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Guest Editorial

Membranes and Transport Mechanisms

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Cellular life depends on the movement of membrane ions. For cells to continue functioning as they go through their life cycle, there must be a tremendous amount of exchange. Cell membranes are active structures rather than merely passive barriers separating cells from their surroundings. Cell membranes are known to be selectively permeable, allowing some chemicals to pass through while preventing others from doing so. Therefore, all cellular exchange activities can have active participation from cell membranes. Through the membrane interface, elements needed for cellular existence, communication among cells, and interaction between cells and their environment are taken in. Additionally, cells have the ability to direct and influence input and export processes, as well as moderate the subsequent signal response. Effective drug transportation across cellular membranes is essential for all treatment procedures. The majority of medications used in cancer therapy require carrier proteins for their transmembrane transport, even though hydrophobic small molecules can enter the cell membrane through straightforward diffusion. As a result, many scientists concentrate on creating novel strategies to improve drug delivery and uptake into desired cells. A live cell's plasma membrane serves as its outer wall. Although it acts as a barrier, it also permits transport between the cell and its surroundings.

While the hydrophilic head groups are in contact with the surrounding water, the bilayer's hydrophobic interior, which is made up of fatty acid chains, renders the membrane impermeable to water-soluble compounds. To reduce the accessibility of hydrophobic fatty acid chains, phospholipids can spontaneously form stable bilayers in an aqueous environment due to their amphipathic nature. As lipids and proteins positioned in the plasma membrane can rotate or diffuse laterally and are distributed asymmetrically in the two leaflets, membranes are extremely dynamic structures. In addition to glycolipids, the outer leaflet of the plasma membrane mostly consists of the phospholipids phosphatidylcholine and sphingomyelin. Phosphatidylethanolamine, phosphatidylserine, and phosphatidylinositol are the three main substances that make up the inner leaflet.

Additionally, both leaflets contain cholesterol, which affects the fluidity of the membrane. Lipid rafts are particular domains abundant in sphingolipids and cholesterol. The plasma membrane's basic role as a selectively permeable wall dividing the inside from the outside of the cell is determined by the structure of the phospholipid bilayer. Membrane proteins are essential for guaranteeing the selective translocation of molecules across the membrane as well as the regulation of cellular connections. They can function as energy converters, ion channels, pumps, receptors, or enzymes. The maintenance of the osmotic pressure and cellular pH, as well as the regulation of drug uptake mechanisms, account for the regulation of fundamental cellular activities.