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Intravenous infusion of the exosomes derived from human umbilical cord mesenchymal stem cells enhance neurological recovery after traumatic brain injury via suppressing the NF-κB pathway

Zhen-Wen Zhang [1 2 3], Pan Wei [4], Gui-Jun Zhang [5], Jing-Xing Yan [1 3], Sai Zhang [2], Jin Liang [2], Xiao-Li Wang [2]

Affiliations + expand

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Abstract

Traumatic brain injury (TBI) is a predominant cause of death and permanent disability globally. In recent years, much emphasis has been laid on treatments for TBI. Increasing evidence suggests that human umbilical cord mesenchymal stem cells (HUCMSCs) can improve neurological repair after TBI. However, the clinical use of HUCMSCs transplantation in TBI has been limited by immunological rejection, ethical issues, and the risk of tumorigenicity. Many studies have shown that HUCMSCs-derived exosomes may be an alternative approach for HUCMSCs transplantation. We hypothesized that exosomes derived from HUCMSCs could inhibit apoptosis after TBI, reduce neuroinflammation, and promote neurogenesis. A rat model of TBI was established to investigate the efficiency of neurological recovery with exosome therapy. We found that exosomes derived from HUCMSCs significantly ameliorated sensorimotor function and spatial learning in rats after TBI. Moreover, HUCMSCs-derived exosomes significantly reduced proinflammatory cytokine expression by suppressing the NF-κB signaling pathway. Furthermore, we found that HUCMSC-derived exosomes inhibited neuronal apoptosis, reduced inflammation, and promoted neuron regeneration in the injured cortex of rats after TBI. These results indicate that HUCMSCs-derived exosomes may be a promising therapeutic strategy for TBI.

Keywords: NF-κB; exosomes; human umbilical cord mesenchymal stem cells; neurological recovery; traumatic brain injury.

Conflict of interest statement

Conflict of interest: Authors state no conflict of interest.

Figures

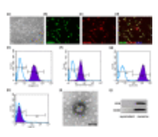

Figure 1 Identification of HUCMSCs and the...

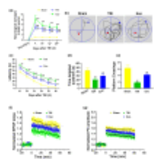

Figure 2 Administration of the HUCMSCs-derived exosomes...

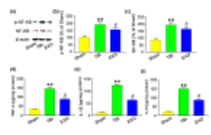

Figure 3 Administration of the HUCMSCs-derived exosomes...

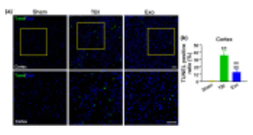

Figure 4 Administration of the HUCMSCs-derived exosomes...

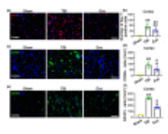

Figure 5 Administration of the HUCMSCs-derived exosomes...

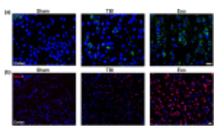

Figure 6 Administration of the HUCMSCs-derived exosomes...

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