

## Induction of Neuron and Glia Cells from Human Umbilical Cord Mesenchymal Cells in Ovariectomized Female Brain

Ju Ran Kim<sup>1</sup>, Seong Jin Yu<sup>1</sup>, Hee Gyoung Kang<sup>1</sup>, Byung Rok Do<sup>2</sup>,  
Seong Ho Koh<sup>3</sup>, Kyung Suk Kim<sup>3</sup>, Seung Hyun Kim<sup>3</sup>, Seah Park<sup>4</sup>,  
Hae Kwan Kim<sup>4</sup> and Sung Goo Kang<sup>1</sup>

<sup>1</sup>*School of biotechnology & Biomedical Science, Inje university, Kimhae  
621-749. Korea*

<sup>2</sup>*Bioengineering Institute, CoreStem Inc., Seoul, Korea*

<sup>3</sup>*Department of Neurology, Institute of Mental Health, College of Medicine,  
Hanyang University, Seoul, Korea*

<sup>4</sup>*Department of Biotechnology, Seoul Women's University, Seoul,  
139-774, Korea*

Mesenchymal stem cells can be expanded rapidly *in vitro* and differentiated into multiple mesodermal cell types. During their trans-differentiation into neuron-like cells, expression markers typical for mature neurons have been reported. In this study, we tested whether intravenously infused human umbilical cord mesenchymal stem cells (HUCMSC) enter brain, survive, differentiate, and improve neurological functional recovery after stroke in rats. Adult SD ovariectomized rats were subjected to transient (1-hour) middle cerebral artery occlusion (MCAO). Experimental groups were as follows: group 1, MCAO alone; group 2,  $3 \times 10^6$  PKH26 labeled HUCMSC injected into tail vein at 24 hours after MCAO. Rats were killed at 35 days after MCAO. Behavioral test(mNSS) were performed. Immunohistochemical staining was used to identify cells derived from HUCMSC. Treatment at 24 hours after MCAO with HUCMSC significantly improved functional recovery, as evidenced by the mNSS. Some HUCMSC were reactive for the astrocyte marker glial fibrillary acidic protein (GFAP), the neuronal marker  $\beta$ -tubulin III and oligodendrocyte marker Gal-C. These result suggest that intravenously administered HUCMSC enter brain,

survive, migrate, and improve functional recovery after stroke. HUCMSC transplantation may provide a cell source to treat ischemia.

Key words) *behavior test, cerebral ischemia, human umbilical cord mesenchymal stem cell, neuronal trans-differentiation, transplataion*