What the Latest Evidence Tells Us About Fat and Cardiovascular Health

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Diabetes has long been considered a risk equivalent to coronary heart disease (CHD) (1,2). The first report of the National Cholesterol Education Program, released in 1988, encouraged therapeutic lifestyle changes (nutrition, weight management, and physical activity) as first-line therapy for treating high blood cholesterol. Included in these recommendations was advice to eat a low-fat, low-cholesterol diet (3). This article presents a summary of the current evidence regarding dietary fat as it relates to diabetes and heart health, including the shift to thinking about type (or quality) of fat, rather than focusing as much on quantity.

In 2013, the American College of Cardiology (ACC) and the American Heart Association (AHA) released new guidelines for the treatment of blood cholesterol. These guidelines recommended a significant shift from aiming for specific LDL cholesterol goals to considering the overall risk level for having both a heart attack and stroke (4). The guidelines also identified four major groups of patients for whom statin medications are indicated because they have the greatest likelihood of preventing stroke and heart attacks, including individuals with diabetes who are 40–75 years of age. Although treating based on risk now trumps treating to LDL targets, the ACC/AHA re-emphasized that lifestyle modification remains a crucial component of cardiovascular disease (CVD) risk reduction, both before and with the use of cholesterol-lowering medications (5).

As of 2015, the American Diabetes Association (ADA) Standards of Medical Care in Diabetes have aligned with the ACC/AHA guidelines and recommend statin therapy for all adults with diabetes who have CVD risk factors or overt CVD, unless contraindicated or not tolerated (6). Current diabetes nutrition recommendations center around individualized eating patterns that focus on a nutrient-rich, whole-foods approach (in appropriate portions) to attain individual blood glucose, blood pressure, blood lipid, and body weight goals, as well as to delay or prevent complications (6,7).

Although individualization remains important, many patients often ask their diabetes educators for specific "diets." Two evidence-based eating patterns often recommended for managing diabetes and lowering CVD risk include the Mediterranean and Dietary Approaches to Stop Hypertension (DASH) diets. By considering both of these eating patterns, nutrition recommendations can be individualized based on personal and cultural food preferences, while focusing on day-to-day meal planning rather than individual nutrients or specific foods (6,7). Each will be discussed in more detail later.

Evidence on Fat, Diabetes, and Cardiovascular Health

Many of the type 2 diabetes nutrition recommendations for dietary

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fat and heart health are the same as those recommended for the general population. According to a scientific report of the U.S. Department of Health and Human Services/U.S. Department of Agriculture (USDA) 2015 Dietary Guidelines Advisory Committee, multiple studies have found no significant associations of total fat reduction with cardiovascular events or mortality (8), and total fat does not appear to affect the incidence of type 2 diabetes (9).

Given that there is no conclusive evidence on the ideal amount of total fat for people with diabetes, diabetes educators should individualize goals to each patient's unique circumstances. For example, reducing overall calorie intake, including calories from fat, may be recommended for weight management (7).

Overall, it appears that fat quality is more important that fat quantity (7). That said, there has been considerable research published in recent years related to saturated fat (and what it is replaced with) and its impact on heart health.

Saturated Fats and Trans *Fats*

Substituting healthy unsaturated fats for saturated fats (SFAs) and *trans* fats is advised for CVD prevention for adults with type 2 diabetes (10). It is now well established that higher intake of *trans* fats from partially hydrogenated vegetable oils is associated with increased risk of CVD and should be minimized as much as possible (11).

Strong evidence from randomized, control trials (RCTs) shows that replacing saturated fats with polyunsaturated fatty acids (PUFAs) significantly reduces total and LDL cholesterol and modestly lowers CHD risk, with a 10% risk reduction for a 5% energy substitution. Replacing SFAs with monounsaturated fats (MUFAs) yielded uncertain effects in the meta-analysis (12).

Consuming carbohydrate in place of saturated fat reduces total and LDL cholesterol, but it also increases triglycerides and reduces HDL cholesterol (8,13). A meta-analysis looking at replacing SFA with carbohydrate found no benefit (13); however, treating all carbohydrates equally in terms of nutrition may be part of the reason for the null finding.

A 2010 prospective study of >53,000 men and women found that the type of carbohydrate consumed played a key role in a person's risk of CHD when replacing saturated fats with carbohydrate (14). The glycemic index, which essentially measures the glycemic response of carbohydrate-containing foods and categorizes them as low, moderate, or high, was used to differentiate carbohydrate (15). When high–glycemic index foods were substituted for saturated fats, there was a statistically significant positive association with risk of myocardial infarction, whereas there was a nonsignificant inverse association with myocardial infarction risk when low–glycemic index foods were substituted for SFAs (14).

Results of a prospective cohort study by Li et al. (16) further corroborate these findings. This study compared the effects of replacing SFAs with unsaturated fats or carbohydrate on CHD risk. The study showed that replacing SFAs with processed carbohydrate had no effect on CHD risk, whereas whole grains lowered CHD risk by 9%. Even more impressive, when the participants replaced 5% of their calories from SFAs with PUFAs, the risk for CHD decreased by 25%. Substituting MUFAs for SFAs lowered risk by 15% (16).

Polyunsaturated Fatty Acids

The evidence of cardioprotective benefits for replacing SFAs with PUFAs, especially linoleic acid, is stronger than for replacement with MUFAs. Further benefits to diabetes may be relevant as well; recent RCTs have found that consuming vegetable oils high in linoleic acid improves insulin sensitivity and may help in the prevention of diabetes (17,18). There are fewer data supporting oleic acid as cardioprotective and almost none showing an effect on insulin sensitivity.

Encouraging patients to eat foods rich in vegetable oils (e.g., nuts and seeds) in place of foods rich in SFAs from meats and high-fat dairy products is a practical way to replace unhealthy fats with healthy fats and improve health outcomes.

Based on observational studies, patients with diabetes should also be encouraged to eat more foods containing eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) omega-3 fatty acids (fatty fish). Omega-3 fatty acids, especially from fatty fish, have been shown to be beneficial in the prevention of heart disease and to have positive effects on lipoproteins. Individuals with diabetes, along with the general public, should be encouraged to eat fish (particularly fatty fish) at least two times (two 4-ounce servings) each week (7,19).

Although eating foods rich in EPA and DHA has been associated with positive health outcomes, taking omega-3 supplements has not. A literature review of omega-3 fatty acid supplementation and CVD risk was completed in 2013 and determined that the "evidence does not support recommending omega-3 (EPA and DHA) supplements for people with diabetes for the prevention or treatment of cardiovascular events" (7).

Monounsaturated Fatty Acids

The Academy of Nutrition and Dietetics Disorders of Lipid Metabolism Workgroup in 2010 (20) concurred with the USDA Nutrition Evidence Library (21), which states, "Strong evidence indicates that dietary monounsaturated fatty acids (MUFA) are associated with improved blood lipids related to both cardiovascular disease (CVD) and type 2 diabetes (T2D), when they are a replacement for dietary saturated fatty acids (SFA). The evidence shows that 5 percent energy replacement of SFA with MUFA decreases intermedi-

ate markers and the risk of CVD and T2D in healthy adults and improves insulin responsiveness in insulin resistant and T2D subjects."

Studies indicate that a MUFA-rich eating pattern benefits glycemic control and CVD risk factors in patients with type 2 diabetes (22,23). A study by Brehm et al. (24) found that a diet high in MUFAs had beneficial effects on cardiovascular risk factors, blood glucose, body weight, and body composition similar to a conventional lower-fat, high-carbohydrate diet (24).

Coconut Oil

The high level of SFAs in coconut oil (~90%) has long raised concerns about its impact on heart health. SFAs raise unhealthy levels of LDL cholesterol and give a small boost to HDL cholesterol. However, coconut oil, in particular, tends to raise HDL even more than other SFAs, which is often attributed to the fact that it consists mainly of medium-chain fatty acids and has a high percentage of lauric acid (44%) (25). A 2009 study from Brazil (26) found that, after 12 weeks of diet supplementation with 1 oz of coconut oil, participants experienced an improvement in their HDL/LDL cholesterol ratio and reduced their waist circumference. Given the brief intervention period for this study and the lack of RCTs exploring the effects of coconut oil on heart health, the role of coconut oil in heart disease requires further evaluation.

Eating Patterns

According to the current nutrition therapy recommendations for diabetes, "a variety of eating patterns (combinations of different foods or food groups) are acceptable for the management of diabetes. Personal preferences (e.g., tradition, culture, religion, health beliefs and goals, economics) and metabolic goals should be considered when recommending one eating pattern over another" (7). Because adults with diabetes often also have hypertension, dyslipidemia, or both, nutrition recommendations should be made with blood glucose, blood pressure, and lipid goals in mind. Eating patterns typically recommended for reducing heart disease risk include the Mediterranean and DASH eating patterns (6,7).

Mediterranean Eating Pattern

The current ADA nutrition therapy guidelines state that, "in people with type 2 diabetes, a Mediterranean, MUFA-rich eating pattern may benefit glycemic control and CVD risk factors and can therefore be recommended as an effective alternative to a lower-fat, higher-carbohydrate eating pattern" (7,22).

A systematic review ranked the Mediterranean eating pattern as the most likely dietary model to provide protection against CHD (5,27). Studies have found that the Mediterranean eating pattern improves CVD risk factors (blood pressure and lipids) in people with diabetes (28). This eating pattern has also been shown to reduce CVD events and stroke (27). Those who reduced their calorie intake while following a Mediterranean eating pattern improved their blood glucose levels as well (29).

The PREDIMED (Prevención con Dieta Mediterránea) nutritional intervention study assessed the efficacy of the Mediterranean eating pattern in the primary prevention of cardiovascular diseases. A Mediterranean eating pattern supplemented with extra-virgin olive oil or tree nuts was compared to a low-fat diet for incidence of cardiovascular death, myocardial infarction, and stroke. Participants did not have CVD at baseline but were at high risk (i.e., had diabetes or ≥3 major cardiovascular risk factors). The relative CVD risk reduction was ~30% (27).

DASH Eating Pattern

The DASH eating pattern is well documented as being effective in lowering blood pressure, a significant CVD risk factor (30), in those with or without metabolic syndrome (31). A DASH eating pattern demonstrates protective effects against CVD, CHD, stroke, and heart failure risk, with reductions of 20, 21, 19, and 29%, respectively (32). The DASH eating pattern also has been shown to have beneficial effects on weight, lipid, and glucose control (33). According to a recent systematic review, this eating pattern may lead to an improvement in insulin sensitivity independent of weight loss (34).

Because both the Mediterranean and DASH eating patterns reduce cardiometabolic risk, following either one, or a combination of both, is appropriate for individuals with diabetes.

Practical Tips for Incorporating Healthful Fats and Nutrient-Rich Foods Into a Heart-Healthy Diabetes Eating Plan

Because the diabetes nutrition recommendations for dietary fat and heart health are similar to those recommended for the general population, the new USDA dietary guidelines (19) apply to those who have diabetes. Individuals with diabetes may find it refreshing that nutrition guidelines recommended for them are the same as those recommended for their family and friends.

According to the 2015 Dietary Guidelines Advisory Committee report (8), refined carbohydrate and added sugars should be replaced by healthy sources of carbohydrate (e.g., whole grains, legumes, vegetables, and fruits) and healthy sources of fats (e.g., nonhydrogenated vegetable oils that are high in unsaturated fats, nuts, and seeds). The consumption of low-fat or nonfat products that contain high amounts of refined grains and added sugars should be discouraged (8).

Health care providers should encourage adults with diabetes to eat:

- Whole, minimally processed foods whenever possible
- An abundance of fruits and vegetables (aim for ≥5 servings/day; the DASH eating pattern recommends 8–10 servings/day)

TABLE 1. Sources of Healthful and Unhealthful Dietary Fats

Healthful Fats (Encourage Patients to Choose More Often)	Unhealthful Fats (Encourage Patients to Limit or Avoid)
PUFAs:	SFAs:
Food sources: nuts and seeds (walnuts, sunflower seeds, and ground flax seeds); fish (especially fatty fish such as salmon, mackerel, tuna, sardines, and herring); and sunflower, safflower, soybean, corn, and canola oils	Food sources: butter; meats; coconuts; poultry with skin; high-fat dairy products (e.g., whole or 2% milk, cream, and ice cream); processed meats (e.g., salami, bologna, sausage, ham, and bacon); and tropical oils (e.g., coconut, palm kernel, or palm oil)
MUFAs:	*Trans* fats:
Food sources: avocados; nuts (almonds, hazelnuts, and pecans) and seeds (pumpkin and sesame); peanut butter and other nut butters; and olive, peanut, safflower, sunflower, and canola oils	Food sources:* crackers, cookies, pastries, doughnuts, chips, stick margarines, and French fries

**Many of these foods can be found without* trans *fats; read food labels to identify these products.*

- Whole grains (aim for several servings—at least half of all grains consumed—of minimally processed grains each day)
- Low-fat dairy products (2–3 servings/day with DASH or several servings per week with a Mediterranean eating plan)
- Nuts, seeds, and legumes (daily on the Mediterranean eating pattern and weekly on the DASH eating pattern)
- Daily consumption of healthful fats (PUFAs, including omega-3 fatty acids, and MUFAs)

Providers should encourage their patients to eat healthful fats more often, with a particular emphasis on PUFAs/omega-3 fatty acids and MUFAs, while reducing their consumption of SFAs (particularly processed meats) and avoiding *trans* fats whenever possible. Additional information about healthful and unhealthful dietary fats is provided in Table 1.

Conclusion

Nutrition remains an essential element in the management of diabetes and CVD risk. In 2015, ADA and AHA released a joint scientific statement on the prevention of CVD in adults with type 2 diabetes emphasizing that lifestyle management (nutrition, physical activity, and education) is a cornerstone of optimal diabetes care (10). Patients should be encouraged to limit SFAs and omit *trans* fats as much as possible. When replacing SFAs, individuals with diabetes should focus on PUFAs, MUFAs, and minimally processed carbohydrate to realize a CVD reduction benefit. Although there is conflicting research regarding the benefits of replacing SFAs with MUFAs, there is strong evidence that a Mediterranean eating pattern supplemented with olive oil and nuts (i.e., high in MUFAs) is heart healthy. Emphasizing a whole-foods approach that is tailored to the health and personal, cultural, and religious needs of individual patients, rather than focusing on specific nutrients, will yield an eating pattern that is sustainable.

Duality of Interest

No potential conflicts of interest relevant to this article were reported.

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