Subject Name: Biochemistry

Study stage: First Stage

ANSWER AND QUESTION

Chemistry of lipids

Metabolism of lipids

Digestion and absorption of lipids

Metabolic disorder of lipids

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- **Functions of Lipids**

1) concentrated sources of energy (9.45 kcal/g)
2) 2) help fat-soluble nutrients to be absorbed by the body (sterols, vitamins)
3) structural element of cell, subcellular components
4) components of hormones and precursors for prostaglandin synthesis

- **Sources of lipids in cells are:**

1) Dietary fat
2)Stored fat
3) De novo synthesis

- **Lipids Digestion In Mouth**

Salivary lipase (enzymes from salivary glands) plays a small role in digestion in adults and an active role in infants (digest short medium fatty acid found in milk).

- **Lipases**

Enzymes that break fats and oils down into fatty acids and glycerol

- **Fate of fats**

absorbed as triglyceride

- **Catabolism of triglycerides/lipolysis**

Triacylglycerols are hydrolized to form glycerol and the corresponding fatty acids (reverse of esterification). Takes place in adipose cells when blood levels of epinephrine, norepinephrine, glucose, or ACTH are elevated. The resulting fatty acid products are then exported to other cells for utilization of energy

- **Fate of glycerol**

The Glycerol released from TAG is uptaken from the blood and phosphorylated by hepatic glycerol kinase into Glycerol-3-phosphate which may then enter glycolysis or glucneogenesis.

- **Fate of fatty acids**

beta oxidation

- **beta oxidation**

A metabolic sequence that breaks fatty acids down to two-carbon fragments that enter the citric acid cycle as acetyl CoA

- **site of beta oxidation**

Mitochondria

- **Stages of beta oxidation**
  1. Activation of fatty acid
  2. Transport of Acyl Co-A from cytosol to Mitochondria
  3. Beta oxidation proper

- **Role of Carnitine**

Mitochondrial membrane transporter (Transport of Acyl Co-A from cytosol to Mitochondria)

- **Dietary lipid sources**

-TAGS
-Sterols
- Phospholipids

- TAGS

90% or more of dietary lipids
- predominately long-chain fatty acids

- **Lingual lipase**

secreted in saliva, and activated in the stomach

- **Gastric Lipase**

released by stomach but only activates in duodenum of small intestine (at neutral pH). Acts on triacylglycerols with short or medium length fatty acids (like in milk).

- **Emulsification**

Occurs in small intestine, lipids have low water solubility so this helps to increase surface area for digestive enzymes to act

- **Lipid catabolism in small intestine**

emulsified triacylglycerols, cholesterol esters, and phospholipids are degraded by pancreatic enzymes secreted into duodenum

- **Catabolism of triglycerides**

lipid soluble but too bulky to pass through mucosal cell membranes.

- **Primary products of lipid catabolism in the intestine**

FFA, cholesterol, 2-monoacylglycerol. Exist complexes with bile salts in a micelle.

Metabolic disorder of lipid metabolism

- **Dyslipidemia**

Diseases associated with abnormal lipid concentrations. Defined by clinical characteristics of patients and laboratory test results. Many, but not all, are associated with chronic heart disease, or atherosclerosis.

- **Dyslipidemia: They can be caused directly by:**
- Genetic abnormalities
- environmental/lifestyle imbalances
- May develop secondarily as a consequence of other diseases

- **heart disease and dyslipidemias; esterified cholesterol**

Arteriosclerosis: The importance of atherosclerosis is the relationship between _ and _. This stems from the deposition of lipids, mainly in the form of _, in artery walls called atherosclerosis.

- **Coronary Heart Disease**

  is important manifestation of Arteriosclerosis
  - Example: Myocardial infarction