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Commentary

Cell- Cell Junctions in the Formation of Tissue

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DESCRIPTION

To form tissues, cells adhere to one another. Cells are bound together by many types of cell-to-cell interactions. The forms of cell-to-cell junctions or attachments that are present in a tissue are connected to that tissue's functions. There are three main cell-to-cell junctions. They are:

- Tight junctions,
- Desmosomes, and
- Gap junctions.

Tight junctions

Tight junctions also called as Occluding junctions or zonulae occludentes. They are multiprotein junctional complexes that act as barriers between the epithelial cells and prevent solute and water leakage. Through the production of water, tiny cation, or anion-specific channels, tight junctions can also act as leaky pathways. Vertebrates are the primary hosts of tight junctions.Invertebrates have septate junctions, which are the comparable junctions.

Tight junctions are made of proteins that firmly hold the cells side by side. Tight junctions are commonly present in epithelial tissues, which constitute the majority of the skin and surround internal organs and cavities. This tight adherence prevents materials from escaping between the cells. For example, the epithelial cells that line your urinary bladder have tight connections that prevent urine from seeping into the extracellular area.

A branching network of sealing strands constitutes tight junctions, and each strand operates independently. Therefore, as the number of strands increases, the junction's potency at blocking ion passage grows dramatically. Each strand is made up of a row of trans membrane proteins that are physically connected to one another by cytoplasmic domain and are embedded in both plasma membranes. The tight junctions are made up of at least 40 distinct proteins. These proteins are made up of both cytoplasmic and transmembrane proteins.

Desmosomes

Desmosomes function between adjacent epithelial cells as spot welds. Desmosomes are formed when short proteins called cadherins in the plasma membrane bind to intermediate filaments. The cadherins connect two adjacent cells to maintain the cells in a sheet-like formation in organs and tissues that stretch, like the skin, heart, and muscles. Desmosome-intermediate filament complexes (DIFC), a network of cadherin proteins, linker proteins, and intermediate filaments of keratin, constitute desmosomes. The extracellular core region, also known as the desmoglea, the outer dense plaque, or ODP, and the inner dense plaque, or IDP, can be used to characterize the DIFCs. Desmoglein and Desmocollin, representatives of the cadherin family of cell adhesion proteins, are found in the extracellular core region, which measures around 34 nm in length.

Both proteins contain calcium-binding regions and five extracellular regions. By permitting the cadherin extracellular ligand on desmoglein and desmocollin to stiffen, extracellular calcium assists in the formation of cadherin adhesion. In contrast to the homophilic binding behaviour of other cadherins, they attach to each other *via* heterophilic interactions in the extracellular space around their N-termini. Desmoglein and desmocollin both contain an internal anchor to maintain their placement within the cell membrane and a single pass transmembrane region.

Gap junctions

Gap junctions are specialized intercellular connections between multitudes of animal cell-types. They directly connect the cytoplasm of two cells, which allows various molecules, ions and electrical impulses to directly pass through a regulated gate between cells. One gap junction channel is composed of two protein hexamers (hemichannels) called connexons in vertebrates and innexons in invertebrates. The hemichannel pair connects across the intercellular space bridging the gap between two cells. Gap junctions are analogous to the plasmodesmata that join plant cells. Gap junctions occur in virtually all tissues of the body, with the exception of adult fully developed skeletal muscle and mobilecell types such as sperm or erythrocytes. Gap junctions are not found in simpler organisms such as sponges and slime molds.

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