''बेटी बचाओ, बेटी पढ़ाओ''

JAYOTI VIDYAPEETH WOMEN'S UNIVERSITY, JAIPUR

(Format for Preparing E Notes)

Faculty of FPD

Faculty Name- **JV'n SMRITI (Assistant Professor)**

Program- 1st Year

Course Name - BPT

Session No. & Name – 2023

Academic Day starts with –

- Greeting with saying **'Namaste'** by joining Hands together following by 2-3 Minutes Happy session, Celebrating birthday of any student of respective class and **National Anthem**.

Lecture Starts with- Review of previous Session- Bacterial cell wall Topic to be discussed today- Today We will discuss about the bacterial cell wall and the composition of carbohydrates and the biological function of cel wall.

- University Library Reference- satyanarayan, godkar..

National song' Vande Mataram'

TOPIC:- Bacterial cell wall

Introduction:-

Bacterial cell wall and membrane are associated with a variety of glycoconjugates and polysaccharides which aids in structural formation as well as performing various functions in the bacterial cell. In gram-negative bacteria, peptidoglycan is majorly present in the periplasmic space and it provides mechanical strength as well as shape to the cell. In some cases, the periplasm contains membrane-derived oligosaccharides (MDOs), which are involved in osmoregulation. The outer membrane mainly contains lipopolysaccharides (LPSs) that bind to divalent cations or chelators for structure stabilization and to increase outer membrane permeability. This LPS contains lipid A, also known as endotoxin, which has shown a powerful biological effect in mammals such as fever, septic shock, multiple organ failure, and mortality. The mucoid (slime-producing) strains contain capsular polysaccharide which aids as virulence factor. The gram-positive bacteria lack an outer membrane and have a much thicker peptidoglycan layer along with a specialized polysaccharide known as teichoic acid. It provides cell wall integrity through complex formation with cations and also assists in cell growth regulation. The present report attempts to provide an overview of bacterial polysaccharide structure, occurrence, and their important functions, along with the biosynthesis and major inhibitors to block biosynthetic pathways.

GLYCOPROTEIN:-

Glycoproteins are proteins having covalently bound carbohydrate. They are found in all living organisms, in both soluble and insoluble forms with diverse functions and properties. 1-3 Indeed, there are more proteins that contain covalently bound carbohydrate in their molecule than are devoid of carbohydrate. The carbohydrate content of glycoproteins ranges from less than 1% to over 80% of the molecule. These carbohydrate units are involved in various biological activities. The history of glycoproteins goes back to as early as 1805, when Bostock first characterized the mucus substance of the animal body as chemically distinct from what we now recognize as protein, although biochemists have shown interest only during the last two decades. The glycoproteins can broadly be classified into three types depending on the nature and function of

their carbohydrate units: 'Typical glycoproteins', which includes several glycoproteins of varied carbohydrate content as indicated in Table 1. The carbohydrate takes the form of oligosaccharide chain(s) which are branched and irregular, consisting of neutral, basic and amphoteric monosaccharides. Glycosaminoglycans, a group of compounds often classified as glycoproteins but differing from typical glycoproteins in that they contain very long polysaccharide chains which are linear and fairly regular, possessing alternating monosaccharide sequences, which generally involve acid and basic monosaccharides. Glycosaminoglycans usually contain uronic acids and sulfate groups. Collagens which have a unique type of glycosylation (Table 1) and represent one of the major groups of protein found in the animal kingdom, occurring in multicellular organisms ranging from sponges to mammals. The presence of carbohydrate in collagens from widely differing sources suggest that it may play an essential biological role.

The recent literature abounds in reports of glycoproteins with unusual properties. Of the many examples, human intestinal enzymes, specific for the hydrolysis of the disaccharides, maltose and sucrose have been shown to be glycoproteins which are resistant to proteolytic digestion. 4 Another very important material which is responsible for the sexual agglutination of cells from one type of yeast with those of another type is also a glycoprotein. 5 Myelin, the white substance forming a sheath around some nerve fibres is found to be a glycoprotein. 6 This discovery was also of interest with regard to speculation about the possible role of glycoproteins in memory and in nerve transmission.

The role of carbohydrates in glycoproteins:-

Protein glycosylation is a costly process for the organism in terms of energy and materials which presumably indicates that these units have important biological functions, and it seems likely that carbohydrate in glycoproteins have diverse functions. Different glycoproteins have different carbohydrates and these in turn may be responsible for varied functions. The following are some functions of carbohydrates of glycoproteins. ~1 Viscosity and water binding capacity The sialic acid of the sialic acid rich glycoproteins of saliva, intestinal, trachial or cervical mucus is responsible for the high viscosity and the functioning of these mucins as lubricants.

The antifreeze activity of antifreeze glycoproteins of antarctic fish depends on the integrity of the disaccharide units that form hydrogen bonds with water molecules, thus preventing the growth of ice crystals. Protein folding, conformation and stabilization of biological membranes Carbohydrates influence protein folding and conformation.

Cell surface glycoproteins possibly act as structural components to stabilize cell membranes both in archebacteria and eukaryotes. Carbohydrates are needed not only for folding and acquisition of the correct conformation of certain proteins, but they also participate in subunit interactions. However, the presence of carbohydrate is not always essential for the particular function of the glycoprotein in which it occurs.

Structure of glycoproteins

The carbohydrate of glycoproteins may be present as simple disaccharide units or as fairly large heteropolysaccharides, which may contain as many as 15-20 monosaccharide residues. The number of moieties may vary from several hundred as in case of disaccharides to only a few or even a single one in heteropolysaccharides.