

Calcium Supplement Guidelines

The University of Arizona • College of Agriculture • Tucson, Arizona 85721

6/98

VERONICA A. MULLINS
R.D., Research Assistant

LINDA HOUTKOOPER
Ph.D., R.D., Nutrition Specialist

Calcium and Health

Calcium is an essential mineral found in great abundance in the body. Ninety-nine percent of all the calcium in the body is found in the bones and teeth. The remaining one percent is in the blood. Calcium plays important roles in nerve conduction, muscle contraction, and blood clotting. If calcium levels in the blood drop below normal, calcium will be taken from bone and put into the blood in order to maintain blood calcium levels. Therefore, it is important to consume enough calcium to maintain adequate blood and bone calcium levels.

Calcium and Disease Prevention

Osteoporosis — Osteoporosis means “porous bone,” and is characterized by a decrease in bone mineral density, bone calcium content, and an increased risk of fractures. Risk factors for osteoporosis include:

- low calcium and vitamin D intakes
- female, thin and/or small framed
- advanced age
- family history of osteoporosis
- postmenopausal
- history of anorexia nervosa or bulimia
- regular use of low-calorie diets
- absence of menstrual periods
- regular use of medications such as corticosteroids and anti-convulsants
- inactive lifestyle
- cigarette smoking
- excessive alcohol use
- low testosterone in men.

One way to help reduce your risk is to consume adequate amounts of calcium in your daily diet. If you cannot consume enough calcium from your foods, supplements are a safe alternative.

Kidney Stones — Too much calcium in your diet can increase your risk for calcium kidney stones. However, recent studies have shown that too little calcium is a risk as well. The best strategy to prevent kidney stones is to consume appropriate amounts of calcium to meet your needs every day, thus avoiding deficient and excess levels.

How much calcium do I need?

Dietary Reference Intakes for Calcium

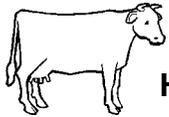
Recommended Calcium Intakes*	milligrams per day
Infants 0-6 months	210
Infants 6-12 months	270
Children 1-3 years old	500
Children 4-8 years old	800
Adolescents 9-13 years old	1,300
Teenagers 14-18 years old	1,300
Adults 19-30 years old	1,000
Adults 31-50 years old	1,000
Adults 51 years old and older	1,200
Pregnancy	
-- Less than or equal to 18 years	1,300
-- 19 through 50 years	1,000
Lactation	
-- Less than or equal to 18 years	1,300
-- 19 through 50 years	1,000

* Source: Institute of Medicine, National Academy of Science, 1997

The National Institute of Health Consensus Conference and The National Osteoporosis Foundation support a higher calcium intake of 1,500 milligrams per day for postmenopausal women not taking estrogen and adults 65 years or older.

How much calcium is too much?

To avoid calcium toxicity it is recommended that you do not take more than 2,500 milligrams of calcium per day. High calcium intakes can lead to constipation, an increased chance for developing calcium kidney stones, and may inhibit the absorption of iron and zinc from food.



How should I get my calcium?

The best way to get your calcium is from the foods you eat. This has the advantage of also providing you with other nutrients in foods that are important for absorbing and using calcium in your body, such as lactose in milk. Some good food sources of calcium are:



Food Source	Serving Size	Calcium (mg)
Milk & yogurt	8 oz	300-450
Cheese	3 oz	300-450
Bones in canned sardines and salmon	3 oz	181-325
Calcium fortified foods (i.e., orange juice, soy milk)	8 oz	200-300
Dark green, leafy vegetables	1/2 cup	50-100
Nuts and Seeds	1 oz	25-75

For people who cannot consume enough calcium from food and beverages and are unable to make changes in their eating habits, calcium supplementation may be necessary to obtain adequate calcium intakes.



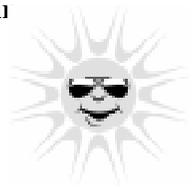
What increases calcium absorption?

The calcium you consume from your diet or as a supplement is absorbed by the body in the small intestine. Not all the calcium you eat will be absorbed, some will pass through your body and be excreted as waste. How much calcium is absorbed by the body depends on the type of calcium you consume, how well the calcium dissolves in the intestines, and the amount of calcium in your body.

Acidic conditions in the intestine — Calcium carbonate requires an acidic environment in order to be dissolved in the intestine and absorbed into the blood. Stomach acid production increases in the presence of food, creating an acidic environment. Therefore, calcium carbonate supplements should be taken with a meal. Calcium citrate does not require the presence of extra stomach acid to dissolve and be absorbed and should be taken on an empty stomach.

Vitamin D — Calcium absorption is dependent on an adequate level of the active form of vitamin D. Often vitamin D is supplemented, along with calcium. Vitamin D has been shown to produce adverse side effects at above 50 micrograms or 2,000 International Units a day.

Vitamin D supplements are usually not necessary because vitamin D is available from vitamin D fortified milk, foods such as fish and egg yolks, and exposure to sunlight by the skin. In general, you only need 15 minutes of sunlight exposure to maintain an adequate vitamin D level. However, the amount of sunshine that your skin absorbs is dependant on the weather, latitude, time of year, the amount of skin exposed, and sunscreen use.



Estrogen — Estrogen is a hormone that plays an important role in helping increase calcium absorption. After menopause, estrogen levels drop and so may calcium absorption. Hormone replacement therapy has been shown to increase the production of vitamin D thus increasing calcium absorption.

Low calcium intakes — Your body absorbs calcium less efficiently as your intake increases, therefore it is best to take your calcium in smaller doses throughout the day to aid absorption. You should not take more than 500 milligrams of calcium at one time.

Low blood calcium — When the calcium level in your blood is low, parathyroid hormone is released and increases the production of vitamin D. The vitamin D helps increase calcium absorption, returns the amount of calcium in your blood to normal levels, and makes calcium available to be deposited in the bones.

Lactose — Lactose, the major carbohydrate in milk, aids calcium absorption, however, how this occurs in the body is still unknown.

Type of supplements — One factor affecting calcium absorption from supplement tablets is how well the calcium tablet dissolves. To ensure you are taking a supplement that will dissolve in your intestine, take one that meets the U.S. Pharmacopeia's (USP) standards for dissolution. The "USP" letters on the label indicate that the supplement meets the U.S. Pharmacopeia's standards for the amount of elemental calcium in a tablet and how well the tablet dissolves. According to USP standards, a calcium tablet must contain 90-110% of the amount of elemental calcium listed on the supplement label and must dissolve in 30-40 minutes.

Caffeine — Recent studies have shown that caffeine intake of up to five or more cups of coffee per day is not a risk factor for increased bone mineral loss in postmenopausal women. Even women with low daily calcium intakes did not show

increased bone losses when consuming this amount of caffeine.



What decreases calcium absorption?

Oxalic Acid — Oxalic acid is a substance that binds to calcium in the intestine. The calcium absorbed from foods high in oxalic acid, such as spinach, soybeans, cocoa, and kale, can be decreased. However, the calcium absorption from other food sources, consumed at the same meal, will not be affected.

Phytates — Phytates are substances found in some plant foods that can bind calcium in the intestine and decrease its absorption. Phytates, unlike oxalic acid, will bind the calcium from other food sources consumed at the same meal.

Dietary fiber — Some kinds of fiber affect calcium absorption. Insoluble fiber, found in foods such as wheat bran and celery, can bind calcium in the intestine and decrease its absorption.

Laxatives or anything that induces diarrhea — Diarrhea can move substances through the intestine very rapidly, not leaving enough time for calcium to be absorbed.

Great excesses of the minerals phosphorous and magnesium in proportion to calcium — The absorption of both magnesium and phosphorous requires vitamin D. If these minerals are consumed in excess, there will be less vitamin D available for aiding calcium absorption. The upper limit of safe intake recommended by the National Academy of Science for phosphorus is 3,000-4,000 milligrams per day and 350 milligrams per day for magnesium

Tannins in tea — Tannins are substances found in tea which can bind with calcium in the intestine, therefore decreasing its absorption.

Medications — Long term use of medications, such as corticosteroids, and anti-convulsants can be damaging to bone. These medications are used for chronic conditions such as asthma, rheumatoid arthritis, and psoriasis. If you need to take these medications for extended periods of time, consult your doctor about ways to help prevent bone loss.

If one or more of these factors apply to you, you can compensate by increasing your calcium intake from food or supplements, as long as you do not exceed 2,500 milligrams of calcium per day.

What type of calcium supplement is best?

The calcium you consume in foods and supplements occurs in a compound form. A compound is a substance that contains more than one ingredient. Other possible ingredients, besides calcium, in a calcium compound include carbonate and citrate.

The calcium in a compound is called elemental calcium. During digestion, the calcium compound dissolves and the elemental calcium becomes available to be absorbed into the blood. If a tablet contains 500 milligrams of calcium carbonate, it contains only 200 milligrams of elemental calcium.

This is because only 40% of the calcium compound is elemental calcium. The other 60%, or 300 milligrams, would be from the carbonate ingredient. Most calcium supplements list the elemental calcium content on the label.



Supplement Form	Percent Elemental Calcium	Comments
Calcium Citrate	21%	Best absorbed supplemental form of calcium. It does not require the presence of extra stomach acid to dissolve. Calcium citrate can come in colloidal form. This is a liquid form of calcium that may be less irritating to the intestinal wall.
Calcium Carbonate	40%	Most common type of calcium supplement on the market. Usually requires extra stomach acid for digestion, so should be taken with a meal.

Many different name brand calcium citrate and calcium carbonate products are on the market today. Citracal® and Solgar® are brand name calcium citrate products. Tums® and Caltrate® are brand name calcium carbonate products.

What calcium supplements should be avoided?

- Dolomite, Oyster shell, and Bone Meal are naturally occurring calcium carbonate sources which may contain heavy metals, including lead. Minimizing lead intake is important for pregnant and nursing women, and children. The Food and Drug Administration (FDA) has set an upper limit for the amount of lead a calcium supplement can contain (7.5 micrograms per 1000 milligrams of calcium). Currently, calcium supplements are not tested by a regulatory agency for lead content before they are placed on the market. It is up to the manufacturer to assure that the lead content of their calcium supplement meets the FDA standards.
- Calcium Phosphate, Calcium Lactate, and Calcium Gluconate have very small percentages of elemental calcium in each supplement tablet. Therefore it is necessary to take a large number of tablets to consume an adequate amount of calcium every day. These calcium supplements should be avoided for this reason.

What is the bottom line?

- Consume appropriate amounts of calcium to stay healthy and reduce your risk for developing osteoporosis and calcium kidney stones.
- Use the table of Dietary Reference Intakes for calcium to find out how much calcium you need to consume each day.
- Avoid taking more than 500 milligrams of elemental calcium at one time to increase absorption. To avoid toxicity, do not take more than 2,500 milligrams of elemental calcium per day.
- Try to consume calcium from foods or beverages. If you take calcium supplements, calcium citrate and calcium carbonate are the best choices because they are easy to find, contain relatively large amounts of elemental calcium, and dissolve well in the body.
- Vitamin D is required for calcium absorption. You can get vitamin D from vitamin D fortified milk and milk products, from exposure to sunlight on your skin, and from some foods, including fish, and egg yolks. Do not take more than 50 micrograms or 2000 International Units a day.



Any products, services, or organizations that are mentioned, shown, or indirectly implied in this publication do not imply endorsement by The University of Arizona.