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The cerebrospinal fluid provides a proliferative niche for neural progenitor cells.

Lehtinen MK, Zappaterra MW, Chen X, Yang YJ, Hill AD, Lun M, Maynard T, Gonzalez D, Kim S, Ye P, D'Ercole AJ, Wong ET, Lamantia AS, Walsh CA.

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Abstract

Cortical development depends on the active integration of cell-autonomous and extrinsic cues, but the coordination of these processes is poorly understood. Here, we show that the apical complex protein Pals1 and Pten have opposing roles in localizing the Igf1R to the apical, ventricular domain of cerebral cortical progenitor cells. We found that the cerebrospinal fluid (CSF), which contacts this apical domain, has an age-dependent effect on proliferation, much of which is attributable to Igf2, but that CSF contains other signaling activities as well. CSF samples from patients with glioblastoma multiforme show elevated Igf2 and stimulate stem cell proliferation in an Igf2-dependent manner. Together, our findings demonstrate that the apical complex couples intrinsic and extrinsic signaling, enabling progenitors to sense and respond appropriately to diffusible CSF-borne signals distributed widely throughout the brain. The temporal control of CSF composition may have critical relevance to normal development and neuropathological conditions.

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