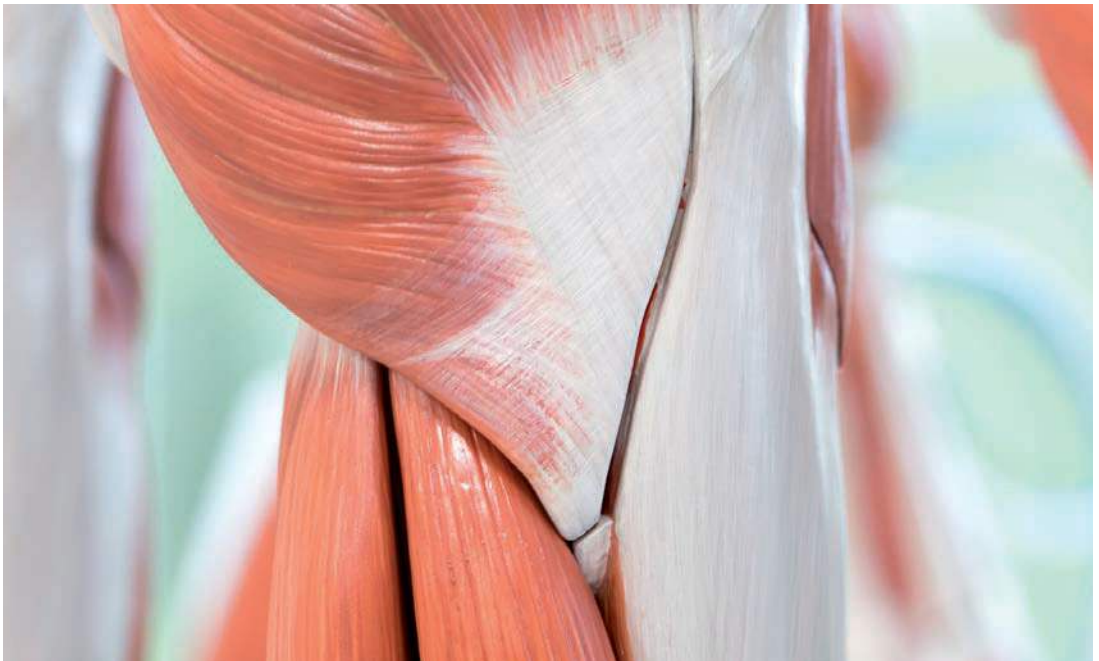


Recovery after exercise

Although this is a relatively new area of dairy research, milk shows promise in the sports nutrition arena. The nutritional composition of milk makes it particularly well suited to support recovery after exercise. There is evidence that milk can be an effective post-exercise rehydration drink due to its fluid and electrolyte content. The protein in milk also helps promote muscle protein synthesis after exercise, and milk has been shown to reduce exercise-induced muscle damage and soreness. Practically, milk is convenient, inexpensive and accessible.



The nutritional composition of the milk matrix, including its protein, carbohydrate and electrolyte content suggests that it would be useful as a sports drink. A number of studies have confirmed a potential role for milk in sports and exercise nutrition, particularly in relation to recovery after exercise¹.

Rehydration

During exercise, fluid is lost from the body as sweat and needs to be replaced.

The main factors that influence the process of post-exercise rehydration are the volume and composition of the fluid consumed, particularly the electrolyte concentration. The **sodium** and **potassium** content of milk make it a good candidate for effective post-exercise rehydration, and several studies have now

shown that low-fat milk can restore and maintain hydration status equally as well as, or better than, a commercially-available sports drink²⁻⁵. The rehydration potential has been demonstrated in children and teens as well as adults⁶. In addition to the electrolyte content, there is some evidence that the **protein** in milk may also enhance rehydration, possibly through slowed gastric emptying⁷. Again, this has been shown in children as well as adults⁸. A recent trial to assess the potential of 12 different drinks to affect hydration status reports that milk (skimmed and whole milk) and an oral rehydration solution were the most effective at maintaining fluid balance⁹.

Muscle recovery and repair

Following exercise, protein is important for recovery and repair. Resistance exercise stimulates muscle protein synthesis but a net gain in muscle mass is only possible if adequate protein or essential amino acids are also consumed. Milk is rich in high quality protein (80% casein and 20% whey) and contains all the essential amino acids; it is a good source of branched chain amino acids including leucine which are integral to muscle metabolism and produces a sustained increase in blood amino acids. Studies support a beneficial effect of milk and of dairy proteins in recovery from resistance exercise. Milk can stimulate protein synthesis and support muscle development following bouts of resistance exercise, in men and women, and in the short and longer term¹⁰⁻¹³ and may have advantages for muscle metabolism over other protein

sources such as soy^{10,12}. Studies of individual milk proteins, particularly whey, also support beneficial effects on skeletal muscle amino acid uptake, protein synthesis and muscle mass¹⁴. In relation to muscle repair after exercise, studies have shown that drinking milk immediately following resistance exercise (500ml) can help to alleviate muscle soreness and drops in muscle performance¹⁵⁻¹⁸.

Glycogen re-synthesis

Carbohydrate is key to supporting glycogen re-synthesis after exercise. Milk contains carbohydrate as the naturally present sugar lactose (glucose and galactose) and so can contribute to glycogen re-synthesis. Studies in this area have largely focused on flavoured milk, particularly chocolate milk, which has greater amounts of carbohydrate and has been shown to be effective for post-exercise muscle glycogen recovery^{1,19}.

Calcium balance

A further area where milk and dairy foods may be of benefit in sports nutrition is in relation to calcium balance. It has been hypothesised that calcium loss through prolonged or excessive sweating may have a detrimental effect on bone²⁰. Although more research is needed, a recent study in competitive female cyclists found that a dairy-based meal before exercise was able to counteract the loss of calcium in sweat and reduce bone breakdown²¹.

It is well established that milk can be effective for rehydration, and for muscle recovery and repair after exercise and sport. Preliminary data suggests it may also be of value pre-exercise as a calcium provider. Practically, milk is convenient, inexpensive and accessible. While chocolate milk and whey proteins also have a role in sports nutrition, the potential of other dairy products such as yogurt and cheese in this context has yet to be fully elucidated. The rich nutrient content of these dairy foods, however, mean they make a valuable contribution to a healthy, balanced diet for sports people.