



# Dietary Calcium

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## Roles of Calcium in the Body

The body contains more calcium than any other mineral. Ninety-nine percent of the calcium in the body is found in bones and teeth. However, one percent of calcium is in blood. The calcium in the blood helps regulate heart and other muscle contractions and transmits nerve impulses. In addition, blood calcium has important functions in blood coagulation, acid-base balance, and maintaining blood pressure.

## Consume Calcium Every Day

The amount of blood calcium is small, and it is very important. Not consuming enough calcium in the diet will lead to calcium being pulled from bones to maintain the blood calcium level. Maintaining blood calcium levels is one reason to consume calcium every day.

Another reason to consume calcium every day is because bones are constantly reforming. Bone continuously breaks down while new bone forms.

The body deposits large amounts of calcium during growth years. This calcium adds length and diameter to growing bones. After about age 20, the body deposits calcium to increase bone density rather than the length or diameter. After about age 30, all individuals, especially women, lose bone mass at a faster rate than it reforms. Obtaining a peak bone mass density during adolescent years reduces the risk of osteoporosis later in life.

## How Much Calcium Does One Need

The body cannot make its own calcium; one must obtain calcium from the diet. The recommended intake for calcium depends on age and stage of life. For most adults, the Dietary Reference Intake (DRI) recommendation is 1,000 milligrams calcium a day. The DRI recommendation for adults over 50, who often suffer from bone loss, is 1,200 milligrams calcium a day. For adolescents (ages 9 to 18) whose growing bones need adequate calcium to reach peak bone density, the DRI recommendation is 1,300 milligrams calcium per day. The DRI recommendations for pregnant and breast-feeding women are that they should consume the amount of calcium recommended for their age group. Research suggests that hormonal changes during pregnancy and lactation increase a woman's ability to absorb calcium and to adapt to the demands on her body during this time. The tolerable upper intake level (UL) for calcium is 2,500 milligrams per day.

## Dietary Reference Intakes for Calcium and Vitamin D

Age	Calcium (mg/day)	Vitamin D (mcg/day)
Infants (0 to 0.5 year)	210	5
Infants (0.5 to 1 year)	270	5
Children (1 to 3 years)	500	5
Children (4 to 8 years)	800	5
Teenagers (9 to 18 years)	1,300	5
Adults (19 to 50 years)	1,000	5
Adults (51 to 70 years)	1,200	10
Adults (70+ years)	1,200	15
Pregnant or Nursing Teenagers	1,300	5
Pregnant or Nursing Women	1,000	5

## Most Americans Do Not Consume Enough Calcium

The majority of Americans do not consume enough calcium. The average adult consumes 500-700 milligrams of calcium per day, below the DRI recommendations of 1,000 milligrams calcium a day. Women and teenage girls fall short of an adequate calcium intake. Teenage girls often replace calcium-rich dairy products with nutritionally inferior foods such as soft drinks. Teenage girls who do not consume enough calcium do not maximize their peak bone density and may be more prone to bone mineral loss and osteoporosis later in life.

## Calcium and Osteoporosis

If one does not eat enough calcium-rich foods to maintain blood calcium, the body will pull the calcium it needs from the bones. Over many years, this can make the bones porous, weak, and brittle and increases the risk of osteoporosis. Osteoporosis affects millions of Americans, particularly older women. Osteoporosis increases the risk of fractures, especially of the spine, hip, and wrist. Other symptoms of osteoporosis include low back pain, hunched back, decreased height, and loss of bone that supports the teeth. Eating calcium-rich foods throughout one's life is one way to help increase bone density and lower the risk of osteoporosis.

## Sources of Calcium

Consuming calcium-rich foods is the best way to obtain the needed amounts of calcium. Dairy foods are a major dietary source of calcium. These foods also contain other nutrients, such as protein, vitamin D and lactose, which help the body absorb and use calcium.

If milk and dairy products are omitted from the diet, it is difficult to consume adequate amounts of calcium. This is especially true when milk is not used as a beverage. Calcium can be added in food preparation. Add non-fat, dry milk to meat loaf, baked beans, gravy, and puddings. However, the amount added per serving adds only a small amount of calcium in proportion to the amount of calcium needed.

Obtaining sufficient calcium from other food groups requires careful planning because most foods in the other food groups contain only small amounts of calcium. Canned salmon and sardines, for example, when they are processed with their bones, supply calcium. However, one has to eat the bones to get the calcium from these foods. Tofu, or soybean curd, provides calcium, but only if processed with calcium sulfate. Dark-green leafy vegetables, such as broccoli, collards, kale, mustard and turnip greens provide calcium; however, the calcium is not as available as it is from dairy foods. Grains are poor sources of calcium; however, when milk is used to make baked goods, these foods provide moderate amounts of calcium. Some commonly consumed foods are fortified with calcium, such as calcium fortified orange juice, and can be a major source of calcium.

## Lactose Intolerance

Lactose intolerance is a condition where a person cannot digest lactose, the main sugar in milk. Lactose is a disaccharide composed of two single sugars, glucose and galactose. Lactose is normally digested in the small intestine by lactase, an enzyme that breaks lactose into the single sugars, glucose and galactose, which can be absorbed by the small intestine. If there is not enough lactase, the undigested lactose moves into the large intestine and is fermented by bacteria naturally found in the large intestine.

Symptoms of lactose intolerance include abdominal cramps, bloating, intestinal gas, diarrhea, and nausea. The severity of symptoms depends on the amount of lactose consumed and the degree of lactose intolerance. Symptoms may occur from 15 minutes to several hours after eating lactose containing foods and beverages.

Lactose intolerance is not a food allergy. A milk allergy is an allergic reaction to the protein in milk, not the lactose, which is a sugar. Individuals with milk allergy usually must avoid all milk products. Individuals with lactose intolerance can use certain dairy products or other foods that are low in lactose.

## What Foods Contain Lactose

Lactose is usually found in dairy foods and foods containing milk or milk solids. If sensitive to lactose, check labels carefully. Key words to look for on food labels are milk, whey, lactose, non-fat milk solids, dry milk solids, curds, cheese, and sweet or sour cream.

A variety of prepared, processed, and baked foods contain small amounts of lactose. Examples are breads, dry cereals, cold cuts, cream soups, salad dressings, candy, cookies, drink mixes, sugar substitutes, and medications. However, most people with lactose intolerance do not have a problem with the small amount of lactose in these foods.

The amount of lactose allowed will depend on one's individual lactose tolerance. Most people with lactose intolerance develop symptoms after consuming about 11 grams or more of lactose, the amount of lactose in one cup of milk. Work with a physician or registered dietitian to determine how much lactose can be tolerated.

## Helpful Hints for Lactose Intolerance

- Lactose, or milk sugar, is found in milk and milk products.
- Lactose intolerance is different for each person. If sensitive to lactose, one may be able to digest small amounts of lactose. Many people with lactose intolerance can handle five to eight grams of lactose at a given time. Most people with lactose intolerance develop symptoms after consuming 11 grams or more of lactose, the amount of lactose in one cup of milk.
- Lactose may be better tolerated when ingested in smaller amounts or with other foods that slow the emptying of the stomach, such as cereal with a small amount of milk.
- Some people with lactose intolerance can handle cultured dairy products such as yogurt or buttermilk because bacteria added in processing reduces the amount of lactose in these foods.
- Read food labels carefully. Many commercial products have ingredients that contain lactose to improve the flavor, texture, or appearance of the food item. Whey, dry milk solids, milk by-products, non-fat dry milk, curds, cheese, lactose, and milk sugar contain lactose. Even if the label says "non-dairy," some foods may contain ingredients derived from milk products that contain lactose. Lactate, lactalbumin, and calcium compounds do not contain lactose.
- If one can tolerate small amounts of lactose, one can enjoy milk by looking for lactose-reduced milk. Milk treated with the enzyme lactase reduces the lactose from the typical 11 grams in a one-cup serving of regular milk to only three grams. Try adding the lactase enzyme in tablet or liquid form to milk to reduce the lactose content. Lact-Aid and Dairy Ease are lactase enzyme products available at any drug store. A slightly sweeter than normal taste may be noticed, but is acceptable on cereal or in cooked foods.

## Calcium Supplements

Calcium supplements do not provide the other nutrients that help the body use calcium, or nutrients the body needs to build healthy bones. Supplements should "supplement" the diet, not "replace" the diet. It is advisable to get a recommendation from a physician or registered dietitian before taking a calcium supplement because there might be reasons that calcium supplements would be unwise or unnecessary.

There are many types of calcium supplements. Supplements vary in the percent of calcium they provide. Most calcium supplements are well tolerated and are not toxic if used in reasonable amounts. However, they should not be given to individuals who have kidney stones or individuals who form kidney stones. Dolomite and bone meal are two calcium supplements that are NOT recommended because of possible contamination with heavy metals such as lead, mercury, arsenic, and cadmium.

Some calcium supplements contain vitamin D. The body needs vitamin D to absorb calcium; however, the body can make vitamin D with adequate sunlight exposure. For older adults who do not get much sunlight exposure, a calcium supplement containing vitamin D may be beneficial. For adults who do get sunlight exposure, a calcium supplement containing vitamin D may not be necessary. The DRI for vitamin D is 5 micrograms per day up to 50 years of age. Older adults may be susceptible to low vitamin D levels as a result of be-

ing homebound, use of sunblocks, and decreased capacity to synthesize cholecalciferol, the precursor to vitamin D, in the skin. As a result, the DRI for vitamin D for adults 51 to 70 years of age is 10 micrograms per day. For adults over 70 years of age, the DRI is 15 micrograms per day. It is possible, through food, calcium and multivitamin supplements, to get more than the DRI for vitamin D a day. Too much vitamin D is undesirable because the body stores vitamin D, and it can be toxic. As a result, the tolerable upper intake level or (UL) for vitamin D is set at 50 micrograms per day.

## References

- National Academy of Sciences Food and Nutrition Board. Dietary Reference Intake Tables. <http://www.nas.html>. Accessed 2005.
- Whitney, E.N. & Rolfes, S.R. Understanding Nutrition, 10<sup>th</sup> ed. 2005. Thomson/Wadsworth Publishing Co., Belmont, CA.

## The Oklahoma Cooperative Extension Service

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The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

Some characteristics of the Cooperative Extension system are:

- The federal, state, and local governments cooperatively share in its financial support and program direction.
- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and research-based information.
- It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.
- It utilizes research from university, government, and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.

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