OPEN ACCESS Freely available online

ISSN: 0974-8369
Biology and Medicine

Perspective

Cell Biology and Molecular Mechanism of Neuronal Progenitor Cells

Meinoshin Okumura*

Department of Cell Biology, National Hospital Organization Toneyama Hospital, Toyonaka, Japan

DESCRIPTION

Neuronal Progenitor Cells (NPCs) are a type of stem cell that gives rise to neurons in the developing nervous system. These cells have a unique biology, which is essential for their function in neurogenesis. NPCs are found in the developing brain and spinal cord and are responsible for generating new neurons during development. These cells are characterized by their ability to divide and differentiate into neurons and glia, the two main cell types in the nervous system. NPCs are typically located in two regions of the developing nervous system the Ventricular Zone (VZ) and the Subventricular Zone (SVZ). The VZ is a layer of cells that lines the ventricles, the fluid-filled spaces in the brain. This layer contains NPCs that are responsible for generating the majority of the neurons in the developing nervous system. The SVZ, on the other hand, is located just beneath the VZ and contains NPCs that generate a smaller number of neurons but are also responsible for producing glia, the support cells of the nervous system. NPCs have a characteristic morphology, which includes a small cell body with a single, elongated process called a radial glial fiber. This fiber extends from the VZ to the pial surface, the outermost layer of the brain. The radial glial fiber acts as a scaffold for migrating neurons during development and also serves as a signaling hub for various molecules that regulate NPC proliferation and differentiation. They also characterized by their unique cell cycle dynamics. Unlike most other cell types in the body, NPCs undergo asymmetric cell division, where one daughter cell remains an NPC, while the other daughter cell differentiates into a neuron or glial cell. This process ensures the continued production of new neurons while maintaining a pool of NPCs for future neurogenesis.

The differentiation of NPCs into neurons or glia is a complex process that is regulated by a variety of molecular signals. These signals include growth factors, neurotransmitters, and other molecules that interact with specific receptors on the surface of NPCs. Differentiation also influenced by environmental factors, such as the presence of other cells in the surrounding tissue. The molecular mechanisms that regulate NPC differentiation are complex and not yet fully understood. However, several key signaling pathways have been identified that play a critical role in this process. These include the Notch signaling pathway, which promotes NPC self-renewal, and the Wnt signaling pathway, which promotes neuronal differentiation. In addition to these signaling pathways, epigenetic modifications also play a crucial role in regulating NPC differentiation. Epigenetic modifications refer to changes in the structure of DNA and its associated proteins that affect gene expression without altering the underlying DNA sequence. These modifications can be inherited during cell division and can influence cell fate decisions. One example of an epigenetic modification that regulates NPC differentiation is DNA methylation. DNA methylation is a process where a methyl group is added to the DNA molecule, which can turn off gene expression. Studies have shown that DNA methylation patterns are dynamic during NPC differentiation and that changes in these patterns can influence cell fate decisions. Another important aspect of NPC biology is their ability to respond to injury or disease. In the adult brain, NPCs are present in a few regions, including the hippocampus. These cells have been shown to contribute to the repair of damaged tissue in the brain and spinal cord.

Correspondence to: Meinoshin Okumura, Department of Cell Biology, National Hospital Organization Toneyama Hospital, Toyonaka, Japan, E-mail: meinoshin@cell.med.ac.jp

Received: 22-Feb-2023, Manuscript No. BLM-23-20385; **Editor assigned:** 27-Feb-2023, Pre QC No. BLM-23-20385 (PQ); **Reviewed:** 14-Mar-2023, QC No. BLM-23-20385; **Revised:** 21-Mar-2023, Manuscript No. BLM-23-20385 (R); **Published:** 28-Mar-2023, DOI: 10.35248/0974-8369.23.15.550.

Citation: Okumura M (2023) Cell Biology and Molecular Mechanism of Neuronal Progenitor Cells. Bio Med. 15:550.