

Investigating the role of miR-21 in adult neurogenesis

Hadil Mohammad Alahdal^{1,2}, Maeve Caldwell³, James Uney¹ and Liang-Fong Wong¹

¹Bristol University, Saudi Arabia

²Princess Nora University, Saudi Arabia

³Trinity College Dublin, Saudi Arabia

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.

Biography

Hadil Mohammad Alahdal has completed PhD from Bristol University (2018), School of Medical Studies. She is currently working as an Assistant Professor in the Biological Department at Princess Nora University.

hmalahdal@pnu.edu.sa