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Isolation and Self-renewal of Neural Stem Cells

Neural stem cells (NSCs) are self-renewing and multipotential neural progenitor cells, which have received strong attention as potential tools to treat the injured or diseased brain. To develop therapeutic strategies intended to capitalize upon the plasticity and propagability of NSCs, we need both to better understand their biology, and to develop better means for their prospective identification and harvest. We report here several new and complementary findings from our laboratories, which address the isolation of neural stem cells, as well as the maintenance, asymmetric cell division1) and regulatory control of the stem cell phenotype. Specifically, we report i) the identification of Hes1 as a negative regulator of neural stem cell differentiation 2), ii) the identification of the Musashi 3), 4), 5) and Hu proteins 6) as selective markers for NSCs and their neuronal daughters, respectively, and iii) the prospective identification of NSCs, in both transgenic 7) and somatic models 8), using fluorescent reporters placed under the control of the nestin enhancer. Together, these findings provide us both new conceptual and operational strategies for studying NSCs, and as such should greatly accelerate their development for the treatment of neurologic disease.

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