
GOOD AFTERNOON

OLLI @ University of Illinois

Fall Semester

October 6, 2020

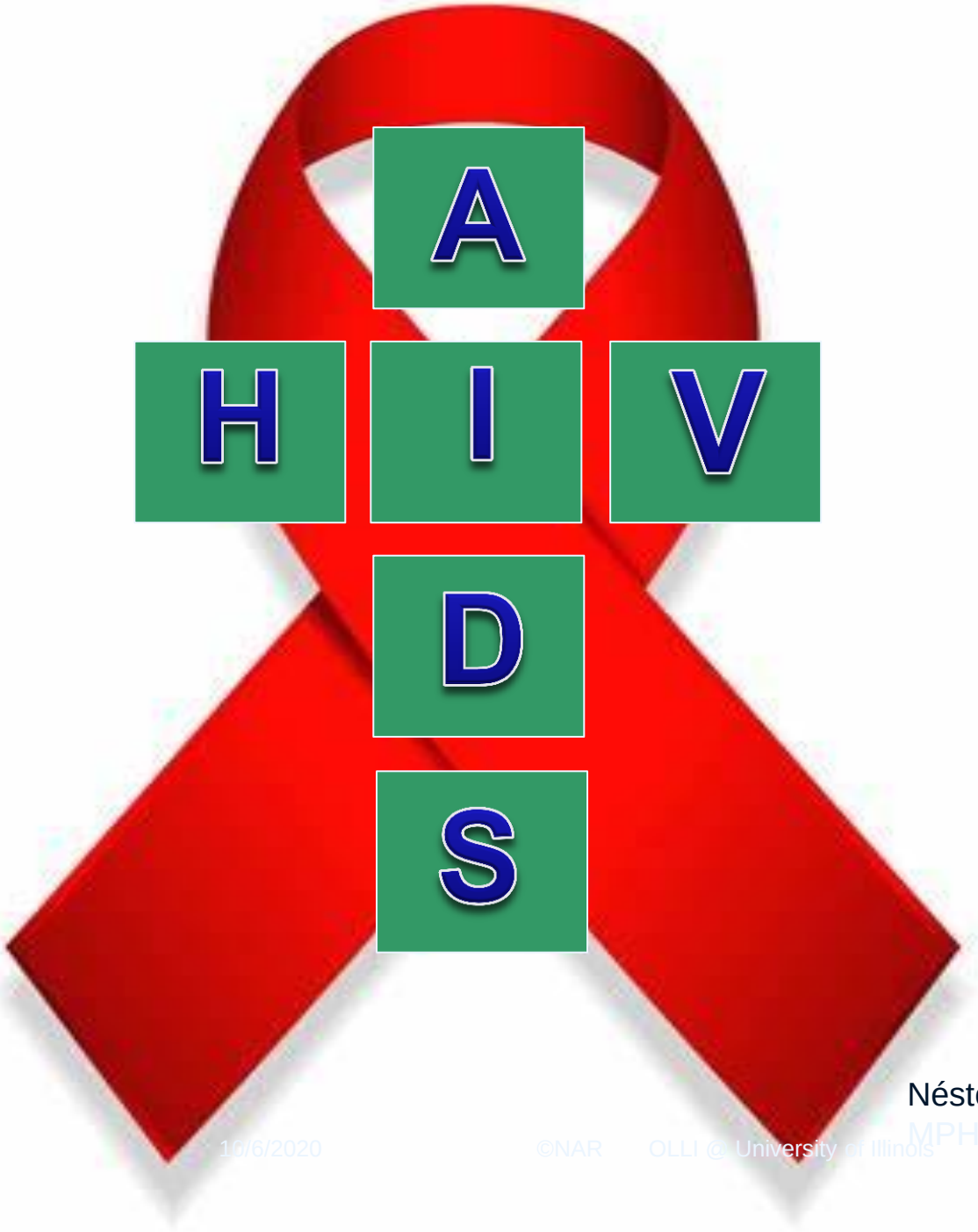
Plagues, Pestilences Poxes and Pandemics

Session 6

Plagues, Pestilences, Poxes and Pandemics.

Course Overview

- Session 1 Sept. 1: Definitions, Biblical Plagues.
- Session 2 Sept. 8: The PLAGUE through time & place.
- Session 3 Sept. 15: Cholera, Yellow Fever, Malaria, etc.
- Session 4 Sept. 22: The Columbian Exchange.
- Session 5 Sept. 29: 20th Century Pandemics.
- Session 6 Oct. 6: HIV/AIDS
- Session 7 Oct. 13: 20th and 21st Century Viruses.
- Session 8 Oct. 20: Corona and other Coming plagues(?)



Néstor A. Ramírez, MD, MPH

Plan for Session 6 (1)

- Definitions.
- What's in a name.
- History in USA and Africa.
- Case Zero.
- Factors of Pandemic Progression.
- Mechanism of disease.

Plan for Session 6 (2)

- Signs & Symptoms.
- Diagnosis.
- Treatment.
- Cure?
- Prevention.
- Lessons learned and forgotten.

DEFINITIONS

Epidemic

- *Sudden* and *rapid* spread of disease to a large number of people in a population within a short period of time.

- Used for infectious diseases, and for diseases with an environmental origin.

Pandemic

- An *epidemic* that crosses international boundaries, usually affecting people on a worldwide scale.
- Near-global disease *outbreaks* when multiple countries across the world are infected.
- Term refers to **extent** of illness not **speed** of spread.

WHAT'S IN A NAME?

The Virus and/or the Disease

- Rare cancer
- Gay plague
- GRID: **G**ay **R**elated **I**mmune **D**eficiency
- LAV: **L**ymphadenopathy **A**ssociated **V**irus
- HTLV – III: Human T-Cell Lymphotropic Virus
- HIV: Human Immunodeficiency Virus.
- AIDS: Acquired Immunodeficiency Syndrome.

The Disease of the 4 “H’s”

- **H**omosexuals.
- **H**eroin Users.
- **H**aitians.
- **H**emophiliacs.

HISTORY OF AIDS
AFRICA, U.S., THE WORLD

Origins of HIV

- HIV made the jump from apes to humans in West-central Africa in the early 20th century.
- AIDS was first officially recognized by the US Centers for Disease Control and Prevention (CDC) in 1981.
- Its cause, HIV infection was identified in the early part of the decade.
- Fierce competition between France and USA.

History of AIDS in the USA (1)

In December 1980, in LA, an MD saw a patient with thrush and extreme weight loss.

He also had a very low T cell (CD4) count.

This implied a serious immune deficiency.

Later, PC Pneumonia was found (rare).

In May, 1981 patient died.

History of AIDS in the USA (2)

- Patient also had a history of STD's.
- Patient had also mentioned he was gay.
- Local MD had 2 gay patients with thrush, diarrhea, CMV, adenopathy..
- MD's in NYC were finding low CD4, adenopathy, PC Pneumonia and CMV in gays.
- Several also had Kaposi's sarcoma (rare).

History of AIDS in the USA (3)

Jim Curran, head of the STD division of the CDC wrote in MMWR in 1981:

"All the above observations suggest the possibility of a cellular-immune dysfunction related to a common exposure that predisposes individuals to opportunistic infections such as pneumocystis and candidiasis."

History of AIDS in the USA (4)

In 1982, CDC decided on the name AIDS.

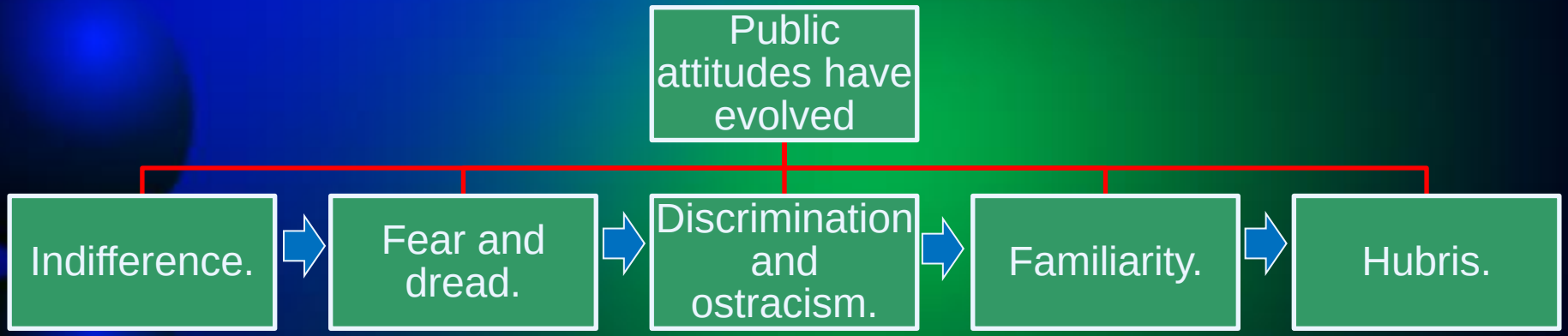
In US at that time: 593 cases.

In 1984: 7,000 cases with 4,000 deaths.

In 2017: Worldwide 36.9 M people living with HIV, with 1.8 M people newly infected.

Since 1981, Worldwide 77.3 M people have contracted HIV and 35.4 M have died of AIDS.

Public Perception of AIDS

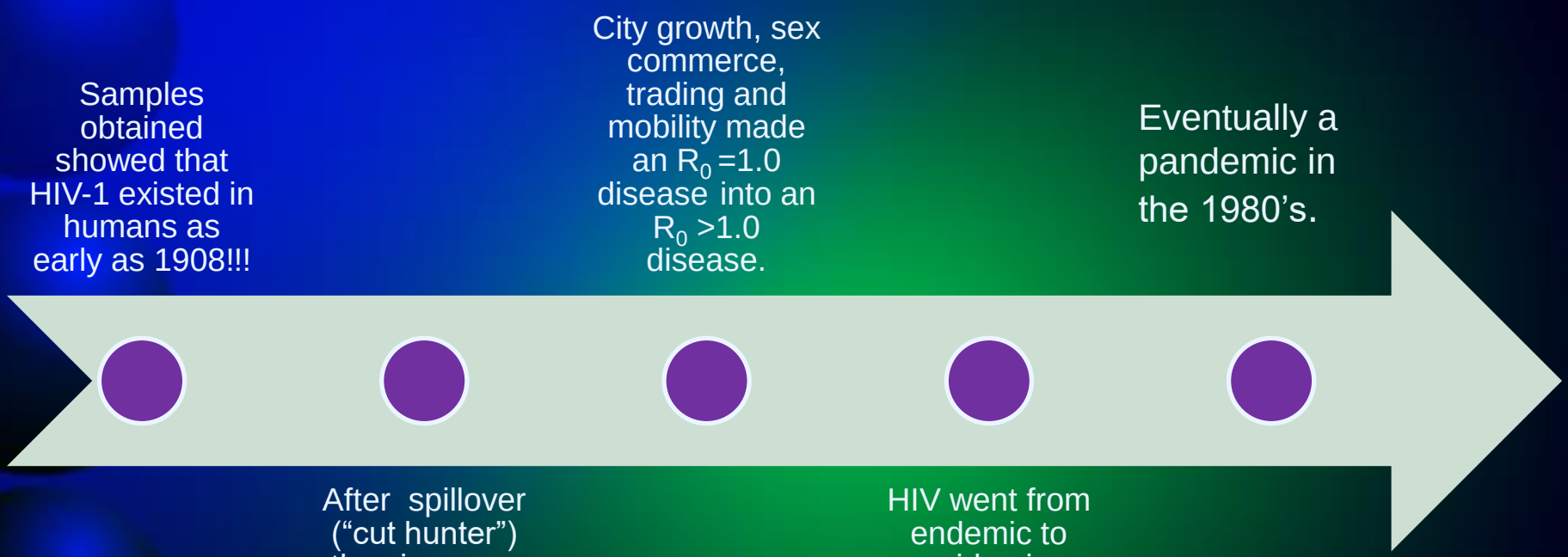


History of AIDS in Africa (1)

- Recent evidence suggests that SIV had been in African monkeys >100 years.

- Spillover happened in the Colonial era in Central Equatorial Africa:
  - Road construction.
  - Railways building.
  - Influx of male laborers into rural areas.
  - Fostering prostitution in large towns and cities.

History of AIDS in Africa (2)



History of AIDS in Africa (3)

- Wars, revolutions and independence stirred the pot and mingled populations.
- WHO and UNESCO sent many professionals to the AEF (Afrique Équatoriale Française).
- Doctors and teachers were brought from Haiti because:
  - Black.
  - Spoke French.
  - Well-educated.
  - Wanted better salaries.
  - Escaping from Duvalier tyranny.

History of AIDS in Africa (4)

- In 1963 1,000 Haitians were in Congo.
- Some Haitians got HIV in Africa.
- Many returned home to Haiti.
- Many migrated to NYC, California, Florida.
- The door to HIV in USA was now open!

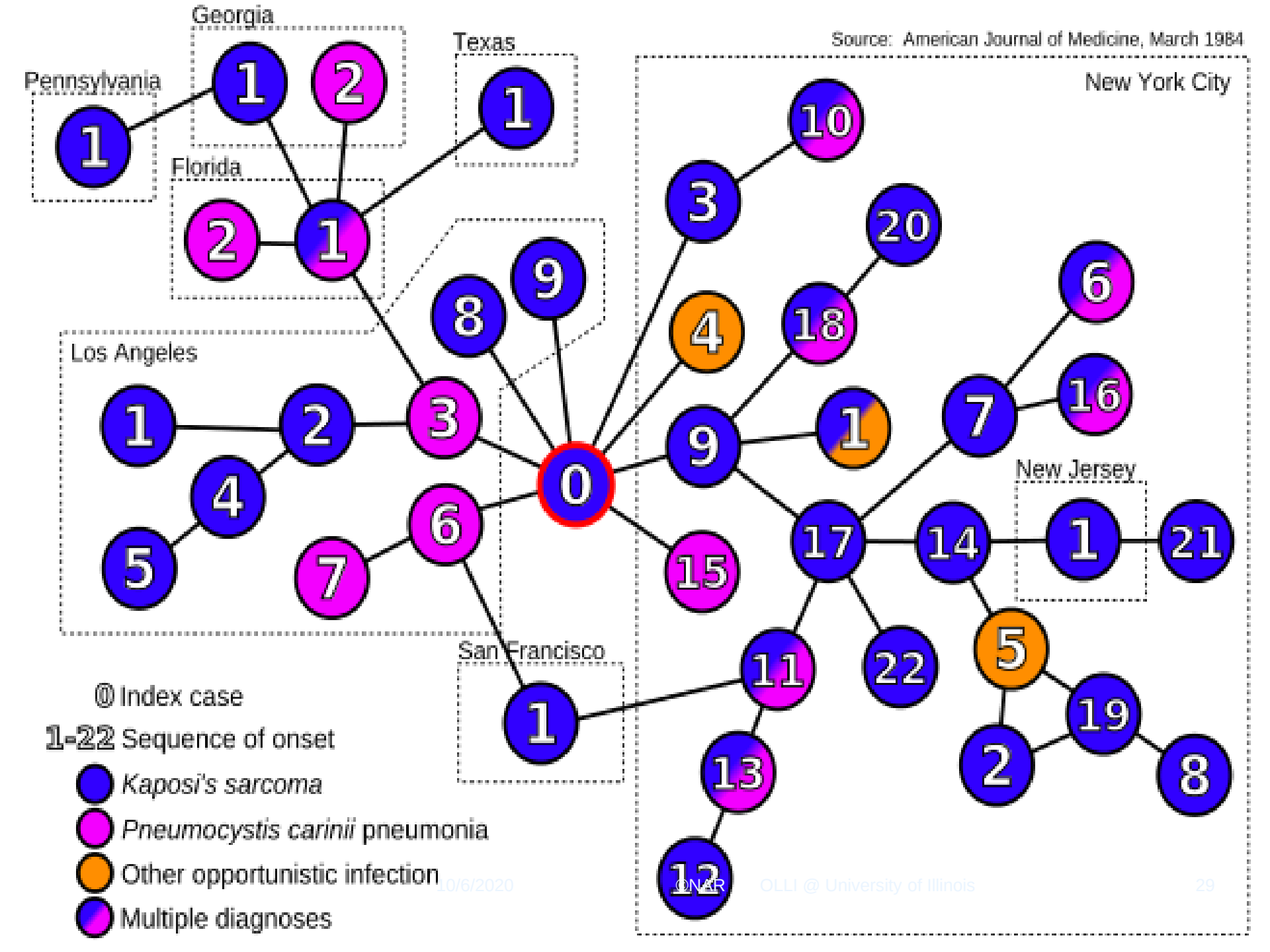
AIDS Worldwide

- In 2018, about 37.9 million people were living with HIV and it resulted in 770,000 deaths.
- An estimated 20.6 million of these live in eastern and southern Africa.
- Between the time that AIDS was identified (early 1980's) and 2018, the disease caused an estimated 32 million deaths worldwide.
- HIV/AIDS is considered an ongoing pandemic.

PATIENT ZERO

“Patient Zero”

- In epidemiology: the first person identified as being infected with a disease.
- Gaëtan Dugas was a gay Canadian airline steward whose sexual activity linked him to 40 of the first 248 men diagnosed with GRID in the US.
- The transmission scenario was compiled by Dr. W. Darrow of the CDC.
- Darrow subsequently repudiated his conclusion, but the name stuck.


Source: American Journal of Medicine, March 1984
Georgia
Pennsylvania
Texas
Florida
Los Angeles
New York City
New Jersey
San Francisco
Index case
1-22 Sequence of onset
Kaposi's sarcoma
Pneumocystis carinii pneumonia
Other opportunistic infection
Multiple diagnoses

Gaëtan Dugas (1)

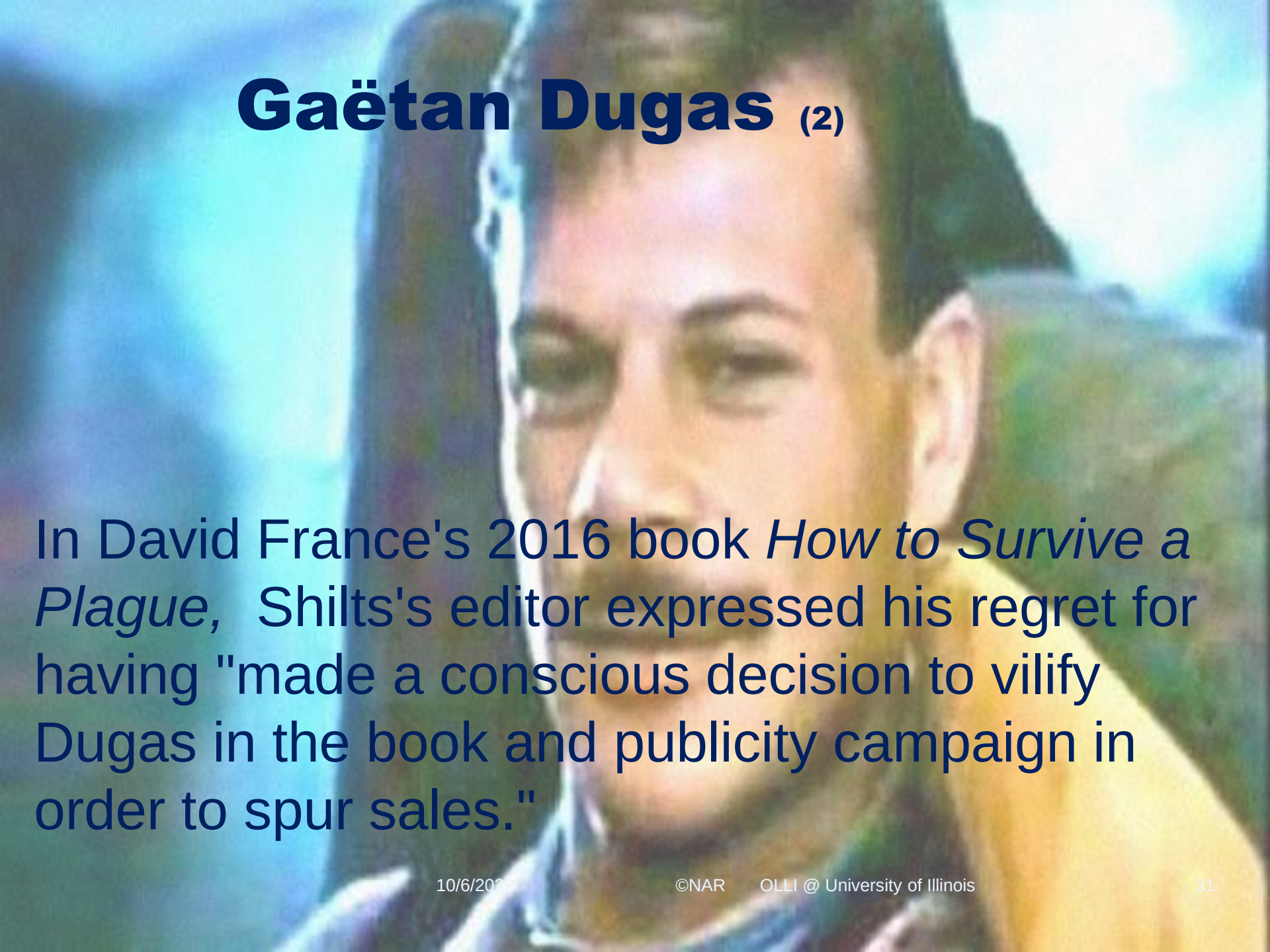
Featured prominently in Randy Shilts's 1987 book And the Band Played On, which documents the outbreak of the AIDS epidemic in the US.

Shilts calls him "Patient Zero" and portrays him as intentionally infecting, or at least recklessly endangering, others with the virus.

He is described as being a charming, handsome sexual athlete who, according to his own estimation, averaged hundreds of sex partners per year.

He claimed to have had over 2,500 sexual partners across North America since becoming sexually active in 1972.

Gaëtan Dugas (2)



In David France's 2016 book *How to Survive a Plague*, Shilts's editor expressed his regret for having "made a conscious decision to vilify Dugas in the book and publicity campaign in order to spur sales."

FACTORS AFFECTING PANDEMIC PROGRESSION

Factors that Affect Pandemic Progression

- The Jump.
- Locomotion.
- Filth.
- Crowds.
- Corruption.
- Blame.
- The Cure.

Pandemic Progression
The Jump (1)

- Introduction and spread of a pathogen in a new host population, by jumping from one host species to another.
- Also *spillover* or cross-species infection.
- Usually between species that share some DNA characteristics.
- Humans and chimpanzees (*Pan troglodytes troglodytes*) share between 98% and 99% of their genomes.

Pandemic Progression
The Jump (2)

- Emerging pathogens tend to share some common traits.
- SIV appears to have been in monkeys in Africa for several 100's of years.
- Simian Immunodeficiency Virus (SIV) jumped into humans and mutated to HIV.
- Directly transmitted RNA viruses are most likely to jump between host species and mutate into new versions.

Pandemic Progression
The Jump (3)

- SIV mutated in smaller monkeys who were eaten by the larger chimpanzees.
- In the 1910's first jump into humans.
- "Cut Hunter hypothesis": human infected by contact with sick ape's blood.

Pandemic Progression
Locomotion

- To pass infection, the host species and/or the infecting species must mobilize and meet.
- *P.t. troglodytes* are very poor swimmers, so that rivers act like walls keeping them in.
- Humans are intrepid explorers who went to the chimp's environment and were exposed.
- Roads built, railroads laid, jungle destroyed.

Pandemic Progression
Filth

- Implies bad sanitary conditions, water supply, protection against pests.
- Includes risky behaviors, deficient health care and overcrowded living.
- Also implies eating unrefrigerated meat from wild animals, including monkeys.

Pandemic Progression
Crowds

- City growth brought in many laborers, with attendant numbers of sex workers.
- Workers from many countries, races, habits, and various immune history and exposures.
- Overcrowded living quarters.

Pandemic Progression
Corruption

- 3rd World countries experience diversion of funds, fake medicines, erroneous supplies, information withholding or distorting and repression.

- Disease control or its absence exploited for political gain.

- Denial of disease progress for ethnic, political or economic reasons, mostly power.

Pandemic Progression
Blame

- An intrinsic and unavoidable part of the progression of pandemics.

- The scientific community, the people, the political establishment, and anyone who has an ox to gore or an axe to grind will find someone to blame for an aspect of the pandemic.

- Sometimes the finger-pointing produces positive results and effective actions..

Pandemic Progression
The Cure

- In many pandemics, no vaccine or cure is attained.
- In some, a therapy or treatment is found.
- Understanding the disease and learning how to prevent its spread are valuable.
- Societal change is part of process.

THE HIV VIRUS

HIV

- Retrovirus: produces *reverse transcriptase*.
  - Single clockwise strand RNA virus.
  - Makes a counter-clockwise RNA strand.
  - Makes a double strand DNA copy of virus.
  - This is the reverse of the normal mechanism.
- Makes an integrase to join into cell's nuclear DNA.
- Uses cell to multiply while destroying cell.

Types of HIV

Two types of HIV have been characterized: HIV-1 and HIV-2.

HIV-1 is the virus that was originally discovered (and initially referred to also as LAV or HTLV-III).

It is more virulent, more infective, and is the cause of the majority of HIV infections globally.

The lower infectivity of HIV-2 implies that fewer people exposed to HIV-2 will be infected per exposure.

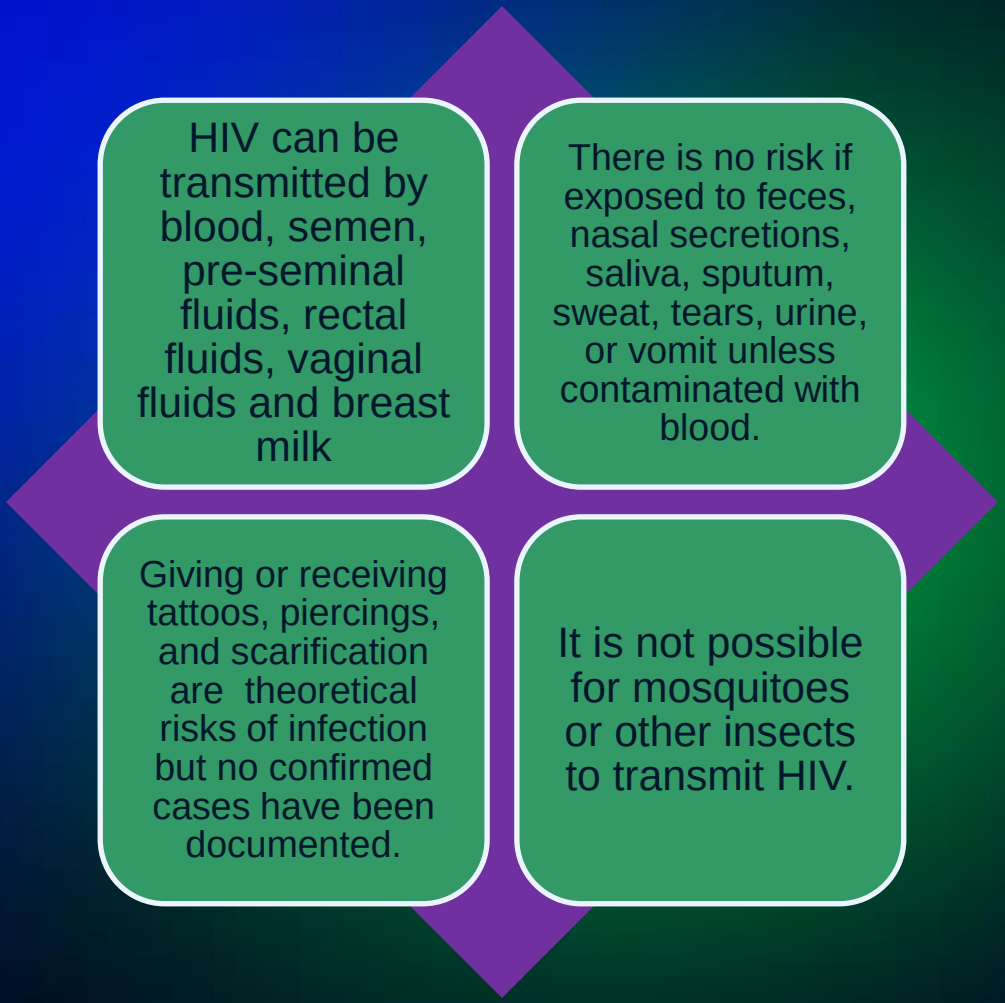
Because of its relatively poor capacity for transmission, HIV-2 is largely confined to West Africa.

MECHANISM OF INFECTION

HIV Transmission and Spread

- By unprotected sex: vaginal, anal and oral.
- From contaminated blood transfusions.
- By infected hypodermic needles.
- Mother to child during pregnancy, delivery, or breastfeeding.

HIV Transmission



HIV Exposure Risks per Act with infected source

Route of Exposure	Chance of Infection
Blood Transfusion	90%
Childbirth (to Child)	25%
Needle-sharing injection drug use	0.67%
Percutaneous needle-stick	0.30%
Receptive anal intercourse*	0.04% to 3.0%
Insertive anal intercourse*	0.03%
Receptive penile-vaginal intercourse*	0.05% to 0.3%
Insertive penile-vaginal intercourse*	0.01% to 0.38%
Receptive oral intercourse (male-to-male)*	0.0% to 0.04%
Insertive oral intercourse (male-to-male)*	0.0% to 0.005%

* Assumes no condom use.

Mechanism of Infection (1)

- Virus enters bloodstream (many routes).
- Invades helper T4 lymphocytes (contain CD4+ surface protein molecules virus adheres to).
- HIV kills T4 cells after replicating in them, or may become latent in macrophages.
- Macrophages, CD8+T (“Killer Cells”) also contain CD4.

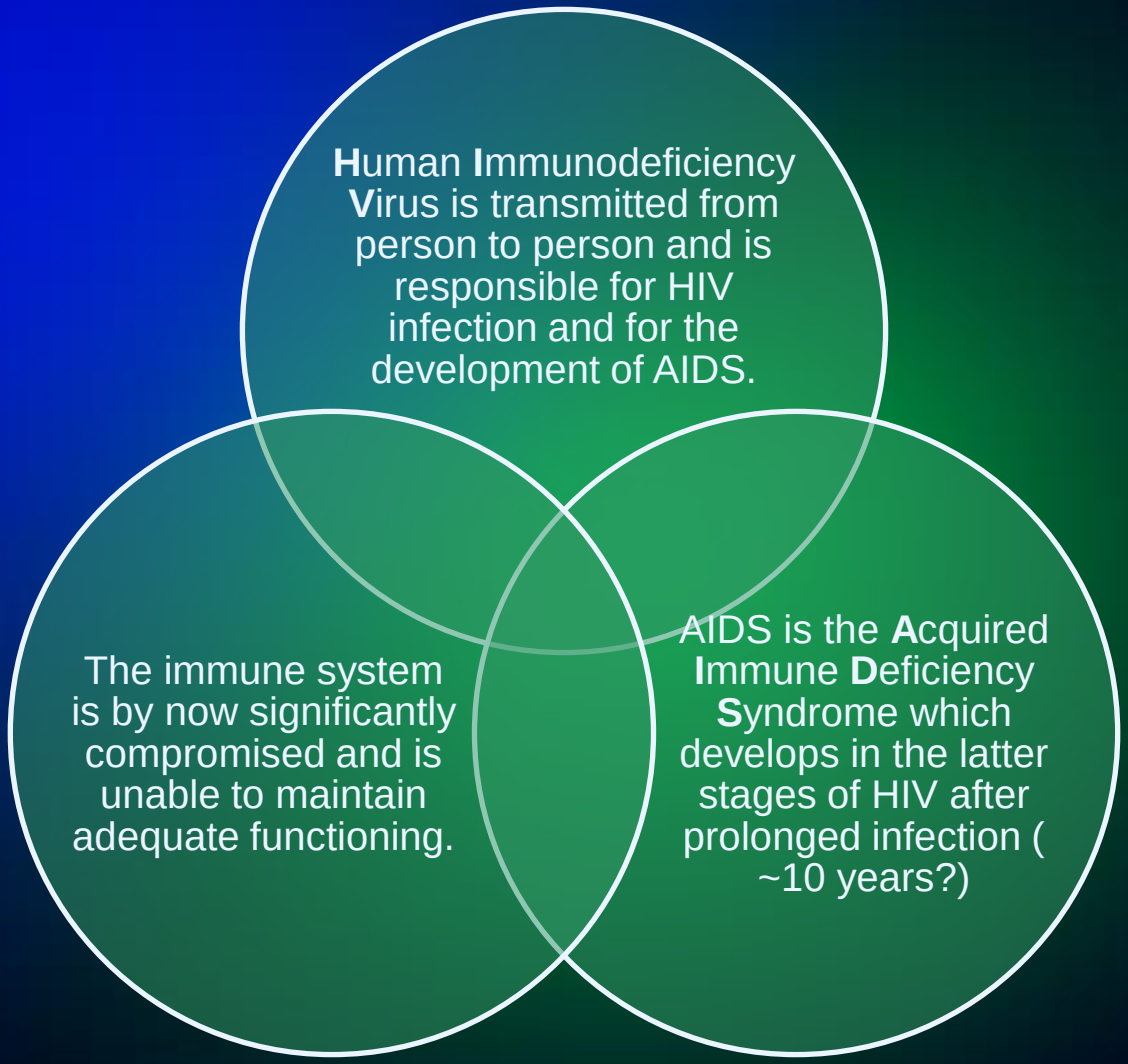
Captain CD4 to the Defense!

Positive

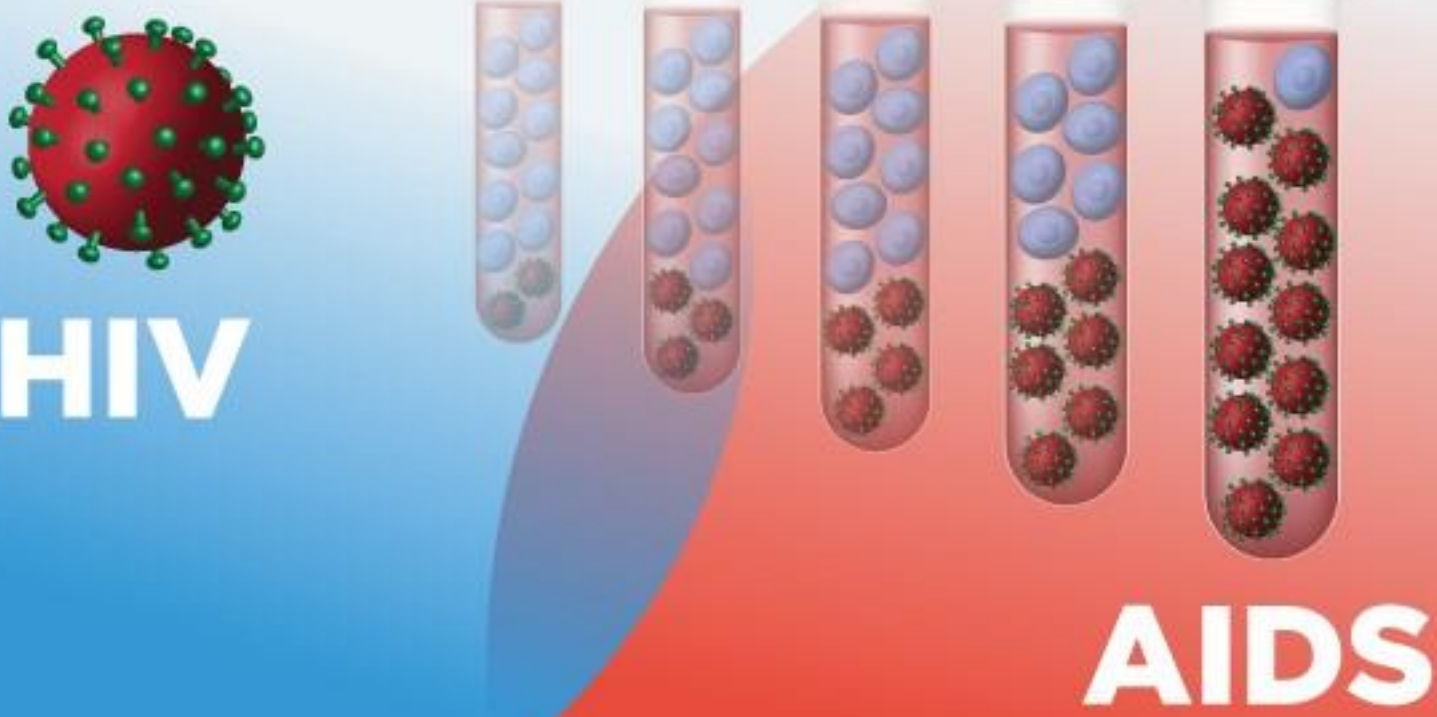
Mechanism of Infection (2)

- HIV and related viruses in monkeys, cats, sheep, goats and horses can become latent.
- After latency inside body's defense cells, it can reactivate and cause disease.
- Called *lentivirus* (slow to cause disease).
- Invades and destroys macrophages.

HIV and AIDS


Human **I**mmunodeficiency **V**irus is transmitted from person to person and is responsible for HIV infection and for the development of AIDS.
The immune system is by now significantly compromised and is unable to maintain adequate functioning.
AIDS is the **A**cquired **I**mmune **D**eficiency **S**yndrome which develops in the latter stages of HIV after prolonged infection (~10 years?)

HIV and AIDS



Mechanism of Infection (3)

In the target cell, the viral RNA genome:

- Is converted into double-stranded DNA by a reverse transcriptase that is transported along with the viral genome.
- Resulting viral DNA is imported into the nucleus and integrated into the cellular DNA by an integrase.
- Once integrated, the virus may become latent, allowing the virus and its host cell to avoid detection by the immune system.

Alternatively, the virus may be transcribed, producing new RNA genomes and viral proteins.

- These are packaged and released from the cell as new virus particles.
- They begin the replication cycle anew.

Mechanism of Infection (5)

After the virus enters the body there is a period of rapid viral replication.

During primary infection, the level of HIV may reach several million virus particles per milliliter of blood.

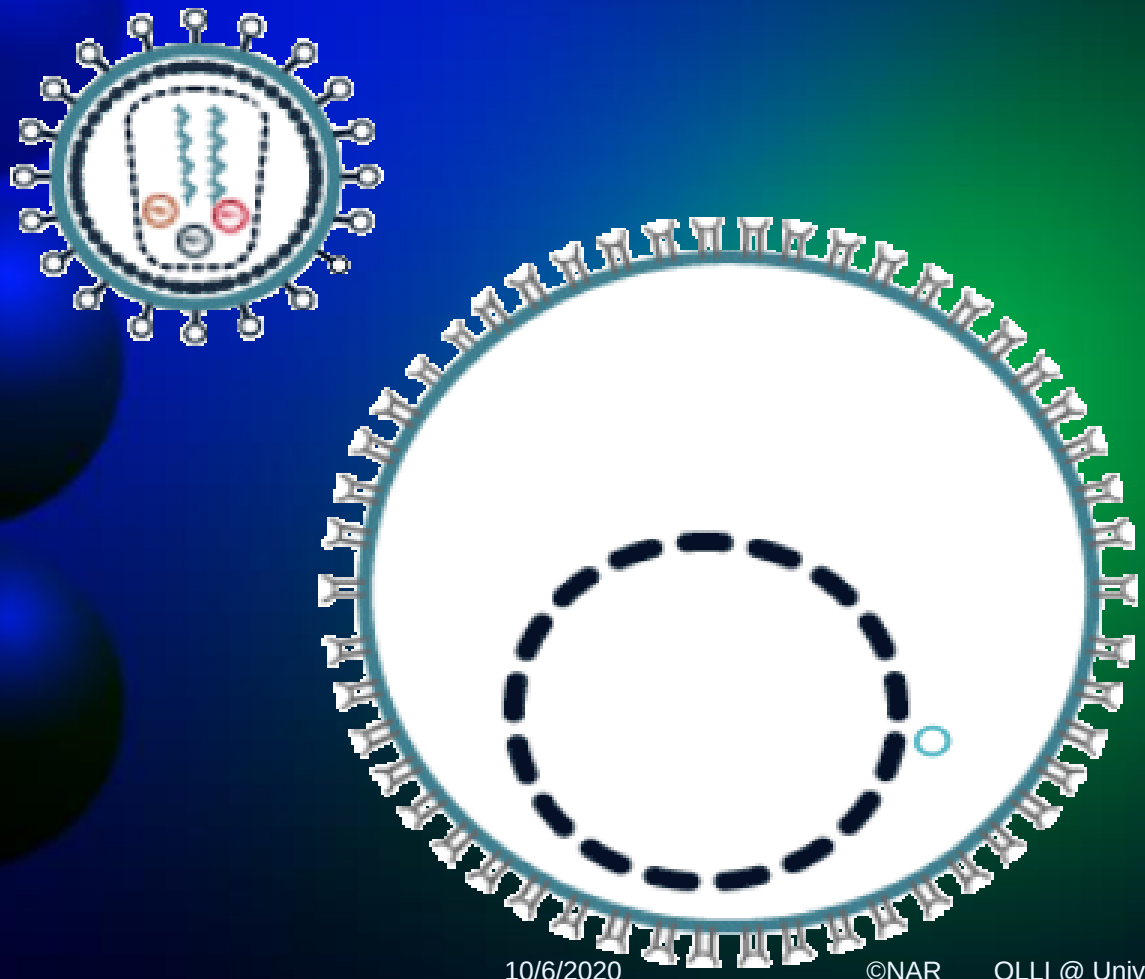
This causes a marked drop in the number of circulating CD4+ T cells with activation of CD8+ T cells, which kill HIV-infected cells.

Also antibody production, or *seroconversion*.

The CD8+ T cell response is important in controlling virus levels, which peak and then decline, as the CD4+ T cell counts recover.

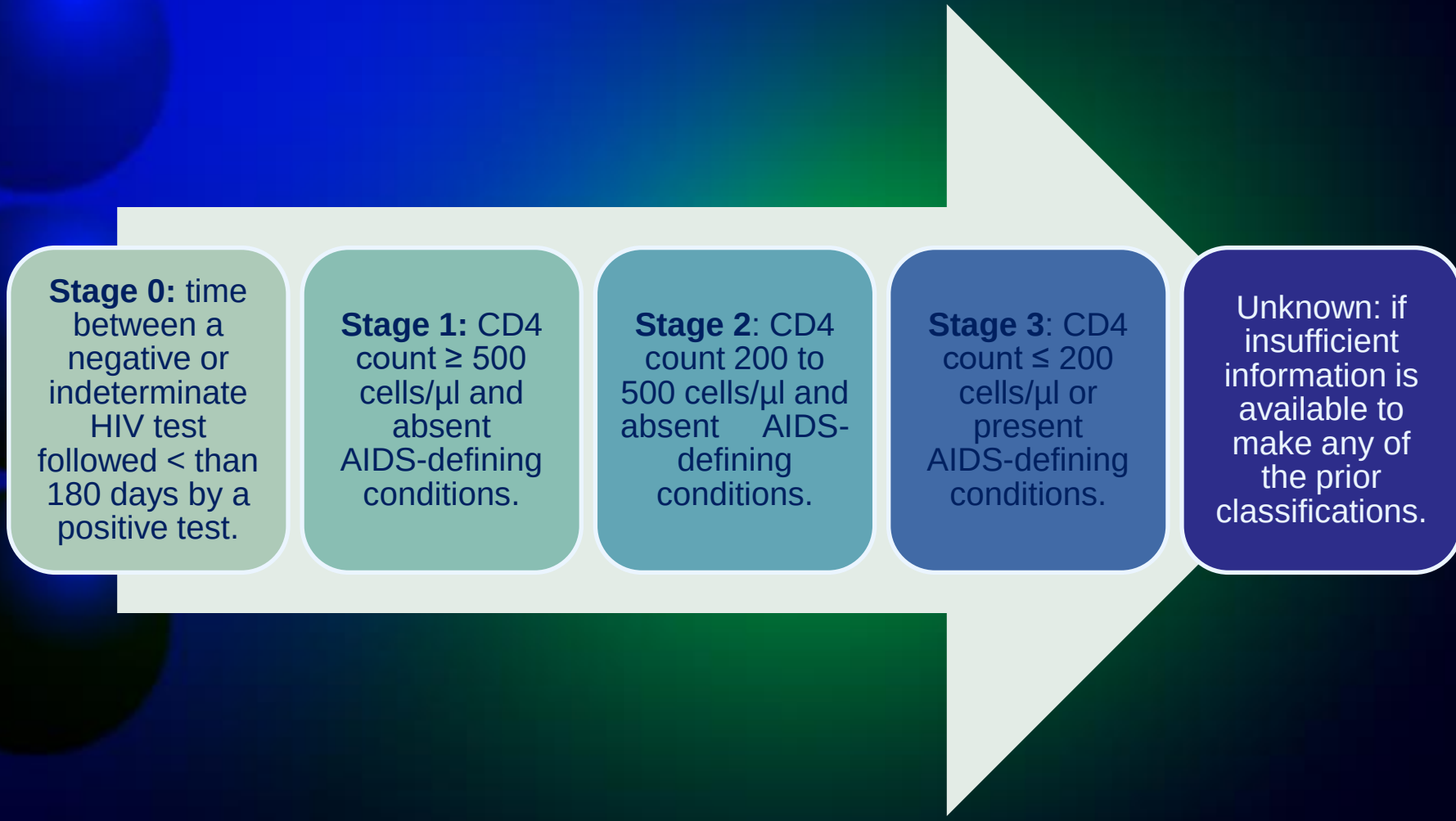
A good CD8+ T cell response has been linked to slower disease progression and a better prognosis, though it does NOT eliminate the virus.

Invasion and Replication of HIV In a Lymphocyte



THE DISEASE

CDC Staging Classification



Acute Infection

Acute infection may be confused with Influenza or Mononucleosis

- Fever.
- Large tender lymph nodes.
- Throat inflammation.
- Maculopapular trunk rash (20-50% of cases)
- Headache.
- Tiredness.
- Sores of the mouth and genitals.
- Vomiting or diarrhea.
- Peripheral neuropathy

S&S Usually appear within 2-4 weeks of exposure

Progression of Infection

Infection: primary (sex) or secondary (transfusion, breast milk?).

Asymptomatic: but may be *infectious* for years.

Acute Infection Syndrome: similar to any viral illness.

AIDS-Related Complex (ARC), (old term):

- Night sweats
- Persistent low-grade fever
- Diarrhea and loss of appetite (thrush)
- Dramatic weight loss
- Nausea and fatigue

Full-Blown AIDS: reappearance & intensifying of above symptoms.

Clinical Latency (1)

- Initial S&S are followed by a stage called clinical latency, asymptomatic HIV, or chronic HIV.
- This 2nd stage of HIV infection can last 3 to 20 years (average 8).
- Near the end of this stage many people experience fever, weight loss, gastrointestinal problems and muscle pains.

Clinical Latency (2)

- 50% to 70% of people develop persistent generalized lymphadenopathy:
  - Unexplained.
  - Non-painful enlargement of more than one group of lymph nodes.
  - Not in the groin.
  - For more than 3 to 6 months.

Full-Blown AIDS

- 50% of people develop it within 10 years.

- Most common initial conditions are:
  - Pneumocystis carinii pneumonia (PCP) [40%].
  - Cachexia in the form of HIV wasting syndrome [20%].
  - Esophageal candidiasis.
  - Recurrent respiratory tract infections.

- Opportunistic infections may be caused by bacteria, viruses, fungi, and parasites that are normally controlled by the immune system.

Opportunistic Infections

- Thrush (Candida)
- Pneumocystis Carinii Pneumonia (PCP)
- Kaposi Sarcoma (KS)
- Cytomegalovirus (CMV)
- Hepatitis B
- Progressive Multifocal Leukoencephalopathy (PML)
- Tuberculosis
- Cryptococcosis
- Cryptosporidiosis
- Toxoplasmosis
- Epstein-Barr virus NHL, Cancer
- Histoplasmosis

Prevention

- Overall preventive measures:
  - Safe sex, condoms.
  - Needle exchange programs.
  - Treating those who are infected.
  - Pre- & post-exposure prophylaxis (PrEP and PEP)
  - Education.

- Social changes re: role of women.

- Newborn illness can be prevented by giving ***both*** the mother and child antiretroviral medication.

Pre-Exposure Prophylaxis (PrEP)

- For people at risk for to lower their chances of getting HIV.
- Helps prevent HIV infection from sex or injection drug use.
- Much less effective when not taken consistently.
- Truvada® for approved to prevent HIV for all people at risk through sex or injection drug use.
- Descovy® excludes people at risk through receptive vaginal sex.

Post-Exposure Prophylaxis (PEP)

Post-exposure prophylaxis (PEP)

Provide 2 or 3-drug regimen of ARVs after HIV exposure to stop infection

- Typically offered to health care providers exposed to HIV via needle stick
- nPEP – offered for non-occupational exposure, sexual exposure, injection drug use exposure
- Must be taken within 72 hours of initial exposure, small window
- ARVs must be taken for 28 days

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Diagnostic Tests (1)

- Nucleic Acid Test (NAT) can tell how much virus is in the blood (HIV viral load test, HIV RNA).
  - Very expensive.
  - Not routinely used for screening.
  - May help in person with high risk exposure and early symptoms.

- An **Antigen/Antibody test** looks for both HIV antibodies and antigens.

- If you have HIV, an antigen called p24 is made before antibodies. develop.

- HIV **Antibody tests** only look for antibodies in blood or oral fluid.

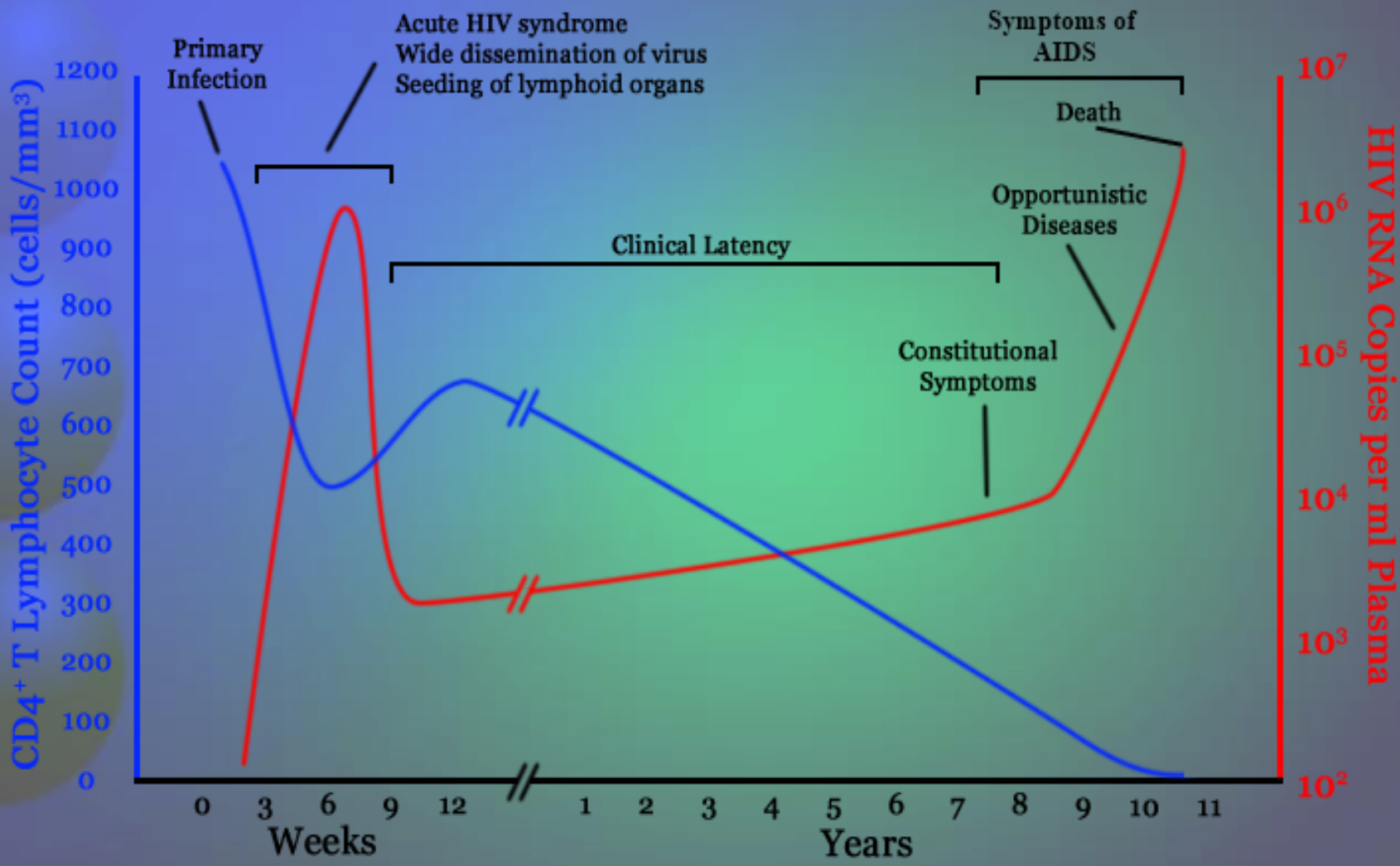
Diagnostic Tests (2)

- Antibody screening tests (ELISA immunoassay).
- Results from rapid test should be confirmed by:
  - PCR test.
  - Western Blot.
  - Indirect immunoassay test.
  - Antibody differentiation between HIV-1 and HIV-2.
- Most people infected develop specific antibodies (i.e. seroconvert) within 3 to 12 weeks after initial infection.
- Primary HIV diagnosis before seroconversion is done by measuring HIV-RNA or p24 antigen.

Diagnostic Tests (3)

- Nowadays, CD4+ counts easily done.
- Most hospital labs provide most tests.
  - ELISA
  - PCR
  - P24 assay
  - Western Blot
- There are some approved rapid home tests.

Timeline of HIV Infection



Treatment

- There is no cure or vaccine.
- Antiretroviral treatment (ART) can slow the course of the disease and allow a near-normal life expectancy.
- Treatment is recommended as soon as the diagnosis is made.
- Untreated, a person has an average survival time after infection of 11 years.

Treatment (2)

- Nowadays ART is a combination therapy.
- Complex schedules with some side effects.
- Unaffordable in some countries.
- Effective if no doses missed.
-
- Suppresses HIV count so that virus is undetectable.

Causes of AIDS (?) (2)

- Voodoo (from Haiti) and other incantations.
- Tail of a comet from outer space.
- HIV is harmless and it is anti-retrovirals like AZT that cause AIDS.
- HIV does not cause anything!

Causes of AIDS ? (1)

- Made by CIA weapons lab with Pentagon and Big Pharma.
- US Government and Pharma to inflict toxic drugs on Africans.
- Preacher Jeremiah Wright: made by government to harm blacks.

SOCIETAL STIGMATIZATION

The 4 “H’s”

- **H**omosexuals.
- **H**eroin Users.
- **H**aitians.
- **H**emophiliacs.

Jerry Falwell

- AIDS is “God’s judgement” and divine retribution for homosexuals’ perverted lifestyle.
- "AIDS is not just God's punishment for homosexuals, it is God's punishment for the society that tolerates homosexuals.“
- After 911: LGBT organizations had angered God, thereby in part causing God to let the attacks happen.

Jesse Helms and AIDS

- Senator **Jesse Helms (NC)** was one of the chief architects of AIDS**-related** stigma in the U.S.
- He fought against any federal spending on HIV research, treatment or prevention.
- He once said, referring to homosexuals, “it’s their deliberate, disgusting, revolting conduct that is responsible for the disease.”

Helms on Gays And Lesbians

- "Weak, morally sick wretches" (1994).
- Engage in "incredibly offensive and revolting conduct" (1990).
- Warned constituents to beware "homosexuals, lesbians, disgusting people marching in the streets, demanding all sorts of things, including the right to marry each other" (1990).

AIDS Paranoia (1)

- Touchless hand dryers, soap dispensers, faucet and toilets in public restrooms.
- Lyndon Larouche: Quarantine all AIDS.
- William F. Buckley and Ann Coulter wanted HIV + tattooed in buttocks or genitals.
- Doctor, Nurses, ambulances refusing to treat HIV+ patients.

AIDS Paranoia (2)

Housing & job discrimination for AIDS.	Insurers denying coverage for high-risk.	Hemophiliac HIV+ children denied access to school and sports, or being expelled.
Fear of donating blood and sub-products.	Family in Florida had house burnt down.	Immigrants denied access to US if HIV+.

RELIGION AND AIDS

Religion and AIDS

- Catholic Church does not support condom use as a prevention and disapproves of LGBT persons.

- Muslims consider promiscuity the main cause and believe that the key to containing and ending the pandemic is promoting abstinence and chastity.

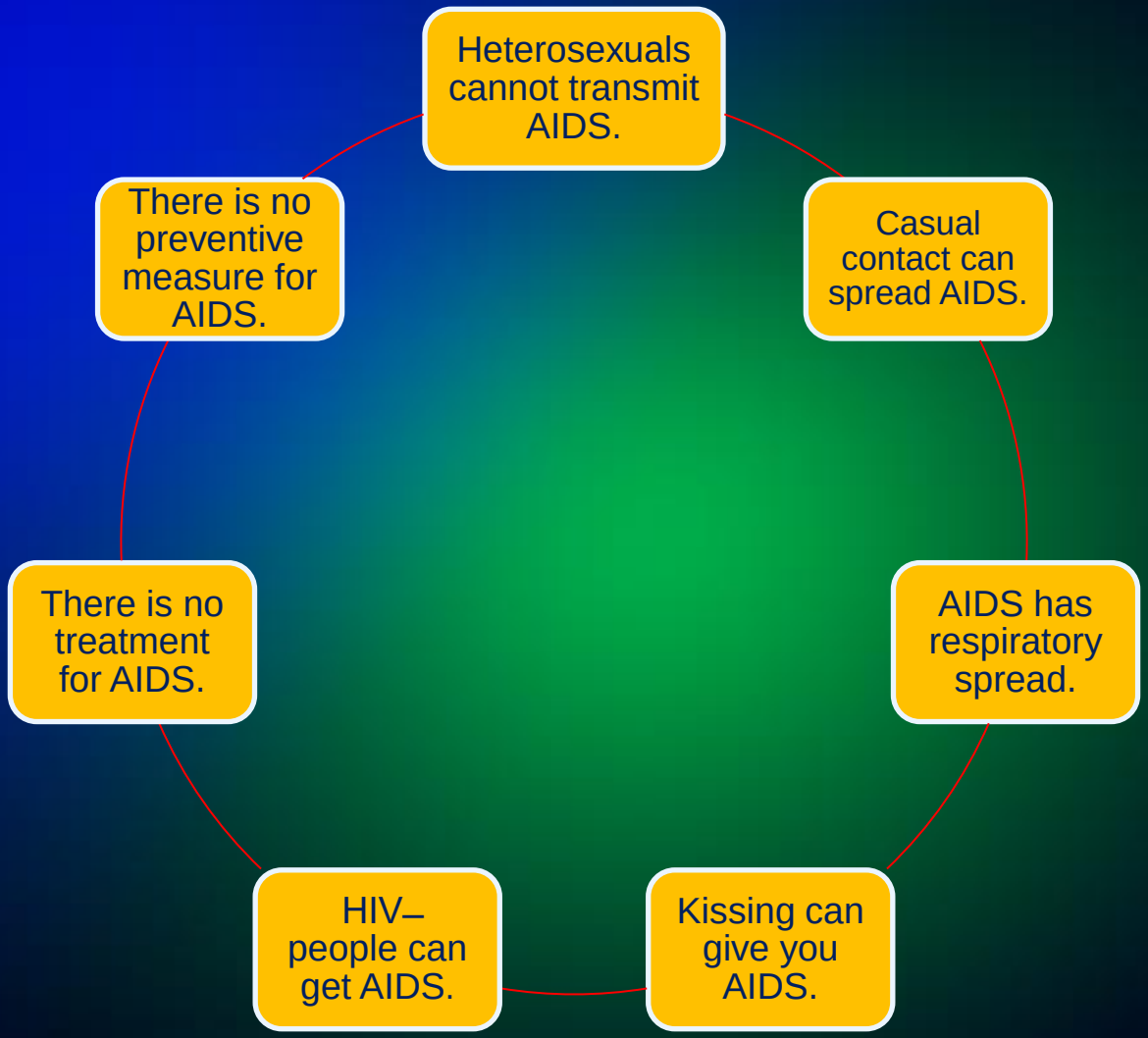
Judaism & Jewish Thinkers

- Judaism does not have a central authority.
- In Jewish Orthodox society, having AIDS is considered a mark of disgrace.
- If society violated the Divine Law, and the natural law, AIDS is a consequence but not a punishment.
- Conservative & Reform Judaism emphasize the importance of *bikur cholim* the responsibility to care for the sick

Newer Catholic Dogma

- Pope Benedict XVI (2010) said that in homosexual relations, where unnatural contraception is not the main concern, condoms can be seen as moral responsibility in preventing HIV infections.
- Also in 2010 he said that the use of condoms is the first step in taking responsibility and attempting to prevent the infection of one's partner.

AIDS Myths


Heterosexuals cannot transmit AIDS.
Casual contact can spread AIDS.
AIDS has respiratory spread.
Kissing can give you AIDS.
HIV– people can get AIDS.
There is no treatment for AIDS.
There is no preventive measure for AIDS.


You can safely share
a desk
a hug
a toilet
dishes
a handshake
with someone who has HIV.

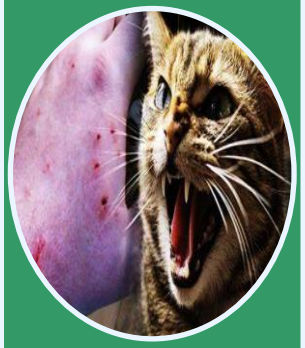
Protect Your Pets

Avoid contact with pet poop

Avoid Stray Animals

Have pets tested for infection

Wash your Hands!



Avoid Scratches and bites

Use rubber gloves to clean pets and habitats.

If you have AIDS you may infect your pets!!!


Q
&
A

THANK YOU

Social Aspects of HIV/AIDS
Country Characteristics

- Pattern I: Western Europe and US.
- Pattern II: Sub-Saharan Africa & Caribbean.
- Pattern III: East Europe, Asia, Middle East.