



Neurological Disorders: A Focus on Cord Blood Stem Cells as a Potential Treatment Option

Today there are more than 600 known disorders and conditions that affect the nervous system and for many of them treatment options are extremely limited. In addition to the physical and mental toll these conditions take on patients, their families and caregivers, they also have an enormous economic impact, resulting in hundreds of billions of dollars annually in medical expenses and lost productivity.¹

Scientists are pursuing research to gain a better understanding of the human nervous system in order to find new breakthroughs. Stem cell therapy is one therapeutic option that is showing great promise. Due to the complexities involved in harvesting human neural cells, easily-accessible, alternative stem cells—like those found in umbilical cord blood—are being researched as potential sources for cellular therapies to treat neurological diseases.

A Closer Look at Cerebral Palsy

Cerebral palsy is a broad term that refers to a group of neurological disorders caused by an injury to the brain that affect body movement and muscle coordination.² An estimated two million children and adults have cerebral palsy in the United States, and an additional 10,000 babies and infants are diagnosed with the condition annually.³

There is currently no cure for cerebral palsy and no standard therapy that works for all patients. Since many of the brain damage-related incidents that cause cerebral palsy occur during pregnancy, prevention is often difficult—leading many researchers to believe regenerative stem cell therapies may offer a treatment option to regen-

erate nerve tissue and repair damage to the brain.

Moving into the Clinic: Cord Blood as Experimental Treatment

In vitro studies have shown cord blood stem cells are able to differentiate into neural cell types.⁴⁻⁶ In animal models, research has demonstrated convincing evidence that cord blood stem cells injected intravenously migrate to the brain (passing the blood-brain barrier) and improve neurological function and promote healing.⁷⁻⁹ The results from such studies lead many researchers to suggest that infusion of cord blood stem cells could alleviate damage to the brain tissue, reduce muscle tightness, and improve gait and mobility-related symptoms in humans.⁷⁻⁹

This research also lends support for the pioneering clinical work at Duke University, focused on evaluating the impact of autologous cord blood infusions in children diagnosed with cerebral palsy. Dr. Joanne Kurtzberg, a professor of pediatrics and pathology and director of Duke's Pediatric Blood and Marrow Transplant Program, is infusing the child's cord blood stem cells back into the body in an effort to facilitate repair of brain tissue damaged by perinatal hypoxic (oxygen-deprived) events. To date, more than 20 children have participated in the experimental treatment.

Beyond Cerebral Palsy: Cord Blood and Other Neurological Disorders

The promising advances being made in cerebral palsy may soon benefit patients with other neurological diseases as well.

In animal models of spinal cord injury, cord blood stem cells have been shown to reduce the size of injury, promote neural tissue growth and improve motor function, leading researchers to believe that cord blood stem cells may prove to be a useful therapeutic strategy to repair injured spinal cords.¹⁰⁻¹³ In fact, a case study published in 2005 showed that a 37-year-old spinal cord injury patient who received a transplant of cord blood stem cells directly into the injured site showed improved sensory perception and movement in the hips and thighs within 41 days of treatment. CT and MRI results also showed regeneration of the spinal cord at the injured site.¹⁴

Cord blood stem cells have demonstrated the ability to differentiate into nearly any cell type and tissue in the body, a capability called pluripotency—an important characteristic previously thought to be limited to only embryonic stem cells (ESCs). Unlike ESCs, cord blood stem cells are easily and painlessly acquired from a child's umbilical cord immediately following birth. Cord blood is rapidly becoming the preferred stem cell source for medical use and research because cord blood stem cells are able to 1) differentiate in a safe and controlled manner; 2) they have been used in clinical practice for more than 20 years; and 3) they are immunologically younger and appear to be more versatile when compared to bone marrow stem cells.

Regenerative Medicine: A New Frontier
Regenerative medicine, using stem cells to repair or replace damaged tissue, is an area of study in which cord blood stem cells hold great promise. Current estimates indicate that approximately 1 in 3 Americans could benefit from regenerative medicine.¹⁵ Other recently published data indicate that as many as 1 in 217 people will undergo a traditional stem cell transplant in their

lifetime. When accounting for future stem cell applications, like emerging regenerative medicine therapies, the researchers estimated the odds of needing a stem cell transplant will be 1 in 102 persons.¹⁶

For use in regenerative therapies, current scientific use suggests that access to autologous (one's own) stem cells offers better treatment options for pa-

tients. Because younger patient populations are more likely to have access to their own cord blood, this therapeutic advancement may hold the greatest hope among children. Cord blood will continue to be evaluated for cerebral palsy and other neurological disorders in the future as more individuals have access to their preserved, autologous cord blood.

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