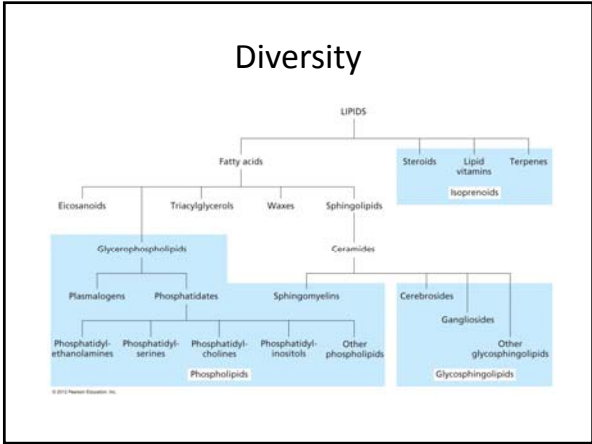


Lipids

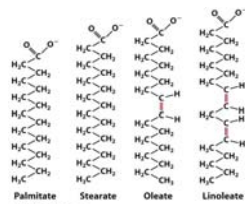
Ch 11, Stryer Short Course

- ## Lipids and Membranes
- There is a lot of important biochemistry of lipids.
 - We won't cover it all!
 - The key points for this class have to do with their role in membranes and fat metabolism
 - Fatty Acids
 - Triacylglycerides
 - Membrane components: phospholipids, glycolipids, steroids



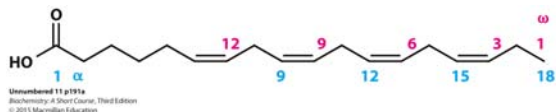
Fatty Acids

- Saturated
- Unsaturated
- Polyunsaturated
- Cis and trans



Nomenclature

- Counting from last carbon (omega carbon)
- Linoleate
 - 18:2 *n*-6
 - 18:2 Δ^{9,12}



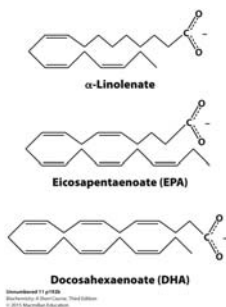
Fatty Acid Melting Points

- Melting point is higher with tight packing (vdW)
- Effect of chain length
- Effect of cis double bonds



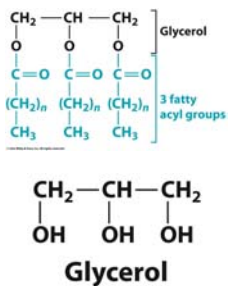
Essential Fatty acids

- Building blocks of key hormones
- W-3 and w-6 are essential
- Nutrition: correlation vs. cause



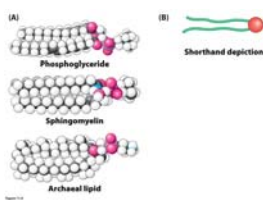
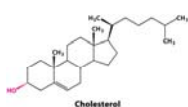
Triacylglycerides

- Complex lipid: Esterification and hydrolysis
- Energy source
 - Highly reduced (9C/g vs 4C/g for glycogen)
 - Hydrophobic: 6x more energy per gram
- Stored in adipose tissue
 - lipases



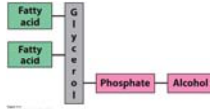
Membrane components

- Polar head, nonpolar tail
- Three types
 - Phospholipids
 - Glycolipids
 - Steroids



Phospholipids

- Phosphoglycerides (aka glycerophospholipids)
- Sphingolipids

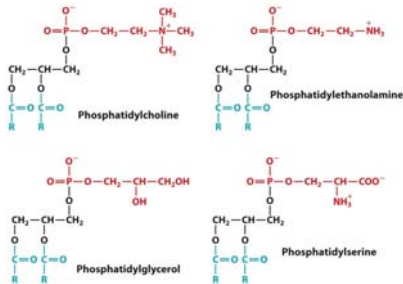


Phosphoglycerides

- Phosphatidyl group: DAG, phosphate

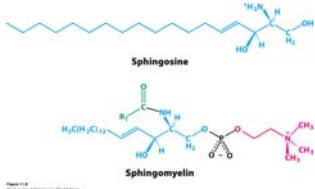


Different Polar Head Groups



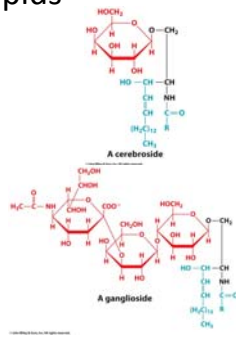
Spingolipids

- Spingosine backbond
- Same overall structure—two nonpolar tails
- Major function in myelin



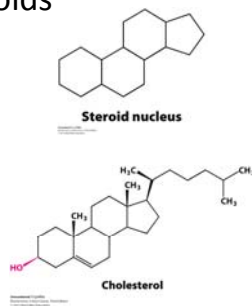
Glycolipids

- Sugars added to sphingosine backbone
- Only on outside of cell membrane: recognition elements
- Single sugar: cerebroside
- Multiple sugars: ganglioside



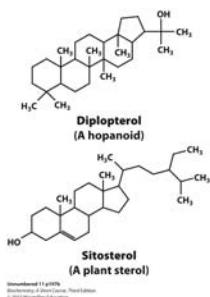
Steroids

- Based on ring system
- Cholesterol
 - Polar head, nonpolar tail
 - Highly rigid
 - Controls fluidity of membrane
- Precursor to many steroidal hormones



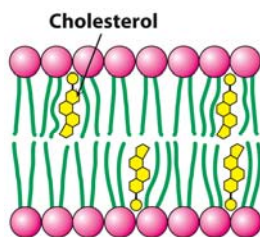
Plants

- Plants are a “no cholesterol” food
- Still require a molecule to serve same role
- Similar structure
 - Structure/function relationship



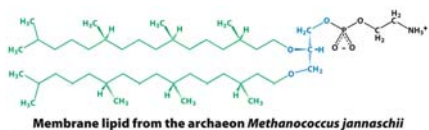
Introduction to Membranes

- Lipid structure makes a bilayer
- Fluidity of membrane: liquid crystal
- Fluidity controlled by cholesterol, tail packing



Extremophiles

- Archaea: branched tails, ether linkages
 - Increased range of temperature
 - Stable to hydrolysis
 - Stable to oxidation



Introduction to Membrane Proteins

- Reversible Anchoring directs proteins to membrane
- Pathology
 - Cancer
 - Hutchinson-Guilford Progeria syndrome

