

RNA-Seq characterization of spinal cord injury transcriptome: A resource for understanding the pathology at the systems level

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Abstract

Spinal cord injury (SCI) is a major medical problem. About 300,000 people are suffering from SCI in the US and nearly 11,000 new cases are reported annually. Currently it is not yet possible to repair the central nervous system and fully restore function. Although it is known that SCI triggers primary and secondary injury signaling cascades characterized by early and prolonged inflammatory responses and cell death, the understanding of the molecular mechanisms is still limited. Therefore, the analyses of transcriptome changes during SCI could provide key insights into the mechanisms and pathways involved in SCI pathology, which will be extremely useful for improving the efficiency of stem cell therapies and pharmacological screening.

We applied RNA-seq technology to characterize the temporal and spatial changes of global gene expression during SCI in mouse models. Tissue samples from acute phase (2 days and 7 days after injury) and chronic phase (1 month and 3 months) were sequenced to reflect the temporal change. Samples from rostral site, caudal site and injury site were sequenced to reflect the spatial property of SCI. We have sequenced 23 RNA-seq libraries and generated ~350 GB of data. We then developed a system for Next Generation Sequencing Data analysis by integrating open source algorithms into a high-throughput pipeline. By applying this analysis pipeline to the SCI data, we have systematically characterized the transcriptome during SCI with the goal of identifying pathways and key regulatory genes critical in SCI and constructing regulatory networks. We also characterized injury stage-specific gene and splice isoform expression. Our study provides a comprehensive reference data set that will guide further testing of therapy targets.

Biography

Dr. Wu completed her doctorate from Baylor College of Medicine and postdoctoral work at Yale and Stanford University. Dr. Wu's work has been recognized with prestige honors and awards, including NIH Pathway to Independence Award (K99/R00), the Senator Lloyd & B.A. Bentsen Center for Stroke Research award and the ISSCR Travel Award etc. Dr. Wu has presented talks and lectures at many international conferences, the Multiple Sclerosis Research Center of New York, Lawrence Livermore National Laboratory, and the University of Florida etc. She has developed a patent, authored a book, and published more than 20 articles in reputed journals.