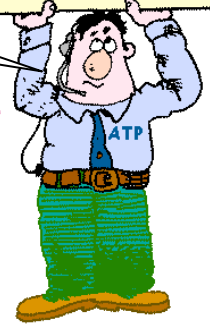


Hooray! More fun  
learning nutrition!!

APPLAUSE!



## **BI 199 Discussion 7**

**I. Announcements** Presentation schedule. Paper draft due due next Wednesday to [lombardi@uoregon.edu](mailto:lombardi@uoregon.edu) by e-mail, .doc or .docx attachment. Outline comments.

**II. Fat Digestion + Storing & Using Fat** S&W pp 164-7

**III. Dietary Fat, Cholesterol & Health** S&W pp 168-72

A. Recommendations for lipid intake

B. Lipoproteins & CVD risk

C. What does food cholesterol have to do w/blood cholesterol?

D. Saturated fat: Top contributors in the US diet.

**IV. Essential Polyunsaturated Fatty Acids** S&W pp 174-6

**V. Consumer's Corner** Weighing Seafoods Risks & Benefits  
S&W pp 177-8

**VI. Processing Unsaturated Fats** S&W pp 178-81

**VII. Fat in the Diet + Defensive Dining** S&W pp 181-8

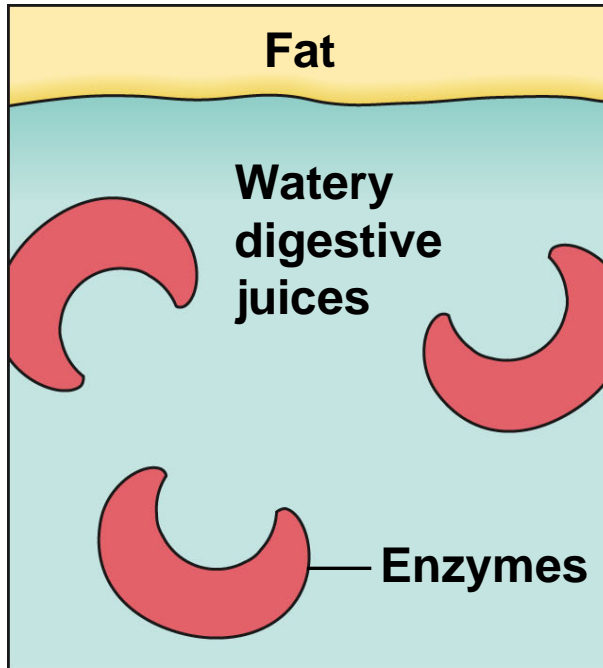
**VIII. Controversy 5** Good fats & bad fats – US Guidelines  
& the Mediterranean Diet S&W pp 191-6

**IX. Quiz Bowl** S&W ch 5 Individual test

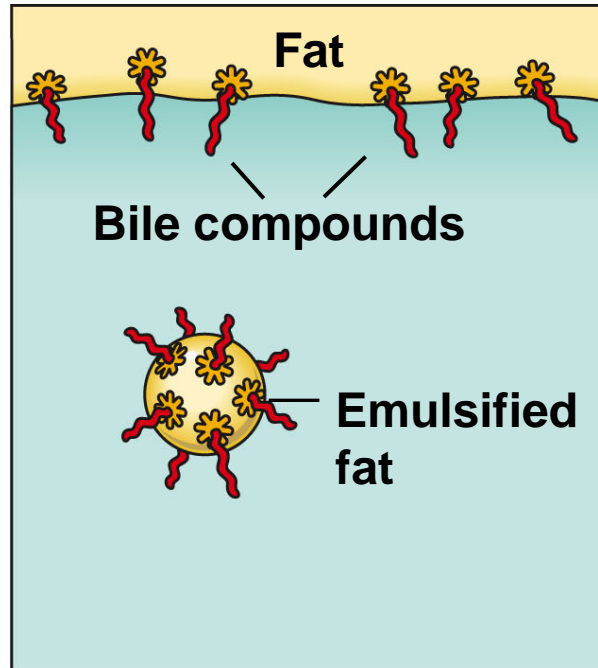
**X. Movie Night** – Hooray!



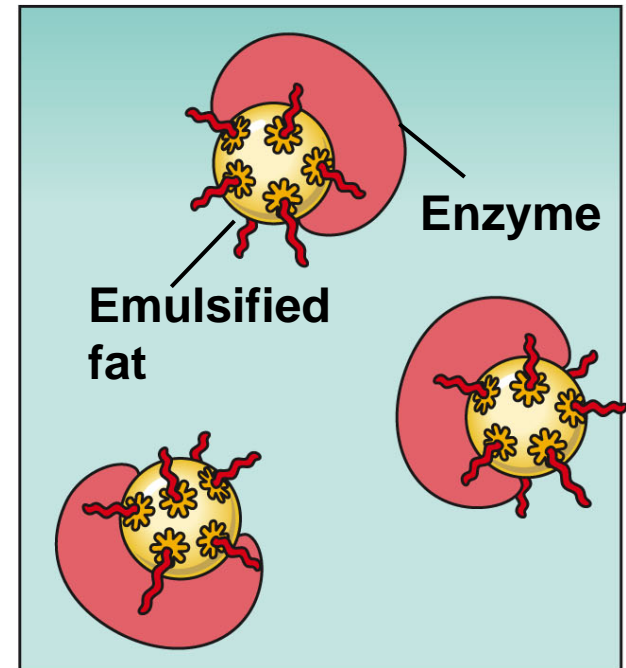
# What does bile do? What's an emulsifier?



In the stomach, the fat and watery digestive juices tend to separate. Enzymes are in the water and can't get at the fat.



When fat enters the small intestine, the gallbladder secretes bile. Bile compounds have an affinity for both fat and water, so it can bring the fat into the water.



After emulsification, more fat is exposed to the enzymes, making fat digestion more efficient.

***More vivid analogy? Defensive lineman splitting double-team? Disperses vs. mixes?***



**1** *Mouth*: Fat mechanically, but not chemically digested (exception: infants?!)

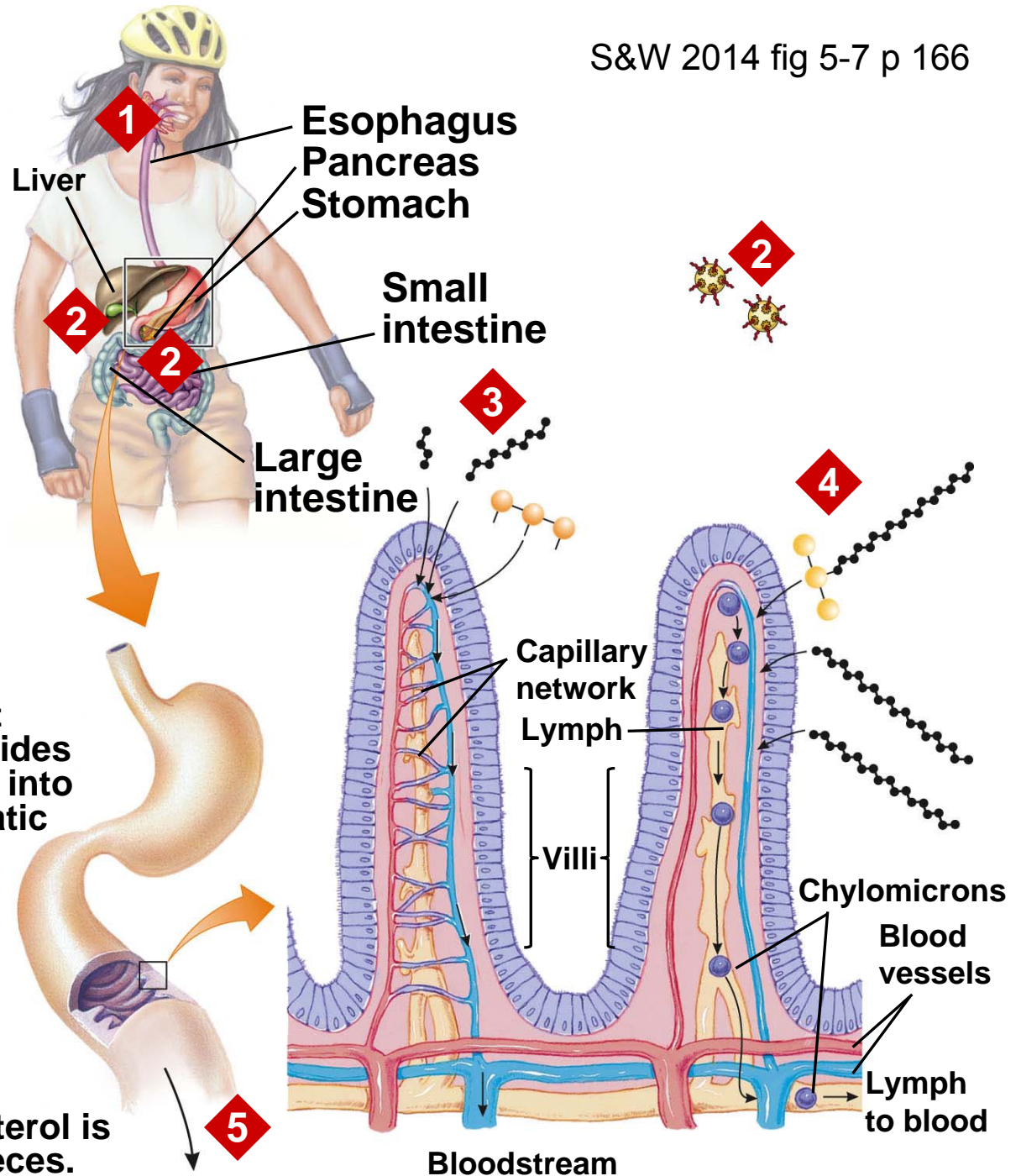
**2** *Small Intestine*: Fat mechanically & chemically digested.

Accessory organs:  
Liver adds bile,  
Pancreas adds lipases.

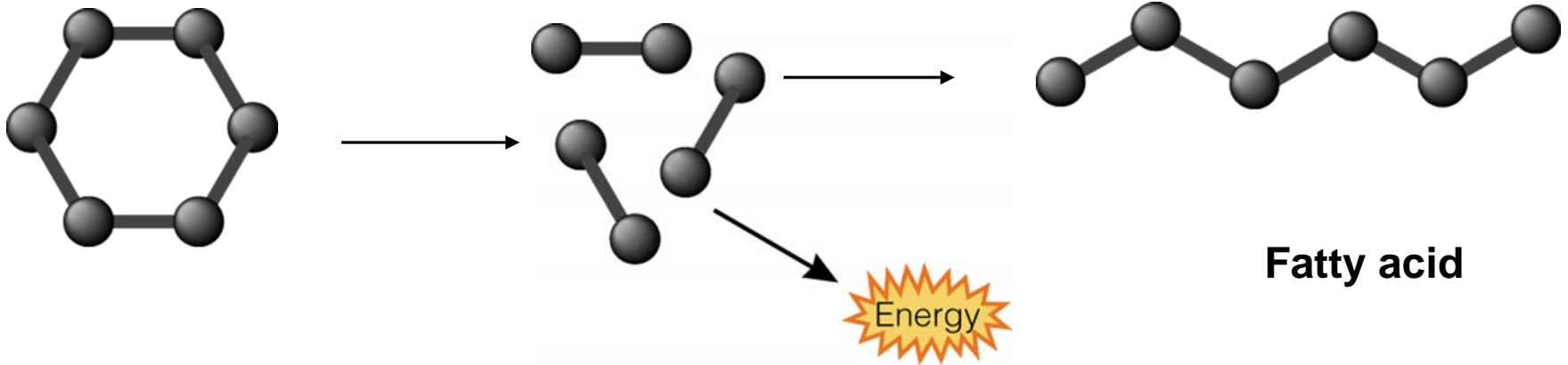
**3** *Small Intestine*: Fat pieces, glycerol & short-chain fatty acids are absorbed directly into blood.

**4** *Small Intestine*: Cells convert larger fat pieces, monoglycerides & long-chain fatty acids back into triglycerides for more lymphatic filtering!

**5** *Large Intestine*: Some cholesterol is entrapped in fiber & exits w/feces.



# ***Excess Glucose to Fat? Yes!***



**Glucose is broken down into fragments.**

**The fragments can provide immediate energy for the tissues.**

**Or, if the tissues need no more energy, the fragments can be reassembled, not back to glucose but into fatty acid chains.**

***Fat provides much fuel during aerobic exercise!***



TABLE  
5-2

## Lipid Intake Recommendations for Healthy People

### 1. Total fat<sup>a</sup> ...Shoot for 1/3 or less of total calories!

#### *Dietary Guidelines for Americans*

- Keep total fat intake between 20 and 35% of calories from mostly polyunsaturated and monounsaturated fat sources such as fish, nuts, and vegetable oils.
- Select and prepare foods that are lean, low-fat, or fat-free.

#### *Dietary Reference Intakes*

- An acceptable range of fat intake is estimated at 20 to 35% of total calories.

### 2. Saturated fat ...Shoot for 1/3 or less of total fat!

#### *American Heart Association*

- Limit saturated fat to less than 7% of total energy.

#### *Dietary Guidelines for Americans;*<sup>b</sup> *Dietary Reference Intakes*<sup>c</sup>

- Keep saturated fat intake low, less than 10% of calories, within the context of an adequate diet.

### 3. *Trans* fat ...Trans fat < 1% of total energy

#### *Dietary Guidelines for Americans*

- Keep *trans* fat intake as low as possible.

#### *American Heart Association*

- Limit *trans* fat to less than 1% of total energy.

### 4. Polyunsaturated fatty acids

#### *Dietary Reference Intakes*<sup>c</sup>

- Linoleic acid (5 to 10% of total calories):  
17 grams per day for young men.  
12 grams per day for young women.
- Linolenic acid (0.6 to 1.2% of total calories):  
1.6 grams per day for men.  
1.1 grams per day for women.

### 5. Cholesterol

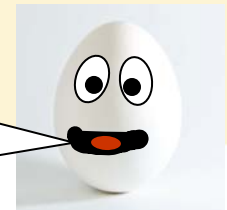
#### *American Heart Association, Dietary Guidelines for Americans, and World Health Organization*

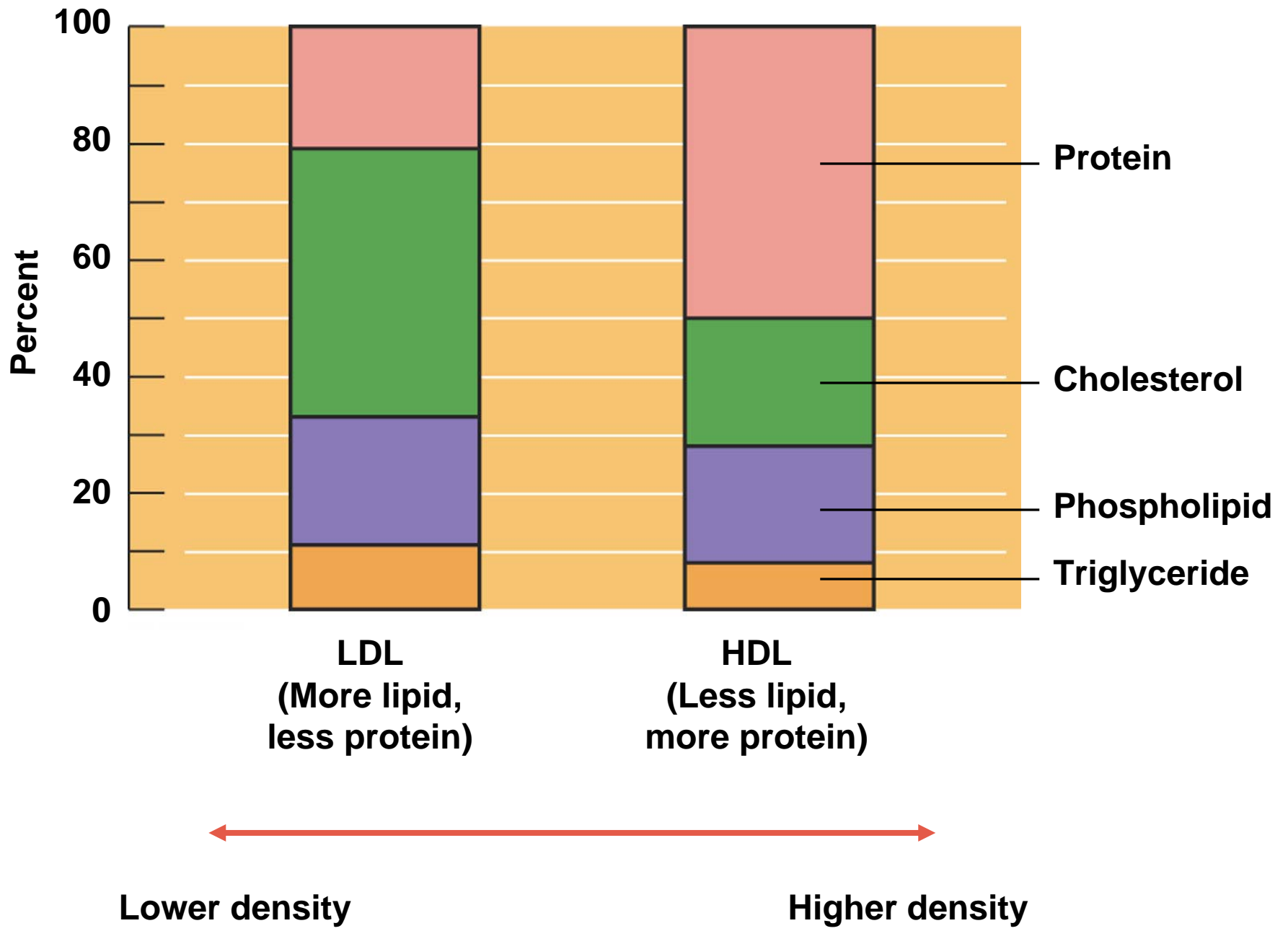
- Limit cholesterol to less than 300 milligrams per day.<sup>d</sup>

#### *Dietary Reference Intakes*<sup>c</sup>

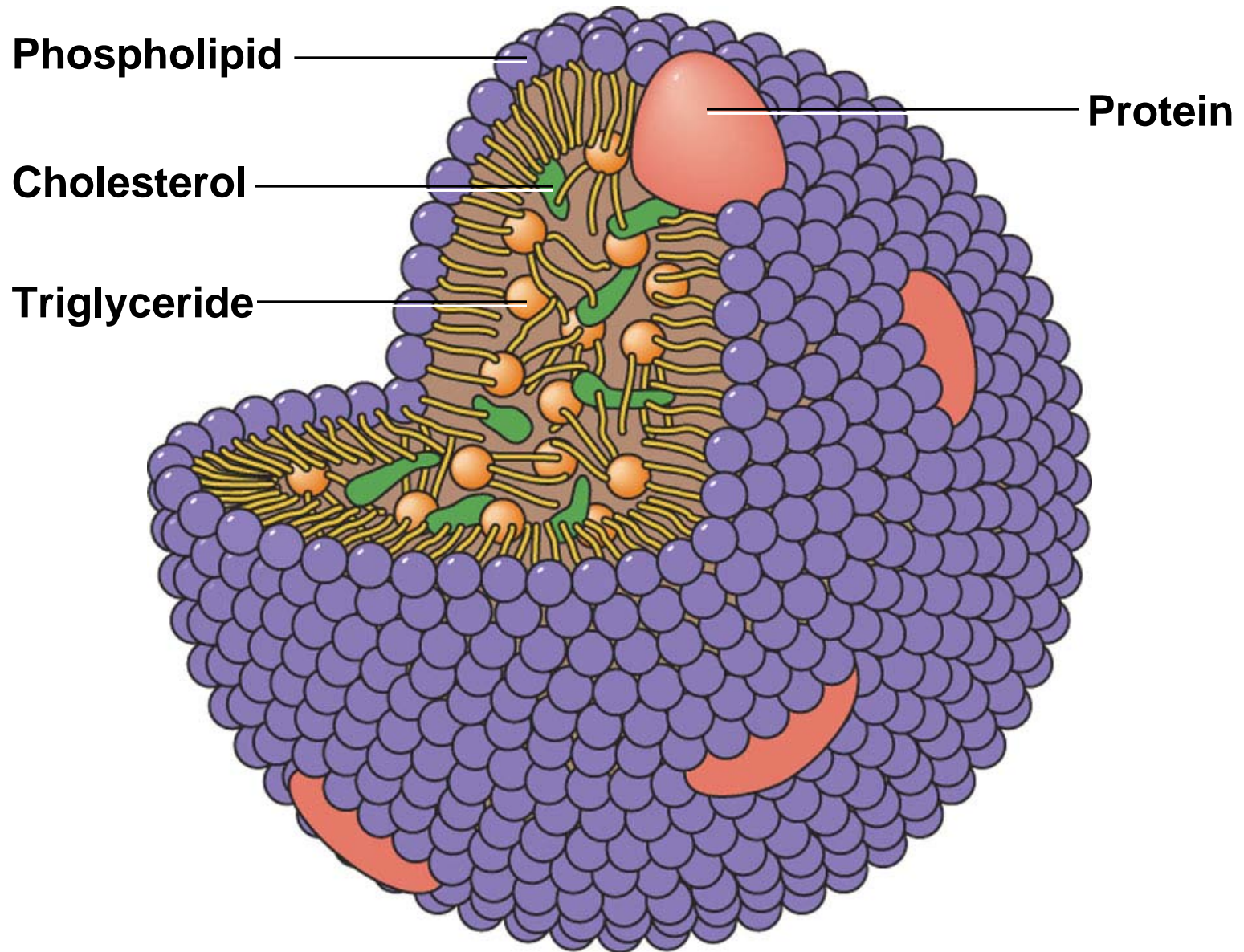
- Minimize cholesterol intake within the context of a healthy diet.

Just 1 of me has 200-240 mg of cholesterol! But still, I'm not the bad guy, sat fat is!









***A typical lipoprotein***

## Table 5–3

### Modifiable Lifestyle Factors in Heart Disease Risk

The more of these factors present in a person's life, the more urgent the need for changes in diet and lifestyle to reduce heart disease risk:

- High blood LDL cholesterol.
- Low blood HDL cholesterol.
- High blood pressure (hypertension).
- Diabetes (insulin resistance).
- Obesity.
- Physical inactivity.
- Cigarette smoking.
- A diet high in saturated fats, including *trans* fats, and low in fish, vegetables, legumes, fruit, and whole grains.

Family history, older age, and male gender are risk factors that cannot be changed.

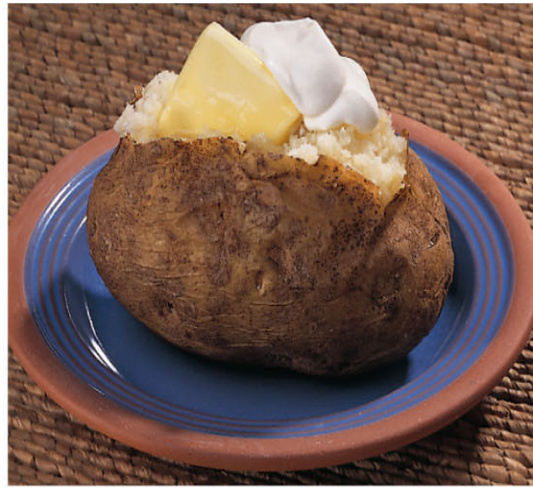
# Higher fat choices...

## Nutrition Facts

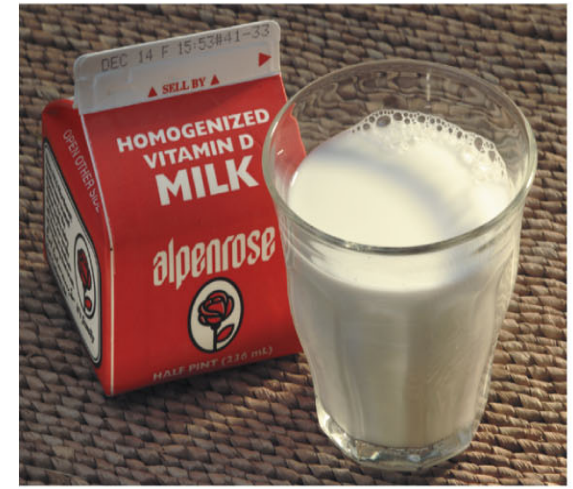
Amount Per Serving



Pork chop (5 ounces) with 1/2 inch of fat



Potato (5 ounces) with 1 tablespoon butter and 1 tablespoon sour cream



Whole milk (1 cup)



© Polara Studios Inc. (all)

# Reducing the fat!

## Nutrition Facts

Amount Per Serving



Pork chop (4 ounces) with fat trimmed off

**450** → **230** kcal



Plain potato (5 ounces)

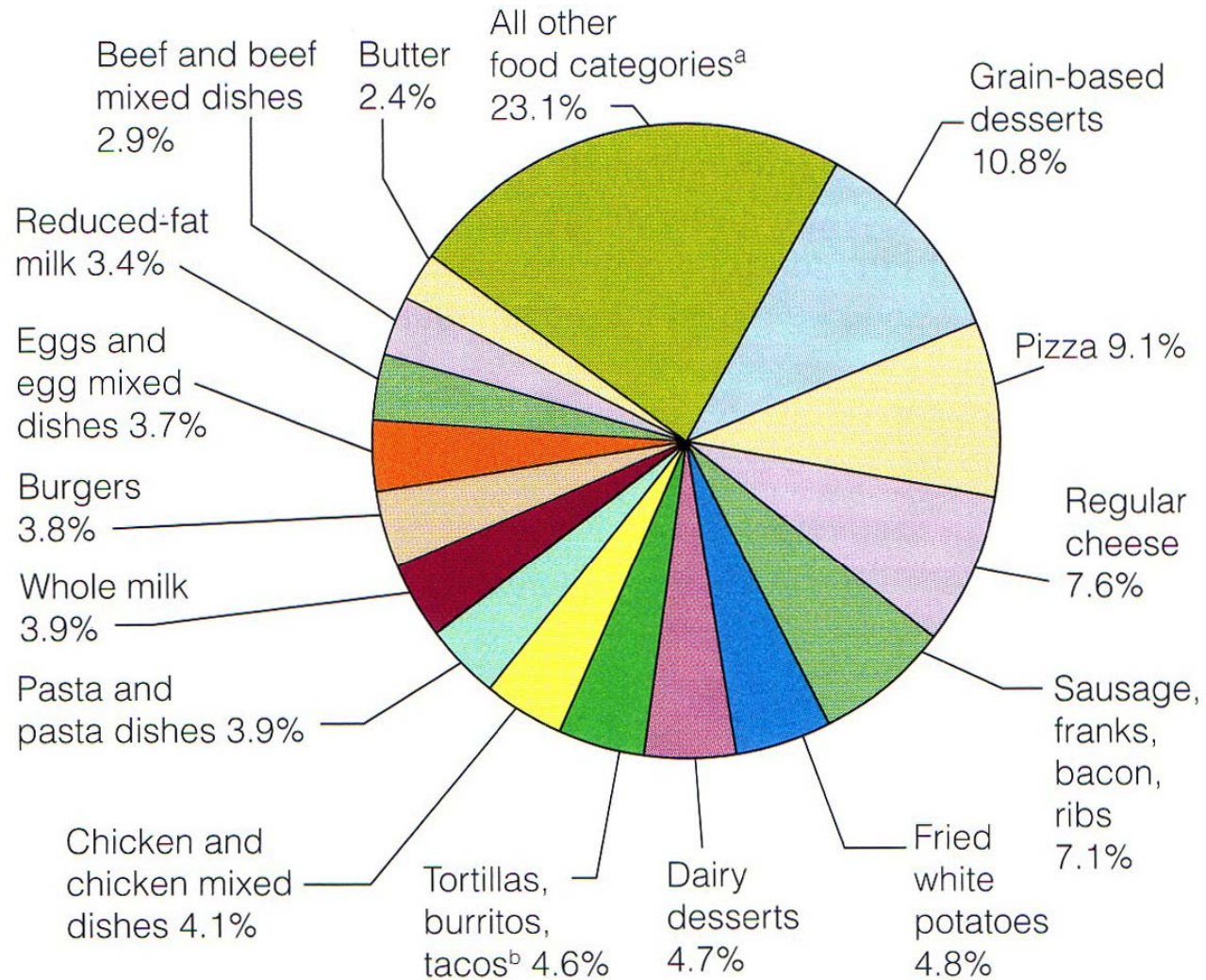
**400** → **150** kcal



Fat-free milk (1 cup)

**150** → **90** kcal

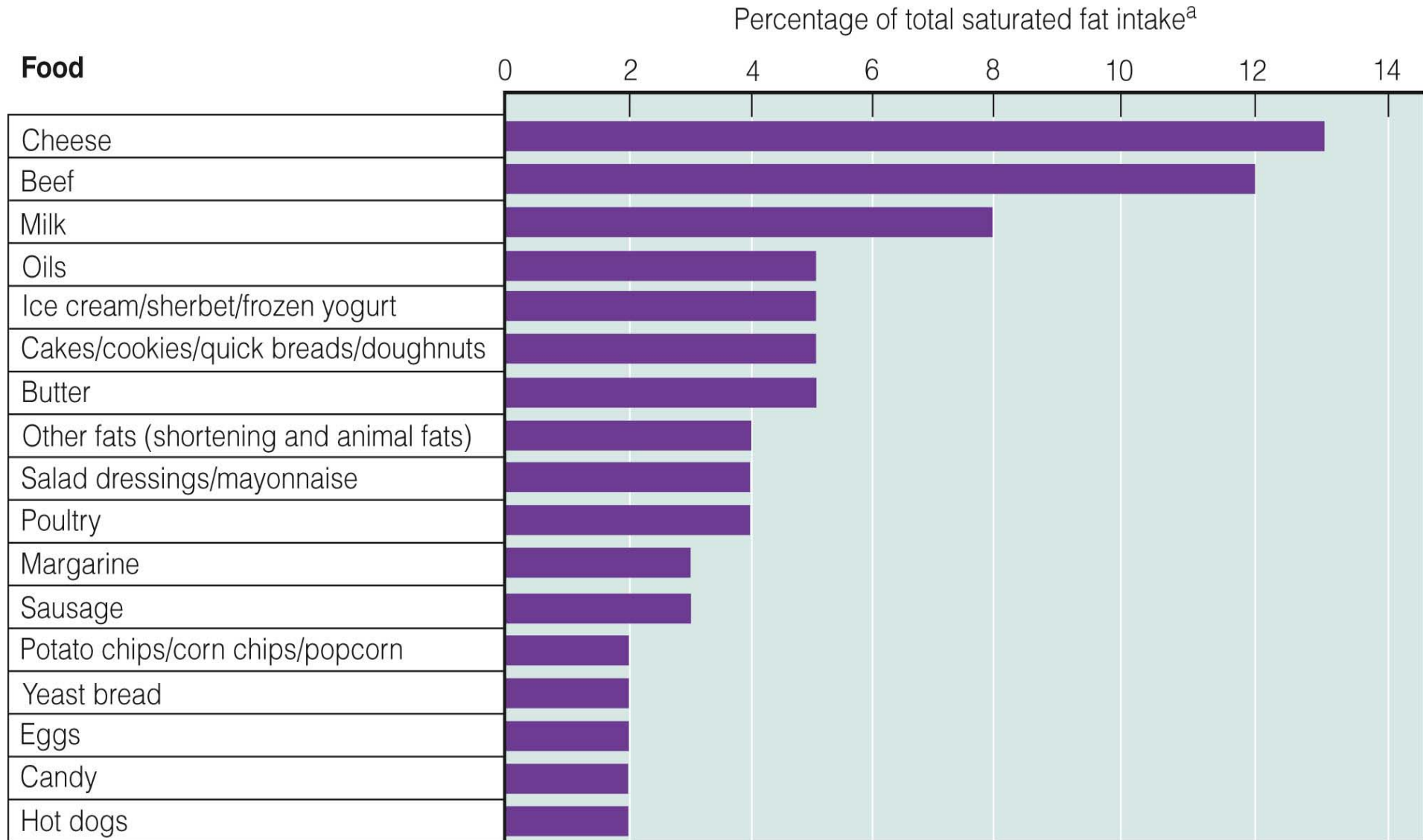
## Sources of Solid Fats in the US Diet



<sup>a</sup>Food categories that each contribute less than 2% of the total solid fat intake.

<sup>b</sup>Includes nachos, quesadillas, and other mixed Mexican dishes.

# Top Contributors of Saturated Fats in US Diets



<sup>a</sup>Rounded values

S&W 2011 fig 5-11 p 165

# Essential Fatty Acids: $\Omega$ -6 Linoleic & $\Omega$ -3 Linolenic Acids

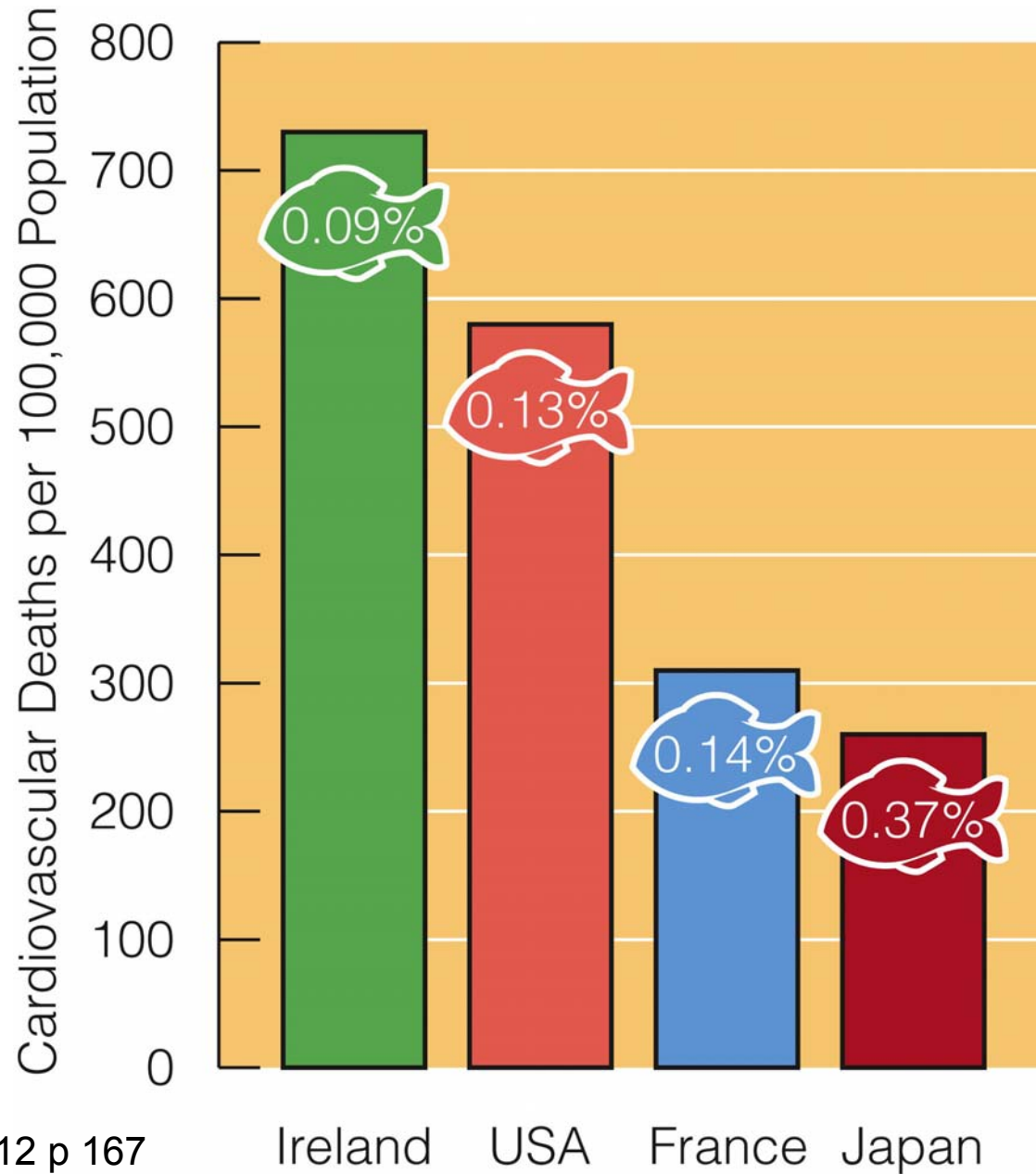


Linoleic  $\rightarrow$  Arachadonic Acid  $\rightarrow$  Inflammatory Cascade

Linolenic  $\rightarrow$  EPA, DHA  $\rightarrow$  Anti-inflammatory



## *Fish Oil Intakes & Cardiovascular Death Rates*



S&W 2011 fig 5-12 p 167



***Deep cold  
water fish  
are fabulous  
sources of  
 $\Omega$ -3 fatty  
acids!***



## Table 5-5

### Potential Health Benefits of Fish Oils

These benefits from fish or fish oil are well-established, but researchers are investigating many others.

#### ***Against heart disease***

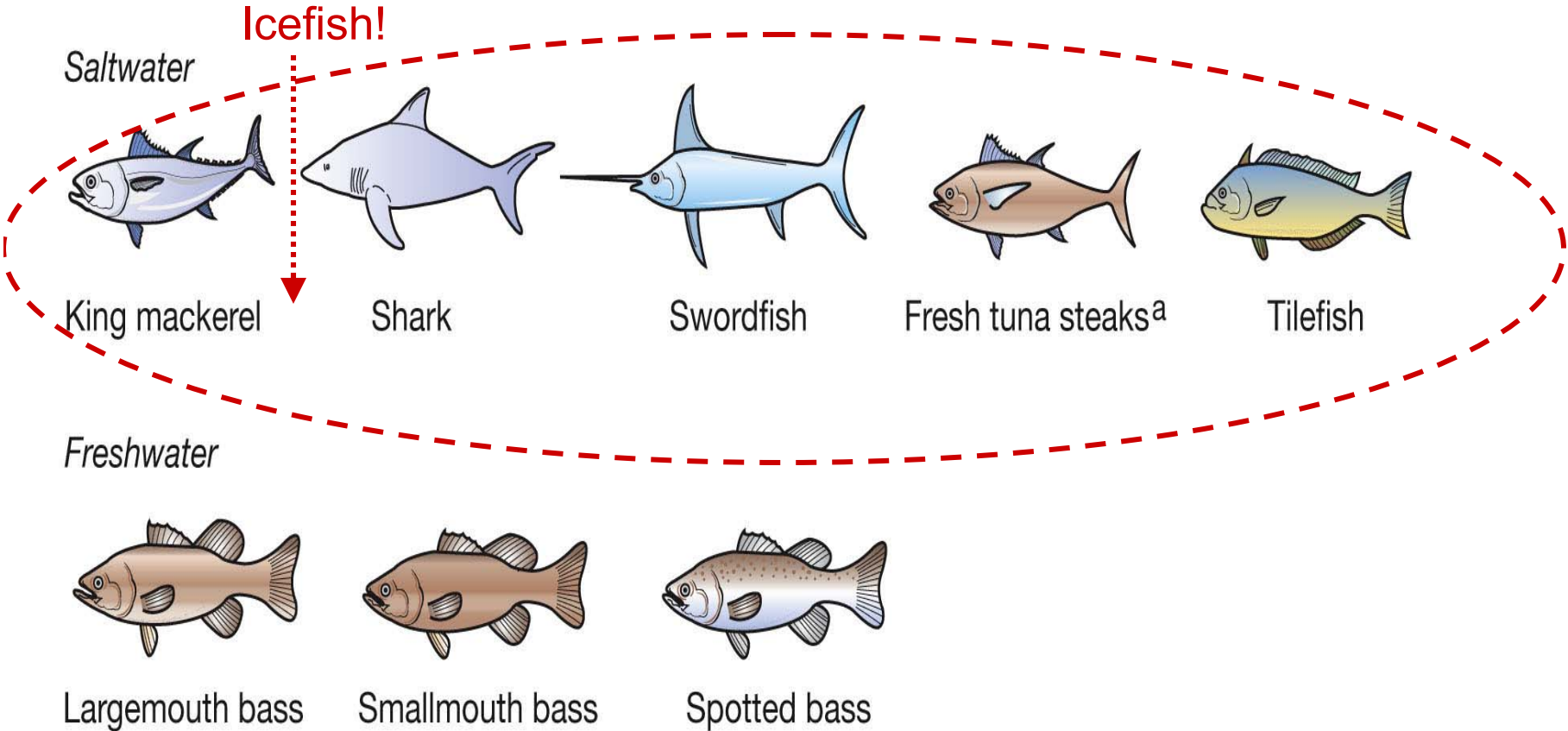
- A shift toward omega-3 eicosanoids by reducing production of omega-6 eicosanoids. This shift may reduce abnormal blood clotting, help sustain more regular heartbeats, and reduce inflammation of many body tissues, including the arteries of the heart.
- Reduced blood triglycerides (in some studies, fish oil supplements elevated blood LDL cholesterol, an opposing, detrimental outcome).
- Retarded hardening of the arteries (atherosclerosis).
- Relaxation of blood vessels, mildly reducing blood pressure.

#### ***In infant growth and development***

- Normal brain development in infants. DHA concentrates in the brain's cortex, the conscious thinking part.
- Normal vision development in infants. DHA helps to form the eye's retina, the seat of normal vision.

**Species most heavily contaminated with mercury**

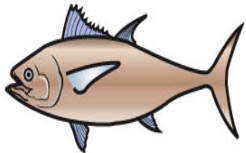
**NB: KISSTT**



<sup>a</sup>Canned albacore (“white”) tuna contains more mercury than light tuna varieties.

**Species lower in mercury:**

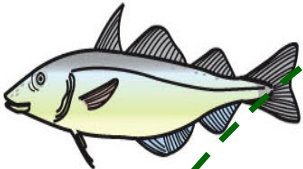
*Saltwater*



Canned light tuna<sup>a</sup>



Catfish



Pollock



Salmon

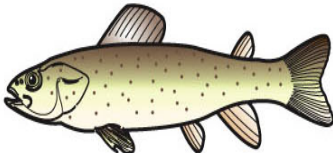


Sardines

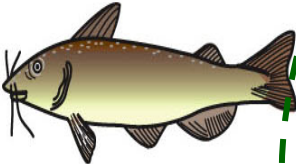


Shrimp

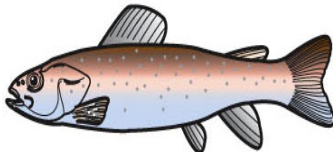
*Freshwater*



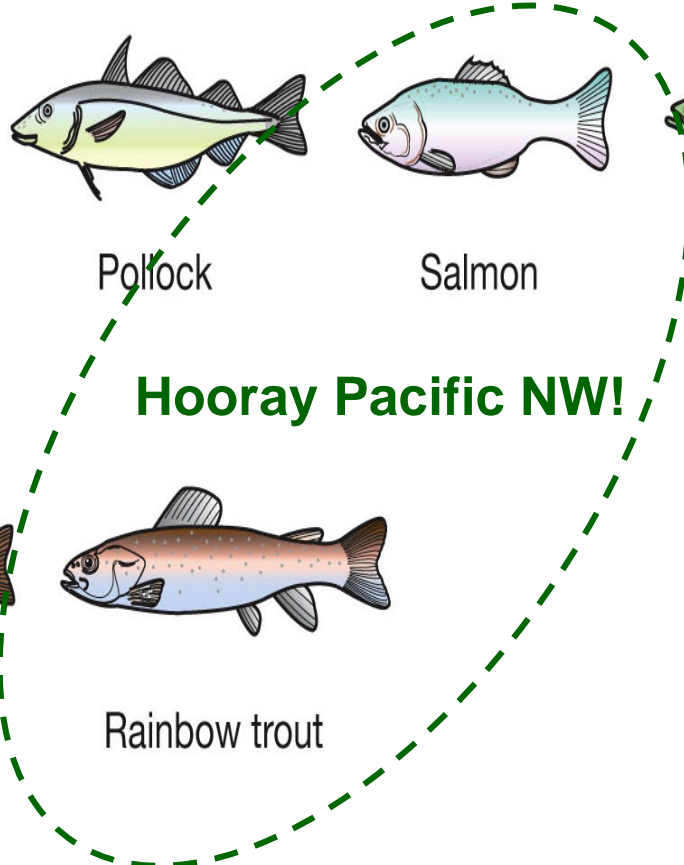
Brown trout



Channel catfish



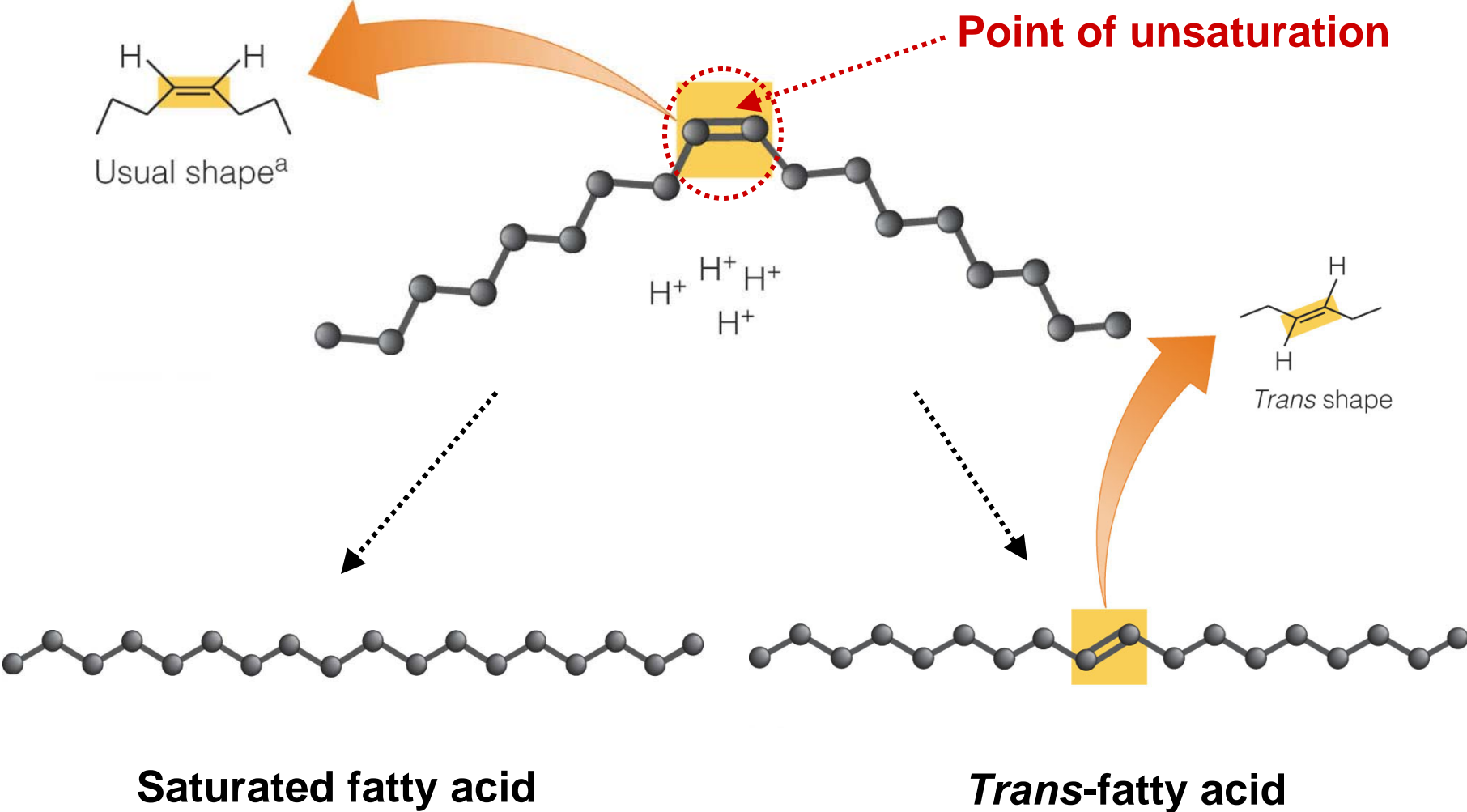
Rainbow trout



**Hooray Pacific NW!**

<sup>a</sup>Canned albacore (“white”) tuna contains more mercury than light tuna varieties.

# Monounsaturated fatty acid



**Processed baked goods often  
contain hydrogenated fats!**



# Saturated fat in a *trans-fat-* free food?

<b>Nutrition Facts</b>	
Serving Size 8 Crackers (28g) Servings Per Container about 9	
<b>Amount per serving</b>	
<b>Calories</b> 165	Calories from Fat 77
% Daily Value*	
<b>Total Fat</b> 8g	<b>13%</b>
Saturated Fat 6g	<b>30%</b>
Trans Fat 0g	
<b>Cholesterol</b> 0mg	<b>0%</b>
<b>Sodium</b> 290mg	<b>12%</b>
<b>Total Carbohydrate</b> 19g	<b>6%</b>
Dietary fiber less than 1g	<b>3%</b>
Sugars 3g	
<b>Protein</b> 3g	
Vitamin A 0%	• Vitamin C 0%
Calcium 2%	• Iron 8%
Thiamin 15%	• Riboflavin 8%
Niacin 6%	• Folate 8%

***NB:*** What's cheapest  
@ production  
time?

**INGREDIENTS:** ENRICHED FLOUR (WHEAT FLOUR, NIACIN, REDUCED IRON, THIAMIN MONONITRATE, RIBOFLAVIN, FOLIC ACID), VEGETABLE OIL (CONTAINS ONE OR MORE OF THE FOLLOWING OILS: SAFFLOWER, CANOLA, SOYBEAN, PALM, COTTONSEED, COCONUT), WHEAT GERM, SUGAR, SALT, HIGH FRUCTOSE CORN SYRUP, EXTRACT OF MALTED CORN AND BARLEY, MOLASSES, LEAVENING (BAKING SODA, MONOCALCIUM PHOSPHATE), EXTRACTIVES OF ANNATTO AND TURMERIC FOR COLOR), MALTED BARLEY FLOUR, SODIUM METABISULFITE.

***1/6 of an avocado or 10 small olives provides  
~ 5 grams of monounsaturated good fat!***





# ♥ Healthy Oils to Minimize Atherosclerosis HAPOC?

H



A



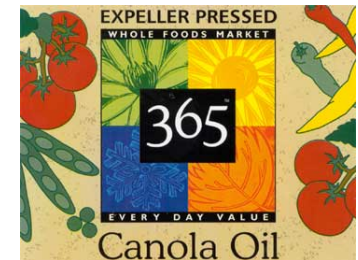
P



O



C



# Nutrition begins with choices in the store! What's in your shopping cart?



**Regular ground beef**  
23% fat



260 cal/3 oz<sup>b</sup>

4½ tsp fat  
8 g saturated fat

**Ground chuck**  
16% fat



220 cal/3 oz<sup>b</sup>

3 tsp fat  
6 g saturated fat

**Commercial ground turkey<sup>a</sup>**  
(with skin ground in)  
13% fat



200 cal/3 oz<sup>b</sup>

2¼ tsp fat  
3 g saturated fat

**Ground round**  
10% fat



180 cal/3 oz<sup>b</sup>

1½ tsp fat  
4 g saturated fat

© Quest Photographic, Inc. (all)

Fat-free, skim, zero-fat, no-fat, or nonfat milk, 8 oz (<0.5% fat by weight)

<b>Calories</b> 80	Calories from Fat 0
<b>% Daily Value*</b>	
<b>Total Fat</b> 0g	<b>0%</b>
Saturated Fat 0g	<b>0%</b>
<b>Cholesterol</b> 5mg	<b>2%</b>

Low-fat milk, 8 oz (1% fat by weight)

<b>Calories</b> 105	Calories from Fat 20
<b>% Daily Value*</b>	
<b>Total Fat</b> 2g	<b>3%</b>
Saturated Fat 1.5g	<b>8%</b>
<b>Cholesterol</b> 10mg	<b>3%</b>

Low-fat cheddar cheese, 1.5 oz

<b>Calories</b> 70	Calories from Fat 30
<b>% Daily Value*</b>	
<b>Total Fat</b> 3g	<b>5%</b>
Saturated Fat 2g	<b>10%</b>
<b>Cholesterol</b> 10mg	<b>3%</b>

## Nutrition Facts

Amount Per Serving



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Whole milk, 8 oz (3.3% fat by weight)

<b>Calories</b> 150	Calories from Fat 70
<b>% Daily Value*</b>	
<b>Total Fat</b> 8g	<b>12%</b>
Saturated Fat 5g	<b>25%</b>
<b>Cholesterol</b> 24mg	<b>8%</b>

Reduced-fat, less-fat milk, 8 oz (2% fat by weight)

<b>Calories</b> 120	Calories from Fat 45
<b>% Daily Value*</b>	
<b>Total Fat</b> 5g	<b>8%</b>
Saturated Fat 2g	<b>10%</b>
<b>Cholesterol</b> 20mg	<b>7%</b>

Strawberry yogurt, 8 oz

<b>Calories</b> 250	Calories from Fat 45
<b>% Daily Value*</b>	
<b>Total Fat</b> 5g	<b>8%</b>
Saturated Fat 3g	<b>15%</b>
<b>Cholesterol</b> 15mg	<b>5%</b>

Cheddar cheese, 1.5 oz

<b>Calories</b> 165	Calories from Fat 130
<b>% Daily Value*</b>	
<b>Total Fat</b> 14g	<b>22%</b>
Saturated Fat 9g	<b>45%</b>
<b>Cholesterol</b> 40mg	<b>13%</b>

Low-fat strawberry yogurt, 8 oz

<b>Calories</b> 240	Calories from Fat 20
<b>% Daily Value*</b>	
<b>Total Fat</b> 2.5g	<b>4%</b>
Saturated Fat 2g	<b>10%</b>
<b>Cholesterol</b> 15mg	<b>5%</b>

Low-fat granola, 1/2 c	
<b>Calories</b> 195	Calories from Fat 35
<b>% Daily Value*</b>	
<b>Total Fat</b> 3g	<b>5%</b>
Saturated Fat 1g	<b>5%</b>
<b>Cholesterol</b> 0mg	<b>0%</b>

Crispy oat bran, 1/2 c	
<b>Calories</b> 150	Calories from Fat 45
<b>% Daily Value*</b>	
<b>Total Fat</b> 5g	<b>8%</b>
Saturated Fat 1.5g	<b>8%</b>
<b>Cholesterol</b> 0mg	<b>0%</b>

Buttery crackers, 5 crackers	
<b>Calories</b> 80	Calories from Fat 35
<b>% Daily Value*</b>	
<b>Total Fat</b> 4g	<b>6%</b>
Saturated Fat 1g	<b>5%</b>
<b>Cholesterol</b> 0mg	<b>0%</b>

Fried rice, 1/2 c <sup>a</sup>	
<b>Calories</b> 140	Calories from Fat 65
<b>% Daily Value*</b>	
<b>Total Fat</b> 7g	<b>11%</b>
Saturated Fat 1g	<b>5%</b>
<b>Cholesterol</b> 20mg	<b>7%</b>

## Nutrition Facts

Amount Per Serving

A homemade waffle	
<b>Calories</b> 220	Calories from Fat 100
<b>% Daily Value*</b>	
<b>Total Fat</b> 11g	<b>17%</b>
Saturated Fat 2g	<b>10%</b>
<b>Cholesterol</b> 50mg	<b>17%</b>

A dinner roll	
<b>Calories</b> 80	Calories from Fat 20
<b>% Daily Value*</b>	
<b>Total Fat</b> 2g	<b>3%</b>
Saturated Fat 0g	<b>0%</b>
<b>Cholesterol</b> 0mg	<b>0%</b>

Fettuccine alfredo, 1/2 c	
<b>Calories</b> 250	Calories from Fat 130
<b>% Daily Value*</b>	
<b>Total Fat</b> 14g	<b>22%</b>
Saturated Fat 8g	<b>40%</b>
<b>Cholesterol</b> 60mg	<b>20%</b>

A breakfast bar	
<b>Calories</b> 150	Calories from Fat 55
<b>% Daily Value*</b>	
<b>Total Fat</b> 6g	<b>9%</b>
Saturated Fat 2.5g	<b>13%</b>
<b>Cholesterol</b> 0mg	<b>0%</b>

A muffin	
<b>Calories</b> 160	Calories from Fat 54
<b>% Daily Value*</b>	
<b>Total Fat</b> 6g	<b>9%</b>
Saturated Fat 1g	<b>5%</b>
<b>Cholesterol</b> 20mg	<b>7%</b>



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A large biscuit	
<b>Calories</b> 260	Calories from Fat 80
<b>% Daily Value*</b>	
<b>Total Fat</b> 11g	<b>17%</b>
Saturated Fat 2.5g	<b>13%</b>
<b>Cholesterol</b> 0mg	<b>0%</b>

A large croissant	
<b>Calories</b> 270	Calories from Fat 130
<b>% Daily Value*</b>	
<b>Total Fat</b> 14g	<b>22%</b>
Saturated Fat 8g	<b>40%</b>
<b>Cholesterol</b> 45mg	<b>15%</b>

**TABLE  
5-7**

## Substitute Ingredients to Lower Saturated Fat Intakes

In addition to reducing foods high in saturated fat, use these substitutions.

Use	Instead of
Fat-free milk products	Whole-milk products
Evaporated fat-free ("skim") milk (canned)	Cream
Yogurt <sup>a</sup> or fat-free sour cream replacer	Sour cream
Soft or liquid margarine, olive oil, butter replacers	Butter
Wine, lemon juice, or broth	Butter
Fruit butters, nut butters	Butter
Part-skim or fat-free ricotta, low-fat or fat-free cottage cheese <sup>a</sup>	Whole-milk ricotta
Part-skim or reduced-fat cheeses, "filled" cheeses in which vegetable oil has replaced saturated fat, avocado for cold dishes	Regular cheeses
Toasted nuts or seeds (in small amounts)	Fried onion or potato chip toppings
Lean ground beef and grain mixture	Ground beef
Low-fat frozen yogurt or sherbet	Ice cream
Herbs, lemons, spices, fruits, liquid smoke flavoring, olive oil, liquid margarine, or ham-flavored bouillon cubes	Butter, bacon, bacon fat
Baked tortilla or potato chips, pretzels	Regular chips

S&W 2011 table 5-7 p 179

**Key:**



Calories



Grams saturated fat

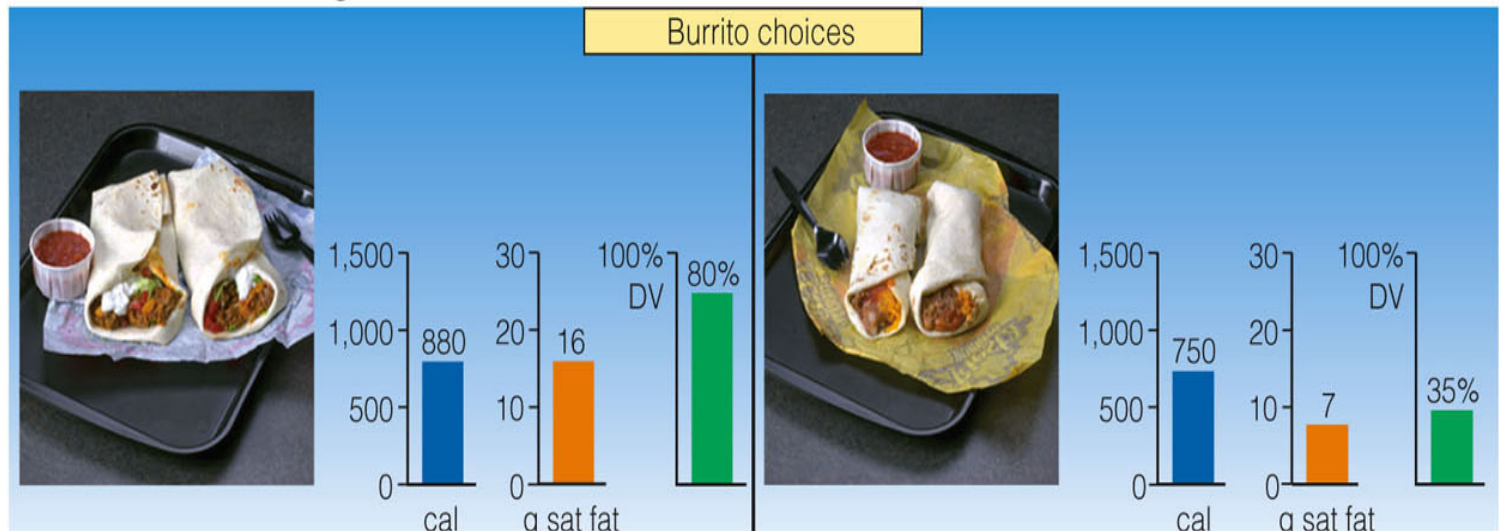


% Daily Value (DV=20 g saturated fat)

When ordering Mexican-style fast food, you can reduce both calories and saturated fat by limiting cheese, meat, and sour cream.

**Higher in saturated fat**

**Lower in saturated fat**



2 "grande" burritos with beef, beans, cheese, and sour cream; salsa

2 bean burritos; salsa

© Matthew Farruggio (all photos)

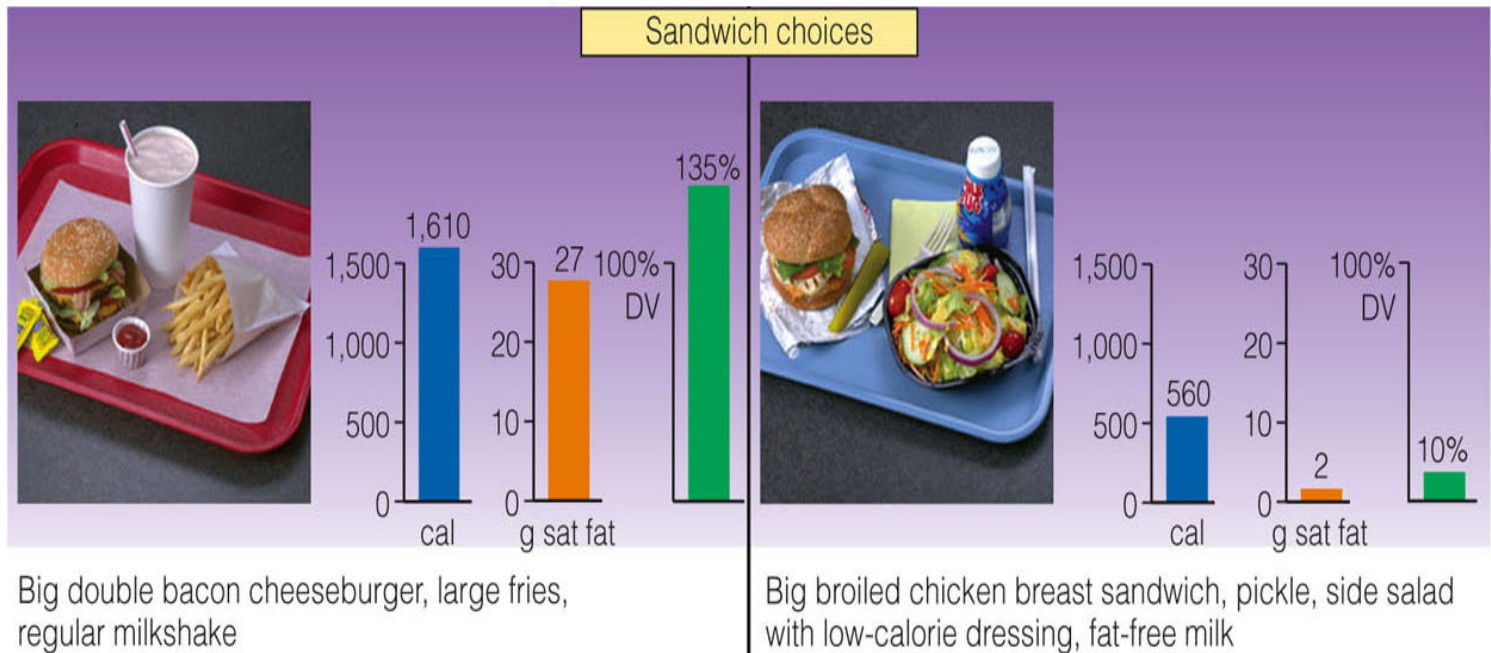
**Key:**

■ Calories

■ Grams saturated fat

■ % Daily Value (DV=20 g saturated fat)

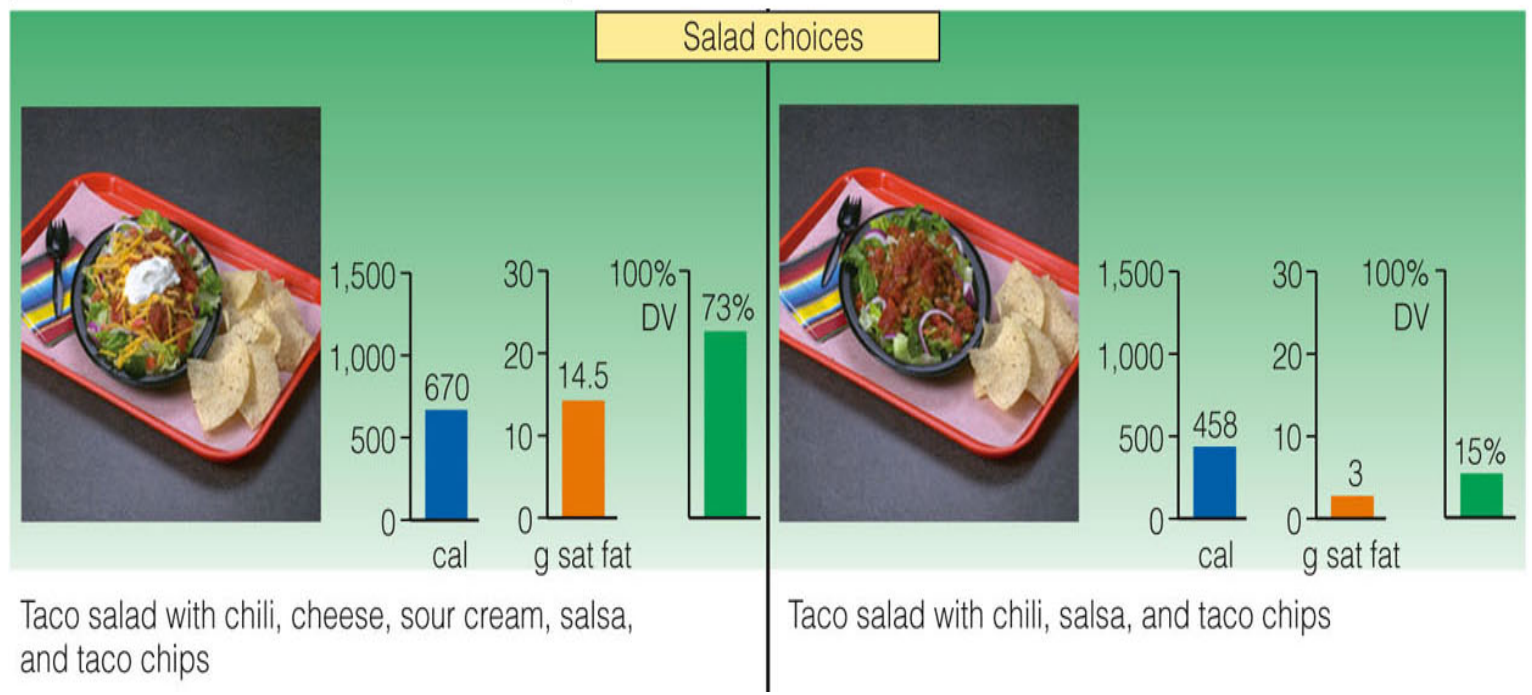
A broiled chicken breast sandwich with spicy mustard is just as tasty as a burger but delivers far less saturated fat and fewer calories. Beware of fried chicken sandwiches or “patties”—these can be as fatty as the hamburger choice.



**Key:**

- Calories
- Grams saturated fat
- % Daily Value (DV=20 g saturated fat)

Don't let add-ons, such as greasy croutons, chips, bacon bits, full-fat cheese, and sour cream pile the calories and saturated fat onto your otherwise healthy fast-food salad. To cut fats and calories, leave off most of the toppings and use just half the dressing.



Taco salad with chili, cheese, sour cream, salsa, and taco chips

Taco salad with chili, salsa, and taco chips



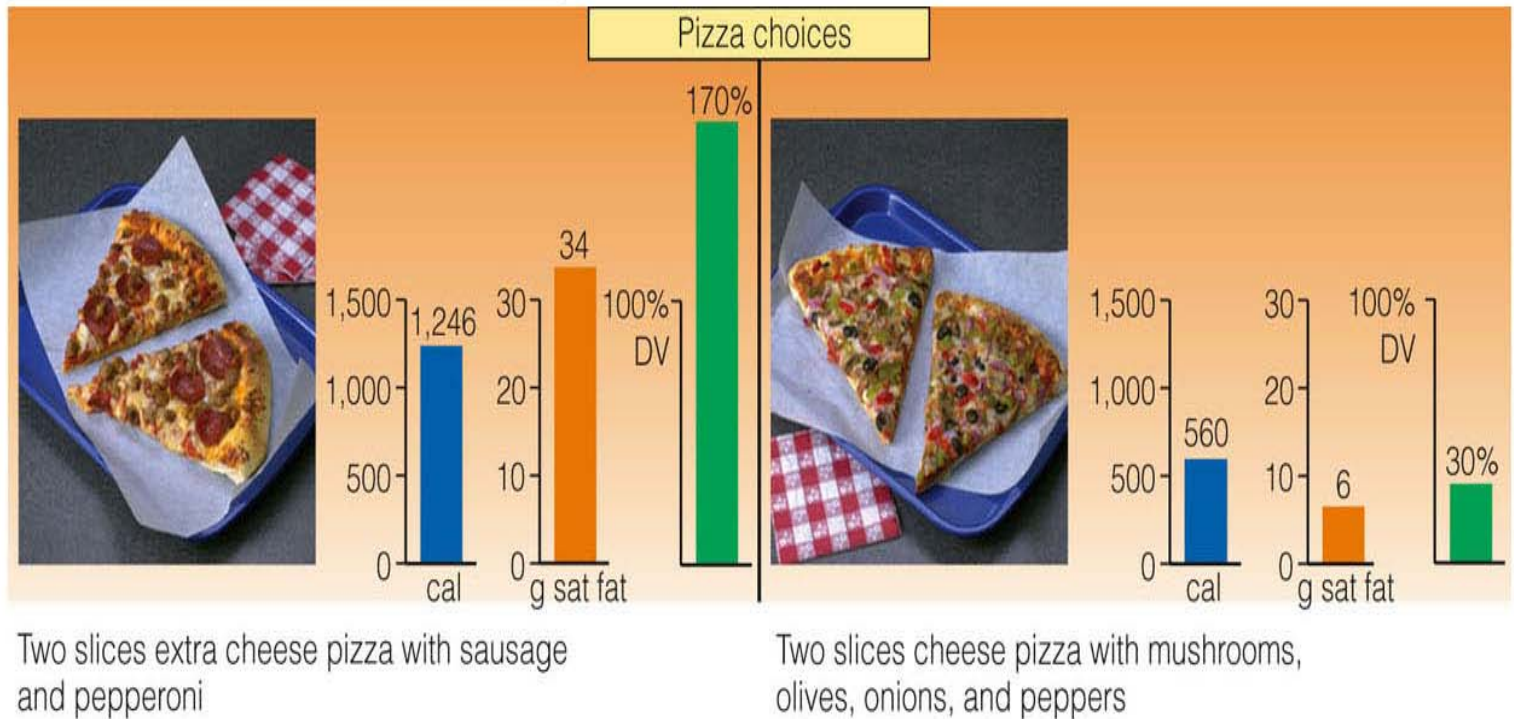
**Key:**

■ Calories

■ Grams saturated fat

■ % Daily Value (DV=20 g saturated fat)

Reduce calories and saturated fat even further: try ordering your veggie pizza with half the regular melted cheese and sprinkle it with parmesan cheese, herbs, or hot peppers for flavor.



# *Olives & their oil may benefit heart health!*



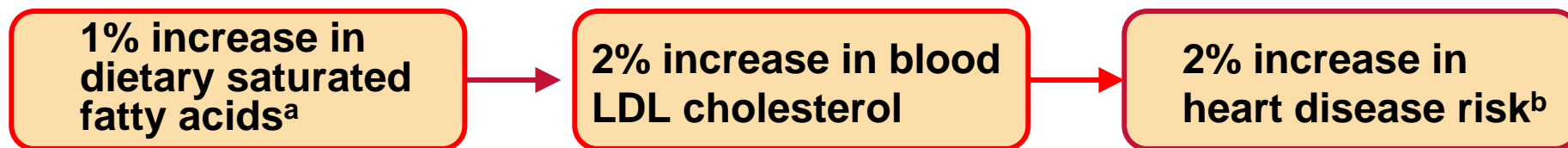
***Fish & other  
seafood  
contribute key  
nutrients to  
the traditional  
Mediterranean  
diet!***



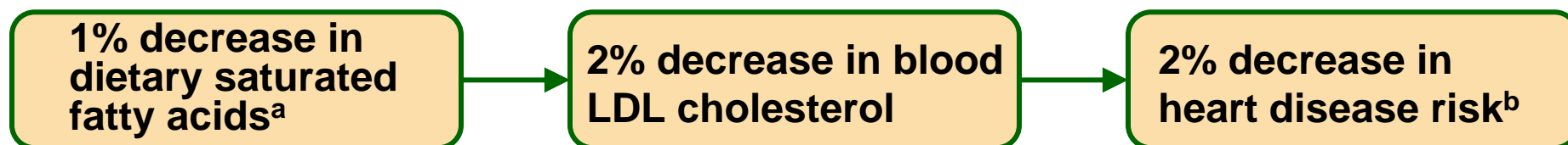
***Nuts add fiber, protein, anti-oxidants, vit E & sterols!***



# ***Dietary Saturated Fatty Acids, LDL Cholesterol & Heart Disease Risk***



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# Mediterranean Diet Pyramid

*A contemporary approach to delicious, healthy eating*

S&W 2011 fig C5-2 p 188

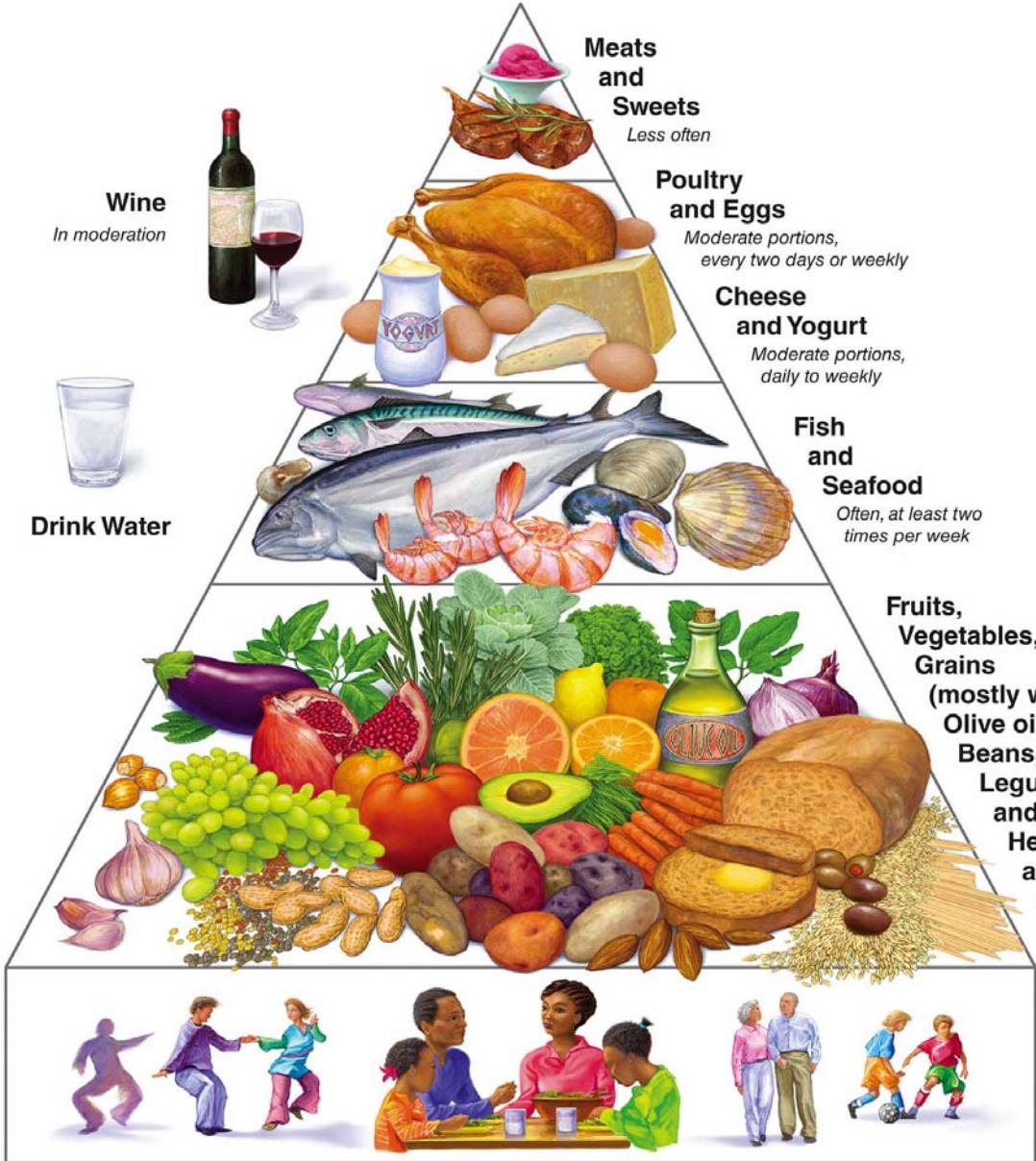


Illustration by George Middleton

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## Quiz Bowl, Chapter 5: Group Competition

1. Which of the following is not one of the ways fats are useful in foods?
  - a. Fats contribute to the taste and smell of foods.
  - b. Fats carry fat-soluble vitamins.
  - c. Fats provide a low-calorie energy source cf: carbohydrates.
  - d. Fats provide essential fatty acids.
2. Generally speaking, *vegetable & fish oils* are rich in \_\_\_\_\_.
  - a. polyunsaturated fat
  - b. saturated fat
  - c. cholesterol
  - d. trans-fatty acids
3. A *benefit to health* is seen when a \_\_\_\_\_ fat is used *in place of* a \_\_\_\_\_ fat in the diet.
  - a. saturated, monounsaturated
  - b. saturated, polyunsaturated
  - c. monounsaturated, saturated
  - d. polyunsaturated, monounsaturated
4. *Chylomicrons*, a class of lipoproteins, are *produced in* cells of the:
  - a. gall bladder
  - b. small intestinal
  - c. large intestine
  - d. liver



## Quiz Bowl, Chapter 5: Group Competition

5. The roles of the *essential fatty acids* include:
  - a. forming parts of cell membranes.
  - b. supporting infant growth & vision development.
  - c. supporting immune function.
  - d. All of the above are correct.
  
6. LDL delivers triglycerides & cholesterol from the liver to the body's tissues. T F
  
7. Taking *supplements of fish oil* is recommended for those who don't like fish. T F
  
8. Consuming large amounts of *trans-fatty acids* lowers LDL cholesterol & thus the risk of heart disease & heart attacks. T F
  
9. *Trans-fatty acids* form in foods primarily when saturated fats are heated as in frying. T F
  
10. Fried fish from fast-food restaurants & frozen fried fish products are often *low in  $\Omega$ -3 & high in saturated fatty acids*. T F

Yahoo! But watch out -  
what's added to your  
popcorn & drink?

