

HIV/AIDS

DR. N.M. SHAIKH
ASSISTANT PROF.
Smt. N.H.L. M.M.C., Ahmedabad

**IS HIV AND AIDS THE SAME
THING?**



World AIDS Campaign

H Human

I Immunodeficiency

V Virus

HIV

- A specific type of virus (a retrovirus)
- HIV invades the helper T cells to replicate itself.
- No Cure
- Because it is commonly acquired by sexual contact, a number of moral, ethical, legal and psychological issues related to HIV positive person.
- Causes enormous Social, Economical & Behavioral impact on individual, families, communities and whole world.

A Acquired

I Immuno

D Deficiency

S Syndrome

AIDS

- Acquired Immunodeficiency Syndrome
- HIV is the virus that causes AIDS
- Disease limits the body's ability to fight infection
- A person with AIDS has a very weak immune system
- No Cure

HISTORY OF AIDS

- First **recognized in June, 1981** at the Centers for Disease Control, U.S.A. in previously healthy homosexual man dying with Pneumocystis carinii pneumonia and candidiasis.
- Virus causing AIDS was **identified in 1983 by French scientists** (LAV-Lymphadenopathy Associated Virus) & **American scientists** (HTLV III-Human T Lymphocytotropic Virus type III) independently.
- The **International Committee on Nomenclature of Viruses** named it the “**Human Immunodeficiency Virus**” (HIV).

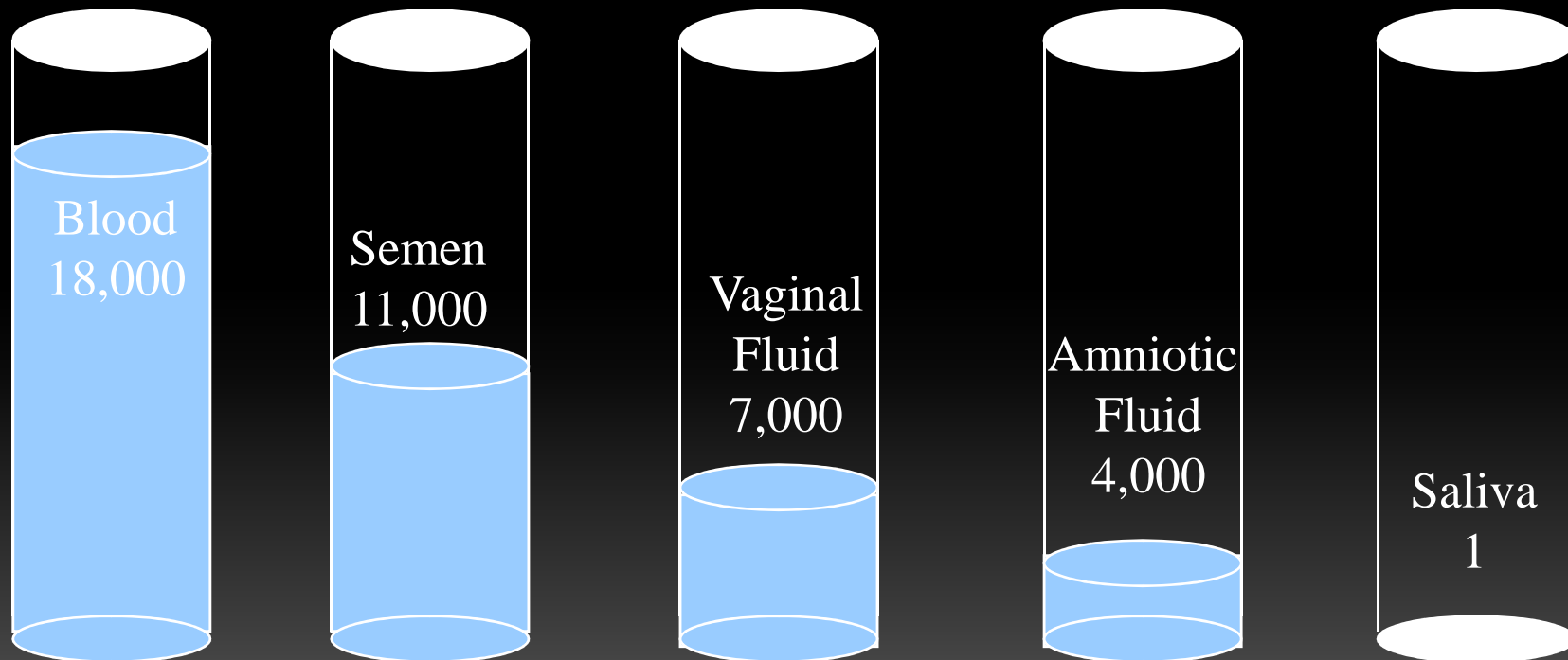
HIV Transmission

- HIV enters the bloodstream through:
 - Open Cuts
 - Breaks in the skin
 - Mucous membranes
 - Direct injection

HIV Transmission

- Common fluids that are a means of transmission:
 - Blood
 - Semen
 - Vaginal Secretions
 - Breast Milk

HIV in Body Fluids



Average number of HIV particles in 1 ml of these body fluids

Transmission of HIV

1. Sexual intercourse (unprotected vaginal/anal/oral) with an infected partner.

- man to man (homosexual)
- man to woman (heterosexual)



Efficiency of transmission (the risk of becoming infected) is affected by

a) Type of sex act

- all unprotected sex act carry risk of HIV transmission because sexual secretions directly come in contact with mucous membranes
- presence of injury to mucous membrane of rectum, vagina or mouth increases risk of HIV transmission
- **RECEPTIVE** partners are at greater risk than **INSERTIVE** partners

Contd.

- b) Frequency of unprotected sex act
- c) Number of high risk partners
- d) Amount of virus present in blood, sexual secretions (semen, vaginal or cervical secretions) of infected partner.
- e) Presence of other STD (sexually transmitted diseases) and/or genital lesions in either partner
 - HIV can be transmitted even if STD is not present but it increases the risk of acquiring & transmitting HIV

2. Transfusion with infected blood, blood products, organ/tissue transplantation and artificial insemination

-Most efficient way



Contd.

3. Contaminated needles & syringes

intravenous drug user patients share same unsterilized needles & syringes to reduce cost of injection.



Contd.

4. Vertical transmission from infected mother to child (before, during and after delivery)

through - amniotic fluid
- genital secretions
- maternal blood
- breast milk

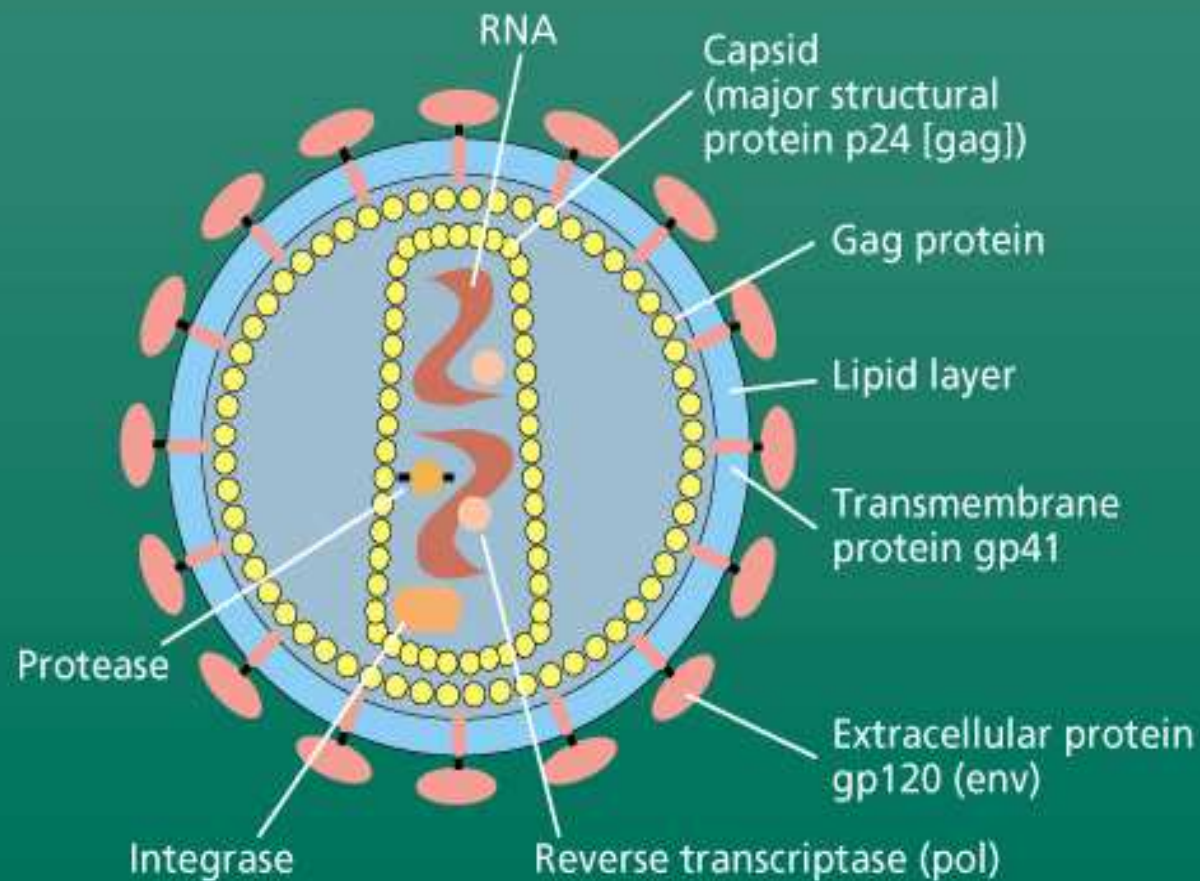


5. Nosocomial infection

in hospital/health care setting on account of accidental needle stick injury or sharp instrument cuts, etc. while treating an HIV/AIDS patient

- extremely uncommon

HIV Structure



Adapted from *HIV/AIDS Handbook*, 3rd ed. Boston: Total Learning Concepts, 1997.

Viral genes & Antigens

Structural genes – gag

pol

env

nonstructural genes – tat

nef

vif

vpu / vpx

vpr

LTR

Genes coding for structural genes

1. gag gene

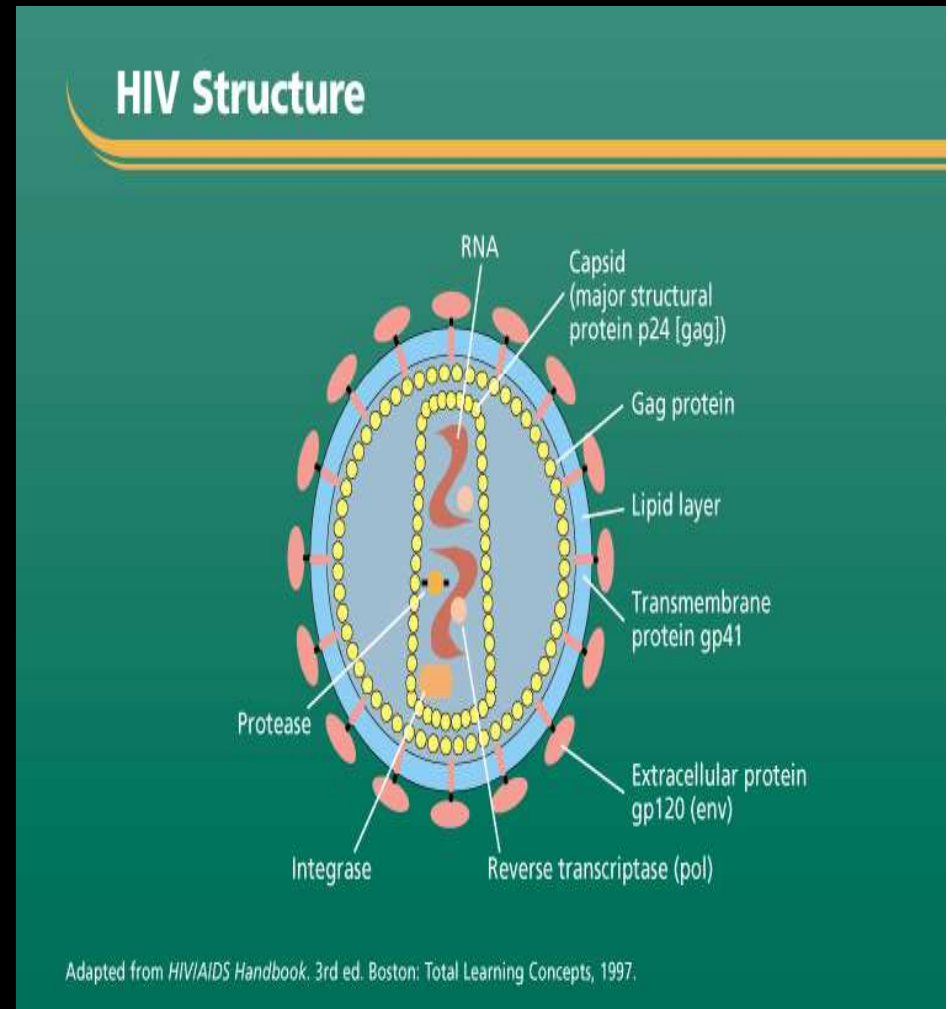
- determines the core & shell of the virus
- precursor protein p55 → p15, p18, p24

2. env gene

- determines the syn. of envelope glycoprotein gp160 → gp120, gp41

3. pol gene

- codes for the RT & other enzymes



Types of HIV

- ❖ Highly mutable virus, exhibits frequent antigenic variations.
- ❖ Based on molecular & antigenic differences two types of HIV - **HIV-1 & HIV-2**
- ❖ **HIV-1** :
 - subtypes - **A**, B, **C**, **D**, E, F, G, H, J, K
 - Group M (Major)
 - Group O (Outlier)
 - Group N (New)
- ❖ **HIV-2** : 40% genetic identity with HIV-1
 - much less virulent than HIV-1
 - West Africa

Differences between HIV-1 & HIV-2

- Slow clinical deterioration & disease development
- Fewer immunological disturbances
- Low transmissibility
- Longer incubation period
- Lower rate of vertical transmission
- Low rate of efficiency of virus isolation
- Low rate of opportunistic infection
- Lower viral load
- Lower level of proviral DNA in circulating lymphocytes
- Possible protection of HIV1 infection

Pathogenesis

- Main receptor - CD4 Ag
 - CD4+ T lymphocytes
 - B lymphocytes, monocytes, macrophages e.g. alveolar macrophages, Langerhans cells, glial cells and microglia.
- Spikes-gp120 - binds with surface receptors on host cell, fusion takes place by gp41 with co-receptors
- 2 co-receptors - CXCR4 & CCR5

- First cell to be infected – resident tissue macrophages or sub mucosal lymphocytes in genital tract or rectum → transported to the draining lymph nodes → virus replicates

↓ 2-3 wks

viraemia

decreased CD4+ T lymphocytes

glandular fever like illness

Macrophages carry virus into CNS

↓ within 1 month

viraemia declines to near undetectable level & illness subsides

↓

Long asymptomatic period of 1-15 years (average 10 yrs)

Asymptomatic period

- small no. of circulating infected CD4+ cells
- low viraemia
- many infected cells in lymph nodes
- follicular hyperplasia in ly. Nodes & other ly. Organs

↓ CD4+ count < 400/ μ l

↓
large no. of virions spill from degenerating ly.nodes into blood

↓
Opportunistic infections with various microorganisms

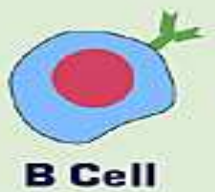
↓
Cause of death - Opportunistic infections, malignancies & cachexia like state

Why there is fall of CD4+ cells

- Viral cytolysis of CD4+ T cells
- Infected CD4+ T cells can fuse via gp120 (upto 100 uninfected CD4+ T cells !!) forming a unit called syncytium
- Immune cytolysis of infected T cells by cytotoxic T cells, NK cells, ADCC & Ab / complement mediated cell lysis
- HIV infect stem cells so there is no replacement
- Autoimmune destruction of infected CD4+ T cells

HUMORAL RESPONSE

CELLULAR RESPONSE



cytokines



Poor production of specific Ab

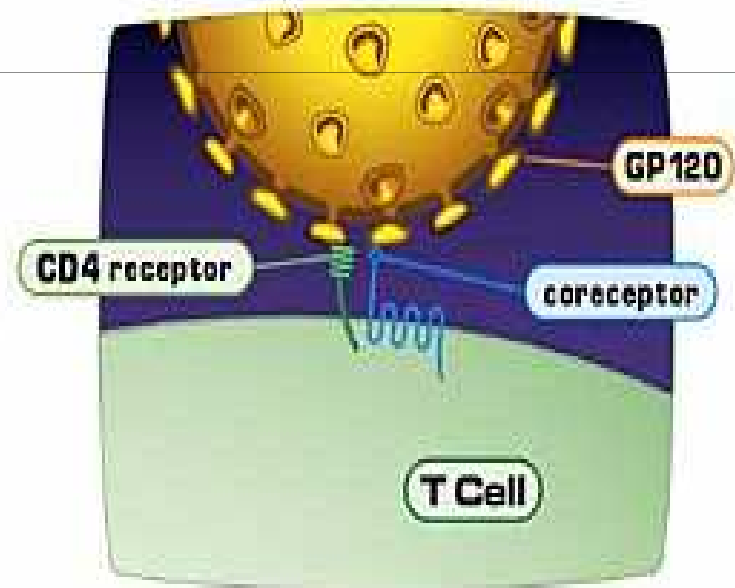
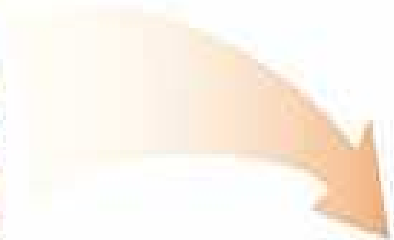
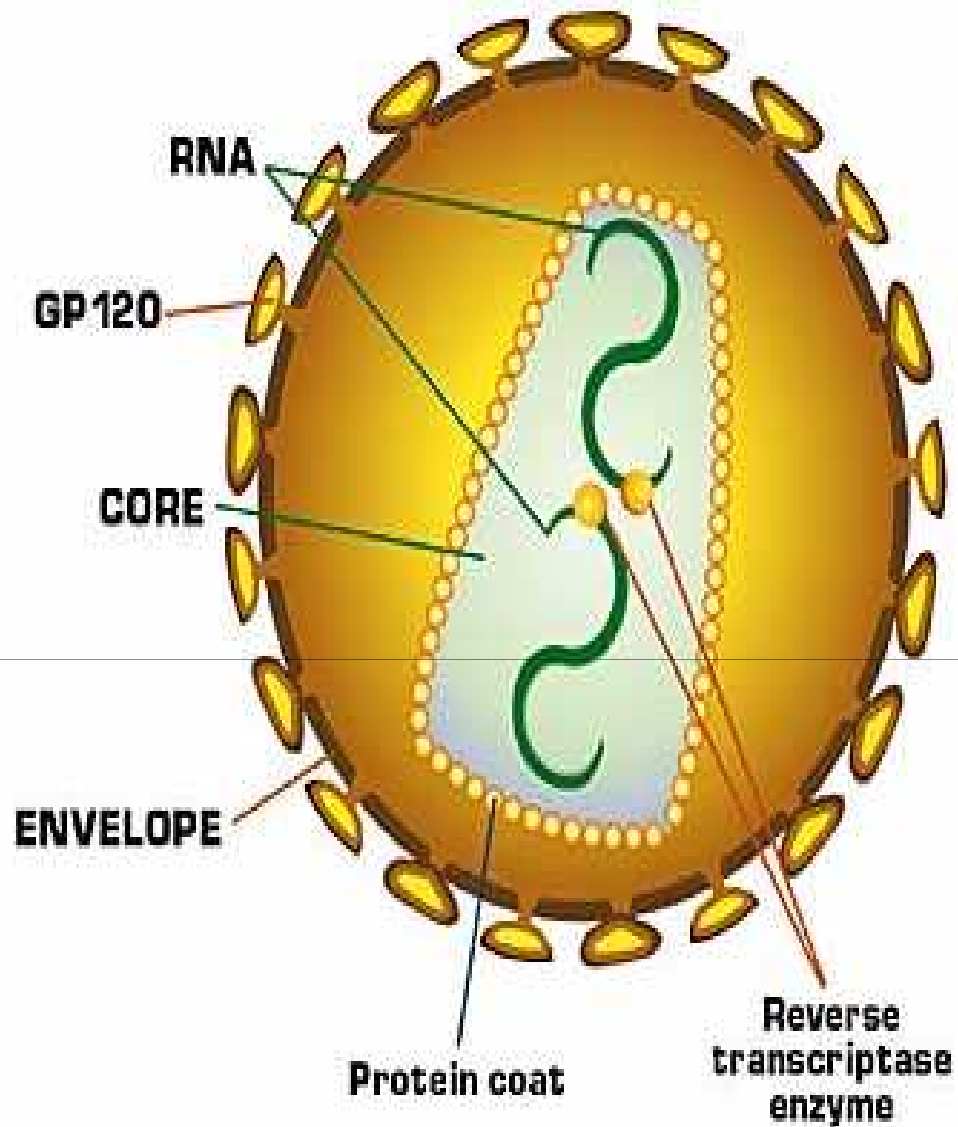


cytokines



Defective killing of I/C
Virus & other pathogens





Stage 1 - Primary

- Short, flu-like illness - occurs one to six weeks after infection
- no symptoms at all
- Infected person can infect other people
- CD4 T-cell count – 1000-500/cu.mm.



Window Period

- The period from the entry of HIV in the host and the appearance of detectable levels of HIV specific antibodies
- During this period the individual is
INFECTED
INFECTIOUS TO OTHERS
SERONEGATIVE
- 90 percent of cases test positive within three months of exposure
- 10 percent of cases test positive within three to six months of exposure



Stage 2 - Asymptomatic



- Lasts for an average of ten years
- This stage is free from symptoms
- There may be swollen glands
- The level of HIV in the blood drops to very low levels
- HIV antibodies are detectable in the blood
- CD4 T-cell count – 750-500/cu.mm.

3. Persistent generalized lymphadenopathy (PGL)

- presence of enlarged nodes, at least 1 cm. in diameter in two or more extra inguinal sites for at least 3 months

4. AIDS related complex (ARC)

- marked immunodeficiency
- constitutional symptoms like fatigue, unexplained fever, persistent diarrhea, marked weight loss of (>10% of body weight)
- opportunistic infections like oral candidiasis, herpes zoster, hairy cell leukoplakia, salmonellosis, tuberculosis.
- generalised lymphadenopathy and splenomegaly are usually present.

5. AIDS

- ✓ End stage disease
- ✓ Recurrent pneumonia because of
 - Pneumocystis carinii infection
 - CMV infection
 - Cryptococcus infection
 - Histoplasma infection
- ✓ Tuberculosis
 - multidrug resistant M. tuberculosis
 - M. avium – intracellulare

contd

- ✓ Oral thrush
- ✓ herpetic stomatitis, gingivitis
- ✓ Intestinal infections with Cryptosporidium, Isospora, Cyclospora etc.
- ✓ CNS infections with toxoplasmosis, cryptococcosis
- ✓ Malignancies like Kaposi's sarcoma, Lymphomas

Stages of HIV disease

	Signs & clinical features	Typical duration	CD4 T cell count Range/cu.mm.
1	Acute primary HIV Infection	1-2 wks	1000-500
2	Asymptomatic, no s/s other than lymphadenopathy	10 years	750-500
3	Early symptomatic (non life threatening infection)	0-5 years	500-100
4	Late symptomatic (life threatening infections, malignancies)	0-3 years	200-50
5	Advanced AIDS (serious opportunistic inf.)	1-2 years	50-0

Susceptibility of HIV

- Very fragile virus
- Susceptible to heat – can be killed within 30 min. at 56⁰ C , by boiling for few seconds
- Most of chemical germicide used in hospitals/ laboratories & health care setting kill HIV at much lower concentrations.

For Sterilization & Disinfection

- Autoclave at 121⁰ C, 15 lbs pressure, 20 min.
- Dry heat at 170⁰ C for 1 hour
- Boiling for 20-30 min.
- Sodium hypochlorite – 5gm/litre for routine purpose (0.5-1%)
- Calcium hypochlorite – 1.4gm/litre
- Ethanol – 70%
- Formalin – 3-4%
- Glutaraldehyde – 2% for 30 min.

Laboratory diagnosis
Of
HIV/AIDS

Purpose of HIV testing

- **Information is useful for prophylaxis, medical management & R/ of HIV & related illnesses.**
- **To assure blood safety & donation safety.**
- **To monitor trends of epidemics.**
- **Identification of asymptomatic individual.**
- **To plan personal & family future.**

Contd.

- **To motivate for behaviour modification through counseling against those who test negative and practice high risk behaviour.**
- **To induce behaviour change & prevent transmission by counseling those who test positive.**
- **To diagnose clinically suspected cases.**
- **For peace of mind of individuals practicing high risk behavior.**

Informed consent after pre test counselling

- **HIV testing must be performed after pretest counseling & after consent.**
- **It prepares individual to face the result.**
- **Testing without consent has proven to be counterproductive & has driven HIV positive individual underground. This makes institution of prevention & intervention measures more difficult.**

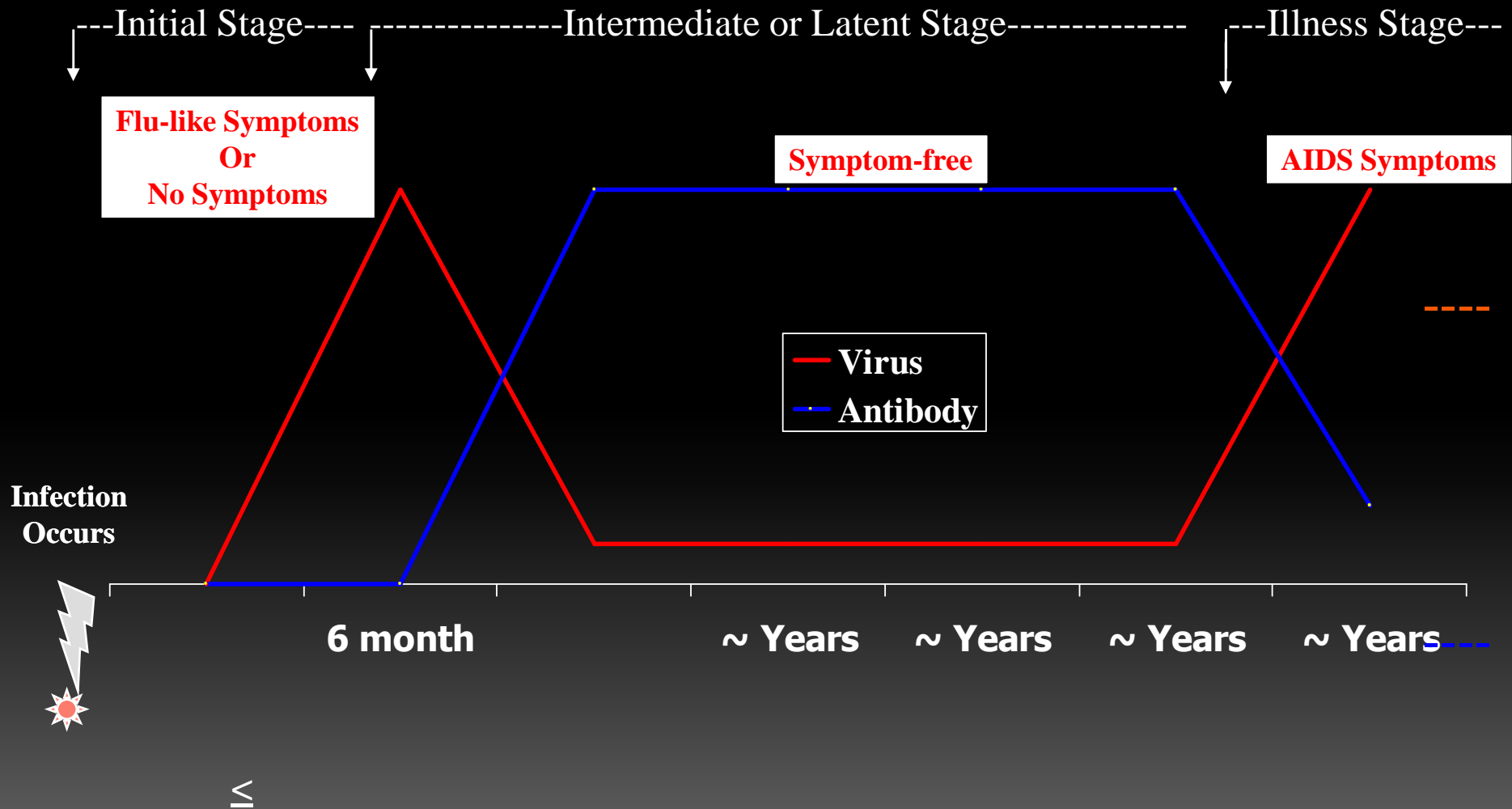
CONFIDENTIALITY

- The confidentiality of test result (+/-) should be strictly maintained in all cases.
- This is to respect privacy & right of individuals and to protect them from discrimination, victimization, & stigmatization.
- Report must be placed in a sealed envelope and submitted to clinician who request the test. The envelope must be marked **“CONFIDENTIAL”**.
- Results should never be communicated via telephones.

Laboratory tests

- Screening tests (Ab detection tests)
 - ELISA
 - Rapid
 - Simple
- Supplemental tests
 - Western blot assay
 - Immunofluorescence test
- Confirmatory tests
 - Virus isolation
 - Detection of p24 Ag
 - Detection of viral nucleic acid

HIV Infection and Antibody Response



Screening tests (Ab detection tests)

- **simplest & most commonly employed technique**
- **detection of serum Ab to both core (p24) or envelope (gp120, gp41)**

ELISA

Different HIV test kits available commercially

- 1st generation - use antigen derived from disruption of viruses grown in human lymphocytes
- 2nd generation - artificially derived recombinant antigens expressed from bacteria or fungi
- 3rd generation - chemically synthesized oligopeptide of 15-40 amino acids-synthetic peptide



Rapid Tests

- Results < 30 minutes
- No need for sophisticated & expensive equipment
- More expensive than ELISA

Simple Test

- Not as fast as rapid test
- Results in 1-2 hours
- Based on ELISA principle

DOT BLOT & COMB tests

- Rapid, easy to perform, can discriminate between HIV-I & HIV-II, do not require sophisticated instrument
- Result read by development of color
- Sensitivity and specificity compared with ELISA
- Draw back –high cost
- Assay utilize recombinant or synthetic peptide- spotted on nitrocellulose paper or microparticles

COMB test





Dot Method – Tri Dot



Supplemental tests

- Detects Ab
- Recommended for validation of the positive results of screening tests
- Not confirmatory but provides only additional information

Western blot test

- highly specific & sensitive
- HIV proteins are separated by polyacrylamide gel electrophoresis
- separated proteins are blotted on to the strips of nitrocellulose membrane.
- membrane is then cut into strips
- these strips are reacted with test sera.
- positive test – presence of bands against at least two of the following gene products :
p24, gp41, gp120/160

Immunofluorescence test

- HIV infected cells are acetone fixed on the glass slides & the reacted with test serum followed by fluorescein conjugated anti-human gamma globulin

Confirmatory tests

1. Virus isolation

- for diagnosis virus is not routinely isolated
- Once infected with HIV, a person remains infected for life.
- the virus present in blood & body fluids mostly within CD4 lymphocytes
- Patient's lymphocytes are co-cultivated with uninfected human lymphocytes in the presence of IL-2
- viral replication can be detected by demonstration of RT & viral antigen

2. Antigen detection : p24 antigen

ELISA

during window period

3. Detection of viral nucleic acid

- PCR – DNA PCR – highly sensitive & specific
- RNA PCR – diagnosis & monitoring the level of viraemia
- complex & costly

COUNSELING

What is counseling?

It is face to face communication by which you can help the person to make decisions and act upon them.

It is a helping process aimed at problem solving.



Pre-test Counseling

- Transmission
- Prevention
- Risk Factors
- Voluntary & Confidential
- Reportability of Positive Test Results

Post-test Counseling

- Clarifies test results
- Need for additional testing
- Promotion of safe behavior
- Release of results

A.B.C.D.

OF

PREVENTION OF

HIV - AIDS

A.

- **Abstinence**
- **Avoid indiscriminate sex (casual or extra-marital or commercial)**
- **Avoid pregnancy if H.R.B. is there or HIV positivity detected.**



Abstinence



- It is the only 100 % effective method of not acquiring HIV/AIDS.
- Refraining from sexual contact: oral, anal, or vaginal.
- Refraining from intravenous drug use

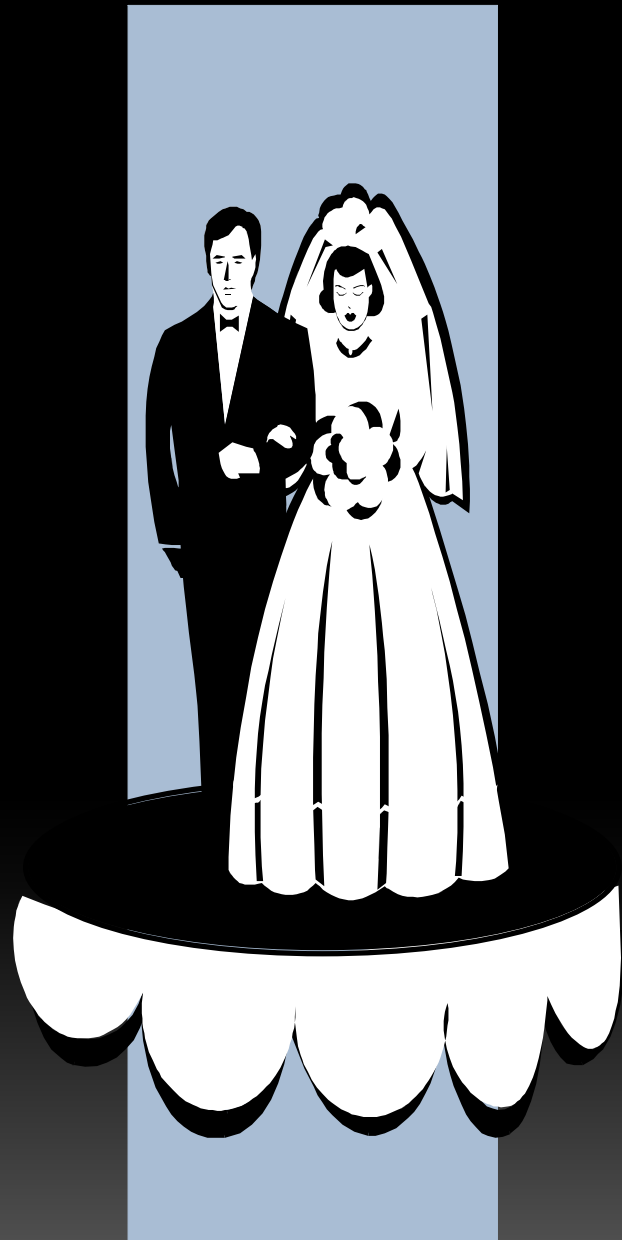


A

Always follow
Universal Work
Precautions

AVOID ALCOHOL & I.D. Use





**BE FAITHFUL TO
YOUR SPOUSE
(PARTNER).**

**Beware of high
risk behavior**

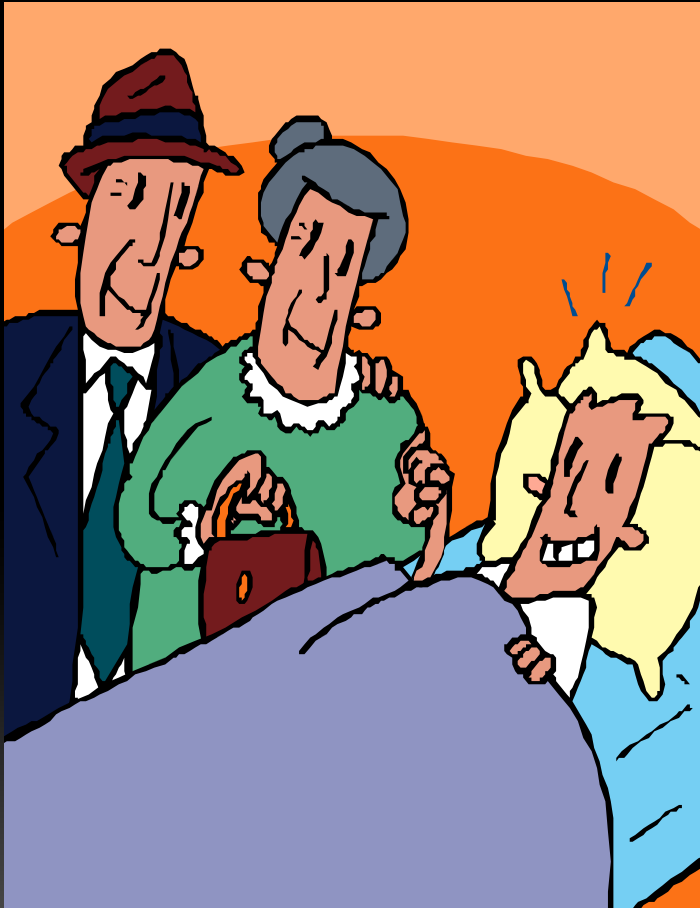
Extra Marital

**Relations are very
dangerous**

C

- **Cannot comply to above two A & B, then lastly**
- **Use Condom**
- **Consistent use**
- **Safe sexual practices**

CONDOM PREVENTS



**Not only Births,
but
Deaths as well**

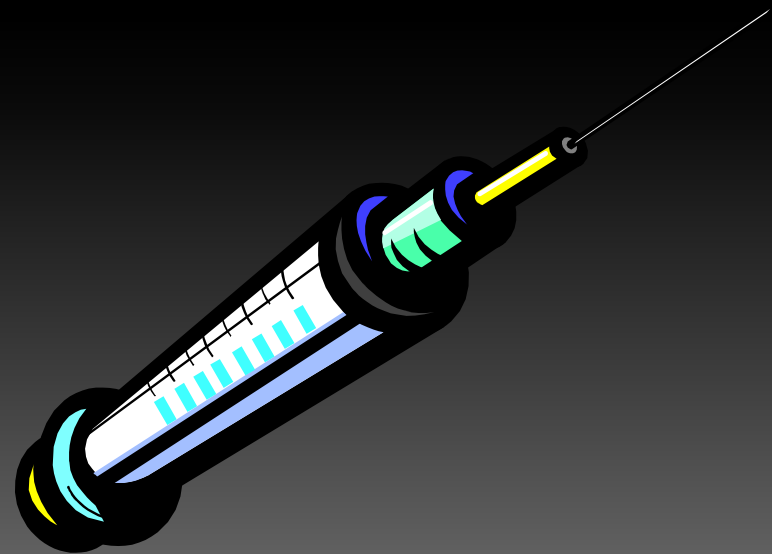
Protected Sex



- Use condoms (female or male) every time you have sex (vaginal or anal)
- Always use latex or polyurethane condom (not a natural skin condom)
- Always use a latex barrier during oral sex

D

- Disposable and sterile syringe & needles, other equipment for health care
- Don't share needles used by others for:
 - Drugs
 - Tattoos
 - Body piercing





**PROMOTE
Voluntary
Blood
Donation**



There is
hardly any
use of a
single unit
of Blood

REMEMBER

People Infected with HIV

- Can look healthy
- Can be unaware of their infection
- Can live long productive lives when their HIV infection is managed
- Can infect people when they engage in high-risk behavior

HIV AIDS

- Once a person is infected they are always infected
- Medications are available to prolong life but they do not cure the disease
- Those who are infected are capable of infecting others without having symptoms or knowing of the infection

HIV Exposure and Infection

- Some people have had multiple exposures without becoming infected
- Some people have been exposed one time and become infected

Condoms

Using condoms is not 100 percent effective in preventing transmission of sexually transmitted infections including HIV

Condoms = Safer sex

Condoms ≠ Safe sex

**HEALTH
EDUCATION
FOR HIV-AIDS**

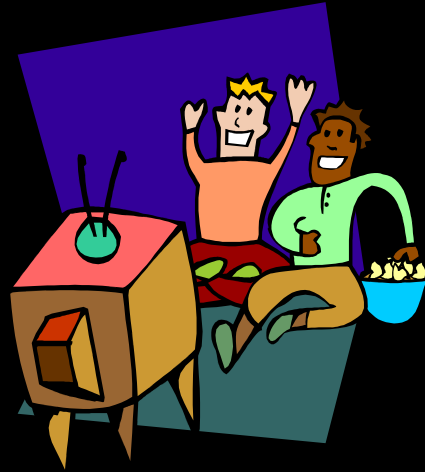
Public Awareness

- Education
 - Health education programs
 - Reduce stigma and discrimination
- Safe sex campaigns
 - Proper use of condom
- HIV Centers



AIDS DOES NOT SPREAD BY

**PLAYING
TOGETHER IN
A FAMILY**



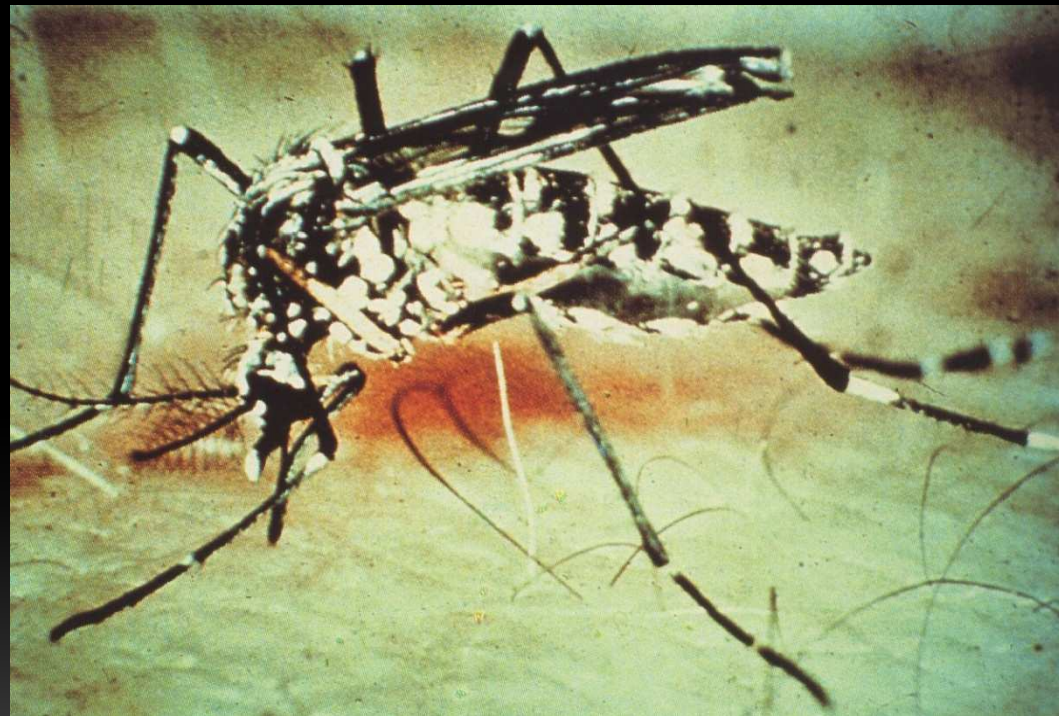
**EATING
TOGETHER**

AIDS DOES NOT SPREAD BY

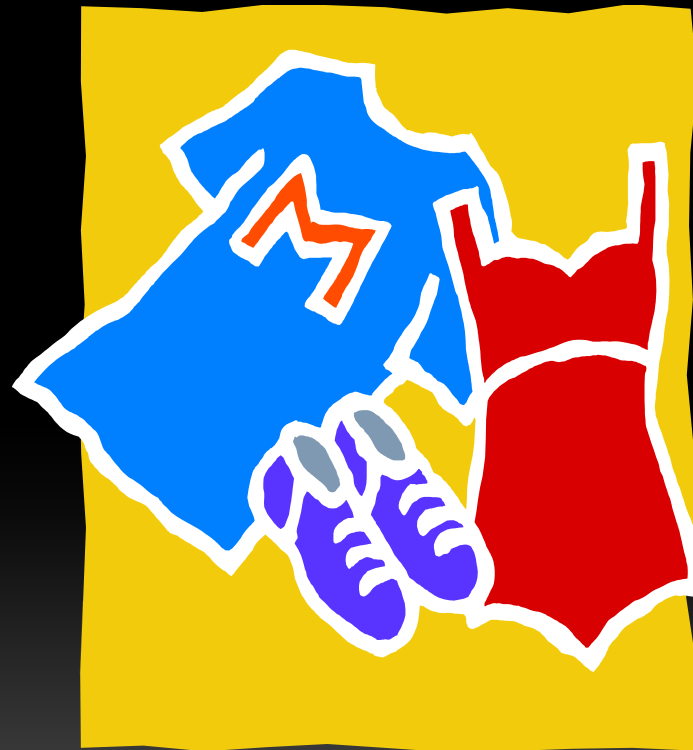


**By Using the
same
bathroom
or
swimming
pool**

AIDS DOES NOT SPREAD BY MOSQUITO BITES



**AIDS DOES NOT SPREAD BY
Sharing clothes**



AIDS DOES NOT SPREAD BY Sharing the bed



AIDS DOES NOT SPREAD BY HUGGING & KISSING



AIDS DOES NOT SPREAD BY



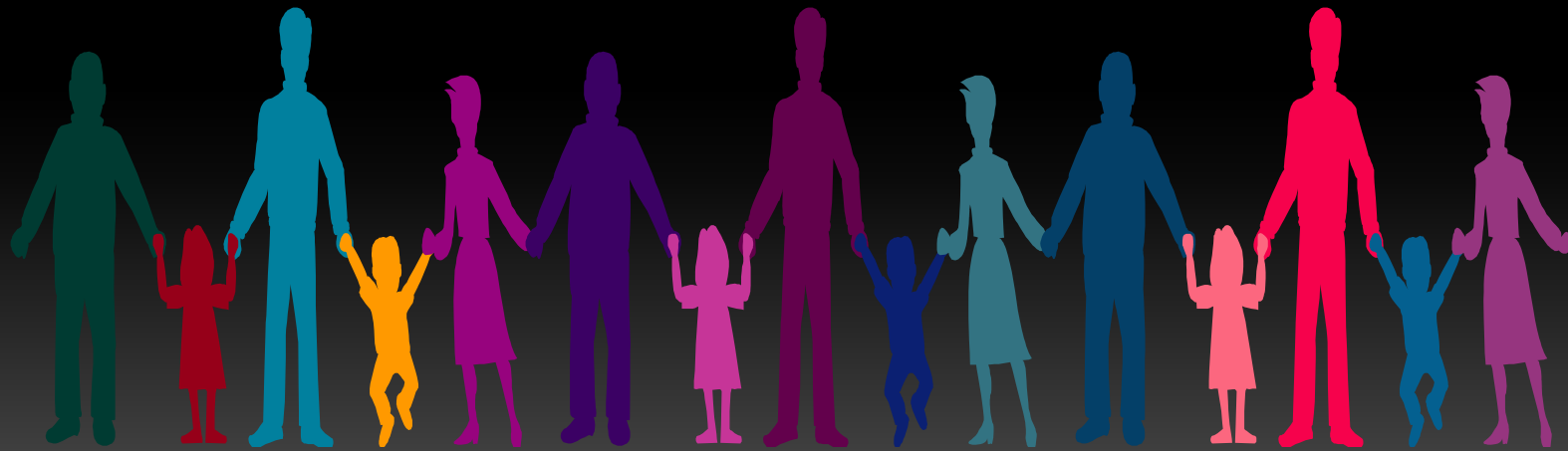
**SNEEZING
OR
COUGHING
(not an Air -
borne
infection)**

AIDS DOES NOT SPREAD BY



**SIMPLE
TOUCH**

CONDEMN AIDS NOT THE PERSON WITH AIDS



Thank You!



ANY QUESTIONS?

