


# Lipids (fats)

**Concentrated energy molecules**

## *I. LIPIDS:*

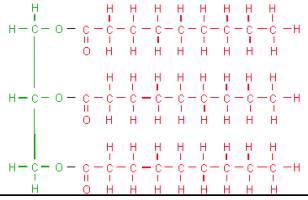
- **Foods:** butter, oil, Crisco, lard
- Commonly called **fats** & **oils**
- Contain **more** C-H bonds and **less** O atoms than **carbohydrates**.
  - Ex: $C_{57}H_{110}O_6$
- Nonpolar; therefore repel **water** (**insoluble**)

## Functions of lipids in our body:

1. **Long term** energy storage (used when carbohydrates are **NOT** available)
   - Concentrated energy storage'
   - Twice the energy of carbohydrates
2. **Insulation –** like whale blubber
3. **Protect** body tissue like your organs (cushioning)

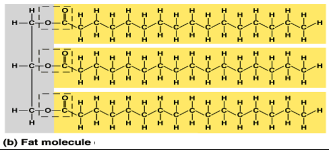
## Triglycerides =

- Majority of fat in organism consist of this type of fat molecules
  - Derived from fats eaten in **foods** or made in the body from other energy sources like carbohydrates.



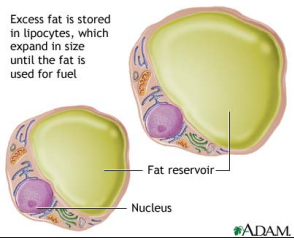
## *Energy Storage*

- Calories ingested in a meal that are not burned are turned into triglycerides then stored in fat cells.
- Released as energy between meals
  - Storage – 3 month supply of energy vs. glycogen's 24 hour supply




## *Energy release*

Hormones regulate the release of triglycerides from fat tissue so they meet the body's needs for energy between meals.



## ***WHICH HAS MORE ENERGY – LIPIDS OR CARBS.?***

•One gram of **fat** contains **TWICE** as much **energy** as one gram of **carbohydrates**. Therefore, **fats** are better **storage** compounds!

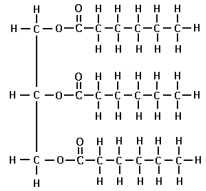
## *What happens to LIPIDS in the body?*

- Broken down by the digestive system via HYDROLYSIS into **fatty acids and glycerol** which are then absorbed into the body through the bloodstream.
- The fatty acids can then be broken down directly to get **energy**, or can be used to make glucose

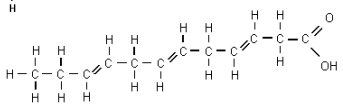
## Types and Examples of Lipids:



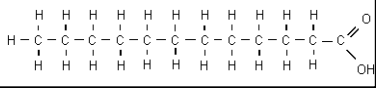
1. **Sterols**- steroids
2. **Waxes** – bee, furniture, ear, car
3. **Cholesterol**- in egg yolks, red meat
4. **Fats**- from animals
5. **Oils** – from plants
6. **Hormones**
   - sex hormones
     - testosterone (male)
     - estrogen (female)



Triglyceride



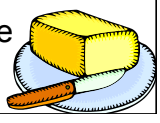
Unsaturated Fat



Saturated Fat

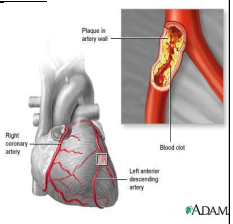
3 types of fats:

1. **Saturated fats** = fatty acid chains of carbon with only **single** bonds between the carbon atoms
   - –Most animals fats
   - –"**Bad Fats**"- cholesterol (heart disease) known as **Low Density Lipoproteins**
   - –**Solid** at room temperature
     - •Ex: **butter**

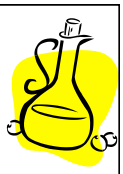


## Excess Triglycerides

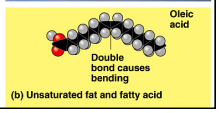
- Cause plaque to build up
  - – **Arteriosclerosis** = walls of the arteries get thick and hard; fat builds up inside the walls and slows the blood flow
    - • Cause blood clots – heart attacks, strokes
- **Hypertension** (high blood pressure)



## Unsaturated fats =



- fatty acid chains of carbon with ONE **double** bond between the carbon atoms
  - "**Good Fats**" (High density Lipoprotein)
  - **Plant, vegetable, and fish fats**
  - **Liquid** at room temperature
    - Ex: **Olive oil**



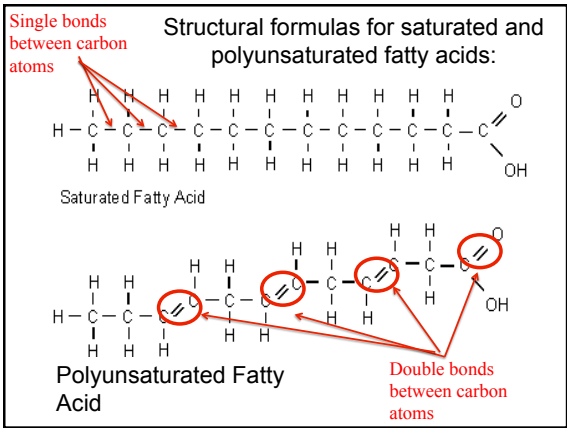

## Polyunsaturated fats

- = MORE THAN ONE double bond between the carbon atoms in the chain
  - can help reduce bad cholesterol levels in your blood
  - provide nutrients to help develop and maintain your body's cells
  - Oils rich in polyunsaturated fats also contribute vitamin E to the diet, an antioxidant vitamin

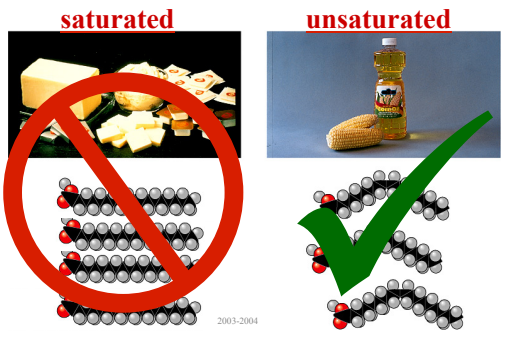
## Sources of Polyunsaturated fats

- soybean oil
- corn oil
- sunflower oil
- fatty fish such as salmon, mackerel, herring and trout.
- provide essential fats such as omega-6 and omega-3 fatty acids which are important for many functions in the body

Structural formulas for saturated and polyunsaturated fatty acids:




## Saturated vs. unsaturated




## Steroids =

- a class of lipids that cause changes in organisms and help regulate natural cycles
- Functions
  - Promotes muscle and bone growth
  - Sex hormones
  - Metabolism regulation
  - Cholesterol is a form of steroid

2003-2004

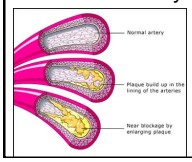
## Steroids: Hormones

- Reproductive hormones - help regulate the reproductive cycle in organisms
- Sex hormones - help determine the development and physical characteristics of gender
- Corticosteroids - help control stress response, immune response, regulation of inflammation and metabolism



## Cholesterol

- about 75% made in liver
  - good molecule in cell membranes
  - make hormones from it
    - including sex hormones
  - but too much cholesterol in blood may lead to heart disease






## Cholesterol

- Low density lipoprotein(LDL)
  - considered the “bad” cholesterol because it can stick to the internal lining of blood vessels (arteries)
  - “plaque” and can impede blood flow and weaken blood
  - A heart attack or stroke can occur when the blood flow stops
- High density lipoprotein(HDL)
  - Cleans walls of arteries
  - considered the “good” cholesterol because it can lower LDL levels



## Phospholipids

- Class of lipids that compose the cell membrane of organisms
- Two parts: a hydrophilic head and two hydrophobic tails
  - Phospholipid heads like water
  - Phospholipid tails are fatty acids and do not like water
- Forms a micelle in water – heads face out while tails face in
- In the cell membrane, phospholipids form a lipid bilayer