

Calcium Fact Sheet

Calcium, the most abundant mineral in the body, is found in some foods, added to others, available as a dietary supplement, and present in some medicines (such as antacids). Calcium is required for muscle contraction, blood vessel expansion and contraction, secretion of hormones and enzymes, and transmitting impulses throughout the nervous system [1]. The body strives to maintain constant concentrations of calcium in blood, muscle, and intercellular fluids, though less than <1% of total body calcium is needed to support these functions.

The remaining 99% of the body's calcium supply is stored in the bones and teeth where it supports their structure [2]. Bone itself undergoes continuous remodeling, with constant resorption and deposition of calcium into new bone [1]. The balance between bone resorption and deposition changes with age. Bone formation exceeds resorption in growing children, whereas in early and middle adulthood both processes are relatively equal. In aging adults, particularly among postmenopausal women, bone breakdown exceeds formation, resulting in bone loss that increases the risk of osteoporosis over time [1].

Table 1: Adequate Intakes (AIs) for Calcium [1]

Age	Male	Female	Pregnant	Lactating
Birth to 6 months	210 mg	210 mg		
7-12 months	270 mg	270 mg		
1-3 years	500 mg	500 mg		
4-8 years	800 mg	800 mg		
9-13 years	1,300 mg	1,300 mg		
14-18 years	1,300 mg	1,300 mg	1,300 mg	1,300 mg
19-50 years	1,000 mg	1,000 mg	1,000 mg	1,000 mg
50+ years	1,200 mg	1,200 mg		

Sources of Calcium: Food and Supplements

Milk, yogurt, and cheese are rich sources of calcium and are the major food contributors of this nutrient to people in the United States. Nondairy sources include vegetables, such as Chinese cabbage, kale, and broccoli. Most grains do not have high amounts of calcium unless they are fortified; however, they contribute calcium to the diet because they do have small amounts and people consume them

frequently [1]. Foods fortified with calcium include many fruit juices and drinks, tofu, and cereals.

The two main forms of calcium in supplements are carbonate and citrate. Calcium carbonate is more commonly available and is both inexpensive and convenient. Both the carbonate and citrate forms are similarly well absorbed, but individuals with reduced levels of stomach acid can absorb calcium citrate more easily. Other calcium forms in supplements or fortified foods include gluconate, lactate, and phosphate. Calcium citrate malate is a well-absorbed form of calcium found in some fortified juices [8]. The body absorbs calcium carbonate most efficiently when the supplement is consumed with food, whereas the body can absorb calcium citrate equally effectively when the supplement is taken with or without food [9].

Calcium supplements contain varying amounts of elemental calcium. For example, calcium carbonate is 40% calcium by weight, whereas calcium citrate is 21% calcium.

The percentage of calcium absorbed depends on the total amount of elemental calcium consumed at one time; as the amount increases, the percentage absorption decreases. Absorption is highest in doses ≤ 500 mg [1]. So, for example, one who takes 1,000 mg/day of calcium from supplements might split the dose and take 500 mg at two separate times during the day.

Some individuals who take calcium supplements might experience gas, bloating, constipation, or a combination of these symptoms. Such symptoms can often be resolved by spreading out the calcium dose throughout the day, taking the supplement with meals, or changing the brand of supplement used.

Factors Affecting Absorption:

Not all calcium consumed is actually absorbed in the gut. Among the factors that affect its absorption are the following:

- Amount consumed: the efficiency of absorption decreases as the amount of calcium consumed at a meal increases [1].
- Age: net calcium absorption is as high as 60% in infants and young children, who need substantial amounts of the mineral to build bone [1,12]. Absorption decreases to 15%-20% in adulthood and continues to decrease as people age; this explains the higher recommended calcium intakes for ages ≥ 51 years [1,12,13].
- Vitamin D intake: this nutrient, obtained from food and produced by skin when exposed to sunlight of sufficient intensity, improves calcium absorption [1].
- Other components in food: phytic acid and oxalic acid, found naturally in some plants, bind to calcium and can inhibit its absorption. Foods with high levels of oxalic acid include spinach, collard greens, sweet potatoes, rhubarb, and beans. Among the foods high in phytic acid are fiber-containing whole-grain products and wheat bran, beans, seeds, nuts, and soy isolates [1]. The extent to which these compounds affect calcium absorption varies. Research shows, for example, that eating spinach and milk at the same time reduces absorption of the calcium in milk [14]. In contrast, wheat products (with the exception of wheat bran) do not appear to have a negative impact on calcium absorption [15]. For people who eat a variety of foods, these interactions probably have little or no nutritional consequence and, furthermore, are accounted for in the overall calcium DRIs, which take absorption into account.

<http://ods.od.nih.gov/factsheets/calcium.asp#h3>

NIH Office of Dietary Supplements

Vitamin D Fact Sheet

What is vitamin D and what does it do?

Vitamin D is a nutrient found in some foods that is needed for health and to maintain strong bones. It does so by helping the body absorb calcium (one of bone's main building blocks) from food and supplements. People who get too little vitamin D may develop soft, thin, and brittle bones, a condition known as rickets in children and osteomalacia in adults.

Vitamin D is important to the body in many other ways as well. Muscles need it to move, for example, nerves need it to carry messages between the brain and every body part, and the immune system needs vitamin D to fight off invading bacteria and viruses. Together with calcium, vitamin D also helps protect older adults from osteoporosis. Vitamin D is found in cells throughout the body.

How much vitamin D do I need?

The amount of vitamin D you need each day depends on your age. Average daily recommended amounts from the Food and Nutrition Board (a national group of experts) for different ages are listed below in International Units (IU):

Infants 0-12 months	200 IU
Children 1-18 years	200 IU
Adults 19-50 years	200 IU
Adults 51-70 years	400 IU
Adults 71 years and older	600 IU
Pregnant and lactating women	200 IU

For infants, children, and adolescents, the American Academy of Pediatrics advises daily intakes of 400 IU, twice the official recommendation of 200 IU.

What foods provide vitamin D?

Very few foods naturally have vitamin D. Fortified foods provide most of the vitamin D in American diets.

- Fatty fish such as salmon, tuna, and mackerel are among the best sources.
- Beef liver, cheese, and egg yolks provide small amounts.
- Mushrooms provide some vitamin D. In some mushrooms that are newly available in stores, the vitamin D content is being boosted by exposing these mushrooms to ultraviolet light.
- Almost all of the U.S. milk supply is fortified with 400 IU of vitamin D per quart. But foods made from milk, like cheese and ice cream, are usually not fortified.
- Vitamin D is added to many breakfast cereals and to some brands of orange juice, yogurt, margarine, and soy beverages; check the labels.

One can get recommended amounts of vitamin D by eating a variety of foods with plenty of fortified milk and fatty fish.

Can I get vitamin D from the sun?

The body makes vitamin D when skin is directly exposed to the sun, and most people meet some or all of their vitamin D needs this way. Skin exposed to sunshine indoors through a window will not produce vitamin D.

Not much sun is needed to make enough vitamin D. During the warmest months, for example, as little as 5-30 minutes of exposure between 10 AM and 3 PM, several times a week to the face, arms, legs, or back without sunscreen may be enough.

However, despite the importance of the sun to vitamin D synthesis, it is prudent to limit exposure of skin to sunlight in order to lower the risk for skin cancer. When out in the sun, wear protective clothing and apply sunscreen with an SPF (sun protection factor) of 8 or more. Tanning beds also cause the skin to make vitamin D, but pose similar risks for skin cancer.

The energy from the sun is not enough for the skin to make vitamin D during the coldest months in the northern half of the United States—above a line drawn between Boston and the northern border of California. Cloudy days, shade, and having dark-colored skin also cut down on the amount of vitamin D the skin makes.

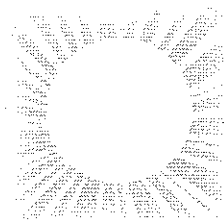
People who avoid the sun, who cover their bodies with sunscreen or clothing, or who live in the northern half of the United States during the winter months should include good sources of vitamin D in their diets or take a supplement.

What kinds of vitamin D dietary supplements are available?

Vitamin D is found in supplements (and fortified foods) in two different forms: D2 (ergocalciferol) and D3 (cholecalciferol). Both increase vitamin D in the blood, but the D3 form may do it better and keep levels raised for a longer time. Many supplements now provide vitamin D3 instead of D2.

http://ods.od.nih.gov/factsheets/VitaminD-Consumer_pf.asp

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Smile the Sun is Shining