



## THE BENEFITS OF DAIRY FOODS IN HEALTH PROMOTION

### SUMMARY

Small dietary changes, such as increasing dairy food intake, can improve the nutritional quality of the diet and play a beneficial role in health promotion and disease prevention. According to a recent analysis, consuming 3 to 4 servings of milk, cheese, or yogurt a day contributes to a healthier population and substantial healthcare cost savings.

A large body of scientific research collected in recent decades demonstrates that an adequate intake of nutrients (e.g., calcium) from dairy foods such as milk, cheese, or yogurt positively affects bone health by increasing bone acquisition during growth, slowing age-related bone loss, and reducing osteoporotic fragility fractures. Based on this research and recognition of Americans' low intake of dairy foods and calcium, the dairy industry, with support from health professional partners, has initiated a nutrition-based marketing and educational campaign called "3-A-Day of Dairy for Stronger Bones" ([www.3aday.org](http://www.3aday.org)). The key message is to consume three or more daily servings of milk, cheese, or yogurt to help build and maintain strong bones and achieve overall health.

Two major studies – the Dietary Approaches to Stop Hypertension (DASH) and the Coronary Artery Risk Development in Young Adults (CARDIA) – show that dairy foods are important components of diets associated with improved health outcomes. The DASH diet – a lowfat, calcium-rich diet that emphasizes lowfat dairy foods (2 to 3 servings/day), fruits (4-5 servings/day), vegetables (4-5 servings/day), grains, and lean meat – has been shown to substantially and quickly reduce blood pressure in persons with high-normal blood pressure. Consuming the DASH diet also reduces

other heart disease risk factors such as blood total and low density lipoprotein (LDL) cholesterol and homocysteine levels. In addition, intake of this diet reduces the risk of stroke and osteoporosis.

Among overweight participants in the CARDIA study (a prospective investigation involving more than 3,000 young adults followed for 10 years), greater intake of dairy products was associated with a lower incidence of insulin resistance syndrome and its components (i.e., obesity, glucose intolerance, hypertension, and dyslipidemia). Each additional serving of dairy products was associated with a 21% lower likelihood of insulin resistance syndrome.

In addition to the above, numerous other investigations support dairy foods' beneficial role in reducing the risk of medical disorders, including hypertension, obesity, insulin resistance and type 2 diabetes, heart disease and stroke, some cancers (colon, breast), and dental caries.

Consuming 3 to 4 servings of dairy foods each day as part of a healthful diet could lead to healthcare cost savings of \$26 billion in the first year and more than \$200 billion over 5 years, according to a recent analysis. Using data from randomized controlled trials and prospective longitudinal studies, researchers evaluated the effects of increasing dairy food intake to optimal levels, mainly through dairy foods, on nine common medical disorders. Estimated improvements in outcomes were combined with data on yearly costs of the medical disorders. Based on the findings, the researchers concluded that consuming 3 to 4 servings of dairy foods a day contributes to improved health outcomes, which may substantially reduce the nation's escalating healthcare costs. **D**

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## INTRODUCTION

Dairy foods are nutrient dense foods providing a high concentration of many essential nutrients relative to their energy value (1,2). These foods are recognized as a synergistic mixture of multiple interacting nutrients and other bioactive components (3). The health benefits of dairy foods are therefore best evaluated when these foods are studied in relatively complete forms such as milk, cheese, or yogurt.

Accumulating scientific findings support a beneficial role for dairy foods in health promotion and disease prevention (4). Major studies show that dairy foods are important components of diets associated with improved health outcomes (5,6). A new analysis of research conducted over the past several decades finds that including 3 to 4 servings of dairy foods per day as part of a healthful diet could lead to significant decreases in risk for various medical disorders and estimated healthcare cost savings of more than \$200 billion over five years (7).

This *Digest* reviews recent research indicating that intake of dairy foods helps to reduce the risk for major disorders such as osteoporosis, hypertension, obesity, insulin resistance and type 2 diabetes, heart disease and stroke, some cancers (i.e., colon, breast), and dental caries. Also discussed is the estimated healthcare cost savings associated with optimal dairy food intake.

## DAIRY FOODS' ROLE IN REDUCING THE RISK FOR VARIOUS MEDICAL DISORDERS

**Osteoporosis.** A large body of scientific evidence demonstrates that adequate intake of calcium and calcium-rich foods such as milk, cheese, or yogurt positively affects bone health by increasing bone acquisition during growth, slowing age-related bone loss, and reducing osteoporotic fragility fractures (4,8-11). Osteoporosis is a skeletal disease in which bones weaken and risk of fractures increases (9). Bone mass in later adult years is primarily influenced by peak bone mass, about 90% of which is reached by 20 years of age (10).




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*Dairy products such as milk, cheese, and yogurt are naturally nutrient-rich foods with unique health benefits.*

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According to the recent National Institute of Health (NIH) Consensus Statement on Osteoporosis (9), "calcium is the specific nutrient most important for attaining peak bone mass and for preventing and treating osteoporosis." This statement is supported by findings from an analysis of 139 studies published between 1975 and 1999 describing the relationship of calcium intake and bone health in children and adults (11). In this analysis, all but two of 52 randomized intervention studies demonstrated that calcium intake increased bone gain during growth and reduced bone loss and/or fractures in later adult years (11). Three-quarters of the 86 observational studies supported calcium's beneficial effect on bone health. All of the studies that used dairy foods as a source of calcium reported a positive link between dairy foods and bone health (11).

In addition to calcium, milk and other dairy foods provide several other nutrients such as phosphorus, vitamin D (if fortified), protein, and magnesium, which are beneficial to bone health (8,10). Dairy foods are considered to be among the best sources of calcium because of their high content of this mineral, overall nutritional value, and relatively low cost (1,12). Recognizing the importance of adequate calcium intake and good nutrition during childhood and adolescence to maximize peak bone mass and reduce the risk of osteoporosis in later adult years, the American Academy of Pediatrics urges pediatricians to recommend milk, cheese, yogurt, and other calcium-rich foods for children's daily diets (13). This recommendation is supported by several recent studies demonstrating that consuming dairy foods benefits children's bone health (14-16).

Researchers in New Zealand found that children ages 3 to 13 years with a history of avoiding drinking cow's milk for prolonged periods had lower dietary calcium intakes, lower bone mineral density of the total skeleton and at specific skeletal sites, and increased risk of prepubertal bone fractures compared with milk-drinking children (14,15). In a recent clinical trial involving 28 healthy boys between 13 and 17 years who participated in a strength training program, those who drank three servings of milk a day in addition to their usual diet had significantly greater increases in bone

mineral density compared to boys who consumed unfortified juice (16).

When data from more than 3,000 women who participated in the third National Health and Nutrition Examination Survey (NHANES) were analyzed, researchers found that women with low milk intake during childhood and adolescence had less bone mass in adulthood and greater risk of fractures (17). The researchers attributed milk's combination of nutrients (e.g., calcium, protein, phosphorus, vitamin D, zinc, and magnesium) to this food's positive effects on bone growth and mineralization (17). The author of an accompanying editorial states that the combination of nutrients in milk "may have a greater effect on enduring skeletal integrity than does calcium given in a short-term supplementation program" (18).

Adult skeletal health is also improved by increasing dairy food or calcium intake (19-25). In postmenopausal Chinese women who increased their milk consumption, bone loss was reduced and bone mineral density was increased (19,20). Drinking at least three servings of fat free or lowfat milk each day significantly reduced bone resorption in older adults, according to a multicenter, randomized controlled trial (21). Likewise, bone resorption was reduced in postmenopausal women with habitual low calcium intakes who increased their intake of calcium and other nutrients by adding three servings of yogurt a day to their diet (22).

Other studies have shown that intake of multiple nutrients (e.g., calcium, vitamin D, phosphorus), as exist in dairy foods, reduce the risk of fractures (8,11,23) and falls (24). The DASH (Dietary Approaches to Stop Hypertension) diet – a lowfat, calcium-rich diet that emphasizes lowfat dairy foods (2-3 servings/day), fruits (4-5 servings/day), vegetables (4-5 servings/day), grains, and lean meat – has been shown to reduce bone turnover, which, if sustained, may improve bone mineral status and reduce the risk of osteoporosis (25).

Based on scientific evidence supporting a beneficial role for dairy foods in bone health and recognition of Americans' low consumption of dairy foods resulting in low calcium intakes, the dairy industry, with

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*Two major studies – the Dietary Approaches to Stop Hypertension (DASH) and the Coronary Artery Risk Development in Young Adults (CARDIA) – provide strong evidence of the health benefits of a diet that includes adequate amounts of dairy products.*

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support from health professional partners (e.g., American Academy of Family Physicians, American Academy of Pediatrics, American Dietetic Association, National Medical Association) has initiated a nutrition-based marketing and education campaign called "3-A-Day of Dairy for Stronger Bones." The key message is to consume three or more daily servings of milk, cheese, or yogurt to help build and maintain strong bones and achieve overall health. For more information, visit [www.3aday.org](http://www.3aday.org).

**Hypertension.** Substantial scientific evidence indicates that increasing consumption of dairy foods or calcium lowers the risk of hypertension or reduces blood pressure (4,5,26-29). Although blood pressure responses to nutrient intakes such as calcium vary among individuals, the beneficial effect tends to be more consistent when foods rather than calcium supplements are used as the mineral source (5,28,30,31).

The blood pressure-lowering effect of dairy products is best exemplified by the DASH clinical trial (5). In this government sponsored, controlled feeding intervention, blood pressure was substantially and quickly reduced in persons with high-normal blood pressure who consumed the DASH diet (5). In those who consumed the diet rich in fruits and vegetables but without dairy products, blood pressure reductions were approximately half the magnitude as found with the DASH diet which included three servings of mostly lowfat dairy products/day (5). The researchers estimated that if Americans follow the DASH diet, blood pressure improvements would rival those obtained with antihypertensive medications (5).

The DASH findings have been confirmed by results from the DASH-Sodium trial (31). In addition, the DASH diet favorably modifies salt's effect on blood pressure in subjects at risk of "salt sensitivity." Results of the PREMIER trial support the benefits of lifestyle modifications (e.g., weight loss, alcohol restriction, increased physical activity), including the DASH diet, for reducing blood pressure (32). Dairy products are among the top contributors of several nutrients such as calcium, potassium, and magnesium (i.e., nutrients

shown to lower blood pressure) provided by the DASH and DASH-Sodium diets (33).

Recently published findings from the CARDIA (Coronary Artery Risk Development in Young Adults) study, a multi-center prospective study involving more than 3,000 young adults followed for 10 years, show a consistent reduction in hypertension with high consumption of dairy foods in initially overweight individuals (6). The likelihood of elevated blood pressure was nearly 20% lower for each daily eating occasion of dairy products (6).

The National Heart, Lung, and Blood Institute, in its most recent (7th) Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure recommends lifestyle modifications (34). The report ranks the DASH diet as the most effective nutritional intervention ahead of sodium restriction.

**Overweight and Obesity.** As discussed in the previous Digest (35) and in recent reviews (36-38), emerging scientific evidence indicates that dairy products and calcium have a beneficial role in controlling body weight/fat in children and adults. Findings indicate that dairy products have greater effects on body weight than predicted from their calcium content alone. A recent randomized controlled clinical trial in obese adults demonstrated that consumption of dairy products significantly accelerated body weight and fat loss (39).

**Insulin Resistance and Type 2 Diabetes.** Dietary patterns characterized by increased dairy consumption may protect overweight individuals from developing obesity and insulin resistance syndrome (IRS), which are key risk factors for type 2 diabetes and heart disease, according to the CARDIA study (6). In this study, overweight participants who consumed the most dairy products (>5 servings/day) had an approximately 70% lower incidence of IRS than those who consumed few dairy products (<1.5 servings/day). IRS, known as the




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*Dairy foods appear to be more effective than calcium alone in reducing the risk for a number of chronic diseases.*

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metabolic syndrome or syndrome X, is characterized by abnormal blood glucose control, high blood pressure, and abnormal blood lipid levels (low HDL cholesterol and high triglycerides) (6). One study found that the prevalence of metabolic syndrome was 40% lower in men who consumed one or more servings of dairy products/day than those who consumed less (40). Reduced risk of type 2 diabetes has been reported in randomized clinical trials that used lowfat dairy foods as a component of dietary interventions (41,42).

**Coronary Heart Disease and Stroke.** In addition to its beneficial effect on hypertension (5), the DASH diet, which contains dairy foods, positively affects other risk factors for heart disease. This diet has been shown to significantly reduce blood total and low density lipoprotein (LDL) cholesterol without affecting blood triglyceride levels (43) and to lower blood levels of homocysteine, an amino acid linked to increased risk of heart disease and stroke (44). Based on the reduction in homocysteine levels, researchers project that intake of the DASH diet could lower atherosclerotic cardiovascular disease by 7% to 9% (44), in addition to the 15% reduction in heart disease and 27% reduction in stroke estimated by the DASH-induced decrease in blood pressure (5). Intake of dairy foods may also reduce the risk for obesity and insulin resistance syndrome, which are additional risk factors for heart disease (35-39).

Consuming dairy foods increases intake of nutrients such as calcium, potassium, and magnesium, which may protect against heart disease either directly or through effects on blood lipids, blood pressure, and body weight (45). Increasing calcium intake has been demonstrated to result in a blood lipoprotein-lipid profile that is associated with a reduction in the risk of coronary heart disease (46-48). A recent study of nearly 500 adults participating in phase 2 of the Quebec Family Study found that higher calcium intake, primarily from dairy products, was negatively correlated with plasma LDL cholesterol,

total cholesterol, and the ratio of total cholesterol to high density lipoprotein (HDL) cholesterol (48).

Dairy products and dairy product nutrients such as calcium, potassium, and magnesium may help to reduce the risk of stroke, a type of cardiovascular disease (29,49). Consumption of dairy foods, such as milk, may have a greater effect on reducing risk of stroke than nondairy sources of calcium (49).

**Cancer.** Intake of dairy foods may lower the risk for certain cancers. Epidemiological investigations report inverse associations between calcium, vitamin D, and dairy food intake and colon cancer (50-54). A clinical trial of 40 adults at high risk for colon cancer found that increasing intake of lowfat dairy foods (i.e., three additional servings of lowfat dairy foods for a total of approximately 1,300 mg/day) or calcium (900 mg supplemental calcium plus 600 mg dietary calcium for a total intake of approximately 1,500 mg calcium/day) for four months significantly reduced the growth of abnormal cells thought to precede colon cancer development (55). A previous study by these researchers found that a diet supplemented with lowfat dairy foods providing a total calcium intake of approximately 1,500 mg/day significantly decreased proliferation of colonic epithelial cells (56). The combination of calcium and vitamin D may be particularly effective in preventing the recurrence of colon cancer, according to a recent randomized clinical trial (57). This finding supports the suggestion that dietary calcium may be more effective than calcium supplements in reducing the risk for colon cancer (58).

Preliminary epidemiological evidence suggests a protective effect of dairy products against breast cancer (59-62). In a 6-year prospective study of premenopausal Norwegian women, those who consumed more than three 8-ounce servings of milk/day had a 44% lower incidence of breast cancer than nonmilk drinkers (60). Consumption of dairy products, especially lowfat dairy products and skim/lowfat milk, was associated with a significantly reduced

risk of breast cancer in premenopausal, but not postmenopausal, women participating in the Nurses' Health Study (59).

More research is needed to determine how intake of dairy foods such as milk may help reduce the risk of developing colon or breast cancer. However, researchers have suggested an anticancer effect for several nutrients in dairy foods such as calcium, vitamin D, and certain milkfat components (e.g., conjugated linoleic acid, sphingolipids, butyric acid) (63,64).

**Dental Health.** Dairy foods such as milk and especially cheese may play a protective role in dental health, according to findings from experimental animal, in vitro, and limited epidemiological studies (4,65-67). Studies show that milk intake does not promote dental caries and may even have a modest caries-protective effect and that different types of cheese (e.g., Cheddar, Swiss, blue, Monterey Jack, process American) may protect teeth against caries (4,65-67). Moreover, researchers have suggested that nutrients in milk and cheese such as protein, calcium, and phosphorus may contribute to the protective effect of these foods against dental caries (67).

### ESTIMATED HEALTHCARE COST SAVINGS ASSOCIATED WITH OPTIMAL DAIRY FOOD INTAKE

Consuming 3 to 4 servings of dairy foods each day as part of a healthful diet could lead to a reduction in healthcare costs of \$26 billion in the first year and more than \$200 billion over five years, according to a recent report (7). This report, which takes into account approximately 100 studies dating from 1980 to 2002, is one of the first to analyze how small dietary changes may contribute to significant healthcare cost savings and a healthier population. Using data from randomized controlled trials and prospective longitudinal studies, the researchers evaluated the effects of increasing dairy food intake to optimal levels to increase calcium intake on nine common medical disorders (i.e., obesity, hypertension, type 2 diabetes, coronary artery disease,

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*Increasing consumption of dairy foods to 3 to 4 servings/day could significantly decrease the risk of several chronic diseases and lead to healthcare cost savings of \$26 billion in the first year and more than \$200 billion in 5 years.*

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stroke, kidney stones, osteoporosis, colorectal cancer, and pregnancy-related complications), at least one of which affects most Americans (7).

## CONCLUSION

The key to a healthful diet is to choose naturally nutrient-rich foods, such as dairy foods, first as part of a balanced diet. Three to four servings of dairy foods per day is recommended by some government and health professional groups to meet calcium needs (68-70). Studies suggest that including optimal intakes of calcium-rich dairy foods in the daily diet improves the nutritional quality of the diet and helps to reduce the risk of many chronic diseases/disorders, resulting in substantial healthcare cost savings (7).



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# DAIRY FOODS' ROLE IN MINORITY HEALTH

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