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Neurotrophic factor reduces inflammation and improve brain neuronal regeneration in inflammatory brain injury

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The risk of serious sequelae caused by central nerve system (CNS) infection is 30-60%. Among them, inflammation is one of the critical mechanisms. But how inflammation alters brain function remains unclear. Here, we provide solid evidence about meningitis caused by brain damage reduced host inflammatory response. Neurotrophic factor family plays an important role in neuron development, differentiation and survival. BDNF expression increased in acute S. pneumoniae meningitis, while obviously alleviated after antibiotic treatment. Neonatal meningitis caused long-term BDNF decreases were correlated to adult animal behavioral deficits. Exogenous BDNF can increase neuron survival both in cortex and hippocampus, and reversed brain damage. Meanwhile, it can increase hippocampus neuron stem cells neurogenesis. These findings indicate that BDNF regulatory expression may be parts of host inflammatory response in S. pneumoniae meningitis, and innate immune response could be a double-edged blade. Although the mechanism is still unknown. According to *in vivo* pneumococcal meningitis experimental models, we investigated BDNF-related signaling effects inflammatory response and hippocampal apoptosis. Before S. pneumoniae intracisternal infection, pretreatment with exogenous BDNF or TrkB inhibitor k252a and assess BDNF/TrkB-signaling axis activation or inhibition. Administered BDNF in rats reduced clinical impairment, pathological severity, and hippocampal apoptosis. Furthermore, BDNF pretreatment suppressed inflammatory factors (TNFα, IL-1β and IL-6) expression while increased anti-inflammatory factor IL-10. It also increased TrkB expression, activated downstream PI3K/protein kinase B (AKT) signaling, and inhibited MyD88/NF-κB-signaling pathway. These results indicated that exogenous BDNF treatment might be a potential therapeutic strategy for inflammatory brain injury. Here is a two-year-old boy with acute necrotizing encephalopathy by infection. After timely treatments with high-dose methylprednisolone and, immunoglobulin therapy, multiple vitamins and nerve growth factor; he had relatively good prognosis and could see neuroregeneration in follow-up brain MRI (Fig 1).

Recent Publications

1. Ling Li, Quanxiang Shui and Zhengyan Zhao (2003) Regulation of brain derived neurotrophic factor expression following antibiotics treatment of experimental bacterial meningitis. J Child of Neurology 18(12):828-34.
2. Ling Li, Quanxiang Shui and Kun Liang Hui Ren (2007) Brain derived neurotrophic factor rescues neurons from bacterial meningitis. Pediatric Neurology 36:324-329.
3. Lian D, He D, Wu J, Liu Y, Zhu M, Sun J, Chen F and Li L (2016) Exogenous BDNF increases neurogenesis in the hippocampus in experimental Streptococcus pneumoniae meningitis. J Neuroimmunol. 15(294):46-55.
4. Xu D, Lian D, Wu J, Liu Y, Zhu M, Sun J, He D and Li L (2017) Brain-derived neurotrophic factor reduces inflammation and hippocampal apoptosis in experimental Streptococcus pneumoniae meningitis. J Neuroinflammation 14(1):156.
5. Xu D, Lian D, Zhang Z, Liu Y, Sun J, Li L (2017) Brain-derived neurotrophic factor is regulated via MyD88/NF-κB signaling in experimental Streptococcus pneumoniae meningitis. Sci Rep 7(1):3545.

Biography

Ling Li has completed her PhD and MD in 2003 at Zhejiang University School of Medicine. She is a Neurologist, Chief Physician, Professor, Supervisor for Doctor, Director of Pediatric Neurology at Xinhua Hospital Affiliated to Shanghai Jiao tong University School of Medicine, Shanghai, China. She has published more than16 papers in reputed journals. Her main research is about strategies to prevent neuronal damage in pediatric bacterial meningitis.

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