Intercellular junctions

Cell junctions:

Numerous membrane-associated structures contribute to cell adhesion and communication, particularly prominent in epithelial tissues, which exhibit high cohesion. These intercellular adhesions are particularly notable in epithelial tissues subjected to pressure, such as the skin.

Intercellular adhesion include:

- Seals to prevent material flow between cells, facilitated by tight (occluding) junctions formed by occludin proteins.

- Sites of adhesion, also known as adhesive or anchoring junctions, formed by cadherin proteins.

- Channels for communication between adjacent cells, facilitated by gap junctions formed by connexin proteins.

These junctions are arranged in a specific order from the apical to the basal ends of the cells.

Tight junctions - adhering junctions - desmosome - gap junctions - hemidesmosome.

Cell junctions are comprised of multi-protein complexes that establish contact either between neighboring cells or between a cell and the extracellular matrix.

Anchoring Junctions establish strong connections between adjacent epithelial cells, creating a tight bond. They are constructed with Cadherin proteins and do not impede the passage of materials between cells.

There are three main types of **Anchoring junctions**:

1. **Desmosomes:** These structures serve as points of attachment between cells, linking to the intermediate filament network within the cell.

2. **Hemidesmosomes:** Positioned at the junction between epithelial cells and the basal lamina, hemidesmosomes, also known as 'half desmosomes,' secure the cell to the basal lamina. Unlike desmosomes, which utilize cadherins for attachment, hemidesmosomes employ integrins, transmembrane proteins that serve as receptor sites for extracellular macromolecules.

3. **Adherent junctions:** These junctions facilitate strong adhesion between neighboring cells and connect to the microfilament (actin filament) via mediator proteins such as catenin.

Tight junctions: A key component of zonula occludens, tight junctions feature transmembrane proteins called claudins, which form tight contacts across the intercellular space, creating a seal. They effectively seal off body cavities and function as barriers.

Gap junctions: These channels facilitate communication between adjacent cells and are composed of connexin proteins. Each connexon complex features a hydrophilic pore approximately 1.5nm in diameter. Gap junctions allow for the rapid exchange of molecules with small diameters, typically under 1.5nm.

The tight junction (zonula occludens) and adherent junction (zonula adherens) typically sit closely together, encircling the cell's apical end in a continuous band. Tight junctions, also known as occluding junctions, prevent the passive flow of material between cells, but they are not particularly robust. Consequently, adhering junctions are located immediately below them, serving to stabilize and reinforce these circular bands, thereby helping to maintain the cohesion of the cell layer. Desmosomes act as robust attachment points, binding to intermediate filaments, thereby supplementing the role of adherens junctions and playing a crucial role in preserving the integrity of an epithelium. Gap junctions, where connexons attach to adjacent cell membranes, possess minimal strength but act as intercellular channels for the flow of molecules.