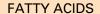
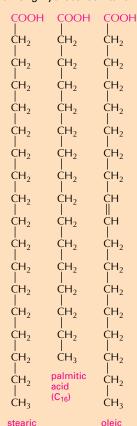
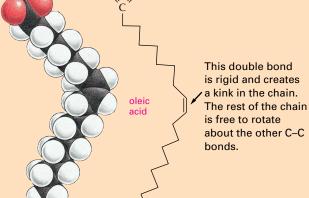
Panel 2–4 Fatty acids and other lipids



All fatty acids have carboxyl groups with long hydrocarbon tails.



Hundreds of different kinds of fatty acids exist. Some have one or more double bonds in their hydrocarbon tail and are said to be unsaturated. Fatty acids with no double bonds are saturated.



carbon skeleton

TRIACYLGLYCEROLS

UNSATURATED

space-filling model

Fatty acids are stored as an energy reserve (fats and oils) through an ester linkage to glycerol to form triacylglycerols.

$$\begin{array}{c} \mathsf{H_2C-OH} \\ | \\ \mathsf{HC-OH} \end{array}$$

stearic

acid

SATURATED

glycerol

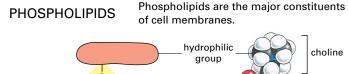
CARBOXYL GROUP

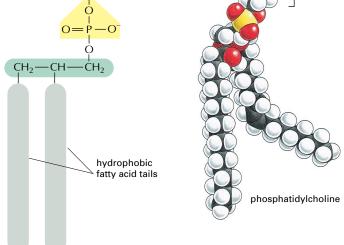
acid (C₁₈)

If free, the carboxyl group of a fatty acid will be ionized.

But more often it is linked to other groups to form either esters

or amides.



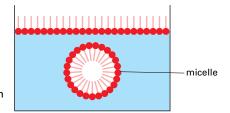


general structure of a phospholipid

In phospholipids two of the –OH groups in glycerol are linked to fatty acids, while the third –OH group is linked to phosphoric acid. The phosphate is further linked to one of a variety of small polar groups (alcohols).

LIPID AGGREGATES

Fatty acids have a hydrophilic head and a hydrophobic tail.

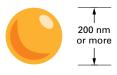


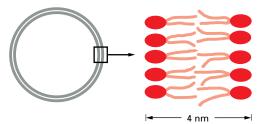
In water they can form a surface film or form small micelles.

Their derivatives can form larger aggregates held together by hydrophobic forces:

Triglycerides form large spherical fat droplets in the cell cytoplasm.

Phospholipids and glycolipids form self-sealing lipid bilayers that are the basis for all cellular membranes.





OTHER LIPIDS

Lipids are defined as the water-insoluble molecules in cells that are soluble in organic solvents. Two other common types of lipids are steroids and polyisoprenoids. Both are made from isoprene units.

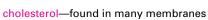
$$CH_3$$

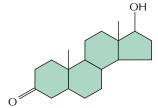
 $C-CH=CH_2$
 CH_2 isoprene

STEROIDS

Steroids have a common multiple-ring structure.



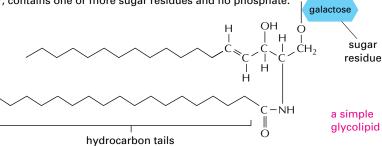




testosterone—male steroid hormone

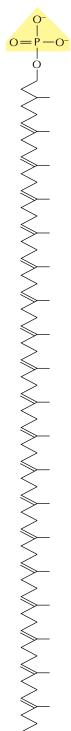
GLYCOLIPIDS

Like phospholipids, these compounds are composed of a hydrophobic region, containing two long hydrocarbon tails, and a polar region, which, however, contains one or more sugar residues and no phosphate.



POLYISOPRENOIDS

long-chain polymers of isoprene



dolichol phosphate—used to carry activated sugars in the membrane-associated synthesis of glycoproteins and some polysaccharides