Healthy Fats & Fatty Acids
Current Dietary Recommendations and Popular Opinions

*Presentation 1 of 2*

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Outline

• Dietary Guidelines recommendations for fat and fatty acids from 1980-2015

• Evidence to support recommendations for SFA, MUFA and PUFA

• Recent SFA research - Conflicts and opinions

• Summary
Quantitative advice related to dietary fat, Dietary Guidelines for Americans, 1980-2015

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<tbody>
<tr>
<td>Total Fat</td>
<td>Avoid too much</td>
<td>Avoid too much</td>
<td>≤30%</td>
<td>≤30%</td>
<td>≤30%</td>
<td>20-35%¹</td>
<td>20-35%²</td>
<td>No Upper limit*</td>
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<tr>
<td>Saturated Fat</td>
<td>Avoid too much</td>
<td>Avoid too much</td>
<td>≤10%</td>
<td>≤10%</td>
<td>≤10%</td>
<td>≤10%; replace SFA with MUFA/PUFA</td>
<td>≤10%; replace SFA with PUFA/ MUFA</td>
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<tr>
<td>Cholesterol</td>
<td>Avoid too much</td>
<td>Avoid too much</td>
<td>Low</td>
<td>≤300mg</td>
<td>≤300mg</td>
<td>≤300mg</td>
<td>≤300mg</td>
<td>No upper limit*</td>
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Note: ¹30-35% for ages 2-3 years; 25-35% for ages 4-18 years.
Note: ²30-40% for children ages 1 to 3 years: 25-35% for ages 4-18 years
Note: *No longer considered nutrient of concern
Key Recommendations DGA 2010: Foods and food components to reduce

- Reduce daily sodium intake to < 2,300 milligrams (mg) and further reduce intake to 1,500 mg among persons who are 51 and older and those of any age who are African American or have hypertension, diabetes, or chronic kidney disease.

- **Consume < 10 percent of calories from saturated fatty acids** by replacing them with monounsaturated and polyunsaturated fatty acids.

- **Consume < 300 mg per day of dietary cholesterol.**

- Keep trans fatty acid as low as possible by limiting foods that contain synthetic sources of trans fats, such as partially hydrogenated oils, and by limiting other solid fats.

- **Reduce the intake of solid fats** and added sugars.

- Limit the consumption of foods that contain refined grains, especially refined grain foods that contain solid fats, added sugars, and sodium.

- If alcohol is consumed, it should be consumed in moderation—up to 1 drink/day for women and 2 drinks/day for men.
2010 Dietary Guidelines: Fatty Acid Profiles of Solid Fats (*to Limit*) and Liquid Vegetable Oils (*to Consume*)
Dietary Guidelines Advisory Committee (DGAC) 2015 Key Recommendations

- The overall body of evidence examined by the 2015 DGAC identifies that a **healthy dietary pattern** is higher in vegetables, fruits, whole grains, low- or non-fat dairy, seafood, legumes, and nuts; moderate in alcohol (among adults); lower in red and processed meats; and low in sugar-sweetened foods and drinks and refined grains.

- The goals for the general population are: < 2,300 mg dietary sodium per day (or age-appropriate Dietary Reference Intake amount), < **10 percent of total calories from saturated fat/day**, and a maximum of 10 percent of total calories from added sugars/day.

- **Sources of saturated fat should be replaced** with unsaturated fat, particularly polyunsaturated fatty acids.
Relationship Between Intake of SFA and Risk of Cardiovascular Disease

- **Strong and consistent evidence** from RCTs shows that replacing SFA with unsaturated fats, especially PUFA, significantly reduces total and LDL-C.
  - Replacing SFA with carbohydrates (sources not defined) also reduces total and LDL-C, but significantly increases TG and reduces HDL-C.

- **Strong and consistent evidence** from RCTs and statistical modeling in prospective cohort studies shows that replacing SFA with PUFA reduces the risk of CVD events and coronary mortality.
  - For every 1% of energy intake from SFA replaced with PUFA, incidence of CHD is reduced by 2 to 3%. However, reducing total fat (replacing total fat with overall carbohydrates) does not lower CVD risk.

- **Consistent evidence** from prospective cohort studies shows that higher SFA intake as compared to total carbohydrates is not associated with CVD risk.

- **DGAC 2015 Grade: Strong**
DGAC 2015 Recommends Replacement of Solid Fats with Unsaturated Oils

Reducing total fat (replacing total fat with overall carbohydrates) does not lower CVD [cardiovascular disease] risk. Dietary advice should emphasize optimizing types of dietary fat and not reducing total fat.

Limiting total fat was also not recommended for obesity prevention; the focus was on healthful food-based diet patterns that include more vegetables, fruits, whole grains, seafood, legumes, and dairy products and include less meats, sugar-sweetened foods and drinks, and refined grains.
Evidence in Support of DGAC 2015 Recommendations for Total Fat and Dietary Cholesterol

- **Total fat**
  - In a Cochrane meta-analysis of trials with 24 comparisons and 65,508 participants of whom 7% had a cardiovascular event, Hooper et al. (Cochrane Database Syst Rev. 2012 May 16;5:CD002137) found no significant association of total fat reduction with cardiovascular events or mortality.

- **Dietary cholesterol**
  - The 2015 DGAC will not bring forward this recommendation (≤ 300 mg/d) because available evidence shows no appreciable relationship between consumption of dietary cholesterol and serum cholesterol, consistent with the conclusions of the American Heart Association (AHA) and American College of Cardiology (ACC). Thus, cholesterol is not a nutrient of concern for overconsumption.
Forty studies (17 cohorts in 19 publications with 361,923 subjects and 19 trials in 21 publications with 632 subjects) published between 1979 and 2013 were included.

Dietary cholesterol was not significantly associated with coronary artery disease, ischemic stroke or hemorrhagic stroke.

Dietary cholesterol significantly increased both serum total cholesterol and LDL-C.

Dietary cholesterol also significantly increased HDL-C and the LDL-C:HDL-C ratio.
Dietary Cholesterol – LDL-C

Dietary Cholesterol – HDL-C

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<tr>
<th>Author</th>
<th>Year</th>
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<th>Subgroup</th>
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<th>Net Change (95% CI) (mg/dL)</th>
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<td>4.5 (-3.2, 12.1)</td>
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<th>Control Dose (mg/d)</th>
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<td>RCT (C)</td>
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<td></td>
<td></td>
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<td>1.0 (-2.1, 4.1)</td>
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Evidence in Support of DGAC 2015 Recommendations for Total Fat (and other Macronutrients) and Body Weight

1. There is strong and consistent evidence that when calorie intake is controlled, macronutrient proportion of the diet is not related to losing weight.
2. A moderate body of evidence provides no data to suggest that any one macronutrient is more effective than any other for avoiding weight re-gain in weight reduced persons.
3. A moderate body of evidence demonstrates that diets with less than 45% of calories as carbohydrates are not more successful for long-term weight loss (12 months). There is also some evidence that they may be less safe. In shorter-term studies, low-calorie, high-protein diets may result in greater weight loss, but these differences are not sustained over time.
4. A moderate amount of evidence demonstrates that dietary patterns with less than 45% calories from carbohydrate or more than 35% calories from protein are not more effective than other diets for weight loss or weight maintenance, are difficult to maintain over the long term, and may be less safe.”
Evidence to Support Current Dietary Recommendations for Fatty Acids
Change in LDL-C with Different Dietary Fats Substituted for CHO

Percentage of Calories Replaced

Micha & Mozaffarian *Lipids* 2010;45:893–905.
“Together the studies provide moderate-quality evidence that reducing saturated fat and replacing it with polyunsaturated fats reduces our risk of cardiovascular disease.”
Effect of Reduced Intake from SFA Relative to Higher Intake for Reduction in Disease Risk?

- Reducing saturated fat for at least two years suggested no clear effects on all-cause or cardiovascular mortality, but a 17% reduction in combined cardiovascular events.
  - Moderate quality evidence

- There were greater reductions (27%) in cardiovascular events in studies that replaced saturated fats by PUFAs than in studies with replacement with MUFAs, CHO or protein, where there was little evidence of any effect.
  - Moderate-quality evidence of effects of replacing saturated fat with PUFA
  - Low-quality evidence of effects of replacing saturated fat with MUFA
  - Moderate-quality evidence of effects of replacing saturated fat with CHO
  - Moderate- or low-quality evidence suggested no clear effects of replacing saturated fat with protein on any health outcomes

Conclusion of Cochrane Review 2015

• Results from 15 RCTs (59,000 participants) indicate a small, but potentially important decrease in CVD risk with a reduction in dietary SFA. Replacing SFA with PUFA "appears to be a useful strategy, and replacing with CHO appears less useful".

• Effects of replacement with MUFA were unclear due to only 1 small trial.

• "Lifestyle advice to all those at risk of CVD should continue to include permanent reduction of dietary SFA and partial replacement by unsaturated fats. The ideal type of unsaturated fat is unclear."
Limitations of the Current Research that Challenges SFA Recommendations
“Our half-century effort to cut back on the consumption of meat, eggs and whole-fat dairy has a tragic quality. More than a billion dollars have been spent trying to prove Ancel Keys's hypothesis, but evidence of its benefits has never been produced. It is time to put the saturated-fat hypothesis to bed and to move on to test other possible culprits for our nation's health woes.”
Eat Butter. Scientists labeled fat the enemy. Why they were wrong

Promotes Strong Bones

- Improves Immune System
Conclusion: Current evidence does not clearly support cardiovascular guidelines that encourage high consumption of polyunsaturated fatty acids and low consumption of total saturated fats.
OBSERVATIONS

FROM THE HEART

Saturated fat is not the major issue
Let's bust the myth of its role in heart disease

Aseem Malhotra interventional cardiology specialist registrar, Croydon University Hospital, London

Re: Saturated fat is not the major issue
30 October 2013

Bravo Dr. Malhotra for an astute, erudite and extremely elegant article. May the this be part of the beginning of the end for all the misinformation, propaganda and incorrect "science" promulgated by so-called "nutritionists" and their useful idiot fellow professionals, many of us in the medical profession included, that plays into the hands of the food industry.

Re: Saturated fat is a major issue.
29 October 2013

Saturated fat is very bad news. The energy content of one gram of fat at 9 Calories is twice that of a gram of carbohydrate at 4 Calories so limiting fat and sugar intake to avoid visceral obesity and dyslipidaemia is essential. Fat is more energy dense than carbohydrate.
"They have done a huge amount of damage," says Walter Willett, chair of the nutrition department at the Harvard School of Public Health in Boston. "I think a retraction with similar press promotion should be considered."

The errors [in this study] "demonstrate shoddy research and make one wonder whether there are more that haven't been detected," writes Jim Mann, a researcher at the University of Otago, Dunedin, in New Zealand, writes in an e-mail. "If I had been the referee I would have recommended rejection."
Problems with Chowdhury et al. 2014
See comments on Ann Intern Med website:

- Gross errors in data abstraction from original papers
- Omitted important studies, especially on PUFA
- Omitted important evidence (e.g., feeding studies)
- Lack of specific comparisons, and failure to acknowledge this
- Misrepresented findings (especially for long-chain N-3 PUFA)
- Failed to acknowledge other summaries based on primary data that had different conclusions
Trans Fatty Acids - Multivariable Adjusted Relative Risk of CHD Associated with Trans Fatty Acid Intake

<table>
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<tr>
<th>Type and Year of Study</th>
<th>No. of Subjects</th>
<th>No. of Events</th>
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<tbody>
<tr>
<td><strong>Prospective cohort studies</strong></td>
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<tr>
<td>Nurses’ Health Study, 2005</td>
<td>78,778</td>
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<td>Health Professionals Follow-up Study, 2005</td>
<td>38,461</td>
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<td>Alpha-Tocopherol Beta-Carotene Cancer Prevention Study, 1997</td>
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<td>Zutphen Elderly Study, 2001</td>
<td>667</td>
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<td><strong>Pooled prospective studies</strong></td>
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<td>EURAMIC, 1995</td>
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<td>Costa Rica, 2003</td>
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<td>482</td>
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<td>Australia, 2004</td>
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<td><strong>Pooled prospective and retrospective studies</strong></td>
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Cardioprotective Benefits of Linoleic Acid

Dietary LA was associated with a 15% lower risk of CHD events and 21% lower risk of CHD deaths

Effects on CHD Risk of Consuming PUFA, CHO, or MUFA in Place of SFA

Mozaffarian et al., *PLOS Medicine*. 2010;7:Issue 3
Figure Legend:

Fat, Carbohydrates, and Heart Disease: Estimated Percentage of Changes in the Risk of Coronary Heart Disease Associated With Isocaloric Substitutions of 1 Dietary Component for Another
Dietary monounsaturated fats for the prevention of metabolic syndrome and atherosclerotic cardiovascular disease risk

Summary

• Dietary Guidelines advise decreasing SFA and TFA. DGAC 2015 recommends replacing them with unsaturated fat, particularly PUFA.

• New research is showing that MUFA and carbohydrates from whole grains when substituted for SFA, decreases CHD risk.
Thank You