**Do individuals treated with anti-retroviral therapy revert to the same physiological response as non-infected individuals?**

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The human immunodeficiency virus (HIV) is a virus that attacks the immune system. The immune system is a natural defense against illness. If the virus is left untreated the results are catastrophic. There are about 36.7 million individuals living with HIV today and many of these individuals are unable to receive treatment. Without treatment the immune system can be so severely damaged it can no longer defend itself. This paper introduces the different anti-retroviral therapies (ART) that are offered to HIV positive patients. A group of individuals with human immunodeficiency virus treated with anti-retroviral therapy and non-infected humans were studied to determine whether immune responses were reverted back to normal. How successful anti-retroviral therapy is on the immune system is determined by how early an individual starts treatment after infected. Early treatment of anti-retroviral therapy dramatically restores immune responses compared to late treatment of anti-retroviral therapy. This study compares the immune response of how the early and late treatment of anti-retroviral therapy affects human immunodeficiency virus individuals and how it is different than non-infected individuals.

**Introduction**

The human immunodeficiency virus depletes CD4+T cells, which can progress into acquired immunodeficiency syndrome (AIDS) if left untreated. Acquired immunodeficiency syndrome is achieved when non-infected individuals have a viral load of 500-1,500 CD4+T cells and human immunodeficiency virus infected individuals have a viral load of <200. Anti-retroviral therapy helps suppress the replicating virus and allows CD4+T cells to increase. T cells are responsible for hunting down and destroying cells that are infected, which causes inflammation. Anti-retroviral medications are used to help reduce inflammation. Individuals living with HIV and AIDS are susceptible to many more infections than standard healthy individuals because of their weakened immune system. How early an infected individual begins treatment is the leading factor in how successful anti-retroviral therapy will be.

**Recent progress**

A recent cohort study found that within the first 4 months of HIV infection, there is a narrow ‘restorative time window’ in which the immune system equilibrates after initial CD4+ T-cell losses and thus is poised for recovery, and they observed that starting ART during this period augmented both the rate and extent of CD4+T-cell reconstitution [1]. The purpose of anti-retroviral therapy is to prevent the growth of the chronic virus. Although complete immune restoration is not guaranteed it is the most effective treatment. Age, hepatic impairment, renal impairment, pregnancy, metabolic disorders, neurocognitive decline, bone complications, fragility, and cardiovascular disease are other factors that contribute to how successful treatment may be.

**Discussion**

In a recent study, it was determined that HIV+ individuals begin to age much quicker than non-infected individuals. The progressed aging is due to chronic inflammation caused by depleted CD4+T cells. Chronic inflammation causes most of the factors that help determine how successful ART will be in an HIV+ individual. One common disorders seen in these individuals is metabolic abnormalities. Hypertriglyceridaemia, visceral obesity and lipoatrophy are a few examples of metabolic abnormalities seen in this study. Although there are few metabolic side effects, the effects of chronic immune activation and inflammation remain the major contributor to CVD risk development [2].

Researches preformed a study of the effects of anti-retroviral therapy on patients with human immunodeficiency virus and patients without human immunodeficiency virus. The purpose of this study was to show how the therapy effects non-infected humans. Integrate strand transfer inhibitors (INSTIs) is a new class of antiretroviral used to treat human immunodeficiency virus. There are three different classes within INSTIs: Dolutegravir, Elvitegravir and Raltegravir. Each of these classes have specific pharmacokinetic and pharmacodynamics profiles. The most distinguishing pharmacokinetic characteristic of the INSTIs is the difference in hepatic metabolism: EVG is primarily metabolized by CYP3A4, while DTG and RAL are primarily metabolized by UGT1A1 [3]. Depending on what other diseases a person has or if a woman is pregnant will determine which INSTI they should take. In the study, Dolutegravic had a maximum concentration between .5 and 1.25 h in healthy volunteers and HIV+ persons had a maximum concentration that occurred within 2.5 h [4].

Even with successful treatment of anti-retroviral therapies inflammation will still be active and immune responses will not revert back to the standard healthy state. It is important for the population to know that anti-retroviral therapies do not cure HIV/AIDS. The treatment is to help the patient prolong their life and allow the symptoms to slow down. In order to have the most successful treatment possible routine HIV screenings are recommended. Roughly 90% of new HIV infections are attributable to individuals with undiagnosed infection (30%) or who have received a diagnosis but are not engaged in HIV care (61%) [5]. For future studies it is important for researchers to understand the importance of treating the chronic inflammation as early as possible as the immune system can not be restored.

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