OPEN ACCESS Freely available online

HIV: Current Research

Commentary

Drug Resistance in HIV-Positive Individuals its Indications and Consequences

Heck Abbas*

Department of HIV and Immunology, University of Aberdeen, Aberdeen, UK

DESCRIPTION

HIV, the virus that causes AIDS, has been one of the most challenging public health issues globally since its discovery in the early 1980s. Anti-Retroviral Therapy (ART) has transformed HIV from a fatal disease to a manageable chronic condition. However, one of the critical challenges in the treatment of HIV is the development of drug resistance. Drug resistance occurs when the virus mutates, rendering ART less effective or ineffective. This essay describes the mechanisms of drug resistance in HIV, factors contributing to its development, and strategies to manage and prevent it. HIV drug resistance primarily arises from mutations in the viral genome. The HIV genome is highly mutable, and during replication, errors are frequently introduced, resulting in genetic diversity. The key mechanisms of resistance include:

HIV has a high replication rate, producing billions of new virions daily. Each replication cycle introduces errors due to the lack of proofreading by the reverse transcriptase enzyme, leading to frequent mutations. This high mutation rate enables the virus to evolve quickly under selective pressure from antiretroviral drugs. When ART is administered, it applies selective pressure on the virus. Drugs targeting specific stages of the HIV life cycle kill susceptible viruses, but those with mutations conferring resistance can survive and proliferate. Over time, these resistant strains can dominate, leading to treatment failure. These directly affect the target of the drug, reducing the drug's efficacy. For example, mutations in the reverse transcriptase gene can reduce the effectiveness of Nucleoside Reverse Transcriptase Inhibitors (NRITs). These mutations may not directly impact drug binding but can enhance the fitness of the virus in the presence of primary resistance mutations. Some mutations can confer resistance to multiple drugs, especially within the same class. For instance, mutations in the protease enzyme can lead to resistance against several Protease Inhibitors (PIs).

Inconsistent adherence to ART can lead to sub therapeutic drug levels, allowing the virus to replicate and select for resistant strains. High adherence is crucial for maintaining effective viral suppression and preventing resistance. Variations in drug absorption, distribution, metabolism, and excretion can lead to fluctuating drug levels in the blood, which can foster resistance. Factors such as drug interactions, food intake, and genetic differences in metabolism can influence pharmacokinetics. Drugs with lower potency or those that require multiple mutations for resistance (high genetic barrier) are less likely to select for resistant strains compared to drugs that can be rendered ineffective by a single mutation (low genetic barrier). Higher viral loads increase the probability of mutations and the likelihood of resistance development. In early stages of infection, rapid viral replication can lead to a diverse pool of viral variants, increasing the risk of resistance. Resistant HIV strains can be transmitted from one individual to another, leading to primary resistance in newly infected individuals. This can complicate initial treatment strategies.

Resistance can lead to virology failure, where the virus is not adequately suppressed, resulting in increased viral load and disease progression. This necessitates changes in the treatment regimen. As resistance accumulates, the number of effective drugs diminishes, limiting treatment options. This is especially concerning in resource-limited settings where access to newer drugs may be restricted. Untreated or inadequately treated HIV can lead to opportunistic infections, increased morbidity, and higher mortality rates. Drug resistance increases healthcare costs due to the need for more expensive second- or third-line therapies and management of complications arising from treatment failure.

CONCLUSION

Drug resistance in HIV remains a significant challenge to effective treatment and control of the virus. Understanding the mechanisms of resistance, factors contributing to its development and strategies for management and prevention is crucial for maintaining the efficacy of ART and improving patient outcomes. Ongoing research and innovation are essential to staying ahead of the evolving virus and ensuring that all individuals living with HIV have access to effective, life-saving therapies.

Correspondence to: Heck Abbas, Department of HIV and Immunology, University of Aberdeen, Aberdeen, UK, E-mail: heck@gmail.com

Received: 05-Jun-2024, Manuscript No. HICR-24-32594; **Editor assigned:** 07-Jun-2024, PreQC No. HICR-24-32594 (PQ); **Reviewed:** 21-Jun-2024, QC No. HICR-24-32594; **Revised:** 28-Jun-2024, Manuscript No. HICR-24-32594 (R); **Published:** 05-Jul-2024, DOI: 10.35248/2572-0805-24.9.401

Citation: Abbas H (2024) Drug Resistance in HIV-Positive Individuals its Indications and Consequences. HIV Curr Res. 9:401.