# Coconut oil and other "fat fads" – health or hype?

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## Learning Objectives

- List current recommendations regarding intake of dietary fats
- Choose dietary fats that best support health
- Think critically about current "fat fads" based on the science

## Outline

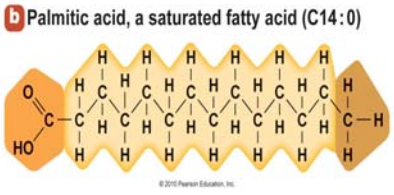
A. Background
- Dietary fats – structure and function
- Current dietary recommendations

B. Fat Fads
- Back to butter?
- Omega-3s
- Coconut oil

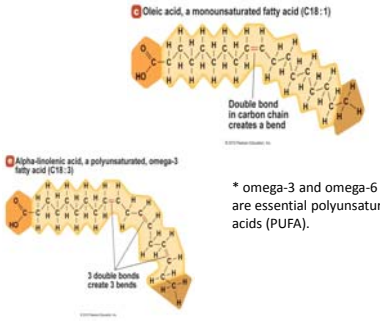
1. Dietary fats - definitions, structures, and functions

## Triglycerides, cholesterol, fatty acids … oh my!

- 95% of the fat we eat in food is in the form of triglycerides
- Triglycerides contain a mix of 3 fatty acids
- Fatty acids have different characteristics depending on their size, number and placement of double bonds
  - Medium-chain vs. long-chain
  - Saturated vs. unsaturated
  - Cis vs. trans

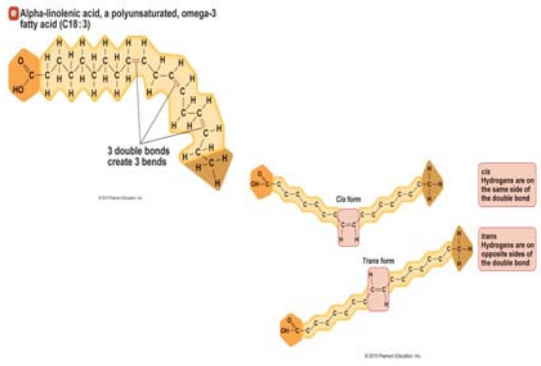


Points of un-saturation create “kinks” in the shape of a fatty acid

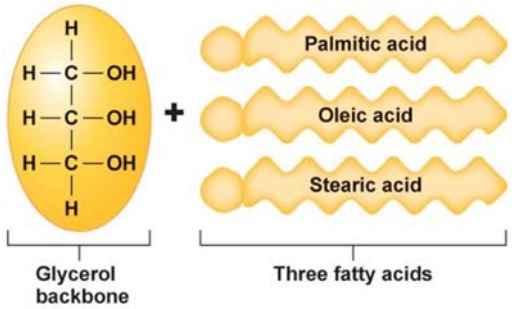



* omega-3 and omega-6 fatty acids are essential polyunsaturated fatty acids (PUFA).

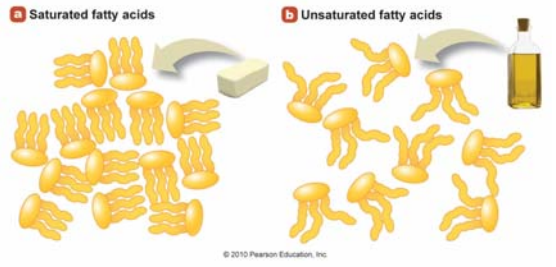
Trans fats = partially hydrogenated PUFA → the process of hydrogenation of PUFA produces trans fat




Triglyercide = glycerol backbone + 3 fatty acids



## The length and shape of fatty acids determines their function in foods and in our body

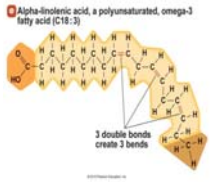



Long, saturated, and straight fatty acids are more stable in foods – they pack tightly together and are more solid at room temperature

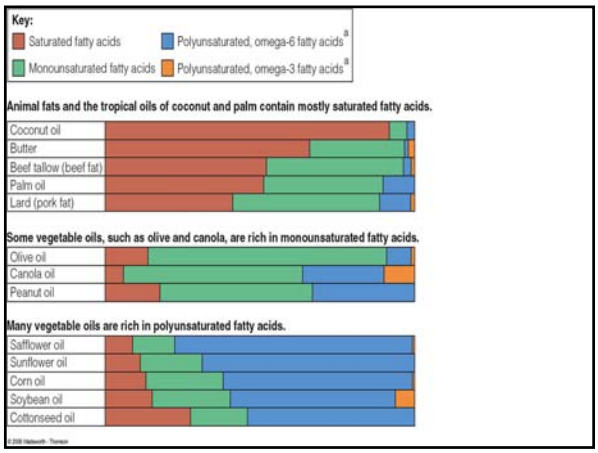
Figure 5.3

## Nomenclature

- SFA – saturated fatty acid
- MUFA – mono-unsaturated fatty acid
- PUFA – poly-unsaturated fatty acid
  - Omega-6
  - Omega-3




- Foods contain triglycerides not individual fatty acids.
- Food sources of fats contain other nutrients and phytochemicals.
- The health effect of fatty acids depend on the length, degree of saturation, and configuration of double bonds.





Kris-Etherton, Yu S. AJCN. 2003.

## 2. Dietary recommendations

True or False? Low-fat diets are healthy diets.



Position statement
Academy of Nutrition and Dietetics

- Dietary fats should provide 20-35% of energy
- Increased intake of n-3 PUFA (aka, omega-3s)
- Limited intake of saturated and trans fat
- Food first – fatty fish, nuts, seeds, lean meats and poultry, low-fat dairy products, fruits, vegetables, whole-grains and legumes.

A person who needs 2,000 kcalories per day

20-35% of 2,000 = 400 – 700 kcalories per day from fat

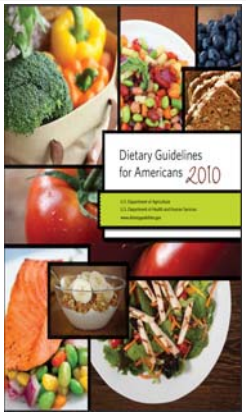
400/9 – 800/9 = 44 - 77 grams of fat per day

## Which one is healthier?

## Are recommendations too fat-cenric?

1 cup cubed avocado
21 grams of fat
3.1 g SFA
2.7 g PUFA
14 g MUFA

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




Reduce saturated fat to <10% of energy.

Keep trans fats as low as possible.

Replace solid fats with oils when possible.

Increase the amount and variety of seafood consumed.

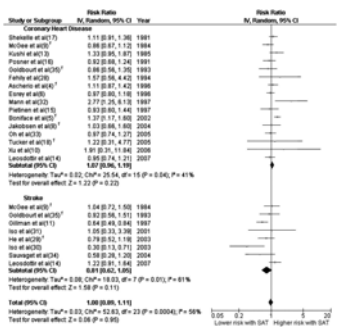

- Dietary guidelines are general, health effects are specific.


Kris-Etherton, Yu S. AJCN. 2003.

## Fat Fad #1 – Back to butter?


- Evidence linking saturated fats to increased risk for LDL cholesterol levels and thus cardiovascular disease may be weaker than previously thought
- It depends what you replace saturated fats with
- Different saturated fats have different effects
- Other properties of foods high saturated fats matter
- AVOID partially hydrogenated vegetable oils

**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.**



Siri-Tarino P W et al. Am J Clin Nutr 2010;91:535-546

Association of dietary, circulating, and supplement fatty acids with coronary risk: a systematic review and meta-analysis.

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, 0.76 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 supplementations.

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.

Publication Types, MeSH Terms, Substances, Grant Support

LinkOut - more resources

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Association of dietary, circulating, and supplement fatty acids with coronary risk: a systematic review and meta-analysis.

"This paper is bound to cause confusion. A central issue is what replaces saturated fat if someone reduces the amount of saturated fat in their diet. If it is replaced with refined starch or sugar, which are the largest sources of calories in the U.S. diet, then the risk of heart disease remains ... However, if saturated fat is replaced with polyunsaturated fat or monounsaturated fat in the form of olive oil, nuts and probably other plant oils, we have much evidence that risk will be reduced."

– Walter Willett, Frank Sacks, Meir Stampfer, Harvard University

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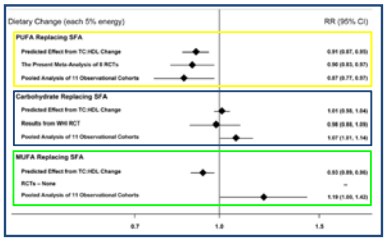
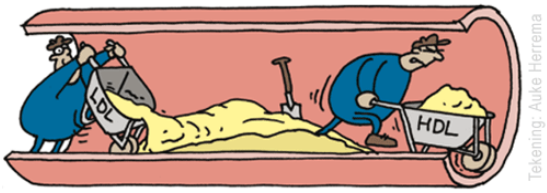
## Effect on CVD risk of Replacing SFA with CHO, PUFA or MUFA




Mozaffarian et al, PLoS Medicine, 2010


Kris-Etherton, Yu S. AJCN. 2003.

## What are LDL and HDL and how are they related to risk of cardiovascular disease?




## Avoid ALL partially hydrogenated oils (aka, trans fats)


- A daily intake of 5 g *trans* fat, corresponding to 2% of energy intake, is associated with an ~30% increase in CAD risk (Stender et al. NEJM, 2006;354:1650-2).
- FDA is looking to remove their "GRAS" status.

## What is this food?

**Ingredients**
MADE FROM ROASTED **PEANUTS** AND SUGAR. CONTAINS 2 PERCENT OR LESS OF: MOLASSES, PARTIALLY HYDROGENATED VEGETABLE OIL (SOYBEAN), FULLY HYDROGENATED VEGETABLE OILS (RAPESEED AND SOYBEAN), MONO- AND DIGLYCERIDES AND SALT.

## Most big brand peanut butters now contain fully hydrogenated fats instead of partially hydrogenated fats. Better, but still a processed fat.


## Rate your spread

Groups of 4
Share with your small group
Group share with one other group
Large group discussion

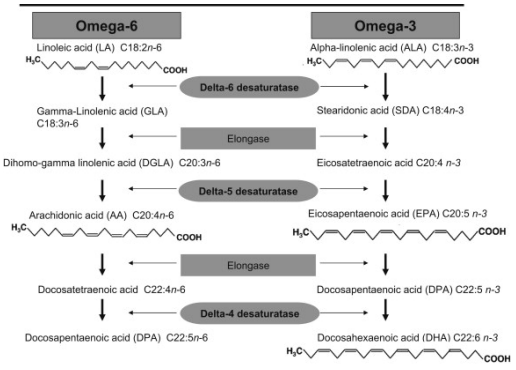
## Rate your "spread" activity

| 1 Tbsp (14 g) | Butter | Stick margarine | Crisco | Tub margarine |
|---|---|---|---|---|
| Total kcals | | | | |
| Total fat (g) | | | | |
| SFA (g) | | | | |
| MUA (g) | | | | |
| PUFA (g) | | | | |
| Omega-3? | | | | |
| Concerns? | | | | |
| Benefits? | | | | |
| Rank order, least healthy choice (1) to most healthy choice (4) | | | | |

## Fat Fad #2 - Omega-3s

- PUFA – position of the first double bond is at the omega-3 position
- Health benefits are well documented and multifaceted (Flock et al. Nut Rev. 2013;7(10):692-702)
  - Stabilize atherosclerotic plaques
  - Anti-inflammatory
  - Reduce cardiac arrhythmias
  - Lower serum triglycerides
  - Reduce blood pressure
  - Reduce oxidative stress
  - Important part of the membranes of neurons

Most effects are specific to "long" chain omega-3s known as EPA and DHA



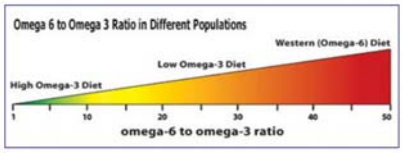

Arterburn L M et al. American Journal of Clinical Nutrition 2006, 83:S1467-1476S

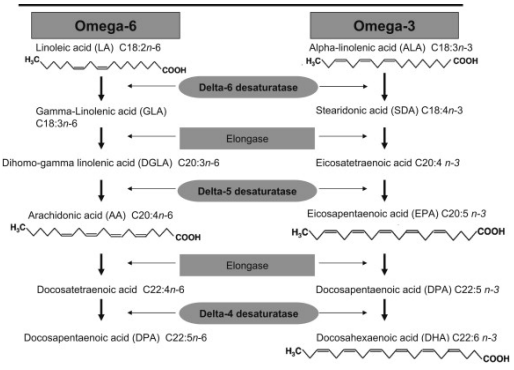
## How much, what foods?

- Alpha-linolenic acid (ALA) → soybean, canola, flaxseed, walnuts, kale, spinach.
- Eicosapentaenoic (EPA) and docosahexaenoic (DHA) → fatty fish like sardines, mackerel, herring, and salmon.
- You should try to eat at least 1 serving of foods rich in omega-3 fatty acids EVERYDAY!
- If you opt for supplements, look for one that provides 500-1000 mg (no more) of EPA and DHA.

## Limited evidence that ratio of omega-6 to omega-3 may be important

| Oil | Omega-6 Content | Omega-3 Content |
|---|---|---|
| Safflower | 75% | 0% |
| Sunflower | 65% | 0% |
| Corn | 54% | 0% |
| Cottonseed | 50% | 0% |
| Sesame | 42% | 0% |
| Peanut | 32% | 0% |
| Soybean | 51% | 7% |
| Canola | 20% | 9% |
| Walnut | 52% | 10% |
| Flaxseed | 14% | 57% |
| Fish* | 0% | 100% |

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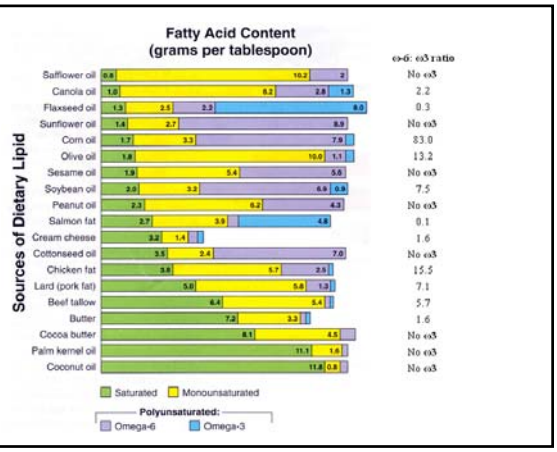



## It takes a lot of green leafies…

**Food sources of alpha-linolenic acid**

| Food source | Amount needed to provide 2 g ALA |
|---|---|
| Broccoli, cooked | 122 c |
| Brussels sprouts | 7.6 c |
| Cabbage | 12 c |
| Canola oil | 1.7 tbsp |
| Flaxseed, ground | 1 tbsp |
| Flaxseed oil | 0.3 oz |
| Kale | 15.4 c |
| Parsley | 400 c |
| Pumpkin seeds | 42.5 oz |
| Soybean oil | 2.4 tbsp |
| Spinach | 50 c |
| Spring greens | 21.7 c |
| Walnuts | 0.9 oz |
| Walnut oil | 0.3 tbsp |

Source: Bergin CL

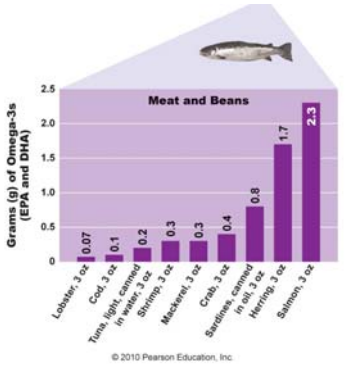
2 grams of ALA = 18 kcals

Table 5. Fat content and fatty acid composition of meat portions from animal errors)

| | Beef steaks | | |
|---|---|---|---|
| | Grass (*n* 5) | Concentrate (*n* 4) | |
| Fatty acids | Mean | Mean | *P** |
| Total fat (g/100g) | 2·49 | 5·31 | 0·01 |
| SFA† | 1409·02 | 1384·58 | 0·78 |
| MUFA‡ | 1416·48 | 1349·4 | 0·42 |
| 18:1*t*11 (TVA) | 68·99 | 86·99 | 0·63 |
| 18:2*c*9,*t*11 (CLA) | 15·30 | 18·27 | 0·37 |
| 18:2*n*-6 (LA) | 87·62 | 161·45 | 0·04 |
| 20:4*n*-6 (AA) | 19·36 | 25·83 | 0·02 |
| Total *n*-6 PUFA§ | 106·98 | 187·28 | 0·03 |
| 18:3*n*-3 (ALA) | 33·19 | 17·52 | <0·001 |
| 20:5*n*-3 (EPA) | 13·24 | 6·39 | <0·001 |
| 22:5*n*-3 (DPA) | 11·84 | 10·33 | 0·41 |
| 22:6*n*-3 (DHA) | 0·35 | 0·99 | 0·44 |
| LC *n*-3 PUFA‖ | 25·97 | 18·69 | 0·02 |
| Total *n*-3 PUFA¶ | 59·16 | 36·21 | <0·001 |
| *n*-6:*n*-3** | 2·29 | 8·39 | <0·001 |
| P:S†† | 0·14 | 0·18 | 0·17 |

McAffee AJ, et al. Red meat from animals offered a grass diet increases plasma and platelet n-3 PUFA in healthy consumers. B J Nutr. 2011;105:80-89.

Is tuna a good source of DHA and EPA?




Is tuna a good source of DHA and EPA?

Fat Fad #3 – Coconut oil


Dining & Wine

Once a Villain, Coconut Oil Charms the Health Food World

Coconut oil

Coconut oil

## Coconut oil

- **Virgin coconut oil –** extracted from the fruit of fresh mature coconuts without high temperatures or chemicals; considered unprocessed. Has a light, sweet-nutty coconut flavor.
- **Refined coconut oil –** made from dried coconut meat that is chemically bleached and deodorized. Neutral flavor, good to a higher temp.
- **Partially hydrogenated coconut oil** – theater popcorn, and junk-food. Avoid like the plague.

## Nutritional value?

- A solid fat, high in saturated fat (90%)
  - 1 Tbsp = 117 kcals, 14 g fat (12 g SFA)
  - Most (50%) of the SFA is **lauric acid (C12:0)**, a medium-chain triglycerides (MTCs; C6 – C12) that provides a neutral/favorable effect on serum cholesterol levels because it increases both HDL and LDL levels (and HDL is relatively difficult to change)
  - MCTs are metabolized differently than longer chain FA → more likely used for energy or metabolized to ketones
  - High in phenolic compounds - antioxidants



Asian Pacific Journal of Tropical Medicine

Coconut (*Cocos nucifera* L.: Arecaceae): In health promotion and disease prevention

Manisha DebMandal, Shyamapada Mandal

"Antibacterial, antifungal, antiviral, antiparasitic, antioxidant, hypoglycemic, hepatoprotective, immunostimulant"

Kalpavriksh (the all giving tree)

## Is there science to support claims for health benefits of coconut oil?

- Limited scientific evidence
- Most evidence is antidotal or at best from in vitro and animal studies
- Few experimental trials in humans (3)

Short Communication

Coconut Oil Attenuates the Effects of Amyloid-β on Cortical Neurons *in vitro*





## Summing it up …

1. A healthy diet includes healthy fats
(at least 44 grams worth if you need ~2,000 kcalories/day).

2. We eat fats in the form of triglycerides but the health effects of fats are determined at the fatty acid level. Not all SFA (bad), MUFA (good), PUFA (good) are equal – this creates confusion!

3. Avoid partially hydrogenated vegetables oils like the plague!

4. Generally, people should eat more of foods that provide PUFA, especially omega-3s (nuts, seeds, whole grains, flaxseed, fatty fish)

5. The jury is still out on health benefits of coconut oil, but in moderation, it can be part of a healthy and balanced diet

## Taste test and questions