Effect of Local TrkB Knockout on the Morphology of Adult-born Granule Cells and Periglomerular Cells in the Mouse Oflactory Bulb

Abstract

Brain-derived neutrophic factor (BDNF) is a neurotrophin known to promote neuronal survival, development and synaptic plasticity in various neural circuits. Along with the TrkB receptor, its effect on the stem cell niches of the adult mouse subventricular zone (SVZ) and rostral migratory stream (RMS) that continuously produce interneurons, specifically granule cells (GC) and periglomerular cells (PGC), for the adult olfactory bulb (OB) is disputed. Opposing evidence show both enhanced neurogenesis and no effect from increased BDNF; studies involving knockouts of TrkB or mutant BDNF similarly yield conflicting evidence of hampered neurogenesis or no effect. Part of the conflict arises from methodology, with many older studies constitutively affecting BDNF and TrkB throughout the brain rather than focused on the SVZ/OB system. The current study aims to narrow genetic modification to the SVZ/OB system by using a $TrkB^{10x/10x}$ mouse line injected with a Cre-IRES-GFP lentivirus locally knockout TrkB. No significant differences were found between KO and WT interneurons in PG and GC dendritic length, arborization, absolute spine number, cell body size and spine density or GC spine position over time and initial branching point depth. However, because of limited WT sample size, no conclusive interpretations can be drawn.