

The Therapeutic Potential of Umbilical Cord Blood in Type 1 Diabetes

In the last few decades, the scientific community has recognized the potential of adult and embryonic stem cells to regenerate new organ tissues and to treat diseases from type 1 diabetes to Parkinson's disease to spinal cord injuries.

One source of adult stem cells is the umbilical cord blood (UCB), the blood remaining in the umbilical cord and the placenta after a child is born. UCB contains blood-forming and other types of stem cells, similar to those found in bone marrow, and other types of adult stem cells. Due to its ease of collection and the fact that it used to be a discarded material, UCB presents an appealing, potentially lifesaving source of stem cells. Researchers have recently recovered stem cells from umbilical cord blood which have additional potential to become organs or tissues.

Clinical Use

At present, the true therapeutic applications of UCB cells are yet to be determined. So far UCB cells have largely been used in clinical transplants as a substitute for bone marrow transplantations to treat malignancies, bone marrow failure, and a few other conditions. Its advantages over bone marrow include ease of cell collection and storage and lower risk of rejection by the patient. It also takes a significantly shorter amount of time to obtain matching cord blood (which is banked) than locating a matching bone marrow donor.

Researchers are trying to determine whether UCB-derived stem cells can be induced to proliferate into other cell types, such as heart cells, nerve cell or insulin-producing cells^{1,2}. UCB cells may also be useful for treatments that modify an inflammatory or immune response.

JDRF Research

JDRF is currently funding research to learn whether transplantation of one's own cord blood can slow or halt the progression of type 1 diabetes. These studies are being conducted at the University of Florida; detailed information is available at www.clinicaltrials.gov/ct/show/NCT00305344.

Storing A Child's Cord Blood At Birth

Because of the interest in using UCB in cell therapies, parents frequently ask whether they should store their newborn's UCB cells in a private or public cord blood bank, particularly when a parent or sibling has type 1 diabetes. While this is a matter of personal choice, some information on the state of the science that might be helpful in making a decision includes:

¹ Kogler G, Sensken S, Airey JA, et al. A new human somatic stem cell from placental cord blood with intrinsic pluripotent differentiation potential. *J Exp Med*. 2004 Jul 19;200(2):123-35

² Sun B, Roh K, Lee S, Lee Y, Kang K, Induction of human umbilical cord blood-derived stem cells with embryonic stem cell phenotypes into insulin producing islet-like structure, *Biochem Biophys Res Commun*. 2007, Mar 23; 354(4):919-23.

In 2007, the American Academy of Pediatrics issued a policy statement³ evaluating cord blood storage by both public and private entities:

- ∞ Private UCB banking businesses store the donors' cells with the possibility of using them to the donors' own benefit in the future. These businesses, however, sometimes appeal to parents' emotional stress and tout unrealistic medical benefits. There is evidence that the UCB from a child with genetic defects also carry the same genetic mutations in its stem cell population, and the potential for children needing transplantation of their own UCB is still doubtful. However, parents are encouraged to store a newborn's UCB if a first-degree relative has been diagnosed with a disease treatable with a transplant.
- ∞ Public UCB banking initiatives aim to collect large populations of these cells that may cover as many genetic variations as possible to maximize patient matching probabilities. These efforts serve the public interest and the cells stored are not meant to be returned to the donors.

As a result, the American Academy of Pediatrics has made the following recommendations for prospective parents:

1. **UCB donation should be discouraged when its storage is directed for later personal or family use.** Most premalignant changes already exist in the UCB, and the transplantation of such UCB may not confer any medical benefits. **Direct UCB banking is encouraged when there is a full sibling in the family with a medical condition that can benefit from UCB transplantation.**
2. **UCB donation should be encouraged when it is banked for public use.** Parents will be notified if abnormalities are found in the UCB during standard laboratory testing. These donations, however, may not be available for future private use.
3. **There is insufficient scientific data to support UCB banking for future private use.** Private banking as a "biological insurance" should be discouraged. All UCB banks should be accredited by the [Foundation for the Accreditation of Cellular Therapy \(FACT\)](#) and follow FACT standards.

Answers to additional frequently asked questions about cord blood banking and storage are available from the American Academy of Pediatrics at:
<http://www.aap.org/advocacy/releases/jan07cordbloodfaq.htm>.

³ <http://aappolicy.aappublications.org/cgi/content/full/pediatrics;119/1/165>