**ASSIGNMENTS 2. DIPLOMA IN HUMAN NUTRITION**

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**1.DESCRIBE THE MAJOR FUNCTION OF EACH REGION OF THE GASTRO INTESTINAL TRACT.**

1.Gasgrointestinal(GJ) Tract

-Consists of organs that collectively form a continuous tube

Mouth-pharynx-esophagus –stomach –small intestine-J-large intestine –J-anus.

a) small intestine

-Location

-The small intestine is located between the stomach and the large intestine

-Size -The small intestine has the following dimensions: Diameter: 1 inch

Length: 20 feet

The small intestine is the longest part of the digestive tract.

-Structure

-The small intestine consists of 3 major extemal regions

b) duodenum

-the initial portion of the small intestine

-The duodenum is separated from pyloric canal of the stomach through the

pyloric sphincter.

c) jejunum

-the middle portion of the small intestine ileum

-the terminal and longest portion of the small intestine

-The ileum is separated from the cecum of the large intestine by the ileocecal

2.Accessory organs

Connected to but not continuous with the organs of the 01 track

A. Teeth ,breaking food down in to small particles.

B. Tongue, fat hydrolysis catalysed by lingual lipase, secreted by the tongue;

C. Salvary, glands starch hydrolysis catalysed by amylase, secreted by the salivary glands;

D. Pancreas, starch hydrolysis catalysed by amylase secreted by the pancreas

E. Liver ,the liver secretes about 1000 mL of bile per day.

F. Gallbladder .The gallbladder is a small organ and can hold about 50 mL of bile at one given time.

.HISTOLOGY OF THE GI TRACT.

The organs of GI tract consist of the same 4 layers the mucosa,Submucosa ,Muscularis,and Serosa

A.Mucosa

Inner layer of the GI tract

Subdivided into the following

A.Epithelium

Located closest to the human of the GI

B. Lamina propria

-consists of coonective tissue containing collagen fibers,elastic fibers,blood vessel,and lymphatic vessels.

c. Muscularis Mucosae

-consists of athin layer of smooth muscle,

2-Submucosa.

Also consists of connective tissue containing collagen fibers,elastic fibers,blood vessels,and lymphatic vessels.

3.Muscularis

-consists of either skeletal muscle or smooth muscle,depending on the organ

The muscularis of the rest of the GI tract(lower esophagus, stomach ,Small intestine and large intestine)

Contains smooth musecle,

The smooth muscle is usually arranged in to an inner circular layer and an outer longitudinal layer contraction of the smooth muscle in the muscularis is responsible for persistalsis.

Peristalsis wavelike contractions with in the wall of the GI tract that propel food over a long distance in an anal ward direction,

-Similar to squeezing atube of toothpaste from the bottom to the top of the tube.

- the function of peristalsis is to propel food down the lumen of the GI tract from the esophagus to the anus.

**DIGESTION AND ABSORPTION OF FATS**

The major fats in the diet are triacylglycerols and, to alesser phospholipids,these are hydrophobic molecules and have to be emulsified to very small droplets-micelles can be absorbed,

This emulsification is achieved by hydrolysis to monoacyl and diacylgycerols and free fatty acid, and also by the action of the bile salts.

Four groups of Compounds that are metabolically important can be considered under the heading of lipids,

A)Triacylglycerol- sometime also known as triglycerides-in which glycerol is esterified to three fatty acids,these are the oils and fats of the diet which provide between 30% and 45% of average energy intake the difference between oils and fats is that oils are liquid at room temperature,whereas fats are solid.

Phospholipids,in which glycerol is esterified to two fatty acids with aphosphate,

And ahydrophilic group esterified to carbon-3 phospholipids are major constituents of cell membranes.

Steroids, including cholesterol and a variety of plant sterols and stanols and extremely small amounts of steroid hormones chemically these are completely different from triacylglycerols and phospholipids,and are not a source of metabolic fuel.

Avariety of other compounds,including vitamin D Vitamin E and Vitamin K

BILE SALTS,the final emulsification of dietary lipids into micelle droplets that are small enough to be absorbed across the intestinal mucosa is achieved by the action of the bile salts,the bile salts are synthesized from cholesterol in the liver and secreted together with phospholipids and cholesterol ,by the gallbladder some 3 g of cholesterol and 30 g of bile salts are secreted by gallbladder each day almost all of which is reabsorbed,so that the total faecal out put of steroids and bile salts is 0.2-1g/day.

The primary bile salts those synthesized in the liver are conjugates of chenodeoxycholic acid and cholic acid with taurine or glycine intestinal bacteria catalysedeconjuation and further metabolism to yield the secondary bile salts,lithocholic and deoxycholic acids,these are also absorbed from the gut,and are reconjugated in the liver and secreted in.

**2.EXPLAIN THE DIGESTION AND ABSORPTION OF LIPIDS, THE ROLE OF SALTS AND THE FORMATION OF CHYLOMICRONS.** **The digestive system**The process by which the polymers in food are broken down into their constituent monomers is called **digestion.**  provides the body with water, electrolytes, and other nutrients. To do this, the digestive system is specialized to ingest food, propel it through the digestive tract, digest it, and absorb water, electrolytes, and other nutrients from the lumen of the gastrointestinal tract. Once these useful substances are absorbed, they are transported through the circulatory system to cells, where they are used. The undigested portion of the food is moved through the digestive tract and eliminated through the anus.

The finely emulsified lipid micelles,containing free fatty acids with small amounts of intact triacylglycerol ,monoacylgycerol,phospholipids cholesterol and fat-soluble Vitamins are absorbed across the intestinal wall in to the mucosal cells,fatty acids are re-esterified to form triacylglycerol are package together with proteins synthesized in the mucosal cells to form chylomicrons.These are secreted in to the lactal in the center of the villus ,and enter the lymphatic system ,which drains into the blood stream at the thoracic duct.In the fed state,in response to the action of insulin lipoprotein lipaseis active at the surface of cells in adipose tissue.it catalyses the hydrolysis of triacylglycerols in chylomicrones,and most of the resultant free fatty acid is taken upby adipose tissue for re-esterification to triacylglycerol for storage.The chylomicron remnants are taken up by the live.by aprocess of receptor-meditated endocytosis,and most of the residual lipid is secreted, together with triacylglycerol synthesized in the liver,in very low-density lipoproteins.

**The absorption of Minerals**.Most minerals are absorbed by carrier-mediated diffusion in to intestinal mucosal cells and accumulated by binding to intracellular proteins.There is then sodium-dependent active transport from the epithelial cells into the blood,where again they are usually bound to transport proteins.Genetic defects of the intracellular binding proteins or the active transport systems at the basal membrane of the mucosal cell can result in functional deficiency despite an apparently adequate intake of the mineral. The absorption of many minerals is affected by other compounds present in the intestinal lumen. A number of reducing compounds can enhance the absorption of iron, and a number of chelating compounds enhance theabsorption of other minerals. For example, zinc absorption is dependent on the secretion by the pancreas of a zinc-binding ligand (tentatively identified as the tryptophan metabolite picolinic acid. Failure to synthesize and secrete this zinc-binding ligandas a result of a genetic disease leads to the condition of acrodermatitisenteropathica ,functional zinc deficiency despite an apparently adequate intake.

**3. DESCRIBE THE ABSORPTION OF MINERALS ESPECIALLY IRON**, **Iron absorption**

Only about 10% of dietary iron is absorbed, and only as little as 1–5% many plant foods. iron deficiency is a serious problem; some 10-15% of women of child-bearing age have menstrual iron losses greater thancan be met from a normal dietary intake.

iron in meat is absorbed better than is inorganic iron from plant foods, and by a separate transport system.

Inorganic iron is absorbed only in the Fe2+ (reduced) form. This means that a variety of reducing agents present in the intestinal lumen together with dietary iron will enhance its absorption. The most effective such compound is vitamin C and, although intakes of 40-60 mg of vitamin C per day are more than adequate to meet requirements, an intake of 25-50 mg per meal is sometimes recommended to enhance iron absorption. Alcohol and fructose also enhance iron absorption.

Like other minerals, iron enters the mucosal cells by carrier-mediated passive diffusion and is accumulated in the cells by binding to a protein, ferritin. Once all the ferritin in the mucosal cell is saturated with iron, no more can be taken up from the gut lumen. Iron can leave the mucosal cell only if there is free transferrin in plasma for it to bind to and, once plasma ferritin is saturated with iron, any that has accumulated in the mucosal cells will be lost back into the intestinal lumen when the cells are shed at the tip of the villus.

The mucosal barrier to the absorption of iron has a protective function. Iron overload is a serious condition, leading to deposition of inappropriately large amounts of iron in tissues, and about 10% of the population are genetically susceptible to iron overload. Once the normal tissue iron-binding proteins are saturated, free iron ions will accumulate in tissues. iron ions in solution are able to generate tissue-damaging oxygen radicals, and this may be a factor in the development of cardiovascular disease and some forms of cancer. Indeed, one of the reasons why women are less at risk of atherosclerosis than men may be that women generally have a lower iron status than men because of menstrual blood losses.

This raises the interesting problem of whether or not it is desirable to recommend high intakes of iron for women of child-bearing age in order to raise their iron reserves to the same level as seen in men. This would prevent the development of iron deficiency but might also put them at risk of iron overload and increased risk of atherosclerosis.

**DESCRIBE AND EXPLAIN THE CLASSIFICATION OF AMINO ACIDS ACCORDING TO THEIR CHEMICAL FUNCTION.**Twenty-one amino acids are involved in the synthesis of proteins, together with a number that occur in proteins as a result of chemical modification after the protein has been synthesized. In addition, a number of amino acids occur as metabolic intermediates but are not involved in proteins.

Chemically the amino acids all have the same basic structure – an amino group

(–NH2) and a carboxylic acid group (–COOH) attached to the same carbon atom (the α-carbon). As what differs between the amino acids is the nature of the other group

that is attached to the α-carbon. In the simplest amino acid, glycine, there are two hydrogen atoms, while in all other amino acids there is one hydrogen atom and a side-chain, varying in chemical complexity from the simple methyl group (–CH ) of alanine to the aromatic ring structures of phenylalanine,tyrosine and tryptophan. the 21st amino acid, the selenium analogue of cysteine, selenocysteine.

The amino acids can be classified according to the chemical nature of the side-chain, whether it is hydrophobic (on the left or right fugher or hydrophilic and the nature of the group:

-small hydrophobic amino acids,glycine,alanine,proline

-branched-chain amino acids,leucine,isoleucine,valine

Aromatic amino,phenylalanine,tyrosine,tryptophan

Sulphur –containing amino acids serine and threonine

Acid amino acids-glutamic and aspartic acids,the salts of these acids are glutamate and aspartate respectively

Amides of the acidic amino acids,glutamine and asparagine

Basic amino acids lysine,arginine,histidine