



Dairy vs supplements *as calcium source*



Why it is better to get calcium from dairy products than from supplements

Adequate dietary calcium intake is needed for optimal bone health throughout life. The consumption of milk and other dairy products is an easy way to achieve adequate calcium intake and simultaneously also increases the nutritional quality of the diet. Obtaining calcium from milk offers benefits over that of calcium from other foods or supplements, especially in unfavourable physiological conditions.

- **Prolonged absorption:** Dairy calcium, which is bound to peptides and proteins, is more likely to remain in solution when the pH is unfavourable, such as in achlorhydria (absence of hydrochloric acid in the gastric secretions of the stomach), and is therefore more easily absorbed.^{1,2}
- **Alternative absorption:** Under the influence of lactose, dairy calcium can be absorbed via the paracellular route in the distal small intestine without vitamin D.^{1,2}
- **Protected absorbability:** Dairy products do not contain any substances (e.g. oxalates, phytates) that are likely to inhibit the intestinal absorption of calcium.¹
- **Meal effect:** Milk and dairy products provide an almost-complete diet and so supply several additional nutrients essential for optimal development and bone health. Consumption of whole-dairy products enhances the absorption of calcium and facilitates the simultaneous intake of phosphorus, which is essential for bone deposition. Low-calcium diets are therefore generally also characterised by low levels of other essential nutrients, such as potassium and magnesium. Consumption of dairy products therefore improves the overall nutritional quality of the diet.¹

The intake of dietary calcium has been shown to be negatively associated with a risk for kidney stones,² as opposed to calcium supplementation, which has been positively associated with a risk for kidney stones. In addition, the World Cancer Research Fund downgraded the evidence supporting an association between high-calcium diets and an increased

risk of prostate cancer from strong to limited in their most recent (2018) expert report on diet, nutrition, physical activity and cancer.³ Limited evidence has also been found for an association between higher consumption (more than two servings a day) of dairy products such as milk, cheese and yoghurt and an increased risk of prostate cancer. Consumption of dairy products has also shown strong evidence for decreasing the risk of colorectal cancer.³

Supplements as a source of calcium

Individuals who choose supplementation to achieve adequate calcium intake should take several factors into account to ensure that their requirements for other nutrients are also met, without risking negative side-effects associated with a high calcium intake from supplementation.

When is calcium supplementation necessary?

Calcium supplementation is recommended only if adequate amounts of calcium cannot be obtained from the diet. This may be the case for individuals who do not consume calcium-rich foods because of either lifestyle choices (e.g. vegans) or clinically diagnosed food intolerances or allergies.⁴

Type of supplementation

Calcium supplements are available as capsules, tablets, chews, wafers, powders and liquids. When calcium supplementation is considered, bioavailability of the calcium, the number of units needed to achieve the desired dose, size of the units, the specific calcium compound and the cost of supplementation should be taken into account. Calcium supplements are available as various mineral compounds, namely as carbonates, citrate, citrate malate, phosphate, gluconate and lactate, and also as calcium from dolomite (calcium magnesium carbonate) or bone meal. Calcium carbonate and calcium citrate are the most popular forms of supplemental calcium. The amount of elemental calcium provided by the different sources ranges from 9% (calcium gluconate) to 40% (calcium carbonate).⁴

Physiological interactions of supplements

Calcium carbonate is cost effective but should be taken with meals to ensure optimal absorption. This form of calcium supplement is, however, contraindicated in patients with achlorhydria or those taking gastric acid suppression medications such as H₂ blockers or proton-pump inhibitors. Calcium citrate, which provides 21% elemental calcium, is recommended as an alternative in such cases. To obtain optimal clinical outcomes, the dose of calcium should not exceed 500 mg at a time. It is further recommended to take smaller doses four times per day, which lowers parathyroid hormone (PTH) levels and decreases resorption, especially important in individuals with osteopenia or osteoporosis.⁴

Risks associated with calcium supplementation

The most important factor to consider when considering

- Gastrointestinal side-effects such as constipation, gas, flatulence and bloating may be experienced with the use of calcium carbonate.^{4,5} In such cases, the carbonate formulation can be replaced with calcium citrate to improve symptoms. Adequate fluid and fibre intake is essential and the recommended intake should not be exceeded.⁴
- Bone-meal or dolomite supplements contaminated with cadmium, mercury, arsenic or lead may expose a patient to toxic metals.⁶
- Kidney stones may develop with calcium intakes close to 2000 mg/day. Calcium supplements should best be taken with meals and should not exceed the upper limit.⁴
- Hypercalcaemia may develop with calcium intakes close to 2000 mg/day, especially when accompanied with high vitamin D intakes (e.g. when taking combined supplements of calcium and vitamin D).⁷
- Excessive calcification in soft tissue, especially the kidneys, may occur at intakes ≥ 2000 mg/day.⁴

Several drug–nutrient interactions associated with calcium supplementations should also be noted (Table 1). Food interactions include the effects of phytic acids, which can decrease absorption, and also caffeine (>300 mg/day) and sodium (>2400 mg/day), which increase urinary excretion of calcium when consumed in excessive amounts. Calcium supplements may also decrease the absorption of iron, zinc and magnesium, especially in compromised patients.⁴

How can dietary calcium consumption be increased?

Calcium consumption is influenced by various psychological, physiological and environmental factors. Addressing the following aspects may assist in meeting calcium requirements without the risk of calcium toxicity or underconsumption of other essential nutrients:⁸

- Substituting milk with soft drinks and high intakes of fizzy drinks should generally be discouraged.
- Eating away from home often could promote regular consumption of low-calcium foods.
- Skipping meals, especially breakfast, may limit calcium intake and compromise overall diet quality.
- Gradually increasing the intake of dairy in the case of lactose intolerance can improve the symptoms associated with the condition. Spread milk intake over the course of the day and consume milk together with foods that do not contain lactose. Yoghurt and aged or hard cheeses are generally better tolerated.
- Increased education efforts regarding the importance of calcium for health and highlighting important food sources of calcium may help to improve dietary calcium intake. Negative attitudes and misconceptions should also be addressed through evidence-based education.
- Parents greatly influence children's choices and intake of foods rich in calcium, and should be positive role models for forming healthy food habits
- Food fortified with calcium (e.g. fortified juices and breakfast cereal) offers a healthy option for reaching recommended calcium intakes.

Conclusion

Food, especially milk and dairy products, is the preferred source of calcium compared with supplements, especially considering the risks associated with calcium supplementation.

Supplements should be used only when an adequate dietary intake cannot be achieved or in individuals with major malabsorption problems or substantial abnormalities of calcium metabolism.⁵



Table 1**Drug–nutrient interactions in calcium supplementation⁴**

Administered drug	Effect
Levothyroxine	Calcium and levothyroxine should be administered 4 h apart, as calcium reduces levothyroxine absorption by forming insoluble complexes.
H ₂ blockers and proton-pump inhibitors	H ₂ blockers and proton-pump inhibitors decrease the absorption of calcium carbonate, which requires an acidic environment.
Tetracyclines	Tetracyclines should be taken 2 h before or 4–6 h after calcium supplements, as calcium decreases the absorption of tetracycline by forming insoluble complexes.
Biphosphonates	Biphosphonates should be taken at least 30 min before calcium supplementation. Ideally, calcium should be taken at another time of day.
Quinolone antibiotics	Quinolone antibiotics should be taken at least 2 h before or 4–6 h after calcium supplementation, as calcium decreases absorption of the drug by forming insoluble complexes.
Digoxin	Hypercalcaemia increases the risk of fatal cardiac arrhythmias.
Thiazide diuretics	Thiazide diuretics decrease the excretion of calcium, and concomitant use with even moderate doses of supplemental calcium may increase the risk of milk-alkali syndrome. Serum calcium and PTH levels should be monitored regularly.
Corticosteroids	Corticosteroids in doses of ≥ 7.5 mg/day can cause significant bone loss, as they decrease calcium absorption, increase calcium excretion and inhibit bone formation. Patients using these drugs should take calcium and vitamin D supplements.
Anticonvulsants, such as phenytoin, fosphenytoin, carbamazepine phenobarbital	These anticonvulsants decrease calcium absorption by increasing the metabolism of vitamin D. Hypocalcaemia and osteomalacia have been identified in patients receiving chronic therapy. Patients receiving these drugs should take calcium and vitamin D supplements.

References

- Guéguen L, Pointillart A. The bioavailability of dietary calcium. *J Am Coll Nutr.* 2000; 19(2 Suppl):119S-136S.
- Booth A, Camacho P. A closer look at calcium absorption and the benefits and risks of dietary versus supplemental calcium. *Postgrad Med.* 2013; 125(6):73-81.
- World Cancer Research Fund/American Institute for Cancer Research. Diet, nutrition, physical activity and cancer: A global perspective. Continuous Update Project Expert Report 2018. Available at: dietandcancerreport.org.
- Straub DA. Calcium supplement in clinical practice: A review of forms, doses, and indications. *Nutr Clin Pract.* 2007; 22(3):286-296.
- Reid IR, Bristow SM, Bolland MJ. Calcium supplements: Benefits and risks. *J Intern Med.* 2015; 278(4):354-368.
- Chapman-Novakofski K. Nutrition in bone health. In: Mahan LK, Escott-Stump S, Raymond J (eds). *Krause's Food and the Nutrition Care Process*, 13th ed. St. Louis: Elsevier, 2012.
- Gallagher ML. The nutrients and their metabolism. In: Mahan LK, Escott-Stump S, Raymond J (eds). *Krause's Food and the Nutrition Care Process*, 13th ed. St. Louis: Elsevier, 2012.
- Pereira GAP, Genaro PS, Pinheiro MM, Szejnfeld VL, Martini LA. Dietary calcium – strategies to optimize intake. *Rev Bras Reumatol.* 2009; 49(2):164-180.

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