

CELL-CELL JUNCTIONS AND OTHER SPECIALIZATION OF PLASMA MEMBRANE

Plasma membranes of neighbouring cells in a tissue frequently exhibit specialized junctional regions that play a role in cell adhesion and in intracellular transport. Most common of these are, as follows: -

1. *Tight junction*,
2. *Belt desmosome*,
3. *Spot desmosome* (Macula adherens),
4. *Gap junction*,
5. *Plasmodesmata*.

1. Tight junction:

- i) Cell-cell junction where plasma membrane of adjacent cells fuse together and prevent passage of most dissolved molecules from one side of membrane sheet to the other. e.g.; in epithelial cells.
- ii) At fusion point the external half-membrane of one cell may form a continuous leaflet with the external half membrane of the adjacent.
- iii) It occurs at the same circumferential level of the cell, so that they give rise to belts of fusion point with adjacent cells.
- iv) The belt obliterates the intercellular space and prevents the flow of materials between the cell-surfaces.
- v) Junctions provided with two interdigitating rows of membrane particles, one row contributed by each cell.
- vi) These rows are called sealing strands, which act in much the same manner as the two halves of a zipper.

2. Intermediate junctions/Belt desmosomes:

- i) Generally found at the interface of the columnar cells, just below the region of the tight junctions.
- ii) They form a band that girdles the surface of the cell membrane.
- iii) The band contains a web of 6nm **actin** microfilament and another group of interwoven intermediate filaments of 10nm, that extends into microvilli.
- iv) Actin microfilaments are contractile and intermediate filaments play a structural role.

3. Spot desmosome:

- i) They appear as localized circular button like areas of contact about 0.5 μm in diameter, in which the plasma membranes of two adjacent cells are separated by a distance of 30-50 nm.
- ii) The intercellular space contains a dense band called **central lamella** (composed of acid mucopolysaccharides and proteins).
- iii) Under each P.M., there is a discoidal intracellular plaque, toward which numerous filaments (10nm) called Tonofilaments converge.
- iv) In addition, thinner filaments that arise from dense plaques and traverse the cell membrane into the intercellular space, form the so called "transmembrane linkers" which provide for mechanical coupling.
- v) Number of spot desmosomes—Correlated with the degree of mechanical stress to which a tissue is subjected. eg; Vaginal epithelium is rich in spot desmosomes.

4. Gap junctions or Nexuses:

- i) Communicating cell junctions that allow ions and small molecules to pass from the cytoplasm of one cell to the cytoplasm of the next.
- ii) Here opposing PMs are separated by a distance of only 30-40 \AA & this intercellular space is penetrated by a number of pipe like structures that extend from cytosol of one cell into cytosol of the adjacent cell.
- iii) Each pipe is composed of cylindrical proteins called connexons, one connexon contributed by each of the two juxtaposed cells.
- iv) Each connexon spans the PM. protruding about 10 \AA into the cytosol of one side of the membrane and