CHAPTER 5: LIPIDS

WHAT ARE LIPID

- Diverse (many and different) group of organic substance – insoluble in water
- Include:
  - Triglycerides
  - Phospholipids
  - Sterols
- Lipid stored in adipose tissue ➔ protect & insulate 1 organ

TRIGLYCERIDES ARE THE MOST COMMON FOOD-BASED LIPID

- Triglycerides contains 3 fatty acids attached to a 3-carbon glycerol backbone
- Fatty acids:
  - Long chain of carbon bound together to hydrogen atoms
- Glycerol:
  - Backbone of triglyceride molecule
  - Composed of 3-carbon atom. One fatty acid attaches to each of these 3-carbon to make triglyceride.
- Can be classified by:
  - Chain length (number of each carbon in fatty acid)
  - Level of saturation (how much hydrogen attached to carbon atom in fatty acid chain)
  - Shape (how they commercially processed)

➤ These factors influence how triglyceride is used in body and affect health

Triglycerides Vary in Chain Length

Short-chain fatty acids: fewer than six carbon atom in length

Medium-chain fatty acids: fatty acids that are 6-12 carbon atoms in length

Long-chain fatty acids: fatty acids are 14 or more carbon atoms in length

▪ Fatty acid chain length:
  - determines the method of digestion and absorption
  - affects how triglycerides are metabolized and used within the body

NOTE:
Short- and medium-chain are digested, transported, and metabolized more quickly than long-

Triglycerides Vary in Level of Saturation

Saturated fatty acid (SFAs):

 Meadow fatty acids have no carbon joined together with double bond

1: isolate
fatty acids are generally solid at room temperature.

Because every carbon atom in the chain is saturated with hydrogen: each has the maximum amount of hydrogen bound to it

**Monounsaturated fatty acids (MUFA)**
- 2 carbon in the chain bound to each other with one double bond
- Generally liquid at room temperature
- Example: olive oil, canola oil, peanut oil, cashew nuts

**Polyunsaturated fatty acids (PUFA)**
- Have more than 1 double bond in the chain
- Generally liquid at room temperature
- Example: cottonseed, canola, corn, and safflower oils

**Carbon Bonding Affects Shape**

* cis fatty acids:
  - hydrogen atom located on the same side of double
  - make molecules kinked

* trans fatty acids:
  - hydrogen atom opposite sides of double carbon bond.
  - make them straighter and rigid

**Hydrogenation:**
- process adding hydrogen to unsaturated fatty acids
- make them more saturated and thereby more solid at room temperature
- During the process, the double bond found in mono- and poly- fatty acids in the oil are broken and make oil more solid at room temperature
- Function: help food contain these fats
- *partially hydrogenated*: some of double bonds are broken

-Research: saturated and *trans* fatty acid raise blood cholesterol levels and appear to change cell membrane function ➔ increased risk for cardiovascular disease

**Some Triglycerides Contain Essential Fatty Acids**
- Essential fatty acid:
  - must be consumed in the diet ➔ can’t not be made by the body
  - two essential fatty acids are linoleic acid and alpha linoleic acid
- Linoleic acid:
  - Aka: omega-6 fatty acid.
  - found in vegetable, nut oils, such as sunflower, safflower, corn, soy, and peanut oils