

THE DAIRY ADVANTAGE

Foods naturally containing calcium, in particular foods from the Milk Group, are the preferred source of calcium (1,2,3,4,5,6,7,8,9,10). As stated by the U.S. Department of Health and Human Services' Healthy People 2010, "with current food selection practices, use of dairy foods may constitute the difference between getting enough calcium in one's diet or not" (11). The Surgeon General, in the first-ever report on Bone Health and Osteoporosis (4), notes that "approximately three 8-ounce glasses of low-fat milk each day, combined with the calcium from the rest of a normal diet, is enough to meet the recommended daily requirements for most individuals." In addition to foods naturally containing calcium, other sources of calcium include calcium-fortified foods and supplements.

Milk and milk products are the preferred source of calcium because of their high content of calcium and frequent intake (12). Other foods such as salmon with bones, some legumes, and some green, leafy vegetables are also good sources of calcium, but these foods generally contain less calcium per serving than milk and milk products (12). Therefore, larger servings of many nondairy foods may be needed to equal the calcium content of a typical serving of milk or other dairy foods. Check the Nutrition Facts panel on food labels to determine how much calcium a product contains (Figure 1).

In addition to the content of calcium in foods, the amount of calcium absorbed from foods varies (13). The bioavailability of calcium ranges from a low of approximately 5% in spinach to more than 50% in some vegetables such as bok choy and broccoli (13). One would need to consume 8 cups of spinach, nearly 5 cups of red beans, or 2 1/4 cups of broccoli to obtain the same amount of calcium absorbed from one 8-ounce glass of milk (13). It would be impractical for most people to eat enough vegetables or other low calcium foods to meet recommended calcium intakes if these foods were the only sources of calcium in the diet (4).

For many Americans, milk and milk products are the major dietary source of calcium (14,15). According to data from USDA's Continuing Survey of Food Intakes 1994-96, 1998, dairy foods contributed about half of the dietary calcium for the total population and more than 60% for people under 19 years of age (15). When food sources of calcium among U.S. adults were examined, milk and cheese were

identified as the top sources (15). In addition to calcium, milk and milk products provide other essential nutrients important for health, such as protein, phosphorus, potassium, riboflavin, vitamin A, vitamin B₁₂, magnesium, and zinc (12). Vitamin D-fortified milk is an important source of vitamin D for many people. This nutrient increases calcium absorption (3). Few foods other than vitamin D-fortified milk provide vitamin D. While optional, nearly all fluid milk marketed in the U.S. is fortified with vitamin D to obtain the standardized amount of 400 IU (10 ug) per quart of milk (3).

Because milk and milk products are good sources of many nutrients, their intake improves the overall nutritional adequacy of the diet (6,14,16,17,18,19,20,21,22,23). Diets low in calcium are commonly low in other essential nutrients as well, reflecting poor dietary patterns. Choosing supplements over food may negatively impact health. A clinical study found that women who consumed fat free milk significantly improved their intake of calcium and other key nutrients including protein, magnesium, thiamin, riboflavin, and zinc. Supplement users only increased their intake of calcium and sodium (18). Studies in children demonstrate that intake of milk, including flavored milk, increases their overall nutrient intake (20,21,22,23,24). Moreover, intake of dairy foods improves the nutritional quality of the diet without significantly increasing total calorie or fat intake, body weight, or percent body fat (14,16,18,19,23).

Individuals can increase their calcium intake to recommended amounts by consuming foods such as milk and milk products without necessarily increasing their body weight, percent body fat, or calorie or fat intake (14,19,21,22,23,25).

FIGURE 1. NUTRITION FACTS LABEL

| Nutrition Facts | |
|----------------------------------|---------------------|
| Serving Size 1 cup (236ml) | |
| Servings Per Container 1 | |
| Amount Per Serving | |
| Calories 80 | Calories from Fat 0 |
| % Daily Value* | |
| Total Fat 0g | 0% |
| Saturated Fat 0g | 0% |
| Trans Fat 0g | |
| Cholesterol Less than 5mg | 0% |
| Sodium 120mg | 5% |
| Total Carbohydrate 11g | 4% |
| Dietary Fiber 0g | 0% |
| Sugars 11g | |
| Protein 9g | 17% |
| Vitamin A | 10% |
| Vitamin C | 4% |
| Vitamin D | 25% |
| Calcium | 30% |
| Iron | 0% |

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

In addition to protein, vitamins, and minerals, milk and milk products contain other less well-known components that have potential health benefits. These include bacterial cultures (*Lactobacillus acidophilus*) in fermented milk products such as yogurt, and conjugated linoleic acid (CLA) and sphingolipids, both present in milkfat (26,27).

Lactic acid bacteria have been shown to reduce or improve certain gastrointestinal conditions such as lactose intolerance, constipation, diarrheal diseases, and colon cancer (26). CLA has been shown to inhibit the development of tumors, reduce or prevent adiposity, improve insulin resistance, enhance bone formation and immune function, and reduce the risk of heart disease in experimental animal, *in vitro*, and limited human investigations (27,28,29,30). The CLA isomer that predominates in milk products (cis 9, trans 11) has specifically demonstrated benefits in combatting cancer and heart disease. Sphingolipids, present in milkfat, reduce chemically induced colon tumors in mice and may have other important roles in health (31,32). Like CLA, further research is necessary to determine whether sphingolipids benefit human health.

USDA's new food guidance system illustrates the nutrient-dense foods your clients should be getting each day. Download these educational tools to help your clients eat according to the new guidelines [Dietary Guidelines Meal Plan](#) and incorporate the recommended number of dairy foods [Super Foods Checklist Improve Diet Quality with Dairy](#).

CALCIUM-FORTIFIED FOODS

Calcium-fortified foods such as juices, fruit drinks, breads, cereals, snack foods, and bottled water are another source of calcium (6). In many cases, these foods are fortified with the same amount of calcium found in an eight-ounce serving of milk (300 mg of calcium). Yet, fortified non-dairy foods are not nutritionally equivalent to dairy (Figure 2).

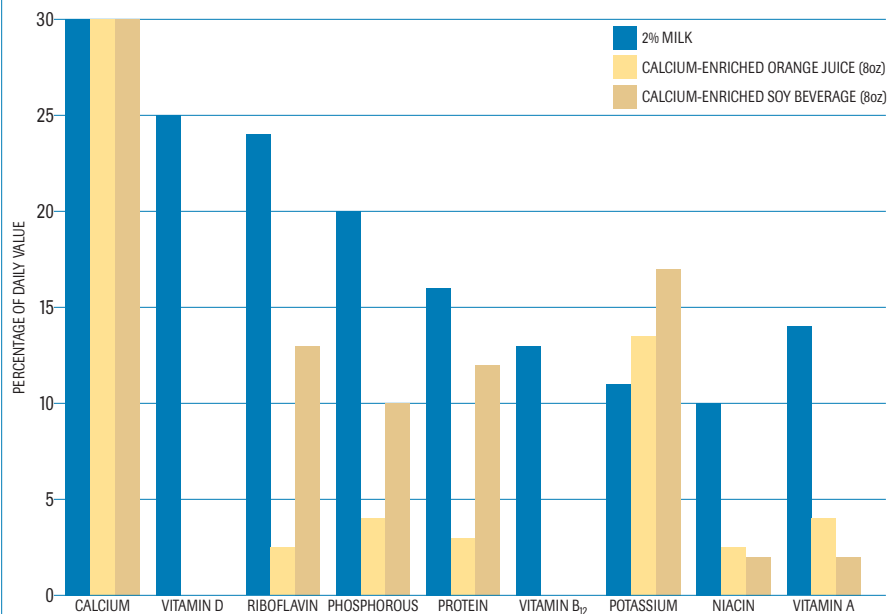
Questions regarding calcium-fortified foods and fortified foods in general center on their potential for nutrient toxicity, imbalances, and reduced bioavailability (6,33,34,35). A study in healthy adults found that the amount of calcium absorbed from a calcium fortified soy beverage was, on average, 25% less than that absorbed from cow's milk (36). A study that used a physical analysis and scoring system to evaluate the efficacy of the calcium fortification system of 4 calcium-fortified rice and soy beverages and 10 different calcium-fortified orange juices, found a wide variability of fortification scores among beverages (37). Milk had the highest score, so was rated the most reliable source, while the soy beverages and 2 or 3 of the orange juices were in the bottom tier. Further, some people may be misled into believing that intake of a fortified food ensures a nutritionally

adequate diet. Poor food choices, not the unavailability of calcium in the food supply, lead to low calcium intakes. While calcium-fortified juices or breads may contain the same amount of calcium as milk, these foods are not nutritionally comparable (6). The U.S. Food and Drug Administration (FDA) cautions against random fortification of foods because of the potential for individuals to over-consume nutrients and for nutrient imbalances in the food supply (38). To meet calcium needs, a change in dietary habits, including increased consumption of calcium-rich foods such as milk and milk products, is needed.

CALCIUM SUPPLEMENTS

Calcium supplements may be necessary and appropriate for certain individuals who cannot meet their calcium requirements through food alone (1,3,4,5). These include individuals with milk allergies and vegetarians who avoid all animal products (vegans). Children with cow's milk allergy or multiple food allergies have been shown to have lower calcium intakes than those without these allergies (39). The calcium status of lactovegetarians who include foods from the Milk Group in their diets is similar to that of omnivores (13,40). In contrast, vegans may be at risk of

FIGURE 2. MILK VS. FORTIFIED PRODUCTS



USDA National Nutrient Database for Standard Reference, Release 18.

calcium deficiency because they exclude food from the Milk Group from their diets and often consume plant sources of calcium with lower calcium bioavailability, such as spinach or dried beans (13,40). Calcium supplements therefore may be necessary to help strict vegetarians meet their calcium needs (40).

Recommendations to use calcium supplements should be limited to individuals identified to be at nutritional risk, and who, for whatever reason, are unable to consume sufficient quantities of milk and milk products and other calcium-rich foods.

Ideally, intake of calcium supplements should be supervised by a health professional, especially considering the potential adverse effects of calcium supplementation (3,6,33).

SIDE EFFECTS OF CALCIUM SUPPLEMENTS

Constipation, intestinal bloating, and excess gas, as well as reduced bioavailability of some nutrients are among potential adverse side effects of certain calcium supplements, especially if consumed in high amounts (>1-2 g/day) (1,6). Although calcium can interact with minerals such as iron and zinc, excess intake of calcium does not contribute to deficiencies of these minerals in humans, especially over the long-term and when needs for iron and zinc are met (3,6). Nevertheless, calcium supplements should be ingested no less than 4 hours before or after taking iron (4). Increasing calcium intake from calcium supplements in the absence of an otherwise healthful diet may lead to nutrient imbalances (e.g., phosphorus deficiency), which potentially could be detrimental to bones (41).

The long-term effect of specific calcium supplements, especially antacids, on the absorption of nutrients, including calcium, is unknown. Taking calcium carbonate with meals improves calcium absorption. This is especially true for individuals with decreased gastric acid production. Other supplements, such as calcium citrate, which is readily absorbed regardless of stomach acid, need not be taken with meals (42). Intake of calcium supplements may interfere with the absorption of medications such as aspirin, bisphosphonates (used to treat osteoporosis) and antibiotics (42).

Detectable levels of lead have been found in some calcium supplements, particularly those from natural sources (43). However, calcium supplements make only a small contribution to total lead intake (44). In addition, the presence of calcium reduces lead absorption (44). In recent years, the supplement industry has taken steps to reduce the lead content of calcium supplements. When the independent testing firm, ConsumerLab, tested 15 calcium products, two failed, one because of its lead content (45). Patients should be encouraged to check supplement labels to ensure that their calcium supplement meets United States Pharmacopoeia (USP) standards for lead (4).

Although many calcium supplement users may not consume higher than recommended levels of calcium, the potential for toxicity is a concern. Calcium intakes up to 2,500 mg/day appear to be safe for most individuals (3). It is unlikely that an individual would take in this amount of calcium from foods, unless several servings of calcium-fortified foods are consumed. However, overuse of calcium-fortified foods, calcium supplements, or antacids containing calcium may increase risk of calcium toxicity, characterized by high blood levels of calcium, kidney damage, and calcification of soft tissues (1,3,33,35).

For certain individuals who cannot meet all of their calcium needs from foods, a calcium supplement can help close the gap between actual and optimal calcium intakes (4). However, the choice of a calcium preparation is an important consideration. Individuals who need calcium supplements should choose one that contains a relatively high percentage of elemental calcium by weight, disintegrates readily, provides a form of calcium that is bioavailable, inexpensive, manufactured by a reputable pharmaceutical company, and free of toxicants. In general, absorption of calcium is most efficient when consumed in doses of 500 mg or less (4). Intake of calcium supplements with vitamin D should be considered for those with low vitamin D status — but total intake of vitamin D should not exceed the Tolerable Upper Intake level of 50 micrograms per day (3).

Calcium supplements should be regarded as a supplement to, not a substitute for, a nutritionally adequate diet. Individuals should talk to their physician and/or a registered dietitian to help them determine how much calcium they currently consume, whether a calcium supplement is needed, and if so, the best type for them to use. The best nutritional strategy to meet calcium needs is from food first, such as by consuming 3 servings of milk, cheese, or yogurt, as recommended in the 2005 Dietary Guidelines (6,46).

MEETING CALCIUM NEEDS

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