

# Calcium

## Medical guide



In order to reduce or prevent bone loss, it is vital to maintain an adequate intake of calcium. Osteoporosis Australia continues to recommend a total daily calcium intake of 1,000-1,300 mg per day, depending on age and sex, and ideally obtained from calcium rich foods in the diet. However, when dietary intake of calcium is not sufficient, supplements may be required at a daily dose of around 500-600 mg per day. Calcium supplementation has also been an integral component of clinical trials with prescription medicines used to treat established osteoporosis.

### Calcium requirements

The NHMRC Nutrient Reference Values (NRV) outline total calcium recommended per day. These requirements take into consideration factors such as calcium excreted from the body (and some calcium not properly absorbed) to ensure adequate intake for the majority of the population.

Recommended adequate calcium intake		
Category	Age (yrs)	Recommended dietary intake
Children	9-11	1,000 mg/day
Teens	12-18	1,300 mg/day
Adults	19+	1,000 mg/day
Women	50+	1,300 mg/day
Men	70+	1,300 mg/day

Source: National Health and Medical Council of Australia 2006.

The highest daily requirements are for teenagers (a period of rapid bone growth) and for women over 50 and men over 70.

It is recommended that daily calcium requirements are achieved through dietary sources.

As calcium content in food varies, it is important that people *regularly* consume 'calcium rich' foods, as part of a normal diet.

Even when calcium intake is adequate, calcium absorption may be impacted by other factors, for example:

- Low vitamin D levels.
- Malabsorption disorders.
- Diets high in oxalates (eg: spinach) or phytates (eg: grains, seeds, legumes).

### Calcium in food

An average diet should include 3-5 serves of calcium rich food daily.

The number of serves is determined by calcium content.

#### Calcium content of key foods

(mg per standard serve)	
Milk, cheese and yoghurt	300-400 mg
Tinned salmon and sardines	220-400 mg
Tofu-calcium set	150 mg
Nuts and tahini	65-110 mg
Selected green vegetables	18-43 mg

Source: extrapolated from FSANZ database with cross reference to Foodworks and Calorie King.

Dairy products are a rich source of calcium (including reduced fat and low fat options).

A simple way to ensure sufficient calcium intake is to include 3 serves per day of dairy foods such as milk, cheese or yoghurt.

People who are intolerant to lactose (not allergic) can often tolerate yogurt and cheese as the lactose has been broken down in these products.

Individuals who are intolerant of dairy products or dislike dairy products will need to incorporate more serves of other high calcium containing foods (eg: specific vegetables, fish and nuts) or calcium fortified foods.

Calcium fortified foods and beverages are available (eg: some cereals, calcium set tofu, soy beverages).

An annual review of a patient's dietary calcium intake can help improve overall calcium consumption.<sup>1</sup>

More than half Australian adults do not reach recommended levels of calcium intake.<sup>2</sup>

### Supplementation

Calcium (and vitamin D) supplementation has been shown to be effective in people who do not get enough dietary calcium (and/or sunlight for vitamin D). Lack of adequate calcium and vitamin D over prolonged periods may negatively impact on bone health. Elderly people, in particular, often find it difficult to achieve adequate sources of these nutrients and may benefit from supplementation.

Calcium supplementation may be required in the following situations:

- People with insufficient dietary calcium intake. Osteoporosis Australia recommends a supplement of 500-600 mg per day when dietary intake is low.<sup>3</sup>
- People taking osteoporosis treatments. Calcium supplementation optimises the effectiveness of most osteoporosis medicines including bisphosphonates, strontium ranelate, denosumab, teriparatide and SERM therapy. It is recommended that calcium supplementation be combined with vitamin D.



- People using corticosteroids for more than 3 months.
- People with diseases/taking medications that can impact on their bones (eg: inflammatory and malabsorption diseases).

**Note:** There is no significant difference in the absorption of calcium from supplements compared with dietary sources provided there is normal stomach acidification.

Supplements containing calcium carbonate require gastric acidity for optimal absorption and should be taken with meals. Supplements containing calcium in other forms, such as citrate or hydroxyapatite, are not affected by gastric acidity.

Calcium supplements (mainly in the form of carbonate) may cause bloating or constipation.<sup>4</sup>

Calcium supplements may lead to kidney stones in susceptible patients (those with a predisposition) but this is uncommon.<sup>5</sup>

## Safety of calcium supplements

Several recent studies (and subsequent media reports) have raised debate around the safety of calcium supplements and possible increased risk of cardiovascular events. Osteoporosis Australia has reviewed these studies and issued a statement about the use of calcium supplementation based on current evidence ([www.osteoporosis.org.au](http://www.osteoporosis.org.au)).

When dietary intake is inadequate, Osteoporosis Australia continues to recommend calcium supplementation to assist patients in reaching overall recommended intake of 1,000-1,300 mg per day (depending on age). Calcium supplementation in doses of 500-600 mg per day is considered safe and effective.<sup>3</sup>

## Calcium and bone density

Numerous studies have been conducted on the effect of calcium supplementation (with or without vitamin D supplementation) on bone mineral density and bone turnover. Most studies indicate a moderate but positive (statistically significant) effect on post-menopausal bone loss.<sup>6,7</sup> These effects were more pronounced in people with low dietary calcium intake.

## Supplementation and fracture prevention

Some randomised controlled trials have shown supplementation with calcium and vitamin D to be effective in reducing fracture risk in the elderly. This is most likely to relate to the fact that many elderly people tend to be deficient in both calcium and vitamin D.<sup>8,9,10,11</sup>

For people who have osteoporosis whether or not they have experienced a fracture, calcium alone (or vitamin D alone) is not sufficient to prevent future fractures.<sup>12,13</sup> GPs must consider anti-osteoporotic treatments for those at high risk of fracture. However, adjuvant supplementation of osteoporosis medicines with calcium and vitamin D is strongly recommended.

## Calcium and ageing

Calcium requirements increase with age (1,300 mg per day for women over 50 and men over 70) as elderly persons can be at increased risk of calcium (and vitamin D) insufficiency.

The main factors to monitor in people with advancing age are reduced calcium intake or poorer calcium absorption, for example:

- Reduced dietary intake of calcium, usually part of decreased overall dietary energy intake (poorer appetite, other illnesses, social and economic factors).
- Decreased intestinal absorption of calcium (exacerbated if vitamin D status is low).
- Less frequent exposure to sunlight hence poorer vitamin D status (eg: elderly who are housebound, institutionalised, or have reduced mobility).
- Decreased capacity of the skin to synthesise vitamin D.
- Decreased efficiency of the kidneys to retain calcium, leading to increased calcium loss in the urine and/or
- Decreased capacity of the kidneys to convert vitamin D into its most active form, 1,25-dihydroxyvitamin D.

1 Sanders K, Stuart A, Kotowicz M, et al. Annual feedback is an effective tool for a sustained increase in calcium intake among older women. *Nutrients* 2010;2:1018-25.

2 Australian Bureau of Statistics 1998, National Nutrition Survey: Nutrient intakes and physical measurements, Australia 1995, cat. No. 4805.0, ABS.

3 Osteoporosis Australia (2014) Statement on calcium supplements, retrieved from: [www.osteoporosis.org.au/health-professionals/research-position-papers/](http://www.osteoporosis.org.au/health-professionals/research-position-papers/)

4 Ebeling P, Eisman J. Recommendations from the vitamin D and calcium forum. *Medicine Today* 2005;16:43-50.

5 Heaney R. Calcium supplementation and incident kidney stone risk: a systematic review. *J Am Coll Nutr* 2008;27:519-527.

6 Tang BM, Eslick GD, Nowson C, et al. Use of calcium or calcium in combination with vitamin D supplementation to prevent fractures and bone loss in people aged 50 years and older: a meta-analysis. *Lancet* 2007;370:657-66.

7 Shea B, Wells G, Cranney A, et al. Meta-analyses of therapies for postmenopausal osteoporosis. VII. Meta-analysis of calcium supplementation for the prevention of postmenopausal osteoporosis. *Endocr Rev* 2002;23:552-59.

8 Prentice RL, Pettinger MB, Jackson RD, et al. Health risks and benefits from calcium and vitamin D supplementation: Women's Health Initiative clinical trial and cohort study. *Osteoporos Int* 2013;24:567-580.

9 Chapuy MC, Pamphile R, Paris E, et al. Combined calcium and vitamin D3 supplementation in elderly women: confirmation of reversal of secondary hyperparathyroidism and hip fracture risk: the Decalys II study. *Osteoporos Int* 2002;13:257-64.

10 Chapuy MC, Arlot ME, Delmas PD, et al. Effect of calcium and cholecalciferol treatment for three years on hip fractures in elderly women. *Brit Med J* 1994;330:1081-2.

11 Prince RL, Devine A, Dhaliwal SS, Dick IM. Effects of calcium supplementation on clinical fracture and bone structure. Results of a 5-year, double-blind, placebo-controlled trial in elderly women. *Arch Intern Med*. 2006;166:869-875.

12 Grant AM, Avenell A, Campbell MK, et al. Oral vitamin D3 and calcium for secondary prevention of low-trauma fractures in elderly people (Randomised Evaluation of Calcium Or vitamin D, RECORD): a randomised placebo-controlled trial. *Lancet* 2005;365:1621-28.

13 Porthouse J, Cockayne S, King C, et al. Randomised controlled trial of calcium and supplementation with cholecalciferol (vitamin D3) for prevention of fractures in primary care. *Brit Med J* 2005;330:1003.