



Immunology

Title : HIV

Lec no : 15

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Introduction:

- HIV is a **viral infection** that destroy **helper T cells** of the immune system
It acts on **CD4+ T Cells**
- Produce **multi-organ diseases**
Due to the **immune deficiency** that occurs due to the killing of **CD4+ T helper cells**
- Characterized by **long incubation periods** and **persistent infection**



بالبدائية ال infection يكون
Reflex as a common cold
و ال signs و ال symptoms
بצלهم ل short period after incubation
و بتضل العدوى مستمرة

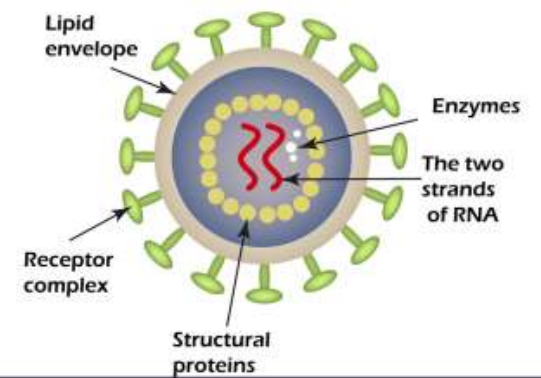
The true symptoms need from 5-15
years to appear

Morphology:

- **Retroviruses transcribe RNA to DNA** Via a protein called **Reverse transcriptase**

- Two viral strands of RNA found in core surrounded by protein outer coat.
- Enveloped virus
- These **knob-like structures** responsible for **binding** to target cell.

The structure of the HIV virus



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Types of HIV

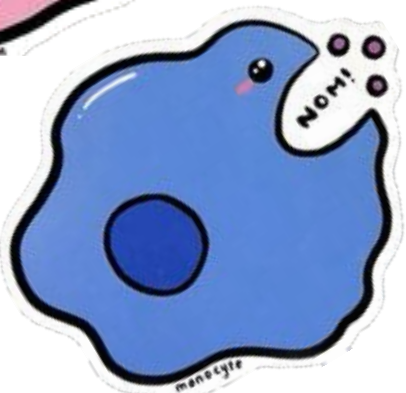
- **Two species** of HIV infect humans:

1. HIV-1 اقوى و تأثيره اسرع من النوع الثاني

- * More virulent, relatively **easy to transmit**
- * Majority of HIV infections globally
- * 3 types of HIV-1: (based on alterations in **env** gene)

2. HIV-2

- * **Less transmittable**
- * Largely confined to West Africa



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Origins of HIV

كل نوع الاصل تبعهم مختلف



HIV-1 likely descended from SIV_{cpz}



HIV-2 likely descended from SIV_{sm}

Transmission prevention مهمة لعملية ال

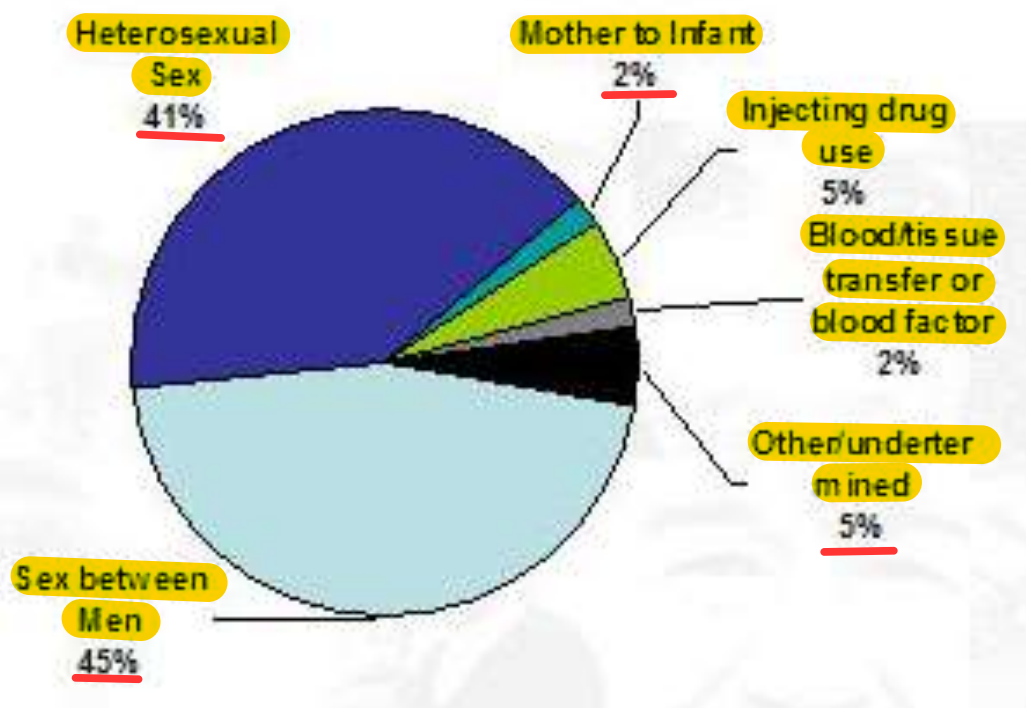
- Sharing of infected drug injection needles/syringes **Drug addiction**
- Accidental needle stick (**healthcare professionals**)
- Unprotected sex with infected individual
- Blood transfusions/Organ transplants
- Transmission from infected mother-to-fetus during pregnancy or delivery
- Transmission from breast milk of infected mother to her baby

Note that the breast milk is contradicted in 3 cases :

- 1- Hepatitis B
- 2- Hepatitis C
- 3- HIV

Route of Transmission of HIV Infection, infections before 2006

حفظ الترتيب



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الدمفة مهمة



Pathogenesis and Virulence Factors

■ HIV enters through mucous membrane or skin and travels to dendritic phagocytes beneath the epithelium, multiplies and is shed.

■ HIV attaches to CD4 molecules and co-receptor; HIV fuses with cell membrane.

Sexual contact -> enter the mucous membrane (بتخبي هناك) -> it hide there in dendritic phagocyte -> attach to CD4+ and costimulator

■ HIV target CD4+ cells

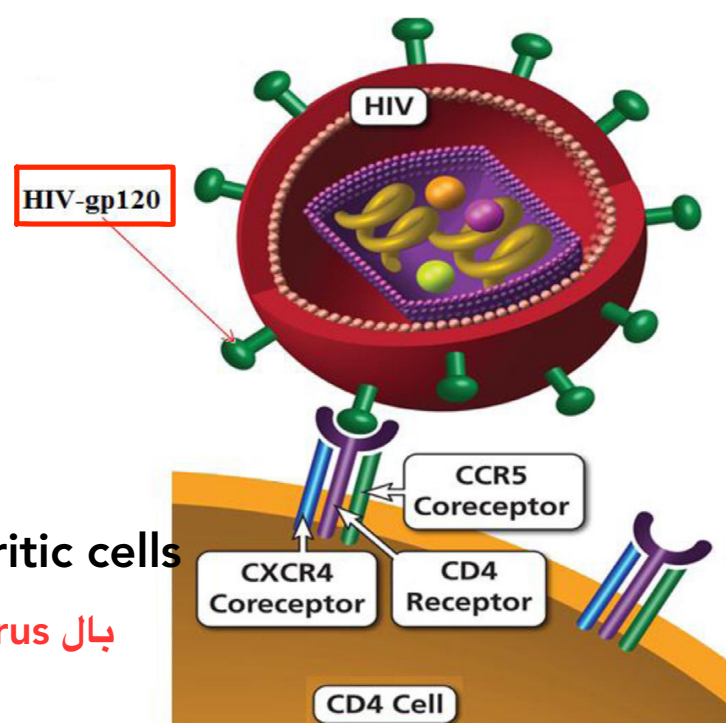
- Th cell
- Dendritic cells
- Macrophages

■ HIV use gp120 to attached to CD4 and co-receptors to get inside the cells

■ Co-receptros

- CXCR4 on T cells
- CCR5 on T cell, macrophage, monocytes and dendritic cells

بال HIV virus عننا glycoprotein او spikes بربطوا فيهم على الخلايا و ال receptors

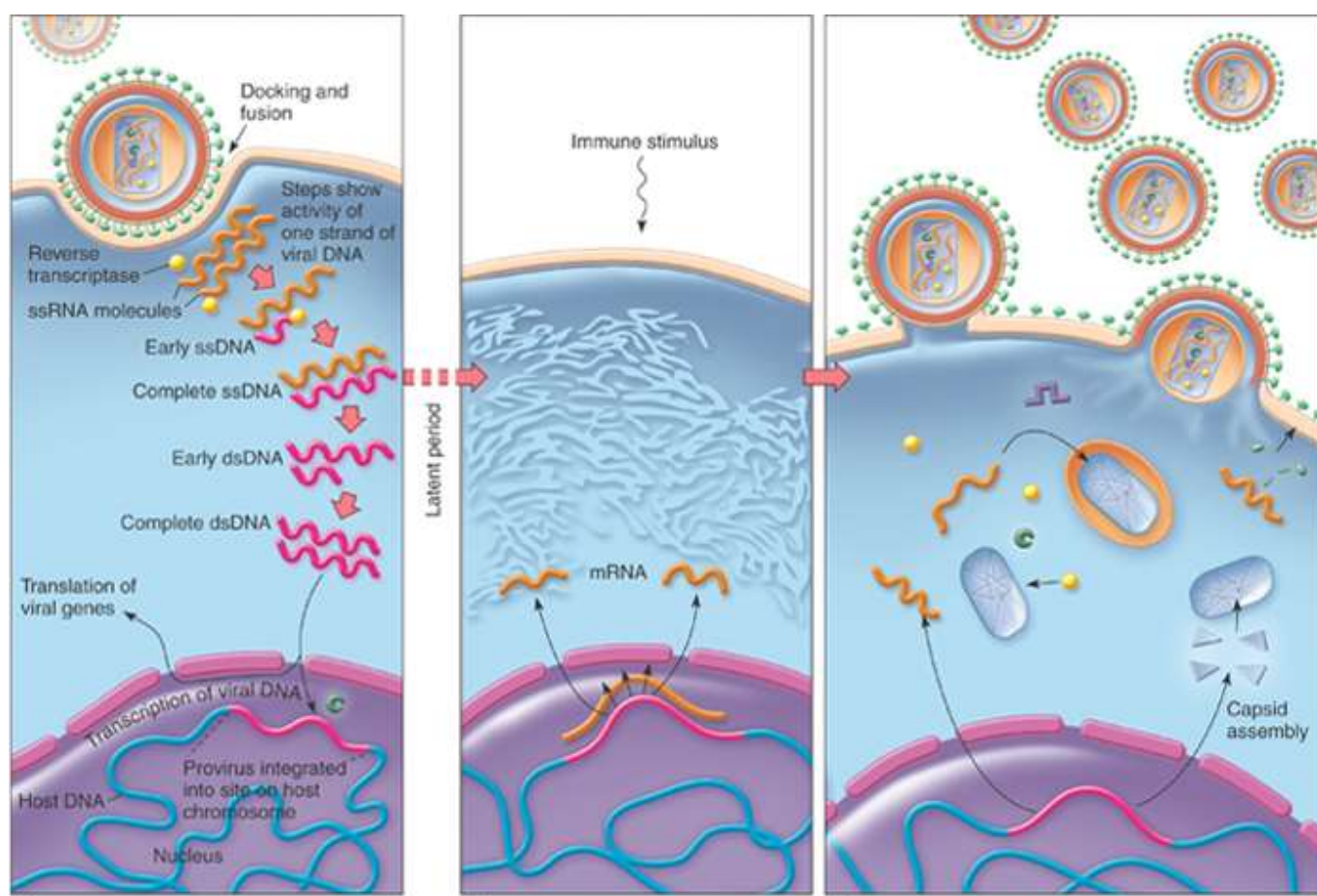


بال HIV، ال gp120 بربط على ال receptor - و الي هو +CD4 ، و بربط كمان مع co-stimulator - الي هم CCR7 و CXCR4

■ Reverse transcriptase makes a DNA copy of RNA.

■ Viral DNA is integrated into host chromosome

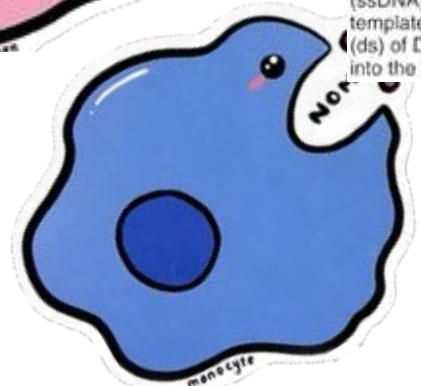
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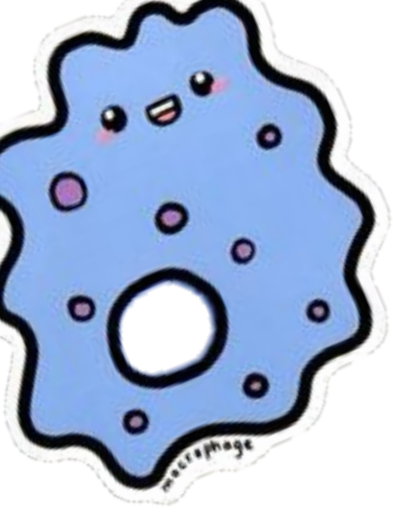
(a) The virus is adsorbed and endocytosed, and the twin RNAs are uncoated. Reverse transcriptase catalyzes the synthesis of a single complementary strand of DNA (ssDNA). This single strand serves as a template for synthesis of a double strand (ds) of DNA. In latency, dsDNA is inserted into the host chromosome as a provirus.

(b) After a latent period, various immune activators stimulate the infected cell, causing reactivation of the provirus genes and production of viral mRNA.

(c) HIV mRNA is translated by the cell's synthetic machinery into virus components (capsid, reverse transcriptase, spikes), and the viruses are assembled. Budding of mature viruses lyses the infected cell.



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Primary effects of HIV infection:

- extreme leukopenia – lymphocytes in particular ↓ WBCs
- formation of giant T cells allowing the virus to spread directly from cell to cell
هسا هاي ال cells بتكون unactive و مجتمعين لل virus ← جمعهم أكبر
- Infected macrophages release the virus in central nervous system, with toxic effect, inflammation.

Secondary effects of HIV:

- Destruction on CD4 lymphocytes allows for opportunistic infections and malignancies.

Clinical Manifestations

■ Human Immunodeficiency Virus (HIV) has an incubation period of about 10 years and eventually leads to Acquired Immunodeficiency Syndrome (AIDS), resulting in the impairment of the immune system.

■ This can lead to death from infections, secondary diseases from opportunistic bacteria and/or viruses that are usually harmless to people, or many different types of cancers.

■ Common diseases associated with HIV infection:

- Kaposi's sarcoma (KS) → **skin cancer**
- Pneumocystis carinii pneumonia (PCP)
- Mycobacterium avium complex (MAC)

مخيم

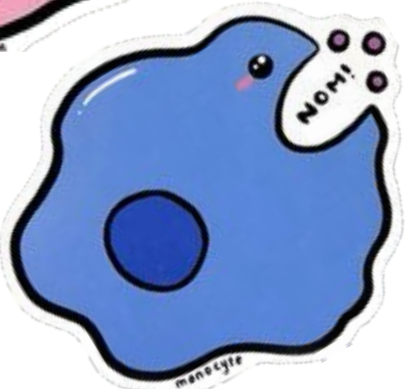


■ Early Symptoms:

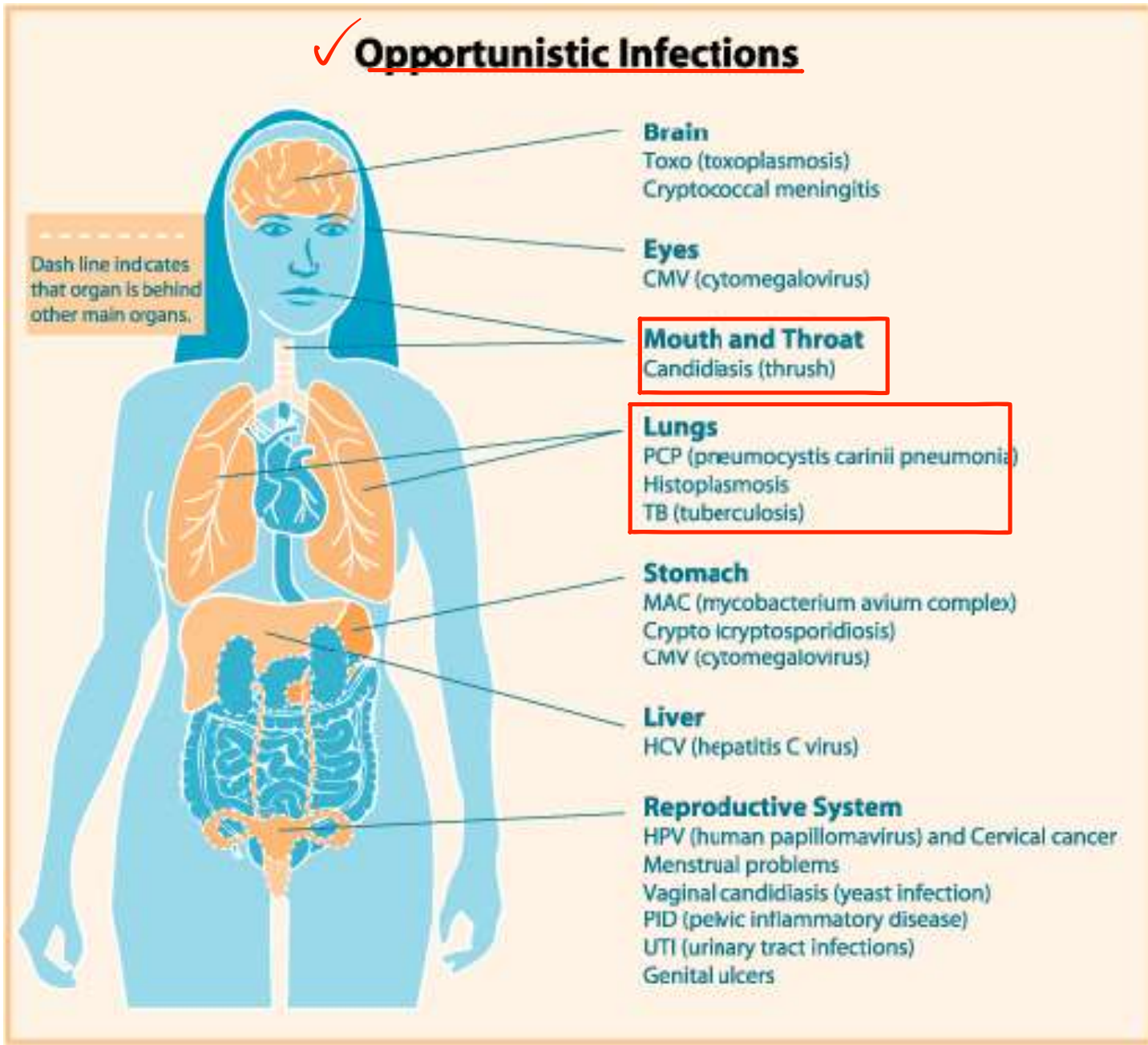
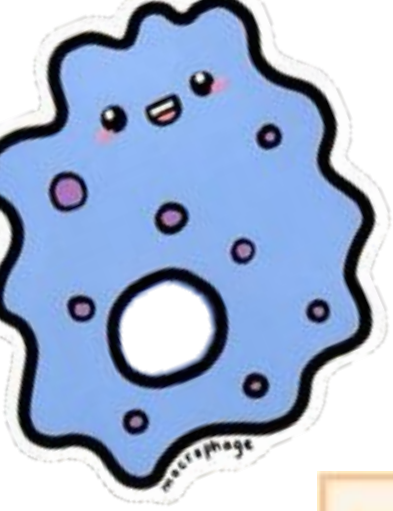
- Most don't exhibit symptoms when first infected
- However, may have flu-like symptoms (fever, headache, tired, enlarged lymph nodes) 1-2 months after exposure
- Very infectious during this period

■ Later Symptoms:

- More sever symptoms may not appear until after 10yrs, however this varies with each individual
- Decline in number of CD4 + T cells
- The most advanced stage of AIDS is classified as having < 200 CD4+ T cells/cubic millimeter of blood (in healthy adults CD4+ T-cell counts = 1,000+)



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■ The treatment for HIV is called **antiretroviral therapy (ART)**. ART involves taking a combination of HIV medicines (called an HIV treatment regimen) every day.

To decrease the progression of the disease

■ ART is recommended for everyone who has HIV. People with HIV should start taking HIV medicines as soon as possible. ART can't cure HIV, but HIV medicines help people with HIV **live longer, healthier lives**. ART also reduces the risk of HIV transmission.

■ A main goal of HIV treatment is to reduce a person's viral load to an undetectable level.

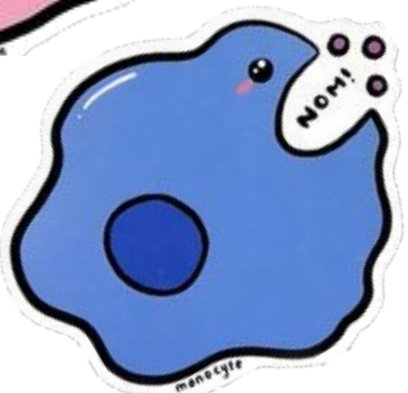
Treatment

- Anti-viral agents
- AZT (Zidovudine) azidothymidine
- ViraMune (Nevirapine)
- Norvir (Ritonavir)

هدول ال drugs هدهم مو يعملوا cure بل انهم
يخففوا ال viral load

Vaccine

- Currently, no vaccines approved for use by the FDA



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