

# **Does vitamin C has the ability to augment the therapeutic effect of bone marrow-derived mesenchymal stem cells on spinal cord injury?**

## **Abstract**

Methylprednisolone (MP) is currently the only drug confirmed to exhibit a neuroprotective effect on acute spinal cord injury (SCI). Vitamin C (VC) is a natural water-soluble antioxidant that exerts neuroprotective effects through eliminating free radical damage to nerve cells. Bone marrow mesenchymal stem cells (BMMSCs), as multipotent stem cells, are promising candidates in SCI repair. To evaluate the therapeutic effects of MP, VC and BMMSCs on traumatic SCI, 80 adult male rats were randomly divided into seven groups: control, SCI (SCI induction by weight-drop method), MP (SCI induction, followed by administration of 30 mg/kg MP *via* the tail vein, once every other 6 hours, for five times), VC (SCI induction, followed by intraperitoneal administration of 100 mg/kg VC once a day, for 28 days), MP + VC (SCI induction, followed by administration of MP and VC as the former), BMMSCs (SCI induction, followed by injection of  $3 \times 10^6$  BMMSCs at the injury site), and BMMSCs + VC (SCI induction, followed by BMMSCs injection and VC administration as the former). Locomotor recovery was assessed using the Basso Mouse Scale. Injured spinal cord tissue was evaluated using hematoxylin-eosin staining and immunohistochemical staining. Expression of transforming growth factor-beta, tumor necrosis factor-alpha, and matrix metalloproteinase-2 genes was determined using real-time quantitative PCR. BMMSCs intervention better promoted recovery of nerve function of rats with SCI, mitigated nerve cell damage, and decreased expression of transforming growth factor-beta, tumor necrosis factor-alpha, and matrix metalloproteinase-2 genes than MP and/or VC. More importantly, BMMSCs in combination with VC induced more obvious improvements. These results suggest that VC can enhance the neuroprotective effects of BMMSCs against SCI.