Commentary
Volume 6:3, 2023

Journal of Clinical Neurology and Neurosurgery

ISSN: 2684-6012 Open Access

Adult Neurogenesis: Unlocking the Secrets of Brain Plasticity

Ashley Erik*

Department of Psychology, Harvard University, Harvard, USA

Description

The human brain, with its intricate web of billions of neurons, has long been regarded as a static and unchanging organ. However, over the past few decades, ground-breaking research has challenged this notion and revealed that the adult brain possesses a remarkable ability to generate new neurons—a phenomenon known as adult neurogenesis. This discovery has revolutionized our understanding of brain plasticity and its implications for learning, memory, and mental health. In this article, we will delve into the fascinating world of adult neurogenesis, exploring its mechanisms, functions, and the potential therapeutic implications it holds. Neurogenesis refers to the process of generating new neurons, which are the specialized cells that make up the central nervous system, including the brain and spinal cord. In the past, it was believed that neurogenesis only occurred during embryonic development and early childhood, and that the adult brain was incapable of producing new neurons. However, more recent research has shown that neurogenesis can indeed occur in certain regions of the adult brain. The subventricular zone (SVZ) and the dentate gyrus of the hippocampus. The SVZ is located along the walls of the lateral ventricles, while the dentate gyrus is a region within the hippocampus, which is involved in learning and memory [1].

The process of adult neurogenesis involves several stages. First, neural stem cells, also known as progenitor cells, divide to produce progenitor cells with more limited potential. These progenitor cells then differentiate into immature neurons, which eventually mature and integrate into the existing neural circuitry. The regulation of neurogenesis is influenced by various factors, including genetics, environmental stimuli, and physiological conditions. For instance, physical exercise, learning experiences, and an enriched environment have been shown to promote neurogenesis. On the other hand, stress, aging, and certain neurological disorders may hinder or reduce neurogenesis. The functional significance of adult neurogenesis is still an area of active research. However, studies in animals have suggested that it may play a role in certain cognitive functions, such as learning, memory, and mood regulation. In humans, the extent and functional implications of adult neurogenesis are still not fully understood, and further research is needed to elucidate its potential therapeutic applications and relevance to various neurological conditions [2].

Neurogenesis, the process by which new neurons are generated, was initially believed to occur exclusively during prenatal development. It was widely accepted that the adult brain was incapable of producing new neurons. However, in the late 20th century, studies conducted on various animal models, including primates and humans, challenged this dogma. The birth of new neurons in the adult brain primarily occurs in two regions: the Subventricular Zone (SVZ) lining the lateral ventricles and the dentate gyrus of the hippocampus [3]. The SVZ is involved in generating new neurons that migrate to the olfactory bulb, contributing to olfactory perception. On the other hand, the hippocampus is crucial for learning, memory, and emotional regulation, making adult neurogenesis in this region particularly intriguing. Once the new neurons reach their destination, they must integrate into existing neural circuits to function effectively. They form synaptic connections with other neurons and undergo a process called synaptogenesis. Proper integration and survival of new neurons are influenced by various factors, including neurotransmitters, growth factors, and the overall neural environment. The discovery of adult neurogenesis has raised intriguing questions about its functional significance. Extensive research using animal models and human studies has shed light on the potential roles adult-born neurons play in various cognitive processes and mental health [4].

The process of adult neurogenesis involves several complex stages, starting from the proliferation of neural stem cells and progenitor cells to the differentiation and integration of new neurons into pre-existing neural circuits. Understanding these mechanisms is vital for unraveling the potential functions and therapeutic applications of adult neurogenesis. The adult brain harbors a small population of neural stem cells, known as radial glia-like cells or type 1 cells, which serve as the source of new neurons. These cells possess the remarkable ability to self-renew and differentiate into different cell types, including neurons and glial cells. Proliferation and Differentiation: Under specific conditions, neural stem cells divide and give rise to transit-amplifying cells, or type 2 cells, which undergo rapid proliferation. These type 2 cells, in turn, produce neuroblasts, or type 3 cells, which migrate to their target regions, such as the olfactory bulb or hippocampus. Once in the target region, the neuroblasts differentiate into mature neurons. The hippocampus, a brain region critical for learning and memory, has been the focus of much research on adult neurogenesis. Studies have demonstrated that the generation of new neurons in the dentate gyrus is associated with improved learning and memory formation [5].

Acknowledgement

None.

Conflict of Interest

None.

References

1. Ihrie, Rebecca A. and Arturo Álvarez-Buylla. "Lake-front property: A unique germinal niche by the lateral ventricles of the adult brain." *Neuron* 70 (2011): 674-686.
2. Lazarini, Françoise and Pierre-Marie Lledo. "Is adult neurogenesis essential for olfaction?." *Trends in neurosciences* 34 (2011): 20-30.
3. Doetsch, Fiona, Isabelle Caille, Daniel A. Lim and Jose Manuel García-Verdugo, et al. "Subventricular zone astrocytes are neural stem cells in the adult mammalian brain." *Cell* 97 (1999): 703-716.
4. Luskin, Maria B. "Restricted proliferation and migration of postnatally generated neurons derived from the forebrain subventricular zone." *Neuron* 11 (1993): 173-189.
5. Livneh, Yoav, Yoav Adam and Adi Mizrahi. "Odor processing by adult-born neurons." *Neuron* 81 (2014): 1097-1110.

How to cite this article: Erik, Ashley. "Adult Neurogenesis: Unlocking the Secrets of Brain Plasticity." *J Clin Neurol Neurosurg* 6 (2023): 180.

***Address for Correspondence:** Ashley Erik, Department of Psychology, Harvard University, Harvard, USA, E-mail: ashley.erik@gmail.com*

Received: 01 June, 2023, Manuscript No. jcnn-23-106066; **Editor Assigned:** 03 June, 2023, PreQC No. P-106066; **Reviewed:** 15 June, 2023, QC No. Q-106066; **Revised:** 20 June 2023, Manuscript No. R-106066; **Published:** 27 June, 2023, DOI: 10.37421/2684-6012.2023.6.180