

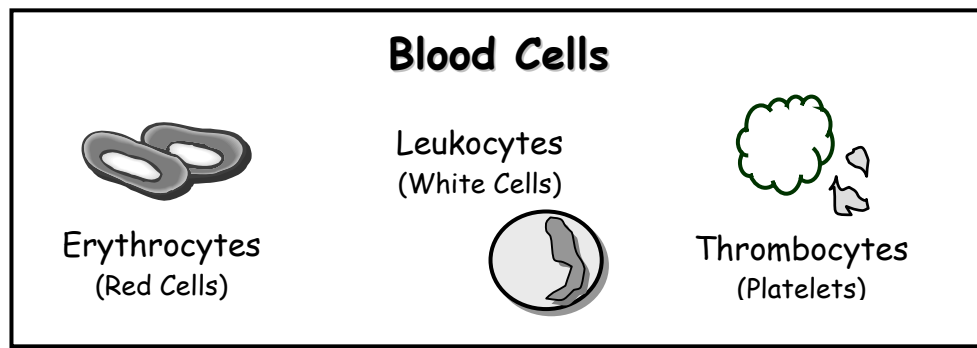
FACT SHEET:

Thalassemia & Hematopoietic Stem Cell Transplants

Children's Hospital & Research Center at Oakland

The purpose of stem cell transplantation is to cure life threatening or chronic diseases, such as thalassemia, using high doses of chemotherapy, followed by transplantation of donor marrow or stem cells. This treatment is an intense one, causing your child's body to temporarily not be able to make blood cells. Your child's ability to make blood cells is then restored by giving healthy stem cells to your child, that is, transplanted into your child's body. These healthy stem cells grow in the bone marrow and restore your child's body's ability to make blood cells, specifically healthy red blood cells and hemoglobin without thalassemia.

Stem cells are the very young cells that mature and develop into red blood cells, white blood cells and platelets. Red cells (erythrocytes) carry oxygen to other cells in your body. White blood cells (leukocytes) fight infection. Platelets (thrombocytes) help blood to clot. All of these cells develop from the stem cells.



Stem cells are produced in the bone marrow. Very small numbers of stem cells also circulate in the blood stream. These are called peripheral blood stem cells (PBSC's). Stem cells are also present in the blood of the umbilical cord of a baby. Therefore, there are three places to obtain stem cells for transplantation: the bone marrow, the blood stream, or from the umbilical cord immediately after birth.

Allogeneic Transplants

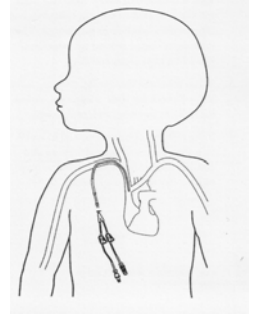
An allogeneic transplant is one in which your child has a brother or sister who donates their stem cells for transplant. Your child's brother or sister must be a tissue match, also called an HLA match. To determine if one of your children is a match for another, a blood test (called HLA typing) is performed.

The Central Venous Catheter

In preparation for the next step in the transplant process, your child will have a small, flexible tube, called a catheter, inserted into a large vein in the chest just above the heart. This is called a central venous catheter. This serves as a way to give your child's medications and nutritional supplements as well as draw blood samples for tests without pain or 'pokes'. You will be taught how to care for the catheter after it is surgically placed.

Insertion of a Central Venous Catheter

Children usually keep their central venous catheter in place for several months after transplant until transfusions and intravenous medications are no longer needed. The placement of the catheter is done in an operating room by a surgeon. Anesthesia (sedation) is used during catheter placement. A small incision (cut) called the “entrance site” is made on the neck or upper chest. A smaller cut or “exit site” is made lower on the chest. The catheter is guided under the skin from the exit to the entrance site. Then the catheter is passed into a large vein and advanced until it reaches the entrance to the right upper chamber of the heart. The whole procedure from start to finish takes approximately 45 to 90 minutes.



Receiving Chemotherapy

The next step in the transplant process is when your child will receive “conditioning” treatment. During this step your child will receive high-dose chemotherapy. The doses of chemotherapy are much higher and potentially more effective than the doses other child would receive for treating illnesses such as cancer. The conditioning therapy kills rapidly dividing cells, including marrow cells. The marrow cells are an important part of the your child’s natural defense, called the immune system. Your child’s immune system helps fight infections and also, recognizes cells that are not genetically identical to them.

On occasion, radiation may also be administered to your child’s body in preparation for transplantation.

Side Effects of Conditioning

Symptoms such as nausea, vomiting, and mouth sores, which are related to receiving chemotherapy can make this phase an uncomfortable experience. Perhaps the most uncomfortable side effect begins a few days after conditioning. Your child’s mouth may become very sore with a condition called oral mucositis (mouth sores). It is a temporary condition, which begins to heal with the production of white cells from the new, transplanted stem cells. It is important to follow through with treatments that promote healing and relieve symptoms, such as frequent mouth rinses.

Chemotherapy also causes hair loss, starting approximately five to ten days after treatment begins. Hair usually starts to grow back in several weeks.

Side effects associated with the specific chemotherapy prescribed for your child will be discussed prior to your child receiving them. We have available many medications and other treatments to prevent and manage these symptoms.

The Transplant Day



Although the infusion of stem cells is usually a brief and uncomplicated procedure, it is a major event. Children and family members often celebrate this day as a special occasion.

The stem cell infusion transplant takes place after your child has completed the conditioning treatment. The stem cells that were collected from the donor are placed in bags that look very much like those used for blood transfusions.

Your child will receive these cells intravenously through the central venous catheter. During the infusion of stem cells your child will rest in bed and can read, watch television or visit with family or friends. Side effects of the stem cell infusion are uncommon and if they occur generally are mild. Some children experience nausea, vomiting, shortness of breath, flushing, chills, or mild fever.

Engraftment

Once transplanted, it takes several weeks for the stem cells to re-grow (engraft) in your child's marrow space, and eventually produce red cells, white cells and platelets. During this time, your child is at risk for several complications and will need to remain in the hospital. We will expect to see signs that the new stem cells are growing (engrafting) and beginning to produce blood cells three to four weeks after the transplant. Often the first sign of engraftment is a rising white blood cell count. Frequent blood counts are done to monitor the progress of the new stem cells.

Until the new cells engraft, your child is very susceptible to infection because of a lack of white blood cells. Bleeding may occur because platelets are low and your child may feel very fatigued from a low red blood cell count. The transplant doctors will prescribe transfusions of platelets to prevent bleeding and red cells to prevent anemia. Despite fatigue, it is important for your child to keep active as it may prevent complications. We will encourage your child to participate in daily routines for hygiene, play, exercise, and health care activities. If your child is not able to eat and drink during this time, we can provide nutritional support until your child can eat and drink adequately.

Complications

- **Viral, bacterial and fungal infections** can be serious problems after a transplant. The greatest period of risk for developing these complications occurs during the first three months after transplant. Most infections can be treated successfully with antibiotics.
- **Pneumonia** is another complication that may occur in the first months after transplant. Your child will have regular chest x rays and we will watch for early signs of pneumonia.
- **Veno-occlusive disease (VOD)** is a complication in which the liver's job of removing waste products from the body is impaired. It is most likely to occur during the first month after transplant. In most cases it will resolve with time and natural healing.
- In addition, there is a risk of **organ failure**, including failure of the heart, kidney, lung, brain, liver or other parts of the body. This risk is increased in children who already have had intensive chemotherapy and/or radiation therapy prior to coming for transplant.

Graft versus Host Disease

Graft-versus-host disease (GVHD) is a complication that occurs after allogeneic transplants. As the transplanted stem cells start growing, they may recognize your child's body as foreign. The new cells (the graft) may attack some of your child's organs such as the skin, gastrointestinal tract or liver (the host). This is **acute** GVHD, the form that can occur shortly after transplant. **Chronic** GVHD is another form that can begin as early as three months after transplant. Medications can be given to prevent and treat GVHD.

Potential Late Problems

Some complications are more likely to arise late, that is, several months after your child's transplant. It is important that you report any new symptoms to your child's doctor promptly. Treatment and follow-up can be started early.

- Chronic graft-versus-host disease (GVHD) develops three to 18 months after allogeneic transplantation. Children with chronic GVHD experience some of the following symptoms: skin changes, liver abnormalities, gastrointestinal distress or breathing problems. Medications that suppress the GVHD are given. Treatment is given at home as an outpatient in close collaboration with your child's referring doctor and the transplant team.
- Infertility is a risk with certain conditioning regimens.
- Steroid therapy is a risk factor that can increase the possibility of developing cataracts, a clouding of the lens of the eye. Cataracts can be surgically removed.
- Growth and development may not progress normally for children who have received high dose chemotherapy or in those who have chronic GVHD. Potential problems will need to be followed closely after transplantation so appropriate therapy may be given.
- Unfortunately, even with stem cell transplant, some patients may experience a recurrence of disease. Yet, despite the risk of serious complications and relapse, stem cell transplantation does offer the hope of cure.

Preparing to Leave the Hospital

We can begin to plan your child's discharge from the hospital when: the new stem cells have engrafted, your child is able to take all medications orally, your child is medically stable and you are trained to provide your child's special health care needs. We ask that you stay within thirty minutes travel time of the hospital when your child is discharged. Most children will require frequent clinic visits once discharged, with a minimum of one to several visits each week.

Preparing to Return Home

Your child will have a complete medical evaluation done approximately 80-100 days after transplant. You will receive the results of this evaluation and recommendations in a conference with the health care team.



The transplant team will give you specific instructions on how to care for your child in the following months. Your child will then be under the care of your referring physician with support from the transplant team. We will also make plans to see your child once every year for a medical evaluation at the transplant center.

Length of Time for Transplant

The length of time for transplant is different for each child. However, stem cell transplant does require a family commitment of providing concentrated care and support for approximately six months to one year, or possibly longer. Many children spend four to six weeks in the hospital and then receive care in the Day Hospital outpatient department for a number of weeks. Your child's physician and coordinator will explain the expected length of treatment to you and your child.

Making the decision to treat your child with stem cell transplantation is often not easy. There are risks and benefits to be thought about and discussed. Please feel free to call the transplant team so that we may provide additional information: 510.428.3374.