

Chapter 4
Fats or Lipids:
From Plate to Waist

Hewlings/Medeiros

PowerPoint presentation created by
Susan J. Hewlings, PhD, RD

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Types of Fats

- Fatty acids
- Triglycerides
- Phospholipids
- Sterols (cholesterol)

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Essential Features of a Fatty Acid

long hydrocarbon chain carboxylic acid group

Fatty acids are hydrocarbon tails with an acid end and a methyl or omega end.
The acid end attaches to glycerol.

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Saturated Fatty Acids

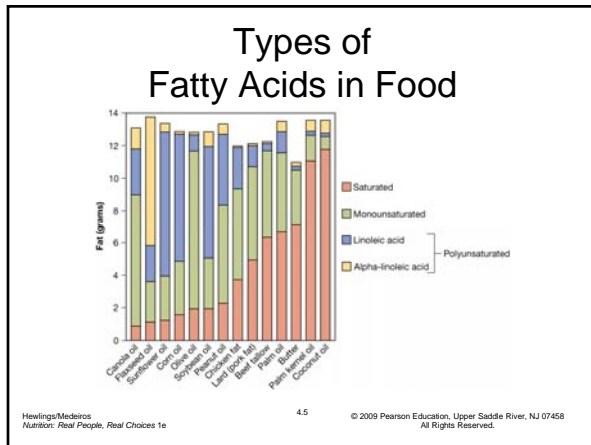
Saturated bond

Unsaturated Fatty Acids

- Monounsaturated fatty acids (one double bond)
- Polyunsaturated fatty acids (> one double bond)

Unsaturated bond or double bond

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Essential Fats

- Location of the double bond in the carbon chain of a polyunsaturated fat influences how body metabolizes it
- If first double bond is 3 C from methyl or omega end = omega 3 fatty acid (Alpha-linolenic)
- If first double bond is 6 C = omega 6 (linoleic)
- Omega 9 = oleic
- Cells in body can produce fatty acids only after C 9, so Alpha-linolenic and linoleic = essential

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Dietary Recommendations for Essential Fats

- Need 1–2% of total kcal from essential fats = 1 Tbsp. of plant oil per day
- Most American get plenty of omega 6 but not enough omega 3
 - Need a ratio of 4:1
- Omega 6 = soybean, corn, safflower oils
- Omega 3 = fish two times a week or regular intake of canola, soybean, walnuts, flaxseed
 - EPA
 - DHA

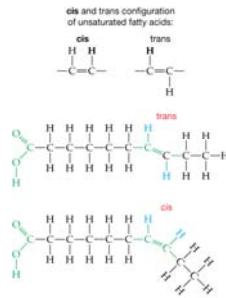
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Hydrogenation

- Process of adding hydrogen to double bonds to increase the solidity of a fat source
- Margarine is hydrogenated plant oils.
- Tub margarine is less hydrogenated than stick.

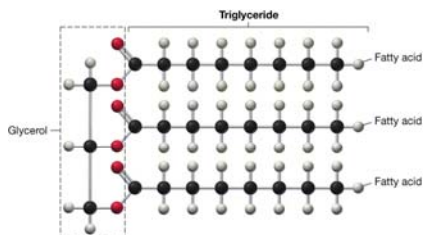


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A Triglyceride



Ester bonds join the fatty acids to the glycerol to make a triglyceride.

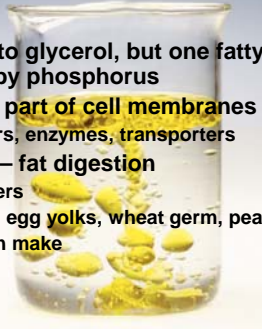
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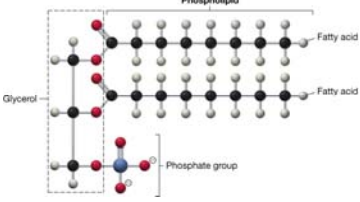
Phospholipids

- Attached to glycerol, but one fatty acid is replaced by phosphorus
- Important part of cell membranes
 - Receptors, enzymes, transporters
- Lecithins – fat digestion
 - Emulsifiers
 - Found in egg yolks, wheat germ, peanuts
 - Body can make



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Chemical Structure of a Phospholipid

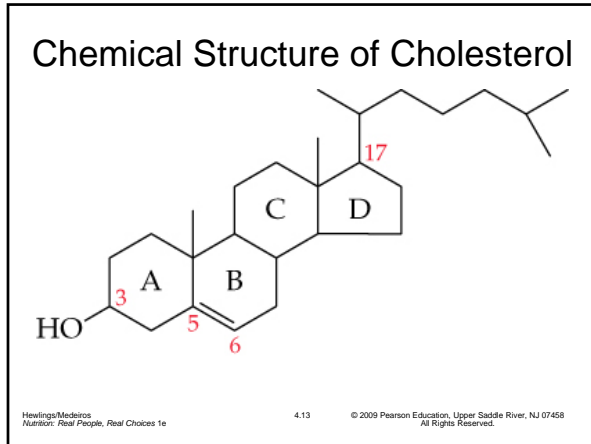


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Cholesterol (Non-Essential Nutrient)

- Used to make steroid hormones, vitamin D, and bile
- Part of cell membranes and lipoprotein “shells”
- Cholesterol is made in most cells (~ 1/2 g/d)
- Liver makes the most and ships out into blood
- Diet provides 200–500 milligrams/day
- Animal foods have cholesterol
- 0 calories/gram (NOT an energy nutrient)

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- ### Functions of Fat
- Storage form of energy
 - Supplies essential fats
 - Absorption and transport of fat-soluble vitamins
 - Insulates and protects organs
 - Flavor of food
 - Satiety
 - Cell membrane function
 - Steroid hormones
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- ### Fats on Food Labels
- Fat free – less than 0.5 g of fat
 - Low fat – 3 g or less of fat per serving
 - Less fat – 25% or less fat than the typical comparison food
 - Light – 50% or less than the comparison food
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Lipids and Health

- Children under 2 years of age: 30–35% of total calories from fat
- Whole milk for children under 2
- Anyone over the age of 2: 20–30% of total calories

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Type Matters

- Eat mostly monounsaturated – 10–12% of total calories
- Some polyunsaturated – 10% of total calories
- Least saturated
 - No more than 10% of calories
 - 20 grams per day if on a 2,000-calorie diet

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Heart Disease

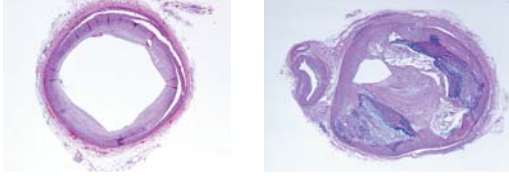
- Leading cause of death in the United States
- Different types of heart disease
- Atherosclerosis (buildup of fat in the arteries)

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Clogged and Clean Arteries



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Risk Factors

- Heredity
- High blood pressure
- Obesity
- Lack of physical activity
- Gender
- Diet
- Increased cholesterol

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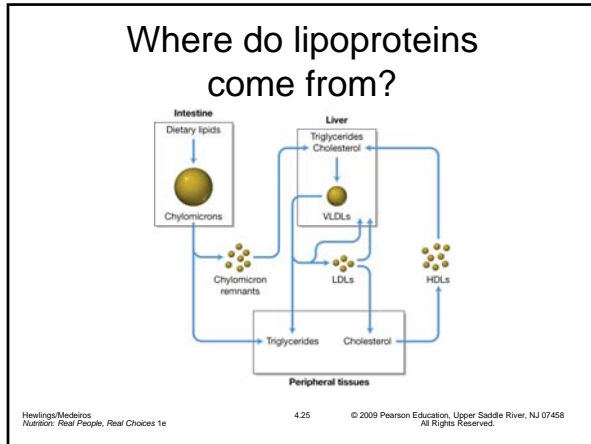
Lipoproteins

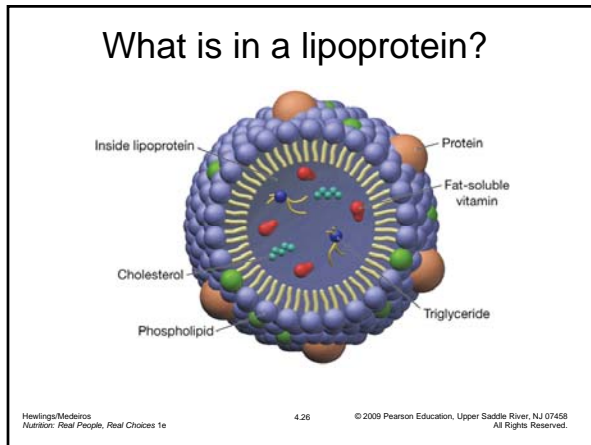
- Composed of triglycerides, cholesterol, and phospholipids
- A "package" used to transport these lipids to body
- Four types
 - Chylomicrons
 - Very low-density lipoproteins (VLDLs)
 - Low-density lipoproteins (LDLs)
 - High-density lipoproteins

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American Heart Association Recommendations

Table 4.4 American Heart Association Recommended Blood Cholesterol Levels

Type	Level
Total cholesterol	Desirable < 200 mg/100 mL
	Borderline to high 200–239 mg/100 mL
	High > 240 mg/100 mL
LDL cholesterol	Optimal < 100 mg/100 mL
	Near desirable 100–129 mg/100 mL
	Borderline high 130–159 mg/100 mL
	High 160–189 mg/100 mL
	Vary High > 190 mg/100 mL
HDL cholesterol	Low < 40 mg/100 mL for men
	< 50 mg/100 mL for women
	High > 60 mg/100 mL

Note: mg/100 mL is the same as mg/dL, which is sometimes found in lab reports or other books.
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