



# Module 1

## Overview of HIV Infection

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**Purpose** To provide you with the basic terms and concepts related to HIV infection.

**Pre-requisite Modules** None

**Learning Objectives** At the end of this module, you will be able to:

- Describe the difference between HIV infection and AIDS
- Discuss the HIV epidemics globally, regionally, and locally in terms of number of people affected
- Define the terms: antibody and antigen
- Explain how “window period” may affect HIV testing results
- Describe the progression of HIV infection

**Content Outline**

- What is HIV?
- What is AIDS?
- The HIV pandemic
- HIV transmission
- Window period
- Stages of HIV infection

**Handout** WHO Staging System for HIV Infection and Disease in Adults and Adolescents



Provide local HIV infection rate and its impact on local community.

**Notes on Customization**

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## What is HIV?

Many people see HIV and AIDS as being the same thing, and therefore make the assumption that someone who is HIV-positive could die tomorrow. This is not true. It is important to distinguish between HIV and AIDS.

HIV stands for Human Immunodeficiency Virus.

- Human: Infecting human beings
- Immunodeficiency: Decrease or weakness in the body's ability to fight off infections and illnesses
- Virus: A pathogen having the ability to replicate only inside a living cell

## Types of HIV Virus

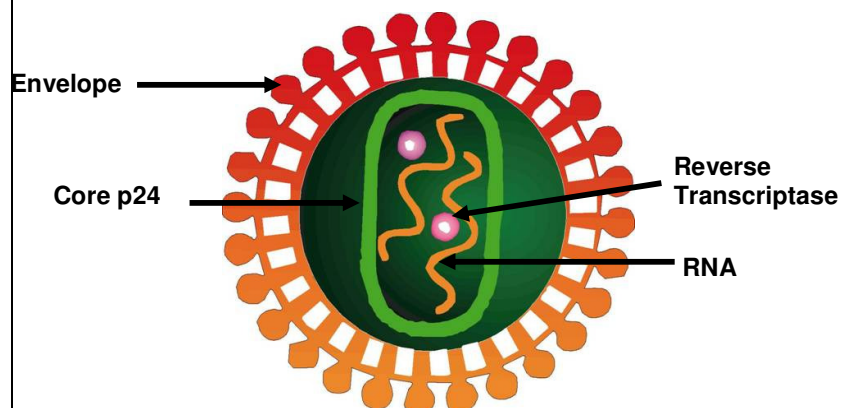
There are two types of HIV virus:

- **HIV 1** is most common in sub-Saharan Africa and throughout the world. HIV 1 can be divided into groups M, N, and O. The pandemic is dominated by Group M, which is composed of subtypes A – J.
- **HIV 2** is most often found in West Central Africa, parts of Europe and India.

Both produce the same patterns of illness. HIV 2 causes a slower progression of disease than HIV 1. It is important for tests to detect the HIV subtypes that are present in the region. Otherwise, testing may lead to false negative results.

## Structure of HIV

Like all viruses, HIV virus is made up of 2 main elements: the external envelope, and the internal core.



HIV is in a family of viruses called retrovirus. Specific test methods are used to detect and measure certain parts of the virus. For example, a test to detect the core of the virus called p24 is used to detect early or pediatric infections.

## What is AIDS?

AIDS stands for:

- Acquired: To come into possession of something new
- Immune Deficiency: Decrease or weakness in the body's ability to fight off infections and illnesses
- Syndrome: A group of signs and symptoms that occur together and characterize a particular abnormality

AIDS is the final stage of the disease caused by infection with the virus.

## HIV vs. AIDS

HIV is the virus that causes AIDS. Not everyone who is infected with HIV has AIDS. Everyone with AIDS is infected with HIV. AIDS is the result of progression of HIV Infection. Anyone infected with HIV, although healthy, can still transmit the virus to another person.

HIV infection leads to a weakened immune system. This makes a person with HIV vulnerable to infections. AIDS results when HIV infection progresses to an advanced stage, damaging the immune system to a point at which the body can no longer fight illness.

Drugs are available which can treat HIV and AIDS. These drugs are called antiretrovirals (ARVs). They prevent the virus from replicating and slow the progress of the disease. Currently, there is still no cure for AIDS or a vaccine that will prevent HIV infection.



### Information Box

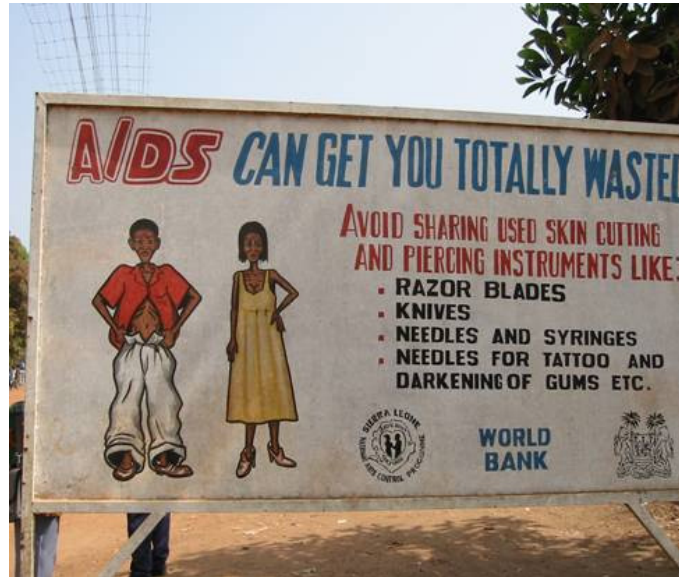
#### How HIV weakens the immune system

Our blood contains white and red blood cells. Normally the white cells fight off and kill any germs which enter our bodies. They do this by eating up the germs and by producing chemicals called antibodies which kill them. In this way our bodies fight off many different germs and we stay healthy.

Sometimes we have symptoms of illness when our white cells are fighting the germs, but usually the white cells win and we get better.

HIV weakens the immune system by entering and destroying our white cells. As more and more white cells are killed, the body becomes less and less able to fight off the many different germs which live around and in our bodies all the time. After many years the white cells are so damaged that these germs, which normally do not cause problems, can cause deadly diseases.

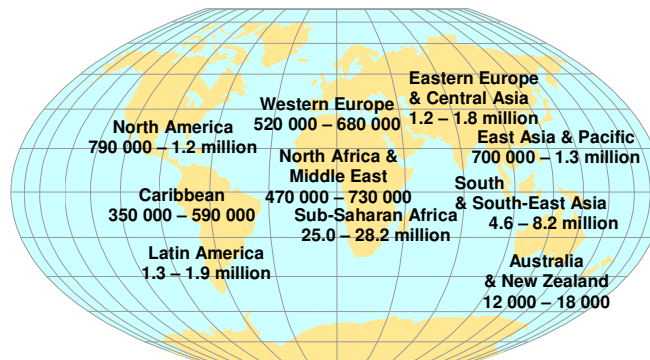
## How is HIV Transmitted?



HIV is transmitted through:

- Unprotected sexual contact with an infected partner
- Exposure of broken skin or wound to infected blood or body fluids
- Transfusion with HIV-infected blood
- Injection with contaminated objects
- Mother to child during pregnancy, birth or breastfeeding

## HIV: A Global Pandemic

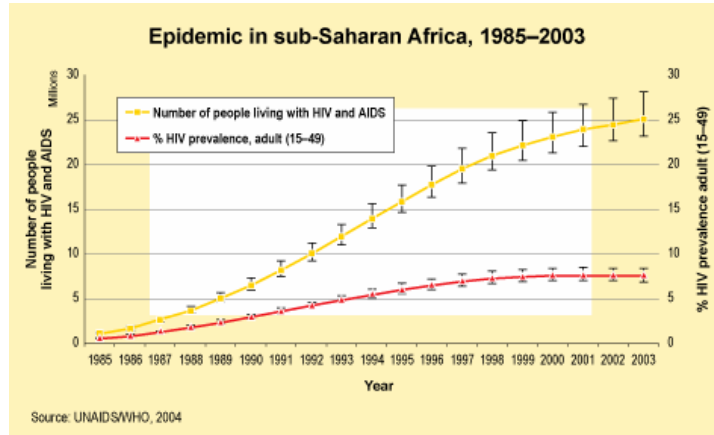


Adults and children estimated to be living with HIV/AIDS (2003): 34 – 46 million total

The above graphic provides estimates for the numbers of persons living with HIV in different continents in 2003. Between 34 and 46 million persons live with HIV; most of these in Africa.

HIV infection is a worldwide epidemic – a pandemic – affecting people everywhere.

## HIV Epidemic in Sub-Saharan Africa



Study the chart above and notice the growing number of people living with HIV and AIDS and the growing trend of HIV prevalence

## Testing for Viral Infection and Immune Response

HIV infection can be measured in terms of:

- The amount of virus circulating in the body –called the viral load
- The amount of antigen – p24 antigen – circulating in the body
- Proteins or cells that protect the body against infection – IgG and IgM antibodies, and CD4 cells

### Information Box

#### Definition of antigen and antibody

**Antigen** is a substance recognized as foreign by the immune system. Antigens can be part of an organism or virus, e.g., envelope, core (p24) and triggers antibody production.

**Antibody** is a protein (immunoglobulin) made by the body's immune system to recognize and attack foreign substances

**i** Information Box

### Measuring human response to HIV infection: B and T cells

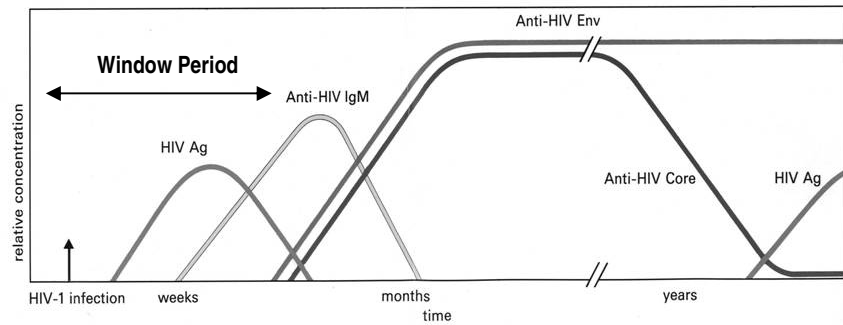
T and B cells are types of white blood cells called lymphocytes that provide protection against infection. B cells are responsible for producing antibodies. There are three types of T cells.

- **Helper T-Cells** (also called CD4+ cells) help other cells destroy infective organisms.
- **Suppressor T-Cells** (also called CD8+ cells) suppress the activity of other lymphocytes so they don't destroy normal tissue.
- **Killer T-Cells** (also called cytotoxic T lymphocytes, or CTLs, and are another kind of or CD8+ cell) recognize and destroy abnormal or infected cells.

Over a period of time, HIV infects and kills white blood cells called CD4 lymphocytes or (T cells), leaving the body unable to fight off certain kinds of infections.

### Evolution of Antibodies

### Serologic Profile of HIV-1 Infection



Study the chart above and notice the timeframe by which antibodies are produced. Specific antibodies are detected at certain times over the course of infection.

Did you notice an area labeled Window Period?

## Window Period

Window period is the phase when you have been infected with HIV, but antibody levels are not detectable. One may test false-negative for HIV antibodies, and can still pass the virus to others during this period.

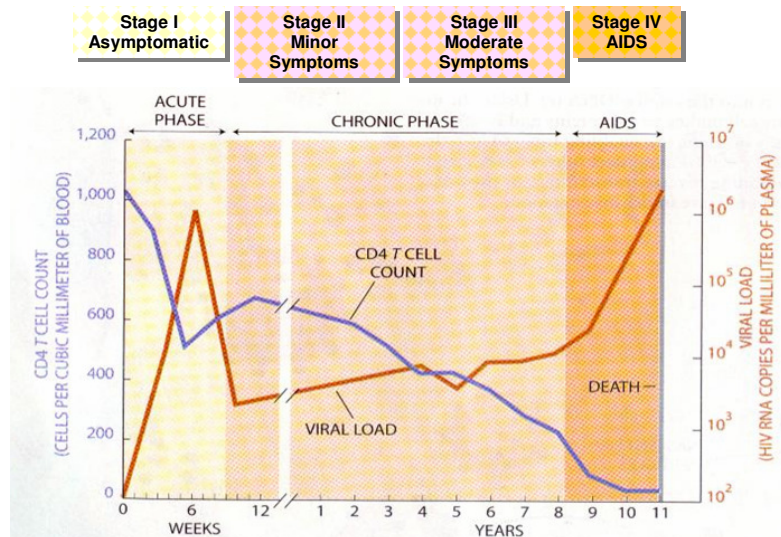
What occurs during the window period is called seroconversion:

- “Seroconversion” is a term used to describe the change from non-detectable to detectable antibody levels. Specimen may test initially non-reactive, but change to testing reactive after a certain time period.
- Seroconversion occurs generally 3-8 weeks after the initial infection.

## Disease Progression

Severity of illness is determined by amount of virus in the body (increasing viral load) and the degree of immune suppression (decreasing CD4+ counts). As the CD4 count declines, the immune function decreases.

## WHO HIV/AIDS Classification System



WHO (World Health Organization) marks the progression of HIV infection with four stages.

For more detail, refer to WHO's classification system that describes the clinical course of HIV infection at the end of this module.

## Can Disease Progression Be Delayed?

Disease progression may be delayed by:

- Prevention and early treatment of opportunistic infections (OIs)
- Antiretroviral therapy
- Positive living



### Key message

- HIV is a global pandemic
- AIDS results when HIV infection progresses to an advanced stage, damaging the immune system to a point at which the body can no longer fight illness.
- HIV can be transmitted through unprotected sexual contact with an infected partner, injection with contaminated sharps, transfusion with HIV-infected blood, and from mother to child during pregnancy, birth or breastfeeding.
- The Window period is the phase when you have been infected with HIV, but antibody levels are not detectable.





## **Module Review**

Find out how much you have learned by answering these questions.

**What is HIV? What is AIDS? How does HIV relate to AIDS?**

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**What are the means by which HIV is transmitted?**

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**What is “window period?” How does it affect HIV test results?**

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**What is an antibody? Antigen?**

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## **Module Review**

Find out how much you have learned by answering these questions.

**How does HIV infection progress?**

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**How can the disease progression of HIV/AIDS be delayed?**

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## WHO Staging System for HIV Infection and Disease in Adults and Adolescents

<p><b>Clinical stage I</b></p> <p>Asymptomatic          Persistent generalized lymphadenopathy  <i>Performance scale 1: asymptomatic, normal activity</i></p>
<p><b>Clinical stage II</b></p> <p>Weight loss, &lt;10% of body weight          Minor mucocutaneous manifestations (seborrheic dermatitis, prurigo, fungal nail infections, recurrent oral ulcerations, angular cheilitis)          Herpes zoster within the last five years          Recurrent upper respiratory tract infections (i.e. bacterial sinusitis)  <i>And/or performance scale 2: symptomatic, normal activity</i></p>
<p><b>Clinical stage III</b></p> <p>Weight loss, &gt;10% of body weight          Unexplained chronic diarrhoea, &gt;1 month          Unexplained prolonged fever (intermittent or constant), &gt;1 month          Oral candidiasis (thrush)          Oral hairy leukoplakia          Pulmonary tuberculosis within the past year          Severe bacterial infections (i.e. pneumonia, pyomyositis)  <i>And/or performance scale 3: bedridden &lt;50% of the day during the last month</i></p>
<p><b>Clinical stage IV</b></p> <p>HIV wasting syndrome, as defined by the Centers for Disease Control and Prevention<sup>a</sup>  <i>Pneumocystis carinii</i> pneumonia          Toxoplasmosis of the brain          Cryptosporidiosis with diarrhoea &gt;1 month          Cryptococcosis, extrapulmonary          Cytomegalovirus disease of an organ other than liver, spleen or lymph nodes          Herpes simplex virus infection, mucocutaneous &gt;1 month, or visceral any duration          Progressive multifocal leukoencephalopathy          Any disseminated endemic mycosis (i.e. histoplasmosis, coccidioidomycosis)          Candidiasis of the oesophagus, trachea, bronchi or lungs          Atypical mycobacteriosis, disseminated          Non-typhoid <i>Salmonella</i> septicaemia          Extrapulmonary tuberculosis          Lymphoma          Kaposi's sarcoma          HIV encephalopathy, as defined by the Centers for Disease Control and Prevention.<sup>b</sup>  <i>And/or performance scale 4: bedridden &gt;50% of the day during the last month</i></p>

Note: both definitive and presumptive diagnoses are acceptable.

- <sup>a</sup>. HIV wasting syndrome: weight loss of >10% of body weight, plus either unexplained chronic diarrhoea (>1 month) or chronic weakness and unexplained prolonged fever (>1 month).
- <sup>b</sup>. HIV encephalopathy: clinical findings of disabling cognitive and/or motor dysfunction interfering with activities of daily living, progressing over weeks to months, in the absence of a concurrent illness or condition other than HIV infection which could explain the findings.