Development of neural stem cell in the adult brain

Xin Duan1, 2, Eunchai Kang2, 3, Cindy Y Liu2, Guo-li Ming1, 2, 4 and Hongjun Song1, 2, 3, 4

1The Solomon H. Snyder Department of Neuroscience, Johns Hopkins University School of Medicine, 733 N. Broadway, Baltimore, MD 21205, USA

2Institute for Cell Engineering, Johns Hopkins University School of Medicine, 733 N. Broadway, Baltimore, MD 21205, USA

3Predoctoral Training Program in Human Genetics, Johns Hopkins University School of Medicine, 733 N. Broadway, Baltimore, MD 21205, USA

4Department of Neurology, Johns Hopkins University School of Medicine, 733 N. Broadway, Baltimore, MD 21205, USA

Available online 29 May 2008.

New neurons are continuously generated in the dentate gyrus of the mammalian hippocampus and in the subventricular zone of the lateral ventricles throughout life. The origin of these new neurons is believed to be from multipotent adult neural stem cells. Aided by new methodologies, significant progress has been made in the characterization of neural stem cells and their development in the adult brain. Recent studies have also begun to reveal essential extrinsic and intrinsic molecular mechanisms that govern sequential steps of adult neurogenesis in the hippocampus and subventricular zone/olfactory bulb, from proliferation and fate specification of neural progenitors to maturation, navigation, and synaptic integration of the neuronal progeny. Future identification of molecular mechanisms and physiological functions of adult neurogenesis will provide further insight into the plasticity and regenerative capacity of the mature central nervous system.