Dairy Foods Promote Optimal Growth, Development and Lifelong Health from the First 1,000 Days through Adolescence

Overview

Setting a foundation of healthy eating from the first 1,000 days – conception through age two – and throughout childhood and adolescence can have long-term impact on health and quality of life. Leading pediatric and health organizations and the U.S. Dietary Guidelines for Americans (DGA) emphasize the importance of healthy eating patterns made up of nutrient-dense foods to meet key nutrient requirements that support growth, development and overall health from conception through adolescence. Dairy foods (i.e., milk, cheese and yogurt) contribute over 15% of total nutritional intake for vital nutrients such as protein, vitamins A and D, thiamin, riboflavin, vitamin B6, vitamin B12, choline, calcium, magnesium, phosphorus, potassium and zinc for children 12 months and older in the U.S. Current research indicates that consumption of dairy foods during childhood and adolescence, as well as consumption during pregnancy and lactation, is associated with a range of beneficial health outcomes including neurocognition, growth and development, metabolic health and emotional well-being. Because of these broad contributions to nutritionally adequate diets and whole-body health, dairy foods are recognized by the DGA and leading health organizations as components of healthy eating patterns in the early stages of life.

DAIRY FOOD CONSUMPTION DURING THE FIRST 1,000 DAYS

Dairy food consumption during pregnancy and lactation contributes key nutrients for healthy growth and development

The first 1,000 days – from conception through age two – is an especially influential time that shapes a child's health trajectory into adulthood. High-quality nutrition during this stage of life lays the groundwork for healthy growth, development and long-term wellness.[1] During pregnancy, energy and nutrient needs increase to support fetal development and placental function,[2,3] and optimizing nutrition during this period is critical for a healthy pregnancy and for promoting infant growth and development before and after birth. Dairy foods at a variety of fat levels can play a key role in helping children meet their nutrient needs and may beneficially influence several maternal and infant health outcomes. Three systematic reviews found that dairy food consumption during pregnancy may be positively associated with infant birth weight and length.[4–6] They also

suggest that dairy food consumption may reduce the risk of having an infant who is small for gestational age, while potentially increasing the risk of having an infant who is large for gestational age.[4–6] A 2022 prospective cohort study of 1,199 mother-child pairs in Japan found that maternal dairy food and milk consumption during pregnancy may reduce the risk of emotional problems in children at 5 years of age.[7] Further replication across varied populations and regions is warranted to validate the results of this observation.

Regularly consuming dairy foods as recommended by the U.S. Dietary Guidelines for Americans (DGA) – three servings of dairy foods per day based on a 2,000 calorie diet – has been shown to enhance nutrient adequacy during pregnancy,[8] a life stage associated with more nutrient deficiencies. Data from the National Health and Nutrition Examination Survey (NHANES; 2001-2014 data collection) suggests that 10% or more of pregnant women have total usual intakes below the Estimated Average Requirement for several nutrients, including magnesium (47.5%), vitamin D (46.4%), vitamin A (15.5%), calcium (12.9%), vitamin B6 (11.5%) and zinc (10.9%).[9] A separate study analyzing NHANES data also indicates that pregnant women often consume less iodine than recommended,[10] with others reporting suboptimal iodine intake among women of reproductive age.[11] Underconsumption of key nutrients during pregnancy is concerning because deficiencies in several nutrients such as iodine, choline and vitamin B12 during early fetal development have been associated with possible long-term health implications for offspring.[9] In particular, iodine deficiency remains a leading cause of preventable brain damage and intellectual disability worldwide.[12,13] During pregnancy, iodine deficiency can impair fetal brain development and growth, and inadequate iodine intake in infants and children is also linked with risk of neurodevelopmental deficits.[12,13]

After pregnancy, nutritional needs remain high throughout lactation. Breastfeeding is recommended for the first six months of life and beyond,[14,15,124] and maternal consumption of nutrient-dense foods, including dairy foods, supports a nutritionally adequate diet for both mother and infant.[16] Maternal dairy food consumption may also influence the nutrient composition of breastmilk. For example, breastmilk iodine concentrations have been correlated with infant iodine status, which may impact infant growth.[17,18] A systematic review identified two randomized controlled trials in which consumption of whole-milk dairy foods during pregnancy supported more lipid-rich breastmilk.[4]

Nutrient-dense complementary foods, such as whole-milk cheese and yogurt, help growing infants meet their changing nutritional needs

At six months of age, infant energy and nutrient needs begin to exceed what breast milk alone can provide, making it a key window for introducing nutrient-dense foods to support growth and development.[31,32] Leading health organizations and the DGA recommend introduction of dairy foods such as whole-milk yogurt and cheese at six months of age alongside breastmilk or fortified infant formula.[14,33,34] For children between six months and four years, dairy food consumption is significantly associated with improved nutrient adequacy.[35] Research indicates that yogurt contributes substantial amounts of vitamin B12, riboflavin, calcium, iodine and phosphorus in children four months to three years,[36] with NHANES data linking cheese as the source of nearly 7% of calcium intake in toddlers ages 12–24 months.[37]

Recent systematic reviews noted that more research is needed on role of nutrient-dense foods like dairy foods for optimal growth, body composition and obesity risk from birth through two years of life due to variability in the available evidence.[42,43,44] Mayer-Davis et al.[44] found "the body of evidence from children and adults has several significant limitations, including lack of specificity and consistency in definition of the exposure, the use of non-validated methods for assessing beverage intake, uncontrolled confounding, and inconsistencies in findings." Future research could help address these limitations.[44] Overall, evidence-based guidelines from authoritative public health organizations, including the DGA and WHO, encourage the consumption of dairy foods during the first 1,000 days to promote proper growth and well-being in children.[14,33]

Key Nutrients for Growth and Development: Daily Value Contributions from Dairy Foods and Their Function

Nutrient	Milk	Yogurt	Cheese	Nutrient Function
Macronutrients				
Protein*	▼	●	▼	Helps build and maintain lean muscle and provides amino acids needed to maintain intestinal tissue integrity, supporting gut health.[19,127]
Vitamins				
Vitamin A*	▼			Supports vision, immune function and growth.[20]
Vitamin D*	▼			Helps the body absorb calcium and supports bone health and immune function.[21]
Vitamin B12*	●	●	▼	Helps with normal blood function and keeps the nervous system healthy.[22]
Riboflavin*	●	●	▼	Helps convert food into energy and enzymes function normally.[23]
Pantothenic Acid	●	▼		Helps convert food into energy and regulate metabolism.[24]
Niacin	▼		▼	Helps convert food into energy.[25]
Minerals				
Calcium*	●	●	▼	Builds and maintains strong bones and teeth; supports nerve and muscle function; contributes to normal enzyme function.[26]
Selenium	▼	●	▼	Protects healthy cells from damage and supports metabolism.[27]
Iodine	●	●	▼	Necessary for proper bone and brain development and metabolic regulation.[13]
Phosphorus*	●	▼	▼	Helps form bones and teeth and supports energy metabolism.[28]
Potassium*	▼			Maintains fluid balance and supports healthy blood pressure and muscle function.[29]
Zinc*	▼	▼		Supports immune function, wound healing and growth.[30]

● Dairy is an excellent source, providing 20% or more of the Daily Value for that nutrient per RACC.

▼ Dairy is a good source, providing 10-19% of the Daily Value for that nutrient per RACC.

* Nutrients identified by American Academy of Pediatrics as essential for neurocognitive development.

Sources: USDA FoodData Central online at http://fdc.nal.usda.gov/. Mean values calculated from database entries across all fat levels of plain vitamin D-fortified fluid milk in legacy, Foundation, and Survey (FNDDS) data sources (n=12).; U.S. Department of Agriculture, Agricultural Research Service. 2016. USDA National Nutrient Database for Standard Reference, Release 28. Nutrient Data Laboratory Home Page, https://www.ars.usda.gov/nutrientdata; low moisture, part skim mozzarella (#01029).; U.S. Department of Agriculture, Agricultural Research Service. 2016. USDA National Nutrient Database for Standard Reference, Release 28. Nutrient Data Laboratory Home Page, http://www.ars.usda.gov/nutrientdata; Low-fat vanilla yogurt (#01119).

Early childhood is an important time period for forming lifelong food preferences

Evidence suggests that early exposure to a variety of foods may help shape food preferences, and dairy foods are important contributors to nutrient intake in infants and toddlers.[38–40] In addition to being nutrient-dense, yogurt and cheese provide sensory experiences for young children, including different textures, tastes and flavors. Plain, unsweetened yogurt, either on its own or combined with fruits or vegetables, is one option for introducing sour or tangy tastes. Cheese is available in various textures, from soft and solid types to textured varieties such as cottage cheese.

Parental social influences, such as feeding practices and parental consumption of dairy foods, may influence a child's dairy food consumption long term. Particularly among preschool-aged children, parents who model eating habits that include dairy foods and allow autonomy to choose dairy foods may help to promote dairy food consumption, forming early habits for healthy eating patterns during childhood.[41]

Introducing dairy foods as part of complementary feeding practices is recommended

Food allergies, such as dairy milk protein allergy, usually appear within the first 1,000 days and resolve during childhood.[45] While earlier guidance recommended that allergenic foods be introduced to the diet after 12 months of age, emerging evidence indicates that delayed introduction of potentially allergenic foods may increase risk of allergy development.[46] Since 2020, the DGA has provided evidence-based recommendations for infants to be introduced to potentially allergic foods, including dairy milk, peanuts and eggs, at the same time as other complementary foods.[14] A 2025 narrative review published in *Pediatrics in Review* discussed introducing dairy foods such as yogurt, cheese and custard between 4-11 months of age, with suggested provision twice weekly; however, additional research may provide further insights into frequency recommendations.[47]

The optimal timing for dairy milk introduction to reduce allergy risk remains a subject of ongoing investigation. Dairy exposure at 0–4 months of age has been linked to food allergies and sensitization in a meta-analysis of six randomized control trials, based on very low certainty of evidence.[48] While research is limited, three cohort studies have described consuming yogurt may reduce the incidence of food sensitivity,[49] atopic dermatitis[49,50] and food allergy[51] during the first 1,000 days. Overall, during childhood, research does not indicate a relationship between dairy food consumption beginning at six months of age and risk of developing dairy milk allergy or other allergic conditions such as eczema.[52–54] Current guidance from authoritative bodies emphasizes introducing potentially allergenic foods alongside other complementary foods at six months of age.[14,34] For toddlers with a diagnosed milk protein allergy, the DGAs indicate unsweetened fortified plant-based beverages are suitable alternatives.[14] Careful attention to nutrition labels is critical when choosing plant-based beverages in this instance, as most plant-based drinks do not provide key nutrients and may lead to nutrient deficiencies that contribute to poor health outcomes.[55,123]

Infants and toddlers who experience gastrointestinal issues may benefit from the consumption of fermented dairy foods

The gut microbiome, the collection of all microorganisms and their genes living in the human gastrointestinal tract, influences both gastrointestinal health and chronic disease risk.[56] Emerging research indicates that early childhood is a critical window to beneficially shape microbial composition and promote overall health and disease prevention later in life.[56]

Incorporation of fermented dairy foods, like yogurt and kefir, during the first 1,000 days may support digestive outcomes during growth.[57,58] A systematic review of six randomized controlled trials indicated that infants and

young children who consumed yogurt and kefir experienced benefits such as fewer diarrhea episodes, more weight gain, less oral rehydration treatment and improved lactose digestion.[49] Although more research is needed, the beneficial bacteria and essential nutrients provided by yogurt are important for proper digestion and immune function and can be part of a balanced diet from complementary feeding in infancy and into the teenage years.[59]

Dairy milk's nutrition is hard to replace with plant-based alternatives

Dairy foods provide a package of high-quality protein along with key micronutrients that are often lacking in children's diets, such as calcium, vitamin D, potassium, iodine and vitamin B12 and dairy milk provides a total of 13 essential nutrients.[1,14] This combination is difficult to match using non-dairy beverages, since replacing dairy milk's nutrients typically requires fortification and most plant-based options do not fortify with the same 13 essential nutrients in dairy milk.[123] In addition, Healthy Eating Research (HER), a national program of the Robert Wood Johnson Foundation, reports that dairy milk is the most affordable option compared to plant-based alternatives based on September 2022 U.S. retail data.[60]

Authoritative statements by at least eleven medical and nutrition groups have provided expert perspectives on the potential for unintended public health consequences of substituting plant-based alternatives for dairy foods.[14,55,61–63] The Dietary Guidelines for Americans do not recommend plant-based beverages other than unsweetened, fortified options as suitable alternatives to dairy milk.[14] In a 2020 position paper, the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition Committee states the substitution of dairy milk with plant-based alternatives can be deleterious to a child's nutritional status, growth and development.[61] As part of an expert panel for HER, the American Academy of Pediatrics, the Academy of Nutrition and Dietetics, the Academy of Pediatric Dentistry and the American Heart Association advise against substituting dairy with plant-based alternatives throughout childhood and adolescence due to their lower protein content and frequent lack of calcium and vitamin D fortification.[55,64]

IMPACT OF DAIRY FOOD CONSUMPTION DURING CHILDHOOD AND ADOLESCENCE

Dairy foods are important sources of nutrition during child growth and development

As children develop, their nutritional requirements change. The DGA highlights the need to focus on foods rich in essential nutrients throughout childhood and adolescence, and nutrients found in dairy foods across a range of fat levels can help support physical and cognitive milestones. For children 2-18 years old, the DGA recommends 3 servings per day for 1600 calories or higher, 2.5 servings for 1200-1500 calories per day and 2 servings per day for 1,000 calories per day.[14] Dairy foods (i.e., milk, cheese and yogurt) can contribute over 15% of total nutritional intake for important nutrients such as protein, vitamins A and D, thiamin, riboflavin, vitamin B6, vitamin B12, choline, calcium, magnesium, phosphorus, potassium and zinc to the diets of Americans 2 years and older in the U.S.[43] However, many children fail to meet daily dairy food recommendations – while toddlers' consumption of dairy foods generally meets or exceeds recommendations, dairy food consumption falls below the recommendations for children, as early as age 3, and adolescents.[43] This is concerning because the essential nutrients provided by dairy foods can be challenging to replace in the diet.[65] Apart from fortified products, the nutrition of plant-based alternatives does not match dairy foods to sufficiently support meeting dietary recommendations.[14]

Dairy food consumption improves bone mineral content and density in childhood and adolescence

Accumulating bone mass during early life can have lasting, beneficial effects on skeletal health across the lifespan.[72] Building this bone mass requires the proper nutrition for constructing and maintaining bone mass, including

calcium, phosphorus, magnesium and vitamin D.[66,67] Building greater bone mass during childhood and adolescence can minimize the risk of bone loss later in life, helping to lower chances of osteoporosis and fractures.[68] Recent systematic reviews link higher dairy food consumption with benefits for bone mineral content and density in children and adolescents, with most evidence in 10-18 year olds.[69–72] This is highlighted in two RCTs in the U.S. and Canada in early- to post-pubertal youth, which demonstrated that targeting ≥3 or ≥4 servings of dairy foods or milk per day for 12-18 months may improve bone mineral content and density at some sites.[73,74] Benefits were most pronounced in females.

Dairy food consumption may promote healthy weight and body composition for children and adolescents

Childhood overweight and obesity rates remain a significant public health concern in the U.S., affecting approximately one in five (14.7 million) children and adolescents.[75] Nutrition and overall diet quality play a critical role in promoting healthy body weight and composition during growth. Results from 11 out of 12 systematic reviews indicate that dairy food consumption may be beneficial or neutral for body size, body composition and the risk of overweight and obesity.[44,69–71,76–85] Systematic reviews also suggest that consuming whole-milk dairy foods may be beneficial or neutral for weight gain or adiposity compared to lower-fat dairy foods.[82–84] While this is a growing body of evidence and public health interest area, most research has been observational and focused in younger children, emphasizing the need for more controlled trials in broader age ranges of children.

Children and adolescents who consume dairy foods, including whole-milk dairy foods, may have lower risk of some cardiometabolic diseases

Diet plays an important role in lowering risk of type 2 diabetes (T2D),[96] which is rising in youth.[97–99] In 2017, T2D rates had increased by 95.3% over 16 years in youth 10-19 years old.[100] Data from NHANES demonstrates nearly one in five youth 12-18 years has prediabetes based on hemoglobin A1c.[101]

Current evidence indicates that dairy food consumption among children and adolescents is not associated with cardiometabolic disease risk and contributes to cardiometabolic health. Two systematic reviews found no relationship between higher-fat milk or dairy food consumption and cardiometabolic risk factors during childhood.[33,82] In a cross-sectional study in 35,614 Brazilian adolescents 12-17 years, two to three daily servings of dairy foods per day were associated with reduced combined risk of prediabetes and T2D in adolescents, with more benefits in those with overweight and obesity.[102] Another cross-sectional study in eight European cities in over 3,000 adolescents 12.5-17.5 years found that milk, yogurt and milk- and yogurt-based beverage consumption was associated with a lower risk of cardiovascular disease, including lower body fat and higher cardiorespiratory fitness.[103] This is an emerging area of research, and additional studies are needed to further understand the role of dairy foods and overall eating patterns in metabolic health during adolescence.

Current evidence does not support eliminating dairy foods to manage acne

Acne development, especially in the adolescent years, can impact a child's mental and physical well-being.[104,105] While a primary cause for acne is hormone-related, diet has been proposed as a potential risk factor.[109,125] Dairy foods have been suggested to influence acne development, related to the body's insulin response which may increase oil production and skin inflammation,[106] with two recent systematic reviews assessing dairy food outcomes and acne reporting conflicting outcomes.[107,108] The American Academy of Dermatology notes although some research links dairy milk with risk of acne, no studies have shown that foods made from milk, such as yogurt or cheese, contribute to breakouts.[109] Therefore, unnecessary exclusion of dairy foods during this life stage may compromise overall nutrient intake. According to the American Academy of Dermatology, many foods produce an insulin response, including foods with a high glycemic index and glycemic load.[110] Overall, the guidelines from this organization conclude that there is conflicting evidence for the value of a low-glycemic diet on acne treatment and insufficient evidence to avoid any specific foods, including dairy foods.[111]

Flavored milk and yogurt can help promote nutritionally adequate diets and healthy weight among children and adolescents

The DGA recommends avoiding added sugar during infancy and early childhood (birth – 4 years), as well as middle childhood (5 – 10 years). In general, the DGA advises limiting added sugar in the diet, and that Americans should aim for no more than 10 g of added sugar per meal, 5 g for mixed products, and 2.5 g for individual dairy foods (e.g., yogurt), which is consistent with the FDA "Healthy" final rule.[14,86]

Research suggests nutrient-dense foods like flavored milk and yogurt with small amounts of added sugars may fit in o calorie-balanced, healthy eating patterns that support nutrient adequacy and weight management in children and adolescents. Flavored milk is a good or excellent source of the same 13 essential nutrients as unflavored milk, including calcium, vitamin D and potassium – essential nutrients that many children do not get enough of in their diets.[43] In studies conducted in children and adolescents, flavored milk consumption is associated with overall enhanced diet quality and is not associated with risk of adverse weight gain.[78,87–93] A 2023 systematic review and meta-analysis of three RCTs of children and adolescents found that substituting sugar-sweetened beverages with either noncaloric beverages or flavored milk reduced body fat percentage.[78] Cross-sectional data supports these findings. For example, analysis of the 2011-2012 National Nutrition and Physical Activity Survey among 2,812 Australian children 2-18 years old linked flavored and plain milk drinkers with higher total daily milk, dairy and calcium intakes than those classified as milk nondrinkers or milk avoiders, and showed that milk consumption did not negatively impact BMI.[93] In another large cohort study of Australian children 2-16 years of age, flavored milk consumption was beneficially associated with micronutrient status without any differences in markers of weight gain.[89] Specific to yogurt, analysis of 2001-2016 NHANES data showed that total yogurt consumption (inclusive of flavored varieties) was associated with higher nutrient intake, nutrient adequacy and diet quality in children.[94] No adverse risk for anthropometric measures was found in children among yogurt consumers or nonconsumers.

In addition, the U.S. dairy community is committed to reducing added sugars in flavored milk in schools. Since 2007, the U.S. dairy community has reduced added sugars in school milk by 56%. Currently, the average added sugar content in 8 ounces of flavored school milk is 7.4 grams, and the average flavored milk served in schools has 124 calories – just 28 more calories than unflavored milk.[95]

Conclusion

Dairy foods contribute significant nutrition to support growth, brain development and foundational health during the formative first 1,000 days from conception to two years. During childhood and adolescence, dairy foods provide essential nutrients that are difficult to replace with other foods, making them a cornerstone of healthy eating patterns to support continued growth and bone development. Evidence from pregnancy through adolescence highlights the role of dairy foods for whole body health including optimal nutrient adequacy, growth, neurodevelopment, bone and cardiometabolic health. Eating habits formed during childhood have potential to influence lifelong food choices and including a variety of dairy foods like milk, cheese and yogurt – from lactose-free options to flavored varieties with small amounts of added sugar to choices across a range of fat levels – can help pave a path for a lifetime of wellness and a longer healthspan.

Translating the Science: Key Takeaways for Health & Wellness Professionals

- **Dairy foods help nourish growing brains, bones and bodies**. From pregnancy and infancy through later childhood and adolescence, dairy consumption can help support growth and neurodevelopment, digestive and cardiometabolic health as well as immune function.[4–6,14,16,20,21,30,35,44,49,57-59,44,69–74,76–85,116-119,126]
- **Dairy foods deliver nutrients of vital importance during the first 1,000 days**. Providing up to 13 nutrients with essential roles in brain development, growth and long-term health outcomes, dairy foods can help fill nutrient gaps and contribute to healthy eating patterns that lay the foundation for a strong healthspan.[14,116-119]
- **Dairy foods offer a unique package of nutrients that may be hard to replace**. Because dairy milk offers a reliable source of nutrients often lacking in children's diets, several leading health authorities advise on the potential unintended nutrition and health risks of replacing dairy milk with plant-based alternatives since they do not provide consistently comparable nutrition.[55,61–64]
- **Dairy food consumption supports bone health and healthy growth during childhood and adolescence.** Higher dairy consumption is linked with improved bone mineral content and density, helping build a strong foundation for lifelong skeletal health.[69–74]
- **Dairy foods can help support healthy weight and cardiometabolic health in children and teens**. Research shows that consuming dairy foods across a range of fat levels is generally associated with beneficial or neutral effects on body weight, body composition and cardiometabolic risk factors in children and adolescents.[33,44,69–71,76–85,102,103] Evidence also supports the role of flavored milk as part of a healthy eating pattern for children and adolescents, providing milk's 13 essential nutrients without impacting weight gain.[78,87–93]
- **Eliminating dairy foods is not recommended as a strategy for managing acne**. Leading authoritative guidance cautions there is insufficient evidence to recommend omitting any specific food – including dairy foods – to manage acne, and avoiding dairy foods may limit consumption of important nutrients.[109]

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