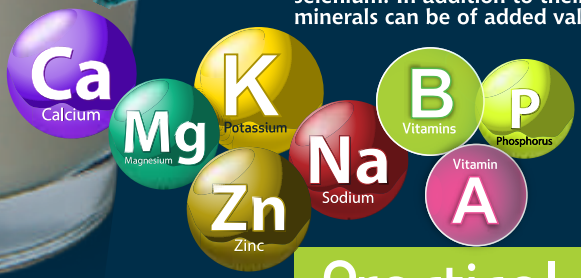
The carbohydrate component in milk (lactose) provides the substrate for resynthesis of muscle glycogen, although the volume of milk required to reach the recommended amounts is large. It is therefore suggested to use flavoured milk after exercise to optimise glycogen resynthesis.

Milk and other dairy products are excellent sources of readily bioavailable calcium, and provide approximately 300 mg calcium per serving.

Milk is a good source of vitamin A, thiamine, riboflavin and vitamin B12, and including milk in the daily diet will help athletes, including lacto-vegetarians, to meet the recommended intakes of these vitamins.

The electrolytes in milk (in particular sodium), together with water, carbohydrates and high-quality protein, are contained in a natural, energy-dense food matrix, which has been proven to support effective recovery of fluid and electrolyte levels in athletes after exercise. The wide variety in flavour, texture and taste of dairy products can also make rehydrating more enjoyable and enhance rehydration.

Milk and dairy are also good sources of readily bioavailable minerals such as calcium, potassium, sodium, phosphorus and magnesium, and trace elements such as iodine, zinc and selenium. In addition to their recognised health benefits, these minerals can be of added value to athletes.



Practical application

DAILY INTAKE

Nutritional intake has an important role in optimising performance during sport and exercise and adaptation to training. Athletes can improve their dietary quality by enjoying nutrient-rich foods from all food groups. Choosing sources from the dairy group provides additional benefits to athletes. Milk and other dairy products are rich in calcium, which supports bone health, contain high-quality protein to support muscle protein synthesis and recovery, and can be an effective source of fluid and electrolytes for rehydration. The unique composition and food matrix of dairy support the use thereof as a sport food to assist athletes to achieve their nutritional goals.

PREPARING FOR EXERCISE

Nutritional goals should ensure that the athlete is well fuelled, that nutritional intake will not interfere with normal physiological responses to the activity and that hydration remains optimal. When planning pre-exercise meals, athletes should choose foods that are familiar and easily digested to avoid gastrointestinal discomfort. Dairy foods such as flavoured milk, yoghurt and maas provide fluid and carbohydrates, and are low in fibre, which promotes gut comfort.

RECOVERY

The nutritional objectives of post-exercise nutrition are to promote muscle recovery and adaptation, resynthesis of muscle glycogen, and fluid replenishment. Milk and other liquid dairy products have a number of characteristics that support recovery.

1 REFUEL

Milk contains some carbohydrates (lactose), which contribute to glycogen resynthesis. Additional carbohydrates supplied through flavoured milk will optimise glycogen resynthesis.

2 REPAIR

Milk contains casein and whey proteins in a ratio of 4:1, which facilitates slower digestion and absorption and so results in sustained increase elevations of amino acids in the blood. Whey protein also contains a large proportion of branched-chain amino acids, which have an integral role in muscle metabolism and protein synthesis.

3 REHYDRATE

The naturally high concentrations of electrolytes in milk can help to replenish losses following exercise. Milk is isotonic, and its natural food matrix, which includes high-quality protein, carbohydrates, water and micronutrients, make milk uniquely suitable for use as a post-exercise recovery drink

MILK in SPORT

protein

Milk contains 3,4 g protein per 100 ml. The protein in milk consists of soluble whey protein (20%), which is rich in branched-chain amino acids (leucine, isoleucine and valine), and casein, which is less soluble. Overall, the essential amino acids are well represented in milk.

Composition:

Protein sources with an adequate amount of essential and branched-chain amino acids, especially leucine, seem to increase the sensitivity of muscle tissue to the muscle buidling effect of protein.

Co-ingestion:

Combining the intake of protein with carbohydrates will lead to a more positive protein balance, probably through reducing protein breakdown and stimulating protein sythesis.

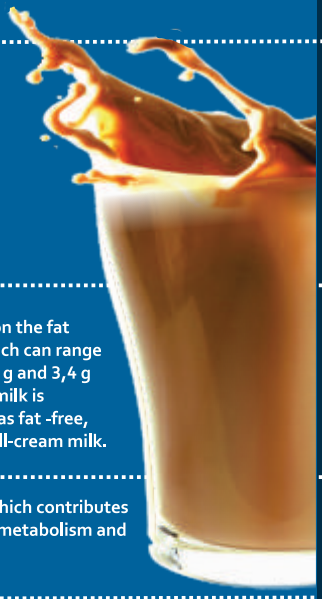
Exercise increases the body's protein requirements. Although a small amount is used as fuel source, dietary protein is used mainly for repairing damaged tissue and building muscle and other tissue. An athlete's protein requirement depends on the nature of training and the daily training load. Apart from the amount of protein, the timing of protein intake, the composition of the protein source and the co-ingestion of other nutrients (especially carbohydrates) are also important.

Timing:

The appropriate timing of protein intake around exercise seems fundamental for optimising training-induced adaptation, and recovery of skeletal muscle. The intake of protein immediately after exercise will decrease muscle breakdown, while increasing muscle protein synthesis. The amount of protein needed to ensure muscle recovery is quite small, approximately 20-25 g.

carbohydrates

Milk typically contains around 4,8 g carbohydrates (intrinsic sugar, lactose) per 100 ml.



Carbohydrates provide an important but fairly limited supply of energy during exercise.

Athletes should consume sufficient amounts of carbohydrates to meet the energy demands of their training programme, paying special attention to high-quality and high-intensity training sessions.

Adequate carbohydrate intake can prevent hypoglycaemia and muscle breakdown when carbohydrate stores in the form of glycogen become depleted, both independently proven to reduce athletic performance.

fats

Depending on the fat content, which can range between 0,5 g and 3,4 g per 100 ml, milk is categorised as fat -free, low-fat or full-cream milk.

Fats are the body's main energy source during low-intensity activities and prolonged exercise (exceeding 90 minutes).

Dietary fat is also important for the provision and absorption of fat-soluble vitamins.

The dietary recommendations for athletes' fat intake are similar to those recommended for non-athletes (approximately 30% of the total daily energy intake), or just slightly higher.

water / hydration

Milk consists of approximately 87% water, which contributes to the recommended fluid intake to support metabolism and various physiological functions in the body.

Exercise leads to increased sweat production to cool the body down. Insufficient water (dehydration) results in fatigue, mental impairment, possible cramping and decreased athletic performance. For effective rehydration, adequate volumes of fluid need to be taken in to replace sweat losses. This amount will vary between individuals and depends on factors such as the type of exercise and environmental conditions. As a general guideline, athletes should drink 1–2 cups of fluid 2 hours before exercise, ½ cup up to 1 cup directly before exercise, ½ cup up to 1 cup every 15–20 minutes during exercise, and 1–2 cups directly after exercise. Alternatively, athletes should consume liquids as dictated by thirst. Beverages that contain both carbohydrates and electrolytes help to ensure that fluid is retained more effectively by the body.

minerals and vitamins

Milk contains a number of essential vitamins, which not only contribute to overall health but are also required in metabolic reactions that support physical activity.

Milk is an source of vitamin A, thiamine (vitamin B1), riboflavin (vitamin B2) and vitamin B12 in particular.

Three servings of dairy provide about 9% of the thiamine recommended for adults, while three servings of full-cream dairy will provide close to a third of the recommended daily amount of vitamin A for adults.

Milk and dairy are also good sources of readily bioavailable minerals such as calcium, potassium, sodium, phosphorus and magnesium, and trace elements such as iodine, zinc and selenium. In addition to their recognised health benefits, these minerals can be of added value to athletes.

The B-vitamins have an important role in energy and substrate metabolism during exercise. Both thiamine and riboflavin contribute to enzyme systems involved in releasing energy from mainly carbohydrates and fatty acids during exercise.

Vitamin A has an important role in gene expression, cellular differentiation, and immunocompetence, while vitamin B12 is necessary for maintenance of nerve tissue and normal blood formation. A deficiency of vitamins A, B1, B2 and B12 has been associated with compromised immunity, and can interfere with optimal training and adaptation during exercise.

Sodium and potassium

Exercise leads to increased sweat production, often resulting in dehydration. Both water and some electrolytes (predominantly sodium, but also small amounts of potassium, magnesium and even calcium) are naturally lost through sweat. Sodium and potassium are involved in maintaining fluid balance, transmission of nerve impulses and muscle contraction. Milk is isotonic and has a naturally high concentration of sodium (133 mg per 250 ml) and potassium (431 mg per 250 ml), which is comparable to that of carbohydrate–electrolyte beverages, shown to enhance post-exercise rehydration. In fact, post-exercise consumption of milk-based beverages has been shown to result in a more positive net fluid balance than consuming an equal volume of carbohydrate–electrolyte beverages.

Calcium, magnesium and phosphorus

Calcium is essential for building and maintaining strong bones and is also involved in muscle contraction during exercise. Athletes who deliberately restrict their energy intake usually also restrict intake of milk and dairy products. As dairy products are the best dietary source of readily bioavailable calcium, this practice may compromise their bone mineral density. Phosphorus is also important for building strong bones, and has a role in the formation of high energy bonds. Magnesium is a required cofactor for more than 300 enzyme systems in the body and is also involved in energy metabolism and muscle contraction. However, dietary deficiencies of both phosphorus and magnesium are rare.

Zinc, selenium and iodine

Zinc is essential for growth and development, wound healing and immunity and also regulates gene expression. Selenium has strong antioxidant properties and has a role in protecting the body against exercise–induced oxidative stress. Iodine is an essential component of thyroid hormones, which are involved in regulating substrate metabolism. Deficiencies of these three minerals have been associated with fatigue and compromised immunity (although selenium and iodine deficiencies are rare), and can interfere with optimal training, adaptation and performance during exercise.

REFERENCES

Bermon S, et al. Consensus statement immunonutrition and exercise. Exerc Immunol Rev. 2017;23:8-50.

García-Berger D, et al. Effects of skim milk and isotonic drink consumption before exercise on fluid homeostasis and time-trial performance in cyclists: A randomized cross-over study. J Int Soc Sport Nutr. 2020;17:17.

James LJ, et al. Cow's milk as a post-exercise recovery drink: Implications for performance and health. Eur Col Sport Sci. 2019;19(1):40-48.

Kerksick CM, et al. ISSN exercise & sports nutrition review update: Research & recommendations. J Int Soc Sports Nutr. 2018;15:38.

Position of the Academy of Nutrition and Dietetics, Dietitians of Canada, and the American College of Sports Medicine: Nutrition for athletic performance. J Acad Nutr Diet. 2016;28:116(3):501-528.

Roy BD. Milk, the new sports drink? A review. J Int Soc Sports Nutr. 2008;5:15.

Russo I, et al. Systematic literature review: The effect of dairy milk on markers of recovery optimisation in response to endurance exercise. Int J Sports Sci. 2019;9(4):69-85.

Shirreffs SM, et al. Milk as an effective post-exercise rehydration drink. Br J Nutr. 2007;98:173.

www.rediscoverdairy.co.za

An initiative by the Consumer Education Project of Milk SA