

- E.g. PC – Phosphatidyl choline, PE – Phosphatidyl Ethanolamine
- Plasmogen – group of phosphoglycerides – has 1 fatty acid chain, attached to glycerol by ester linkage, has 1 hydrocarbon chain, attached to glycerol by ether linkage (20% of phosphoglyceride content in us)

Sphingolipids – Derivatives of Sphingosine – Amino alcohol with long hydrocarbon chain, various fatty acid chains are attached to sphingosine by an amide bond

(glycolipids with single sugar/branched disaccharide attached to sphingosine backbone)

Steroids – Single hydroxyl group (instead of polar head), has conjugated ring and short hydrocarbon chain as hydrophobic tail

Phospholipid Bilayer – Heads face out, tails shielded within = has a self-sealing property, is a 2D fluid

Movement

- Molecules free to move in plane of bilayer
- 3 movement types – Lateral (10^7 per second), rotation around the long axis and flip-flop (once a month)
- Lipid composition effects thickness and curvature of the bilayer

Bilayer thickness – Cholesterol has lipid ordering effect on phosphoglyceride, increasing thickness. (has no effect in SM layer)

Bilayer Curvature – PC – cylindrical – forms flat monolayers, PE – smaller head – conical shape – forms natural curve in membrane

Micelle – water soluble spherical arrangement of phospholipids, forms spontaneously in aqueous solution

Liposome – artificial spherical phospholipid bilayer structure, aqueous interior, forms in vitro, may contain membrane proteins

Proteins in bilayer – some cross bilayer, others are on top or embedded in the bilayer

Membrane Proteins fluidity – Membrane proteins are free to move within membrane plane

E.g. Human + mouse membrane proteins → mixed after 10 min

- Mixing is essential for membrane function – diffusion, distribution, fusion and division
- Maintained within limits – will not be too or too little fluid
- Determined by phospholipid composition (more closely packed tails = less fluid) and temperature (increase temp – more movement = more fluid)

Heat disorders non polar tails, causes membrane to turn from gel like to fluid like

Lipid Bilayer – Asymmetrical – 2 halves differ due to different proteins and phospholipids

Assymetry

- Generated in the cell
- Inside (cytosolic face) – exposed to cytosol
- Outside (non cytosolic face) – exposed to cell exterior/organelle interior (glycolipids only occur in this part of the membrane)

Membrane Proteins - Carry out membrane functions, make up 50% of mass of plasma membrane

Membrane Protein Functions

- Transport
- Enzyme Activity
- Signal transduction
- Cell – Cell recognition
- Intercellular Joining
- Attachment to cytoskeleton and Extracellular Matrix (ECM)

- Enclosed by nuclear envelope formed of 2 concentric membranes – inner = binding site for chromosomes, outer = is continuous with ER
- Envelope perforated by nuclear pores (has approx. 100 proteins)
- contains 2m of DNA with 5-8 micro metre diameter

Nucleolus

- In Nucleus
- Where rRNA genes clustered and where ribosomal subunits are assembled.

Chromosome Structure – Chromosomes – long linear DNA structures, associated with proteins that fold and pack DNA thread – collectively called chromatin
Eukaryotes have interphase chromosomes

DNA Packing – Basic Unit - Nucleosomes – “beads on a string” = core particles + linker DNA

Core particles – 8 histone proteins (2x(H2A, H2B, H3 and H4) and a + charged AA

Has 146 base pairs of DNA

Linker DNA – has 50 base pairs of DNA

1. Nucleosomes form, converting DNA molecule into a chromatin thread = 1/3 initial length
 2. H1 Histone binds to DNA adjacent to core, nucleosomes packed to generate 30nm of fibre
 3. 30nm fibre looped to scaffold of non-histone proteins
- = Maximal packing of Metaphase Chromosomes

Gene Regulation for Eukaryotes

- Info carried on many chromosomes (not 1 as in prokaryotes)
- Enclosed in double membrane bound nucleus
- RNA that is transported into cytoplasm is regulated to modulate mRNA availability
- mRNA has a wide range of half-lives (prokaryotic mRNA has a rapid half-life – leading to rapid response to environmental change)

DNA Packing – In prokaryotes – interphase chromosomes have transcriptionally active and quiet regions

Chromatin

Heterochromatin – most condensed form of interphase chromatin (x – chromosome inactivation)

Euchromatin – 10% of chromatin

Chromosomes – attached to nuclear envelope – not randomly arranged

Ribosomes

- Protein manufacturing cell machinery
- Large multi-component complex – 50 ribosomal proteins and ribosomal RNA (rRNA)
- Free in cytoplasm or attached to rER
- Large + small subunit = protein synthesis site

Eukaryotic gene regulation – occurs at many levels

- Regulation of transcription
- Regulation of splicing and processing
- Regulation of transport
- Degradation of mRNA
- Translational regulation
- Protein Modification

Mitochondria – in almost all eukaryotic cells (not RBC)

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