**IQRA NATIONAL UNIVERSITY**

**DEPARTMENT OF ALLIED HEALTH SCIENCES**

**Mid-term Assignment (spring– 2020), HND 2nd**

**Course title: Macronutrients in Human Nutrition**

**Course instructor: Prof. Dr. Jehangir Khan Kahlil**

**Department: Human Nutrition and Dietetics**

**Time allowed: 48 Hours**

**Date: 13/04/2020 Marks: 30**

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**Note: Attempt all questions from the section.. All questions carry equal marks**

**Questions: 1 (10)**

What are Carbohydrates? What is their role in our body.

**Question: 2 (10)**

What are the impacts of deficit and excess intakes of carbohydrates?

**Question: 3 (10)**

What are the important functions of proteins in our body? Illustrate the chemical structure of protein.

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**Semester : 2nd (BS HND)**

Answer Of Question No : 1

**CARBOHYDRATES:**

Theseare polyhydric/polyhydroxy alcohols having carbonyl groups, which can be an aldehyde (H – C = O ) or ketone group ( C = O ). These on hydrolysis yield polyhydroxy aldehyde or polyhydroxy ketone. These are minimally made up of 3 Carbon atoms.

When carbonyl group which is potentially active in carbohydrates is free and not making any bond, it will have **reducingproperty**. Reducing sugars have property that can either take Oxygen or donate hydrogen to the compound to which they react. To observe this reducing activity a change in colour of solution is noticed during chemical reaction .

So sugar with atleast onefree aldehyde or ketone group in their structures will be called **reducing sugar**.

Sugars having no free active group in their structureare called **non reducing sugars**.

In carbohydrates two sugar residues are joined together by a bond called ‘glycosidic linkage’.

**Classification**: it is done on the basis of number of sugar residues present in carbohydrates.

1. **Monosaccharides :** this class includes simplest sugars which cannot be further hydrolyzed. All monosaccharides are reducing sugars. Depending on carbonyl group present in monosaccharides it can be an aldehyde of ketone. Examples include triose containing 3 carbon atoms , tetrose containing 4 carbon atoms , pentose containg 5 carbon atoms and hexose containing 6 carbon atoms.
2. **Diasaccharides :** they produce two monosaccharides unit on hydrolysis. Examples include:

Maltose = glucose + glucose

Lactose = glucose + glactose

Sucrose = glucose + fructose

1. **Polysaccharides :** these are long chains of monosaccharides which yield more than 10 monosaccharide units on hydrolysis. Their function is to form structural elements of cells. All polysaccharides are non reducing sugars.

**Role of carbohydrates in our body :**

Carbohydrates have my structural and functional role in our body as listed below:

1. Glucose which is a monosaccharide produces NADPH2 through glycolysis. NADPH2 helps to keep glutathione of RBCs in reduced form to prevent oxidative damage. In same way it keeps pentose in reduced form for the synthesis of DNA and RNA.
2. Glucose also produces NADPH2 through glycolysis which helps in the production of ATP which is the main energy currency of the cell.
3. Glactose plays an important role in the development of the brain tissues.
4. Mannitol which is an osmotic diuretic is given in patient with cerebral edma or head injury to decrease intracranial pressure. This mannitol is basically produced by the reduction of mannose.
5. Fructose is present in considerable amount in seminal fluid and provide energy to spermatozoa.
6. Fructose has ability to enter the cell and get metabolised without the need of insulin so diabetic patient can also have it.
7. Glycosides such as present in digitalis which is a naturally occurring plant has effect on heart so it is called cardiac glycosides.
8. Glycogen is used to maintain blood sugar level during fasting.
9. Dextrans has clinical use as plasma expanders in treatment of shock.
10. Cellulose stimulates intestinal peristalsis and hence prevent consitipation.

Answer of question no. 2

**Impact of deficient intake of carbohydrates :**

When carbohydrates are deficient in diet it can have some short term as well as some long term effects.

**Short term effects include**:

Deprevation of glycogen reserves as a result of insufficient glucose, when these reserves are also depleted body starts to break down protein in muscles so it can be used as an energy source. Therefore muscle bulk is reduced and low BMI is observed.

**Long term effects**:

1. metabolism slows down.
2. body gets fatigue easily.
3. Muscles aches are increased.
4. Ketosis is induced which is basically the transformation of liver fat into acids called ketones which body then uses for fuel.
5. Over time ketosis may lead to dehydration, altered chemical balance in blood and low blood sugar level
6. Risks of stroke and heart attack are also increased.

**Impact of excessive intake of carbohydrates** :

Excessive intake of carbohydrates mean binge eating of carbohydrates in diet. Impact of excessive intake includes :

1. Overconsumption of carbohydrates is linked with the occurrence of type 2 diabetes. When carbohydrates are binge eaten it produces surge of glucose in body due to which demand of insulin in body is increased which wears out the beta cells of pancreas due to increased demand and result in type 2 diabetes.
2. Dental caries are also induced due to excessive intake of carbohydrates as bacteria on our teeth metabolizes carbohydrates and leaves behind an acid that damages enamel that is outer hard tissue of teeth.
3. Excessive carbs intake can also lead to obesity.
4. Leaky gut syndrome can also occur as a result of high carb intake that damages intestinal tract.
5. High risks of heart attack and cancer.

Answer of question no.3

**Protein** :

Proteins are made up of units of amino acids joined together by peptide linkage. They also contain elements such as Nitrogen and Sulphur etc.

**Structure of amino acid**: amino acidsare the building block of protein. Amino acid contain aminegroup (-NH2) and acidic group (-COOH). A side chain ( R – group ) is also present that determines the characteristics and fuction of amino acid.

**NH2**

**R – C – COOH**

**H**

**Classification of amino acids :**

They are classified as acidic or basic , polar or non polar , charged or uncharged and essentialor non essential**.**

**Essential amino acids** cannot be synthesized in our body and are needed to be taken from diet whereas **non essentialamino acids** can be synthesized in our body.

**ORGANIZATION OF PROTEIN STRUCTURES :**

There are 4 level of organization which include :

1. Primary structure : it consist of number of amino acids organized as straight polypeptide chain.
2. Secondary structure : polypeptide chain is folded into a coiled structure by disulphide bonds and hydrogen bonds.
3. Tertiary structure : in this structure there is arrangement of coiled chains of proteins into specific layers .
4. Quaternary structure : in this type of organization there are several monomeric units having primary, secondary and tertiary structures which are joined together.

**Functions of proteins in our body :**

1. Proteins are important constituent of plasma and cell membrane.
2. Proteins such as histones combine with nucleic acids to form nucleoproteins which make DNA.
3. Enzymes present in human body are all made up of proteins.
4. Proteins also serve as hormones in human body.
5. Proteins such as fibrinogen and prothrombin help in coagulation of blood.
6. Actin and myosin helps in muscle contractions.
7. Haemoglobin carry oxygen in blood.
8. Proteins present in plasma provide colloid osmotic pressure which is important for circulation of blood.
9. Proteins are source of energy as 1gm of protein provide 4.2 kilocalories.
10. Collagen and Elastin are present in skin, tendon and ligaments.
11. Our nails and hair are also made up of keratin which is a protein.