

Nutrition and Health Info Sheet: Calcium

For Health Professionals

Produced by:
Anna Jones, PhD
Sheri Zidenberg-Cherr, PhD
Center for Nutrition in Schools
Department of Nutrition
University of California, Davis
October 2016

What function does calcium have in the body?

Calcium is a mineral used for numerous functions, including building bones and teeth, muscle contraction, blood clotting, maintenance of cell membranes, and nerve transmission.¹ Because most of the calcium in the body is found in the skeleton, calcium's critical function in maintaining bone health receives much attention.

How is vitamin D important in calcium metabolism?

Calcium in the blood is tightly regulated; Vitamin D plays an important role in maintaining calcium homeostasis.² In response to a drop in blood calcium, vitamin D acts in three ways to maintain calcium levels in the blood: increasing absorption of calcium from the gut; increasing reabsorption of calcium by the kidney to limit urinary excretion; and mobilizing calcium from bone.² Low vitamin D levels can result in inadequate calcium absorption from the gut, and over time can negatively impact bone health.

What are the effects of calcium deficiency?

Adequate intake of calcium is essential for maximizing bone density. Therefore, an inadequate intake of calcium can adversely influence bone formation and may contribute to osteoporosis. Osteoporosis is a decrease in bone density and strength that results in increased susceptibility to bone fractures. It is a debilitating disease most commonly found in postmenopausal women; however, men are also at risk for this disease. In the United States, 8 million women and 2 million men are estimated to have osteoporosis.³ Osteoporosis cannot be cured; it can only be prevented or its progression delayed. The best ways to prevent the disease are to build strong bones early in life by eating a well-balanced, calcium-rich diet, and by making weight-bearing exercise a regular routine.



Who is at risk for inadequate calcium intake?

Calcium is considered a nutrient of concern by the Dietary Guidelines for Americans, as it is under consumed by a large proportion of the population.⁴ Calcium consumption is below the Estimated Average Requirement (EAR) for over 40 percent of Americans above the age of 2 years. At elevated risk for inadequate intake are preadolescent and adolescent girls, pregnant women, and women who are middle-aged or older.⁴ Inadequate intake of vitamin D also presents a problem with regards to calcium, due to the importance of vitamin D in calcium absorption. More than 80 percent of Americans over the age of 2 consumed below the EAR for vitamin D. Individuals who are non-Hispanic black are at the greatest risk for vitamin D deficiency.⁴



How much calcium should be consumed each day?

The Dietary Reference Intakes (DRIs) for calcium aim to ensure that individuals will be able to maximize peak adult bone mass, maintain adult bone mass, and minimize bone loss in later years.¹ Table 1 shows the current recommendations for calcium intake.

Table 1. Current recommendations for calcium intake for various age groups^{1,5}

Age Group and Pregnant or Lactating Women	USDA MyPlate Dairy Group Recommendations (per day)	Current Calcium Recommended Daily Allowance	Tolerable Upper Intake Level (per day)
Infants birth to 6 mo 7-12 mo	No recommendation No recommendation	200 mg 260 mg	1,000 mg 1,500 mg
Children 1-3 yr 4-8 yr	2 cups (children 2 and older) 2 ½ cups	700 mg 1000 mg	3,000 mg 3,000 mg
Adolescents 9-13 yr 14-18 yr	3 cups 3 cups	1,300 mg 1,300 mg	2,500 mg 2,500 mg
Adults 19-30 yr 31-50 yr 51-70 yr (Women) 50-70 yr (Men) >70	3 cups 3 cups 3 cups 3 cups 3 cups	1,000 mg 1,000 mg 1,200 mg 1,000 mg 1,200 mg	2,500 mg 2,500 mg 2,000 mg 2,000 mg 2,000 mg
Pregnant women ≤18 yr 19-50 yr	3 cups 3 cups	1,300 mg 1,000 mg	3,000 mg 2,500 mg
Lactating women ≤18 yr 19-50 yr	3 cups 3 cups	1,300 mg 1,000 mg	3,000 mg 2,500 mg

Is it risky to consume too much calcium?

It is difficult to consume too much calcium through food sources. In fact, most people do not consume adequate amounts of this nutrient; however, it is best to obtain calcium through dietary sources and to limit supplements so that the DRIs are not exceeded. The DRI committee also established Tolerable Upper Intake Levels (ULs), listed in table 1. At calcium intakes above the UL, serious side effects may occur, including severe renal damage and abnormal calcium deposition in the body's soft tissue. Some individuals may also develop hypercalcemia (excessive amounts of calcium in the blood) or hypercalciuria (excessive amounts of calcium in the urine).¹ It should be stressed that the UL is not an intake goal; rather, it is recognized to be the maximum intake that the body can safely tolerate. Serious side effects may occur at higher levels. Consuming calcium in excess of the DRI is unnecessary and may interfere with the absorption of essential nutrients, such as iron, and with the efficacy of medications such as tetracycline.

What are good sources of calcium?

Dairy products (milk, cheese, yogurt, etc.) are the most concentrated food sources of calcium (e.g. one cup of milk contains approximately 271 mg of calcium). As shown in Table 2, tofu is the most concentrated source of nondairy calcium. Even individuals who are lactose intolerant are usually able to eat small amounts of dairy products such as yogurt, cheese, and lactase-treated milk, especially when eaten as part of a meal. Those who avoid dairy products due to allergies may select nondairy foods that contain calcium, such as beans, tofu (if processed with calcium sulfate), broccoli, kale, and canned fish with bones. However, it is difficult to absorb the same amount of calcium from these nondairy alternatives as from dairy products because the overall calcium concentrations and bioavailabilities are lower. Calcium-rich foods and calcium-fortified foods are the preferred choices for obtaining calcium because additional nutrients (e.g. vitamin D in milk) can contribute to bone development and the prevention of osteoporosis. Check food labels to find out the percentage of calcium in processed foods. Every 10 percent of calcium listed on the label is equivalent to



Photo by: USDA <https://flic.kr/p/ozPBHg>

approximately 100 mg of calcium. For those who are unable to attain sufficient calcium through their diet, supplements such as calcium citrate or calcium carbonate are recommended.¹

What are some food sources rich in calcium?

Table 2. Calcium-rich food sources ⁶

	Serving size	Calcium (mg)	Calories
Dairy foods			
Milk (2% milk fat)	1 cup	271	122
Cottage cheese (2% milk fat)	1 cup	156	203
Mozzarella cheese (part skim, low moisture)	1 oz	222	72
Cheddar cheese (natural, not processed)	1.5 oz	303	170
Cream cheese (regular, plain)	1 oz	23	99
Yogurt (plain, skim milk)	8 oz	452	127
Nondairy foods			
Tofu (firm, only if processed with calcium sulfate)	1/2 cup	861	183
Sardines (with bones, in oil, drained)	3 oz	324	177
Salmon (pink, with bones, in water, drained)	3 oz	181	118
Orange juice (calcium fortified)	1 cup	253	137
Broccoli (fresh, steamed)	1 cup	88	19
Kale (scotch, fresh, chopped, steamed)	1 cup	172	36

Acknowledgements:

Erin Digitale, PhD, Karrie Heneman, PhD, and Cristy Hathaway contributed to this Fact Sheet.

References:

1. IOM (Institute of Medicine). Dietary Reference Intakes for Calcium and Vitamin D. 2011. Washington, DC: The National Academies Press.
2. Vitamin D. Oregon State University Linus Pauling Institute Micronutrient Information Center. 2014. <http://lpi.oregonstate.edu/mic/vitamins/vitamin-D>. Accessed Sep 16, 2016.
3. Wright NC, Looker A, Saag K, et al. The Recent Prevalence of Osteoporosis and Low Bone Mass Based on Bone Mineral Density at the Femoral Neck or Lumbar Spine in the United States. *J Bone Miner Res*, 2014, 29(1): 2520–2526.
4. US Department of Agriculture and US Department of Health and Human Services. 2015. Scientific Report of the 2015 Dietary Guidelines Advisory Committee. Dietary Guidelines for American Website, <http://health.gov/dietaryguidelines/2015-scientific-report/PDFs/Scientific-Report-of-the-2015-Dietary-Guidelines-Advisory-Committee.pdf>.
5. US Department of Agriculture. ChooseMyPlate.gov Website. Washington, DC. Dairy. <http://www.choosemyplate.gov/dairy>. Accessed Sep 16, 2016.
6. US Department of Agriculture, Agricultural Research Service, Nutrient Data Laboratory. USDA National Nutrient Database for Standard Reference, Release 28. Version Current: September 2015. <https://ndb.nal.usda.gov/ndb/> Accessed Sep 16, 2016.

The University of California prohibits discrimination or harassment of any person on the basis of race, color, national origin, religion, sex, gender identity, pregnancy (including childbirth, and medical conditions related to pregnancy or childbirth), physical or mental disability, medical condition (cancer-related or genetic characteristics), ancestry, marital status, age, sexual orientation, citizenship, or service in the uniformed services (as defined by the Uniformed

Services Employment and Reemployment Rights Act of 1994: service in the uniformed services includes membership, application for membership, performance of service, application for service, or obligation for service in the uniformed services) in any of its programs or activities.

University policy also prohibits reprisal or retaliation against any person in any of its programs or activities for making a complaint of discrimination or sexual harassment or for using or participating in the investigation or resolution process of any such complaint.

University policy is intended to be consistent with the provisions of applicable State and Federal laws.

Inquiries regarding the University's nondiscrimination policies may be directed to the Affirmative Action/Equal Opportunity Director, University of California, Agriculture and Natural Resources, 1111 Franklin Street, 6th Floor, Oakland, CA 94607, (510) 987-0096.

Copyright © The Regents of the University of California, Davis campus, 2016. All rights reserved. Inquiries regarding this publication may be directed to cns@ucdavis.edu. The information provided in this publication is intended for general consumer understanding, and is not intended to be used for medical diagnosis or treatment, or to substitute for professional medical advice.