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Final term paper

Bio chemistry

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Q1: How Fat Soluble vitamins are absorbed by the body?

A: The Fat soluble vitamins A, D, E and K are absorbed from the intestinal lumen using the same mechanisms used for absorption of other lipids. In short, they are incorporated into mixed micelles with other lipids and bile acids in the lumen of the small intestine and enter the enterocyte largely by diffusion.

Fat-soluble vitamins are stored in the fatty tissues of the body and the liver. These are easier to store than water soluble vitamins, and they can stay in the body as reserves for days, and sometimes months.

Fat-soluble vitamins are absorbed through the intestinal tract with the help of fats, or lipids.

Q2: Classify the Bloor classification of lipids discuss Fatty acid & its types?

CLASSIFICATION OF LIPID BY BLOOR

BLOOR (1943) has proposed the following classification of lipids based on their chemical composition

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- * Simple lipids
- * Compound lipids
- * Derived lipids

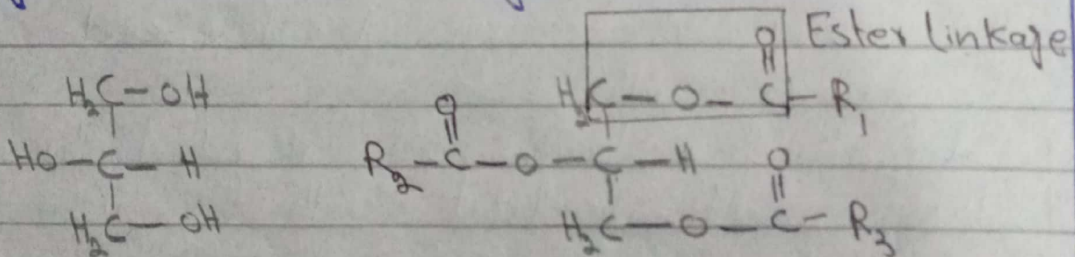
A. SIMPLE LIPIDS OR HOMOLIPIDS

These are esters of Fatty acid with various alcohols.

1. Fats and oils (triglycerides, triacylglycerals)
These are esters of Fatty acids with a trihydroxy alcohol, glycerol.
A Fat is solid at ordinary room temperature whereas an oil is liquid.

2. Waxes

These are esters of Fatty acids with high molecular weight alcohols.



Glycerol

Triacylglycerol

B. COMPOUND LIPIDS OR HETEROLIPIDS

These are esters of Fatty acids with alcohol and possess additional group(s) also. They include:

- * Phospholipids
- * Glycolipids
- * Sulfolipids
- * Lipoproteins

PHOSPHO' LIPIDS

- * These are phosphate containing lipids.
- * They are present in all biological membranes.
- * They play an important role in electron transport, oxidative phosphorylation and transportation of ions across the membranes.

PHOSPHOLIPIDS are of Two TYPES:

- 1- Glycerophospholipids.
- 2- sphingophospholipids.

Glyco Lipids.

These are compound lipids which contain carbohydrate in addition to fatty acid and alcohol.

sulfol. lipids

These are sulfate containing lipids.

Lipoproteins

These lipids contain protein in addition to fatty acid and alcohol.

c. DERIVED LIPIDS

These are the substance derived from simple and compound lipids by hydrolysis

These include Fatty acids, mono- and diglycerides, steroids, terpenes and carotenoids.

Fatty acid

A Fatty acid is a carboxylic acid with a long aliphatic chain, which is either saturated or unsaturated. Most naturally occurring Fatty acids have an unbranched chain of an even number of carbon atoms, from 4 to 28.

Types of Fatty acid

Fatty acids can be divided into four general categories:

- saturated
- monounsaturated
- polyunsaturated
- trans Fats.

Saturated Fatty acids and trans Fats are associated with an increased risk of coronary heart disease.

Monounsaturated Fatty acids and polyunsaturated fatty acids are associated with decreased risk of coronary heart disease, although these associations are not uniformly supported in the literature. Omega-3 Fatty acids, which are a type of polyunsaturated fatty acid, have been studied as potential therapy for a variety of medical conditions because of their suspected anti-inflammatory properties.

Saturated Fatty acids.

When a fatty acid is saturated it is an indication that there are no carbon-carbon double bonds. Saturated fatty acids have higher melting point than unsaturated acids of the corresponding size due to their ability to pack their molecules together thus leading to a straight rod-like shape.

Unsaturated Fatty acids

If a fatty acid has one or more double bond then this is an indication that it is an unsaturated fatty acid.

Most naturally occurring fatty acids contain an even number of carbon atoms and are unbranched.

unsaturated fatty acids, on the other hand, have a cis-double bond(s) that create a kink in their structure which does not allow them to group their molecules in straight rod-like shape.

Types of unsaturated fatty acid.

These may be classified, based on the degree of unsaturation.

- A. Monoethenoid acid = These contain one double bond, example is oleic acid.
- B. Diethenoid acids = Two double bonds, example is linoleic acid.
- C. Triethenoid acids = Three double bonds, example is linolenic acid.
- D. Tetraethenoid acids = Four double bonds, example is Arachidonic acid.

Q3: Write down the biological significance of any 5 essential minerals;

Biological significance of minerals

- Ca
- P
- Zn
- Fe

o Biological Significance of Iron

- It play an important role in production of RBCs
- It helps blood cells to carry oxygen from the lungs to body parts
- It play important role in immune system
- It prevent you from the feeling tired
- Lack of iron in RBCs cause anemia.

• Ca

- Ca is essential for building strong bones & teeth in children.
- It helps muscles to contract & relax
- It is important in blood clotting BP regulation & immune system.
- It deficiency cause osteoporosis, rickets poor growth & mental depression.

P

- It is important for healthy bone & teeth
- Above 80% P is located in bones as a $\text{Ca}_3(\text{PO}_4)_2$ in body.

It has a role in energy production as component of ATP

- It is part of DNA & RNA thus helps in genetic information transfer & protein synthesis.

it is constituent of plant cells, essential for cell division & development of new tissues.

- It is required to balance pH in body.

- It also helps in function of body muscular system thus important for heart beat.

- Its deficiency causes rickets, osteomalacia, poor formation of teeth, irregular breathing pattern, joint stiffness & pain.

Zn

It is important for normal growth, wound healing & nervous system.

- It helps to improve immune system.

- It plays important role in breakdown of carbohydrates.

- It enhances action of insulin.

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- Helps in sense of taste & smell
- Its deficiency cause skin problems, slow healing of wounds loss of appetite, weight loss & decrease ability of food taste.

IODINE

- Promote normal thyroid function
- The body needs Iodine to make thyroid hormones. These hormones control the body's metabolism and many other important functions
- The body also needs thyroid hormones for proper bone and brain development during pregnancy
- Also helps in normal growth.

Q4:- Discuss digestion and absorption of Lipids.

Lipid digestion

- Digestion is the first step to lipid metabolism, and it is process of breaking down the triglycerides into smaller monoglyceride units with the help of lipase enzyme.

- Digestion of fats begin in the mouth through chemical digestion by lingual lipase.
- Ingested cholesterol is not broken down by the lipases and stays intact until it enters the epithelium cells of small intestine.
- Lipids then continue to the stomach where chemical digestion continues by gastric lipase and mechanical digestion begins (peristalsis).
- The majority of lipid digestion and absorption - however, occurs once the fats reach the small intestines.
- It is the pancreatic lipase that is responsible for signaling for the hydrolysis of the triglycerides into separate free acids and glycerol units.

• Lipid Absorption

- The second step in lipid metabolism is the absorption of fats occurs only in the small intestines.
- Once the triglyceride are broken down into individual fatty acid glycerols, along with cholesterol, they will aggregate

into structures called micelles.

- Fatty acid and monoglycerides leave the micelles and diffuse across the membrane to enter the intestinal epithelial cells and transport to the body.

Q5:- Briefly explain Function, sources & deficiency symptoms of following vitamins:

- 1- Retinol
- 2- Thiamin
- 3- pyridoxine

A:-1 Vitamin A (Retinol)

Function:- Important for healthy bones, teeth, mucous membranes, skin, vision especially in the dark.

Carotenoids, which are other forms of vitamin A, are powerful antioxidants.

Sources:- Retinol - meat, eggs, oily, Fish liver, milk, cheese, kidney.
 Carotenoids - carrots, sweet potatoes, apricots, ~~or~~ melon, broccoli, spinach pumpkin and all other green and orange fruits and vegetables.

Symptoms of deficiency: poor night vision eye problems, weakened immune system and more prone to infection.

2- Vitamin B₁ (Thiamin)

Function:- protects the heart and the nervous system from the build-up of toxic substances and is needed to convert carbohydrates and fats into energy.

Sources:- meat, Fortified bread and cereals, grains, dried beans, potatoes, spinach, nuts, peas.

Symptoms of deficiency:- Tiredness and fatigue, muscle weakness, nerve damage, confusion, enlarged heart.

3- Vitamin B₆ (Pyridoxine)

Function:- Required for the formation of red blood cells and various neurotransmitters and helps to maintain

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nerve function, a healthy immune system and healthy antibodies.

Sources: meat, eggs, chicken, liver, fish, beans, nuts, whole grains & cereals, bananas and avocados.

Symptoms of deficiency: - skin disorders, mouth sores, confusion, depression and anemia.