MEDIRES
Symbol of Quality Research

Archives of Immunology Research and Therapy
info@mediresonline.org

ISSN: 2836-5003 REVIEW ARTICLE

# Perspective of Human Leukocyte Antigen Testing

Nnodim Johnkennedy[1]*, Nwaokoro Joakin Chidozie[2], ugwuibe Nkemakolam Jonah[1]

[1]*Department of Medical Laboratory Science, Imo State University, Owerri Nigeria*
[2]*Department of Public Health, Federal University of Technology, Owerri, Nigeria*

***Corresponding Author:*** Nnodim Johnkennedy, Department of Medical Laboratory Science, Imo State University, OwerriNigeria.

**Received Date**: September 13, 2022; **Accepted Date**: September 26, 2022; **Published date**: December 05, 2022

**Citation:** N. Johnkennedy, N. J. Chidozie, ugwuibe N.J., (2022). Perspective of Human Leukocyte Antigen Testing. Archives of Immunology Research and Therapy. 1(1). DOI: 10.58489/2836-5003/001



## Abstract

Most of the cells in the body have proteins or markers called human leukocyte antigens (HLA). To determine which cells, belong in the body and which do not, the immune system uses HLA. Human leukocyte antigen (HLA) typing is used to match recipients and donors for bone marrow or cord blood transplants. The human major histocompatibility complex (HLA) is located on the short arm of chromosome 6, and it is a complex of genes that encode cell-surface proteins necessary for immune system regulation. It is well known that this human genetic system is the most polymorphic. HLA class I and class II molecules' biological function is to present antigens that have been processed into peptides. HLA was initially just a list of antigens discovered as a result of transplant rejection. HLAs are alloantigens that range from person to person due to genetic variance. In essence, every person's immune system is tailored to the distinct HLA and self-proteins produced by that person; when tissues are transferred to another person, however, things go wrong. Individuals almost always have different "banks" of HLAs, which causes transplant rejection because the recipient's immune system mistakes the transplanted tissue for non-self and kills the foreign tissue. HLAs were found as a result of this realization.

***Key Words:*** *Human Leukocyte Antigens (HLA), immune system, histocompatibility*

## Introduction

The human leukocyte antigen test, or tissue typing detects antigens on white blood cells that predict tissue compatibility for organ transplantation. The Major Histocompatibility Complex (MHC), contains human leukocyte antigens (HLA). It is a unique protein that is present on the surface of every nucleated cell in the body as well as the genes that produce it. The surface of a person's white blood cells (leukocytes) and other cells with a nucleus is covered with an inherited mix of HLA antigens. A person's primary HLA genes and the accompanying antigens that are found on their cell surfaces can be determined by HLA testing [1].

The MHC system and these antigens are crucial for the control of the immune system. They assist the body's immune system in differentiating between "self" and "foreign" or "non-self" cells. Any cell that is regarded as "non-self," including antibodies, can cause an immunological response. Production [2].

When transplanting an organ, this is essential in medicine. For a bone marrow transplant to be effective and for the tissue to not be attacked or rejected by the recipient's immune system, the HLA genes in the donor and recipient must match as closely as possible. In fact, there must be a close match between bone marrow donors and receivers for the immune cells (lymphocytes) in the donated bone marrow to avoid attacking the recipient's cells in a process called graft-versus-host disease [4].

Antigen compatibility between the donor and recipient is desirable in kidney or lung transplants, but typing

incompatibilities are less important as long as the recipient has not generated antibodies that are specific to the donor's antigens. To reduce organ rejection, many medications could be given to help suppress the recipient's immune system. When the donor organ and the intended recipient are compatible, it is more possible that the recipient will recognize the organ as "self" and not reject it. Blood group testing and HLA testing are both used to locate and match organ and tissue donors with recipients who share the same or a sufficient amount of HLA genes and antigens [4].

It goes without saying that it can be challenging to find a donor who is compatible with the intended recipient. The fact that each specific HLA gene can take on a wide variety of forms or variants is one factor. Finding a suitable donor might be difficult because there are so many distinct HLA gene combinations that could occur. However, haplotypes—groups of HLA genes that are closely spaced, as observed on chromosome 6—are inherited jointly; a kid inherits one haplotype from each parent. Due to this, family members are more likely than unrelated potential donors to share the same group of HLA genes. A recipient's parents, kids, or siblings are frequently the best transplant matches [5].

Matching organ and tissue transplant recipients with compatible donors is the main purpose of HLA testing. Different types of transplants demand various degrees of compatibility between the intended recipient and the donor. This could affect the HLA tests that are run and the HLA genes that are examined.

In order to evaluate compatibility, HLA testing normally consists of three parts:
Identifying HLA alleles is required for the HLA typing of donors and recipients. It could involve molecular (DNA) typing or serological HLA testing.

HLA testing is done on family members who voluntarily give bone marrow or organs to determine if they are a match for the relative in need of the donation [6].

Receivers are subjected to an HLA antibody test to see if any antibodies exist that might be directed against the donated organ or tissue. After being exposed to non-self-antigens, some people have produced HLA-specific antibodies. Pregnancy, especially numerous pregnancies (due to exposure to the father's HLA that has been passed on to the fetus), blood or platelet transfusions, or previous organ donation are the three main causes of exposure to non-self HLA (s). HLA antibodies must be taken into account during matching because they may assault donor tissues that have the relevant HLA type if they become present [7].

To find out if the person awaiting a matching organ has produced new HLA antibodies, HLA antibody testing may be repeated and updated on a regular basis. After a transplant, HLA antibody testing can be performed to detect whether the receiver has produced more or different antibodies against the donor [8].

Once a possible donor has been found, the next stage is lymphocyte crossmatching (donor-specific). It helps establish whether the recipient is immune to the antigens found in the donor's lymphocytes. T and B lymphocytes from the donor's white blood cells are combined with serum from the intended recipient. Any reaction (a positive outcome) would suggest that the two are probably incompatible. Always consider the donor's HLA typing and the recipient's known antibody specificities when interpreting the crossmatch result [3].

Testing for the HLA gene can occasionally help in the diagnosis of some autoimmune illnesses. One of the systems responsible for the body's detection of "self" and "non-self" antigens and the immune response to foreign substances is the HLA system. The body will occasionally unintentionally create antibodies against one's own cells (autoantibodies). Some of these autoimmune processes have been linked to specific HLA gene alleles [9].

When it is initially decided that a person has to have an organ or bone marrow transplant, HLA and antibody testing is frequently carried out. A recipient of bone marrow, however, may not be subjected to antibody testing. Results from HLA testing won't alter with time [6].

Testing for HLA antibodies can be done on a prospective recipient on a regular basis and after certain occurrences, including a pregnancy or blood transfusion, to determine whether they have produced any new HLA antibodies. HLA antibodies can occasionally form in people who often undergo blood or platelet transfusions. It could be required to identify

the antibodies and periodically check on them. After the transplant, HLA antibody testing is also used to evaluate whether the receiver has produced more or different antibodies against the donor's transplanted organ [10].

In addition to other evaluations like a tissue biopsy sample of the transplanted organ, the presence of antibodies to donor antigens may suggest that the recipient is undergoing organ rejection. To diagnose and handle the rejection, the doctor needs this information [2].

HLA typing is done on family members who volunteer to be transplant donors to determine if they are a good match for a relative in need of a kidney, liver, lung, bone marrow, or other type of transplant. On unrelated people who sign up for the donation register to become bone marrow donors, HLA typing is also carried out [7].

HLA testing is carried out on organs from deceased donors in order to match them as fast as feasible to a potential receiver or recipient. A few hours to no more than a day or two are necessary to assure the optimum viability of the organs or tissues [4,6].

After a possible donor has been located using HLA typing, crossmatch testing is conducted. In order to make sure that there is no mismatch, this test might be done soon before an organ transplant. When using living donors, the crossmatch compatibility test is typically run twice: once when the donor is first discovered and once right before the transplant itself [10].

## Conclusion

The laboratories that focus on histocompatibility and immunogenetics carry out HLA testing. Testing donors and recipients to see whether their HLAs match

## Conflict Of Interest

The authors declare no conflict of interest.

## References


1. Hudson, L. E., & Allen, R. L. (2016). Leukocyte Ig-like receptors–a model for MHC class I disease associations. *Frontiers in immunology*, *7*, 281.
2. Klein, J. (1986). *Natural history of the major histocompatibility complex*. Wiley.
3. Shankarkumar, U. (2004). The human leukocyte antigen (HLA) system. *International Journal of Human Genetics*, *4*(2), 91-103.
4. Nakamura, T., Shirouzu, T., Nakata, K., Yoshimura, N., & Ushigome, H. (2019). The role of major histocompatibility complex in organ transplantation-donor specific anti-major histocompatibility complex antibodies analysis goes to the next stage. *International journal of molecular sciences*, *20*(18), 4544.
5. Burrows, S. R., Rossjohn, J., & McCluskey, J. (2006). Have we cut ourselves too short in mapping CTL epitopes?. *Trends in immunology*, *27*(1), 11-16.
6. Robson, K. J., Ooi, J. D., Holdsworth, S. R., Rossjohn, J., & Kitching, A. R. (2018). HLA and kidney disease: from associations to mechanisms. *Nature Reviews Nephrology*, *14*(10), 636-655.
7. Matsumura, M., Fremont, D. H., Peterson, P. A., & Wilson, L. A. (1992). Emerging principles for the recognition of peptide antigens by MHC class I molecules. *Science*, *257*(5072), 927-934.
8. Nunes, J. M., Buhler, S., Roessli, D., Sanchez-Mazas, A., HLA-net 2013 collaboration, Andreani, M., ... & Vidan-Jeras, B. (2014). The HLA-net GENE [RATE] pipeline for effective HLA data analysis and its application to 145 population samples from Europe and neighbouring areas. *Tissue antigens*, *83*(5), 307-323.
9. Ryan, S. O., & Cobb, B. A. (2012, May). Roles for major histocompatibility complex glycosylation in immune function. In *Seminars in immunopathology* (Vol. 34, pp. 425-441). Springer-Verlag.
10. De Villartay, J. P., Rouger, P. H., Muller, J. Y., & Salmon, C. (1985). HLA antigens on peripheral red blood cells: analysis by flow cytofluorometry using monoclonal antibodies. *Tissue antigens*, *26*(1), 12-19.
11. Mosaad, Y. M., Farag, R. E., Arafa, M. M., Eletreby, S., El-Alfy, H. A., Eldeek, B. S., & Tawhid, Z. M. (2010). Association of human leucocyte antigen Class I (HLA-A and HLA-B) with chronic hepatitis C virus infection in Egyptian patients. *Scandinavian journal of immunology*, *72*(6), 548-553.