

# Human Leukocyte Antigen and AIDS in African American Communities

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## Abstract

Today, in the African American community a prevalence of HIV (Human Immunodeficiency Virus) infection or AIDS (Acquired Immunodeficiency Syndrome) exists with many people unaware of their health status or illness. They accounted for only 13% of the U.S. population but for 47% of AIDS cases diagnosed in the United States in 2006. Some decide to never get tested to discover one's HIV status, this may be the case due to lack of knowledge of the disease and that there is medication that can help maintain the immune system so that AIDS does not manifest. But, this may still be too taboo for the masses of the black community because contracting and living with HIV or AIDS is a "death sentence". Perhaps, with effective prevention and intervention the black community could potentially lessen the rate of new HIV related cases. This paper is intended to illustrate the relation between human leukocyte antigen (HLA) and HIV in the African American community.

## Introduction

Human leukocyte antigen is a protein (or marker) found on most cells in your body and is used to match you with a donor for your bone marrow or cord blood transplant. The best transplant outcome happens when a patient's HLA and the donor's HLA closely match (HLA matching) [1]. HLA class I restriction with cytotoxic T-cell lymphocytes (CTL) plays a key role in the immune response to and destruction of virally infected cells. The HLA system has since been found associated with resistance to many different viruses, and a variety of studies have reported an HLA association with human immunodeficiency virus transmission and disease progression leading to AIDS. Once exposed to the virus the human body begins a slow progressive degeneration of the immune system, characterized by a decline of CD4+ T cells, with the absence of medication as a regulator, eventually results in immunodeficiency or opportunistic infections, and death. However, there are, HIV-positive persons who have not required treatment and continue to survive and do well despite the HIV-1 infection. There are many host immunogenetic factors that may modulate the clinical variations of HIV-1 disease, and the HLA system in particular has been implicated as a critical influence on the clinical course of HIV infection [2].

Apart from playing its role in the onset of many inflammatory diseases, the course of HIV infection differs among individuals and is thought to be partly related to host-factor variability, reflecting broad genetic heterogeneity. The polymorphic human leukocyte antigens are herein analyzed intensively with respect to this relationship. Cytotoxic T lymphocyte responses, activated by HLA antigen presentation, are concerned in the control of HIV replication. An immunological explanation for the protective role for HLA B27 in HIV disease is that B27+ patients have a specific and strong CTL response against the p24 epitope, a conservative HIV protein that does not easily mutate. Some HLA genes seen in long-term non-

progressors (LTNP) (>10 years disease free) are associated with a favorable prognosis. One of the alleles found predominantly in LTNPs is HLA-B27. More genetic factors seem to influence disease progression in HIV infections, it would be interesting to further explore the influence of the genetic makeup of these HIV-infected individuals. Knowledge of the immune genetic profile might give clues for the individual course of the HIV infection, may influence the development of drug-resistant viruses and will possibly lead to a tailored therapeutic strategy in HIV-infected persons [3].

## Leukocyte and HIV relationship

HIV infection often causes anemia, which decreases the number of circulating red blood cells. Blood is made up of a variety of different cells; including red blood cells (erythrocytes), white blood cells (leukocytes), and cells that help in clotting (platelets). Anemia results when there are too few red blood cells because they are being destroyed, are not maturing correctly, or being produced adequately in the bone marrow. Red blood cells carry oxygen throughout the body, if people don't have enough

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red blood cells they begin to feel tired and breathless, and have difficulty concentrating. Severe, untreated anemia may have complications such as heart failure and other organ damage.

Many people with HIV also have problems with their levels of white blood cells. Leukocytes are white blood cells that respond to and protect the body from infection. HIV attacks and destroys leukocytes. When the number of white blood cells decreases, a dangerous condition called leukopenia can develop, which makes the body more prone to infections. The specific types of white blood cells that respond directly to infection are called neutrophils. A decrease in these cells is called neutropenia, and can also seriously impair the body's ability to fight off infection.

People with HIV often have problems with their levels of platelets, making the body slow its production of platelets, or when platelets are destroyed at a higher than normal rate, a condition called thrombocytopenia occurs, this condition makes people bleed and bruise easily.

The drugs used to treat HIV may cause anemia and other blood disorders. The drugs used to treat HIV as well as the drugs used to combat other infections associated with HIV can cause anemia and other blood disorders. This is because these drugs can impair the production of leukocytes, red blood cells, or platelets in the bone marrow [4].

### CD4 count (white blood cells)

CD4 cells (often called T-cells or T-helper cells) are a type of white blood cells that play a major role in protecting your body from infection. They send signals to activate your body's immune response when they detect "intruders," like viruses or bacteria.

Once a person is infected with HIV, the virus begins to attack and destroy the CD4 cells of the person's immune system. HIV uses the mechanism of the CD4 cells to multiply and spread throughout the body. The CD4 count of an uninfected adult/adolescent who is generally in good health ranges from 500 cells/mm<sup>3</sup> to 1,200 cells/mm<sup>3</sup>. A very low CD4 count (less than 200 cells/mm<sup>3</sup>) is one of the ways to determine whether a person living with HIV has progressed to stage 3 infection [5].

### HIV types and strains

HIV type 1 and HIV type 2 are two distinct viruses. Worldwide, the predominant virus is HIV-1, and generally when people talk about HIV without specifying the type of virus they are referring to HIV-1. The relatively uncommon HIV-2 virus is concentrated in West Africa, but has been seen in other countries and less infectious and progresses slower than HIV-1. The strains of HIV-1 can be classified into four groups. The most important group, M, is the 'major' group and is responsible for the majority of the global HIV epidemic. The other three groups are N, O and P. They are quite uncommon and only occur in Cameroon, Gabon and Equatorial Guinea [6].

### HIV-1 Group M subtypes

In the HIV-1 group M there are known to be at least nine genetically distinct subtypes. Additionally, different subtypes can combine genetic material to form a hybrid virus, known as a 'circulating recombinant form' (CRFs), of which quite a few have been identified. The dominant HIV subtype in the Americas, Western Europe and Australasia is sub type B. However, this subtype represents only 12% of global HIV infections.

Currently, there is less research available for subtype C, even though just under half of all people living with HIV have subtype C. HIV subtype C is very common in the high prevalence countries of Southern Africa, as well as in the horn of Africa and India. The greatest diversity of subtypes is found in Cameroon and the Democratic Republic of Congo - the region where the HIV-1 epidemic originated [instigated].

### HIV and Black/African Americans

Blacks/African Americans have the most severe burden of HIV of all racial/ethnic groups in the United States. Compared to other races and ethnicities, African Americans account for a higher proportion of new HIV infections, those living with HIV, and those ever diagnosed with AIDS. Blacks/African Americans accounted for an estimated 44% of all new HIV infections among adults and adolescents (aged 13 years or older) in 2010, despite representing only 12% of the US population [7]. The mt DNA L2 lineage is significantly associated with decline of CD4+ T cells in HAART-naïve HIV-infected individuals of African American descent [8]. A whole-genome association study on HIV-1 viral load set point in an African American cohort, and an intronic SNP in the HLA-B gene showed one of the strongest associations [9].

### Prevention challenges

African Americans face great challenges that contribute to the higher rates of HIV infection. The prevalence of people living with HIV in African American communities and most African Americans tend to have sex with partners of the same ethnicity, which means that they face a greater risk of HIV infection with each new sexual encounter. African American communities continue to experience higher rates of other sexually transmitted infections (STIs) compared with other racial communities in the United States. Too many people are unaware of their HIV status. Diagnosis late in the course of HIV infection is common, resulting in missed opportunities to get early medical care and prevent transmission to others. Lack of awareness of HIV status has fragmented the African American community making the community defenseless against the virus.

These factors may explain why African Americans have worse outcomes on the HIV continuum of care, including lower rates of linkage to care, retention in care, being prescribed HIV treatment, and viral suppression. Many at risk for HIV

fear discrimination and rejection more than infection and may choose not to seek testing.

## Treatment for HIV

HIV is treated using a combination of medicines to fight HIV infection called antiretroviral therapy (ART). Antiretroviral therapy is not a cure, but it can control the virus so that you can live a longer, healthier life and reduce the risk of transmitting HIV to others. The HIV medicines prevent the virus from multiplying, reducing the amount of HIV in your body, gives your immune system a chance to recover and fight off infections and cancers. Antiretroviral therapy is recommended for all people with HIV, if left untreated, HIV will attack the immune system and eventually progress to AIDS [10]. An HIV vaccine would be of enormous benefit to the population.

## Discussion

Health and socioeconomic status have great correlation, being that if you are impoverished you may be at risk for HIV than one that is wealthy having access to prevention and intervention knowledge and skills to not be exposed to HIV. Now, the poverty rate is greater among African Americans than other racial or ethnic groups. The socioeconomic issues linked with poverty are access to decent health care, suitable for human being type housing, and HIV prevention and intervention training, but the African American community is drenched with unawareness, with immoral functions learned from the legacy of “chattel” slavery to be docile and servile unable to be independent or do for oneself. The African American community must heal herself, without any fear, discrimination, homophobia, and negative perceptions about HIV; to promote testing and maintaining ones’ status through medication like antiretroviral treatments (ART).

The concepts of HLA molecules driving the evolution of HIV, together with differential impacts of HLA alleles on disease outcome, raise important questions as the quest for an HIV vaccine continues. The basic concepts outlined provide potential paths toward better defining the components required for effective control of HIV. A better definition of the properties of the CD8 T cells that mediate infected cell killing, and how to enhance this function, remains a priority. The path toward an HIV vaccine has not been easy, and the ongoing evolution of HIV under HLA-associated immune selection pressure is a significant challenge.

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