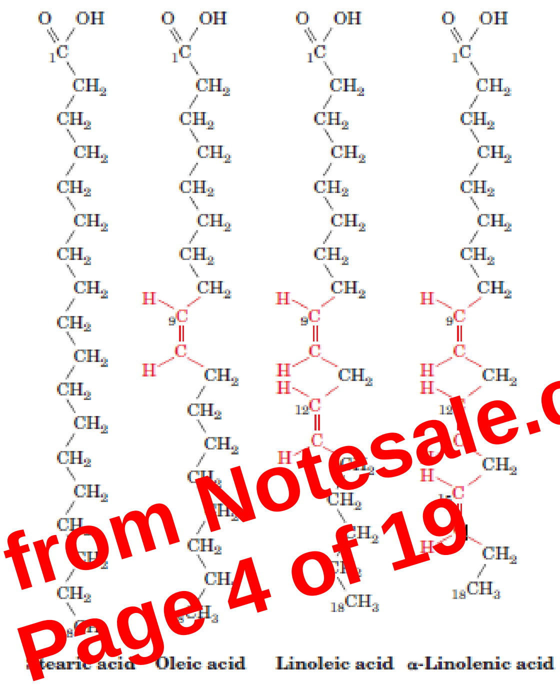
Also, more often; when fatty acids appear to be unsaturated, the double bond is usually in Cis form between C9 and C10 designated Δ9, and other double (if present) bonds are usually in the form and sequence Δ12, Δ15 (arachidonic acid is an exception). Observing this , it is discovered that double bonds of polyunsaturated fatty acids are almost never conjugated and are separated by a methylene groups.



In addition, physical properties of fatty acids is a function of chain length and degree of saturation, the longer the fatty acyl chain and fewer the double bond, the lower the solubility in water, for example saturated fatty acid of 12:0 to 24:0 are solid at room temperature, while unsaturated fatty acids of same length are liquid at room temperature. This physical difference is due to difference in degree of packing as the free rotation around saturated fatty acid fosters great flexibility and no steric hindrance, allowing tight packing in nearly crystalline array. In contrast, double bond induces a constriction and steric hindrance, thus folding is never tight

FATS

Triacylglycerols, otherwise known as fats or triglyceridesare cmposed of three fatty acids; each in ester linkage with the –OH groups of a single glycerol.

Triacylglycerides may have the same kind of fatty acid in the three positions; such are called “simple triglycerides”, although most naturally occurring triacylglycerides are having “mixed fatty acid groups”

Triacylglycerides are insoluble in water because the polar –OH of the glycerols are in ester linkage, therefore they are non-polar hydrophobic molecules with lower density than water.

Fats are often founds as oily cytosolic droplets of eukaryotic cells, invertebrates; there are specialized cells (adipocytes) that stores large amount of triacylglycerides. Also, they are often stored in the seeds of some plants.

Often times, eukaryotic cells specialized for storing fats(e.g adipocytes and germinating seeds) often posses the enzyme "Lipase" which catalyses the hydrolysis of the acylglycerides, releasing fatty acids; which are used when requires as fuels.

Why are triacylglycerols somewhat preferably efficient fuel store than polysaccharides ?

1. Carbon atoms of fatty acids are reduced than those of sugars, yet oxidations of triglycerides yield more than twice much energy than from the oxidation of sugars
2. Triacylglycerols are hydrophobic and therefore unhydrated, therefore they carry no extra weight of water of hydration when transported as fuel.
3. The body can accumulate triglycerides much enough for one month energy supply, whereas the body can store less than a day body energy supply in form of glycogen

Triglycerides stored under skin also function as insulators against harsh temperature, they confer buoyancy in some other organisms.

It is important the potential ability of lipid foods to become "rancid" as a result of oxidative cleavage of the double bonds in unsaturated fatty acids. This oxidation produces aldehydes and carboxylic acids of shorter chain length which are often volatile with unpleasant odour and taste. Thus partial hydrogenation is often practised on oils to reduce most double bond to full saturation. However, this practise also has a defect of converting some of the Cis double bonds to Trans configuration which has been indicted to be associated with cardiovascular health risks, inflammation and autoimmunity

WAXES

Biological waxes are esters of long chain(C14-C36) saturated fatty acid with long chain alcohols(C16-C30). Waxes have higher melting points than triglycerides. Waxes functions biologically as metabolic fuel store, water repellant. In addition, skin glands of animals secrete waxes to protect hair, skin and keep it water proofed, pliable and lubricated, as well as water proofs birds feathers. In plants, waxes gives some leaves their shiny and thick appearance which prevents evaporation and parasite attack

Biological waxes has also found large variety of use industrially as pharmaceuticals, cosmetics etc

Having discussed the 5 types of structural membrane lipids. Its is convincing to take a quick peep into degradation of some and highlight related clinical relevance's and associated inborn errors.

Glycerophospholipids degradation occurs with the activity of a specific lysosomal hydrolytic enzyme "Phospholipase type A", which cleaves one of the fatty acyl ester link to glycerol, producing a lysophospholipid (mono acyl glycerol 3-phosphate). Another enzyme "Lysophospholipase" cleaves off the the remaining fatty acyl ester linkage.

Gangliosides are also degraded be a set of lysosomal enzyme that cleaves off sugar moiety sequentially and completely; to form ceramide. Disorders of ganglioside breakdown are responsible for several hereditary sphingolipid storage diseases, such as Tay-Sachs disease, which are characterized by an invariably fatal neurological deterioration in early childhood.

FUNCTIONAL METABOLITES & BIOSIGNALLING ACTIVITY OF LIPIDS

Having known the functional classes of lipids, there are some more minute groups of lipids that plays active roles as cellular messengers and metabolites, potents signals as hormone and eicosanoids, some redox cofactors, some pigments, plant volatile signals, and certain metabolomes as polyketides all fall into this category.

Few activities of lipids in this category will be discussed.

1. **Phosphatidylinositol and its phosphorylated derivatives are cellular metabolism regulators and structural chaperones:**

   Phosphatidylinositol 4,5-bisphosphate in the cytoplasmic inner face of plasma membranes serves as a specific binding site for certain cytoskeletal proteins and for some soluble proteins involved in membrane fusion during exocytosis.

   It also serves as a reservoir of messenger molecules that are released inside the cell in response to extracellular signals interacting with specific receptors on the outer surface of the plasma membrane.

   The signals act through a series of steps that begins with enzymatic removal of a phospholipid head group and ends with activation of an enzyme (protein kinase C), as seen for example in the biomechanism of the hormone vasopressin. Phospholipase C hydrolyzes the bond between glycerol and phosphate in phosphatidylinositol 4,5-bisphosphate, releasing two products: inositol 1,4,5-trisphosphate (IP3), which is water-soluble, and diacylglycerol, which remains associated with the plasma membrane.