

ASC 406/606

Lecture [13]

Lipids

Lipids

Definition:

- A heterogenous group of organic compounds in plant & animal tissues
- Oily or greasy substances
- Not soluble in water
- Soluble in organic solvents (e.g., benzene, ether, chloroform)

Importance of Lipids

A) Lipids provide nutrients

1. (high energy value)
- 2.
- 3.

Importance of Lipids

B) Lipids provide functions

1.
 - subcutaneous fat & fat around certain organs
- 2.
3. (cell membrane, mitochondria)
 - phospholipids & lipoproteins
4. : a)
 - b)
 - c)

Importance of Lipids

C) Lipids cause disorders

- 1.
- 2.
- 3.
- 4.
- 5.

* Important to animal agriculture:
red meat, milk & eggs

Classification of Lipids

A) Generic

- Solid @ room temperature
- Highly saturated
- Animal origin

- Liquid @ room temperature
- Highly unsaturated
- Plant origin

Classification of Lipids

B) Chemical

1) Fatty Acids

- The major components of the important dietary lipids
- Very few are found free in cells or tissues
- Each FA is a hydrocarbon chain + terminal -COOH group
- Usually contain an even # of C -atoms
- Synthesized from 2-C units (CH₃COOH) in mammalian cells
- The chain length ranges from 2-C to 24-C
- FA of 16-C & 18-C are predominant in higher plants and animals

Classification of Lipids

I. Saturated FA

- No C=C bonds
- Short-chain FA:
 - Acetic acid
 - Propionic acid
 - Butyric acid
- Long-chain FA:

(16:0)

(18:0)

Classification of Lipids

II. Unsaturated FA

- Contain 1 to 4 C=C bonds
- Include:



Classification of Lipids

B) Chemical

2) Simple Lipids

- Esters of FA with alcohols
- Glycerol esters are the most common
- Three categories:
 - Monoglycerides
 - Diglycerides
 - Triglycerides (triacylglycerols):
 - The major constituent of food lipids
 - The primary storage in adipose tissue
 - ~ 98% of lipids in concentrate feedstuffs

Classification of Lipids

B) Chemical

2) Simple Lipids

Triglycerides:

+

Structure:

Classification of Lipids

B) Chemical

3) Compound Lipids

+

+

a) Phospholipids

FA + alcohol +

- membrane structure & micelle formation

Structure:

Classification of Lipids

B) Chemical

3) Compound Lipids

FA + alcohol + other compounds

b) Glycolipids

FA + alcohol +

- forages

Structure:

Classification of Lipids

B) Chemical

3) Compound Lipids

FA + alcohol +

c) Lipoproteins

lipid/protein complex

- lipid transport in blood
- Examples:
