

SCIENCE SUMMARY: Type 2 Diabetes

Dairy food consumption is linked to lower risk for type 2 diabetes



Overview

Dairy foods such as milk, cheese and yogurt are foundational foods in healthy eating patterns. The dairy group contributes important shortfall nutrients, including calcium, vitamin D and potassium to the U.S. diet. Low-fat and fat-free dairy foods are part of the Dietary Guidelines for Americans (DGA) dietary recommendations. A growing body of research indicates that dairy food consumption is associated with multiple health benefits, and a 2016 review concluded that high- to moderate-quality evidence indicates dairy foods are associated with a lower risk for type 2 diabetes (T2D). 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

T2D affects nearly 29 million American adults and accounts for 90-95% of all diagnosed cases of diabetes. More than 20% of health care spending is spent on people diagnosed with diabetes.¹ Poor diet and physical inactivity are recognized as key contributors to the epidemics of overweight, obesity and diet-related chronic diseases, including T2D.^{2,3,4} The DGA states that healthy eating patterns are associated with lower risk for several chronic diseases, including cardiovascular disease (strong evidence) and T2D (moderate evidence).² The DGA recommends 3 daily servings of low-fat or fat-free dairy foods for those 9 years and older, 2½ for children 4-8 years, and 2 for children 2-3 years in the Healthy U.S.-Style Eating Pattern.²

The 2015 Dietary Guidelines for Americans notes that current evidence indicates healthy eating patterns, which include low-fat or fat-free dairy foods, are linked to lower risk for T2D among adults.²

Research explores links between dairy food consumption and lower risk for T2D

The 2015 DGA recommendation to include dairy foods in healthy eating patterns builds on conclusions that emerged in the 2010 DGA, including that dairy food consumption is associated with lower risk for T2D.⁵ The 2010 DGA conclusions were based on studies published through 2009, and evidence on the association between dairy food consumption and T2D has continued to grow.ⁱ In 2016, Drouin-Chartier, et al., published a comprehensive systematic review of prospective research on dairy and chronic diseases, including T2D, and rated the quality of evidence.^{6,ii} This Science Summary highlights the findings from the Drouin-Chartier review,⁶ and includes findings from emerging research on links between dairy fat consumption and lower risk for T2D. Current evidence indicates dairy food consumption is associated with lower risk for T2D, and some individual foods may provide benefits.

ⁱ Research published between 2009 and 2016 (6, 7-12, 18-21) has explored the association between dairy food consumption and T2D in six meta-analyses (7-12) that examined 21 total prospective cohort studies, plus four prospective cohort studies not included in those meta-analyses (18-21).

ⁱⁱ Drouin-Chartier et al. (6) reviewed six meta-analyses on T2D (7-12), published beginning in 2010, plus four additional prospective cohort studies (18-21).

For more information, please visit: <https://www.nationaldairycouncil.org/science-summary>

©2018 NATIONAL DAIRY COUNCIL: Type 2 Diabetes



SCIENCE SUMMARY: Type 2 Diabetes

Dairy food consumption is linked to lower risk for type 2 diabetes



High- to moderate-quality evidence finds eating dairy foods is linked to lower risk for T2D

The Drouin-Chartier review concluded that high-quality evidence indicates low-fat dairy food consumption, as well as yogurt consumption, is associated with lower risk for T2D.⁶ In addition, it concluded that moderate-quality evidence indicates total dairy food consumption, as well as cheese consumption, is associated with lower risk for T2D. These conclusions were based on six meta-analyses of prospective cohort studies (PCS) that showed favorable^{7,8,9,10,11} or neutral¹² associations between dairy food consumption and risk for T2D.

Of the studies reviewed by Drouin-Chartier, et al., two meta-analyses published in 2010 and 2011, respectively, found total dairy consumption is associated with lower risk for T2D.^{7,8} A dose-response meta-analysis published in 2013 found 200 grams per day of total or low-fat dairy (245 grams of milk = one 8-ounce cup) is associated with a 6% and 12% lower risk for T2D.⁹ Researchers found a 20% lower risk for T2D associated with eating 30 grams per day of cheese (28 grams cheese = one ounce) and a 9% lower risk (trend) associated with eating 50 grams per day of yogurt (245 grams yogurt = one 8-ounce cup).⁹

Another dose-response meta-analysis published in 2013 reached similar conclusions: risk for T2D is lowered by 7% for every 400 grams per day of total dairy foods consumed.¹¹ Two meta-analyses published in 2014 and 2016, respectively, found no link between total dairy food consumption and risk for T2D,^{11,12} but one found higher consumption of yogurt is associated with lower risk for T2D.¹¹ These findings shed more light on the associations between dairy food consumption and lower risk for T2D and point to the need for more studies about individual dairy foods, like milk, cheese and yogurt, on risk for T2D.

Drouin-Chartier, et al., concluded that high- to moderate-quality evidence indicates dairy food consumption is linked to lower risk for T2D.⁶

Moderate-quality evidence finds eating high-fat dairy foods does not increase risk for T2D

The Drouin-Chartier review indicated there is moderate-quality evidence that high-fat dairy food (i.e., whole milk and whole milk dairy foods like cheese and yogurt) consumption is not associated with higher risk for T2D (based on four meta-analyses).⁶ All four meta-analyses included in the systematic review found no link between high-fat dairy food consumption and T2D.^{8,9,10,12} This observational evidence indicates that consumption of high-fat dairy foods is not linked to higher risk for T2D, but more research on this topic is needed to confirm these observations.

Fatty acid biomarkers of dairy food consumption also associated with lower risk for T2D

Studies that examined links between higher-fat dairy food consumption and risk for T2D had similar findings as emerging studies that examine links between dairy fatty acid biomarkers in the blood after dairy food consumption and risk for T2D. One meta-analysis of five studies found consumption of fatty acid biomarkers of dairy fat consumption, including plasma levels of trans-palmitoleic acid, is linked to lower risk for T2D.¹³ Two PCS included in the meta-analysis found that individuals with the highest plasma levels of trans-palmitoleic acid have a 48%¹⁴ and 62%¹⁵ lower incidence of T2D. Another PCS included in the meta-analysis found that serum pentadecanoic acid, another fatty acid biomarker for dairy food consumption, is associated with a 27% lower risk for T2D.¹⁶ Two large prospective cohorts of American men and women also included in the meta-analysis indicated higher dairy fat biomarkers in plasma are associated with lower incidence of T2D.¹⁷ More research is needed to better understand these observations.

For more information, please visit: <https://www.nationaldairycouncil.org/science-summary>

©2018 NATIONAL DAIRY COUNCIL: Type 2 Diabetes



SCIENCE SUMMARY: Type 2 Diabetes

Dairy food consumption is linked to lower risk for type 2 diabetes



References

- ¹ Centers for Disease Control and Prevention. At a Glance Fact Sheets. Diabetes: working to reverse the US epidemic, 2016. Atlanta, GA: U.S. Department of Health and Human Services; 2016. <http://www.cdc.gov/chronicdisease/resources/publications/aag/diabetes.htm>.
- ² U.S. Department of Health and Human Services and U.S. Department of Agriculture. 2015-2020 Dietary Guidelines for Americans. 8th Edition, December 2015. <http://health.gov/dietaryguidelines/2015/guidelines/>.
- ³ Malik VS, Willett WC, Hu FB. Global obesity: trends, risk factors and policy implications. *Nat Rev Endocrinol* 2013;9:13-27.
- ⁴ Oggioni C, Lara J, Wells JC, Soroka K, Siervo M: Shifts in population dietary patterns and physical inactivity as determinants of global trends in the prevalence of diabetes: an ecological analysis. *Nutr Metab Cardiovasc Dis* 2014;24:1105-11.
- ⁵ U.S. Department of Agriculture and U.S. Department of Health and Human Services. Dietary Guidelines for Americans, 2010. 7th Edition, Washington, DC: U.S. Government Printing Office, December 2010.
- ⁶ Drouin-Chartier JP, Brassard D, Tessier-Grenier M, Côté JA, Labonté ME, Desroches S, Couture P, Lamarche B: Dairy product consumption and risk of cardiovascular-related clinical outcomes. *Adv Nutr* 2016;7:1026-40.
- ⁷ Elwood PC, Pickering JE, Givens DI, Gallacher JE: The consumption of milk and dairy foods and the incidence of vascular disease and diabetes: an overview of the evidence. *Lipids* 2010;45:925-39.
- ⁸ Tong X, Dong JY, Wu ZW, Li W, Qin LQ: Dairy consumption and risk of type 2 diabetes mellitus: a meta-analysis of cohort studies. *Eur J Clin Nutr* 2011;65:1027-31.
- ⁹ Gao D, Ning N, Wang C, Wang Y, Li Q, Meng Z, Liu Y, Li Q: Dairy products consumption and risk of type 2 diabetes: systematic review and dose-response meta-analysis. *PLoS One* 2013;8:e73965.
- ¹⁰ Aune D, Norat T, Romundstad P, Vatten LJ: Dairy products and the risk of type 2 diabetes: a systematic review and dose-response meta-analysis of cohort studies. *Am J Clin Nutr* 2013;98:1066-83.
- ¹¹ Gijssbers L, Ding EL, Malik VS, de Goede J, Geleijnse JM, Soedamah-Muthu SS: Consumption of dairy foods and diabetes incidence: a dose-response meta-analysis of observational studies. *Am J Clin Nutr* 2016;103(4):111-24.
- ¹² Chen M, Sun Q, Giovannucci E, Mozaffarian D, Manson JE, Willett WC, Hu FB: Dairy consumption and risk of type 2 diabetes: 3 cohorts of U.S. adults and an updated meta-analysis. *BMC medicine* 2014;12:215.
- ¹³ de Souza RJ, Mente A, Maroleanu A, Cozma AI, Ha V, Kishibe T, Uleryk E, Budyłowski P, Schönemann H, Beyene J, Anand SS: Intake of saturated and trans unsaturated fatty acids and risk of all cause mortality, cardiovascular disease, and type 2 diabetes: systematic review and meta-analysis of observational studies. *Brit Med J* 2015; doi:10.1136/bmj.h3.
- ¹⁴ Mozaffarian D, de Oliveira Otto MC, Lemaitre RN, Fretts AM, Hotamisligil G, Tsai MY, Siscovick DS, Nettleton JA: trans-Palmitoleic acid, other dairy fat biomarkers, and incident diabetes: the Multi-Ethnic Study of Atherosclerosis (MESA). *Am J Clin Nutr* 2013;97:854-61.
- ¹⁵ Mozaffarian D, Cao H, King IB, Lemaitre RN, Song X, Siscovick DS, Hotamisligil GS: Trans-palmitoleic acid, metabolic risk factors, and new-onset diabetes in U.S. adults: a cohort study. *Ann Intern Med* 2010;153:790-9.
- ¹⁶ Santaren ID, Watkins SM, Liese AD, Wagenknecht LE, Rewers MJ, Haffner SM, Lorenzo C, Hanley AJ: Serum pentadecanoic acid (15:0), a short-term marker of dairy food intake, is inversely associated with incident type 2 diabetes and its underlying disorders. *Am J Clin Nutr* 2014;100:1532-40.
- ¹⁷ Yakoob MY, Shi P, Willett WC, Rexrode KM, Campos H, Orav EJ, Hu FB: Mozaffarian D. Circulating biomarkers of dairy fat and risk of incident diabetes mellitus among men and women in the United States in two large prospective cohorts. *Circulation* 2016;133:1645-54.
- ¹⁸ O'Connor LM, Lentjes MA, Luben RN, KhawKT, Wareham NJ, Forouhi NG: Dietary dairy product intake and incident type 2 diabetes: a prospective study using dietary data from a 7-day food diary. *Diabetologia* 2014;57:909-17.
- ¹⁹ Ericson U, Hellstrand S, Brunkwall L, Schulz CA, Sonestedt E, Wallstrom P, Gullberg B, Wirfalt E, Orho-Melander M: Food sources of fat may clarify the inconsistent role of dietary fat intake for incidence of type 2 diabetes. *Am J Clin Nutr* 2015;101:1065-80.
- ²⁰ Diaz-Lopez A, Bullo M, Martinez-Gonzalez MA, Corella D, Estruch R, Fito M, Gomez-Gracia E, Fiol M, Garcia de la Corte FJ, Ros E, et al.: Dairy products consumption and risk of type 2 diabetes in an elderly Spanish Mediterranean population at high cardiovascular risk. *Eur J Nutr* 2016;55:349-60.
- ²¹ Bergholdt HK, Nordestgaard BG, Ellervik C: Milk intake is not associated with low risk of diabetes or overweight-obesity: a Mendelian randomization study in 97,811 Danish individuals. *Am J Clin Nutr* 2015;102:487-96.