

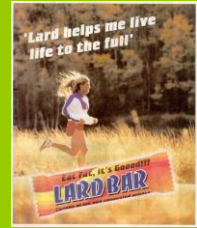
Macromolecules

Ch. 5



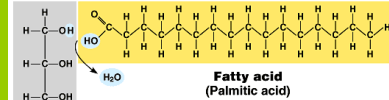
Lipids

- insoluble in water because of non-polarity
- energy storage (twice as much energy as a carbohydrate or a protein)
- animals store fats in adipose tissue which is light weight and also serves as a cushion for organs
- fat or blubber also prevents heat loss in mammals
- plant fat usually only found in seeds

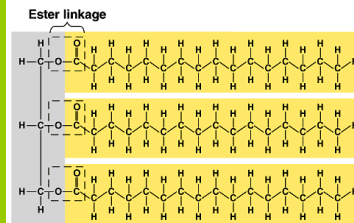


Fats

- a glycerol (three carbon alcohol) and fatty acid (long, hydrocarbon chain with a carboxyl group)
- enzymes catalyze synthesis of fats by making an ester (bond between a hydroxyl group and a carboxyl group) linkage between glycerol and fatty acids
- since there are three carbons on the alcohol it will typically take three fatty acids making a triglyceride.



Glycerol
(a) Dehydration synthesis



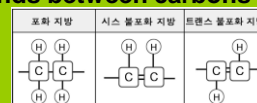
(b) Fat molecule (triglyceride)

CFU

- Which elements are in lipids?
- How do carbs and lipids differ?
- Do lipids dissolve in water?
- What makes up a fat?
- What is the main functional group on fatty acids?
- What four things make up a triglyceride?

Characteristics

- fatty acids within a fat may not all be the same
- fatty acids may differ by the number and location of carbon-to-carbon bonds
- **Unsaturated Fats**-no double bonds between carbons
- **Saturated Fats**- one or more double bonds between carbons



Saturated Fats


- maximum number of hydrogen
- Solid at room animal.
- Lard, butter, bacon grease



Unsaturated Fats


- $C=C$ causes kinks and lower number of hydrogens
- liquid at room temperature
- most plant fats
- Ex. corn, peanut and olive oil
- * Peanut butter has been hydrogenated to be solid





Stearic acid

(a) Saturated fat and fatty acid



Oleic acid

Double bond causes bending

(b) Unsaturated fat and fatty acid

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- animals can only make saturated fats and monounsaturated (only one double bond) fats so polyunsaturated fats must come from the diet (called essential fatty acids)

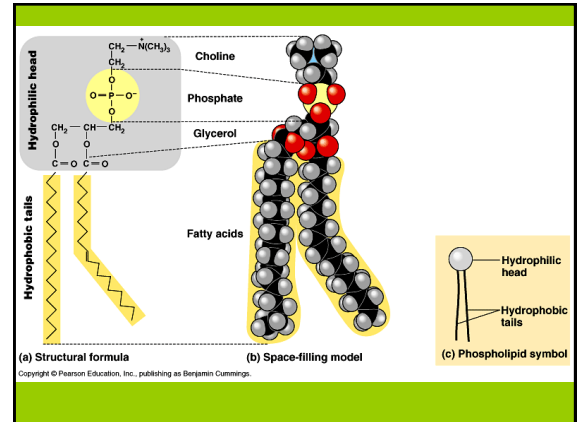
CFU

- Which type of fat has the most hydrogen-saturated or unsaturated?
- Which type of fat has double bonds?
- Which type of fat is solid at room temperature?
- What causes unsaturated fats to be liquid at room temperature?
- Do plants have fat? Which type?

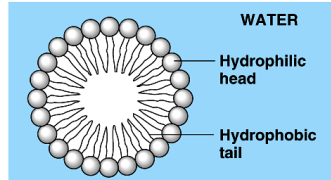
Nutrient	Daily Value
Total Fat	65 grams (based on 30% of 2000 calories)
Saturated Fat	20 grams (based on 8% to 10% of 2000 calories)
Cholesterol	300 milligrams
Total Carbohydrate	300 grams (about 60% of 2000 calories)
Fiber	25 grams
Sodium	2400 milligrams
Potassium	3500 milligrams
Protein	50 grams (about 10% of 2000 calories)

Phospholipids

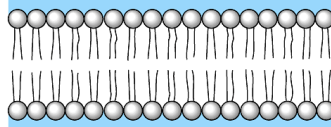
- glycerol, two fatty acids, and a phosphate group
- are ambivalent towards water: one end is hydrophobic and the other is hydrophilic
- major part of cell membranes



(a) Micelle



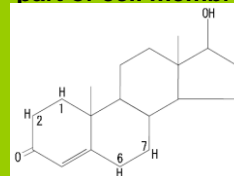
(b) Phospholipid bilayer



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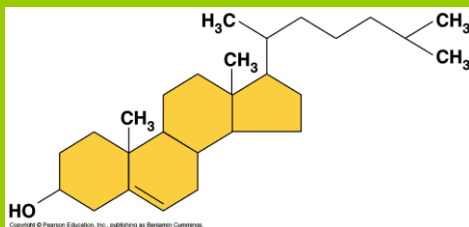
Steroids

- four fused carbon rings with various functional groups attached
- cholesterol is an important steroid (building block for hormones and bile components)
- part of cell membrane



CFU

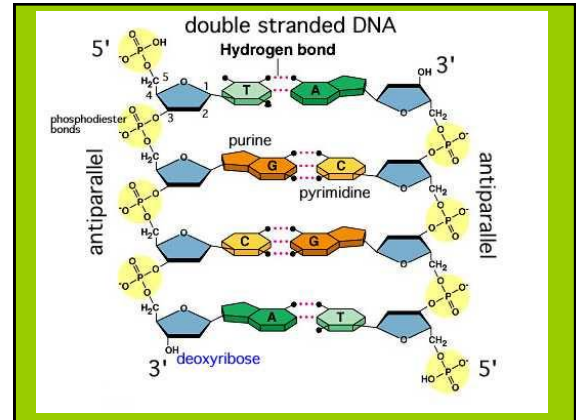
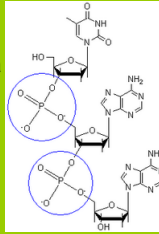
- What makes up a phospholipid?
- Which side of a phospholipid is hydrophilic? Hydrophobic?
- Where are phospholipids found?
- How can you recognize most steroids?
- Give examples of some steroids.



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Nucleic Acids

- two types: DNA (deoxyribonucleic acid) and RNA (ribonucleic acid)
- five carbon sugar covalently bonded to a phosphate group and a nitrogenous base
- polymer of nucleotides make a nucleic acid
- nucleotides are joined by phosphodiester linkages between the phosphate of one nucleotide and the sugar of the next



Functions of nucleotides

- monomers for nucleic acids
- transfer energy (ex. ATP)
- enzyme acceptors (ex. NAD)
- DNA is code of life
- DNA can be used to look at relationships among organisms

