Understanding the Regulatory Role of FHL2 Protein in the Development of Newborn Neurons in the Adult Hippocampus

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ABSTRACT

The hippocampus is one of the discrete areas of the brain involved in the proliferation of new neurons throughout adulthood. The production and development of new neurons, including the growth of dendrites and the formation of synaptic connections with the mature cohort, are critical for hippocampus-associated functions, including memory formation/retrieval and spatial recognition. Dysregulation in the continuum of newborn cell development is reported in pathology such as epilepsy. Yet, the molecular mechanism involved in immature neurons development, including dendrite growth, is poorly understood. We characterized the role of a newly described gene implicated in neural stem cell cycling called FHL2. FHL2 has been reported in numerous signaling pathways in immune and cancer cells but its role in the brain primarily adult hippocampus is not understood. We first confirmed the endogenous expression of FHL2 in immature neurons using immunolabeling. Next, we engineered viral vectors for genetic manipulation and observed that overexpression of FHL2 results in marked sprouting of neurites in contrast to the silencing of FHL2 in newborn neurons. Also, to study the effect of environment on the expression of FHL2 in immature neurons, a cohort of mice placed in an enriched environment (including tunnels and toys) showed higher expression of FHL2 in immature neurons in contrast to the standard environment, after 14 days of exposure. Together, these results suggest a novel role of FHL2 in newborn neuron development in the adult hippocampus and can help investigate its relevance in pathology of the central nervous system.

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