Editorial

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Investigating the role of miR-21 in adult neurogenesis

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MicroRNAs (miRNAs) are a class of small non-coding RNAs that act as post-transcriptional regulators and play important roles in neurodegenerative diseases and brain disorders. MiR-21, a miRNA that is dysregulated in cancers including glioblastomas, targets cellular processes including cell proliferation and apoptosis. MiR-21 has been shown to be upregulated following traumatic brain injury and spinal cord injury; this upregulation has been postulated to reduce lesion size, enhance cell survival and confer better neurological outcome. Due to its effects on cell proliferation and survival, miR-21 was speculated to play a role in adult neurogenesis in the mammalian brain. The effect of altering miR-21 levels on the cell fate of newborn neurons in the adult hippocampus was investigated using transgenic mice that globally either overexpress miR-21 (miR-21 OE) or lack miR-21 (miR-21 KO). First, increased neurogenesis in the Dentate Gyrus (DG) of miR-21 OE mice was detected, while miR-21 KO mice showed reduced neurogenesis in the same area. Transgenic mice lacking miR-21 (miR-21 KO) demonstrated impairment in learning and memory in the Morris Water Maze task. Mir-21 KO mice also showed reduced neurogenesis in the subventricular zone. To further understand the pathways that are involved in miR-21 regulation in the adult brain, miR-21 targets were investigated experimentally and using bioinformatics prediction tools. These results suggest that miR-21 plays an important role in regulating adult neurogenesis and learning behavior. Overall, this is the first study to investigate miR-21 altered expression role in the adult normal brain. Linking miR-21 role in this study to increased miR-21 levels in the brain and spinal cord after injury will help to identify possible therapeutic strategies for treating traumatic injuries and neurodegenerative diseases.