

Impacts on Human Health: HIV/AIDS and diseases

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Impacts on Human Health: HIV/AIDS and diseases

- I. Adverse effects of stressful environment on mental well being**
- II. Indirect effects of stressful environment on human health**
- III. Adulteration in food, medicines and human health**
- IV. Development and spread of disease causing organisms**
- V. Development and spread of vectors or carriers of serious diseases**
- VI. Direct effects of severe environment on human health**
- VII. Spread of HIV and AIDS**

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Purpose

Provide basic information about HIV and AIDS, including

- Introduction
- causes,
- transmission,
- progression,
- knowledge, and
- challenges.



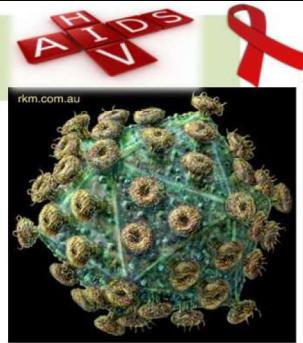
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Human Diseases

Endemic, Epidemic and Pandemic – The Difference

- **Endemic:** a disease that exists permanently in a particular region or population. Malaria is a constant worry in parts of Africa.
- **Epidemic:** An outbreak of disease that attacks many peoples at about the same time and may spread through one or several communities.
- **Pandemic:** When an epidemic spreads throughout the world. → AIDS

What is HIV



- Human
- Immunodeficiency
- Virus
- Responsible for causing AIDS
- HIV is a retrovirus that attacks the immune system.
- Its genetic material, RNA, must be converted into DNA during replication.
- Over time, the immune system and the body loses its ability to fight the virus.

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What is AIDS?

- Acquired Immuno Deficiency Syndrome
- Characterized by signs and symptoms of severe immune deficiency
 - Weight loss of more than 10% of body weight
 - Diarrhea lasting longer than 1 month
 - Fever lasting longer than 1 month
 - Other signs

Source: WHO

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Discovery of HIV & AIDS Virus

Luc Montagnier and **Françoise Barré-Sinoussi**, identified the human immunodeficiency virus (HIV) that causes AIDS in 1983, while working at the Pasteur Institute in Paris.

They originally called it **Lymphadenopathy Associated Virus (LAV)**.



Françoise Barré-Sinoussi (left),
Luc Montagnier (centre) and
Harald zur Hausen
shared the medicine Nobel for their
work on viruses in 2008.

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ETIOLOGY

Etiology- The scientific study of the causes of disease.

- The world first became aware of AIDS in the early 1980's.
- Researchers aren't sure exactly when and how HIV developed.
- The most likely theories assume that HIV-I was transmitted to humans from chimpanzees sometime in the early 20th century.

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HIV & AIDS

- AIDS was first recognized by the United States Centers for Disease Control and Prevention (CDC) in 1981 ([Source: Greene 2007](#))
- Between its discovery and 2014 AIDS has caused an estimated 39 million deaths worldwide.
- HIV/AIDS is considered a **pandemic**—a disease outbreak which is present over a large area and is actively spreading. HIV is believed to have originated in west-central Africa during the late 19th or early 20th century.
- In 2016 about 36.7 million people were living with HIV and it resulted in 1 million deaths.
- There were 300,000 fewer new HIV cases in 2016 than in 2015. Most of those infected live in sub-Saharan Africa.

Human immunodeficiency virus infection and acquired immune deficiency syndrome (HIV/AIDS)

Human immunodeficiency virus infection and acquired immune deficiency syndrome (HIV/AIDS) is a spectrum of conditions caused by infection with the **human immunodeficiency virus (HIV)**.

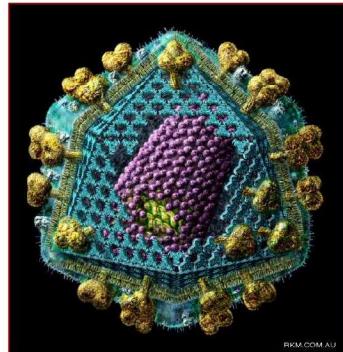
1. Following initial infection, a person may not notice any symptoms or may experience a brief period of influenza-like illness.
2. Typically, this is followed by a prolonged period with no symptoms.
3. As the infection progresses, it **interferes more with the immune system**, increasing the risk of common infections like tuberculosis, as well as other opportunistic infections, and tumors that rarely affect people who have working immune systems.

Human immunodeficiency virus infection and acquired immune deficiency syndrome (HIV/AIDS)

- These late symptoms of infection are referred to as acquired immunodeficiency syndrome (AIDS).
- This stage is often also associated with drastic weight loss.

What Are HIV & AIDS?

- HIV~ (Human Immunodeficiency Virus) The virus compromises the body's ability to handle disease and causes AIDS.
- AIDS~ (Acquired Immune Deficiency Syndrome) It is related to HIV, but they are not one in the same.
- A person has AIDS only in the final stages of HIV infection, after the immune system becomes unable to defend itself against foreign invaders like bacteria, other viruses, and allows the development of certain cancers.



What is HIV?

Human Immunodeficiency Virus

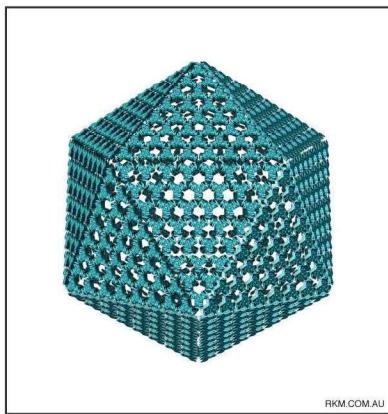
an RNA based virus that causes AIDS

I. Attacks the Immune System

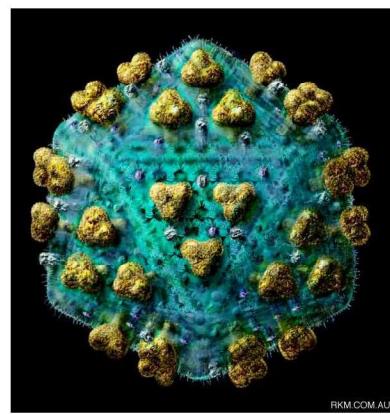
2. Destroys the body's defenses against diseases

3. Body becomes vulnerable to infections & cancers that don't normally develop in healthy people

What does HIV look like?



HIV Capsule

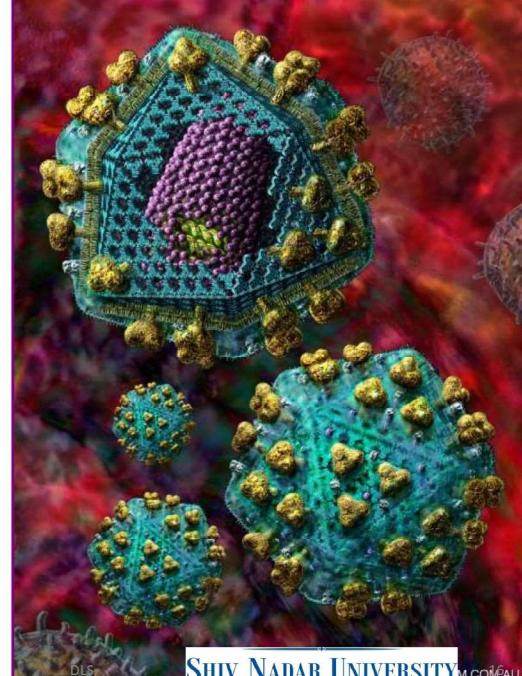


HIV

What does HIV look like?

A cut away view of the virus.

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HIV

- Retrovirus, enveloped ssRNA, RT (RNA dependent DNA polymerase).
- Lentiviruses (HIV1 and 2), and Oncoviruses (HTLV1, HTLVII).
- Fastidious, requires intimate contact.
- Attacks CD4 + cells.

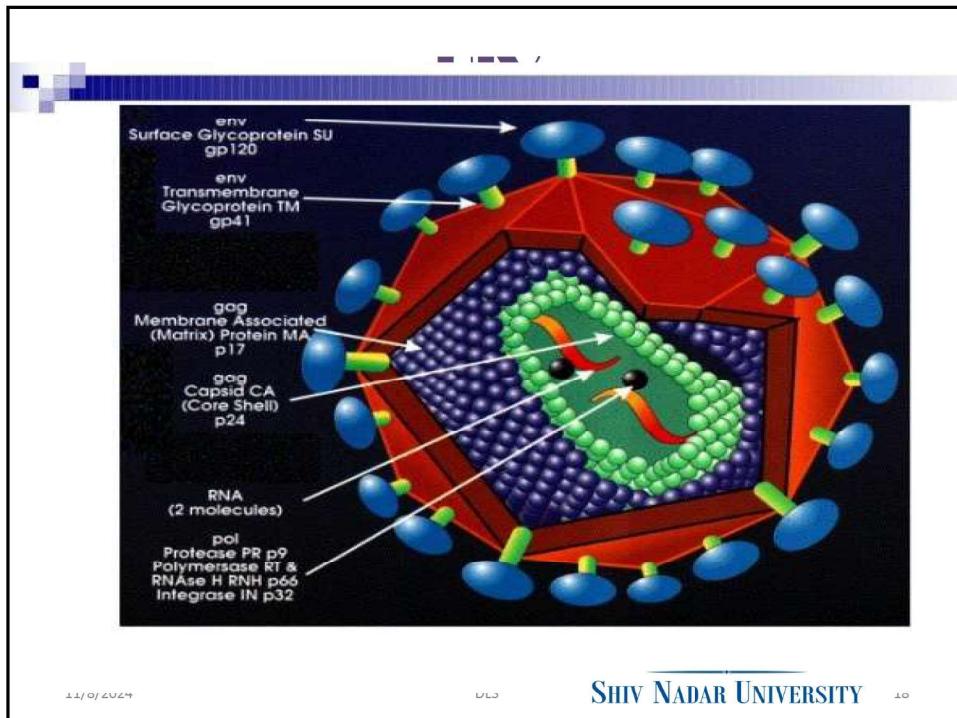
A **retrovirus** is a type of virus that inserts a DNA copy of its RNA genome into the DNA of a host cell that it invades, thus changing the genome of that cell.

Lentivirus—cause chronic disease with long incubation period.

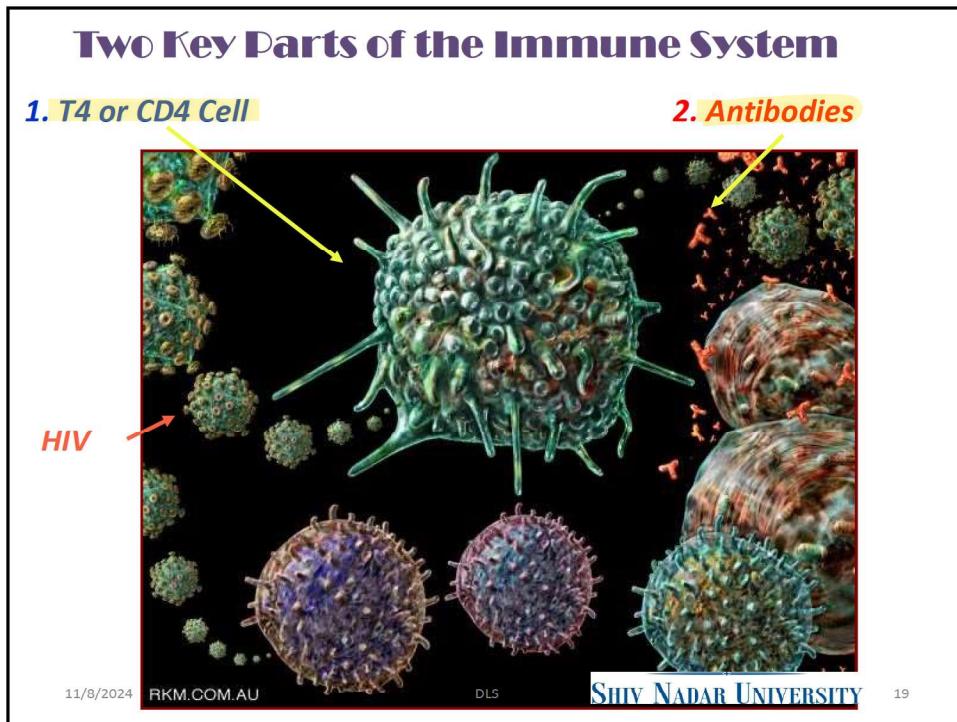
A **fastidious** organism is any organism that has complex or particular nutritional requirements.

In other words, a fastidious organism will only grow when specific nutrients are included in its medium. (HIV require intimate contact or transfer of body fluids).

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CD4 Cell (CD4 Lymphocyte, T helper Cell, T4 Cell)

CD4 Cell (CD4 Lymphocyte, T-helper Cell, T4 Cell):

A type of white blood cell that carries the CD4 cell surface marker and helps the body fight infection. ...

HIV invades CD4 cells, typically resulting in their dysfunction or destruction.



T4 or CD4 Cells and Antibodies

T4/CD4 Cells

- In molecular biology, CD4 (cluster of differentiation 4) is a glycoprotein found on the surface of immune cells such as
 - T helper cells, monocytes, macrophages, and dendritic cells.
- CD4+ T helper cells are white blood cells that are an essential part of the human immune system.
- They are often referred to as CD4 cells, T-helper cells or T4 cells.

T4 or CD4 Cells and Antibodies

Antibodies:

- An **antibody** (AB), also known as an **immunoglobulin** (Ig), is a large Y-shape protein produced by **plasma cells** that is used by the immune system to identify and neutralize foreign objects such as bacteria and viruses.
- The **antibody** recognizes a unique part of the foreign target, called an **antigen.**

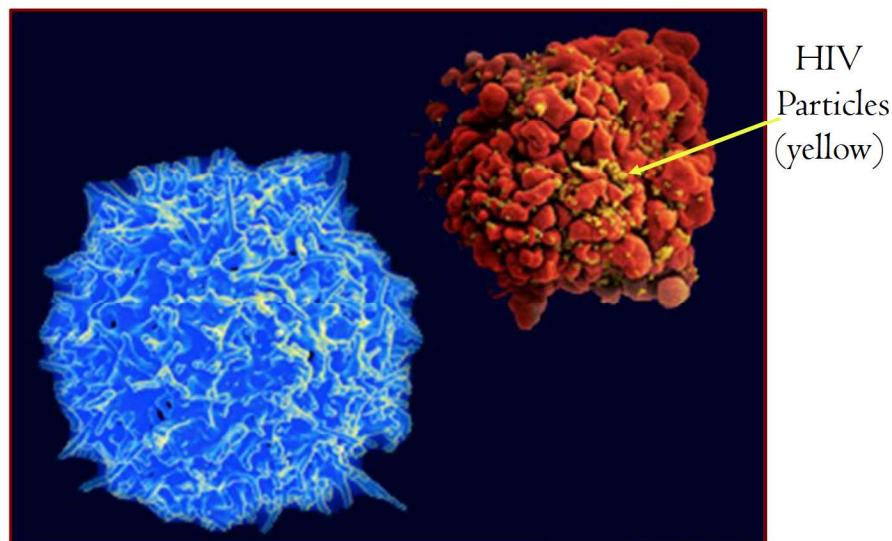


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Healthy T Cell & Infected T Cell



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HIV Infection: Immune suppression

Natural History of HIV Infection

Immune suppression

- HIV attacks white blood cells, called CD4 cells, that protect body from illness.
- Over time, the body's ability to fight common infections is lost.
- Opportunistic infections occur.



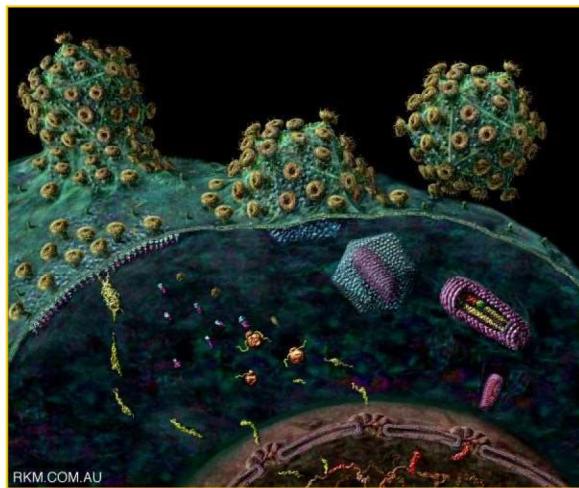
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How Does HIV get into a T Cell?



I. HIV attaches to infection fighting T cell

2. Locks on to two entry areas of the T cell at once. (Keys in lock)

3. Tricks T cell to allow Virus RNA to enter

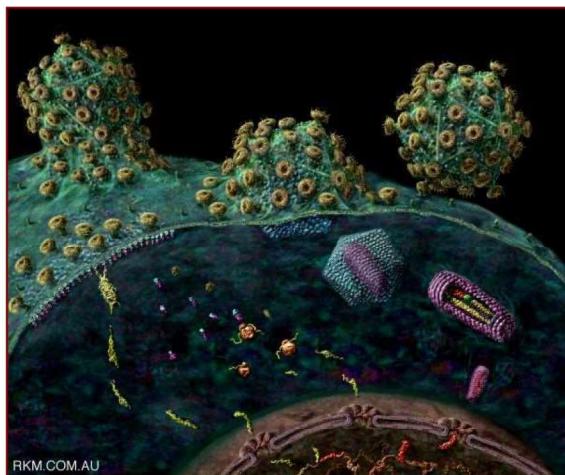
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What Does HIV do inside a T Cell?



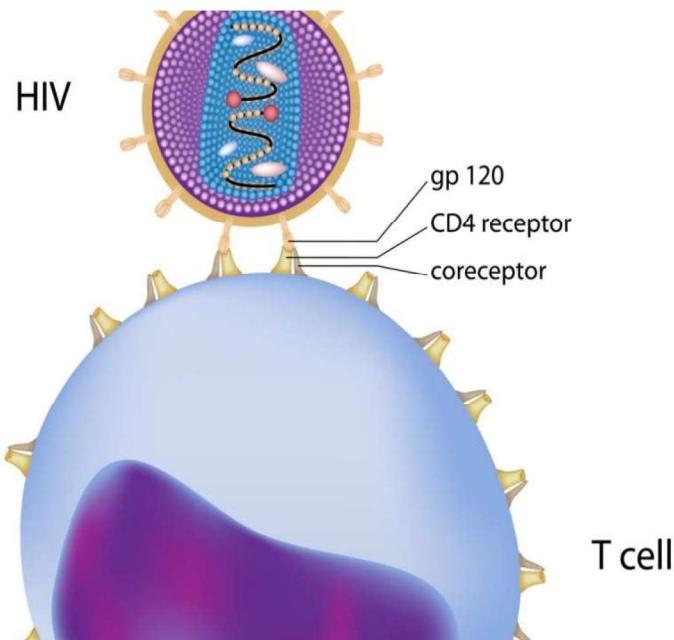
1. Virus's RNA changes into DNA
2. Enters Cell nucleus & becomes part of Host's DNA!
3. Programs T cell to produce virus in abundance
4. New viruses bud off Host T cell, killing T cell, & enters bloodstream
5. New HIV viruses infect more T cells

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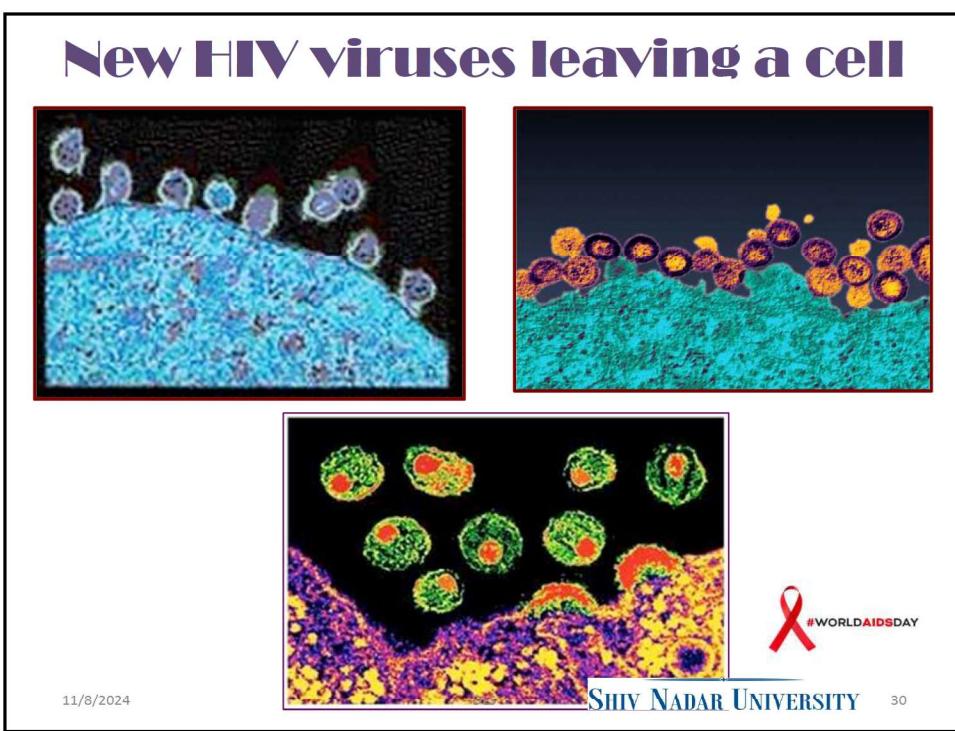
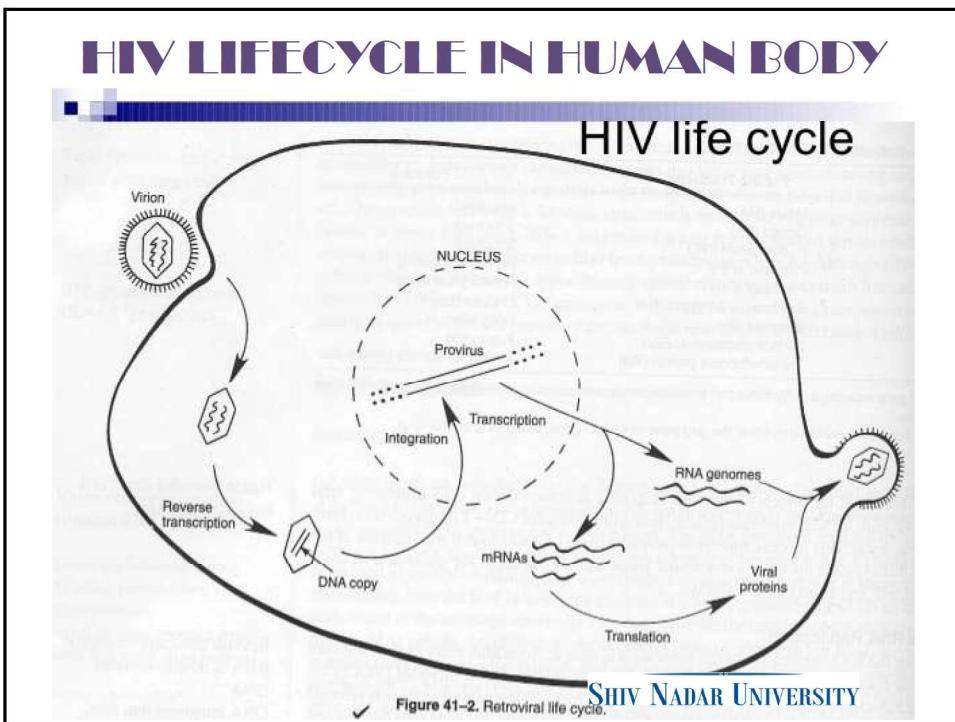
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DIAGNOSIS

To be tested for HIV you usually give a sample of blood or a swab of fluids from your mouth.

It is recommended that if a person is sexually active or had multiple partners they should be tested every 6 months.



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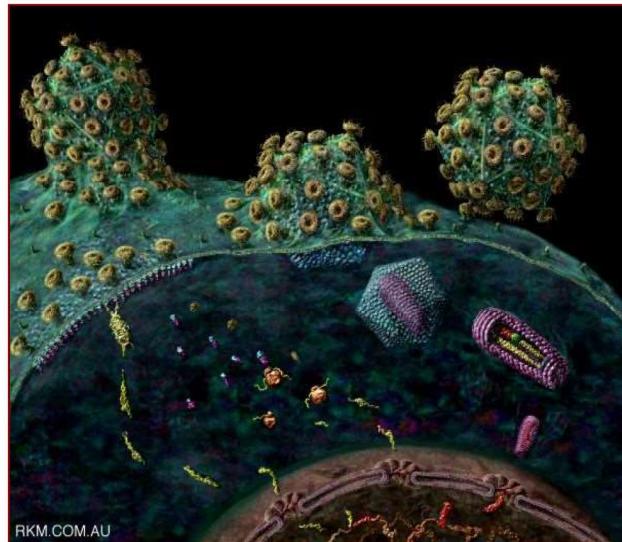
HIV Transmission

Requires:

1. Infected body fluid

AND

2. Entry into body



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HIV Infection Transmission from one person to another

Transmission of HIV

HIV is transmitted by

- Direct contact with infected blood
- Sexual contact: oral, anal or vaginal
- Direct contact with semen or vaginal and cervical secretions
- Mothers infected with HIV to infants during pregnancy, delivery and breastfeeding



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HIV Transmission Infected body fluids

Four Fluids, if infected, can transmit HIV

a. Blood
b. Semen
c. Vaginal Secretions
d. Breast Milk

If these enter the body

- Comes into contact with:
 - mucous membranes, damaged tissue, or is injected into the body
- Through:
 - Vaginal, anal, or oral sex
 - Contaminated needles
 - IV drug use

Unprotected sexual intercourse with an infected partner

Vertical transmission (mother to child)

- in utero
- during delivery
- breastmilk

Injection drug use (rare: infected blood/blood products)

HIV INFECTION

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Which Fluids are safe?

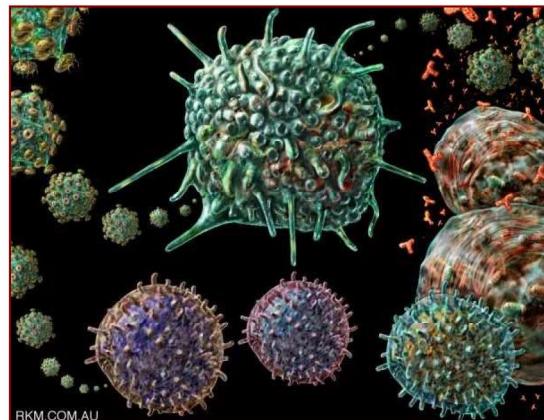
Four Fluids that can't transmit HIV

a. Spit/saliva

b. Pee/Urine

c. Sweat

d. Tears



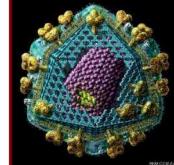
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HIV Transmission



- Perinatal transmission during pregnancy, labor and deliver, or breastfeeding
- Occupational exposure via needle stick or exposure to eyes, nose, or open wound
 - Since 1981 there have been 57 documented cases of occupational transmission in the US
- Blood transfusion or organ donation from an HIV infected donor (rare in US)

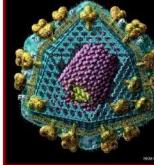
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HIV Transmission



- HIV is NOT transmitted by casual contact
 - Working or playing with an HIV positive person
 - Shaking hands
 - Public pools
 - Hugging
 - Public toilet
- HIV is not transmitted by air, food, or mosquito and does not survive long outside the body even in optimum condition

SYMPTOMS

When HIV emerges from latency (the period when someone with HIV shows no signs of it) symptoms can include:

- Dry, flaky skin (Xeroderma)
- Chronic fatigue
- Fever that comes and goes (Pyrexia)
- Diarrhea that lasts more than a week
- Heavy night sweats (Hyperhidrosis)
- Rapid weight loss
- Swollen lymph nodes
- White spots on tongue, mouth & throat



What happens to someone is diagnosed with AIDS?

Immune system breaks down => Hospital ??

Cause of death - a variety of normally - preventable diseases. Some are:

- a. Pneumonia
- b. Toxoplasmosis - an infection with a parasite called Toxoplasma gondii.
- c. Kaposi's sarcoma cancer forms in the lining of blood & lymph vessels.
- d. Mycobacterium Avium complex
- e. Invasive cervical cancer

Potential Exposure to HIV

- Percutaneous injury
 - Needle-stick or cut with a sharp object
- Mucous membrane or non-intact skin
 - Chapped, abraded, dermatitis
- Comes into contact with:
 - Blood
 - Tissue
- Bodily fluids:
 - Semen
 - Vaginal secretions
 - Cerebrospinal fluid
 - Synovial fluid
 - Pleural fluid
 - Peritoneal fluid
 - Pericardial fluid
 - Amniotic fluid

Note: Feces, nasal secretions, saliva, sputum, sweat, tears, urine, and vomitus are not infectious unless **visibly bloody**

Phases of HIV Infection

Acute

- HIV replicates quickly
- Energy requirements increase

Asymptomatic

- No symptoms

Symptomatic

- Onset of opportunistic infections
- Further increase in nutritional requirements

Late symptomatic (full-blown AIDS)

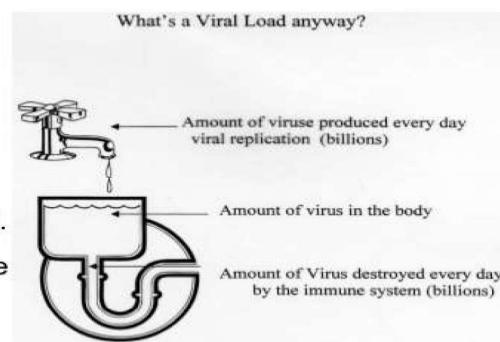
- Heightened viral load
- Intense weight loss
- Opportunistic infections taking control

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HIV Infection

Natural History of HIV Infection

- Severity of illness is determined by amount of virus in the body (increasing viral load) and the degree of immune suppression (decreasing CD4 count).
- Higher the viral load, the sooner immune suppression occurs.



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Treatment of HIV and AIDS

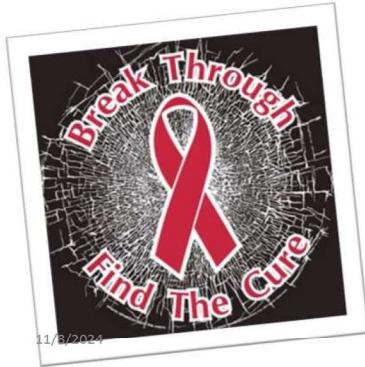
- No cure
- Treatment can help slow progression to AIDS, reduce OIs, and minimize malnutrition.
- The most effective treatment is anti-retroviral therapy (ART) using antiretroviral drugs (ARVs)

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TREATMENT- ARVT

There is no cure for HIV.

Anti-Retro-Viral therapy (ARVT) can reduce the presence of the virus in the body, but can not eliminate it.



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PROGNOSIS

The prognosis for those with HIV is improving with the development of antiretroviral drugs (ARVD) that help reduce the amount of HIV in the blood to an “undetectable viral load”.

ARVT are medications that treat HIV. The drugs do not kill or cure the Virus. However, they can prevent the growth of Virus and consequently further slowdown infection.



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PREVENTION

- To prevent HIV transmission during sex you need to use a condom.
- HIV can be spread through vaginal, anal or oral sex.
- Open sores from STDs like herpes & syphilis provide gateways for HIV to enter the body.
- Gonorrhea & Chlamydia may weaken the skin & mucous barriers that help prevent infection.
- If someone inject drugs, use a new sterile needle each time to significantly reduce the risk of HIV transmission.

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FACTS

- ✓ HIV is not airborne and cannot be caught by touching skin, sweat or saliva.
- ✓ One cannot get HIV by holding hands or sharing drinks.
- ✓ Mosquito's do not inject other peoples blood when they bite and so can't spread HIV.

What is the “Window Period?”

The time period between a person's exposure & actual infection with HIV and until antibodies are detectable in the body.

- After *three months* there are usually enough antibodies to show on an AIDS test.

Nearly all people (99%) develop antibodies by THREE months.

HIV and the Immune System

A person can be HIV infected and not have AIDS if the person's immune system is intact.

Often this period is from 8-10 years.

Has no symptoms, person is a carrier.

After this period, the immune system begins to lose the fight.

At this point the person has AIDS

Impact of HIV in Countries



Impact of Global HIV

- **Negative economic impact on countries**
- **Overwhelmed healthcare systems**
- **Decreasing life expectancy**
- **Deteriorating child survival rates**
- **Increasing numbers of orphans**

Impact of HIV on the Health Sector

- Straining of already meager health budgets
 - Overall public health spending less than US\$10/person (UNAIDS)
- Heavy demands on health system
 - Increased need for medical supervision
 - Longer hospital stays
 - Health workers shortages and burnout

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Impact of HIV on the commercial Sectors

- Illness and death of person, of different working group
- Increased Cost of training to replace those lost to AIDS

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HIV Infection and body organs affected

Natural History of HIV Infection

Direct infection of organ systems

- **Brain (HIV dementia)**
- **Gut (wasting)**
- **Heart (cardiomyopathy)**

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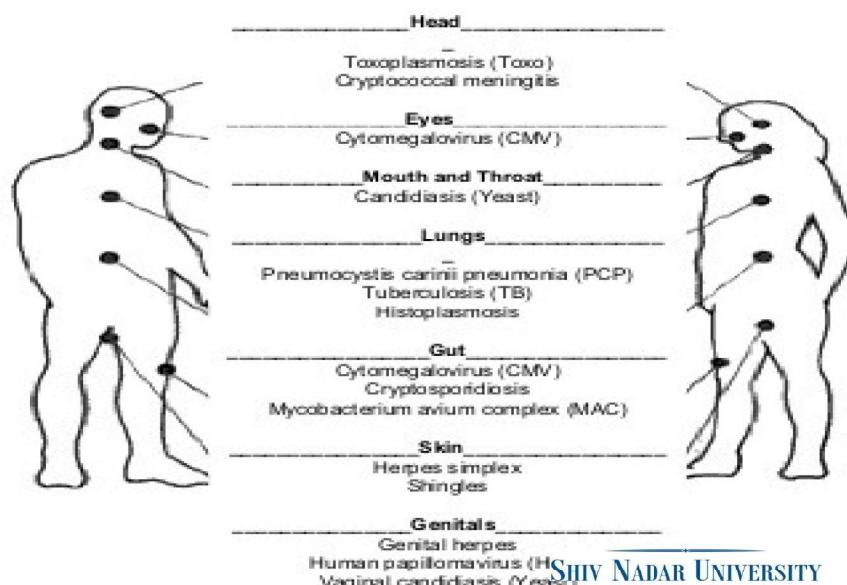
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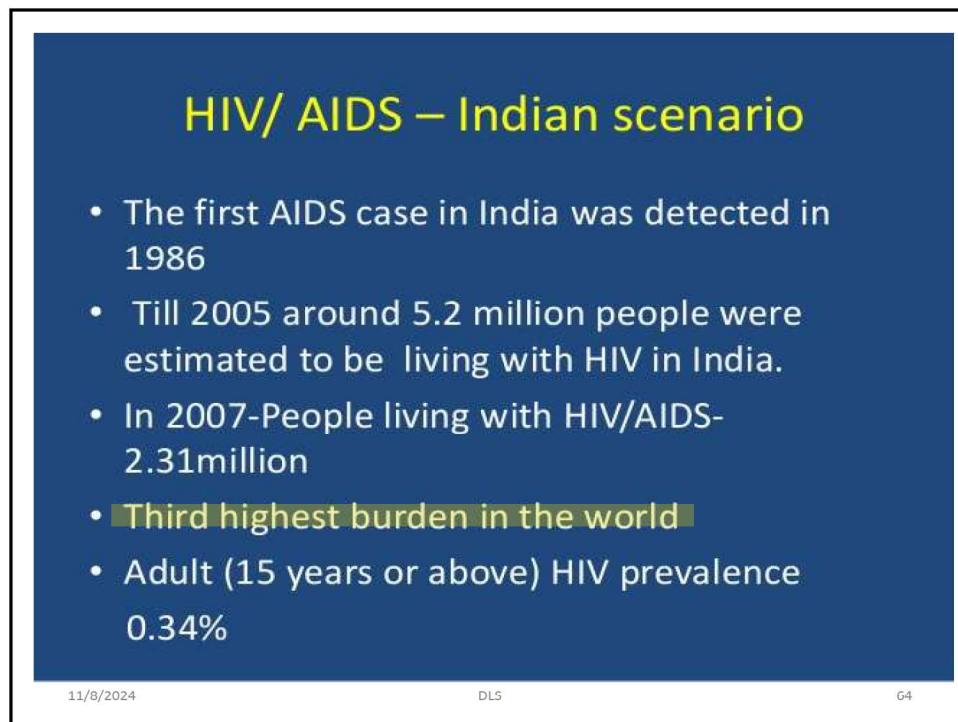
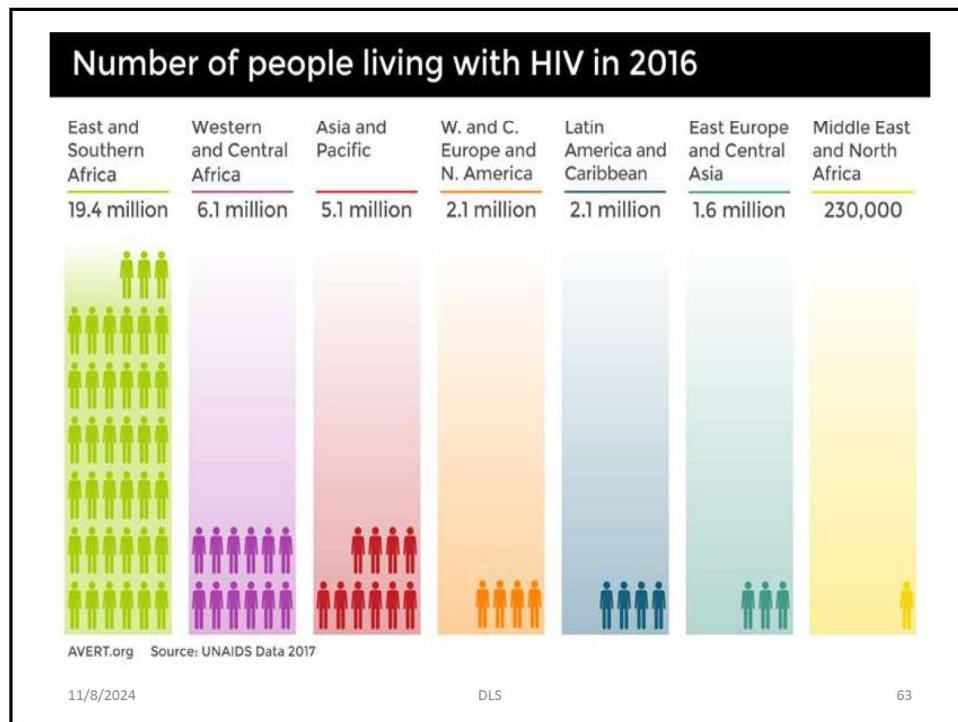
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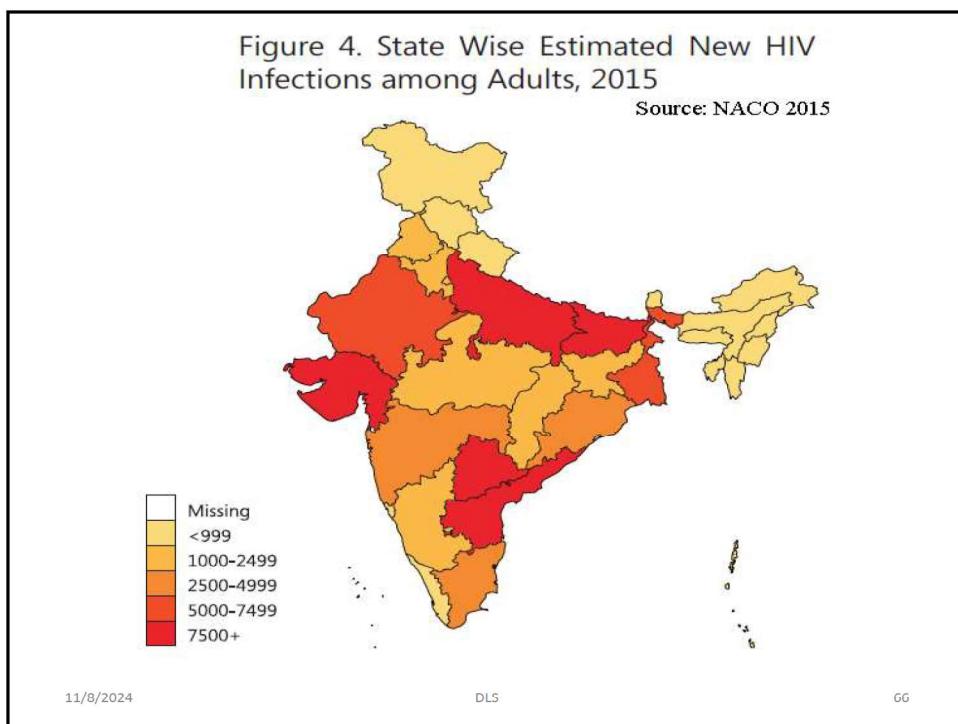
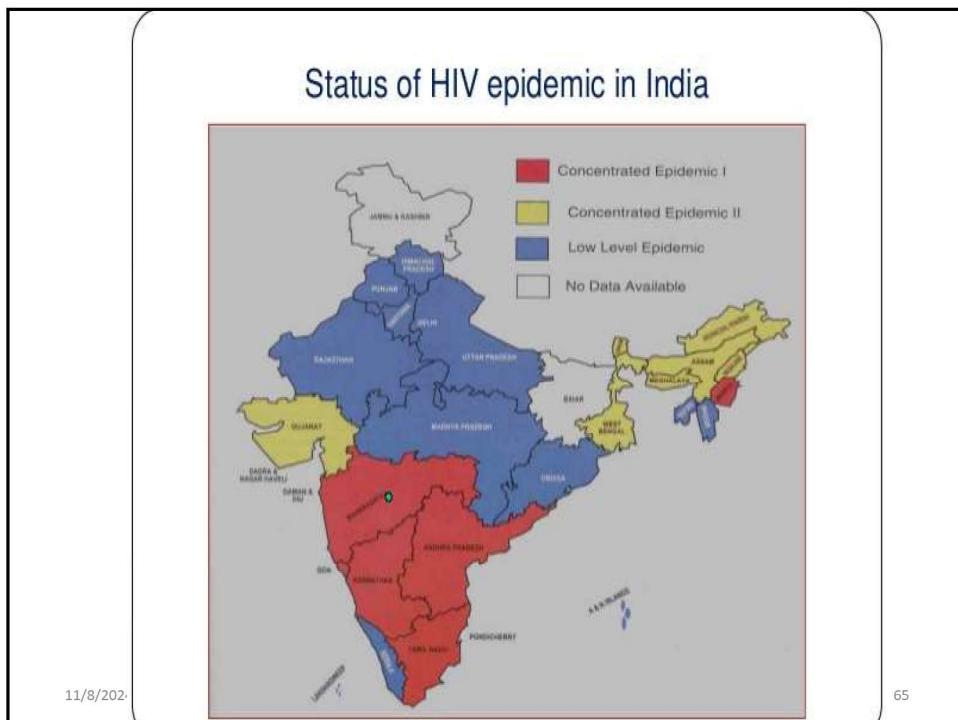
HIV Infection and body organs affected

• HIV Related Opportunistic Disease



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Treatment for HIV/AIDS

Treatments

- The most effective treatment for HIV is highly active antiretroviral therapy- a combination of several antiretroviral medicines that aims to control the amount of virus in your body.
- Other steps you can take include keeping your immune system strong, taking medicines as prescribed, and monitoring your CD4+ (white blood cells) counts to check the effect of the virus on your immune system is the best way to live longer with HIV.



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Treatment of AIDS & Life Expectancy

Treatment helps people live longer.

- In 1993 = less than 7 years
- In 2006 = 20 years or more...
....if properly treated
- New drugs are the cause of the increase

2011: About 33.3 million people worldwide are infected with HIV, the virus that causes AIDS.

In 2009, the last year for complete statistics, 2.6 million people became infected and 1.8 million people died.

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Making Progress – AIDS by the numbers

33% decrease in new HIV infections since 2001

29% decrease in AIDS-related deaths (adults and children) since 2005

52% decrease in new HIV infections in children since 2001

40-fold Increase in access to antiretroviral therapy 2002–2012

What are the problems with Treatment?

- a. Have to take lots of pills
- b. Pills can make people sick – side effects
- c. Pills don't work for everyone – or forever
- d. Pills cost lots of money!

**2010 avg cost est. = \$398,000 / 20+ years
or \$1,659 / month
Advanced cases = \$3,390 / month**

Prevention of HIV/AIDS



- Practice safe sex to prevent HIV
- Reduce your number of sex partners
- Talk with your sex partner or partners about their sexual history, as well as your own sexual history
- Do not share intravenous (IV) needles, syringes, cookers, cotton, cocaine spoons, or eyedroppers with others if you use drugs.
- Tell your sex partner or partners about your behavior and whether you are HIV-positive.
- Follow safe sex practices, such as using condoms.
- Do not donate blood, plasma, semen, body organs, or body tissues.
- Do not share personal items, such as toothbrushes, razors, or sex toys, that may be contaminated with blood, semen, or vaginal fluids.

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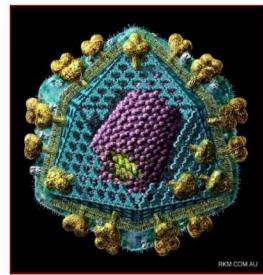
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Let's Rewind!

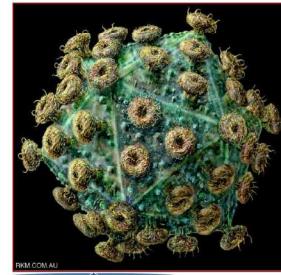
Brainstorm respectfully:

What are 3 ways you can think of to keep
a person safe from HIV/AIDS???



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How to keep safe?

1. No sex = abstinence
2. Have only one uninfected partner
= monogamy
3. Use protection = Protect your self – During blood transfusion, don't use syringe from others, or safe practice.

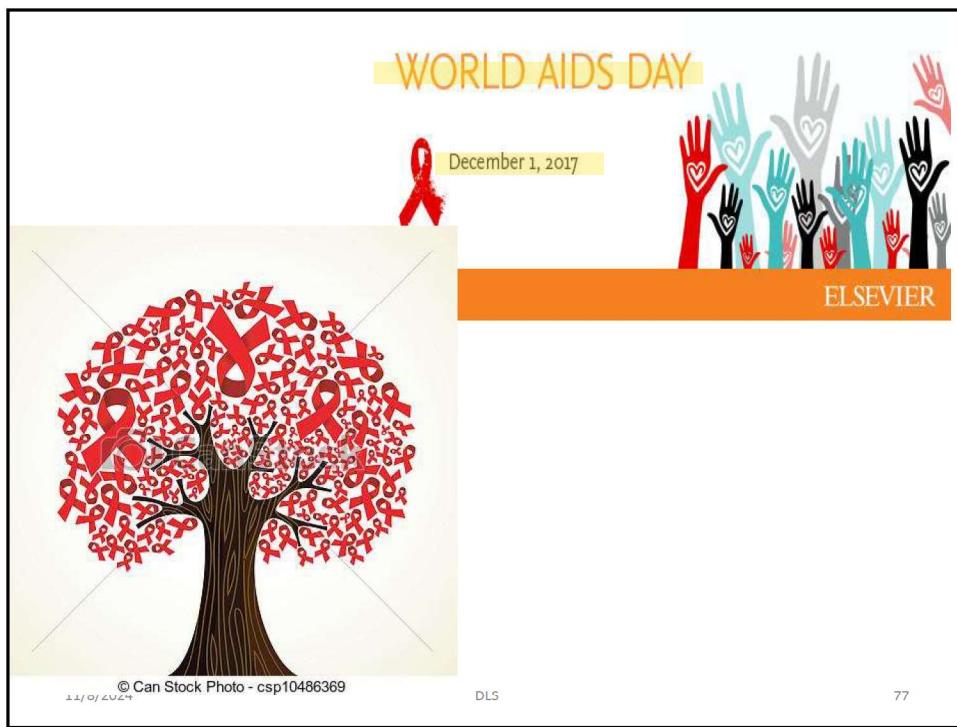




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