

## Umbilical Cord Blood Banking

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### Abstract

It is more than 20 years since the first cord blood transplant (CBT) was performed, following the realisation that cord blood (CB), which is normally wasted, is rich in progenitor cells and capable of rescuing haematopoiesis. Since then it has been appreciated that CB is rich in stem cells, and has many other features not the least of which is its ability to rescue the transplanted patient without a rigid need for full human lymphocyte antigen (HLA) compatibility. Also it is easily accessible, relatively free from infections and poses no medical risk to the donor.

Umbilical cord blood, which contains a rich source of hematopoietic stem and progenitor cells, has been used successfully as an alternative allogeneic donor source to treat a variety of pediatric genetic, hematologic, immunologic, and oncologic disorders. Because there is diminished risk of graft-versus-host disease after transplantation of cord stem cells using matched related donors, These scientific advances have resulted in the establishment of not-for-profit and for-profit cord blood-banking programs for allogeneic and autologous cord blood transplantation.

**Keywords:** Cord blood; Human; Lymphocyte antigen autologous; Allogeneic; Cord blood transplantation; Donor; Receptent.

### Introduction

After a baby is born, the umbilical cord and placenta are no longer needed and are usually discarded. However, the blood remaining in the umbilical cord and placenta is rich with blood-forming cells. (These cells are not embryonic stem cells.) By collecting and freezing this blood, the healthy blood-forming cells can be stored and may later be used by a patient who needs them.

### Definition

Umbilical cord blood banking is the practice of preserving for future use fetal blood that remains in the umbilical cord at the time of birth.

### Purpose

Umbilical cord blood is special because it contains a lot of cells called hematopoietic stem cells. A stem cell is an unspecialized master cell that can develop into several different kinds of specialized cells.

### Hematopoietic

Stem cells are found in bone marrow, and in lesser amounts, in blood. Stem cells can be used to treat various genetic disorders that affect the blood and immune system, leukemia and certain cancers, and some inherited disorders of body chemistry. To date, more than 70 disorders have been treated with stem cells from cord blood.[1]

Stem cells are unspecialized cells that produce all blood cells. These include:

- Platelets, which are needed for blood clotting
- Red blood cells, which transport oxygen to the cells
- White blood cells, which help fight disease

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Parents can now choose to store their newborn baby's cord blood at a private cord-blood bank in case their baby or a family member ever needs it. Or parents can donate the cord blood to a public cord-blood bank so that any genetically matched individual needing treatment has access to it.

#### *How Cord Blood is Used?*

The first successful umbilical cord stem cell transplantation occurred in 1988, when a newborn girl donated cord blood to cure her brother of Fanconi's anemia,

Individuals with certain illnesses are treated with chemotherapy and/or radiation that destroys their own stem cells. Following this treatment, they receive a stem cell transplant, usually through a large vein in the chest. The transplanted stem cells make their way to the bone marrow. In the marrow, the stem cells continually make new copies of themselves and produce blood cells that rebuild a healthy blood and immune system.

*Some diseases treated with blood stem cell transplant include:*

- acute lymphatic leukemia
- acute myelogenous leukemia
- chronic myelogenous leukemia
- Hodgkin disease
- Non-Hodgkin lymphoma
- neuroblastoma
- severe combined immune deficiency
- anaplastic anemia
- thalassemia
- sickle cell anemia

#### *Advantages of Stem Cells from Cord Blood*

- Safe, easy collection
- More matches
- Faster availability:
- More ethnic diversity:
- Reduced risk of graft vs. host disease (GVHD)

#### *Ethical Concerns*

Informed consent for cord blood collection is obtained. Legally, the cord blood belongs to the child, but the consent of the mother alone is usually obtained for collection, and the consent of the father is rarely considered (Ballen, 2006). Because the cord blood now has a "value," the person who obtains consent and that same person's professional connection to the private cord blood bank may come into question.

Additional ethical concerns about umbilical cord blood banking involve the timing of clamping the umbilical cord after birth. Overall, the issue of when to clamp and cut the umbilical cord is controversial. There is no consensus on how early or how late in the birthing process the umbilical cord ought to be clamped and cut, although the cord obviously still provides nourishment and removes waste until it is clamped or spontaneously stops pulsing.

#### *Precautions*

Umbilical cord blood collection is usually not done in the case of multiple births.

#### *Description*

Cord blood collection is a simple procedure that takes between three and seven minutes. It is done immediately after the baby is delivered. Cord blood is drained into a standard blood bag, and then processed and frozen at very low temperatures.

#### *Preparation*

Parents who wish to bank their child's cord blood must plan ahead. Private storage requires ordering a kit in advance and coordinating with the health care providers doing the delivery to make sure the cord blood is collected properly. Mothers must test negative for infectious diseases such as HIV and hepatitis before delivery. Donation to a public cord blood bank is not always possible because of their limited number and location.

#### *Aftercare*

No special aftercare is required for mother or child, but the cord blood must remain frozen at low

temperatures.

### *Risks*

The main risk associated with umbilical cord blood collection is the possibility that it will become contaminated with bacteria during collection

### *Key Terms*

*Allogeneic:* A transplant where the donated material comes from different (although often related) individual than the recipient.

*Autologous:* A transplant where the material for the transplant comes from the individual who is also the recipient; thus, the transplant material is genetically identical to the donor's body.

*Hematopoietic Stem Cell:* A cell that can develop into any type of specialized blood cell.

### **Conclusion**

Umbilical cord blood was once thought of as a waste product of the birthing experience, but now it is valued for its content of stem cells. Today, more than 20 years after the first successful umbilical cord blood stem cell transplant, more families are seeking

information about whether or not to invest in saving their newborn's umbilical cord blood. Saving the cord blood in public banks is a worthy undertaking for any family. It is recommended that expectant families only consider cord blood banking in private banks when they have a relative with a known disorder that is already treatable by stem cell transplants. Moreover, expectant families should not rely on commercial cord blood banks as their sole source of information about cord blood banking.

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