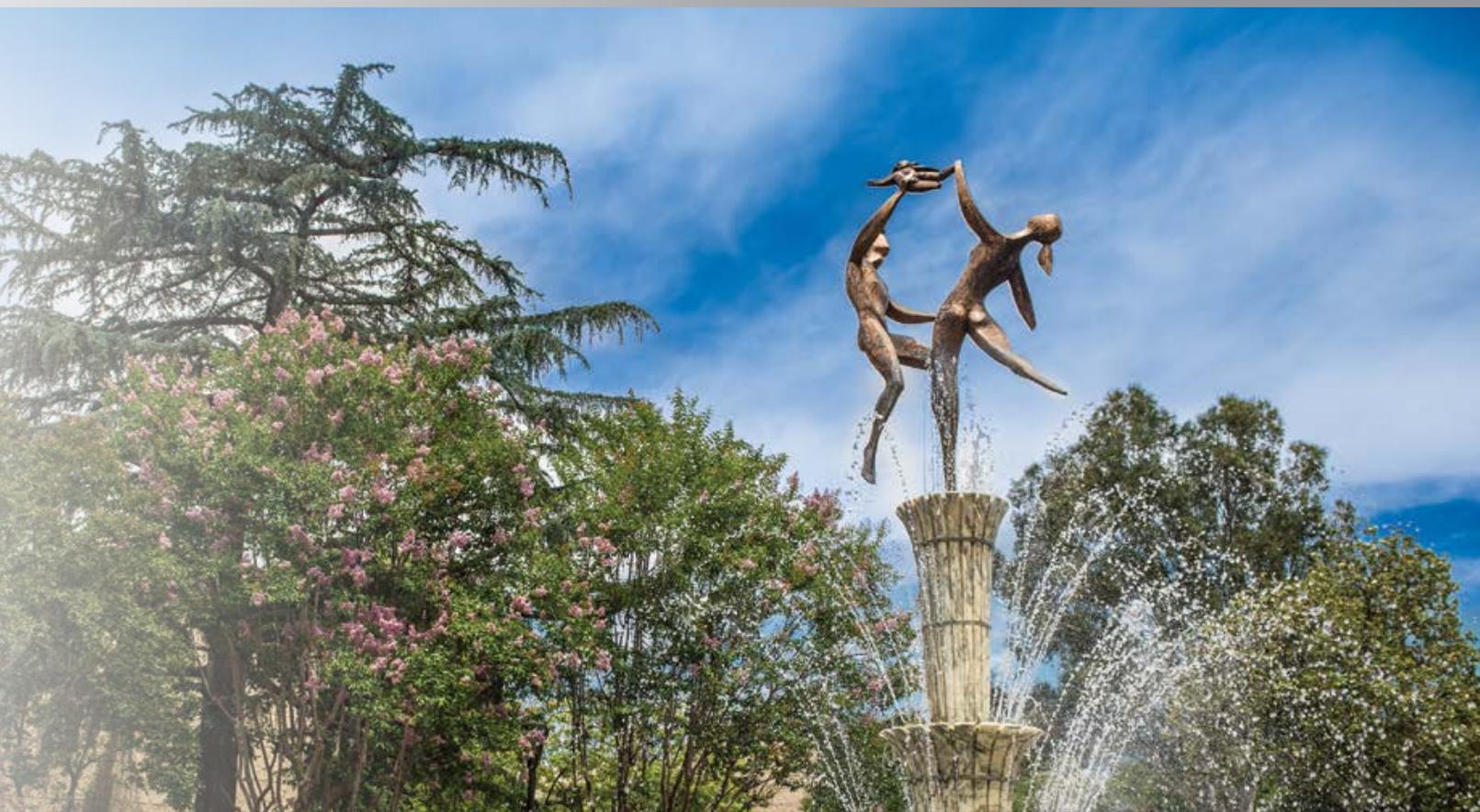


*“Read this chapter and you will learn what happens during a bone marrow transplant.”*

— BMT Survivor

## CHAPTER 6



### **Types of Transplants**

**Allogeneic Transplants**

**Autologous Transplants**

# Chapter 6

## Types of Transplants

### Allogeneic Transplant

An allogeneic transplant is the infusion of stem cells from one person to another. These two people have a similar genetic type. The donor may be a brother or sister, but can be a parent, child or even an unrelated person.

The degree to which the patient's and donor's tissues match is determined by a blood test called HLA typing or tissue typing.

### Unrelated Donor Transplant

Unrelated Donor Transplant (URD) is a type of allogeneic transplant using a donor from the general population who is not related to the patient but who is a very close HLA match to the patient. Since many of us share similar genetic backgrounds, it is possible that someone not related to us has a similar genetic type.

### Human Leukocyte Antigen Typing for Allogeneic Transplantation

The term "Human Leukocyte Antigen (HLA) Typing" is used to describe the process of matching donor HLA to patient (recipient).

The process of HLA typing involves drawing a sample of blood from the patient and the donor, HLA typing both samples, and then comparing them to determine if they are a match to one another. HLA genes help to control an individual's immune system. The function of the **immune system** is to protect each individual from harmful bacteria, viruses and chemicals (e.g., toxins).

#### Be The Match

#### The National Marrow Donor Program®

The National Marrow Donor Program® (NMDP) is an agency that facilitates the search for patients who have no siblings or whose relatives who are not a match for them. If a match is found, further evaluation of the potential donor is done. Donors are admitted to a hospital in their area, and stem cells are collected within 24 hours before the transplant.

City of Hope's Be The Match team is available to assist patients in registering friends and family members. The team is able to go into your community and educate and support the registration of volunteer donors. Staff is trained and able to assist in non-English speaking communities as well.

Contact City of Hope's Be The Match team at 626-301-8483 or [bethematch@coh.org](mailto:bethematch@coh.org)

Each individual has a set of HLA genes, one haplotype (or group) inherited from each parent. The two inherited haplotypes represent their complete tissue type (genotype).

## Syngeneic Transplant

**Syngeneic** means a perfect tissue match. A syngeneic transplant is the infusion of stem cells from one identical twin to another. An identical twin is a perfectly matched donor and is considered to be HLA identical with the patient. This type of transplant is similar to an autologous transplant in that there is minimal risk of GVHD. The stem cells, however, are known to be free of cancer.

## Selecting a Donor

The selection of a suitable donor is determined by the degree that their HLA genes match those of the patient. The group of genes (HLA-A, HLA-B, HLA-C, DRB1, DQB1 and DPB1) are closely situated on chromosome 6. Each of the genes is found to have a large number of variations (alleles). Determining the tissue type is the process of determining the alleles each person has inherited. This process is complex and takes approximately 10 working days.

A donor who is found to share both of the HLA haplotypes with the patient may be selected as a donor and is considered a fully matched donor. If a donor is found to share only part of the patient's HLA genotype, they may be selected as a donor (if a fully matched donor is not available), and will be considered a mismatched donor.

## Haploidentical Transplants

An HLA-haploidentical donor shares a haplotype with the transplant recipient. This means that the donor and recipient have the same set of closely linked HLA-genes on one of the two number six chromosomes they inherited from their parents. Rather than being a match for each other, they are a half-match. Parents are always a half-match for their children and vice versa. Siblings have a 50 percent chance of being a half-match for each other. (They have a 25 percent chance of being a perfect match and a 25 percent chance of not matching at all.)

<http://www.seattlecca.org/diseases/alternative-donor-program.cfm>

**Haploidentical hematopoietic stem cell transplantation (HSCT) provides an opportunity for nearly all patients to benefit from HCT when a HLA genotypically matched sibling is not available.**

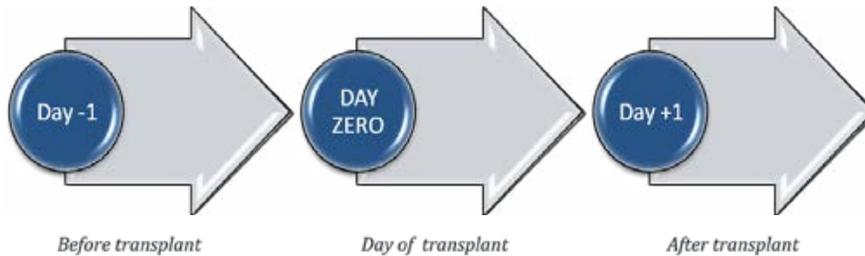
The use of hematopoietic stem cells from relatives who are partially matched for HLA provides some advantages for patients lacking HLA-matched sibling donors or fully matched unrelated donors. Virtually all patients have at least one HLA-partially matched family member, parent, sibling or child who is immediately available to serve as a donor.

<http://www.nature.com/bmt/journal/v42/n1s/full/bmt2008117a.html>

## Infusion of Allogeneic Blood and Marrow Stem Cells

The new stem cells or bone marrow are administered to replace the old diseased bone marrow.

The day of your transplant is referred to as Day Zero. The days before 'Day Zero' are referred to as "minus" days and the days following your transplant are "plus" days. Thus, the day before your transplant is "Day -1" and the day after is "Day +1."



On Day Zero, the infusion of the stem cells or bone marrow takes place in your hospital room. The process is similar to a blood transfusion and is given through your vascular access device (VAD). You will receive medication about 30 minutes before the transplant which may make you sleepy and will help minimize any side effects. Even with the pre-medication, reactions may still occur but are usually minimal.

The stem cells come from the blood bank and will be infused slowly as the rate of the infusion is based on the total numbers of the stem cells. Allogeneic stem cells are most often stored in one or more bags, which will infuse in less than four hours, depending on the amount contained each bag and the number of bags. Your nurse will monitor your vital signs and oxygen level throughout the infusion.

## Engraftment

Engraftment is the point when your "new" stem cells or marrow begins to make WBCs, RBCs and platelets. After you have received your stem cells your blood counts will be checked daily to determine when engraftment begins. Engraftment usually occurs 14 to 30 days after day zero of your transplant. Remember that all patients are different and length of time to engraft varies from one person to another.

## Autologous Transplant

**Autologous** means from yourself. Some of your own healthy stem cells are removed, or “harvested,” at a time when there is no evidence of cancer cells in your blood and bone marrow. These stem cells are then frozen and stored. They will be given back to you after you receive high doses of conditioning chemotherapy and/or radiation.

Some types of cancer may respond best to chemotherapy given in very high doses. High-dose chemotherapy can kill a great number of cancer cells but it also can have a harmful effect on some normal cells, especially on blood cells made in the bone marrow. Bone marrow that has been suppressed or destroyed may not be able to make new blood cells. An autologous transplant will “rescue” you from the effects of high-dose chemotherapy and/or radiation treatments by replacing the destroyed bone marrow with the stem cells that were previously collected.

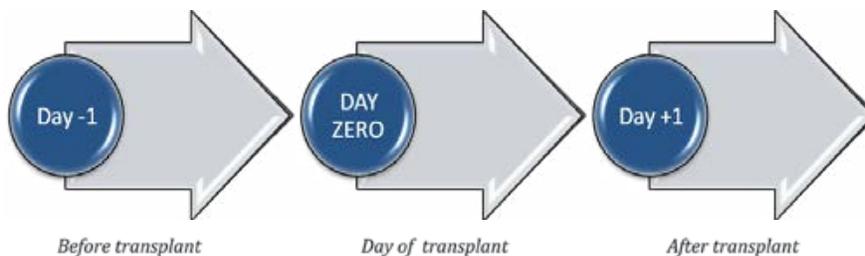
## Apheresis

Apheresis is the process used to collect the healthy stem cells from your blood. An apheresis nurse will oversee the collection of your stem cells before you receive high dose conditioning chemotherapy. He/she will place you on the apheresis machine and will monitor the number of stem cells that are being collected each day. The apheresis nurse will teach you about apheresis and will answer your questions about transfusions of blood or platelets and the use of specific blood donors.

## Infusion of Autologous Blood and Marrow Stem Cells

The new stem cells or bone marrow is administered to replace the diseased bone marrow.

The day of your transplant is referred to as Day Zero. The days before ‘Day Zero’ are referred to as “minus” days, and the days following your transplant are “plus” days. Thus, the day before your transplant is “Day -1” and the day after is “Day +1.”



On Day Zero the infusion of the stem cells or bone marrow takes place in your hospital room. The process is similar to a blood transfusion and is given through your vascular access device (VAD). You will receive medication about 30 minutes before the transplant to help prevent any side effects. These medications may make you sleepy. So please plan on taking your shower early. Even with the pre-medication reactions may still occur, but usually are minimal.

Your frozen stem cells are thawed immediately before infusing, at the patient's bedside. The amount of stem cells infused on your day of infusion is determined by your doctor who will order the number of bags required to deliver the target number of stem cells you require.

Each bag of autologous stem cells will be infused rapidly over five to ten minutes. During the infusion, your nurse will monitor your vital signs and oxygen level. He/she will remain with you until the infusion is completed.

Some common side effects you may experience during your stem cell infusion include nausea, vomiting or a cold sensation due to the rapid infusion of cells.

To preserve the stem cells, we have added dimethyl sulfoxide (DMSO). This may cause a very strong oyster or garlic like odor in your room for two to three days after your stem cells have been infused. During the infusion you may experience an unpleasant taste in your mouth from this stem cell preservative. We suggest that you bring some hard candy with you to the hospital to help mask that taste. This taste will dissipate once the infusion of the cells is complete.

## **Engraftment**

Engraftment is the point when your "new" stem cells or marrow begins to make white blood cells, red blood cells and platelets. After you have received your marrow or stem cells your blood counts will be checked daily to determine if or when engraftment begins. Engraftment usually occurs 10 to 30 days after day zero of your transplant. Remember that all patients are different and the length of time to engraft varies from one person to another.