Future heat stroke treatment found in dental pulp stem cells

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Scientists in Taiwan have found that intravenous injections of stem cells derived from human exfoliated deciduous tooth pulp (SHED) have a protective effect against brain damage from heat stroke in mice. Their finding was safe and effective and so may be a candidate for successfully treating human patients by preventing the neurological damage caused by heat stroke.

The study is published in a future issue of *Cell Transplantation* and is currently freely available on-line as an unedited early e-pub.

"Heat stroke deaths are increasing worldwide and heat stroke-induced brain injury is the third largest cause of mortality after cardiovascular disease and traumatic brain injury," said study lead author Dr. Ying-Chu Lin of the Kaohsiung Medical University School of Dentistry, Kaohsiung City, Taiwan. "Heat stroke is characterized by hyperthermia, systemic inflammatory response, multiple organ failure and brain dysfunction."

To investigate the beneficial and potentially therapeutic effects afforded by the protective activities of self-renewing stem cells derived from human exfoliated deciduous teeth, the scientists transplanted SHED into mice that had suffered experimental heat stroke.

According to the research team, these cells have "significantly higher proliferation rates" than stem cells from bone marrow and have the added advantages of being easy to harvest and express several growth

factors, including vascular endothelial growth factor (VEGF), and they can promote the migration and differentiation of neuronal progenitor cells (NPCs).

"We observed that the intravenous administration of SHED immediately post-heat stroke exhibited several therapeutic benefits," said Dr. Lin. "These included the inhibition of neurological deficits and a reduction in oxidative damage to the brain. We suspect that the protective effect of SHED may be related to a decreased inflammatory response, decreased oxidative stress and an increase in hypothalamo-pituitary-adrenocortical axis activity following the heat stroke injury."

There are currently some drawbacks to the experimental therapy, said the researchers. First, there is a limited supply of SHED. Also, SHED transplantation has been associated with cancer and immune rejection.

"Further studies are warranted to determine the precise mechanism or production of SHED-mediated growth factors in our heat stroke model," concluded the researchers.

"This study provides the first step towards a potential therapy for the treatment of heat stroke" said Dr. Shinn-Zong Lin, professor of Neurosurgery and superintendent at the China Medical University Hospital, Beigang, Taiwan and Coeditor-in-chief of *Cell Transplantation*. "The use of SHED is an intriguing approach which requires further study to elucidate the cellular and secretory factors necessary for benefit."

More information: Tseng, L-S.; Chen, S-H.; Lin, M-T.; Lin, Y-C. Transplantation of human dental pulp-derived stem cells protects against heat stroke in mice. Cell Transplant. Appeared or available online: March 7, 2014. www.ingentaconnect.com/content … /content-CT1100Tseng

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