Neurogenesis

Neurogenesis is the process of generating new neurons in the brain, which is most commonly observed in certain regions of the brain, such as the hippocampus.

Neurogenesis (birth of neurons) is the process by which neurons are generated from neural stem cells and progenitor cells.

Most active during pre-natal development, neurogenesis is responsible for populating the growing brain with neurons. Neurogenesis was shown to continue in two parts of the brains of adult mammals: the hippocampus and the subventricular zone. Studies have indicated that the hormone testosterone in vertebrates, and the prohormone ecdysone in insects, have an influence on the rate of neurogenesis.

Neurogenesis in the cerebral infarction after an ischemic event is important to the rehabilitation of patients.

Adult neural stem/progenitor cells (NSPCs) in two neurogenic areas of the brain, the dentate gyrus and the subventricular zone are major players in adult neurogenesis. Addressing specific questions regarding NSPCs outside of their niche entails in vitro studies through the isolation and culture of these cells. As there is heterogeneity in their morphology, proliferation, and differentiation capacity between these two neurogenic areas, NSPCs should be isolated from each area through specific procedures and media. Identifying region-specific NPSCs provides an accurate pathway for assessing the effects of extrinsic factors and drugs on these cells and investigating the mechanisms of neurogenesis in both healthy and pathologic conditions. A great number of isolation and expansion techniques for NSPCs have been reported. The growth and expansion of NSPCs obtained from the dentate gyrus of aged rats are generally difficult. There are relatively limited data and protocols about NSPCs isolation and their culture from aged rats. Our approach is an efficient and reliable strategy to isolate and expand NSPCs obtained from young adult and aged rats. NSPCs isolated by this method maintain their self-renewal and multipotency. Key features • NSPCs isolated from the hippocampal dentate gyrus of young adult and aged rats, based on Kempermann et al. (2014) and Aligholi et al. (2014). • Maintenance of NSPCs isolated from the dentate gyrus of aged rats (20-24 months) in our culture condition is feasible. • According to our protocol, the maximum growth of primary neurospheres obtained from isolated NSPCs of young and aged rats took 15 and 35 days, respectively [1)]

[1)]
Afhami M, Behnam-Rassouli M, Gorji A, Karima S, Shahpasand K. Isolation and Culture of Neural Stem/Progenitor Cells from the Hippocampal Dentate Gyrus of Young Adult and Aged Rats. Bio Protoc. 2023 Oct 5;13(19):e4843. doi: 10.21769/BioProtoc.4843. PMID: 37817897; PMCID: PMC10560695.