

ORGAN TRANSPLANTATION



Organ transplantation is surgery to replace a damaged body organ with a healthy one. Organ transplantation is not new. In 1909, an experimental kidney transplant was done, followed by animal model successes in 1933, and then transplantation of organs in identical twins in 1954. In 1957, the first safe bone marrow cells were infused into a human. In the 1960s, kidney transplantations, liver transplantation, and the first heart transplantation were successfully performed. The rejection of donor tissue was researched and advanced with the introduction of immunosuppressive drugs (agents that lessen or prevent an immune response that causes an organ rejection). In the 1990s, newer immunosuppression drugs (steroids and cyclosporines) were introduced. Although immunosuppression drugs are quite successful in controlling the rejection of a transplanted organ, they continue to be a problem because of the side effects, the complications, and the nonimmune toxicity that leads to high morbidity (illness or unusual condition) and mortality (death) rates. The instances of transplantation has broadened and with most organs, a waiting list of suitable donors is increasing.

The most successful factor in a transplantation is in the matching of antigens that are different in the cells of each person. Registries, donor cards on driver's licenses, and retrieval teams were organized, but the ongoing problem of the availability of matching donors limits most transplant programs.

Careful selection of the donors, good matching of tissue-typing, and adequate support systems for the patient helps reduce the death rates from a transplantation.



CLASSIFICATION OF TRANSPLANTATION

Autograft or Autoplastic (Homoplastic) Transplantation of tissue from one part to another part of the same body.

Allograft Transplantation of an organ between two persons who are not identical twins (different genes).

Isograft Transplantation of a compatible tissue or organ between identical twins.

Heteroplastic Transplantation of a part from one individual to another individual of the same or closely related species.

Heterotopic Transplantation where a transplant is placed in a different location in the receiving patient than it had been in the donor.

Homotopic Transplantation in which the transplant occupies the same location in the receiver as it had in the donor.

Xenograft The tissue of an animal transplanted to a human.

TYPES OF TRANSPLANTATION

■ BONE MARROW TRANSPLANTATION

The bone marrow is the soft spongy material that fills the cavities of the bone. The marrow is active tissue with a rich blood supply and produces most of the blood cells (including all red blood cells and platelets) and most of the white cells. The bone marrow is sensitive to radiation, chemotherapy and many diseases. In some cancers, eg leukemia, the bone marrow cells are all replaced by the cancer cells. Bone marrow transplantation is a technique that offers hope to seriously ill people with aplastic anemia, immunodeficiencies, and certain cancers. Other less frequent cancers for bone marrow transplant consideration is testicular cancer, neuroblastoma, trophoblastic, and ovarian cancer. In cancer treatment, the existing bone marrow is destroyed by doses of chemotherapy and/or radiation. The marrow or stem cells are collected from the patient (autologous) prior to treatment, from a donor (allogenic), or from an identical twin (syngenic). The marrow or stem cells are infused following the high dose therapy.

When someone is diagnosed with a disease that requires a bone marrow transplant, the members of the patient's immediate family will be asked if they are willing to be a bone marrow donor. To find the necessary compatibility within these family members, a tissue typing test must be performed. This test is a blood test which determines HLA (Human Leucocyte Antigen) tissue type. The potential bone marrow donor must have the same HLA tissue type as the patient. A Leucocyte is a white blood cell; an antigen is a substance on the surface of that cell. The HLA tissue typing identifies a donor by the unique antigens on the blood cell. Compatibility of tissue type cannot be predicted by external factors common to family members, such as similar hair or eye color, blood group or sex. On average, one out of every three people who need a bone marrow transplant will find a suitable donor in his/her immediate family. Brothers and sisters have about a one in four chance of being a match with each other.



■ LIVER TRANSPLANTATION

Liver transplantation is being performed frequently and with great success. It is often performed on people with potentially fatal, nonmalignant liver diseases (severe liver failure or some types of cirrhosis). Young children who are born with liver disorders can now be given liver transplants. Patients who are not eligible for this transplant include those with active alcohol or chemical abuse, metastatic (spread to other body parts) cancers, non-liver primary cancer, HIV positive status, angiosarcoma, and other serious diseases.

■ HEART TRANSPLANTATION

Heart transplantation is used when someone has severe, life-threatening (end-stage) heart complications where there are no other options or possibilities for any other type of treatment. A heart transplant may be needed for congestive heart failure, coronary heart disease, or cardiac arrhythmias (irregular heartbeats). There are many processes which much take place prior to heart transplantation. Other organ systems must be monitored for disease, as this could rule out the possibility of a heart transplantation. The patient must have histocompatibility matching (tissue typing) done to identify the requirements that will be needed in his/her donor's heart. This information is submitted to organ donation banks, at which time the patient begins the waiting period until a new heart is found. As there is always a shortage of available organs for transplantation, a patient could wait for a long time, or even die before an acceptable heart is found. If, however, the patient receives a heart transplantation, immunosuppressive drug therapy (antirejection medication) will be required for the balance of his/her lifetime. Research shows that there is a significantly higher success factor with transplants that have been performed at "high volume" medical facilities...that is, hospitals and medical centers who regularly perform the largest numbers of transplants.

■ HEART-LUNG TRANSPLANTATION

Heart and lung transplants present several problems, predominantly the lack of suitable donors with normally functioning heart and lungs. Pulmonary changes and infections tend to occur very soon after a donor's death, and because it is difficult to preserve the heart and lung "block," the donor must be near the recipient's hospital when the organs are removed so that surgery can be performed immediately. The complication and rejection rates are higher than heart or lung transplants done alone.



■ LUNG TRANSPLANTATION

For a few persons with serious end stage lung disease (young adults with cystic fibrosis, adults with chronic obstructive pulmonary disease (COPD) or emphysema, idiopathic pulmonary fibrosis, or primary pulmonary hypertension, lung transplantation is an option. The selection procedure is extensive and includes the presence of end-stage lung disease that does not respond to medical therapy, a favorable physiological age (usually less than 65 years of age), compliance, absence of other debilitating diseases or conditions, a favorable support system, and a donor with HLA, ABC Phenotype compatibility. The patients who are ineligible for lung transplantation are those with active system infections, irreversible systemic disease, active tobacco use, drug and alcohol abuse, or a malignancy (cancer). The success rate for lung transplantation is less favorable than heart transplantation.

■ KIDNEY TRANSPLANTATION

With modern technology, kidney transplantation is less risky than other organ transplants. Rejection of a kidney is not necessarily fatal because the patient can be kept alive with an artificial kidney machine through dialysis. Dialysis and kidney transplantation are the only two treatment options for persons with end-stage renal disease. Suitable candidates are selected carefully. Sibling donors are good candidates for donating an organ. When a relative is not available as a donor, tissue-typing centers throughout the country are contacted to help locate acceptable donors from accident victims or others who have offered to donate their kidneys after death (cadaver kidney). Cadaver kidneys must be transplanted within 48 hours of the death of the donor. After the transplantation, the recipient receives immunosuppressant drugs to keep his or her body from rejecting the “foreign” kidney. Immunosuppressive drugs, such as cyclosporine and corticosteroids, are used. Candidates must be shown to be of a compliant behavior, psychologically stable, under 60 years of age, and in generally good physiological condition other than the renal disease. Although the outcome is more favorable with a blood relative donor, the chances of success of the kidney functioning after one year is 80 percent. If the kidney is rejected, a second or third transplantation can be performed. Careful medical follow up and support are important to the success of the transplantation.

■ KIDNEY-PANCREAS TRANSPLANTATION

When a kidney transplant is done in a diabetic patient, a combination kidney-pancreas transplant can be considered at the same time. Diabetics who do not need a kidney transplant can be transplanted with a pancreas — with increased technical risks and complications from the immunosuppressive therapy. If successful, the need for insulin can be eliminated or reduced. The success rate is about 60 percent.



■ PANCREAS TRANSPLANTATION

Transplantation of a pancreas is usually performed in association with a kidney transplant for end stage renal disease which is secondary to diabetes mellitus. It is technically difficult to both harvest the organ and transplant the organ. This transplant has a higher rejection rate but when successful, can eliminate the need for the hormone, insulin, in treating the diabetic patient.

■ CORNEAL TRANSPLANTATION

If eyesight is greatly impaired by scarring or opacity of the cornea, transplantation may be possible. Because there is no blood supply involved, immunological rejection does not occur. However, it cannot be done if there is any infection in the eye. Often, tissue-typing is done to help ensure a good match between the recipient and the donor cornea. The donor cornea can be preserved in a special solution for several days, if necessary, before the surgery. Complications include failure of the graft, increased intraocular pressure (glaucoma), and retinal detachment.

■ LIGAMENT REPLACEMENT

Ligament replacement, as in the anterior cruciate ligament of the knee, is possible using cadaveric ligaments which are frozen until needed. There is a ligament bank of frozen ligaments which is available for this use.

■ BLOOD DONATION

The availability of blood donated by volunteers is an integral part of the organ donor program. More than 14 million pints of blood are donated and used each year.



TRANSPLANT DIFFICULTIES

The most common causes of transplant difficulties are through the action of white blood cells and antibodies in the body that treat the new organ as a foreign body and try to destroy it (rejection). Donated organs are matched to the patient's tissue type as closely as possible, but a perfect match is extremely difficult. To prevent rejection of a transplanted organ, the body's immune response must be "counterbalanced" by treatment with immunosuppressive drugs. The development of these drugs has resulted in fewer side effects and has improved the survival rates of transplant patients.

TRANSPLANT COMPLICATIONS

The complications include adverse side effects of the cytotoxic treatment, early infection (before 100 days), graft failure, graft-versus-host disease (HLA disparity causing graft rejection), late infections (after 100 days), relapse of the disease being treated, and long term complications. Carefully matched blood products, administered antibiotics, isolation techniques, and hematopoietic growth factor availability are improving the process. In specialty centers, experienced clinicians and nursing staffs, available outpatient facilities, pharmacies, nutritional support services, and administration support help to decrease the complications.

EXPERIMENTAL TRANSPLANTATION

With the success of transplantation, the discovery of immunosuppressive drugs, and the advancement in surgical techniques, research is currently in progress for the transplantation of multiple tissues, particularly in degenerative diseases where there is the inability to function, such as Parkinson's disease.

Donor fetal tissue and the placenta are now being used to aid in the treatment of some diseases. Scientists and research are continually striving to find a way to encourage the body's immune system to accept these selected "foreigners."

ORGAN AND TISSUE DONATION

At the present time, there are almost 60,000 people waiting for an organ transplant. While waiting, people die each day because there are no organs available to save their lives. The following questions and answers will help you to understand what it means to donate your organs, and perhaps assist you in making the decision to give a "gift of life."



CLASSIFICATIONS OF DONORS

Syngeneic The donor of a syngeneic transplant is an identical twin of the recipient. The recipient is not at risk for severe reaction to the transplant.

Allogenic The donor may be a brother, sister, or parent of the recipient or from an unrelated donor. In order to establish the compatibility of the potential donor bone marrow, a test for human lymphocytic antigens (HLA) is done to see if there is a match. In unrelated donors, a National Bone Marrow Registry has been set up to help locate HLA matched donors.

Autologous (self-donating) The bone marrow donor is from the person with the cancer. The cells are collected prior to the anticancer treatment and returned following high doses of chemotherapy or radiation. There is no risk of graft-versus host disease in autologous transplantation.

■ HOW DO I BECOME AN ORGAN OR TISSUE DONOR?

Discuss it with your family. Making these wishes known to your loved ones is the most critical issue concerning organ donation. This avoids any delays in providing organs and tissues upon your death. Many family members will find it uncomfortable to decide this after your death, so make your intentions clear to them since many states require a family member's consent before organs or tissues are removed. Also, sign a "Uniform Donor Card" in the presence of two witnesses, preferably those family members who are aware that you wish to be an organ donor. Keep the organ donor card in your wallet.

■ WHAT IS THE COST OF DONATING ORGANS AND TISSUE?

There is no cost associated with organ donating. It is against the law to buy and sell human organs and tissues. The OPO (Organ Procurement Organization), a federally-designated organization, pays for all costs involved in the organ donation and recovery.

■ WHAT CAN BE DONATED?

The heart, liver, lungs, pancreas, kidneys, heart valves, corneas, tissue, bones, skin, tendons, and ligaments (see illustration on previous page).

■ HOW ARE THE DONATED ORGANS DISTRIBUTED?

The distribution is managed by regional organ banks that are linked by a computer to a national network that allows for a prompt matching of donors and recipients.



■ **IF I WERE TO DONATE MY ORGANS, WOULD MY FAMILY EVER BE TOLD WHAT ORGANS WERE USED, AND TO WHOM THEY WERE GIVEN?**

Many organ procurement agencies send out letters to the donor's family, telling them which organs were used, the age of the recipient, and occasionally, other information about the recipient.

■ **DOES ORGAN DONATION VIOLATE RELIGIOUS TEACHINGS OR BELIEFS?**

Organ donation is currently consistent with the beliefs of all major religions. If you are unsure, consult with your clergy for advice.

■ **WHAT IF I CHANGE MY MIND?**

If you change your mind, simply destroy your organ donor card.

■ **HOW ARE MY ORGANS REMOVED FOR DONATION?**

Donated organs are surgically removed from the deceased donor in a routine operation similar to gallbladder or appendix removal. Normal funeral arrangements are possible — there are no visible signs that an organ(s) has been removed.

■ **HOW WILL MEDICAL PERSONNEL KNOW THAT I AM A DONOR?**

They will know if you carry a "Uniform Donor Card," which is widely available (or receive one by mail by calling the Coalition on Donation at 1-800-355-SHARE). You should also contact the driver's license bureau to make arrangements for a donor notation to be applied to your driver's license.

■ **MUST I DONATE ALL OF MY ORGANS?**

No. You may specify which organs you wish to donate. Your wishes will be followed.

■ **IF I AM IN AN ACCIDENT AND AM TAKEN TO THE HOSPITAL FOR MEDICAL CARE, WOULD THE DOCTORS NOT TRY TO SAVE MY LIFE IF THEY KNOW I AM PLANNING TO DONATE MY ORGAN(S)?**

No. The medical team treating you is separate from the transplant team. The Organ Procurement Organization is not notified until all lifesaving efforts have failed and death has been determined. The OPO does not notify the transplant team until your family has consented to the donation of your organ(s).



■ WHO CAN BECOME AN ORGAN DONOR? ARE THERE AGE LIMITS FOR DONATING YOUR ORGANS?

Everyone can indicate their intent to donate their organs; organs may be donated by someone as young as a newborn. The medical suitability of each organ is determined at the time of death.

■ IF I DONATE MY ORGANS, COULD THE RECIPIENT OR HIS/HER FAMILY DISCOVER MY IDENTIFY AND TRY TO CONTACT MY FAMILY?

Information about the donor is released by the OPO to the organ recipient only if the family that donated requests that their name(s) be provided.

■ CAN YOU DONATE CERTAIN ORGANS WHILE STILL LIVING?

Yes. You can donate blood safely every eight weeks (contact your local branch of the American Red Cross for more information). You can donate bone — if you are going to have total hip replacement surgery, you can donate the bone that is going to be removed from your body (contact the American Red Cross at 1-800-GIVE-LIFE for more information). You can donate bone marrow (talk with your family physician or health care provider). Finally, you can donate a kidney, part of your liver, or part of your lung. If you have ties to relatives, friends, or others who need one of these organs, contact that person's transplant center to see if you could be a potential candidate.



THE STEPS INVOLVED IN ORGAN DONATION AND TRANSPLANTS

1. A potential donor who has been diagnosed as “brain dead” (see below for explanation of brain death) must be identified.
2. The next-of-kin must be informed of the opportunity to donate their relative’s organs and tissues and must give their permission.
3. An Organ Procurement Organization is contacted to help determine organ acceptability, obtain the family’s permission, and match the donor with the most appropriate recipient(s). If permission is granted, a search is made for the most appropriate recipient(s) using a computerized listing of transplant candidates which is managed by the United Network for Organ Sharing, which operated the National Organ Procurement and Transplantation Network.
4. It is common for donors and their families to contribute multiple organs and tissues, therefore several recipients may be helped by a single donor. Organ(s) and tissue(s) are first surgically removed from the donor, and preserved for transport.
5. The donor organs and tissues are transported to the transplant center(s) where the recipient will have his/her diseased organ removed, and the donated organ implanted.

UNDERSTANDING DEATH OF THE BRAIN AND BODY

When someone is “brain dead” they have no blood flow or oxygen going to their brain. It also means that their brain is no longer functioning in any way, and never will function again. A person who is brain dead can never live again; the brain cannot recover from death. It does not, however, mean that other organs (such as heart, kidneys, liver) are dead, although they may continue functioning for only a few days after brain death.

You cannot kill someone who is brain dead by removing life support — that person is already deceased. Life support is merely keeping the organs temporarily functioning. It is important to understand a heart will continue to beat, as long as it is supplied with oxygen (life support). The heart could even continue to beat if it was removed from the body, placed in a jar full of saline solution, and given oxygen. This is to illustrate that the heart can continue to beat, even though the brain is dead.

Ordinarily, a physician will record the time of death as the time that “brain death” occurs, even if life support continues to be administered. Medically and legally, a person is dead at the time of brain death. The failure of many organs begins to take place upon brain death.

It is difficult to accept the death of a loved one. It must be emphasized, however, that when a family member has been declared brain dead, it is time that the deceased’s family will need to consent to the organ donations, and Federal law requires that all families of brain dead patients be offered the option of organ and tissue donation from the deceased.



UTAH TRANSPLANT CENTERS AND CONTACTS

LDS HOSPITAL

8th Avenue & C Street, Salt Lake City, UT 84143

Phone (801) 321-1085

Contacts UNOS (United Network for Organ Sharing) Representative (801) 321-3095
Director, Heart Transplant Program (801) 321-3095
Director, Lung Transplant Program (801) 321-3095
Clinical Coordination (801) 321-3090

PRIMARY CHILDREN'S MEDICAL CENTER

100 North Medical Drive, Salt Lake City, UT 84113

Phone (801) 588-2600

Contacts UNOS (United Network for Organ Sharing) Representative, (801) 588-2600
Director, Kidney Program (801) 581-7738
Director, Heart Program, (801) 581-7304
Clinical Coordinator (801) 588-2608.

UNIVERSITY OF UTAH MEDICAL CENTER, SALT LAKE CITY VA MEDICAL CENTER

50 North Medical Drive, Salt Lake City, UT

Phone (801) 581-7738

Contacts UNOS (United Network for Organ Sharing) Representative (801) 583-7738
Program Administrator (801) 581-2121
Director, Lung Program (801) 584-1239
Clinical Coordinator (801) 585-3693

