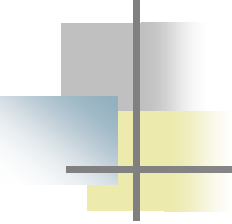


LIPIDS: Structure

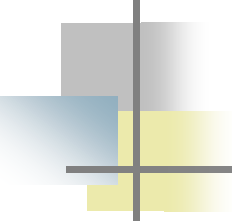
Triglycerides,
Phospholipids,
and Sterols

**By: Shozab Seemab Khan
(PhD Scholar)**



TYPES OF LIPIDS

1. Triglycerides
2. Phospholipids
3. Sterols



TRIGLYCERIDES

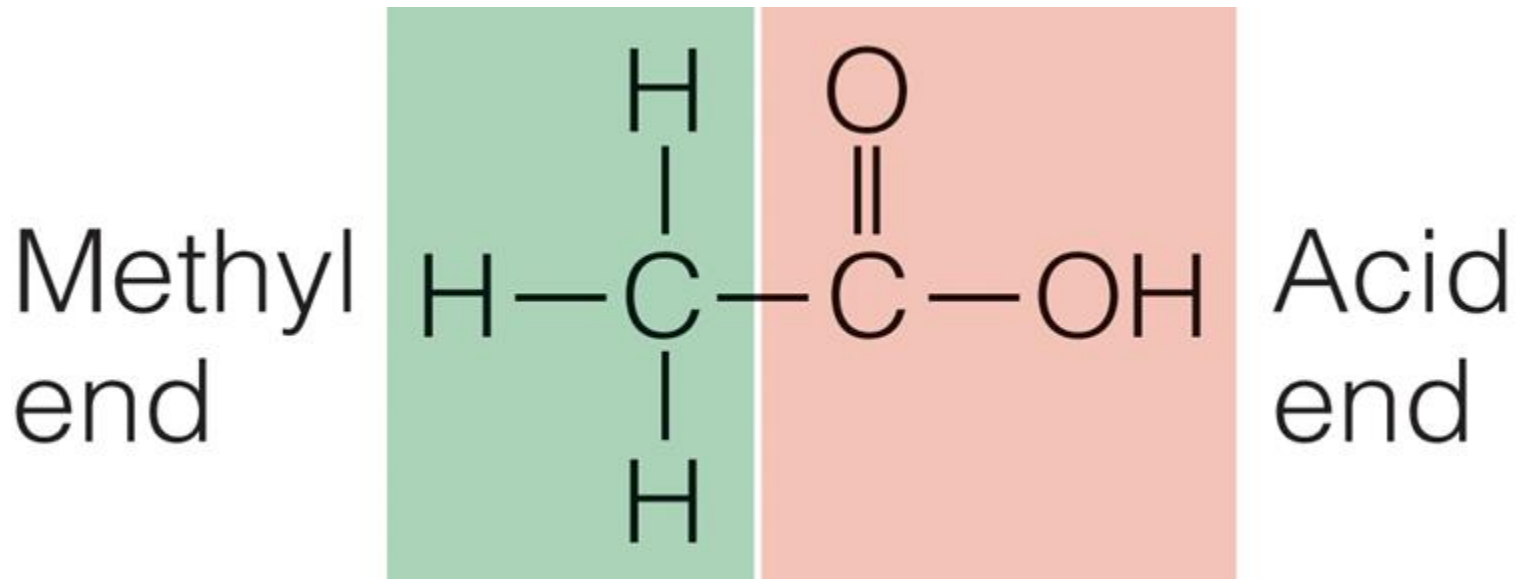
- **Triglycerides** – Fats & Oils

Structure – composed of

3 fatty acids + glycerol

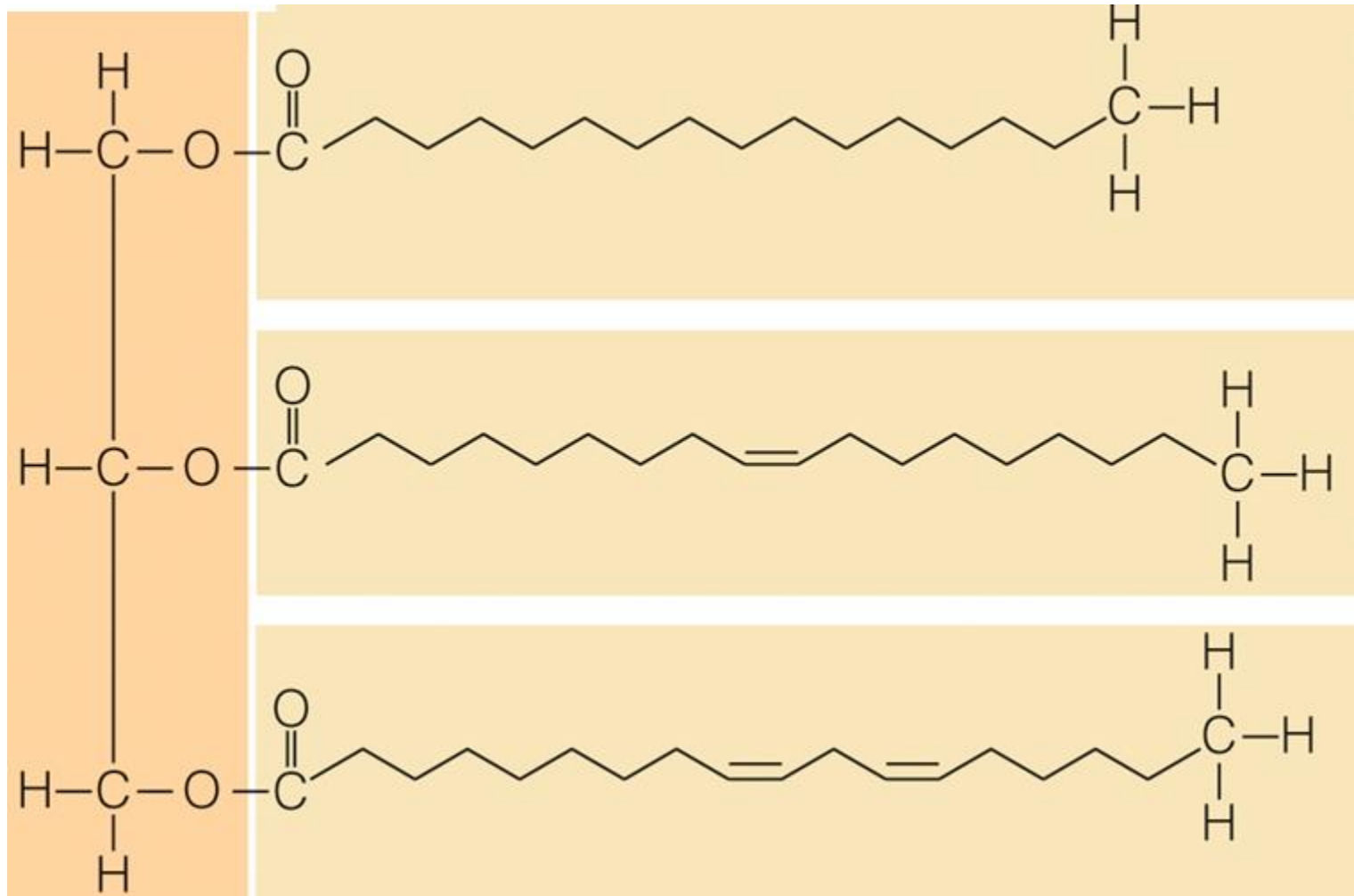
Fatty Acids

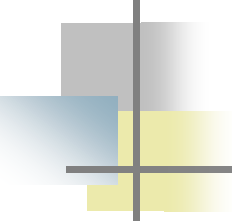
- Organic acid (chain of carbons with hydrogens attached) that has an acid group at one end & a methyl group at the other end. e.g CH_3COOH



Fatty Acids & Triglycerides

- glycerol + 3 fatty acids $\rightarrow$ triglyceride + H_2O



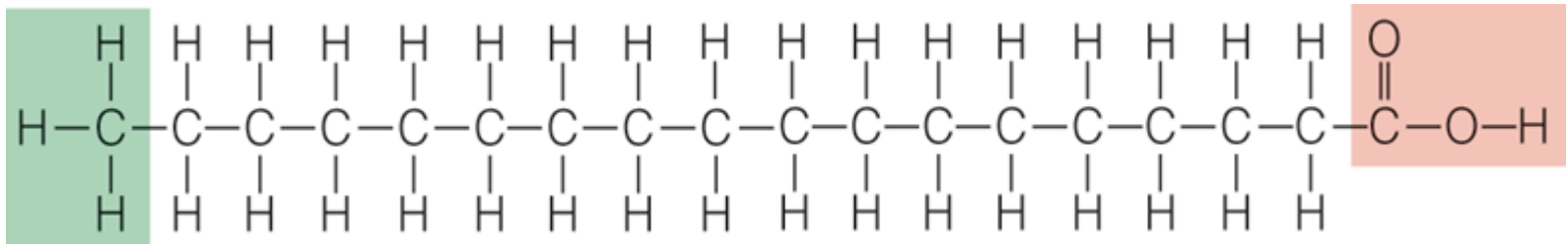


FATTY ACIDS

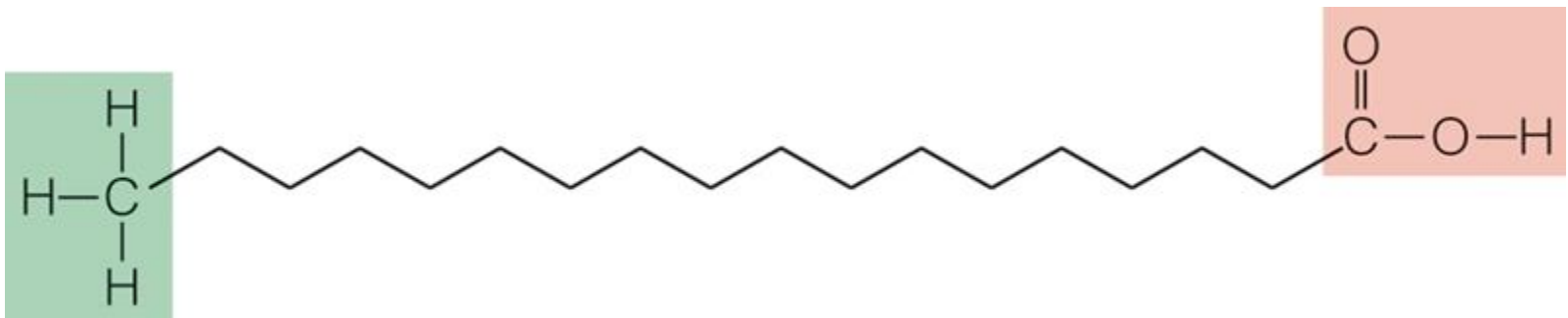
Saturation

- **Saturated fatty acid** – carbon chains filled with hydrogen atoms (no $C=C$ double bonds)
 1. Saturated fat – triglyceride containing 3 saturated fatty acids, such as animal fats (butter)
 2. Appear solid at room temperature

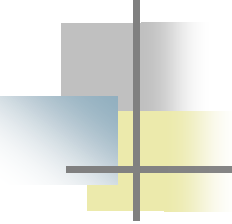
- Length of carbon chain



Stearic acid – 18-carbon, saturated

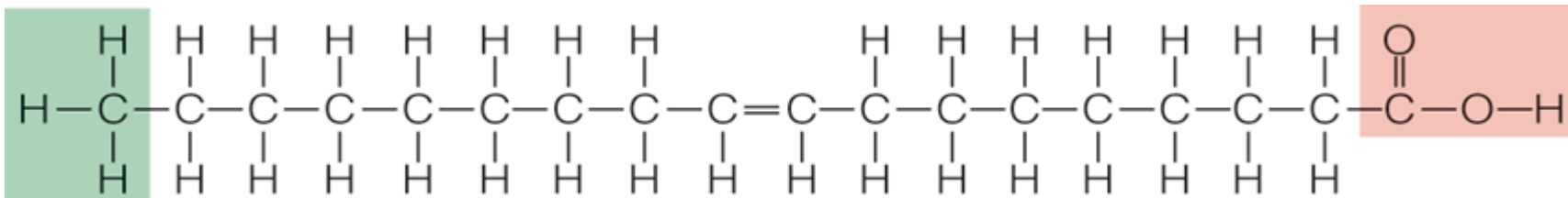


Simplified structure

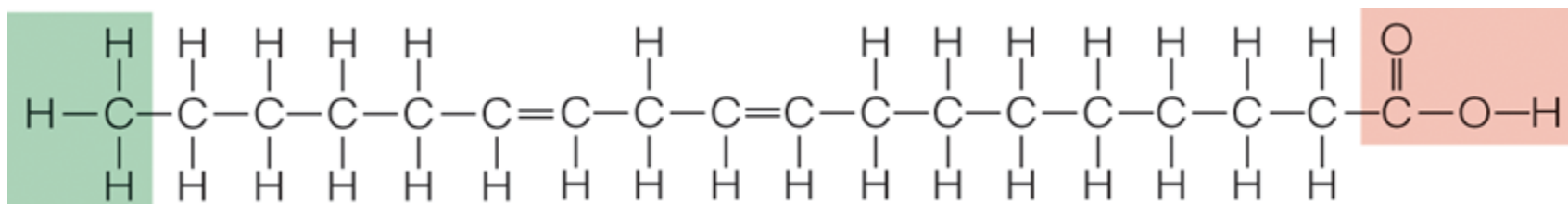


FATTY ACIDS

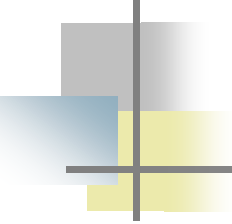
- **Unsaturated fatty acid** – carbon chains lack some hydrogens (>1 C=C double bond)
 1. Monounsaturated fat – triglyceride containing fatty acids with 1 double bond; i.e. canola & olive oil
 2. Polyunsaturated fat- triglycerides containing a high % of fatty acids with >2 double bonds; i.e. corn, safflower, soybean, sunflower oils and fish;
 3. Appear liquid at room temperature



Oleic acid – 18-carbon, monounsaturated



Linoleic acid – 18-carbon, polyunsaturated



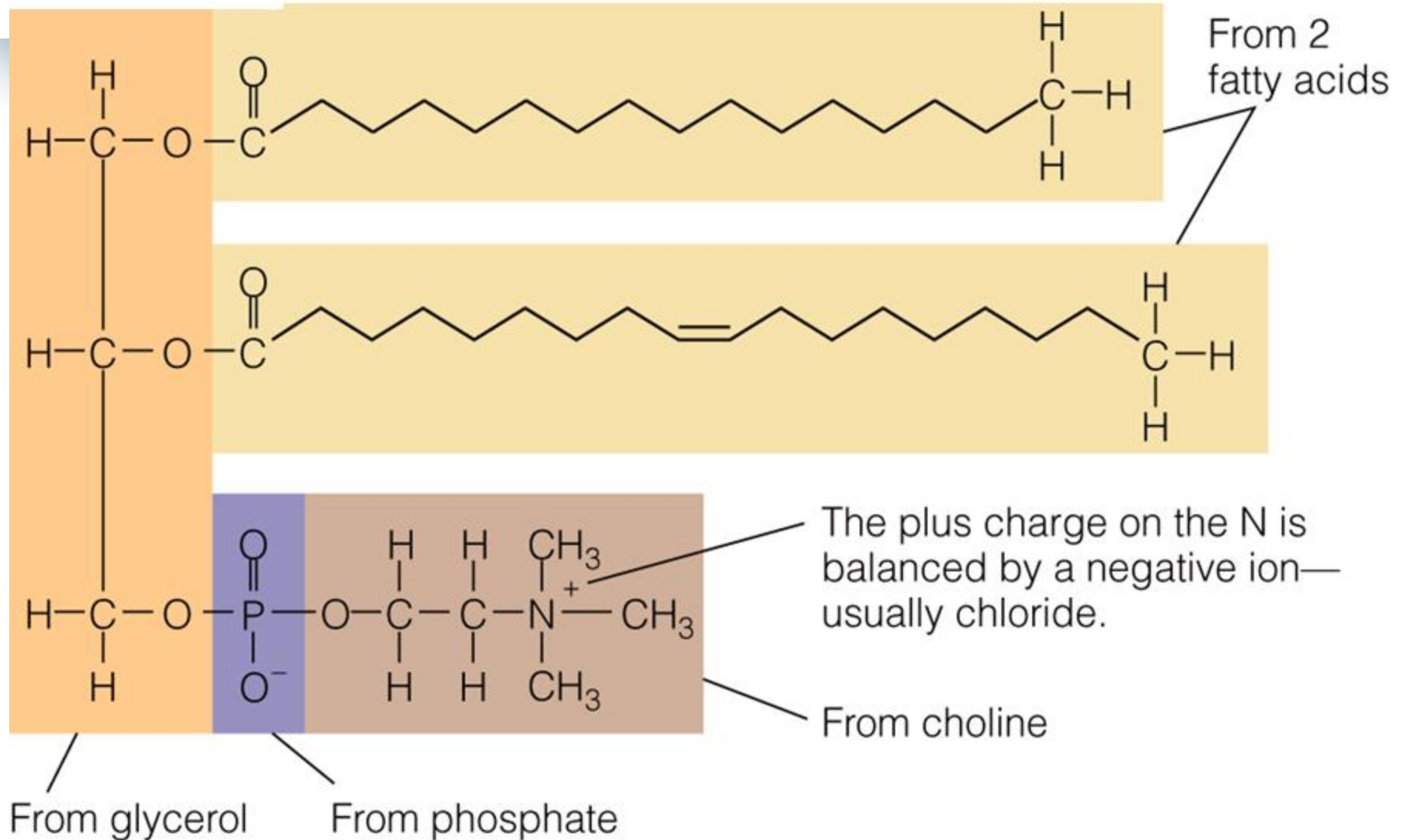
PHOSPHOLIPIDS

- **Phospholipids** – similar to triglycerides in structure except only 2 fatty acids + choline

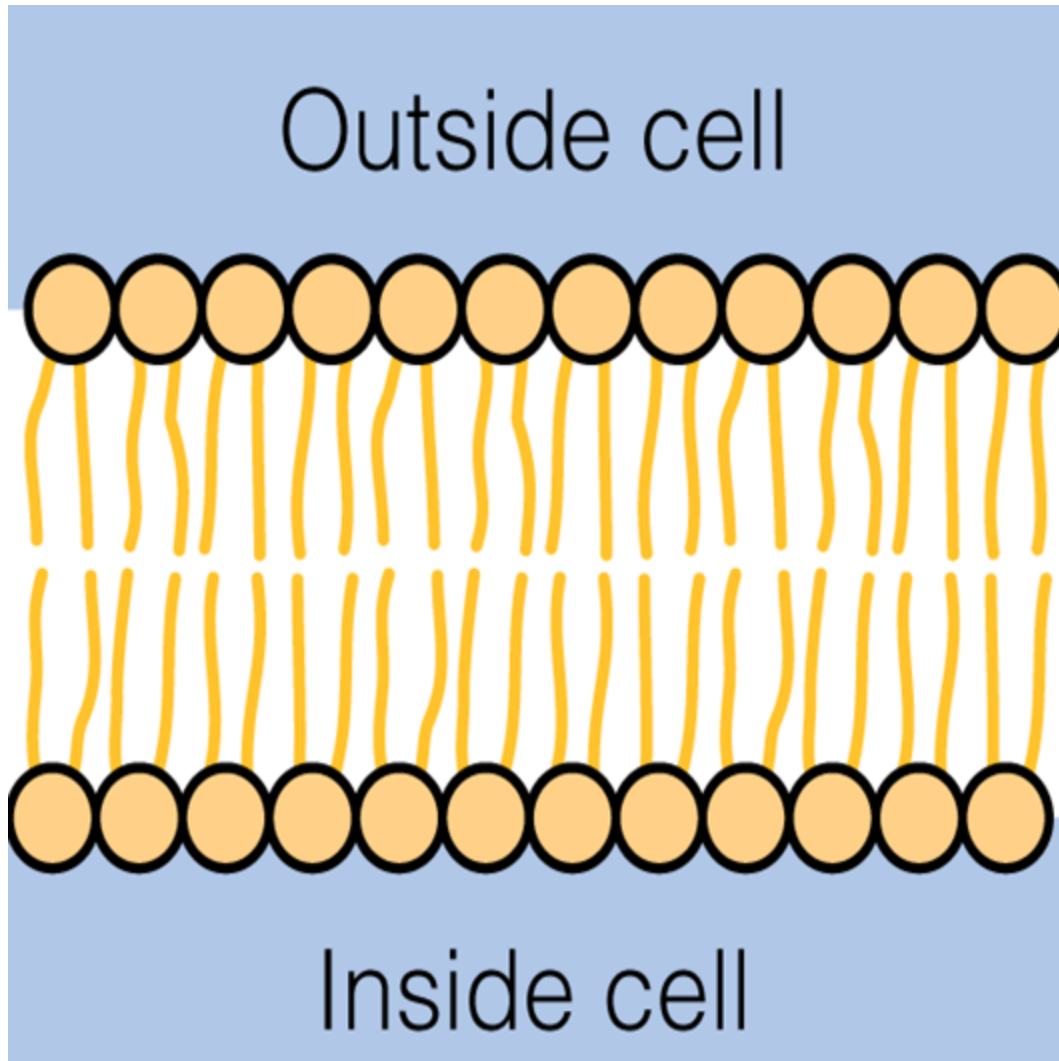
Phospholipids in foods:

Lecithin, egg yolks, soybeans, wheat, peanuts

Lecithin



Phospholipids



Outside cell

Watery fluid

Glycerol heads

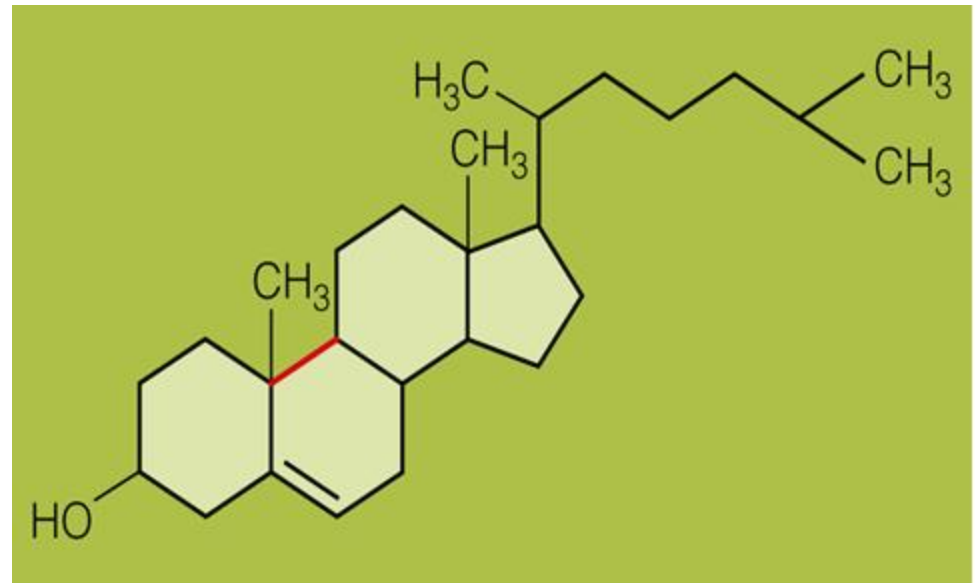
Fatty acid tails

Inside cell

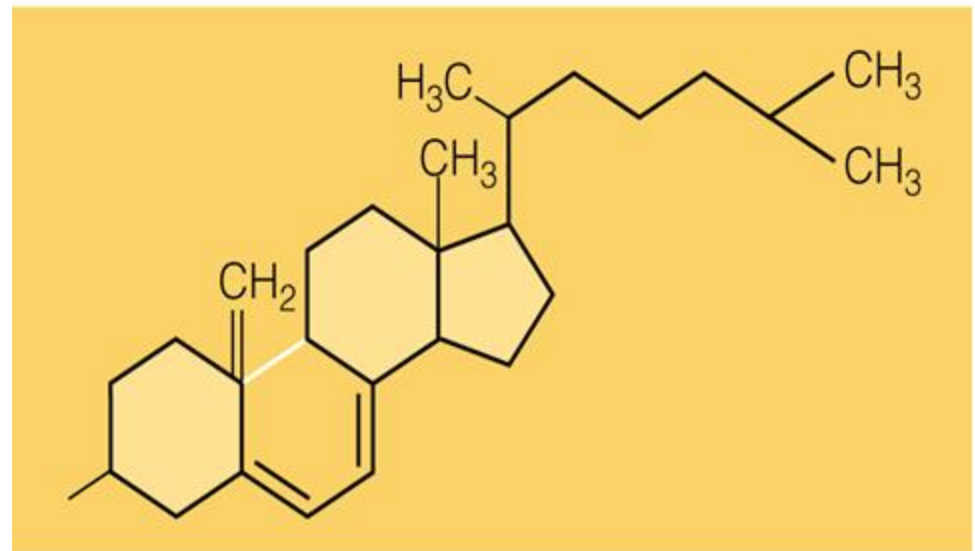
Watery fluid

Sterols

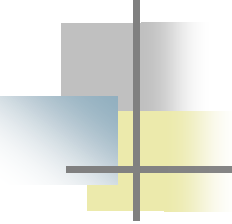
Structure consists of carbon rings



Cholesterol



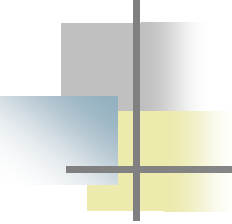
Vitamin D₃



STEROLS

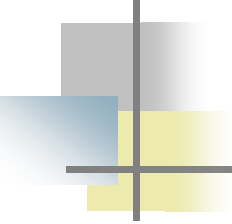
■ Important part of:

1. Sex hormones – testosterone
2. Vitamin D
3. Bile (aids fat digestion)
4. Adrenal hormones - cortisol
5. Cholesterol – in foods and made by the liver; dietary sources include egg yolks, liver, meats, dairy products



Fat Digestion

- Hydrolysis
 - Triglycerides → monoglycerides, fatty acids, glycerol



Health Effects of Fats

- Excess fat intake contributes to many diseases including:
 1. Obesity
 2. Diabetes
 3. Cancer
 4. Heart disease
- How?
 1. High fat diets = high kcal diets
 2. High saturated fat intake raises blood cholesterol
 3. High fat intakes may promote cancer