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Functional recovery of stroke rats induced mesenchymal stem cells derived microvesicle

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Objectives
to investigate the ability of normal and stroke rat brain extract-treated mesenchymal stem cell (MSC) derivedmicrovesicles (NMB-MVs and SBE-MVs) to attenuate ischemic brain injury induced by permanent middle cerebral artery occlusion (pMCAo) in rats

Method
We extracted the MSC at normal or stroke rat brain. To remove the MSC derived MV, we conducted the centrifugation at 100000g for 1 hour at 4℃ and filtering. We found that the cytokine profiles of normal and stroke brain extracts were similar; the extracts contained a number of neurogenic and neurotrophic factors and cytokines that can significantly influence the quality and quantity of MSC-derived MVs. To examine the therapeutic benefits of MVs of brain extract-treated MSCs in an ischemic stroke model, intracarotid MV injections (0.2 mg/kg) were administered to Sprague-Dawley rats 2 days after pMCAo.

Result
Our Results demonstrated that NBE-MSC-MVs and to a lesser extent SBE-MSC-MVs ameliorated ischemic brain injury with improved functional recovery. Immunohistochemical analyses showed that NBE-MSC-MVs reduced inflammation, enhanced angiogenesis with increased endogenous neurogenesis in rat brain. To obtain mechanistic insights into the therapeutic effect of these MVs, we performed an integrative mass spectrometry-based proteomics analysis and found that the NBE-MSC-MV proteome is highly enriched for vesicular proteins. Finally, using a systems biology approach, we reconstructed a network of NBE-MSC-MV therapeutic factors linked to anti-inflammation, angiogenesis, neurogenesis, and apoptosis; this network may represent a proteome system stimulated by brain extract.

Conclusion
The treatment of ischemic rats with NBE-MSC-MVs promotes the functional recovery of damaged stroke brain via modulation of anti-inflammation, angiogenesis and neurogenesis.