Biphasic electrical stimulation: A strategy may bring hope to spinal cord injury patients

August 24 2013

Researchers at the Beihang University School of Biological Science and Medical Engineering, led by Dr. Yubo Fan, have discovered that Biphasic Electrical stimulation (BES), a non-chemical procedure, may be used as a strategy for preventing cell apoptosis in stem cell-based transplantation therapy. The article describing their studies will be published in the August 2013 issue of *Experimental Biology and Medicine*. The scientists believe that their technique will be used for spinal cord injury patients in the future.

Spinal cord injury (SCI) is a serious disease of the central nervous system. According to Spinal Cord Injury Facts & Statistics, 250,000 Americans are spinal cord injured patients. Approximately 52% of spinal cord injured individuals are considered as paraplegic, and 47% patients are quadriplegic. In addition, 11,000 new injuries occur each year, and 82% are male.

Transplantation of Stem Cells is a potential clinical therapy for repair and regeneration of injured spinal cord, and brings new hope for patients. However, the survival rate of transplanted cells is relatively low because the cells are particularly vulnerable to apoptosis in the spinal cord. Factors proposed for causing such low survival include immune reactions, limited trophic factors and hypoxia. It appears that a lack of adequate growth factors plays an important role in the survival of transplanted cells. "We've shown for the very first time that BES may provide insight into preventing growth factor deprivation-triggered apoptosis in olfactory bulb neural precursor cells (OB NPCs)," said

Yubo Fan, professor of Biological Science and Medical Engineering at Beihang and senior author. "These findings suggest that BES may thus be used as a strategy to improve cell survival and prevent cell apoptosis in stem cell-based transplantation therapies," Fan explained. The results may guide future efforts to restore functions lost after spinal cord injury.

The team of researchers investigated the protective effects of BES on growth factor-deprived apoptosis in OB NPCs. The NPCs were exposed to 12 h of BES. The results were that BES enhanced cell survival and prevented the apoptosis of NPCs caused by growth factor deprivation. The anti-apoptotic effect of BES was dependent on the activation of the PI3K/Akt signaling cascade and an increase in brain-derived neurotrophic factor (BDNF) production. "What was especially surprising and exciting was that a non-chemical procedure can prevent apoptosis in stem cells therapy for spinal cord injury patients," Fan said. "How BES precisely regulates the survival of exogenous stem cells is still unknown, but will be an extremely novel area of research on spinal cord injury in the future," Dr. Fan added.

Dr. Steven R. Goodman, Editor-in-Chief of *Experimental Biology and Medicine*, said "The fact that Biphasic Electrical Stimulation can improve the survival of neural precursor cells is truly exciting and will provide the basis for future studies that could lead to novel therapies for patients with spinal cord injury. I look forward to future advances in this field".

Provided by Society for Experimental Biology and Medicine

Citation: Biphasic electrical stimulation: A strategy may bring hope to spinal cord injury patients (2013, August 24) retrieved 19 April 2024 from https://medicalxpress.com/news/2013-08-biphasic-electrical-strategy-spinal-cord.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.