Human umbilical cord blood cells found to enhance survival and maturation of key brain cells

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Laboratory culture (in vitro) studies examining the activity of human umbilical cord blood cells (HUCB) on experimental models of central nervous system aging, injury and disease, have shown that HUCBs provide a 'trophic effect' (nutritional effect) that enhances survival and maturation of hippocampal neurons harvested from both young and old laboratory animals.

"As we age, cognitive function tends to decline," said Alison E. Willing, PhD, a professor in the University of South Florida's (USF) Department of Neurosurgery and Brain repair and lead author for a study published in the current issue of Aging and Disease. "Changes in cognitive function are accompanied by changes in the hippocampus, an area of the brain where long term memory, as well as other functions, are located, an area of the brain among those first to suffer the effects of diseases such as Alzheimer's disease."

According to Dr. Willing and her USF co-authors, these changes contribute to stroke and dementia in the aging population when neural cells become more susceptible to stressors and disease processes. Because HUCB cells have received attention as an alternative source of stem cells that have been studied and shown to be effective with wide therapeutic potentials, how the cells might be used to repair the diseased, as well as normally aging brain, has become an important question.

"It is important to understand how these cells may be manipulated to support hippocampal function in order to develop new therapies," she explained. "Accordingly, this study sought to examine the potential for HUCBs to enhance proliferation and increase survival of hippocampal cells derived from aging adult rat brains."

The study found that HUCBs were not only able to protect hippocampal neurons taken from the brains of young adult and aged rats, but also promoted the growth of dendrites - the branching neurons acting as signaling nerve communication channels - as well as induced the proliferation hippocampal neurons.

"These protective effects may be a function of growth factors and cytokines (a small signaling protein linked to the inflammatory response) produced by the HUCB cells," observed Dr. Willing.

The researchers also reported that the difference between HUCB-treated cultures and non-treated cultures was "more dramatic in the older adult rat brain cultures" than in those younger rats. Further, they speculated that synapses - the communication links between neuronal cells -may have been forming in the cultures.

They concluded that HUCB cells benefit aging adult hippocampal neurons by 'increasing their survival, growth, differentiation, maturation and arborization' (branching).

"The mechanisms by which HUCB cells extend the life of hippocampal cells may include enhancing the proliferative capacity of the cells or protecting existing and newly generated neurons from damage and death," concluded Dr. Willing.

According to Dr. John Sladek, professor of neurology at the University of Colorado School of Medicine, this study is important for its potential

contribution to regenerative medicine's future ability to benefit from an important source for stem cells, the umbilical cord.

"The fact that HUCBs enhanced the survival of - and maturation of - hippocampal neurons has profound implications for the treating brain injury and degenerative diseases such as Alzheimer's disease, ALS and Parkinson's disease," said Dr. Sladek.

Provided by University of South Florida