Identifying Neuroregenerative Pathways

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Technology description

Examining niche environments and growth factors in adult and fetal brains that allow the differentiation of stem cells into neural progenitors

Technology Overview

For many years, neuroscientists have operated under the belief that neurogenesis ceases to occur after the first several years of life, effectively meaning that any damage to neurons is irreparable.
While more recent evidence has shown that adult neurogenesis does actually occur in the hippocampus, the fact still remains that neural death following a stroke or traumatic brain injury frequently leads to lifelong debilitation, as the brain is unable to develop new circuitry in the damaged regions. This lack of neuroregeneration is similarly seen in patients who experience spinal injuries or neuro-degenerative disorders, leading to varying levels of cognitive and motor dysfunction that the body is unable to restore.
Dr. Hevner's research group studies transcription factors and neurogenesis in the developing and adult mouse brain. Specifically, Hevner studies the pathways involved to activate or repress genetic programs of cell cycle progression, cell migration, axon guidance, synapse formation and neuronal fate and subtype specification. This research has led to the discovery that Tbr2 upregulation is associated with the differentiation of radial glial into neural progenitor cells.
Lineage tracing using a Tbr2-cre GFP reporter has allowed Hevner’s group to identify the transient expression of Tbr2 during its differentiation into postmitotic projection neurons in the subventricular and ventricular zones of the neocortex. The neocortex is a much more expansive region than the hippocampus, and often associated with cognitive impairment following acute injury. Hevner’s work, which focuses on understanding both the localization of neurogenesis and the triggers allowing it to occur in the neocortex, could prove pivotal in helping restore damaged brain and nerve function.
Ongoing work involves the use of in vivo and in vitro models of neural damage and subsequent repair, and Hevner’s group is currently working to understand the role of different growth factors in promoting regeneration. Hevner is interested in testing new pre-clinical drug candidates that could promote neuroregeneration by inducing adult stem cell differentiation into neural progenitors.

Institution

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