

Calcium supplements

Calcium is the most abundant mineral in the body. Calcium is required for the normal development and maintenance of the skeleton as well as for the proper functioning of neuromuscular and cardiac function. It is stored in the teeth and bones where it provides structure and strength.

The role of calcium supplements in the prevention and treatment of many chronic conditions remains controversial. Calcium is widely recommended for the prevention and treatment of osteoporosis. Numerous studies have shown an increased risk of cardiovascular disease and stroke among calcium supplement users. Studies have shown no beneficial effect on the incidence of breast cancer, colorectal cancer or cognitive decline in postmenopausal women with calcium supplements.

Calcium dietary intake

Australian guidelines recommend 1300 mg daily dietary intake for men aged >70 years and postmenopausal women. Residents should be offered a diet high in calcium and supplements should only be used when dietary intake is inadequate. Absorption of dietary calcium decreases with age and menopause in women. Low estrogen levels experienced with menopause increase bone resorption, decrease efficiency of calcium absorption in the gut and decrease renal conservation of calcium. The upper level of calcium intake is 2500mg per day.

Calcium is found mainly in milk and other dairy foods including yoghurt and cheese. There are smaller amounts in bony fish, legumes and certain nuts, fortified soy beverages and breakfast cereals. Vegetarians and vegans may have lower dietary intakes.

The International Osteoporosis Foundation website has a list of calcium content of common foods and a useful calculator for determining dietary intake. The Australian Dietary Guidelines recommend 2 to 3 serves of dairy foods per day.

Calcium absorption can be affected by other foods. For example, foods rich in oxalic acid (e.g., spinach, rhubarb, beans) or phytic acid (seeds, nuts, grains, certain raw beans and soy) can reduce dietary calcium absorption when eaten together. Caffeine, excessive alcohol intake and high salt intake can increase urinary calcium loss.

Osteoporosis

Calcium plus vitamin D supplementation is widely recommended to prevent osteoporosis and subsequent fractures. Calcium supplementation has a small positive effect on bone density. The combination of calcium and vitamin D supplementation reduces the risk any fracture by 15% and the risk of hip fractures by 30%. The beneficial effects appear greater in people in residential aged care.

Most studies of medicines used for the treatment of osteoporosis include calcium and vitamin D supplements. Therefore, it is recommended that supplements are co-administered in people prescribed bisphosphonates and denosumab.

Cardiovascular disease

Popular supplements including multivitamins, vitamin D, calcium and vitamin C show no consistent benefit for the prevention of cardiovascular disease, heart attack or stroke. There is also no evidence of benefit for all-cause mortality.

Calcium supplements in doses higher than the recommended amount have been shown to increase the risk of myocardial infarction. The Women's Health Initiative showed no increase in myocardial infarction with calcium supplements (1000mg) and Vitamin D (400 IU) daily. So, there is no clear consensus of the risk of cardiovascular events with calcium supplementation.

In a recent study oral calcium supplementation was associated with lower survival and a greater need for aortic valve replacement in elderly patients with mild to moderate aortic stenosis. Aortic stenosis is a common valvular disease that can lead to heart failure, affecting around 4% of people aged over 85 years. There is no proven pharmacological therapy for aortic stenosis and aortic valve replacement is the only treatment. The dosage of calcium supplementation in the study varied from 500 to 2000mg per day.

However, it is clear that calcium from dietary sources does not lead to an increased cardiovascular risk.

Renal failure

Calcium carbonate can be used as a phosphate binder in people with chronic kidney disease. It binds with dietary phosphate in the gastrointestinal tract forming a poorly absorbed compound, thus reducing serum phosphate concentration. Usual dose is 500–600 mg elemental calcium (given as 1250–1500 mg calcium carbonate) with each meal. Higher doses can be used if necessary.

Calcium supplements

When adequate dietary calcium intake is not possible, daily supplement in doses of 500 to 600mg daily can be used. Twice daily dosing of calcium supplements was routinely seen many years ago; however, it is no longer considered safe or beneficial. Routine use of calcium supplements without an indication is not recommended.

Calcium carbonate (*Caltrate*) and calcium citrate (*Citracal*) are the most widely available supplements. Many products and formulations are available including effervescent and chewable tablets which may be more suitable for residents with swallowing problems.

Calcium carbonate is better absorbed when taken with meals. It is not well absorbed however in patients with achlorhydria, which may occur with proton pump inhibitors (PPIs).

Calcium citrate is preferred for people taking PPIs (esomeprazole, lansoprazole, omeprazole, pantoprazole, rabeprazole) or H2 blockers (famotidine, nizatidine) for the treatment of dyspepsia, peptic ulcer disease or gastro-oesophageal reflux disease (GORD). Whilst the dose contained in products with calcium citrate is lower than calcium carbonate, calcium citrate is more soluble and therefore better absorbed.

Fixed dose combinations with vitamin D are also available and are recommended to reduce the pill burden. The major function of vitamin D is to maintain calcium in the body by enhancing absorption of calcium from the diet. Some products include:

- Calcium (as citrate) 315mg, vitamin D 12.5mcg (*Citracal + D*)
- Calcium 600mg (as carbonate) 600mg, vitamin D 12.5mcg (*Caltrate Bone Health, Cal-600 + D, Ostelin*)
- Calcium 600mg (as carbonate) 600mg, vitamin D 25mcg (*OsteVit-D & Calcium One-a-Day*)

Combination packs with alendronate 70mg are also available on the PBS (*ReddyMax Plus D-Cal*).

Adverse effects

Common adverse effects of calcium supplements include belching, flatulence, abdominal distension, and constipation. High calcium intake can lead to kidney stones and may interfere with other minerals such as zinc and iron.

Summary

Calcium is best obtained from the diet and 1300mg per day of elemental calcium is recommended. If dietary sources are inadequate, supplements in doses up to 600mg daily can be used. Calcium citrate may be better absorbed in older persons and therefore is the preferred supplement. Adequate calcium intake from dietary sources or supplements is necessary for the prevention and treatment of osteoporosis.

References

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BMJ 2008 336: 262-266.
Heart. Published online April 25, 2022.

Further information

<https://www.osteoporosis.foundation/educational-hub/topic/calcium/list-of-calcium-content-of-common-foods>
<https://healthybonesaustralia.org.au/your-bone-health/calcium/>