''बेटी बचाओ, बेटी पढ़ाओ''

JAYOTI VIDYAPEETH WOMEN'S UNIVERSITY, JAIPUR

FACULTY OF PHYSIOTHERAPY & DIAGNOSTICS

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 structure of glycoprotein and the biological function of glycoprotein.

- University Library Reference- satya narayan.

  National song' Vande Mataram'

TOPIC :- Bacterial cell wall

Bacterial Cell Wall

The bacterial cell wall consists of peptidoglycan, an essential protective barrier for bacterial cells that encapsulates the cytoplasmic membrane of both Gram-positive and Gram-negative bacterial cells. Peptidoglycan is a rigid, highly conserved, complex structure of polymeric carbohydrates and amino acids. The carbohydrate polymer consists of alternating β-(1,4) linked *N*-acetyl glucosa mine and *N*-acetylmuramic acid residues (Fig. 14.1). The *N*-acetylmuramic acid residues are typically attached to three to five amino acids which are often cross-linked through their side chains, giving the peptidoglycan a web-like appearance. The necessity and highly conserved nature of peptidoglycan makes for an ideal MAMP for NOD2 and other innate immune receptors to recognize bacterial cells.

GLYCOPROTEINS:

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.

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.

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.

The carbohydrate units of glycoproteins contain mainly n-galactose, o-mannose, Dglucose, L-fucose, N-acetyl-D-glucosamine, N-acetyl-D-galactosamine, xylose, rhamnose and sialic acid but the content and proportion of these sugars varies considerably from one glycoprotein to another. For example, collagen contains less than 1% of carbohydrate (glucose/galactose) while rat sublingual glycoproteins contain as much as 81% carbohydrate comprised of D-galactose, D-mannose, L-fucose, N-acetyl-3/-o-hexosamines and sialic acid. Hence any distinction between different classes of glycoproteins based purely on their carbohydrate content will tend to be arbitrary.

Functions

Nearly all cellular processes involve glycoproteins. They play various roles in our body, including those related to our immune systems, physical protection, cell-to-cell communication, and reproductive systems.

- Glycoproteins are present on the lipid bilayer of cell membranes. They can operate in the aqueous environment due to their hydrophilic character, which plays a role in chemical bonding and cell-cell recognition.
- Cell surface glycoproteins are crucial for cross-linking proteins (such as collagen) and cells to strengthen and stabilise a tissue.
- Plants can resist gravity because of glycoproteins found in their cells.
- White blood cells guard the blood arteries as they search for prospective invaders. They use lectin-type glycoproteins to adhere to the blood vessel lining.
- Glycoproteins are present in the grey matter of the brain, where they collaborate with synaptosomes and axons.

- The glycoproteins thrombin, prothrombin, and fibrinogen are necessary for blood coagulation.
- Red blood cells also depend on glycoproteins for their function. The type of glycoprotein on human red blood cells is referred to as the blood type. Red blood cells with type A blood have A antigens or A glycoproteins. As a result, the body learns that the blood is a component of oneself and is instructed not to fight it.
- Due to their ability to facilitate sperm cell attachment to the egg's surface, glycoproteins are essential for reproduction.
- Glycoproteins called mucins are present in the mucus. The molecules protect delicate epithelial surfaces in the digestive, reproductive, urinary, and respiratory tracts.
- Glycoproteins support the immunological response. The specific antigen to which an antibody (or glycoproteins) can bind depends on the carbohydrate it contains. Surface glycoproteins on B and T cells also bind antigens.
- Glycoproteins also maintain the health of our skin. The epithelial cells that form skin have glycoproteins on their surface—these aid in bonding the skin cells in our bodies, creating a strong barrier to protect them.
- Another glycoprotein that helps in the stability of human skin is cadherin