



Institute for Women's Health Research
Putting Women's Health First

July 2012

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Dear Friends,

The month of July is National Cord Blood Awareness month. Human umbilical cord blood contains a number of adult stem cells that can be stored for later use in the treatment of many diseases. These diseases include a variety of cancers, metabolic and immune disorders. Each year, many families choose to bank cord blood, but there are still many who are unfamiliar with the life-saving capabilities of stem cells.

We hope that this month's e-newsletter can provide information on cord blood and encourage individual exploration of current cord blood research and banking. A resource such as this has potential to be extremely important in the lives of both children and adults, and may even be the last hope for a cure or a prolonged life. Please join us in celebrating learning about the ongoing research on cord blood and the great potential it has in the future of women's health.

Sincerely,

The Institute staff



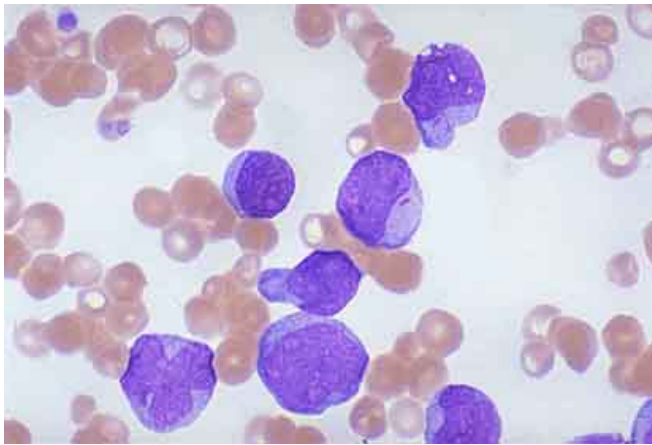
CORD BLOOD

Everything was coming together for Tammy in 2007. She started a new job, her husband was successful and her sons were healthy. She found happiness and fulfillment through exercise and healthy eating. One day, she began to notice flu symptoms that persisted and began to interfere with her quality of life. Many of her coworkers had the flu and this was a reasonable explanation for her sudden illness. Her doctor confirmed the diagnosis, but when the symptoms did not go away, she became certain that something worse was at play.

She headed to the emergency room, wherein doctors performed basic tests and concluded that nothing serious was wrong. Still, her conditioned worsened. Suspecting cancer, physicians admitted her for further observation. Her health continued to deteriorate and she entered the ICU. Multiple hospitals around the country tested biopsy samples and a pathologist finally diagnosed her with NK-cell lymphoma, a rare cancer with only two diagnoses annually in the US. After days in the hospital and numerous chemotherapy treatments, doctors insisted on a bone marrow transplant, but a match could not be found. Fortunately, Vanderbilt University Medical Center found a cord blood match for her and subsequently performed a transplant. She remains in remission thanks to this life-saving transplant and has been able to witness her boys' high school graduation.

Cord Blood and its Capabilities

Cord blood was responsible for the turnaround of Tammy's prognosis and has been a valuable resource for many other patients. Cord blood, the blood found in the umbilical cord of a newborn baby, contains various non-embryonic stem cells that can be used for life-saving medical treatments. Non-embryonic stem cells (those not derived from human embryos) are found in adults, children, the placenta, umbilical cords and cadavers (1). Compared to adult stem cells, the non-embryonic stem cells of cord blood are young, flexible and have not yet been exposed to the external environment. Because they are



unspecialized, they have the power to differentiate into multiple cell types (2). This means they can replicate to replace damaged tissue at various sites in the body, allowing for the reversal of damage by recreating healthy tissues for blood, organs, and overall immune health.

Cord blood can be used to treat of a variety of conditions such as cerebral palsy, hearing loss, traumatic brain injury and diabetes. In addition to the stem cells found in cord blood, the stem cells of cord tissue are also useful. These cells, called mesenchymal stem cells (MSCs), are the focus of current research on treatment of conditions such as heart disease, stroke, cartilage injury, and liver disease. Families can bank cord tissue in the same way cord blood is banked, and can use it later on if illness occurs.

To date, doctors have used cord blood in 25,000 transplants. Stem cells from cord blood may be used to regenerate healthy tissues in patients with Type I Diabetes, heart attack, brain injuries, spinal cord injuries or cerebral palsy. Treatments include reproducing healthy blood and immune cells after chemotherapy, and cord blood transplants have successfully treated a variety of cancers including acute leukemia, chronic leukemia, and Hodgkin's lymphoma. Further, cord blood has been used to treat blood disorders such as sickle cell anemia and aplastic anemia, and a multitude of other Immune and Metabolic disorders (3).

Cord Blood Collection and Use

The stem cells from cord blood and from bone marrow and adipose (fat) tissue are isolated in similar ways. The process for obtaining stem cells from cord blood is less invasive than other mechanisms, but some research shows that the success rates for isolating stem cells from the umbilical cord are slightly less than that of the marrow or adipose tissue (4).

The actual collection process is a painless and quick one for both the mother and the child. Soon after the mother gives birth, the doctor or midwife cuts the umbilical cord. They clamp and clean a portion of the cord, and a collection bag or syringe is used to extract the cord blood. A doctor or midwife sets aside the tissue after removal of the blood for the family use if desired. They then send the blood (and tissue if

chosen) to the bank (public or private) to be processed and stored. They assure a painless and simple procedure; it takes roughly five minutes and proves to be safe for both the mother and the newborn. The doctor or mid-wife can perform the process for both vaginal and caesarean section births. Most banks will contact the family after the cord blood or tissue has been successfully processed and stored.



The transplant of stem cells from cord blood is called an allogenic transplant, which uses stem cells from a donor versus stem cells from one's own body (called an autologous transplant). The transplant involves injecting cord blood into a donor recipient to promote blood production. From the stem cells, new blood cells can develop and thus fight disease (6). Human leukocyte antigen (HLA) testing matches patients to potential donors. These antigens are protein molecules and determine HLA type. Physicians determine HLA type of patients and donors before a transplant. The number of common HLA molecules determines the compatibility of patient and donor. Of patients needing a transplant, 95% can find at least one match for the majority of HLA markers and many can find a match for nearly all of the HLA markers through resources like the Be The Match Registry (5).

A close match is crucial to minimize the likelihood of the immune system attacking the transplant. A more precise match promotes engraftment, the growth and creation of new cells from the donated ones, and reduces the possibility of graft-versus-host disease, an attack on the body by the immune cells of the newly donated cord blood. Family donation is ideal because it increases the likelihood of being a match. Everyone inherits half of their HLA from the mother and half from their father, giving siblings a 25% (1 in 4) chance of being a match. Though it is less likely than that within a family, it is possible that a good match can be found between unrelated donors and patients. Further, genetic variations tend to be inherited by race/ethnicity, so patients from a specific ethnic group are likely to find a match within that group (family or unrelated) (5).

Donation versus Banking: Advantages and Disadvantages

Expectant mothers can pay to bank their cord blood for family use or donate it for public use. The cells are readily accessible with family

banks at 3,500 participating hospitals in all states and available to the family worldwide if the family should move away. Some family banks house cord tissue as well. Family (private) banks require an initial collection and processing fee and annual costs to bank it. Prices vary (between \$900-\$2,100 for initial fee and around \$100 annually) and often offer payment plans. Banking stem cells can grant peace of mind especially for those with a family history of illness, and can also provide a tremendous life-saving resource for non-family members in desperate need of treatment (7).



There are also options for families who do not have the financial resources to bank cord blood. If a family can meet the following criteria, they can bank for free, regardless of financial standing, with the [Cord Blood Registry \(CBR\)](#). The family must have a family member that has been diagnosed with a life-threatening illness

who qualifies for treatment with stem cells, have approval by a physician or oncologist that treatment with stem cells would be beneficial, and the patient must be a full sibling or parent to the donor, and have an active disease or be in remission. The patient must also reside in the United States.

Donations of cord blood makes stem cells publically accessible which increases the national supply of cells and a patient's chance of finding a match. Still, only a limited number of hospitals participate in only 27 states and the donor must give birth in one of the 27 hospitals. Currently, cord tissue cannot be donated. Worldwide there are 18.5 million donors totaling more than 590,000 cord blood units. On average 54,000 people become donors using Be The Match Registry every month, increasing the chances of someone in need finding a match. Still, cord blood is saved from less than 5% of births in the United States, even though there is potential for 14,900 people per year between the ages of 0 to 65 years old to benefit from the life saving transplants (8).

The Odds of Needing a Donation

The odds of needing a transplant for a blood disease or hereditary

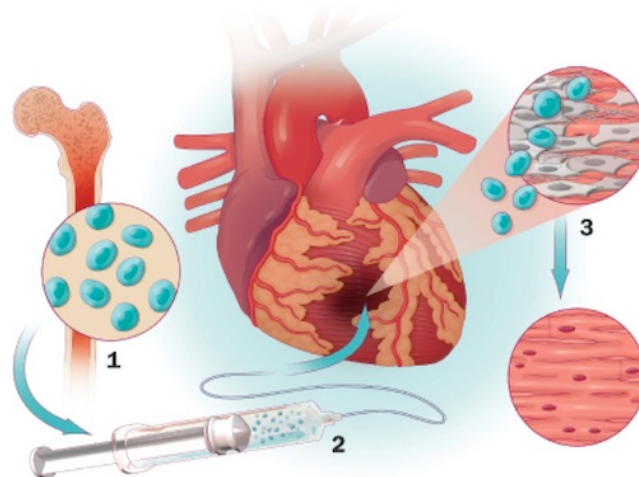
disorder are 1 in 5,000 by the age of ten; the odds of needing a transplant for a solid tumor are 1 in 10,000 by the age of ten. According to the American Academy of Pediatrics, the chances of a child needing his or her own stem cells in their lifetime are 1 in 200,000. Still, the likelihood of requiring a transplant is low, but donating stem cells to the public bank gives patients a chance to find a match and to receive potentially life-saving treatment. Similarly, if one pays to bank it -- a costly, but potentially worthwhile option -- it is available should an illness arise for family or others in need of a donor.

Currently, the most likely therapy using cord blood stem cells for children is in treatment of Cerebral Palsy. Since 2005, hundreds of children in the United States and beyond have received this treatment (9). Although the benefits of cord blood stem cells are clear, the study of cord blood and its use is a relatively new field of inquiry so ethical concerns still arise. Ethical use of fetal stem cells includes use of cord blood since umbilical cords are detached from newborns, while unethical means of obtaining stem cells would include harm to a fetus.

Cord Blood and Cardiovascular Health

Cardiovascular disease is the leading cause of death for women in the United States. The older a woman gets, the more likely she is to develop heart disease, but women of all ages should be cognizant of risk factors. Interestingly, research on cord blood and its potential to prevent and treat cardiovascular disease has emerged within the last few years. Because heart cells do not readily regenerate, researchers believe that stem cells may have the capacity to repair or replace damaged portions of tissue within blood vessels and heart muscles (10). In research on rats, results have shown that cord blood stem cells have the ability to migrate and engraft to damaged heart muscle, contribute to creating new blood vessels, improve structural damage, and decrease the size of infarction (obstruction of blood supply).

Although more research is needed on cord blood for treatment of cardiovascular disease, there is evidence we can currently rely on that is hopeful for many populations. Scientists believe that cord blood may have the most immediate benefits for children born with structural defects of the heart. With this knowledge in mind, it is encouraging to consider the vast



capabilities of cord blood and the implications for prevention and treatment of conditions that directly impact child and maternal health.

Content by Erin Meyer, IWHR Intern and Heather Pieske

References

- (1) <http://cbhd.org/stem-cell-research/overview>
- (2) <http://www.ncbi.nlm.nih.gov/pubmed/17166095>
- (3) <http://www.viacord.com/treatable-diseases.htm>
- (4) <http://onlinelibrary.wiley.com/doi/10.1634/stemcells.2005-0342/full>
- (5) <http://www.seattlecca.org/description-of-hla.cfm>
- (6) <http://www.mayoclinic.com/health/stem-cell-transplant/MY00089/>
- (7) <http://parentsguidecordblood.org/how/>
- (8) *Be the Match*, marrow.org
- (9) *National Institutes of Health*
- (10) <http://www.medicalnewstoday.com/releases/97995.php>

HEALTH TIP

Are you someone considering cord blood banking or donation? There are many resources that can give further information about the costs, uses, and process.

[Cord Blood Registry](#)

(1-888-588-4604)

[Cord Blood Registry's Newborn Possibility Program](#)

(1-888-932-6568)

[Participating hospitals and how to donate](#)

(1-800-MARROW2)

[American Association for Blood Banks](#)

(1-866-384-0476)

[Be the Match Registry](#)

INSTITUTE HAPPENINGS

- Congratulations to Institute staffer Sharon Green, who received the 2012 Medical Activist Award from the [Women's Health Foundation](#) on June 7. Members of the Institute staff joined Sharon at a celebration that included a solo performance by Tony Awardee Heather Headley.
- Institute Director Teresa Woodruff, PhD was one of three featured speakers at a TEDx event entitled The Complex World of Fertility on June 19. Dr. Woodruff discussed how she started the field of oncofertility and the lifesaving treatments in development that address the unmet needs of cancer patients who lose their fertility during treatment. Other speakers included Dr. Thomas O'Halloran who is studying the role of zinc in fertility and Dr. Brian Uzzi who explains how scientific discoveries are best done by teams rather than solo scientists. For event videos, visit www.tedx.northwestern.edu.

UPCOMING EVENTS

- The 2012 Oncofertility Consortium Conference, Dialogues in Oncofertility, will be held Wednesday, September 26 through Friday September 28, 2012. For information, click [here](#).
- The Institute for Women's Health Research will begin its 2012-2013 forum series on September 11, 2012. Watch our [website](#) for dates and speakers.

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