

Lipids IV

Steroids

- Cholesterol plays an important role in membrane fluidity and the starting material for steroids and vitamin D
 - Six rings three cyclohexane and one cyclopentane
 - Modified with hydrophobic functional groups on carbons 10,13 and 17
 - Inflexible hydrophobic bulky molecule
 - -OH on the 3rd carbon - makes the molecules amphipathic
 - Found in all tissues in the membranes often acylated at the OH
 - Function in membranes
 - Cholesterol broadens the phase change from solid to fluid or oil like state.
 - The stiff ring decreases coiling and movement of the fatty acid tails in the phospholipids. This can have two effects on fluidity
 - Below the melting point - cholesterol is too bulky to fit into the rigid crystal state. This increases the melting point
 - Above the melting point the cholesterol still restricts the movement of the fatty acid tails. Thus the melting point is decreased
- Atherosclerosis - heart disease where plaque form blockages in blood flow. Specialized cells macrophages are converted to foam cells where they are filled primarily with cholesterol and cholesterol esters. Eventually these cells can calcify and harden ultimately blocking the flow of blood to the heart.
- Precursor for the steroids

Steroid hormones - do not act by binding receptors like other hormones. These are lipid soluble hormones that are transported through the plasma and interstitial fluids bound to steroid carrier proteins (SCP). Once to the cells, the steroid crosses the membrane and binds specifically to a cytosolic steroid receptor. The complex often travels to the nucleus and acts at the level of altering DNA-> RNA ->Protein production. (transcription)

- Glucocorticoids - involved in reducing inflammation, pain and carbohydrate metabolism.
 - Inhibits actions of PLC.
 - Can bind to proteins which act then bind to DNA and alter gene expression and protein production
- Mineralcorticoids - required for normal kidney function in the regulation of K⁺ and Na⁺ ion filtration
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- Glucocorticoids, mineralcorticoids and some androgens are produced in adrenal cortex - small organ just above the kidney. Over 50 varieties found in this tissue

- Sex steroids; Androgens and estrogens. Structures are related and formed from the other. Effect of these are hormonal. Source is generally from the gonadal tissues.

Membrane dynamics -

- Formation of lipid bilayers - these structures form due to the insolubility in water.
 - When enough lipids are present, micelles form. Eventually these can fill out enough to form a bilayer where the polar heads face the aqueous phase and the hydrophobic tails are buried in the nonpolar phase
 - Lipids easily diffuse laterally but rarely "flip" due to the changes in entropy changes that must accompany such a switch.