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Short Communication

The Role of Cell Receptors in Cellular Communication, Signalling and in Disease Therapy

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DESCRIPTION

Cell receptors play a pivotal role in cellular communication, acting as molecular messengers that facilitate the exchange of information between cells. These specialized proteins are situated on the cell membrane or within the cell, where they respond to various signals, including hormones, neurotransmitters, and growth factors. The intricate network of cell receptors allows cells to communicate and coordinate their activities, contributing to the regulation of essential physiological processes.

Types of cell receptors

Cell receptors are broadly classified into three main types: G Protein-Coupled Receptors (GPCRs), Receptor Tyrosine Kinases (RTKs), and ion channel receptors [1, 2].

G protein-coupled receptors

GPCRs represent the largest and most diverse family of cell surface receptors. These receptors traverse the cell membrane seven times and are coupled to G proteins, which act as intermediaries to transmit signals from the extracellular environment to the cell's interior. When a signaling molecule, such as a hormone, binds to the GPCR, it induces a conformational change that activates the associated G protein, initiating a cascade of intracellular events [3].

Examples of GPCRs include adrenergic receptors, which respond to adrenaline, and serotonin receptors, involved in mood regulation. Pharmaceuticals targeting GPCRs are widely used, making them significant therapeutic targets for various diseases [4].

Receptor tyrosine kinases

RTKs are transmembrane proteins that play a crucial role in regulating cell growth, differentiation, and survival. When a ligand binds to the extracellular domain of an RTK, it induces receptor dimerization and autophosphorylation of tyrosine residues in the intracellular domain. This phosphorylation event activates a signaling cascade, activating various downstream pathways involved in cellular responses [5].

Epidermal Growth Factor Receptor (EGFR) is a well-known RTK implicated in cancer development, and drugs targeting EGFR have become essential in cancer therapy. The dysregulation of RTK signaling is associated with numerous diseases, emphasizing the importance of understanding these receptors for therapeutic interventions [6].

Ion channel receptors

Ion channel receptors are integral membrane proteins that form channels allowing the passage of ions across the cell membrane. Ligand binding or changes in membrane potential can modulate the opening or closing of these channels, influencing cellular processes such as neurotransmission and muscle contraction [7].

N-Methyl-D-Aspartate (NMDA) receptors, involved in synaptic plasticity and learning, are examples of ion channel receptors. Understanding the function of ion channel receptors is critical for unraveling the mechanisms underlying neurological disorders and designing targeted therapies [8].

Cell receptors in disease and therapy

Aberrant signaling through cell receptors is implicated in various diseases, including cancer, neurodegenerative disorders, and cardiovascular diseases. Consequently, targeting these receptors has become a prominent strategy in drug development [9].

For instance, drugs that modulate GPCRs are widely used in the treatment of hypertension, asthma, and psychiatric disorders. RTK inhibitors, such as those targeting the Human Epidermal Growth Factor Receptor 2 (HER2) receptor in breast cancer, have revolutionized cancer therapy. Moreover, ion channel modulators are utilized to treat conditions like epilepsy and cardiac arrhythmias [10].

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CONCLUSION

Cell receptors are indispensable components of cellular communication, coordinate the complex web of signaling pathways that regulate physiological processes. Understanding the diverse types of receptors and their roles in health and disease is crucial for advancing medical research and developing targeted therapeutic interventions. As the study of cell receptors explores deeper into the intricacies of cell receptor signaling, new opportunities for drug discovery and personalized medicine are likely to emerge, improved treatments for a wide range of disorders.

REFERENCES

1. Redza-Dutordoir M, Averill-Bates DA. Activation of apoptosis signalling pathways by reactive oxygen species. Biochim Biophys Acta. 2016;1863(12):2977-2992.
2. Hou X, Mankoci S, Walters N, Gao H, Zhang R, Li S, et al. Hierarchical structures on nickel-titanium fabricated by ultrasonic nanocrystal surface modification. Mater Science and Eng C Mater Biol Appl. 2018;93:12-20.
3. Di Palma F, Douet M, Boachon C, Guignandon A, Peyroche S, Forest B. Physiological strains induce differentiation in human osteoblasts cultured on orthopaedic biomaterial. Biomaterials. 2003;24(18):3139-3151.
4. Gotoh Y, Cooper JA. Reactive oxygen species-and dimerization-induced activation of apoptosis signal-regulating kinase 1 in tumor necrosis factor-α signal transduction. J Biol Chem. 1998;273(28): 17477-17482.
5. Engebrecht J, Nealson K, Silverman M. Bacterial bioluminescence: isolation and genetic analysis of functions from Vibrio fischeri. Cell. 1983;32(3):773-781.
6. Dharshini LC, Vishnupriya S, Sakthivel KM, Rasmi RR. Oxidative stress responsive transcription factors in cellular signalling transduction mechanisms. Cellular Signal. 2020;72:109670.
7. Nishida T, Hattori K, Watanabe K. The regulatory and signaling mechanisms of the ASK family. Adv Biol Regul. 2017;66:2-2.
8. Sies H, Jones DP. Reactive oxygen species (ROS) as pleiotropic physiological signalling agents. Nat Rev Mol Cell Biol. 2020;21(7): 363-383.
9. Yu FX, Zhao B, Panupinthu N, Jewell JL, Lian I, Wang LH, et al. Regulation of the Hippo-YAP pathway by G-protein-coupled receptor signaling. Cell. 2012;150(4):780-791.
10. Carstensen A, Herdean A, Schmidt SB, Sharma A, Spetea C, Pribil M, et al. The impacts of phosphorus deficiency on the photosynthetic electron transport chain. Plant Physiol. 2018;177(1): 271-284. .