SCIENCE SUMMARY: Type 2 Diabetes




Overview

Dairy foods such as milk, cheese and yogurt are foundational foods in healthy eating patterns. They contribute important shortfall nutrients, including calcium, vitamin D and potassium. Low-fat and fat-free dairy foods are part of the Dietary Guidelines for Americans (DGA) recommendations, and a wide variety of nutrient-rich dairy foods are available that can help Americans meet nutrition, health and taste preferences. A growing body of research indicates that dairy food consumption is associated with multiple health benefits, including a reduced risk for type 2 diabetes (T2D). This summary reviews studies about dairy food consumption and T2D published between 2009 and 2015, building on the scientific review conducted for the 2010 DGA. This research provides further support for consuming low-fat or fat-free dairy foods as recommended in the 2015 DGA.

Healthy eating patterns can help lower risk for T2D and decrease public health costs

Type 2 diabetes affects nearly 29 million Americans 20 years and older (1), and it is estimated that one in three Americans born today will develop diabetes over his or her lifetime (2). The annual estimated cost of diagnosed diabetes in the U.S. has increased from $174 billion in 2007 to $245 billion in 2012 (3). Each year, one million people receive a new diagnosis of diabetes, and T2D accounts for 90-95% of all diagnosed cases (4). Genetic and environmental factors influence the development of T2D, and a healthy eating pattern helps contribute to overall health and the management of T2D (4). The 2015 DGA states that healthy eating patterns are associated with reduced risk for several chronic diseases, including cardiovascular disease (strong evidence) and type 2 diabetes (moderate evidence) (5). The DGA recommends three daily servings of low-fat or fat-free dairy foods for those 9 years and older, 2½ for children 4-8 years, and two for children 2-3 years, in the Healthy U.S.-Style Eating Pattern (5).

The 2015 DGA notes that moderate evidence indicates healthy eating patterns are associated with reduced risk for type 2 diabetes (5).

Accumulating evidence finds dairy food consumption is linked to lower risk for T2D

National and global health organizations recognize factors such as poor diet and physical inactivity as key contributors to the epidemics of overweight, obesity and several diet-related chronic diseases, including T2D (6, 7). The 2010 Dietary Guidelines, based on evidence published through mid-2009, stated: “Moderate evidence…indicates that intake of milk and milk products is associated with a reduced risk of cardiovascular disease and type 2 diabetes and with lower blood pressure in adults” (8). Since 2009, the body of evidence on dairy foods and type 2 diabetes has continued to grow.

Research published between 2009 and 2015 has examined links between dairy food consumption and T2D in five meta-analyses and/or systematic reviews (9-13), 13 prospective cohort studies (14-26), ten of which are about the association between dairy foods and T2D (14-23) and three of which relate to dairy fat (24-26). Results from the majority of these studies support the association between higher dairy food consumption and a reduced risk for T2D in a range of population groups. Because most of the research is observational, research is needed to understand the mechanisms underlying these observations. Overall, this research is consistent with the role of dairy foods in the healthy eating patterns recommended in the DGA.

Meta-analyses and systematic reviews find dairy food consumption linked to lower T2D risk

In a meta-analysis of 17 prospective cohort studies, higher consumption of total dairy products, low-fat dairy foods and cheese, compared to lower consumption, was associated with a lower risk for T2D (9). Associations were also found for higher consumption of yogurt, and low-fat or fat-free milk and cheese. These associations were further supported through dose-response analysis showing T2D risk was reduced by 7% for every 400 grams per day of total dairy foods consumed, or about 1.7 servings of milk per day (9). Another large dose-response meta-analysis of 16 prospective cohort studies found that consuming 200 grams per day of total dairy or low-fat dairy was associated with a 6% and 12% lower risk for T2D, respectively (10). When investigating the effects of individual dairy foods, researchers found a 20% lower risk for T2D associated with consuming 30 grams per day of cheese, and a 9% lower risk associated with consuming 50 grams per day of yogurt.

A meta-analysis of 14 prospective cohort studies found that each serving per day of yogurt was associated with an 18% lower risk for T2D, while consumption of other dairy foods and total dairy were not associated with incidence of T2D (11). Additional analysis of three large prospective cohort studies in the U.S. in the same publication also found that each serving of yogurt per day was associated with 17% lower T2D risk (11). Two smaller meta-analyses found higher consumption of low-fat dairy foods was associated with a 14% lower risk of T2D (12), and higher intakes of dairy foods were associated with a 15% reduction in risk (13). Taken together, the large majority of observational cohort studies find that higher consumption of dairy foods, especially yogurt, is associated with a reduced risk for T2D in adult populations around the world.

Emerging evidence linking yogurt intake with lower risk for T2D (9-11) indicates the process of milk fermentation that produces yogurt may modify milk in a beneficial way. Research is needed to better understand this observed association.

Prospective cohort studies find dairy consumption does not increase or lowers risk for T2D

Two large prospective studies conducted in the U.S. found higher consumption of dairy foods is associated with reduced risk for T2D. A study of U.S. postmenopausal women from the Women's Health Initiative Observational Study found that higher low-fat dairy food consumption was associated with a 40-50% reduced risk for T2D, and compared with women who ate yogurt less than once per month, more frequent yogurt intake (more than twice per week) was associated with a 54% lower risk for diabetes (14). In U.S. women who had been tracked since adolescence, higher dairy food consumption during adolescence was associated with a lower risk for T2D in later adulthood (15). Prospective cohort studies conducted outside the U.S. have found beneficial or neutral effects of total dairy food consumption, or specific dairy groups such as high-fat dairy, low-fat dairy, cheese or yogurt, on T2D risk in Europe, Japan, Britain and Australia (16-23).

Prospective cohort studies find fatty acids in dairy foods linked to lower T2D risk

Emerging research has found specific benefits associated with consumption of dairy fat, the fat found naturally in whole, reduced-fat and low-fat dairy foods. Two prospective studies found that individuals with the highest plasma levels of *trans*-palmitoleate, a fatty acid biomarker of dairy fat consumption, had a 48% (24) and 62% (25) lower incidence of T2D. Another prospective study found that serum pentadecanoic acid, a fatty acid present in dairy fat that is considered an independent biomarker for dairy food intake, was associated with a 27% lower risk for T2D after 5 years (26). A recent trial had consistent findings: in 86 overweight and obese Australian adults with metabolic syndrome, measures of insulin resistance were lower in adults with higher serum concentrations of specific phospholipid species and fatty acids that are markers of higher fat dairy consumption (27). Taken together, these studies indicate that the unique fatty acid profile of dairy fat may contribute to the observed associations of dairy foods with T2D risk.

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