

# Science Summary

## Dairy and Bone Health



### Overview

Daily consumption of dairy foods like milk, cheese and yogurt is part of the Dietary Guidelines for Americans (DGA) recommendations for children, adolescents and adults. Research indicates that dairy foods are integral dietary components for building and maintaining healthy bones throughout the lifespan, from early childhood to late adulthood. Dairy foods contain

nutrients essential for bone growth and development, including calcium, vitamin D, phosphorus, potassium and magnesium. Consuming adequate amounts of dairy foods daily helps ensure that children and adolescents achieve peak bone mass, which is associated with reduced risk for osteoporosis later in life. Consuming dairy foods throughout adulthood, including older adulthood, can help ensure the maintenance of healthy bones and is linked with reduced fracture risk. Research published since 2015, highlighted below, provides further support for the 2020 DGA recommendations that all Americans ages 9 and older consume three servings of low-fat or fat-free dairy foods as part of the Healthy U.S.-Style Dietary Pattern, accompanied by adequate physical activity, to support bone health.

### Leading health organizations recommend eating dairy foods daily to achieve peak bone mass

Developing peak bone mass by young adulthood with good nutrition, including adequate calcium and vitamin D intake, and physical activity is one strategy to optimize bone health and reduce the risk of bone diseases later in life.<sup>1,2</sup> The importance of consuming dairy foods as part of healthy dietary patterns to achieve peak bone mineral density in childhood and adolescence has been recognized by numerous health professional organizations as well as the 2020 DGA.<sup>3</sup> The Healthy U.S.-Style Dietary Pattern in the 2020 DGA recommends 3 daily servings of low-fat or fat-free dairy foods for those 9 years and older, 2½ servings for children 4-8 years and 2 servings for children 2-3 years.<sup>3</sup> It also recommends 1½ to 2 servings of whole- and reduced-fat dairy foods for toddlers 12-23 months and small amounts of yogurt and cheese for infants 6 to 12 months, depending on developmental readiness.<sup>3</sup> Milk is the top food source of important nutrients for bone health, including calcium, vitamin D and potassium, among Americans 2 years and older.<sup>4-6</sup> The National Institutes of Health (NIH) stress the importance of calcium for bone development and highlight that consuming the recommended 3 servings of dairy foods per day during childhood and adolescence can help meet calcium requirements.<sup>7</sup> The American Academy of Pediatrics (AAP) recommends that pediatricians “encourage increased dietary intake of calcium- and vitamin D-containing foods and beverages,” such as dairy products.<sup>2</sup> Like the 2020 DGA, the AAP recommends that children 4 to 8 years consume “2 to 3 servings of dairy products” or calcium-equivalent foods daily and that adolescents consume 4 servings per day of dairy or calcium-equivalent foods.<sup>2</sup>

## Consuming dairy foods is linked with improved bone mineral density in children and adolescents

Three systematic reviews<sup>1,8,9</sup> and a clinical trial<sup>10</sup> demonstrate the importance of consuming dairy foods for children and adolescents to achieve peak bone mass. One systematic review indicated that consuming dairy foods was linked with greater bone mineral content during childhood in 6 of the 7 trials it reviewed.<sup>9</sup> Similarly, a second systematic review showed that, in 8 of 11 randomized controlled trials, consuming dairy foods was associated with greater bone mineral content and density in children and adolescents.<sup>8</sup> A 2016 systematic review and position statement from the National Osteoporosis Foundation (NOF) also indicated a beneficial role of dairy foods for bone mineral density from childhood through late adolescence.<sup>1</sup> After the authors of the NOF review assessed over 150 studies on lifestyle factors related to peak bone mass in children, adolescents and young adults, they determined that the links between calcium and bone health and between physical activity and bone mass and density were supported by the strongest evidence (“grade A”). Good evidence, “grade B,” supported the links between dairy intake and bone health, vitamin D intake and bone health and physical activity and bone structure.<sup>1</sup>

A clinical trial assessed the impact of consuming an additional 3 servings of dairy foods daily (in addition to usual dairy food intake) on bone mass accrual, comparing it to usual intakes of dairy foods in boys and girls from 8 to 16 years of age.<sup>10</sup> The only difference between the two groups is that the group consuming additional servings of dairy foods had greater gains in bone mineral content of the tibia.<sup>11</sup> This study reinforces the importance of adequate calcium intake for bone health in childhood and adolescence.

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## Consuming dairy foods is linked to better bone mineral density and bone mass maintenance in adults

Research indicates that consuming dairy foods helps maintain bone mass throughout adulthood and is associated with reduced fracture risk and greater bone mineral density. Results of four systematic reviews indicate the importance of meeting dairy recommendations to help maintain bone mineral density in adulthood.<sup>12-15</sup> Among women, low milk intake during adolescence was associated with a 1.7% to 3% lower hip bone mineral density in adulthood.<sup>12</sup> Two reviews found that eating yogurt was linked to better bone health.<sup>13,14</sup> In one of these reviews, higher yogurt intake (compared with low or no intake) was linked with reduced risk of hip fracture, and eating cheese daily was linked with higher bone mineral density.<sup>13</sup> A meta-analysis found that eating dairy foods increased bone mineral density in women, concluding that “dairy product consumption should be considered an effective public health measure to prevent osteoporosis in postmenopausal women.”<sup>15</sup>

Evidence from prospective cohort studies and clinical trials indicates that consuming dairy foods does not negatively impact bone health outcomes and may be linked to improved bone health. According to one prospective cohort study, higher intakes of milk, milk and yogurt, and milk, yogurt and cheese were linked to greater bone mineral density in men.<sup>16</sup> Similarly, a study that assessed bone health in 1,955 women across the menopausal transition found that dairy food intake was not linked with loss of bone mineral density or fracture risk.<sup>17</sup> Dairy food intake was low overall among study participants, with 65% consuming less than 1.5 servings of dairy foods per day. Another prospective study found that consuming dairy foods was not linked with bone mineral density over a 4 year period.<sup>18</sup> Results of two clinical trials indicate that eating yogurt may benefit bone mineral density in older adults<sup>19</sup> and may benefit bone turnover and bone metabolism in young adult males when paired with regular physical activity.<sup>20</sup> In a third clinical trial, eating dairy foods and taking calcium and vitamin D supplements led to greater bone calcium retention in postmenopausal women.<sup>21</sup>

## Dairy foods may help maintain bone mineral density with weight loss

Obesity affects nearly 42% of U.S. adults.<sup>22</sup> However, treating obesity with weight loss can decrease bone mineral density, especially in women.<sup>23</sup> Emerging evidence indicates that consuming dairy foods as part of a healthy dietary pattern in weight-reduction programs may help maintain bone health. In one clinical trial, post-menopausal women participating in a weight loss study consumed either 4-5 servings of low-fat dairy foods per day or calcium and vitamin D supplements. Participants consuming dairy foods had better bone health outcomes than those in the control group.<sup>24</sup> A second trial of 35 adolescent girls with overweight or obesity found that the 19 girls assigned to consume 4 servings of dairy foods per day had better bone health markers (decreased bone resorption) than the 16 girls assigned to consume less than 2 servings of dairy foods daily.<sup>25</sup>

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