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Dietary Saturated Fat and Cardiovascular Health: A Review of the Evidence

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BACKGROUND

Dietary fats and oils provide calories and essential fatty acids and are sources of fat-soluble vitamins A, D, E, and K. Certain types of fat, however, can increase risk of chronic cardiovascular diseases that affect the heart, blood vessels, and brain. The type of fat that is consumed can have either positive or negative effects on risk of cardiovascular disease (CVD). Saturated fatty acids (SFA) and *trans* fatty acids are generally considered unhealthy; whereas, monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA) are considered beneficial.

The effect of dietary SFA on CVD risk is partially mediated by effects on blood lipids, in particular, increased total cholesterol and low density lipoprotein (LDL) cholesterol. Elevated blood LDL cholesterol increases atherosclerotic lipid accumulation in blood vessels and is an intermediate marker of CVD progression. Therefore, reduction in SFA intake has been a key component of dietary recommendations to reduce risk of CVD. Currently, determining macronutrient replacements for SFA is an active area of investigation.

This *Nutrition Insight* provides a summary of the evidence-based systematic review on dietary SFA and CVD conducted by the 2010 Dietary Guidelines Advisory Committee (DGAC) and the USDA Nutrition Evidence Library (NEL) in support of the *Dietary Guidelines for Americans, 2010*.

REVIEW OF THE EVIDENCE

The 2005 Dietary Guidelines Advisory Committee addressed the issue of SFA intake and CVD risk and concluded that SFA intake should be kept as low as possible with a recommendation of <10 percent of calories from SFA (Dietary Guidelines Advisory Committee, 2005). This was consistent with the earlier Institute of Medicine (IOM) report that concluded there is no incremental level of SFA intake that does not incrementally increase CVD risk (Institute of Medicine, 2002). In 2010, the DGAC updated and re-examined the relationship between dietary SFA intake and risk of CVD, focusing on intermediate markers such as

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The USDA Nutrition Evidence Library (NEL) specializes in conducting systematic reviews to inform Federal nutrition policy and programs. The Library is a key resource for making food and nutrition research accessible to all Americans.

www.NEL.gov

LDL cholesterol and outcomes such as coronary events and coronary death (Dietary Guidelines Advisory Committee, 2010). This process was informed by a NEL evidence-based systematic review conducted on this topic that used a rigorous, transparent, and reproducible methodology. The full DGAC 2010 report can be accessed at www.dietaryguidelines.gov.

In brief, the NEL systematic review of the literature published from 2004 to 2009 identified 12 studies on SFA and CVD risk in healthy adults or those at elevated chronic disease risk. Overall, 11 intervention trials and 1 pooled analysis of 13 epidemiological studies were included. The intervention trials ranged in sample size from 14 to 191 subjects and the pooled analysis included 344,696 participants. The quality of the studies was assessed, and eight studies were given a positive quality rating and four were rated neutral. Further information on NEL search items, databases queried, evidence abstraction and analysis, and criteria for assessing study quality can be accessed at www.nutritionevidencelibrary.gov.

Most methodologically strong studies tested a reduction in an average American intake of SFA by replacement with PUFA, MUFA or, to a lesser extent, carbohydrates. Dietary SFA replacement with PUFA or MUFA resulted in significantly decreased total and LDL cholesterol, indicating an improved blood lipid profile. Replacement of SFA with carbohydrates decreased total and LDL cholesterol; however, compared to PUFA or MUFA, carbohydrate decreased HDL cholesterol and increased triglycerides. Decreased HDL cholesterol and increased triglycerides are blood lipid measures of increased CVD risk. Overall, these studies showed that blood lipid profiles are improved when SFA are replaced by PUFA or MUFA. By comparison, replacing SFA with carbohydrates

had some negative effects on blood lipids. However, these studies did not distinguish between the type and quality of carbohydrates, such as whole versus refined grains.

A pooled analysis of 13 epidemiologic studies showed a significant relationship between dietary SFA intake and increased risk of coronary events and coronary mortality in middle-aged and older men and women. The analysis showed that replacing 5 percent of total calories as SFA with PUFA would be associated with a decreased risk of non-fatal myocardial infarction and coronary death.

Overall, these results show that substituting SFA with unsaturated fats, such as replacing solid fats with oils, is a healthy food choice. Substituting SFA with carbohydrates, without regard to the quality of the carbohydrates, has not been shown to provide benefits.

CONCLUSIONS AND FUTURE RESEARCH

Based on their review of the science, the 2010 DGAC concluded there is strong evidence that dietary SFA increase serum total and LDL cholesterol and are associated with increased risk of CVD. The evidence shows that a decrease in SFA equivalent to 5 percent of calories, replaced by PUFA or MUFA, decreases risk of CVD in healthy adults. Researchers continue to investigate the optimal macro-nutrient substitutes for SFA, with an emphasis on the benefits of PUFA. Further investigation of types of carbohydrates that distinguish between degree of processing, fiber content, and glycemic index of carbohydrate replacements for SFA is ongoing.

FROM RESEARCH TO RECOMMENDATIONS

The *Dietary Guidelines for Americans (DGA), 2010* (available at www.dietaryguidelines.gov) recommends reducing SFA intake to less than 10 percent of calories by replacing them with PUFA and MUFA (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010). The DGA also indicates that lowering the percentage of calories from dietary SFA to 7 percent can further reduce the risk of CVD.

The current percentage of total calories from SFA in the American diet is 11 percent. Therefore, the DGA indicate Americans should limit consumption of major food sources high in SFA. Top food sources of SFA in the American diet include regular cheese; pizza; grain-based desserts; dairy desserts; chicken and chicken mixed dishes; and beef, beef mixed dishes, and burgers (National Cancer Institute, 2010). Examples of foods that are high in SFA, and lower SFA alternatives, are listed in table 1 (U.S. Department of Agriculture, 2010).

Table 1. Saturated fat and calorie content of selected foods

Food item	Saturated fat (grams)	Calories
Cheese (1 oz)		
Regular cheddar cheese	6.0	114
Low-fat cheddar cheese	1.2	49
Dairy-based desserts (½ cup)		
Regular ice cream	4.9	145
Frozen yogurt, low-fat	2.0	110
Chicken (½ chicken breast)		
Fried (meat, skin, and batter)	4.9	364
Roasted (meat, no skin)	0.9	141
Ground beef (3 oz, cooked)		
Regular ground beef (25% fat)	6.1	236
Extra lean ground beef (5% fat)	2.6	148

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