Dietary Fat Phobia – *Dispelling the Myth That All Fats Are Bad*

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Director and Senior Scientist, Cardiovascular Laboratory
Tufts University, Boston, MA
Roadmap

Dietary Fat Phobia – Dispelling the Myth That All Fats Are Bad

- Roots of the fat phobia
  - History of dietary guidance to the general public
  - Timeline of dietary guidance to healthcare professionals
- Dietary fat and cardiovascular disease
- Dispelling the myth
Public’s Attitudes About Dietary Fat

Is There a Fat Phobia?

% Avoid -- carbs | % Avoid -- fats
---|---
2002: 20 | 62
2004: 27 | 64
2006: 25 | 65
2008: 29 | 65
2010: 29 | 65
2012: 29 | 65
2014: 29 | 65

GALLUP July 29, 2014
U.S. Guidance – Eating Patterns

For Health... eat some food from each group... every day!

GROUP ONE
- Green and yellow vegetables...
  - Some raw—some cooked, frozen or canned

GROUP TWO
- Oranges, tomatoes, grapefruit...
  - Or raw cabbage or salted greens

GROUP THREE
- Potatoes and other vegetables and fruits
  - Raw, dried, cooked, frozen or canned

GROUP FOUR
- Milk and milk products...
  - Fluid, evaporated, dried milk, or cheese

GROUP FIVE
- Meat, poultry, fish, or eggs...
  - Or dried beans, peas, nuts, or peanut butter

GROUP SIX
- Bread, flour, and cereals...
  - Natural whole grain—or enriched orArmored

GROUP SEVEN
- Butter and fortified margarine
  - (with added Vitamin A)

IN ADDITION TO THE BASIC 7...
EAT ANY OTHER FOODS YOU WANT

1940’s
1956–1970’s

**U.S. Guidance – Eating Patterns**

**A Daily Food Guide**

- **Milk Group**
  - Some milk for everyone
  - Children: 3 to 4 cups
  - Teenagers: 4 or more cups
  - Adults: 2 or more cups

- **Meat Group**
  - 2 or more servings
  - Beef,veal,pork,lamb,poultry,fish,eggs
  - Alternates:
    - dry beans, dry peas, nuts

- **Vegetable Fruit Group**
  - 4 or more servings
  - Include:
    - A citrus fruit or other fruit or vegetable important for vitamin C
    - A dark-green or deep-yellow vegetable for vitamin A—at least every other day
    - Other vegetables and fruits, including potatoes

- **Bread Cereal Group**
  - 4 or more servings
  - Whole grain, enriched, or restored

Plus other foods as needed to complete meals and to provide additional food energy and other food values.
FOOD WHEEL
A Pattern for Daily Food Choices

1984
The Food Guide Pyramid
A Guide to Daily Food Choices

Fats, Oils, & Sweets
USE SPARINGLY

Milk, Yogurt, & Cheese Group
2-3 Servings

Vegetable Group
3-5 Servings

Fruit Group
2-4 Servings

Bread, Cereal, Rice, & Pasta Group
6-11 Servings

Meat, Poultry, Fish, Dry Beans, Eggs, & Nuts Group
2-3 Servings

These symbols show fats and added sugars in foods:

KEY
△ Fat (naturally occurring and added)
▼ Sugars (added)

1992
Choose a diet low in fat, saturated fat, cholesterol
Dietary Guidelines for Americans

Choose a diet **low in fat, saturated fat, cholesterol**

Choose a diet **moderate in fat, saturated fat, cholesterol**
Choose a diet **low in fat**, saturated fat, cholesterol

Choose a diet **moderate in fat**, saturated fat, cholesterol

Limit saturated fat


Dietary Guidelines for Americans
2015 Dietary Guidelines for Americans

A healthy eating pattern includes:

A healthy eating pattern limits:

- Saturated fats and trans fats
- Added sugars
- Sodium
Dietary Guidelines for Americans

- Choose a diet **low in fat**, saturated fat, cholesterol
- Choose a diet **moderate in fat**, saturated fat, cholesterol
- Limit saturated fat

U.S. Guidance Related to Dietary Fat

- NCEP (National Cholesterol Education Program, NHLBI)
  - Step I diet (1988)
    - <30% energy fat
  - Step II diet (1993)
    - <30% energy fat
  - TLC (therapeutic lifestyle change) diet (2002)
    - 25% to 35% energy fat
AHA/ACC Lifestyle (2013) – Dietary Pattern

Consume a dietary pattern that emphasizes intake of vegetables, fruits, and whole grains; includes low-fat dairy products, poultry, fish, legumes, non-tropical vegetable oils, and nuts; and limits intake of sweets, sugar-sweetened beverages, and red meats.
Public’s Attitudes About Dietary Fat

GALLUP July 29, 2014
Are Americans Confused About Dietary Fat?
Are Americans Confused About Dietary Fat?

March 26, 1984 – March 28, 2015
Contributors to Confusion About Dietary Fat

Terminology confusion;
- Type of fat
  - Saturated/unsaturated
  - SFA, MUFA, PUFA
- PUFA
  - N-6 FA and n-3 FA
- Unsaturated
  - MUFA and PUFA
  - *Cis*-double and *trans*-double bond containing FA
Contributors to Confusion About Dietary Fat

Terminology confusion;

- Vegetable oils
- Plant oils
- Tropical oils
- Non-tropical vegetable oils
- Liquid vegetable oils
- Selectively breed vegetable oils
- Genetically modified oils
- Low alpha-linolenic acid oils
Contributors to Confusion About Dietary Fat

Terminology confusion;
- Animal fat
- Vegetable fat
- Solid fat
- Trans fat
Omega-3 Fatty Acids

- ALA
- EPA
- DHA

Polyunsaturated Fat
- n-3 FA
- ω-3 FA

Monounsaturated Fat
- N-9 FA

Saturated Fat
- Long chain SFA
- Short chain SFA
- SFA

Essential FA
- Ruminant Trans Fat

Non-essential FA
- Partially-hydrogenated Fat
- Industrial Trans Fat
- Partially-hydrogenated Fat
- Trans Fat
- Ruminant Trans Fat

Trans Fat
- Trans Fat
- Artificial Trans Fat

Long chain SFA
- Trans Fat

Short chain SFA
- Long chain SFA

Monoenoic Fatty Acid
- Long chain SFA
Omega-3 Fatty Acids

- n-3 FA
- ω-3 FA

DHA

ALA

EPA

Saturated Fat

- Long chain SFA
- Short chain SFA

Polyunsaturated Fat

- Essential FA
- Non-essential FA

Monounsaturated Fat

- N-9 FA

Trans Fat

- Ruminant Trans Fat
- Industrial Trans Fat
- Artificial Trans Fat

Partially-hydrogenated Fat

Essential FA

N-6 FA

N-3 FA

ω-3 FA

n-3 FA

Trans Fat

Partially-hydrogenated Fat

n-3 FA
Contributors to Confusion About Dietary Fat

Nutrient labeling –

2% milk

Reduced fat
Contributors to Confusion About Dietary Fat

Nutrition Facts

<table>
<thead>
<tr>
<th>Serving Size 1 Cup (240mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amount per Serving</strong></td>
</tr>
<tr>
<td><strong>Calories</strong> 130</td>
</tr>
<tr>
<td><strong>Fat Cal</strong> 45</td>
</tr>
<tr>
<td><strong>%Daily Value</strong></td>
</tr>
<tr>
<td><strong>Total Fat</strong> 5g</td>
</tr>
<tr>
<td>8%</td>
</tr>
<tr>
<td><strong>Saturated Fat</strong> 3g</td>
</tr>
<tr>
<td>15%</td>
</tr>
<tr>
<td><strong>Trans Fat</strong> 0g</td>
</tr>
<tr>
<td><strong>Cholesterol</strong> 20mg</td>
</tr>
<tr>
<td>7%</td>
</tr>
<tr>
<td><strong>Sodium</strong> 120mg</td>
</tr>
<tr>
<td>5%</td>
</tr>
<tr>
<td><strong>Potassium</strong> 360mg</td>
</tr>
<tr>
<td>10%</td>
</tr>
<tr>
<td><strong>Total Carbohydrate</strong> 12g</td>
</tr>
<tr>
<td>4%</td>
</tr>
<tr>
<td><strong>Dietary Fiber</strong> 0g</td>
</tr>
<tr>
<td>0%</td>
</tr>
<tr>
<td><strong>Sugars</strong> 11g</td>
</tr>
<tr>
<td><strong>Protein</strong> 8g</td>
</tr>
<tr>
<td>16%</td>
</tr>
<tr>
<td>Vitamin A 10%</td>
</tr>
<tr>
<td>• Vitamin C 0%</td>
</tr>
<tr>
<td>Calcium 30%</td>
</tr>
<tr>
<td>• Iron 0%</td>
</tr>
<tr>
<td>Vitamin D 25%</td>
</tr>
</tbody>
</table>
Replacing sat fat with polyunsaturated fats is ‘questionable’
Nathan Gray, June 30, 2014
FOODNavigator.com
Lard may not be as bad for your health as the fat’s detractors say

By Gisela Telis, Published: April 17, 2013

Once a Villain, Coconut Oil Charms the Health Food World

March 1, 2011 - By MELISSA CLARK
Saturated fat could be good for you

A Norwegian study challenges the long-held idea that saturated fats are unhealthy

THE UNIVERSITY OF BERGEN

Saturated fat may be healthy for you: Study

Daily News & Analysis
December 4, 2016
## Systematic Review – Dietary Factors and Coronary Heart Disease

<table>
<thead>
<tr>
<th>Evidence of a Causal Association From Cohort Studies</th>
<th>Cohort Data Only</th>
<th>Supported by RCTs</th>
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</thead>
<tbody>
<tr>
<td><strong>Weak</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplementary vitamin E</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Supplementary ascorbic acid</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Total fat</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Saturated fatty acids</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Polyunsaturated fatty acids</td>
<td></td>
<td>No^f</td>
</tr>
<tr>
<td>ω-3 Fatty acids, total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eggs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk</td>
<td></td>
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### Systematic Review – Dietary Factors and Coronary Heart Disease

#### Evidence of a Causal Association From Cohort Studies

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<tbody>
<tr>
<td><strong>Strong</strong></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>“Mediterranean” diet b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High-quality diet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nuts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trans-fatty acids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glycemic index or load</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“Prudent” diet c, d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“Western” diet d, e</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monounsaturated fatty acids d</td>
<td></td>
<td></td>
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Meta-analysis of Prospective Cohorts for SFA and CHD

<table>
<thead>
<tr>
<th>Study, year of publication</th>
<th>Duration, years</th>
<th>Events/cohort, n</th>
<th>RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EUROASPIRE, 2003</td>
<td>5</td>
<td>34/415</td>
<td>0.34 (0.09, 1.28)</td>
</tr>
<tr>
<td>Framingham, 1991 (age 45–55 years)</td>
<td>16</td>
<td>99/420</td>
<td>0.78 (0.61, 1.00)</td>
</tr>
<tr>
<td>SHS, 2006 (age 60–79 years)</td>
<td>7.2</td>
<td>92/1,279</td>
<td>0.80 (0.41, 1.56)</td>
</tr>
<tr>
<td>ATBC, 1997</td>
<td>6.1</td>
<td>635/21,930</td>
<td>0.93 (0.60, 1.44)</td>
</tr>
<tr>
<td>Framingham, 1991 (age 56–65 years)</td>
<td>16</td>
<td>114/393</td>
<td>0.99 (0.77, 1.27)</td>
</tr>
<tr>
<td>HPFS, 1996</td>
<td>6</td>
<td>229/43,757</td>
<td>1.72 (1.01, 2.93)</td>
</tr>
<tr>
<td>Mann et al., 1997</td>
<td>13.3</td>
<td>64/10,802</td>
<td>2.77 (1.25, 6.14)</td>
</tr>
<tr>
<td>SHS, 2006 (age 47–59 years)</td>
<td>7.2</td>
<td>46/1,659</td>
<td>5.17 (1.64, 16.30)</td>
</tr>
<tr>
<td>Subtotal (I² = 72.1%, p = 0.001)</td>
<td></td>
<td></td>
<td>1.14 (0.82, 1.60)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>CHD event</th>
</tr>
</thead>
<tbody>
<tr>
<td>EUROASPIRE, 2003</td>
</tr>
<tr>
<td>ATBC, 1997</td>
</tr>
<tr>
<td>HPFS, 1996</td>
</tr>
<tr>
<td>NHS, 2005</td>
</tr>
<tr>
<td>SHS, 2006</td>
</tr>
<tr>
<td>Subtotal (I² = 0.09%, p = 0.673)</td>
</tr>
</tbody>
</table>

Deciding risk
Comparing highest SFA intake to lowest intake

Meta-analysis of Prospective Cohorts for SFA and CHD

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Risk Ratio IV, Random, 95% CI</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary Heart Disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shekelle et al(17)</td>
<td>1.11 [0.91, 1.36]</td>
<td>1981</td>
</tr>
<tr>
<td>McGee et al(9)</td>
<td>0.86 [0.67, 1.12]</td>
<td>1984</td>
</tr>
<tr>
<td>Kushi et al(13)</td>
<td>1.33 [0.95, 1.87]</td>
<td>1985</td>
</tr>
<tr>
<td>Posner et al(16)</td>
<td>0.92 [0.68, 1.24]</td>
<td>1991</td>
</tr>
<tr>
<td>Goldbourt et al(35)</td>
<td>0.86 [0.56, 1.35]</td>
<td>1993</td>
</tr>
<tr>
<td>Fehily et al(28)</td>
<td>1.57 [0.96, 4.42]</td>
<td>1994</td>
</tr>
<tr>
<td>Ascherio et al(4)</td>
<td>1.11 [0.87, 1.42]</td>
<td>1996</td>
</tr>
<tr>
<td>Esrey et al(6)</td>
<td>0.97 [0.80, 1.18]</td>
<td>1996</td>
</tr>
<tr>
<td>Pietinen et al(15)</td>
<td>0.93 [0.60, 1.44]</td>
<td>1997</td>
</tr>
<tr>
<td>Boniface et al(5)</td>
<td>1.37 [1.17, 1.60]</td>
<td>2002</td>
</tr>
<tr>
<td>Jakobsen et al(8)</td>
<td>1.03 [0.66, 1.60]</td>
<td>2004</td>
</tr>
<tr>
<td>Oh et al(33)</td>
<td>0.97 [0.74, 1.27]</td>
<td>2005</td>
</tr>
<tr>
<td>Tucker et al(18)</td>
<td>1.22 [0.31, 4.77]</td>
<td>2005</td>
</tr>
<tr>
<td>Xu et al(10)</td>
<td>1.91 [0.31, 11.84]</td>
<td>2006</td>
</tr>
<tr>
<td>Leosdottir et al(14)</td>
<td>0.95 [0.74, 1.21]</td>
<td>2007</td>
</tr>
<tr>
<td>Subtotal (95% CI)</td>
<td>1.07 [0.96, 1.19]</td>
<td></td>
</tr>
</tbody>
</table>

Heterogeneity: Tau² = 0.03; Chi² = 52.63, df = 23 (P = 0.0004); I² = 56%
Test for overall effect: Z = 0.06 (P = 0.95)

“Current evidence does not clearly support cardiovascular guidelines that encourage high consumption of polyunsaturated fatty acids and low consumption of total saturated fats.”
Saturated fats not so bad for heart after all?
Major Types of Dietary Fat and Risk of Coronary Heart Disease: A Pooled Analysis of 11 Cohort Studies

P value, test for heterogeneity=0.05; combined hazard ratio (95% CI)=0.96 (0.82, 1.13)

Major Types of Dietary Fat and Risk of Coronary Heart Disease: A Pooled Analysis of 11 Cohort Studies

PUFAs for SFAs (per 5 E% increments)

AHS (7), F
AHS (7), M
ARIC (8), M
ATBC (9), M
FMC (10), F
FMC (10), M
GPS (5), F
GPS (5), M
HPFS (11), M
IHD (12), M
IWHS (13), F
NHSa (4), F
NHSb (4), F
VIP (14), M
WHS (15), F
Combined

Hazard ratio

P value, test for heterogeneity=0.40; combined hazard ratio (95% CI)=0.74 (0.61, 0.89)

Meta-analysis of Randomized Controlled Trials – Replacing With PUFA, Carbohydrate, MUFA

Dietary Change (each 5% energy)

**PUFA Replacing SFA**
- Predicted Effect from TC:HDL Change: 0.91 (0.87, 0.95)
- The Present Meta-Analysis of 8 RCTs: 0.90 (0.83, 0.97)
- Pooled Analysis of 11 Observational Cohorts: 0.87 (0.77, 0.97)

**Carbohydrate Replacing SFA**
- Predicted Effect from TC:HDL Change: 1.01 (0.98, 1.04)
- Results from WHI RCT: 0.98 (0.88, 1.09)
- Pooled Analysis of 11 Observational Cohorts: 1.07 (1.01, 1.14)

**MUFA Replacing SFA**
- Predicted Effect from TC:HDL Change: 0.93 (0.89, 0.96)
- RCTs – None: --
- Pooled Analysis of 11 Observational Cohorts: 1.19 (1.00, 1.42)

Relative Risk of CHD for Each 5% Energy Intake

Dietary Fat and Cardiovascular Disease

A Presidential Advisory From the American Heart Association

Circulation. 2017;136:e1-e23
“Core” Intervention Studies

- Compared high SFA and PUFA
- Did not use high trans fat as major component
- Controlled dietary intake
- At least 2 y in duration
- Biomarkers established difference between groups
- Validated “hard” CVD outcomes

Dietary Fat and Risk CHD
A Pooled Analysis of 11 Cohort Studies

N=344,696; CHD events = 5,249; * P<0.05

Mean 12-month weight change (p>0.05);
• Low fat – 29% energy
• High fat – 45% energy
‘Healthy ‘Low Fat and High Fat Diets and Body Weight

Mean 12-month weight change (p>0.05);
• –5.3 kg for the healthy low-fat diet group
• –6.0 kg for the healthy low carbohydrate diet group.

Similar range for weight change, approximately 40 kg, within each group (–30 kg to 10 kg).

Gardner CD et al. JAMA 2018;319:667-679
(a) Healthy Low Fat

12-month weight change (kg)

n=215

(b) Healthy Low Carb

12-month weight change (kg)

n=221

Gardner CD et al. JAMA 2018;319:667-679
Public’s Attitudes About Dietary Fat

GALLUP July 29, 2014
Public’s Attitudes About Dietary Fat

GALLUP July 27, 2015
Dietary Fat Phobia

- Replace SFA with PUFA was simplified to low SFA and later low fat

- Low fat = Low calorie

- Carbohydrate content of diets increased at the expense of PUFA
Dispelling Dietary Fat Phobia

Dietary fat
- Source essential fatty acids
- Major source fat soluble vitamins
- Critical for absorption of fat soluble nutrients

Body fat
- Role in regulation body temperature
- Cushions internal organs
- Storage from metabolic energy – short term and long term
What approach should we take moving forward?

Develop clear, concise unified message about dietary fat and health outcomes.
Commentary

Dispelling Dietary Fat Phobia

Bring Back Home Economics Education

Alice H. Lichtenstein and David S. Ludwig

JAMA 2010;303:1857
Dietary Fat Phobia – *Dispelling the Myth That All Fats Are Bad*

- **Roots of the fat phobia**
  - History of dietary guidance to the general public
  - Timeline of dietary guidance to healthcare professionals
- **Dietary fat and cardiovascular disease**
- **Dispelling the myth**
Research Support

Study Participants