Update on new dietary fat recommendations

Heidi Wengreen, RDN, PhD
Associate Professor of Nutrition
Utah State University
Learning objectives

1. Describe at least one common misconception about the relationship between dietary fat and health.

2. List current recommendations regarding dietary fat.

3. Plan a one day diet that follows the current recommendations.
Outline

• T/F quiz
• History of dietary fat recommendations in the U.S.
• Current recommendations
• Fitting recommendations into dietary patterns
• T/F quiz - revisited
True or False?

• Low-fat diets are the best diets for those at risk for cardiovascular disease.
• Cholesterol rich foods (like eggs) are bad for you.
• Your total and LDL cholesterol levels are the best indicators of your risk for a heart attack.
• Saturated fat raises your “bad” cholesterol and that causes heart disease.
• Low-fat options are generally “healthier” options (low fat vs. full fat yogurt, salad dressing).
A big FAT lie?
The History of dietary guidance about dietary fat

• Ancel Keys and the Seven Country Study and prior work (1958)
• Keys Diet Heat Hypothesis
• Keys persuaded the American Heart Association to release 1st guidelines targeting fat → many scientists opposed it (John Yudkin)!
• The first Dietary Goals for the United states (1977)
Keys’s 1952 Chart:
Fat Calories vs. Deaths from Degenerative Heart Disease

Degenerative Heart Disease 1948–49, Men

- Japan
- Italy
- Japan
- U.S.A.
- Canada
- Australia
- England and Wales

Age 55–59
Age 45–49

Deaths per 1000

Fat Cal. as % of Total

22 countries instead of 7? Weaker association
Classic Diet-Heart Hypothesis

Diet

↑ Saturated fat, ↑ Cholesterol
↓
↑ Serum Cholesterol
↓
Atheromatous Plaques
↓
Coronary Artery Narrowing
↓
Myocardial Infarction
DIETARY GOALS FOR THE UNITED STATES

PREPARED BY THE STAFF OF THE
SELECT COMMITTEE ON NUTRITION
AND HUMAN NEEDS
UNITED STATES SENATE

FEBRUARY 1977

Printed for the use of the Select Committee on Nutrition
and Human Needs

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON, D.C.: 1977

U.S. DIETARY GOALS

1. Increase carbohydrate consumption to account for 55 to 60 percent of the energy (caloric) intake.
2. Reduce overall fat consumption from approximately 40 to 30 percent energy intake.
3. Reduce saturated fat consumption to account for about 10 percent of total energy intake; and balance that with poly-unsaturated and mono-unsaturated fats, which should account for about 10 percent of energy intake each.
4. Reduce cholesterol consumption to about 300 mg. a day.
5. Reduce sugar consumption by about 40 percent to account for about 15 percent of total energy intake.
6. Reduce salt consumption by about 50 to 85 percent to approximately 3 grams a day.

The Goals Suggest the Following Changes in Food Selection and Preparation

1. Increase consumption of fruits and vegetables and whole grains.
2. Decrease consumption of meat and increase consumption of poultry and fish.
3. Decrease consumption of foods high in fat and partially substitute poly-unsaturated fat for saturated fat.
4. Substitute non-fat milk for whole milk.
5. Decrease consumption of butterfat, eggs and other high cholesterol sources.
6. Decrease consumption of sugar and foods high in sugar content.
7. Decrease consumption of salt and foods high in salt content.
History of the Total Fat Dietary Guidelines

• 1980
  - Avoid Too Much Fat:
  - A diet low in fat makes it easier for you to include the variety of foods you need for nutrients without exceeding your calorie needs because fat contains over twice the calories of an equal amount of carbohydrates or protein.

• 1985
  - Foods high in fat should be used sparingly
  - Americans. But for the U.S. population as a whole, it is sensible to reduce daily consumption of fat. This suggestion is

• 1990
  - Keep total fat intake moderate
  - The types of fatty acids consumed are more important in influencing the risk of cardiovascular disease than is the total amount of fat in the diet. Animal

• 1995
  - Keep total fat intake between 20 to 35 percent of calories, with most fats coming from sources of polyunsaturated and monounsaturated fatty acids, such as fish, nuts, and vegetable oils.

• 2000

• 2005

• 2010

• 2015

?
Fat intake and obesity 1980s to now

US Fat Intake vs. Obesity Prevalence, 1980-2010

Sources: USDA Economic Research Service, CDC NHANES surveys  
Prepared by Stephan J. Guyenet
Sugar intake and obesity 1980s to now


Sources: USDA Economic Research Service, CDC NHANES surveys
Prepared by Stephan J. Guyenet
The average American diet*

Percent of population eating recommended amounts

Vegetables: Too little
Dairy
Fruit
Oils
Grains
Proteins

Percent of population exceeding recommended amounts

Added sugars
Saturated fats
Sodium (salt): Too much

*For people older than 1, based on a 2007-2010 study

Source: Health.gov

The issue of saturated fats — that is, those fats characteristic of meat and dairy products — is especially charged politically because it serves as a proxy for the arguments over the morality and health effects of meat.
Dietary Guidelines for Americans 2015

- Emphasis is on healthy eating patterns. Including,
  - Fat-free or low-fat dairy, including milk, yogurt, cheese, and or fortified soy beverages
  - Oils (vs. saturated and trans fat)

- Limit trans fat (same)
- Limit saturated fat to <10 percent of calories (same)
- NO quantification of cholesterol limit (different)
- Total fat? (quietly ignored)
✓ Limit trans fat *(same)*

✓ Limit saturated fat to <10 percent of calories (same)

✓ NO quantification of cholesterol limit (different)

✓ Total fat? (quietly ignored)
Trans fat = partially hydrogenated vegetable oil → look for this in ingredient lists.
FDA recently removed PHO’s GRAS status (3- years from June 2015 to comply)
What to eat? (trans fat)

• Naturally occurring trans fat in meat and dairy is OK.
• There is **NO ROOM** for PHOs.
✓ Limit trans fat (same)
✓ Limit saturated fat to <10 percent of calories (same)
✓ NO quantification of cholesterol limit (different)
✓ Total fat? (quietly ignored)
Dietary Guidelines- 2015?

Cholesterol. Previously, the Dietary Guidelines for Americans recommended that cholesterol intake be limited to no more than 300 mg/day. The 2015 DGAC will not bring forward this recommendation because available evidence shows no appreciable relationship between consumption of dietary cholesterol and serum cholesterol, consistent with the conclusions of the AHA/ACC report.\textsuperscript{2,35} Cholesterol is not a nutrient of concern for overconsumption.
2015-2020 DGAs for Americans

**Dietary Cholesterol**

The body uses cholesterol for physiological and structural functions but makes more than enough for these purposes. Therefore, people do not need to obtain cholesterol through foods.

The Key Recommendation from the *2010 Dietary Guidelines* to limit consumption of dietary cholesterol to 300 mg per day is not included in the 2015 edition, but this change does not suggest that dietary cholesterol is no longer important to consider when building healthy eating patterns. As recommended by the IOM,[24] individuals should eat as little dietary cholesterol as possible while consuming a healthy eating pattern. In general, foods that are higher in dietary cholesterol, such as fatty meats and high-fat dairy products, are also higher in saturated fats. The USDA Food Patterns are limited in saturated fats, and because of the commonality of food sources of saturated fats and dietary cholesterol, the Patterns are also low in dietary cholesterol. For example, the Healthy U.S.-Style Eating Pattern contains approximately 100 to 300 mg of cholesterol across the 12 calorie levels. Current average intake of dietary cholesterol among those 1 year and older in the United States is approximately 270 mg per day.
Dietary cholesterol and heart disease?

- In 1912 Anichkov discovered that feeding cholesterol to rabbits led to atherosclerosis.
- Rabbits are herbivores- metabolize cholesterol differently
- 80% of the cholesterol in our body is made by our body
- 1 egg = ~200 mg of cholesterol

### Change in LDL, HDL, and LDL Size as a Response to DC provided by Egg in Various Populations

<table>
<thead>
<tr>
<th>POPULATION</th>
<th>DURATION</th>
<th>ADDT’L DC</th>
<th>LDL</th>
<th>HDL</th>
<th>LDL:HDL RATIO</th>
<th>LDL SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHILDREN</td>
<td>4 wk</td>
<td>518 mg/d</td>
<td>↑</td>
<td>↑</td>
<td>No Change</td>
<td>↑</td>
</tr>
<tr>
<td>WOMEN</td>
<td>4 wk</td>
<td>640 mg/d</td>
<td>↑</td>
<td>↑</td>
<td>No Change</td>
<td>↑</td>
</tr>
<tr>
<td>MEN</td>
<td>12 wk</td>
<td>640 mg/d</td>
<td>No Change</td>
<td>↑</td>
<td>↑</td>
<td>No Change</td>
</tr>
<tr>
<td>MEN/WOMEN</td>
<td>12 wk</td>
<td>215 mg/d</td>
<td>No Change</td>
<td>↑</td>
<td>↑</td>
<td>No Change</td>
</tr>
<tr>
<td>MEN/WOMEN</td>
<td>4 wk</td>
<td>640 mg/d</td>
<td>↑</td>
<td>↑</td>
<td>No Change</td>
<td>↑</td>
</tr>
<tr>
<td>MEN/WOMEN</td>
<td>12 wk</td>
<td>250 mg/d</td>
<td>No Change</td>
<td>↑</td>
<td>↑</td>
<td>No Change</td>
</tr>
<tr>
<td>MEN/WOMEN</td>
<td>12 wk</td>
<td>400 mg/d</td>
<td>No Change</td>
<td>No Change</td>
<td>No Change</td>
<td>N/A</td>
</tr>
</tbody>
</table>

What to eat? (cholesterol)

• U.S. Healthy Eating Pattern
• Eggs are listed with other protein foods including meats, poultry, and eggs (10-28 oz-eq/week for a 1,000 – 2,200 kcalories diet)
• A few eggs a week is A-ok! (2-3 eggs per week)
✓ Limit trans fat (same)
✓ Limit saturated fat to <10 percent of calories (same)
✓ NO quantification of cholesterol limit (different)
✓ Total fat? (quietly ignored)
History of Saturated Fat Guidelines

- 1980: Populations like ours with diets high in saturated fats and cholesterol tend to have high blood cholesterol levels. Individuals within these populations usually have greater risks of having heart attacks than people eating low-fat, low-cholesterol diets.

- 1985: Cancer. The higher levels of saturated fat and cholesterol in our diets are linked to our increased risk for heart disease.

- 1990: Choose a diet low in saturated fat.

- 1995: Choose foods low in saturated fat.

- 2000: Eating extra saturated fat, high levels of cholesterol, and excess calories will increase blood cholesterol in many people. Of these, saturated fat has the greatest influence. The

- 2005: ...most Americans need to decrease their intakes of saturated fat and trans fats.

- 2010: Therefore, have no dietary requirement for saturated fatty acids. A strong body of evidence indicates that higher intake of most dietary saturated fatty acids is associated with higher levels of blood total cholesterol and low-density lipoprotein (LDL).

- 2015: ...should continue to monitor saturated fat intake. Saturated fat is still a nutrient of concern for overconsumption, particularly for those older than the age of 50 years.
Foods high in SFA should be replaced with foods high in unsaturated fats, and other choices to reduce solid fats...
Meta-analysis of prospective cohort studies evaluating the association of saturated fat with cardiovascular disease\textsuperscript{1–5}

Patty W Siri-Tarino, Qi Sun, Frank B Hu, and Ronald M Krauss

2010
**FIGURE 2.** Risk ratios and 95% CIs for fully adjusted random-effects models examining associations between saturated fat intake in relation to coronary heart disease and stroke. \(^1\)Updated data were provided by respective investigators (4, 5, 8, 18, 29, 35) or derived from a provided data set (9, 36). SAT: saturated fat intake; IV: inverse variance.
Saturated Fat and Cardiometabolic Risk Factors, Coronary Heart Disease, Stroke, and Diabetes: a Fresh Look at the Evidence

Renata Micha • Dariush Mozaffarian

A review of evidence from randomized controlled trials and prospective cohort studies.
Changes in Total Cholesterol: HDL-C Ratio for Consumption of SFA, MUFA, PUFA, and TFA

What you replace saturated fat with matters!

Fig. 2 Changes in blood lipid levels for consumption of saturated fatty acids (SFA), monounsaturated fatty acids (MUFA), polyunsaturated fatty acids (PUFA), or trans fatty acids (TFA) as an isocaloric replacement for carbohydrate (CHO) as a reference, based on two meta-analyses of randomized controlled feeding trials [5, 6]. β reflects the change for each 1% energy isocaloric replacement; *P < 0.05
Effects of dietary fatty acids and carbohydrates on the ratio of serum total to HDL cholesterol and on serum lipids and apolipoproteins: a meta-analysis of 60 controlled trials.

Mansink RP, Zock PL, Kester AD, Katan MB.

Abstract

BACKGROUND: The effects of dietary fats on the risk of coronary artery disease (CAD) have traditionally been estimated from their effects on LDL cholesterol. Fats, however, also affect HDL cholesterol, and the ratio of total to HDL cholesterol is a more specific marker of CAD than is LDL cholesterol.

OBJECTIVE: The objective was to evaluate the effects of individual fatty acids on the ratio of total to HDL cholesterol and on serum lipoproteins.

DESIGN: We performed a meta-analysis of 60 selected trials and calculated the effects of the amount and type of fat on total:HDLLDL cholesterol and on other lipids.

RESULTS: The ratio did not change if carbohydrates replaced saturated fatty acids, but it decreased if cis unsaturated fatty acids replaced saturated fatty acids. The effect on total:HDLLDL cholesterol of replacing trans fatty acids with a mix of carbohydrates and cis unsaturated fatty acids was almost twice as large as that of replacing saturated fatty acids. Lauric acid greatly increased total cholesterol, but much of its effect was on HDL cholesterol. Consequently, oils rich in lauric acid decreased the ratio of total to HDL cholesterol. Myristic and palmitic acids had little effect on the ratio, and stearic acid reduced the ratio slightly. Replacing fats with carbohydrates increased fasting triacylglycerol concentrations.

CONCLUSIONS: The effects of dietary fats on total:HDLLDL cholesterol may differ markedly from their effects on LDL. The effects of fats on these risk markers should not in themselves be considered to reflect changes in risk but should be confirmed by prospective observational studies or clinical trials. By that standard, risk is reduced most effectively when trans fatty acids and saturated fatty acids are replaced with cis unsaturated fatty acids. The effects of carbohydrates and of lauric acid-rich fats on CAD risk remain uncertain.
Predicted changes ($\Delta$) in the ratio of serum total to HDL cholesterol and in LDL- and HDL-cholesterol concentrations when carbohydrates constituting 1% of energy are replaced isoenergetically with lauric acid (12:0), myristic acid (14:0), palmitic acid (16:0...)

Different saturated fatty acids have different effects on LDL, HDL, and total cholesterol: HDL ratios!
Association of dietary, circulating, and supplement fatty acids with coronary risk: a systematic review and meta-analysis.


Erratum in

Abstract
BACKGROUND: Guidelines advocate changes in fatty acid consumption to promote cardiovascular health.

PURPOSE: To summarize evidence about associations between fatty acids and coronary disease

DATA SOURCES: MEDLINE, Science Citation Index, and Cochrane Central Register of Controlled Trials through July 2013.

STUDY SELECTION: Prospective, observational studies and randomized, controlled trials.

DATA EXTRACTION: Investigators extracted data about study characteristics and assessed study biases.

DATA SYNTHESIS: There were 32 observational studies (530,525 participants) of fatty acids from dietary intake; 17 observational studies (25,721 participants) of fatty acid biomarkers; and 27 randomized, controlled trials (103,052 participants) of fatty acid supplementation. In observational studies, relative risks for coronary disease were 1.02 (95% CI, 0.97 to 1.07) for saturated, 0.99 (CI, 0.89 to 1.09) for monounsaturated, 0.93 (CI, 0.84 to 1.02) for long-chain ω-3 polyunsaturated, 1.01 (CI, 0.96 to 1.07) for ω-6 polyunsaturated, and 1.16 (CI, 1.06 to 1.27) for trans fatty acids when the top and bottom thirds of baseline dietary fatty acid intake were compared. Corresponding estimates for circulating fatty acids were 1.06 (CI, 0.86 to 1.30), 1.06 (CI, 0.97 to 1.17), 0.84 (CI, 0.63 to 1.11), 0.94 (CI, 0.84 to 1.06), and 1.05 (CI, 0.75 to 1.44), respectively. There was heterogeneity of the associations among individual circulating fatty acids and coronary disease. In randomized, controlled trials, relative risks for coronary disease were 0.97 (CI, 0.69 to 1.36) for α-linolenic, 0.94 (CI, 0.86 to 1.03) for long-chain ω-3 polyunsaturated, and 0.89 (CI, 0.71 to 1.12) for ω-6 polyunsaturated fatty acid supplementation.

LIMITATION: Potential biases from preferential publication and selective reporting.

CONCLUSION: Current evidence does not clearly support cardiovascular guidelines that encourage high consumption of polyunsaturated fatty acids and low consumption of total saturated fats.

PRIMARY FUNDING SOURCE: British Heart Foundation, Medical Research Council, Cambridge National Institute for Health Research Biomedical Research Centre, and Gates Cambridge.
Figure 1. RRs for coronary outcomes in prospective cohort studies of dietary fatty acid intake.

<table>
<thead>
<tr>
<th>Dietary Fatty Acid Intake</th>
<th>Studies, n</th>
<th>Participants, n</th>
<th>Events, n</th>
<th>RR (95% CI)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total saturated fatty acids</td>
<td>20</td>
<td>283 963</td>
<td>10 518</td>
<td>1.02 (0.97–1.07)</td>
</tr>
<tr>
<td>Total monounsaturated fatty acids</td>
<td>9</td>
<td>143 985</td>
<td>6020</td>
<td>0.99 (0.89–1.09)</td>
</tr>
<tr>
<td>Total ω-3 fatty acids</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>α-Linolenic</td>
<td>7</td>
<td>154 338</td>
<td>6615</td>
<td>0.99 (0.86–1.14)</td>
</tr>
<tr>
<td>Total long-chain ω-3 fatty acids</td>
<td>16</td>
<td>422 071</td>
<td>8313</td>
<td>0.93 (0.84–1.02)</td>
</tr>
<tr>
<td>Total ω-6 fatty acids</td>
<td>6</td>
<td>169 935</td>
<td>5884</td>
<td>1.01 (0.96–1.07)</td>
</tr>
<tr>
<td>Total trans fatty acids</td>
<td>5</td>
<td>155 270</td>
<td>4662</td>
<td>1.16 (1.06–1.27)</td>
</tr>
</tbody>
</table>

Size of the data marker is proportional to the inverse of the variance of the RR. RR = relative risk.

* Pooled estimate based on random-effects meta-analysis. Corresponding forest plots, $I^2$ estimates, and pooled RRs based on fixed-effects meta-analysis are provided in Supplement 1, available at www.annals.org.
Fatty Acid Composition

Polyunsaturated Fat
Monounsaturated Fat
Saturated Fat

Cocnut Oil
Extra Virgin Olive Oil
Avocado Oil
Peanut Oil
Canola Oil
Sesame Oil
Soybean Oil
Corn Oil
Grapeseed Oil

Fatty Acid Percentages

0% 20% 40% 60% 80% 100%

Fatty Acid Percentages

Polyunsaturated Fat
Monounsaturated Fat
Saturated Fat
### Saturated fat profile of common foods; Esterified fatty acids as percentage of total fat[^9]

<table>
<thead>
<tr>
<th>Food</th>
<th>Lauric acid</th>
<th>Myristic acid</th>
<th>Palmitic acid</th>
<th>Stearic acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coconut oil</td>
<td>47%</td>
<td>18%</td>
<td>9%</td>
<td>3%</td>
</tr>
<tr>
<td>Palm kernel oil</td>
<td>48%</td>
<td>1%</td>
<td>44%</td>
<td>5%</td>
</tr>
<tr>
<td>Butter</td>
<td>3%</td>
<td>11%</td>
<td>29%</td>
<td>13%</td>
</tr>
<tr>
<td>Ground beef</td>
<td>0%</td>
<td>4%</td>
<td>26%</td>
<td>15%</td>
</tr>
<tr>
<td>Salmon</td>
<td>0%</td>
<td>1%</td>
<td>29%</td>
<td>3%</td>
</tr>
<tr>
<td>Egg yolks</td>
<td>0%</td>
<td>0.3%</td>
<td>27%</td>
<td>10%</td>
</tr>
<tr>
<td>Cashews</td>
<td>2%</td>
<td>1%</td>
<td>10%</td>
<td>7%</td>
</tr>
<tr>
<td>Soybean oil</td>
<td>0%</td>
<td>0%</td>
<td>11%</td>
<td>4%</td>
</tr>
</tbody>
</table>
What to eat? (saturated fat)

- Limit your intake of these sources of saturated fat
  - 10% of 2,000 calories per day is 200 calories or 22 grams of saturated fat

- 3 ounces of beef = 6 grams SFA; 1 Tbsp butter = 7 grams SFA; 1 ounces of cheddar cheese = 5 grams SFA; 0.5 cup chocolate ice cream = 5 grams SFA

- fatty beef (high in stearic acid; C18)
  - lamb,
  - pork,
  - poultry with skin,
  - lard and cream,
  - butter,
  - cheese and
- other dairy products made from whole or reduced-fat (2 percent) milk,
- Coconut (high in lauric acid; 12C) and palm oil
✓ Limit trans fat (same)
✓ Limit saturated fat to <10 percent of calories (same)
✓ NO quantification of cholesterol limit (different)
✓ Total fat? (quietly ignored)
What is the most important dietary factor?

Most Favorable VS Least Favorable Population Quintile

- Vegetables
- Fruits
- Alcohol
- Whole Grains
- SFA

Percent Reduction In CVD Risk
Primary prevention of cardiovascular disease with a Mediterranean diet.


Abstract

BACKGROUND: Observational cohort studies and a secondary prevention trial have shown an inverse association between adherence to the Mediterranean diet and cardiovascular risk. We conducted a randomized trial of this diet pattern for the primary prevention of cardiovascular events.

METHODS: In a multicenter trial in Spain, we randomly assigned participants who were at high cardiovascular risk, but with no cardiovascular disease at enrollment, to one of three diets: a Mediterranean diet supplemented with extra-virgin olive oil, a Mediterranean diet supplemented with mixed nuts, or a control diet (advice to reduce dietary fat). Participants received quarterly individual and group educational sessions and, depending on group assignment, free provision of extra-virgin olive oil, mixed nuts, or small nonfood gifts. The primary end point was the rate of major cardiovascular events (myocardial infarction, stroke, or death from cardiovascular causes). On the basis of the results of an interim analysis, the trial was stopped after a median follow-up of 4.8 years.

RESULTS: A total of 7447 persons were enrolled (age range, 55 to 80 years); 57% were women. The two Mediterranean-diet groups had good adherence to the intervention, according to self-reported intake and biomarker analyses. A primary end-point event occurred in 288 participants. The multivariable-adjusted hazard ratios were 0.70 (95% confidence interval [CI], 0.54 to 0.92) and 0.72 (95% CI, 0.54 to 0.96) for the group assigned to a Mediterranean diet with extra-virgin olive oil (96 events) and the group assigned to a Mediterranean diet with nuts (83 events), respectively, versus the control group (109 events). No diet-related adverse effects were reported.

CONCLUSIONS: Among persons at high cardiovascular risk, a Mediterranean diet supplemented with extra-virgin olive oil or nuts reduced the incidence of major cardiovascular events. (Funded by the Spanish government’s Instituto de Salud Carlos III and others; Controlled-Trials.com number, ISRCTN35739639.)
A Primary End Point (acute myocardial infarction, stroke, or death from cardiovascular causes)

- Med diet, EVOO: hazard ratio, 0.70 (95% CI, 0.53–0.91); P = 0.009
- Med diet, nuts: hazard ratio, 0.70 (95% CI, 0.53–0.94); P = 0.02

<table>
<thead>
<tr>
<th>Years</th>
<th>No. at Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control diet</td>
</tr>
<tr>
<td>0</td>
<td>2450</td>
</tr>
<tr>
<td>1</td>
<td>2268</td>
</tr>
<tr>
<td>2</td>
<td>2020</td>
</tr>
<tr>
<td>3</td>
<td>1583</td>
</tr>
<tr>
<td>4</td>
<td>1268</td>
</tr>
<tr>
<td>5</td>
<td>946</td>
</tr>
</tbody>
</table>
Jenkins first studied a portfolio of four foods in 2002 to reduce LDL-C. The subjects were currently following a very low saturated fat diet which approximated the National Cholesterol Education Program (NCEP) Step II diet. After one week on the very low SFA diet, the test diet was initiated:

- plant sterols (1 g/1,000 kcal)
- soy protein (23 g/1,000 kcal)
- almonds (28g/day)
- viscous fibers (9g/1,000 kcal).
Percent change from baseline in the ratio of LDL:HDL on the combination diet ($n = 13$).
The study was a randomized crossover design;
• 34 participants completed all three 1-month treatments,
  • Control (traditional low-fat diet),
  • 20 mg Lovastatin (drug therapy to lower cholesterol),
  • dietary portfolio of foods
FIGURE 2. Mean (±SE) percentage change from baseline in LDL-cholesterol concentrations with the portfolio (▲; n = 34), control (●; n = 34), and statin (■; n = 34) diets. Data for the 3 time points were analyzed with a two-factor repeated-measures ANOVA, with interaction based on actual data and not on the change from baseline. The diet effect and the diet-by-time interaction were significant ($P < 0.001$). Values at the same time point with different lowercase letters are significantly different, $P < 0.020$ (paired comparison by least-squares-means procedures with Tukey's adjustment).
What to eat? (total fat)

• Fruits and vegetables
• Whole grains
• Nuts
• Fatty fish and omega-3s
• Soy and plant sterols
• Soluble fiber
• Eggs
• Nut and vegetable oils
Things to avoid in heart healthy diets

• Processed foods
  - Added sugar
  - No-fat alternatives to higher fat options
  - Added fat
  - Added salt
  - Ingredients or processes that are un-recognizable

• Partially hydrogenated fats
Original Investigation

Added Sugar Intake and Cardiovascular Diseases Mortality Among US Adults

Quanhe Yang, PhD; Zefeng Zhang, MD, PhD; Edward W. Gregg, PhD; W. Dana Flanders, MD, ScD; Robert Merritt, MA; Frank B. Hu, MD, PhD

**IMPORTANCE** Epidemiologic studies have suggested that higher intake of added sugar is associated with cardiovascular disease (CVD) risk factors. Few prospective studies have examined the association of added sugar intake with CVD mortality.
Hazard Ratios of CVD Mortality According to Usual % of Calories from Added Sugar

Adjusted Hazard Ratios of CVD Mortality

- 7.40%
- 11.40%
- 14.80%
- 18.70%
- 25.20%
Which one is healthier?

21 grams of fat  
15 grams of fat  
21 grams of fat
1 cup cubed avocado
21 grams of fat
3 g SFA
3 g PUFA
14 g MUFA

3 ounces of steak
15 grams of fat
7 g SFA
1 g PUFA
6 g MUFA

1 donut
21 grams of fat
11 g SFA (palm oil)
17 g sugar
Which one is healthier?
### Nutrition Facts

<table>
<thead>
<tr>
<th></th>
<th>Amount/Serving</th>
<th>%DV*</th>
<th>Amount/Serving</th>
<th>%DV*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Fat</strong></td>
<td>0g</td>
<td>0%</td>
<td>0g</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Sat Fat</strong></td>
<td>0g</td>
<td>0%</td>
<td><strong>Polyunsat Fat</strong></td>
<td>0g</td>
</tr>
<tr>
<td><strong>Trans Fat</strong></td>
<td>0g</td>
<td>0%</td>
<td><strong>Sodium</strong></td>
<td>310mg</td>
</tr>
<tr>
<td><strong>Cholesterol</strong></td>
<td>0mg</td>
<td>0%</td>
<td><strong>Total Carbs</strong></td>
<td>5g</td>
</tr>
<tr>
<td><strong>Sugars</strong></td>
<td>0g</td>
<td>0%</td>
<td><strong>Fiber</strong></td>
<td>0g</td>
</tr>
<tr>
<td><strong>Protein</strong></td>
<td>0g</td>
<td>0%</td>
<td><strong>Calories</strong></td>
<td>30</td>
</tr>
</tbody>
</table>

*Percent Daily Values (DV) are based on a 2,000 calorie diet.

### Ingredients:
- WATER, CORN SYRUP, MALTODEXTRIN, SUGAR, MODIFIED FOOD STARCH, BUTTERMILK*, SALT, LESS THAN 2% OF: VINEGAR, GARLIC PUREE, ONION PUREE, DRIED GARLIC, DRIED ONION, SPICE, SOUR CREAM* (CREAM, NONFAT MILK, CULTURES), XANTHAN GUM, SOY LEICITHIN*, SOYBEAN OIL*, MONOGLYCERIDES*, NATURAL FLAVORS (SALT, ARTIFICIAL COLOR, MONOSODIUM GLUTamate, LACTIC ACID, PHOSPHORIC ACID, DISODIUM PHOSPHATE, WITH POTASSIUM SORBATE, SODIUM BENZATE, TEHO AND CALCIUM DISODIUM EDTA AS PRESERVATIVES, ALPHA TOCOPHEROL)* (VITAMIN E), *ADDS A TRIVIAL AMOUNT OF FAT AND/or CHOLESTEROL.
Which one is healthier?

- Swedish fish
- Dark chocolate?
Which one is healthier?

- Fat free yogurt
- Greek yogurt, add your own fruit and nuts
<table>
<thead>
<tr>
<th>Yogurt</th>
<th>Calories</th>
<th>Total Fat (g)</th>
<th>Cholesterol (g)</th>
<th>Sodium (mg)</th>
<th>Sugars (g)</th>
<th>Protein (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chobani Original Plain (6 oz.)</td>
<td>240</td>
<td>17</td>
<td>65</td>
<td>60</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>Chobani Lowfat Plain (6 oz.)</td>
<td>130</td>
<td>3.5</td>
<td>10</td>
<td>70</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>Chobani Nonfat Plain (6 oz.)</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>70</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>Chobani Vanilla Nonfat (6 oz.)</td>
<td>120</td>
<td>0</td>
<td>0</td>
<td>65</td>
<td>13</td>
<td>16</td>
</tr>
<tr>
<td>Chobani Honey Nonfat (6 oz.)</td>
<td>150</td>
<td>0</td>
<td>0</td>
<td>65</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>Chobani Peach Nonfat (6 oz.)</td>
<td>140</td>
<td>0</td>
<td>0</td>
<td>80</td>
<td>19</td>
<td>14</td>
</tr>
<tr>
<td>Chobani Strawberry Nonfat (6 oz.)</td>
<td>140</td>
<td>0</td>
<td>0</td>
<td>80</td>
<td>19</td>
<td>14</td>
</tr>
<tr>
<td>Chobani Blueberry Nonfat (6 oz.)</td>
<td>140</td>
<td>0</td>
<td>0</td>
<td>65</td>
<td>20</td>
<td>14</td>
</tr>
</tbody>
</table>
Which one is healthier?

• DEPENDS

• Compared to what?

• How much?

• In the context of what diet?
What does a healthy balanced 2,000 calories per day heart healthy diet look like?
Tip #1
A healthy diet has balance, variety, & moderation!
True or False?

• Low-fat diets are the best diets for those at risk for cardiovascular disease.
• Cholesterol rich foods (like eggs) are bad for you.
• Your total and LDL cholesterol levels are the best indicators of your risk for a heart attack.
• Saturated fat raises your “bad” cholesterol and that causes heart disease.
• Low-fat options are generally “healthier” options (low fat vs. full fat yogurt, salad dressing).
What did you learn?

1. Is fat the “bad guy” of nutrition?
2. What should you replace saturated fat with in your diet?
3. What other dietary factors matter in regards to your risk for heart disease?
4. Are low-fat alternatives always healthier choices?
Summary

1. Eating a diet that contains a moderate amount (up to 35% of total calories) of fat isn’t bad for health – it’s good for health!
   • Fats are like fonts, it’s the type that matters.

2. The current recommendation is to consume <10% of calories as saturated fat (the AHA says limit saturated fat to 5-6%) – replacing saturated fat with unsaturated fat, NOT carbohydrates.

3. A heart healthy diet includes a variety of whole and natural foods (not processed foods) – vegetables, fruits, whole grains, legumes, nuts, eggs, dairy, poultry, fish, red meat, nuts, avocados