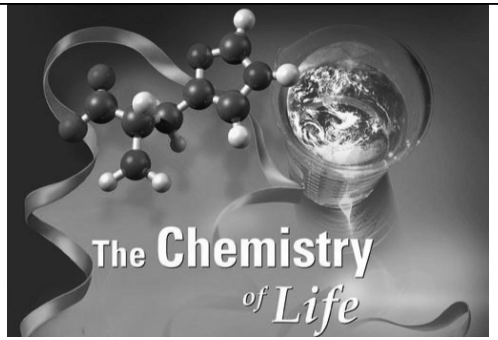
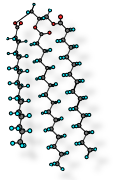



Living tissues: 70% water + 30% macromolecules
Carbohydrates
**Lipids**
Nucleic Acids
Proteins

# Lipids-types and roles

**1. Fats and oils**

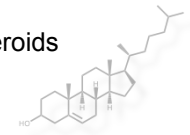
- **Storage of energy**
- **Insulation and protection**



2. Phospholipids

- structural role in cell membranes

3. Steroids



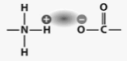
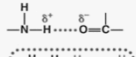
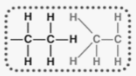
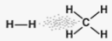
# Lipids Mmmmmm…. Lard

•Hydrocarbons that are insoluble in water due to numerous nonpolar covalent bonds.

•Aggregate together, with weak *van der Waals* interactions holding individual moleculues together.

•This forms a macromolecule of individual lipid molecules that are not covalently bonded

**TABLE 2.1 Chemical Bonds and Interactions**

| NAME | BASIS OF INTERACTION | STRUCTURE | BOND ENERGY* |
|---|---|---|---|
| Ionic attraction | Attraction of opposite charges |  | 3–7 |
| Covalent bond | Sharing of electron pairs |  | 50–110 |
| Hydrogen bond | Sharing of H atom |  | 3–7 |
| Hydrophobic interaction | Interaction of nonpolar substances in the presence of polar substances (especially water) |  | 1–2 |
| van der Waals interaction | Interaction of electrons of nonpolar substances |  | 1 |

*Bond energy is the amount of energy (Kcal/mol) needed to separate two bonded or interacting atoms under physiological conditions.

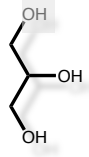
# Triglycerides

- Most common unit of lipid is the triglyceride (simple lipid)
- If form solid at room temp = fat  liquid = oil
- Composed of 3 fatty acids + 1 glycerol molecule

Fatty acid

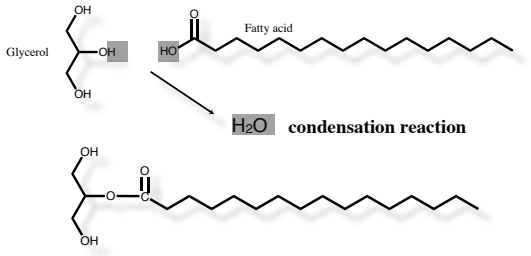
Palmitic acid

Glycerol



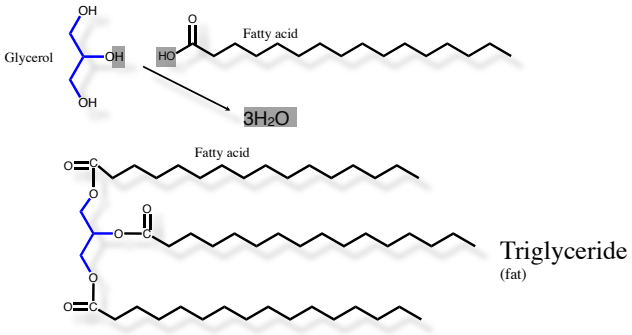
## Triglyceride synthesis

**Condensation (Dehydration)** joins fatty acids to glycerol



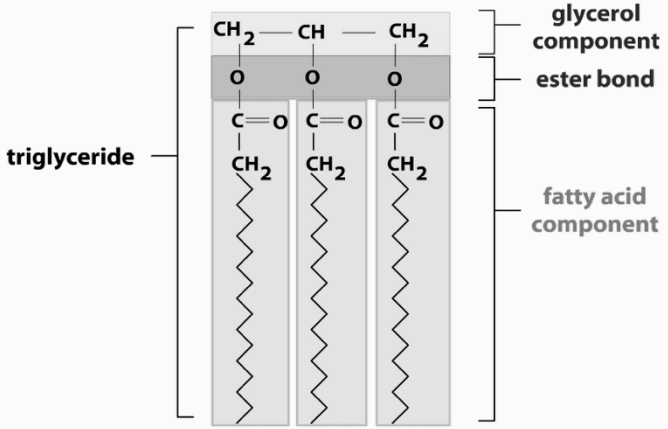

## Triglyceride synthesis

**3 Condensation (Dehydration) reactions** join fatty acids to glycerol



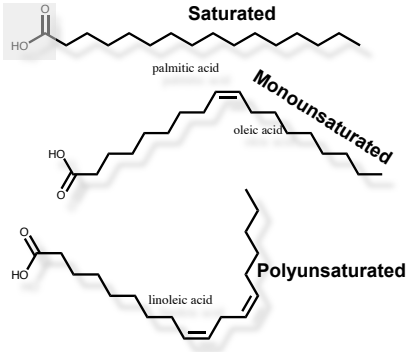

Triglyceride
(fat)

## Building a Triglyceride



# Fatty acids

*Fatty acids can be saturated or unsaturated*



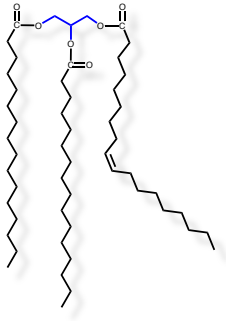

- Saturated Fats stack **T**end to be **solid** at room temperature
- Unsaturated fatty acids are kinked and do not stack
- These hydrocarbon bonds are rich in energy

# Triglycerides (fat)

Triglycerides can be a mixture of **saturated** and **unsaturated** fatty acids

Saturated fat

Unsaturated fat




## - Is it your enemy??

- Fat supplies essential fatty acids (EFAs)
- Fat ferries vitamins A/D/E/K around the body
  – "fat-soluble vitamins"
- Necessary for maintaining healthy skin
- Plays a central role in promoting proper eyesight and brain development


"Not all fat's bad. Maybe you're gaining the omega-3 polyunsaturated kind."

- Trans fats: "hydrogenated" unsaturated fatty acids,
  -synthesized to improve stability of unsaturated FAs
  -No EFAs are derived from Trans fats
- Trans fats increase total and LDL cholesterol levels


- pick *unsaturated fat* over saturated or trans fat.
- Saturated fats stack tightly, requiring more energy to break apart
- Saturated fat examples: butter, bacon, lard, and the fats in meat, poultry, fish