

MEMBRANE ORGANIZATION & FUNCTION:

16 Oct 1991, rvsd 10/15/92, 10/13/93, 10/10/94, 10/16/96, 12Oct01, 21Oct02, 15Oct03, 13Oct 04, 17Oct 05, 12Oct 07, 17Oct08, 19Oct09
BRP p. 177-190, BKH 5th: 166-190, BKH 6th pp 162-186, 7th: 156-189

ANALYSIS OF MEMBRANE LIPIDS AND PROTEINS:

LIPIDS: TLC CHROMATOGRAPHY: (p 166)

lipids extracted with CHCl_3 (etc) concentrated, spotted on silica gel, (p 166) [silicic acid: H_2SiO_3 = opal]

A solvent system (zB: chloroform, methanol and water) is used to move up plate, separating components.

Nonpolar move fastest (do not stick to the polar silicic acid)

Order: (fastest to slowest)	Fastest	Cholesterol	40%	structures: p 164
	Next fastest	Phosphatidylethanolamine	30%	
	Next to slowest	Phosphatidyl choline (lecth)	15%	
	Slowest	Phosphatidyl serine	10%	

Plasma membrane lipids = **60% phospholipids, 40% cholesterol** (p 172)

Fatty Acids must be 16 to 18 carbons long, 12 do not form stable bilayer

cholesterol present in all but inner mitochondrial & bacterial membranes

cholesterol strengthens, 'buffers' the fluidity and **drops permeability by 10x.** (p 170)

fluidity important: keeps enzymes colliding for interactions: p 169

too fluid, leaky (nerves don't function above 43°C)

Regulable in bacteria by **desaturase** enzyme, adjusting no. of ethylene bonds, p168 & 171 for structure effects

(uses O_2 to remove H_2 , functions better at low temp with more O_2) (Note importance in Atlantic salmon)

Eukaryotes: **cholesterol is 40-50% of molecules of lipid** in membrane. P 172

PROTEINS: **Freeze fracture** shows **integral proteins** stick with inner monolayer: (p 174-175 & 188)

P (protoplasmic) face has many more protein "bumps"

E (exterior) face has fewer protein "bumps"

Analysis of membrane proteins: SDS-polyacrylamide gel electrophoresis: (p 179)

solubilize with detergent (sodium dodecyl sulfate), run in DC field:

Size is major affecter: all proteins are coated with "-" charged SDS groups, move to "+" anode.

CLASSES OF MEMBRANE PROTEINS:

transport ATPases

energy transducers

receptors

clathrins (aid phagocytosis, etc)

CARBOHYDRATES: Form glycocalyx (p 185-186)

(Human RBC = 52% protein, 40% lipid, 8% oligosaccharides) **Glycosylation** adds sugars. Sialic acid = "-"

glycoproteins: **major fraction**, are exterior, shown by use of **lectins:**

(plant proteins, bind specific sugars, EM show glycoproteins on outside.)

glycolipids: **minor fraction**, carry antigenic determinants

MEMBRANES ARE ASYMMETRIC:

transverse diffusion very unfavored: 1 mol/sev hrs

lateral is easy the length of RBC in seconds (p 169)

polarity of membrane lipids: outer: choline-containing lipids (lecithin)

all glycolipids are exterior, important for cell-cell recognition

inside: ethanolamine and serine

peripheral proteins anchored to integral proteins

FLUIDITY: Evidence:

1) Add fluorescent lipid to memb, bleach to make dark spot, spot becomes diffuse at edge. (p 169)

2) Frye and Edidin fused human & mouse cells with different fluorescent Ab, followed fate: became diffuse in hour. (p. 187)

3) Electric field causes proteins to migrate. See EM, p 186