BIOCHEMISTRY AND CYTOGENETICS

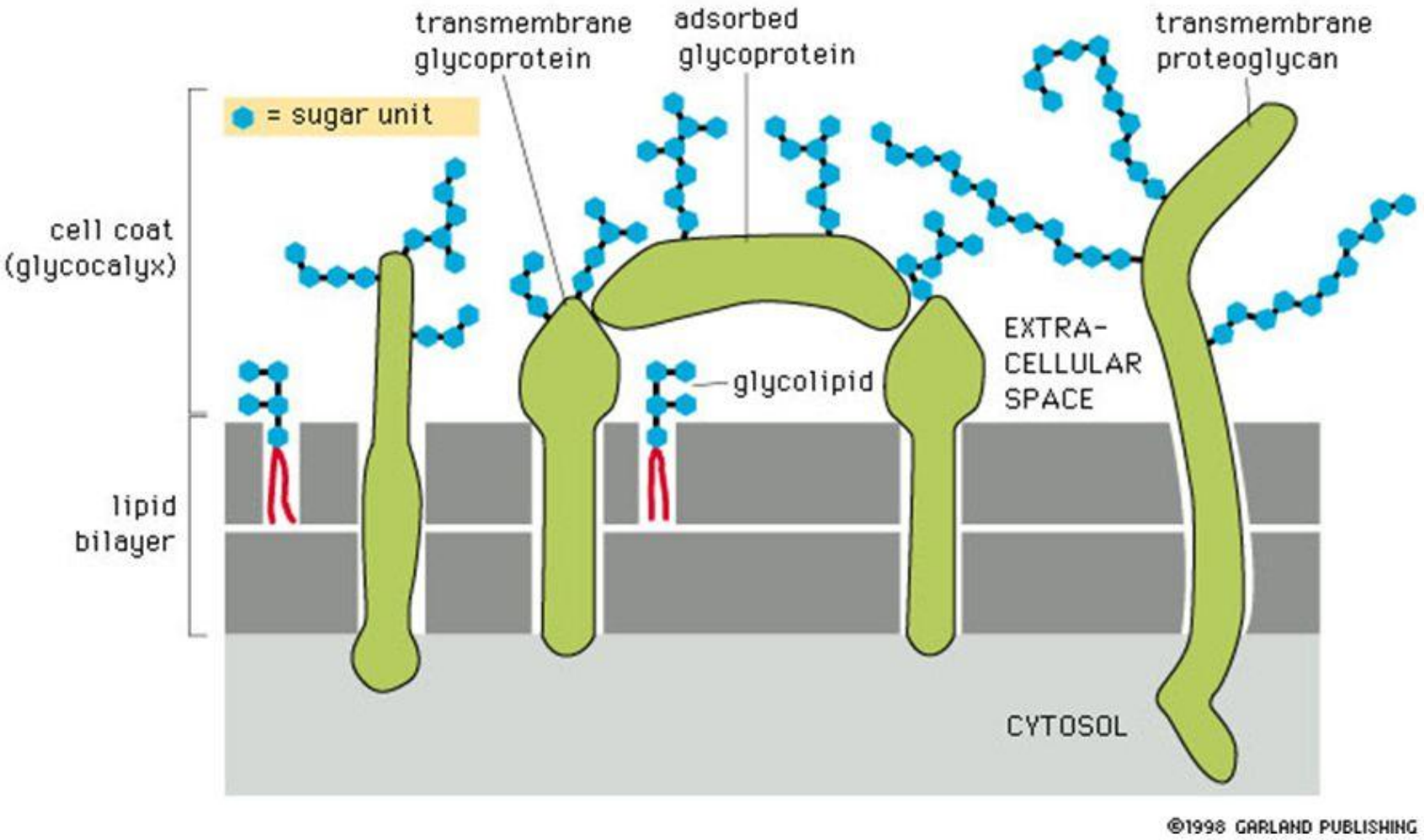
TOPIC : CELL COAT

FIRST SEMESTER M.SC ZOOLOGY

REMYA VARGHESE (ASSISTANT PROFESSOR ON CONTRACT)

Cell coat

Glycocalyx – Cell Coat



Cell coat

- A plasma membrane or plasma lemma is rarely found naked. It is always surrounded by a protective layer.

- In plant cells a cellulose wall is present, whereas, in animal cells some type of external coating is present but that is not the cell wall. In animal cell the exposed surface of outer leaflet of plasma membrane is surrounded and protected by the cell coat.

- It is sometimes also called glycocalyx since it contains sugar units in glycoprotein and polysaccharides.

- The cell coat is generally considered to be equivalent to the oligosaccha-ride side chains of glycolipid, trans membrane glycoprotein and trans membrane proteoglycans that stick out from the outer leaflet of plasma membrane

- Beyond the cell coat of many cells, however, there is a separate ‘fuzzy’ layer which is principally made of carbohydrates secreted by the cell.
- Two layers are very difficult to distinguish from each other because the fuzzy layer appears as an extension of the cell coat proper.

- The cell coat varies in thickness depending on the cell types. In general, it is 10 to 20 nm in thickness. But in case of Amoeba the cell coat is made of fine filaments which are 5 to 8 nm in diameter and 100 to 200 nm in length.

- The cell coat can resist vigorous mechanical and chemical attacks to protect the cell. But it is lost by washing with the solution of urea or exposure to enzymes.

- When the solution of urea or enzyme is withdrawn, the cell coat is re-formed by the continuous secretion of cell coat components from the cell.

- The biosynthesis of the glycoproteins forming the glycocalyx takes place in the ribosomes of the endoplasmic retic-ulum and the final binding with the oligosac-charide moiety occurs in the Golgi complex.

- Therefore, the cell coat is secretory product of the cell and is overlaid on the cell surface and undergoes continuous renewal.

- It contains many enzymes involved in the digestion of carbohydrates and proteins.
- The glycocalyx makes a kind of microenvironment for the cell.
- The classical ABO blood groups are based on specific antigens of the red cell coat. It also plays a part in cell-cell and cell-matrix recognition process.

FUNCTIONS OF CELL COAT

- **i. Supportive Function:**
- The cell coat provides mechanical strength to the cell and protects the cell from external injury.
- **ii. Filtration:**
- It acts as a filter and regulates the passage of molecules according to size. This types of function is found in case of many capillaries—specially in the kidney glomerulus.

- **iii. Diffusion Barrier**
  - The cell coat may change the concentration of different substances at the cell surface by acting as a diffusion barrier.
- **iv. Microenvironment:**
- The cell coat has negatively charged sialic acid termini on the glycoprotein and may bind Ca^{++} and Na^{+} ions. Thus it may change the cationic environment of the cell.

- **v. Enzymes:**
- Many enzymes including alkaline phosphatase have been detected in the cell coat. All the enzymes are involved in the terminal digestion of carbohydrates.

- **vi. ABO Antigens:**
- The classical ABO blood groups are based on specific antigens of the erythrocyte's cell coat which are specified by the terminal carbohy-drates. Several other histo-compatible antigens are also present on the cell coat, which allow the recognition of the cell of one organism and the rejection of other cell.

- **vii. Cell to Cell Recognition and Adhesion:**
- In a tissue, cells are able to recognise similar cells. This phenomenon leads to adhesion among the similar kinds of cells. This is shown by H.V. Wilson's experiments (1907) with sponge. Sponges are ideal material for this experiment because they are composed of only a few cell types.