

TOPIC 2.3: LIPIDS

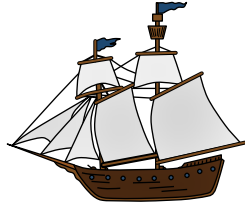
Functions of Lipids

Lipids are a class of non-polar organic molecules

- Include triglyceride (adipose tissue), phospholipid (bilayer), cholesterol (animal cell membrane), steroids (hormones)

Lipids may serve a variety of cellular functions, including:

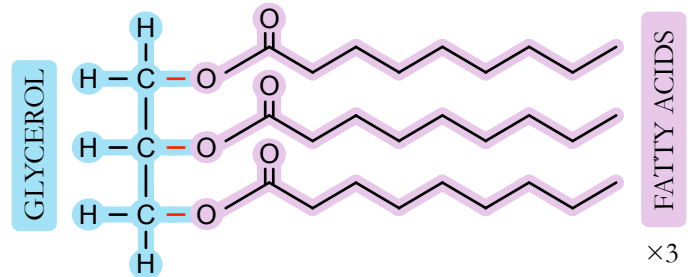
- **S**torage of energy (triglycerides)
- **H**ormonal roles (steroids)
- **I**nsulation (thermal)
- **P**rotection of organs
- **S**tructural roles (cholesterol)



Triglycerides

Triglycerides are lipids used for long-term energy storage

They are composed of a glycerol molecule covalently linked to three fatty acid chains (via condensation reactions)



Fatty Acids

Fatty acids are long hydrocarbon chains found in certain lipids

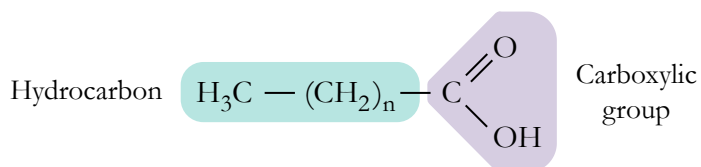
- Principally found in triglycerides and phospholipids

Saturated Fatty Acids

- Possess no double bonds in the hydrocarbon chain
- Are generally solid at room temperatures (e.g. animal fat)

Unsaturated Fatty Acids

- Possess double bonds (mono = one ; poly = many)
- Are generally liquid at room temperature (e.g. plant oils)



General Structure of a Saturated Fatty Acid

Unsaturated fatty acids occur in two distinct configurations

Cis Isomer	Trans Isomer
H atoms on the <i>same side</i>	H atoms on <i>different sides</i>
Double bond creates <i>kink</i> in fatty acid chain	Double bond does <i>not</i> create kink (linear chain)
Are <i>loosely</i> packed and usually <i>liquid</i>	Are <i>tightly</i> packed and usually <i>solid</i>
Occur commonly in <i>nature</i>	Occurs in <i>processed food</i>
Generally <i>good</i> for health	Generally <i>bad</i> for health

Lipid Health Risks

Fats and cholesterol cannot dissolve in the blood and so are packaged with proteins (as lipoproteins) for transport

- Low density lipoproteins (LDLs) transport cholesterol from the liver to the rest of the body (bad for health)
- High density lipoproteins (HDLs) scavenge excess cholesterol and return it to the liver for disposal (good)

Fatty acids can influence the levels of lipoproteins:

- Cis fats raise levels of HDL (↓ blood cholesterol)
- Saturated fats raise levels of LDL (↑ blood cholesterol)
- Trans fats raise levels of LDL and lower levels of HDL

High levels of blood cholesterol can cause atherosclerosis and lead to health issues like coronary heart disease (CHD)

