



Dairy foods supply key nutrients that can help Americans achieve peak bone mass

Overview

Low-fat and fat-free dairy foods such as milk, cheese and yogurt are part of current Dietary Guidelines for Americans (DGA) and American Academy of Pediatrics (AAP) recommendations for children and adolescents. Milk contains calcium and vitamin D, essential nutrients for bone growth and development. These essential nutrients, and others found in dairy foods, can be an important factor in helping to achieve peak bone mass. Reaching peak bone mass is associated with reduced risk osteoporosis later in life. Research continues to support the current DGA recommendations to consume three servings of low-fat or fat-free dairy foods for children and adolescents ages 9 years and older as part of a nutrient-rich diet, along with adequate physical activity, to help achieve peak bone mass.

Healthy eating patterns including dairy foods support bone health in children

Many nutrients work together to support growth and maintenance of bone, including calcium, vitamin D, and phosphorus (1-4). Consuming adequate amounts of bone-building nutrients is especially important during childhood and adolescence (1, 4-7). Milk is the main food source of calcium, vitamin D, phosphorus and protein in the diets of children (8), reinforcing the role of milk and milk products as an integral part of healthy eating patterns for growing children and adolescents (5, 7, 8). Research supports developing peak bone mass by young adulthood, via good nutrition and physical activity, as one strategy to optimize bone health and help reduce the risk of bone diseases later in life (7).

Childhood and adolescence are important time periods to optimize bone health via nutrition

Bone is a living and dynamic tissue composed mainly of a calcium-phosphate mineral complex, protein and bone cells (10). During childhood, bones are growing in length, breadth and mass (1), and about 40-60 percent of adult skeletal bone mass is acquired during adolescence (7). Ninety percent of bone mass accrues by the age of 18 years (11), and even when bones stop growing in length, they can continue to gain mass and strength (1, 7).

Much nutrition research on bone health over the past three decades has focused on the role of calcium and vitamin D in bone growth and maintenance (2, 7, 13-19), but other nutrients play important roles. Because calcium is a primary component of the skeleton, bone growth during childhood determines much of the daily calcium requirement (2). Vitamin D helps the body maintain adequate calcium levels by modifying calcium absorption, which is especially important during times of low calcium intakes (2). Phosphorus helps build and maintain the calcium-phosphate bone matrix (3) and protein provides structure and flexibility to bones (10). While there has been speculation that dietary animal protein interferes with the body's ability to retain calcium, research indicates that dietary protein works together with calcium to improve calcium retention and bone metabolism, thus this perception is unfounded in healthy individuals (20, 21).

Once thought to be an inevitable part of aging, osteoporosis is now considered to have its roots in childhood... In fact, bone mass attained in early life is thought to be the most important modifiable determinant of lifelong skeletal health (7).

Achieving peak bone mass is key strategy to help lower risk of bone disease later in life

Osteoporosis, or low bone density, affects about 54 million Americans, particularly women over 50 years of age. It is characterized by bone fragility and fracture, which is linked to increased mortality (9). Maximizing peak bone mass by young adulthood is one strategy recommended to help reduce the risk of bone diseases like osteoporosis later in life (4-6). The AAP points out that “bone mass attained in early life is thought to be the most important modifiable determinant of lifelong skeletal health.” (7). After peak bone mass has been achieved, a slow but progressive decline in bone mass occurs, and interfering with achieving optimal peak bone mass can lead to increased fracture risk as an adult (7). Lifestyle behaviors shown to improve skeletal health and support achieving peak bone mass include consuming a healthy dietary pattern, including at least three daily servings of low-fat or fat-free dairy foods for those 9-18 years old, and getting regular physical activity, including high-impact and weight-bearing exercise (7).

Authoritative reports recommend dairy foods and dairy nutrients for bone health

The Institute of Medicine (IOM), based on the substantial body of evidence linking adequate calcium intake and vitamin D status to higher bone mass, mineral density and content, published the 2011 expert report *Dietary Reference Intakes for Calcium and Vitamin D* (2). They recommend 700-1,300 mg calcium/day and 600 IU vitamin D/day for children ages 1-18 years, and recommend obtaining these nutrients from dietary sources (2).

In 2010, the DGA stated that “Moderate evidence indicates that intake of milk and milk products is associated with bone health, especially in children and adolescents” (5). The 2010 DGA also modified the dairy recommendations to meet the IOM’s new calcium recommendations, and recommends three daily servings of low-fat or fat-free dairy foods for children and adolescents ages 9-18 years, 2½ servings for children 4-8 years and two for children 2-3 years (5). The AAP, in its 2014 clinical report on optimizing bone health, recommends pediatricians “Encourage increased dietary intake of calcium- and vitamin D-containing foods and beverages” and “Children 4 through 8 years of age require 2-3 servings of dairy products or equivalent per day. Adolescents require 4 servings per day.” (7).

The American Academy of Pediatrics’ clinical report states, “Dairy products constitute the major source of dietary calcium... Children 4 through 8 years of age require 2 to 3 servings of dairy products or equivalent per day. Adolescents require 4 servings per day” (7).

More recently, the 2015 Dietary Guidelines Advisory Committee (DGAC) report identified calcium, vitamin D and phosphorus as “the most critical nutrients for healthy bone” (12). The report noted that dairy foods can be difficult to replace with other calcium-containing foods and beverages because they are not nutritionally equivalent substitutes. The 2015 DGAC also assessed the association between dietary patterns and bone health in 13 studies published since 2000 (12). The DGAC took a different approach than the 2010 DGAC, and focused on dietary patterns, not food groups. They concluded that “Although there is strong evidence on the roles of vitamin D and calcium in bone health across the age spectrum, further research is needed on dietary patterns that are most beneficial” (12). The 2015 DGAC recommended three servings of low-fat or fat-free dairy foods for those 9 and older in the Healthy US-Style and Healthy Vegetarian patterns (12).

Most Americans are not meeting current DGA dairy food recommendations

Calcium, vitamin D and phosphorus are recognized as the most critical nutrients for bone health (12), and milk is the No. 1 food source of calcium, vitamin D, phosphorus, protein and other nutrients in the diets of children (8). Though very young children achieve recommended dairy intakes, by the time they reach school age, consumption falls short of current recommendations (12). The 2010 DGA and the 2015 DGAC identified calcium and vitamin D as nutrients of public health concern due to under-consumption by Americans, including school-aged children and adolescents (5, 12). While most Americans 2 years and older consume adequate phosphorus, just over half of adolescent girls 14-18 years of age were not meeting the Estimated Average Requirement in 2005-2006 (22).

SCIENCE SUMMARY: Peak Bone Mass

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