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miR-20a regulates genes involved in oligodendrocyte lineage and splicing

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microRNAs (miRNA) are small non-coding RNA molecules that regulate gene expression posttranscriptionally. miRNAs have emerged as a critical regulatory pathway in the mammalian central nervous system (CNS). By profiling the expression patterns of miRNAs in both oligodendroglial cell line and oligodendrocytes purified by FACS from the CNP-EGFP transgenic mice, we have identified 145 miRNAs expressed in oligodendrocytes. We showed that miR-20a interacts specifically with the 3'UTR of the proteolipid protein (PLP1), a major CNS myelin protein, and suppresses PLP1 expression in oligodendrocytes (Journal of Neuroscience Research, 2012, in press). In the current study, we sought to investigate the regulatory roles of miR-20a in the expression of genes that are important for either oligodendrocytic cell biology or RNA metabolism. Exogenous miR-20a precursor mimics and anti-sense inhibitors were introduced into oligodendrocytes to up- and down-regulate the endogenous miR-20a production, respectively. Real-time qRT-PCR analysis was performed to monitor the changes in mRNA expression level of 12 RNA processing factors and 14 genes that are involved in transcriptional regulation or signal transduction pathways in oligodendrocytes. We show that miR-20a controls the expression of splicing regulators hnRNP H, hnRNP I, hnRNP A2B1, Tra2a, Sfrs7 and Sfrs11, transcription factors Pou6f1, Stat2 and Sox6, and protein kinases Cdk2 and Cdk5rap2. In addition, the expression of Hdac 3 and IGF-I is regulated by miR-20a. Taken together, we demonstrate for the first time that miR-20a broadly regulates genes that are involved in oligodendrocyte differentiation, splicing and PLP alternative splicing.

Biography

Dr. Erming Wang currently is an Assistant Professor, Research Title Series, in the Department of Neurology at the University of Kentucky, USA. Dr. Wang received his Ph.D. degree in Genetics from Chinese Academy of Sciences. Dr. Wang has started his research on RNA interference and RNA biology since 1998. His present research is aimed at elucidating the regulatory roles of microRNAs in controlling the proteolipid protein (PLP1) gene expression in cells in oligodendrocyte lineage in the developing brain, and finding molecular targets for future development of RNA-based therapeutics to correct the abnormal PLP1 expression in patients with PLP1-related disorders.

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