Neuroepithelial cell

Neuroepithelial cells are the “stem cells” of the nervous system, deriving from actual stem cells in several different stages of neural development. These neural stem cells then differentiate further into multiple types of cells, like neurons, astrocytes and other glial cells. They appear during embryonic development of the neural tube as well as in adult neurogenesis in specific areas of the central nervous system. They are also associated with several neurodegenerative diseases. These cells have often been called neuroblasts in an effort to delineate them as precursors to neurons and glial cells.

Duy et al. found convergence of congenital hydrocephalus risk genes in embryonic neuroepithelial stem cells. Of all CH risk genes, TRIM71/lin-41 harbors the most de novo mutations and is most specifically expressed in neuroepithelial cells. Mice harboring neuroepithelial cell-specific Trim71 deletion or CH-specific Trim71 mutation exhibit prenatal hydrocephalus. CH mutations disrupt TRIM71 binding to its RNA targets, causing premature neuroepithelial cell differentiation and reduced neurogenesis. Cortical hypoplasia leads to a hypercompliant cortex and secondary ventricular enlargement without primary defects in CSF circulation. These data highlight the importance of precisely regulated neuroepithelial cell fate for normal brain-CSF biomechanics and support a clinically relevant neuroprogenitor-based paradigm of CH [1)].

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Duy PQ, Weise SC, Marini C, Li XJ, Liang D, Dahl PJ, Ma S, Spajic A, Dong W, Juusola J, Kiziltug E, Kundishora AJ, Koundal S, Pedram MZ, Torres-Fernández LA, Händler K, De Domenico E, Becker M, Ulas T, Juranek SA, Cuevas E, Hao LT, Jux B, Sousa AMM, Liu F, Kim SK, Li M, Yang Y, Takeo Y, Duque A, Nelson-Williams C, Ha Y, Selvaganesan K, Robert SM, Singh AK, Allington G, Furey CG, Timberlake AT, Reeves BC, Smith H, Dunbar A, DeSpenza T Jr, Goto J, Marlier A, Moreno-De-Luca A, Yu X, Butler WE, Carter BS, Lake EMR, Constable RT, Rakic P, Lin H, Deniz E, Benveniste H, Malvankar NS, Estrada-Veras JI, Walsh CA, Alper SL, Schultze JL, Paeschke K, Doetzlhofer A, Wulczyn FG, Jin SC, Lifton RP, Sestan N, Kolanus W, Kahle KT. Impaired neurogenesis alters brain biomechanics in a neuroprogenitor-based genetic subtype of congenital hydrocephalus. Nat Neurosci. 2022 Apr 4. doi: 10.1038/s41593-022-01043-3. Epub ahead of print. PMID: 35379995.