EXECUTIVE SUMMARY

Calcium, vitamin D and protein are required for healthy bone growth and maintenance, and dairy foods are important sources of these nutrients. Though a large body of evidence supports the beneficial effects of calcium and vitamin D to help prevent bone loss and osteoporosis, studies of dairy foods and bone, per se, in adults have provided inconsistent results, possibly due to variable study designs. Evidence published since the release of the 2010 Dietary Guidelines for Americans (DGA) indicates that consuming adequate amounts of dairy foods, calcium and vitamin D can improve bone mass, markers of bone metabolism or both in adults, especially women. Clinical trials examining higher levels of dairy foods (3 servings or more per day) to lower levels (1 serving or less per day) provide the most reliable evidence for dairy’s effects on bone health. The current body of research reinforces the importance of meeting the DGA recommendations of 3 servings of low-fat or fat-free dairy foods (e.g., milk, cheese or yogurt) each day for Americans ages 9 years and older.

OSTEOPOROSIS HAS HIGH PUBLIC HEALTH COSTS

Declining bone health and osteoporosis are major public health concerns. Roughly 44 million Americans (55% of people 50 years and older) have osteoporosis or are at high risk for developing this condition, with higher incidence in women and as age increases.1 Osteoporosis and the subsequent risk of fractures contribute to a significant economic and disease-related burden. Bone mass increases throughout childhood and adolescence and peaks by the third decade of life. In women, who are at most risk for osteoporosis, bone mass begins to rapidly decline in the first few years after menopause and then slows during the postmenopausal years. Maximizing bone mass is important because its maintenance may slow the development of osteoporosis commonly associated with age. Genetics have a significant effect on peak bone mass, although lifestyle and behavioral factors such as nutrition and exercise also have an impact on bone growth and preservation.1

ACCUMULATING EVIDENCE SUPPORTS A BENEFICIAL EFFECT OF DAIRY FOODS ON BONE HEALTH IN ADULTS

The DGA found a link between dairy food consumption and bone health in children and states “…intake of milk and milk products is linked to improved bone health, especially in children and adolescents…”2 For adults, however, the 2010 Dietary Guidelines Advisory Committee concluded that research results were “…inconsistent due to variability in outcomes considered.”3 Dairy foods are the main food source of calcium and vitamin D,4 and without consuming dairy foods, it is difficult to obtain the recommended amounts of calcium, potassium, magnesium and other nutrients.5,6 The same year the DGA was released, the 2010 Dietary Reference Intakes report on calcium and vitamin D made recommendations for all age and gender groups based primarily on bone health outcomes.7 Well-controlled clinical studies are needed to better link nutrient intake, dairy food consumption and bone health in a meaningful
way. Since 2010, new research* on this topic has explored the effects of dairy food consumption via eight clinical trials8-15 and two prospective cohort studies.16-17** Findings indicate an overall benefit of adequate dairy consumption for bone health in adults, providing further support for consuming 3 daily servings of low-fat or fat-free dairy foods (e.g., milk, cheese or yogurt) by Americans 9 years and older.

**TRIALS SHOW DAIRY FOODS IMPROVE BONE MASS AND BONE METABOLISM IN PREMENOPAUSAL WOMEN**

Three studies, using very different study designs, examined dairy food effects on bone in premenopausal women. One study compared the effects of four cups fat-free milk to four cups of a carbohydrate drink consumed five days per week combined with resistance exercise. Among the milk-drinking group, dietary calcium intake and serum vitamin D increased, and markers of bone metabolism indicated a possible reduction in bone turnover.8 In a study conducted in Iran, adding two glasses of milk (600 mg/day of calcium) per day to the regular diet, three days a week for two months improved hip and spine bone mineral density (BMD).9 However, another study found no change in bone mineral content and density between groups consuming < 700 mg calcium per day in their regular diet compared to 1,300 mg calcium per day, either from dairy or dairy plus supplements, for 21 weeks.10

**TRIALS SHOW DAIRY FOODS IMPROVE BONE MASS AND BONE METABOLISM IN POSTMENOPAUSAL WOMEN**

The Postmenopausal Health Study tested the effect of 3 daily servings of vitamin D fortified low-fat milk and yogurt on bone metabolism and BMD among women 55–65 years old. Adequate dairy food consumption led to increased calcium, vitamin D, magnesium and phosphorus intakes, and improved BMD in arms, total spine and total body and favorable changes to total body BMD and markers of bone metabolism, indicating reduced bone remodeling.12

*Dairy food nutrients such as calcium, vitamin D and protein contribute to the beneficial effects of dairy foods on bone health.7

**TRIALS SHOW DAIRY FOODS IMPROVE BONE MASS AND BONE METABOLISM DURING WEIGHT LOSS**

Three studies among women measured the effect of dairy intake on bone metabolism markers and BMD during weight loss, a time when bone can be lost. Though study designs varied, all compared consumption of higher daily amounts of dairy foods (3 or more servings or diets providing at least 1,200 mg of calcium per day) compared to lower amounts (<1 serving or diets providing < 500 mg calcium per day). In one study, higher dairy consumption improved lumbar spine BMD.13 In another study, women in the higher dairy groups (>3 servings per day or 6–7 servings per day) had improved bone metabolism markers, but no change in BMD.14 Another study tested the effect of dairy foods on bone during a 24-week weight maintenance phase, following 12 weeks of weight loss, and found no change in BMD during either phase.15

**PROSPECTIVE COHORT STUDIES FIND BENEFIT OF DAIRY CONSUMPTION ON BONE HEALTH PARAMETERS**

In a prospective cohort study conducted in Poland among 625 postmenopausal women, a positive correlation was found between calcium intake from dairy foods and BMD, whereas low dairy calcium intake was associated with previous bone fractures.16 In a 12-year follow-up of the Framingham Offspring Study, associations among various dairy foods and BMD and hip fracture risk, most dairy food consumption was associated with higher BMD at the hip and spine, while milk and fluid dairy consumption was associated with higher BMD at the hip but not the spine.17

For more information and references for this report visit: www.NationalDairyCouncil.org/Research/ResearchSummaries