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Therapeutic effects of mesenchymal stem cells for blast traumatic brain injury: Lessons from the *in vitro* model

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Blast traumatic brain injury (bTBI) has high incidence among military personnel. Unfortunately, available therapies cannot stop or reverse the blast-evoked neurodegenerative cascade. However, an increasing body of evidence indicates that bone marrow-derived mesenchymal stem cells (BMSC) have therapeutic effects for non-bTBI, although they have not been tested following bTBI. Our group developed an in vitro bTBI model to study mechanisms of blast-evoked neurodegeneration and determine therapeutic potential of BMSC for bTBI. Organotypic hippocampal cultures (OHCs) were exposed to a blast overpressures of 150 or 270 kPa using a helium-driven open-ended shock tube. OHCs were exposed off-axis from the shock tube to isolate effects of shockwave overpressure. Blast-evoked cell damage was analyzed by propidium iodide (PI) uptake at different time points following exposure. Both overpressures induced OHCs damage, with higher overpressures causing significantly more cell death. Half of the OHCs were transferred to wells with BMSC at 2 hrs following exposure to 150 kPa and following confirmation of similar damage levels in all OHCs. OHCs and BMSC co-cultures were grown for 7 days. The BMSC-treated group exhibited a decrease in cell death (i.e., decreased PI uptake) compared to the untreated group at 24 hrs post-injury. By 72 hrs, BMSC-treated OHCs were statistically indistinguishable from the sham-injury group, highlighting BMSC rapid protective effects. Since OHCs and BMSC were grown without direct cell-cell contact, these experiments demonstrate that BMSC protective effects were achieved through paracrine factors released in the culture medium. BMSC therapeutic potential for bTBI and underlying mechanisms will be further explored.

Biography

Aleksandra Glavaski-Joksimovic is an Assistant Professor at the Department of Neurosurgery, Medical College of Wisconsin. She received her PhD degree in Neuroscience and Veterinary Anatomy at the Iowa State University. Following graduation, she conducted a Postdoctoral training at the Iowa State University, Karolinska Institute, and Northwestern University. From 2009 to 2011, she worked as a Research Assistant Professor at the Department of Pediatrics, Feinberg School of Medicine, Northwestern University. In May 2011, she joined the Medical College of Wisconsin. Her studies are focused on the therapeutic potential of adult stem cells in a brain injury and disease.

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