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COMMENTARY

Revisiting neural stem cell identity

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The discovery of neural stem cells (NSCs) in the adult mammalian central nervous system (CNS) has dramatically changed our view on the regenerative capacity of this organ (1, 2). We now realize that the adult brain, including humans, retains the ability to replenish its cellular constituents, neurons and glia, although the extent is very limited compared with lower vertebrates (2). Cell turnover driven by NSCs has been implicated in higher brain functions such as learning and memory (3). Adult NSCs have also been shown to participate in neuronal cell replacement after injury, raising the possibility of stem cell-based therapy for neurological disorders (4). Despite extensive studies in the past decade, one fundamental question remains unanswered: What is the identity of NSCs? In 1999, two groups reported apparently contradictory results: Johansson *et al.* (5) provided evidence that ependymal cells, which constitute a ciliated single-cell-thick epithelial layer lining the lateral ventricle (LV), retain the characteristics of NSCs (Fig. 1*A*). In contrast, Doetsch *et al.* (6) identified glial fibrillary acidic protein (GFAP)-positive astrocyte-like cells, which reside in a region beneath the ependymal layer called the subependymal layer or subventricular zone (SVZ), as NSCs.

Although these two results were not necessarily mutually exclusive, they sparked a debate that has been ongoing ever since. For better understanding of the basic biology of NSCs and their future successful use for therapy, reconciliation of this long-debated issue is awaited. The work of Coskun *et al.* (7) in this issue of PNAS addressed this question by using new tools and approaches.

View larger version (55K):

Fig. 1. Cytoarchitecture of the ventricular wall of the adult rodent brain. The topological relationship between the ependymal layer and SVZ (*A*) and cell types known to reside in . . . *[Full Text of this Article]*

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Companion article to this Commentary:

From the Cover: CD133$^+$ neural stem cells in the ependyma of mammalian postnatal forebrain

Volkan Coskun, Hao Wu, Bruno Blanchi, Sean Tsao, Kevin Kim, Jing Zhao, Juan Carlos Biancotti, Leah Hutnick, Richard C. Krueger, Jr., Guoping Fan, Jean de Vellis, and Yi E. Sun

PNAS 2008 105: 1026-1031. [Abstract] [Full Text]