The fascinating world of neurocellular biology.

Rob Cairns*

Department of Cancer Biology, University of Pennsylvania, Pennsylvania, USA.

Introduction

Neurocellular biology is a specialized field that delves into the cellular and molecular foundations of the nervous system. This branch of biology examines how neurons and glial cells function, communicate, and contribute to the complex processes of the brain and nervous system. Understanding neurocellular biology is crucial for unraveling the mysteries of neural development, function, and the pathophysiology of neurological diseases. This article explores the key elements of neurocellular biology, highlighting the structure and function of neurons and glial cells, neural communication, and the implications for health and disease [1].

The cellular components of the nervous system

The nervous system is composed of two primary types of cells: neurons and glial cells. Each type plays distinct but complementary roles in maintaining neural function and integrity. Neurons, or nerve cells, are the fundamental units of the nervous system responsible for transmitting information throughout the body [2]. They are specialized for rapid communication via electrical and chemical signals. Key components of neurons include. Glial cells, often referred to as the support cells of the nervous system, outnumber neurons and perform various critical functions, including maintaining homeostasis, forming myelin, and providing support and protection for neurons. Major types of glial cells include [3]. Star-shaped cells that provide structural and metabolic support to neurons, maintain the blood-brain barrier, and regulate neurotransmitter levels.

Produce myelin in the Central Nervous System (CNS), insulating axons to enhance signal transmission. Produce myelin in the Peripheral Nervous System (PNS) and aid in the repair of damaged nerves. Act as the immune cells of the CNS, removing debris and defending against pathogens. Line the ventricles of the brain and spinal cord, involved in the production and circulation of Cerebrospinal Fluid (CSF) [4].

Neural communication: Neural communication involves both electrical and chemical processes that enable rapid and precise signaling within the nervous system [5].

Neurons communicate through electrical impulses known as action potentials. An action potential is generated when a neuron's membrane potential reaches a critical threshold, causing a rapid influx of sodium ions followed by an efflux of potassium ions. This electrical signal travels along the axon to the axon terminals [6].

At the axon terminals, the action potential triggers the release of neurotransmitters from synaptic vesicles into the synaptic cleft, the gap between neurons [7].These chemical messengers bind to receptors on the postsynaptic neuron, eliciting a response that can either excite or inhibit the postsynaptic cell [8].

Neurogenesis and neural plasticity: Neurogenesis, the process of generating new neurons, occurs primarily during development but also in certain brain regions in adults, such as the hippocampus [9]. Neural plasticity refers to the ability of the nervous system to change its structure and function in response to experience or injury, a fundamental property underlying learning and memory [10].

Conclusion

Neurocellular biology provides profound insights into the intricate workings of the nervous system. By understanding the roles and interactions of neurons and glial cells, researchers can uncover the underlying mechanisms of neural development, function, and disease. Continued advancements in this field hold promise for developing new therapeutic strategies to treat neurological disorders and improve brain health, ultimately enhancing the quality of life for individuals affected by these conditions. As research progresses, the complex yet fascinating world of neurocellular biology will continue to reveal the secrets of the brain and nervous system.

References

1. Davis JB. Neuroeconomics: constructing identity. J Econ Behav. 2010;76(3):574-83.
2. Molitor L, Krispin S, Van-Zuiden W, et al. Organellomics: AI-driven deep organellar phenotyping of human neurons. bioRxiv. 2024:2024-01.
3. Hong Q, Jin X, Zhou C, et al. Gold nanoparticles with amyloid-β reduce neurocell cytotoxicity for the treatment and care of Alzheimer's disease therapy. Gold Bull. 2023;56(3):135-44.
4. Goetzl EJ, Miller BL. Multicellular hypothesis for the pathogenesis of Alzheimer's disease. The FASEB Journal. 2017;31(5):1792-5.
5. Lipkin LE. Cytoplasmic inclusions in ganglion cells associated with parkinsonian states: a neurocellular change studied in 53 cases and 206 controls. Am J Pathol. 1959;35(6):1117.

***Correspondence to:** Rob Cairns**,** Department of Cancer Biology, University of Pennsylvania, Pennsylvania, USA, E-mail: Cairns@mskcc.org

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6. Kim YJ, Lim HS, Kim JH, et al. Quantitative analysis of 7 compounds in Diospyros lotus leaf extract and its biological effects on neuroprotection and antineuroinflammation. Nat Prod Commun. 2020;15(5):1934578X20924859.
7. Lin XX, Nieder A, Jacob SN. The neurocellular implementation of representational geometry in primate prefrontal cortex. bioRxiv. 2023:2023-03.
8. Faber R. Basic Neurocellular Patterns: Exploring Developmental Movement: Bonnie Bainbridge Cohen. Burchfield Rose Publishers, 2018.
9. Salari V, Valian H, Bassereh H, et al. Ultraweak photon emission in the brain. J Integr Neurosci. 2015;14(03):419-29.
10. Morris DC, Zacharek A, Zhang ZG, et al. Extracellular vesicles—Mediators of opioid use disorder?. Addict Biol. 2023;28(12):e13353.

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