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# Brain Conference 2015

Joint Conference of

**KSBNS**(The Korean Society for Brain and Neural Science)

and **KSND**(The Korean Society for Neurodegenerative Disease)

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fraction volume were measured using T2-weighted image data. For DTI image data analysis, three regions of interests (ROIs) including corpus callosum, internal capsule, and striatum were defined. The neural fiber tractography and DTI indices were measured from these three ROIs. All Image post-processing was performed by using homemade MATLAB (Math Works Inc, Natick, MA, USA) code and DSI studio (<http://dsi-studio.labsolver.org>).

**Results:** In anatomical T2-weighted image analysis, relative ventricular volume show lower increasing rate in the ischemic serum preconditioned MSCs injected group than FBS-cultured MSCs injected group and PBS-only injected group. The relative infarction volume show higher decreasing rate in the ischemic serum preconditioned MSCs injected group than FBS-cultured MSCs and PBS group. In DTI indices results, FA shows higher value in the ischemic serum preconditioned MSCs injected group than FBS and PBS group. Also, tractography results show high number of fiber tracts in the ischemic serum preconditioned group at both 2 and 5 weeks later after ischemic stroke.

**Conclusion:** Ischemic serum preconditioned MSCs can improve brain recovery after stroke. Using MRI technique, we can assess the recovery of the brain microstructure in various neurological disorders.

**Key Words:** Magnetic Resonance Imaging, Diffusion Tensor Imaging, Ischemic Stroke, Mesenchymal Stem Cell, Regeneration Therapy

## PJ-01

### EFFECT OF NETWORK ARCHITECTURE ON BURST AND SPIKE SYNCHRONIZATION IN A SCALE-FREE NETWORK OF BURSTING NEURONS

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We investigate the effect of network architecture on burst and spike synchronization in a directed scale-free network (SFN) of bursting neurons, evolved via two independent  $\alpha$ - and  $\beta$ -processes. We first consider the  $\alpha$ -process (i.e., growth and preferential directed attachment) of symmetric preferential attachment with the same in- and out-degrees, and study emergence of burst and spike synchronization by varying the coupling intensity  $J$  and the noise intensity  $D$  for a fixed attachment degree. We employ realistic order parameters and statistical-mechanical measures, based on the instantaneous population burst and spike rates. Then, the thresholds for the bursting and the spiking transitions are determined in terms of the realistic bursting and spiking order parameters, respectively. Moreover, the degrees of the burst and the spike synchronization are also measured in terms of the realistic statistical-mechanical bursting and spiking measures, respectively. Next, we choose appropriate values of  $J$  and  $D$  where only the burst synchronization occurs in the case of symmetric attachment, and study the effect of the scale-free connectivity on the burst synchronization by varying (1) the degree of symmetric attachment, (2) the asymmetry parameter of asymmetric preferential attachment of new nodes with different in- and out-degrees, (3) the probability for the  $\beta$ -process, intensifying the internal connections between pre-existing nodes without addition of new nodes. In all these three cases (1)-(3), changes in the degree and the type of synchronization are discussed in connection with the network topology such as the average path length and the betweenness centralization.

**Key Words:** Directed scale-free networks, Burst and spike synchronizations, Suprathreshold bursting neurons