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Prospect

The culture of neural stem cells

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ABSTRACT

A stem cell has three important features. Firstly, the ability of self-renewal: making identical copies of itself. Secondly, multipotency, generating all the major cell lineages of the host tissue (in the case of embryonic stem cells - pluripotency). Thirdly, the ability to generate/regenerate tissues. Thus, the study of stem cells will help unravel the complexity of tissue development and organisation, and will also have important clinical applications. Neural stem cells (NSCs) are present during embryonic development and in certain regions of the adult central nervous system (CNS). Mobilizing adult NSCs to promote repair of injured or diseased CNS is a promising approach. Since NSCs may give rise to brain tumor, they represent in vitro models for anti-cancer drug screening. To facilitate the use of NSCs in clinical scenarios, we need to explore the biology of these cells in greater details. One clear goal is to be able to definitively identify and purify NSCs. The neurosphere-forming assay is robust and reflects the behavior of NSCs. Clonal analysis where single cells give rise to neurospheres need to be used to follow the self-renewal and multipotency characteristics of NSCs. Neurosphere formation in combination with other markers of NSC behavior such as active Notch signaling represents the state of the art to follow these cells. Many issues connected with NSC biology need to be explored to provide a platform for clinical applications. Important future directions that are highlighted in this review are; identification of markers for NSCs, the use of NSCs in high-throughput screens and the modelling of the central nervous development. There is no doubt that the study of NSCs is crucial if we are to tackle the diseases of the CNS such as Parkinson's and Alzheimer's. J. Cell. Biochem. © 2008 Wiley-Liss, Inc.

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