



# MILK

## Nutritious by nature

The science behind  
the health and nutritional impact  
of milk and dairy foods

# Sports and Exercise Nutrition

There is a growing body of scientific research on the role of milk and dairy foods in sport and exercise nutrition. 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 high-quality 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. Other dairy foods also contain several of the key nutrients needed to help achieve sports nutrition goals.



**The nutrients in the milk matrix, including its high-quality protein, carbohydrate and electrolyte content suggests its potential value as a sports drink.**

A number of studies have confirmed a role for milk in sports and exercise nutrition, particularly in relation to recovery after exercise<sup>1-3</sup>.

## 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, commercially-available sports drinks<sup>4-7</sup>. The rehydration potential has been demonstrated in children and teens as well as adults<sup>8</sup>. In addition to the electrolyte content, there is some evidence that the protein in the milk matrix may also enhance rehydration, possibly through slowed gastric emptying<sup>9</sup>. Again, this has been shown in children and adults<sup>10</sup>. A 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 balance<sup>11</sup>.

## 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); it is a good source of branched chain amino acids including **leucine**, which are integral to muscle metabolism and produce a sustained increase in blood amino acids. Studies support a beneficial effect of milk and 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 term<sup>12-15</sup> and may have advantages for muscle metabolism over other protein sources such as soy<sup>12,14</sup>. Studies of individual milk proteins, particularly **whey**, also support beneficial effects on skeletal muscle amino acid uptake, protein synthesis and muscle mass<sup>16</sup>. It is increasingly recognised that the matrix of the food in which the protein is contained – the combination of other nutrients and structure and how they interact - can influence rates of muscle protein synthesis, and beneficial dairy matrix effects have been suggested<sup>17,18</sup>.

**It is well established that milk can be effective for rehydration, and for muscle recovery and repair after exercise and sport. Preliminary data suggests milk and dairy may also be of value pre-exercise as a calcium provider. Practically, milk is convenient, inexpensive and accessible. Chocolate milk and whey proteins also have an established role in sports nutrition, and the potential of other dairy products such as yogurt and cheese in this context is increasingly recognised. The rich nutrient content of these dairy foods, together with their versatility and palatability, mean they can help athletes reach their sports nutrition goals and make a valuable contribution to a healthy, balanced diet for sports people.**

In relation to muscle repair after exercise, studies have shown that drinking milk (500ml) immediately following strenuous exercise can help to alleviate exercise-induced muscle damage such as muscle soreness and drops in muscle performance. This has been shown for males and females, including for aspects of team sport performance such as agility and sprinting<sup>19-25</sup>.

## 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 have greater amounts of carbohydrate and have been shown to be effective for post-exercise muscle glycogen recovery<sup>1,26</sup>. Some recent work also suggests that lactose may be useful as a carbohydrate source during exercise<sup>27</sup>.

## 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 a drop in blood calcium levels and increased bone breakdown during intense exercise may contribute to the poorer bone health seen in some endurance athletes such as cyclists and rowers<sup>28</sup>. A study in competitive female cyclists found that a calcium-rich dairy-based meal before exercise was able to counteract the drop in blood calcium and reduce bone breakdown<sup>29</sup>. Further research is now underway in other groups of athletes, including rowers, to investigate the potential benefits of a high-dairy intake pre-exercise for calcium balance and bone health. It has been suggested that other nutrients in the dairy matrix such as phosphorus and magnesium may contribute to the beneficial effects.

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