



## ANALYSIS ON IMMUNE EVASION STRATEGIES OF THE VIRUS HIV

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### ABSTRACT

*Viruses must be to great degree effective predators as they depend on living cells for replication. All living species speak to prey for a viral intruder. Viruses have coevolved with their hosts and thusly have constrained pathogenicity in an immune-competent normal host. Being a noteworthy first line of immune safeguard, the supplement framework keeps a consistent vigil against viruses. Its capacity to perceive huge panoply of viruses and virus-tainted cells, and trigger the effectors pathways, brings about balance of viruses and executing of the contaminated cells. This choice weight applied by supplement on viruses has influenced them to develop a large number of countermeasures. These incorporate focusing on the acknowledgment particles for the shirking of location, focusing on key catalysts and edifices of the supplement pathways like C3 convertases and C5b-9 development – either by encoding supplement controllers or by enlisting film bound and solvent host supplement controllers, dividing supplement proteins by encoding protease, and repressing the amalgamation of supplement proteins. Moreover, viruses likewise misuse the supplement framework for their own advantage.*

### 1. INTRODUCTION

'Immunis' the Latin word importance excluded is the wellspring of current English words immunology and immunity. The essential capacity of the insusceptible system is to shield the host from any invaders as well as adjusted self substances. The system creates a huge assortment of cells and molecules prepared to do particularly perceiving and dispensing with obviously boundless cluster of existing remote invaders and also recently advancing structures. The insusceptible system is made out of two segments: I) innate immunity, which reacts quickly, yet does not have memory and ii) versatile immunity, which has a slack, yet has memory. The innate resistant system ensures the host by building up different barriers against pathogens. These incorporate humoral, substance and cellular barriers. The versatile immunity then again is antigen particular and can mount more grounded insusceptible reaction after resulting exposures to a similar pathogen because of immunological memory.

The complement system is a fundamental piece of the humoral barriers of innate immunity. A special element of this system is it has the capacity of perceiving pathogens in the nearness



and in addition nonattendance of example acknowledgment molecules. On account of this property, this system perceives the current, as well as the recently rising pathogens. The complement system has a variety of serum proteins for initiation prompting decimation of pathogens and both serum and also cell surface proteins for direction to avert hyperactivation, in this manner keeping away from demolition of typical host tissues and organs [1].

The pathogenic microorganisms including viruses ought to be dispensed with by the invulnerable system. Yet, notwithstanding the variety of an efficient resistant system arrange viral diseases are normal. In this manner, it is possible that viruses in the proper way of advancement more likely than not created brilliant techniques to sidestep the host resistant apparatus. Reliable with this commence, viruses have for sure created different resistant avoidance instruments to get away from the host Immunological reactions. It has been seen that viruses with bigger viral genome, for example, herpesviruses and poxviruses have developed more various systems of resistant avoidance which cover humoral, cellular and effector safe reactions [2]. Since the complement system is a vital humoral hindrance it has turned into an objective for insusceptible avoidance. In this way, both herpes and in addition poxviruses encode molecules to subvert the complement system. The known cases of herpesviruses, which encode complement regulatory proteins, incorporate herpesvirussaimiri (HVS). Kaposi's sarcoma-related herpesvirus (KSHV/HHV-8) also, murine -herpesvirus 68, herpes simplex virus (HSV)- 1 HSV-2 and EBV. A few individuals from the poxvirus family are additionally known to encode for useful complement regulatory proteins that incorporate variola, vaccinia, cowpox and monkeypox viruses.

## **2. INNATE IMMUNITY**

The innate immune system covers a few types of liost safeguard against pathogens. Together these constitute the principal line of host safeguard, which impacts prior to the activity of the adaptive immune system (1). By qualities, the innate immunity is various and developmentally antiquated, and furthermore can trigger the adaptive immunity, however it doesn't produce memory. Essentially, not at all like adaptive immunity, the qualities in charge of innate immunity are encoded in the germline DNA and don't require the quality modification. Since it experiences attacking pathogens at an extremely early phase of infection, the adaptive immune system does not become possibly the most important factor unless the innate protections are ruptured [3].

Concentrates on innate immunity picked up energy when it turned out to be certain that innate immunity is older than adaptive immunity, which is discovered just in jawed vertebrates. Phylogenetic investigations uncovered that effector molecules of innate immunity can be followed back to plants and there exists striking likenesses between the molecular association of creature and plant system for nonself acknowledgment and hostile to microbial resistance [4]. Like creepy crawlies and vertebrates, plants have receptors for



pathogen-related molecules (e.g. FLS2 receptor of *Arabidopsis thaliana*) and saved mitogen-related protein kinase signaling falls, and produces antimicrobial peptides.

## **2.1 Importance of Innate Immunity**

Innate immunity is phylogenetically saved. Its quality in creatures without the adaptive immune system and in vertebrates with all around created adaptive immunity contends well for its significance. The reaction time of innate immunity is inside minutes to hours while that of adaptive immunity is three to five days, which is adequate for some, pathogens to multiply and demolish the host. In this way innate immunity must assume a fundamental part in controlling pathogens. This worldview however consistent did not get wide help as of not long ago, fundamentally due to absence of huge learning identified with innate immune insufficiency cases [5]. Late confirmations however plainly demonstrate that innate immunity is not just an imperative first line of resistance against pathogens, yet in addition an indispensable part for both initiation and foundation of adaptive immunity.

## **3. HIV VIRUS**

In 1981, Acquired Immunodeficiency Syndrome (AIDS) was first portrayed, as a particular clinical disease among young fellows engaging in sexual relations with men (MSM), who gave either *Pneumocystis carinii* pneumonia (now known as named *Pneumocystis jirovecii* Frenkel 1999, to pay tribute to the Czech parasitologist) and/or an uncommon kind of tumor of skin, Kaposi's sarcoma, seen just in immunocompromised persons. They demonstrated remarkable example of fundamental immunosuppression with no identifiable reason. Comparable cases were hence announced in hemophilia patients who had gotten blood products and intravenous medication users (IDUs) who shared needles and syringes, It was additionally proposed that a variation of Human T lymphotropic retrovirus (HTLV) may be the etiological specialist of AIDS, with comparable cell tropism and transmission route. After the acknowledgment of the disorder, inside 2 years the causative specialist, Human immunodeficiency virus (HIV) was confined from the patients of AIDS [6].

### **3.1 Classification of Retroviruses**

As indicated by the International Committee on scientific categorization of viruses, retroviruses are isolated into oncoviruses, lentiviruses, and spumaviruses.

1. The oncoviruses contain the oncogenic retroviruses and are separated into type B, type C, and sort D viruses based on their morphology and genome structure.
2. The lentiviruses contain viruses (e.g., human immunodeficiency virus related with gradually dynamic, generally deadly conditions).

#### 4. STRUCTURE OF HIV

HIV is a virus having a place with the family retroviridae. There are two kinds of retrovirus: 1) oncogenic or transforming retroviruses, which prompt neoplasms; and 2) cytopathic or lentiviruses, of which HIV is an illustration.

HIV is a RNA virus. HIV contains two strands of RNA in its deepest center, encompassed by two layers of auxiliary proteins [7]. Together, the RNA and these protein coats make up the nucleocapsid of the virus molecule. (A virus molecule is additionally called a virion). Within the center is additionally a chemical called turn around transcriptase. The auxiliary proteins in these two coats are assigned "p" for protein, alongside a number that shows the sub-atomic weight. The peripheral layer of the virus is a lipid bilayer got from the host cell's membrane. The virus gains this membrane as it is discharged (buds) from the host cell in which it reproduced. Inserted in this bilayer are glycoproteins (i.e., proteins with sugar chains included) that are encoded by the genome (hereditary material) of the virus. These viral glycoproteins are assigned by the letters "gp" in addition to a number demonstrating the atomic weight. There are two noteworthy viral glycoproteins, called gp120 and gp41 (i.e., they have sub-atomic weights of 120,000 and 41,000, individually)

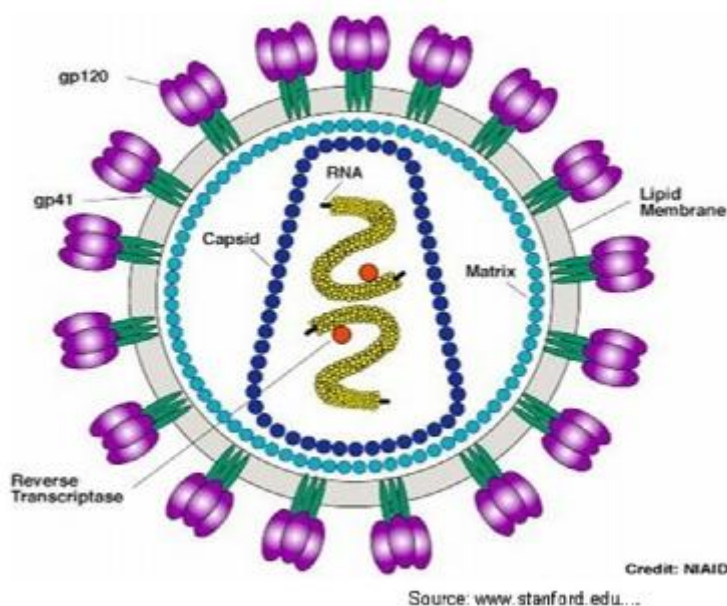


Figure 1: Structure of HIV

##### 4.1 Life Cycle of HIV

In the first place, as portrayed, the gp120 of the virus contacts CD4 on a T partner cell. Macrophages and microglial cells (which are found in the focal nervous system) additionally have CD4 and can be contaminated with HIV. At the point when HIV initially taints a man, it



has an inclination for attacking macrophages and is called macrophage-tropic (or m-tropic). As the disease advances, the virus changes to specially taint T cells (T-tropic). When this move perfectly tropic strain happens, the disease generally accelerates. This tropism is conceivable on the grounds that HIV needs to communicate with cell surface structures notwithstanding CD4 to taint a host cell. These different structures, as mentioned above, are named co-receptors. Macrophages and T cells have distinctive co-receptors, which enable HIV to segregate between these two cell writes. The co-receptor on macrophages is called

CC chemokine receptor 5 (CCR5); the co-receptor on T cells is called CXC chemokine receptor 4 (CXCR4). Utilizing gp41, the virus wires with the T cell or macrophage and enters it. As the virus is disguised, its lipid and protein coats are shed. The viral single-stranded (ss) RNA is then discharged free into the cytoplasm of the cell [8].

Next, turn around transcriptase (RT) makes DNA from the ssRNA. This is the invert of the ordinary procedure in the cell, whereby ss detachment RNA is interpreted from chromosomal DNA: consequently the name turn around transcriptase. After integration inot the host cell genome, both of two things could happen: 1.The cell can stay inactive, and the provirus will stay lethargic, 2.Or on the other hand if the host cell is activated, at that point the provirus will be activated, as well. The provirus won't be activated unless the cell is activated. Whatever procedures activate the T cells or macrophages will likewise make cellular factors tie to the LTRs of the provirus, accordingly actuating the provirus. At the point when the proviral genome is activated, huge dispatcher RNAs that code for in excess of one protein are delivered. These mRNAs deliver substantial polyproteins that must be cut into the individual proteins of the infection by catalysts called proteases. Initial, a protease gave by the host cell divides the polyprotein result of the pol quality to shape the viral proteins called reverse transcriptase, integrase, and viral protease. The viral protease at that point separates polyproteins made by the muffle and env qualities into individual proteins.

## 4.2 AIDS

Helps is staged or arranged in light of the quantity of CD4 cells in the patient's blood (demonstrated by a number), and in addition by the sorts of opportunistic diseases from which the patient has endured (shown by a letter). An ordinary CD4 T-cell check is around 1100 cells/cu. mm (In Indian populace the mean CD4 T-cell check is around 950 cells/cu. mm for male 395-1627 cells/cu. mm, female 511-1817 cells/cu. mm). In ordering AIDS, a tally >500 is class 1, from 200-499 is classification 2, and <200 is class 3. Clinically, a patient who is asymptomatic or has an intense contamination or lymphadenopathy just is class A. Classification B incorporates patients with loose bowels, neuropathies, fever, Candida (yeast) contaminations, and pelvic provocative disease. Classification C, incorporates patients experiencing "substantial obligation" AIDS characterizing opportunistic contaminations, for example, Toxoplasma, Pneumocystis carinii, Mycobacterium,





Mycobacterium avium complex (MAC), cryptococcal disease, spread TB. Patients who are slightest influenced would consequently be delegated "A1", though those with cutting edge disease would be "C3". All mixes of numbers and letters are conceivable.

### **4.3 Isolation of HIV**

The infection in charge of AIDS was first announced from Dr. Luc Montagnier's Laboratory at the Institute Pasteur, Paris in May 1983. The infection was secluded from a lymph node of a person with Lymphadenopathy.

Number of people living with HIV in 2007

Total 33.2 million [30.6–36.1 million]

Adults 30.8 million [28.2–33.6 million]

Women 15.4 million [13.9–16.6 million]

Children under 15 years 2.5 million [2.2–2.6 million]

People newly infected with HIV in 2007

Total 2.5 million [1.8–4.1 million]

Adults 2.1 million [1.4–3.6 million]

Children under 15 years 420 000 [350 000–540 000]

AIDS deaths in 2007 Total 2.1 million [1.9–2.4 million]

Adults 1.7 million [1.6–2.1 million]

Children under 15 years 330 000 [310 000–380 000]

In light of the phylogenetic investigation of various separates got from assorted geographical regions, HIV is partitioned into types, groups, subtypes, genotypes, flowing recombinant structures (CRFs) and special recombinant structures (URFs). HIV-1 can be isolated into 3 noteworthy Groups; M (real), N and O (Outlier). Group M is further subcategorized into numerous subtypes; A-D, F-H, J and K [9]. Group O are unmistakably extraordinary and genetically more firmly identified with simian immunodeficiency infection (SIV) and HIV-2. Group N seems to have emerged from connection between a group M and a group O infection.

### **4.4 HIV-1 ENV Binding to CD4 and Coreceptor**



Notwithstanding CD4, the HIV requires a coreceptor for section into target cells. The chemokine receptors CXCR4 and CCR5, individuals from the G protein-coupled receptor superfamily, have been distinguished as the central coreceptors for T cell line-tropic and macrophage-tropic HIV-1 secludes, separately. Macrophage-tropic HIV-1 viruses essentially utilize CCR5 (R5) as a coreceptor, though T-cell line-tropic viruses utilize CXCR4 (X4). Double tropic viruses (R5X4) utilize both coreceptors. A subset of viruses can likewise utilize elective coreceptors, for example, CCR2b, CCR8, Apj, STRL33 (BONZO/CXCR6), GPR1, GPR15 (BOB), CX3CR1 (V28), Chem R23, and RDC-1, for infection passage in transfected cells. CCR5 is a receptor for the  $\beta$ -chemokines macrophage provocative protein (MIP)-1 $\alpha$  and  $\beta$  and RANTES. The major coreceptor for syncytium-initiating strains showing up at the late stages of AIDS progression and additionally T-cell line-adjusted strains is CXCR4, a receptor for the CXC chemokine stroma cell-inferred factor (SDF)- 1 $\alpha$ . These binding occasions result in the introduction of the already concealed fusion peptide of gp41 and its entrance into the target cell layer, which prompts fusion of the virion with the plasma film.

#### **4.5 HIV-1 ENV and Neutralization**

The common history of human immunodeficiency infection (HIV), infection demonstrates that inside weeks to a very long time after infection, a perceivable immune reaction related with a decrease in viremia happens [10]. This immune reaction is described by the production of HIV-particular antibodies and the extension of HIV-particular CD4 and CD8 T cells. Amid the Asymptomatic stage after HIV infection, the level of the immune response reactions stays high in the plasma of tainted individuals. A neutralizing test including cell lines and research center adjusted strains permitted neutralizing antibodies (NAbs) to be distinguished in the plasma right on time after infection .The diminished counter acting agent reaction related with the loss of HIV-neutralizing antibodies went with clinical symptoms that imply AIDS. The HIV-1 envelope protein (Env) is the target of infection neutralizing antibodies; however it doesn't ordinarily evoke a solid neutralizing neutralizer reaction in tainted individuals. The capacity of HIV to avoid the immune system has been related to some extent with both the fast variability of the HIV Env protein grouping and the covering of epitopes by glycosylation.

#### **5. CONCLUSION**

In excess of 33.4 million individuals worldwide are at present living with HIV-1 and about 25 million of these individuals have surrendered to the infection. Albeit, current hostile to retroviral therapies have given promising outcomes in expanding the life expectancy of HIV-1-contaminated individuals, the viable control of the overall AIDS pandemic stays tricky. HIV-1 pathogenesis is portrayed by an elevated condition of ceaseless and fundamental safe activation that prompts a significant consumption of CD4+ T cells, bringing about invulnerable fatigue and rise of AIDS. Moreover, HIV-1's capacity to transform and adjust



to specific weight forced by the host resistant reaction brought about a striking level of viral hereditary decent variety, which now represents a more prominent test for the total annihilation of the infection. Three instruments can add to the escape from NABs: point transformations, changes in glycosylation examples, and inclusions and erasures in the Env. HIV-1 Env is a profoundly glycosylated protein. Inoculating against difficulties related with a lacking immune framework is considerably all the more difficult. Boosting a lacking immune framework appears to be unfeasible, in this way immunotherapy or tending to the reason for the immune inadequacy give off an impression of being more suitable in these cases.

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