

Neural stem cells (NSCs) in the ventricular-subventricular zone (V-SVZ) generate adult-born olfactory bulb (OB) interneurons. Recent observations indicate that NSCs uncouple self-renewing from differentiating divisions to maintain life-long OB neurogenesis. According to this model, NSCs detach from the

ventricle and relocate at the basal side of the V-SVZ to differentiate, thereby leading to NSC consumption. Using genetic and viral NSC tagging and apical membrane labelling, we here found on the contrary that basal neurogenesis originates from an additional novel NSC type resident in the basal V-SVZ and that aging decreases NSC activation, rather than promoting NSC consumption. Apical and basal NSCs differ in Nestin expression, primary cilia extension and frequency of cell division. However, both apical and basal NSCs similarly express GFAP, SOX9 and Lrig1 and they are capable of self-renewal and long-term quiescence. Within six weeks, apical NSCs generated few neuroblasts in the basal V-SVZ and in the OB, indicating that adult-born OB neurons essentially originate from basal NSCs. Supporting this, we found that pregnancy, a physiological modulator of OB neurogenesis, affects the number of basal but not apical NSCs. Lastly, apical NSCs displayed the highest levels of Notch activation in the neural lineage. Selective apical downregulation of the Notch-signalling effector Hes1 decreased Notch activation while increasing proliferation across the niche and neurogenesis from apical NSCs. Thus, OB neurogenesis is driven by basal NSCs, whereas notch signalling inhibits neurogenesis from apical NSCs.