

## Proceedings of German Society for Stem Cell Research (PGSSCR)

### **Neuronal hypoxia: protective effects of mononuclear cord blood cells after direct and indirect application**

Reich DM<sup>1</sup>, Hau S<sup>1</sup>, Scholz M<sup>3</sup>, Emmrich F<sup>1, 2</sup>, Kamprad M<sup>2</sup>, Boltze J<sup>1</sup>

<sup>1</sup>Fraunhofer-Institute of Cell Therapy and Immunology

<sup>2</sup>Institute of Clinical Immunology and Transfusion Medicine, University of Leipzig

<sup>3</sup>Institute of Medical Informatics, Statistics and Epidemiology (IMISE), University of Leipzig

Published on 16 May 2007

Pathophysiological models developed from animal studies form the basis of our understanding of the development of stroke. *In vivo* data display a perfusion-related dependency of neuronal cell damage. Nearly total loss of cerebral blood perfusion leads to necrotic cell death in the ischemic core. Residual energy supply in the surrounding penumbra induces apoptosis whose early phases are reversible. Consequently, rescue of the penumbra is the basis of stroke therapy. *In vivo* administration of external cell fractions recently demonstrated clear therapeutic benefits. However, the complexity of *in vivo* models has hindered understanding of the mechanisms involved in functional recovery so far.

Based on fully matured neuroblastoma cells (SH-SY5Y) we established a unique *in vitro* model of neuronal hypoxia that affords the possibility of investigating apoptotic neuronal cell death and neuroprotective cell therapies.

We employed the post hypoxic cell cultures for direct co-culturing with various fractions of stem cell containing mononuclear cells

(MNC) from human umbilical cord blood (HUCB). Over the course of 3 days, all applied MNC-fractions provided significant protection from neuronal apoptosis and also triggered the retaining of neuronal characteristics such as forming networks.

Clear neuroprotection was also detectable when MNC were affixed in impermeable cell-culture-inserts. In direct as well as in indirect co-cultures MNC induced an alteration in cytokine and chemokine concentrations. Our data suggest that the neuroprotective effects of MNC might result from direct cell-cell contacts and/or the adjustment of specific soluble mediators.