ASHI
AMERICAN SOCIETY FOR HISTOCOMPATIBILITY & IMMUNOGENETICS
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About Histocompatibility and Immunogenetics

Specialists in the field of Histocompatibility and Immunogenetics work hard to provide transplant patients with organs and bone marrow that have the best chance of long term success. Through organizations such as ASHI, they are always learning the latest techniques and scientific advances. Their knowledge and skills are utilized by transplant surgeons, transplant physicians, transplant coordinators, and organ procurement coordinators as part of a team effort.

Histocompatibility is the state in which a donor and recipient share antigens so that a graft is accepted and remains functional. Also, refers to the study of factors that determine the acceptance or rejection of grafted tissues or organs. Histocompatibility testing is the performance of assays to determine whether recipient and donor are histocompatible.

Immunogenetics is the study of immunity to disease and the relationship to genetic make-up.

What that means:
Histocompatibility antigens are proteins on the surface of the cells in the body. Their main function is to help the immune system defend against invaders such as bacteria, viruses, and parasites. The immune system can also recognize as foreign the histocompatibility antigens of other people's cells and will fight them, causing rejection of grafts.

Histocompatibility antigens in humans are called HLA (for Human Leukocyte Antigens). There are many different HLA antigens, but the ones that seem to be most important for transplantation are HLA-A, HLA-B, and HLA-DR.

HLA antigens are very “polymorphic.” That means that in a population they can be found in many different forms. There are more than 25 forms of HLA-A, more than 50 forms of HLA-B, and more than 15 forms of HLA-DR. These different forms are caused by slight differences in the amino-acids that make up the proteins.

A person’s genes are the blueprints that tell cells how to organize the amino-acids to make the proteins. The HLA genes are on chromosome number six. These genes are passed down from parent to child. Each person gets two copies of each gene, one copy from the father and one from the mother. So a child will not match either parent exactly, but will be half of a match. Because each parent has two copies of each gene, there are four possible combinations of genes that they could pass down to their children. Therefore, most of the children in a family will not completely match each other. The chance that a given child will have completely the same HLA antigens as those of a brother or sister is only a 25%.

Histocompatibility antigens have been shown to play an important role in certain infectious diseases. In addition, the HLA antigens are involved in immune diseases such as diabetes, rheumatoid arthritis, and others.

Transplantation is a procedure in which an organ or tissue that is damaged and not functioning is replaced with one obtained from another person. Transplants from identical twin donors are not rejected, because all the genes are identical. Transplants from HLA-identical siblings are matched for all the major transplantation antigens (HLA) and also do very well.

Matching. Because HLA antigens can be recognized as foreign by another person's immune system, transplant professionals try to match as many of the HLA antigens as possible, between the donated organ and the recipient. That way, there is less of a chance that the recipient's body will reject the organ. In order to do this, the HLA type of every potential organ recipient is determined before they are placed on the waiting list. When a potential organ donor becomes available, the donor's HLA type is determined as well. A match program is run through the United Network for Organ Sharing (UNOS) and the best possible recipient for each organ is chosen. Further tests, known as crossmatches, are performed to make absolutely sure that the donor organ is suitable for the recipient.

HLA typing is performed in laboratories by trained Histocompatibility Technologists. It is typically performed using blood drawn from a person's arm. Using various laboratory techniques, the blood can be separated into components such as red blood cells, white blood cells, platelets, plasma, and serum. HLA typing is performed on a fraction of the white blood cells known as lymphocytes. Within the last few years, techniques using DNA for HLA typing have evolved. These techniques have enabled us to discriminate even more of the different forms of each HLA antigen.

Crossmatching is performed using serum from the recipient which is reacted against lymphocytes from the donor.

Each organ has different requirements for HLA antigen matching. For instance, kidneys are sensitive to graft rejection, so every effort is made to transplant the best possible matches. On the other hand, livers are less sensitive to rejection, so HLA matching is not as high a priority. Hearts and lungs fall somewhere between, and the effects of matching on pancreas and small bowel transplants are still being studied. Studies are also ongoing to determine which of the HLA antigens are the most important to match, which other antigens play a role, and what other factors affect organ transplant success.

Transplants of Bone Marrow. In cases of failure of the blood-forming cells due to disease or due to the effect of treatment with drugs used for the elimination of cancer, bone marrow transplants can be performed to restore the patient's blood and immune system. Bone marrow transplants have also been used to cure genetic diseases such as inborn errors of metabolism, in which a patient's cells cannot produce a key enzyme. Bone marrow transplants require an even higher level of HLA antigen matching, because not only are they susceptible to graft rejection, they can also lead to "graft versus host disease" in which the transplanted bone marrow cells attack and injure the tissue of the recipient. Because graft versus host disease can be fatal or lead to chronic illness, the best matched marrow possible is given. This is typically from an HLA-matched brother or sister. Because not all patients have an HLA-matched sibling, marrow from another well-matched relative can also be used. If none are available, a search for a match can be performed through the National Marrow Donor Progam (NMDP) which has a computerized list of the HLA types of over 1.8 million people who have volunteered to donate some of their bone marrow to a patient who needs it to live.

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