HIV / AIDS

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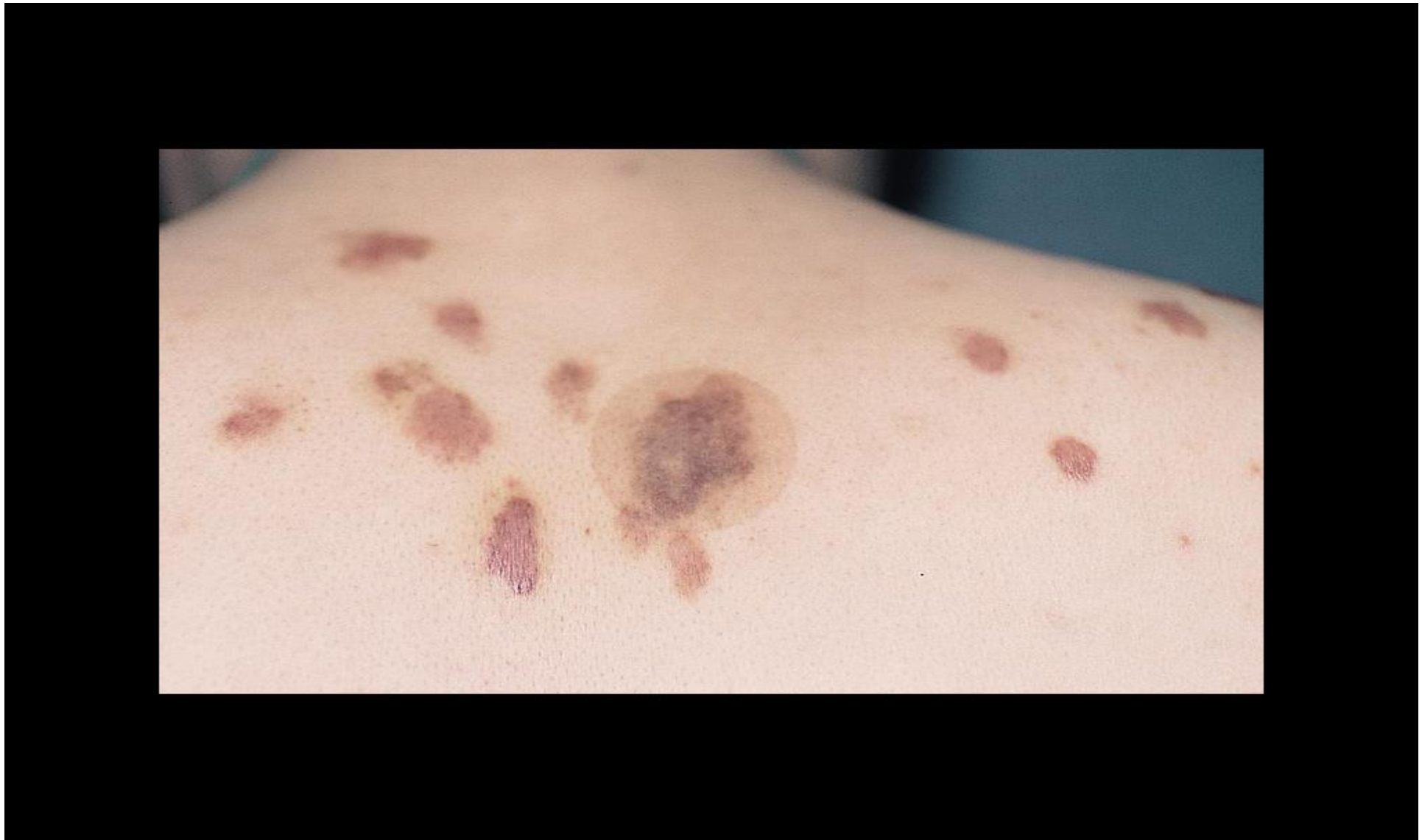
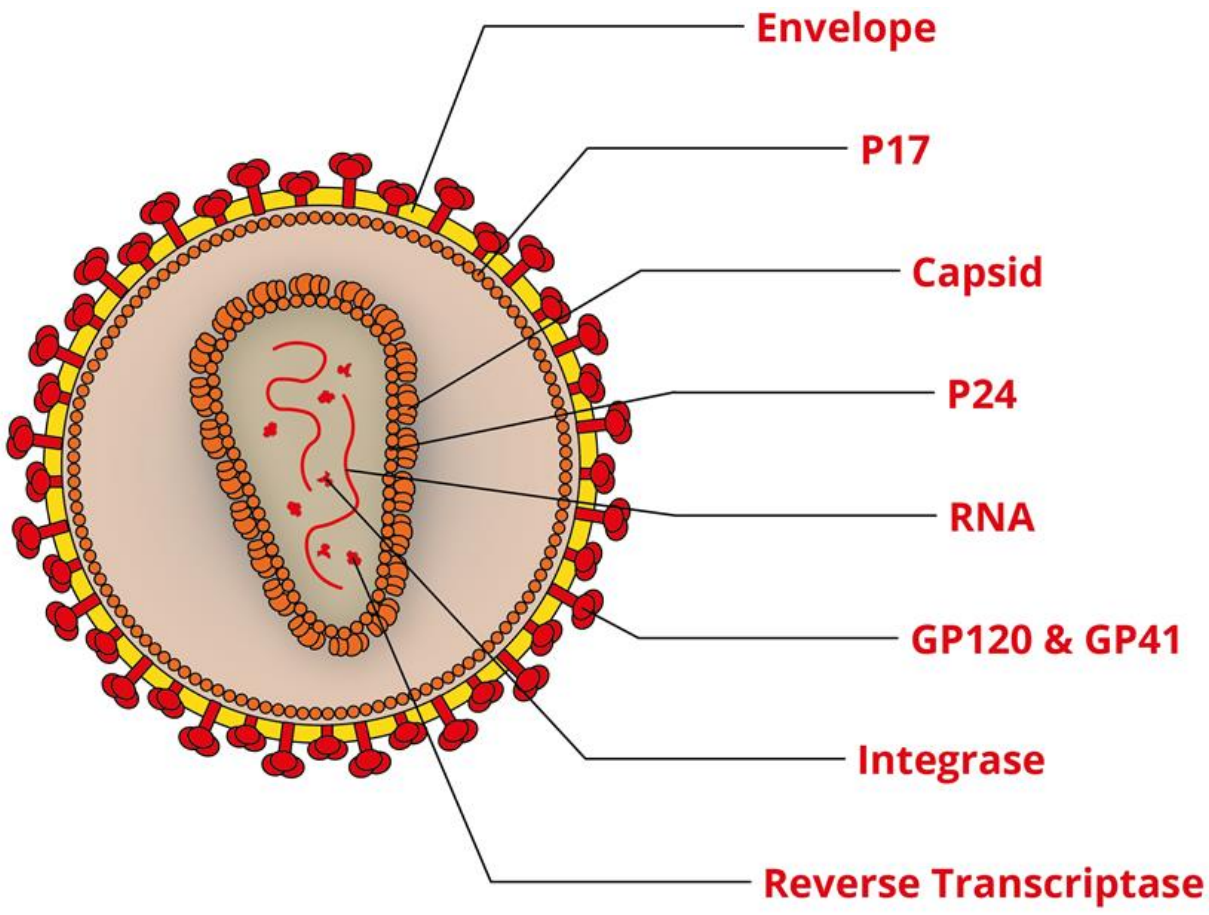
Kaposi´sarcoma in a 20-year old man who had AIDS



HIV



Source: https://thenativeantigencompany.com/poc-diagnostics-for-hiv-2/

Virus classification

Group: *Retroviridae*

Family: *Lentiviridae*

Genus*: Lentivirus*

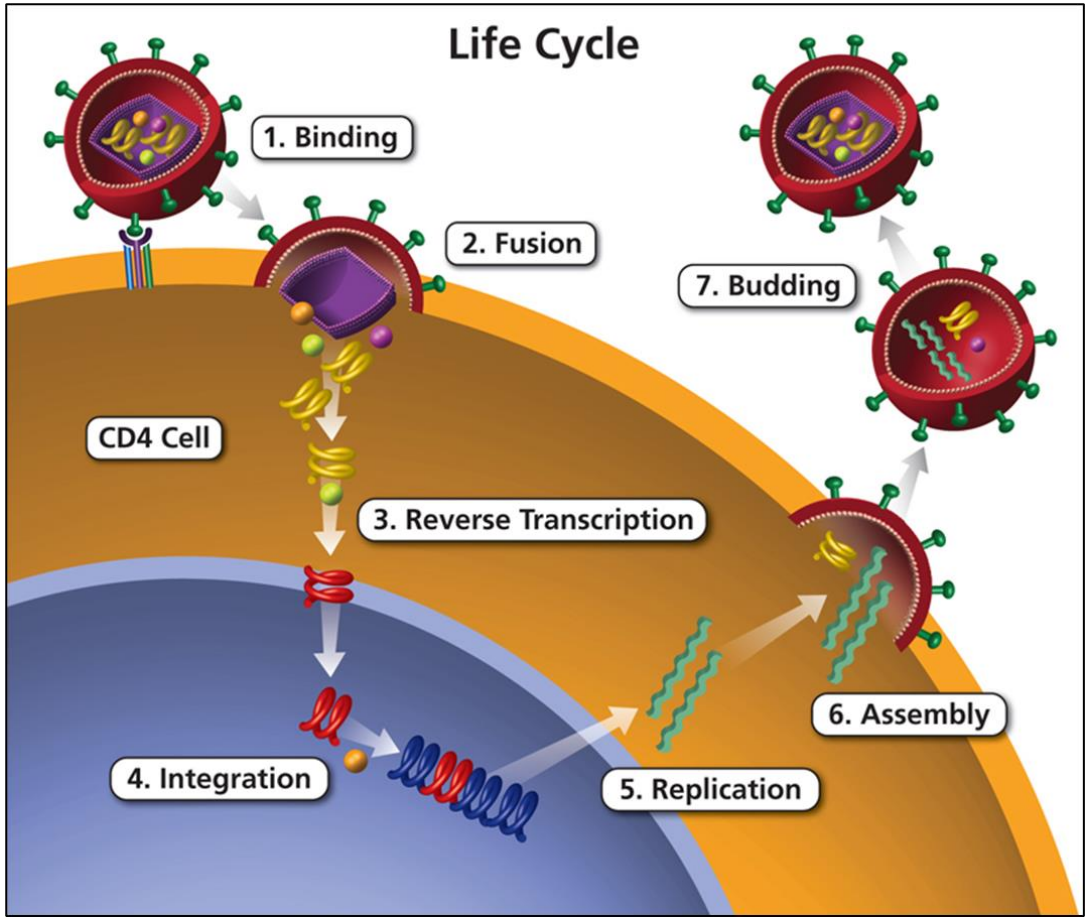
Species: Human immunodeficiency virus 1

Species: Human immunodeficiency virus 2

HIV life cycle

Most important parts of HIV:

- Protein pg120 (binding)
- Reverse transcriptase
- Enzyme integrase
- Enzyme protease



Source: https://clinicalinfo.hiv.gov/en/glossary/life-cycle

History of HIV

The AIDS epidemic was discovered June 5, 1981, when the U.S. Centers for Disease Control and Prevention (CDC) reported a cluster of *Pneumocystis carinii* pneumonia (now classified as Pneumocystis jiroveci pneumonia) in five homosexual men in Los Angeles.

The disease was originally dubbed GRID, or Gay-Related Immune Deficiency, but health authorities soon realized that nearly half of the people identified with the syndrome were not homosexual men.

In 1982, the CDC introduced the term AIDS to describe the newly recognized syndrome, though it was still casually referred to as GRID.

History of HIV

In 1983, scientists led by Luc Montagnier at the Pasteur Institute in France first discovered the virus that causes AIDS. They called it lymphadenopathy-associated virus (LAV).

A year later a team led by Robert Gallo of the United States confirmed the discovery of the virus, but they renamed it human T lymphotropic virus type III (HTLV-III).

The dual discovery led to considerable scientific disagreement, and it was not until President Mitterrand of France and President Reagan of the USA met that the major issues were resolved.

In 1986, both the French and the U.S. names for the virus itself were dropped in favour of the new term, human immunodeficiency virus (HIV).

Nobel Prize in Physiology and Medicine 2008

Photo: L. Dolega/SCANPIX

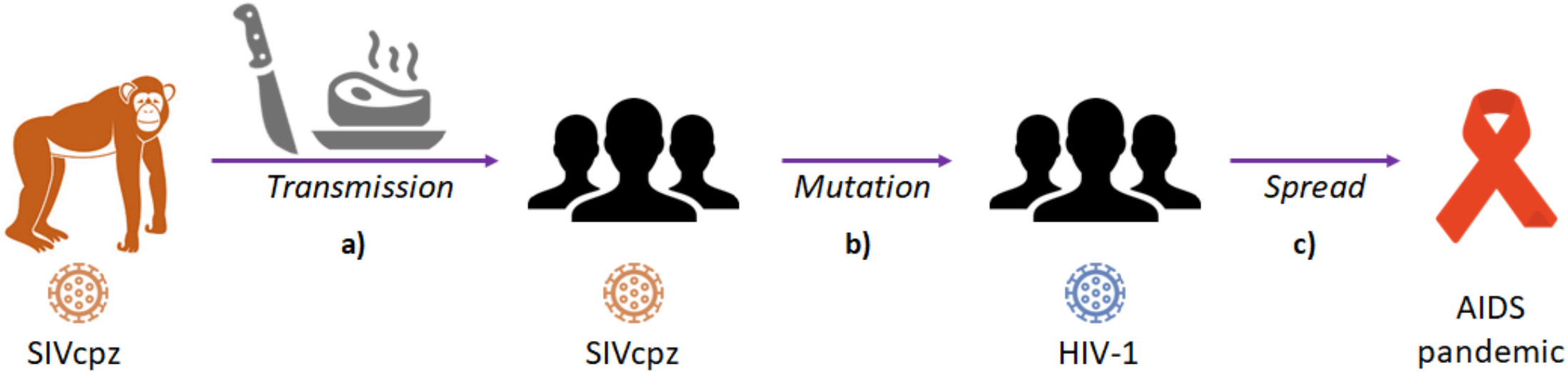
Françoise Barré-Sinoussi

Photo: DKFZ/SCANPIX

Luc Montagnier

Source of image: https://thefutureofthings.com/upload/items_icons/2008-Nobel-Prize-in-Physiol_large.jpg

Origin of HIV-1



Source: https://medium.com/@Nutrisphere/where-the-heck-did-hiv-come-from-b00ca900064cm

HIV, pathogenesis

HIV primarily infects vital cells in the human immune system such as helper T cells (specifically CD4+ T cells), macrophages and dendritic cells.

HIV infection leads to low levels of CD4+ T cells through three main mechanisms:

- firstly, direct viral killing of infected cells;
- secondly, increased rates of apoptosis in infected cells;
- and thirdly, killing of infected CD4+ T cells by CD8 cytotoxic lymphocytes that recognize infected cells.

When CD4+ T cell numbers decline below a critical level, cell-mediated immunity is lost, and the body becomes progressively more susceptible to opportunistic infections.

WHO

- There were an estimated **37.7 million** [30.2–45.1 million] people living with HIV at the end of 2020, over two thirds of whom (25.4 million) are in the WHO African Region.
- In 2020, 680 000 [480 000–1.0 million] people died from HIV-related causes and 1.5 million [1.0–2.0 million] people acquired HIV.

- To reach the new proposed global 95–95–95 targets set by UNAIDS, we will need to redouble our efforts to avoid the worst-case scenario of a half million excess HIV-related deaths in sub-Saharan Africa, increasing HIV infections due to HIV service disruptions during COVID-19, and the slowing public health response to HIV

95-95-95 strategy

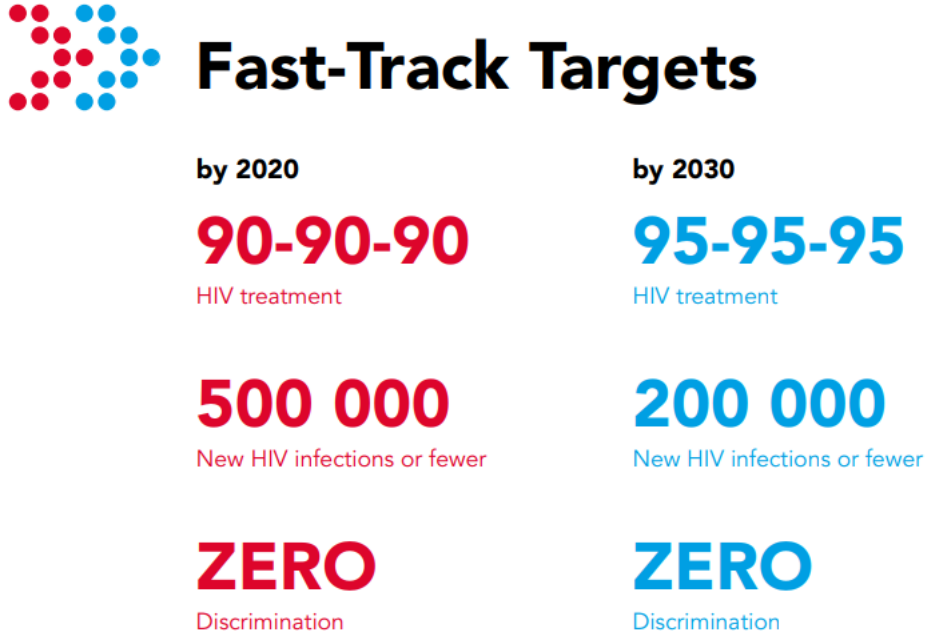
The ambitious 95-95-95 strategy was announced by UNAIDS in 2014, aiming to end the AIDS epidemic by 2030 by achieving:

95 % diagnosed among all people living with HIV

95 % on antiretroviral therapy among diagnosed

95 % virally suppressed among treated.

An intermediate goal of 90-90-90 was set for 2020.



Source: https://www.unaids.org/sites/default/files/media_asset/201506_JC2743_Understanding_FastTrack_en.pdf

HIV subtypes

HIV 1 - group“M” (major) – subtypes A, B, C, D, E, F, G, H, I,… (expected other)

Subtypes:

- A – West and Middle Africa
- B – Europe, North and sud America, Thailand
- C – Sud Africa, Indie
- D – Middle Africa
- E – Middle Africa, Thailand, Indie
- F – Brazilie, Romania, Zair
- G – Middle Africa
- H – Gabun, Zair
- I – Africa

Clinical Stages of HIV (CDC)

Stage 1: Acute HIV Infection

•People have a large amount of HIV in their blood. They are very contagious.

•Some people have flu-like symptoms, later no symptoms

•persistent generalized lymphadenopathy (PGL)

Stage 2: Chronic HIV Infection

•This stage is also called asymptomatic HIV infection or clinical latency. Later non specific signs.

Stage 3: Acquired Immunodeficiency Syndrome (AIDS)

• badly damaged immune system, with increasing number of severe illnesses, incl. opportunistic infections and tumors.

Laboratory categories of HIV

According to CD4+ lymfocyte count:

Category 1	more than 500 cells/µl (= mm^3)
Category 2	200 – 500 cells/µl
Category 3	less than 200 cell/µl

HIV, routes of transmission

- Transmission

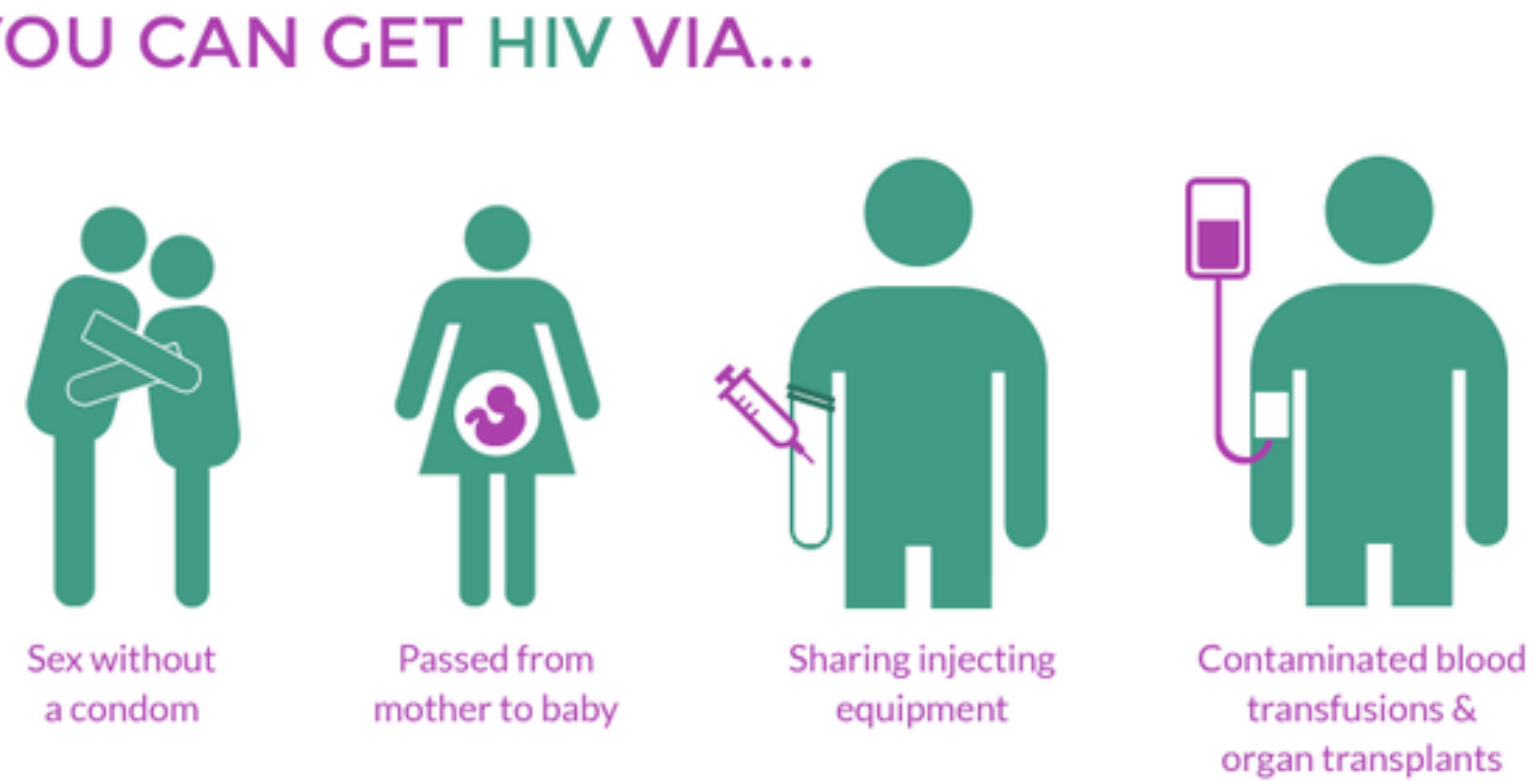
Exposure Route Estimated infections per 10,000 exposures to an infected source:

- Blood Transfusion 9,000
- Childbirth 2,500
- Needle-sharing injection drug use 67
- Receptive anal intercourse* 50
- Percutaneous needle stick 30
- Receptive penile-vaginal intercourse* 10
- Insertive anal intercourse* 6.5
- Insertive penile-vaginal intercourse* 5
- Receptive fellatio* 1
- Insertive fellatio* 0.5

* assuming no condom use

Routes of transmission of HIV

- sexual
- blood
- from mother to child (MTCT)



Source of picture: https://redcarehmo.com/2018/06/28/quick-look-hivaids/hiv-2/

Only 3 ways to get HIV

1. **Sexual intercourse** (without condom)

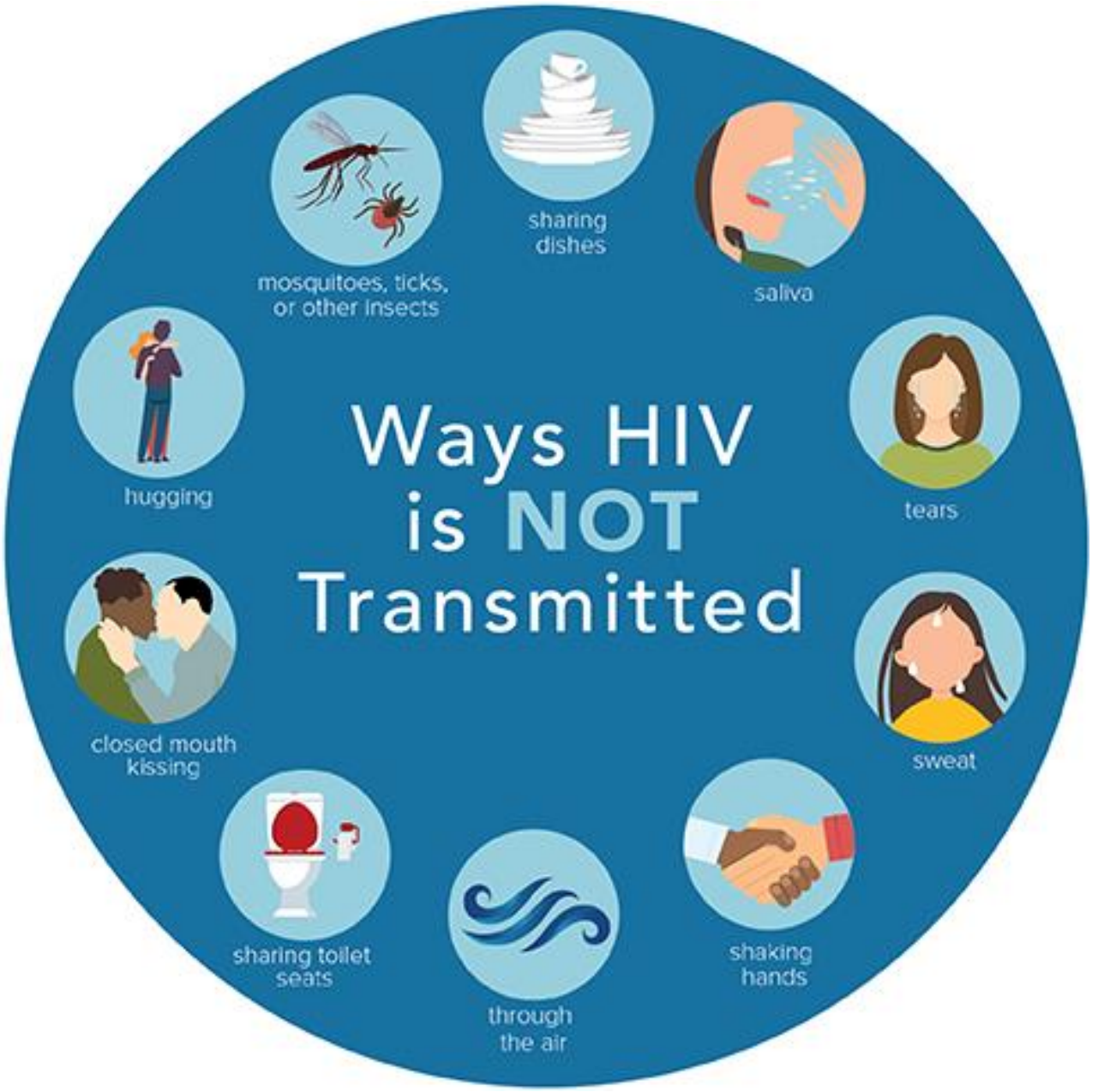
2. **Via blood, organs** (especially i.v. drug uses, blood transfusion)

3. **Mother-to-child transmission** (MTVT)

- An HIV-positive mother can transmit HIV to her baby any time during pregnancy, childbirth, or breastfeeding. However, the mother treatment reduces the risk to 1 %*

*Source: https://www.cdc.gov/hiv/basics/hiv-prevention/mother-to-child.html

HIV is not transmitted:



Source of image: https://www.cdc.gov/hiv/basics/hiv-transmission/not-transmitted.html

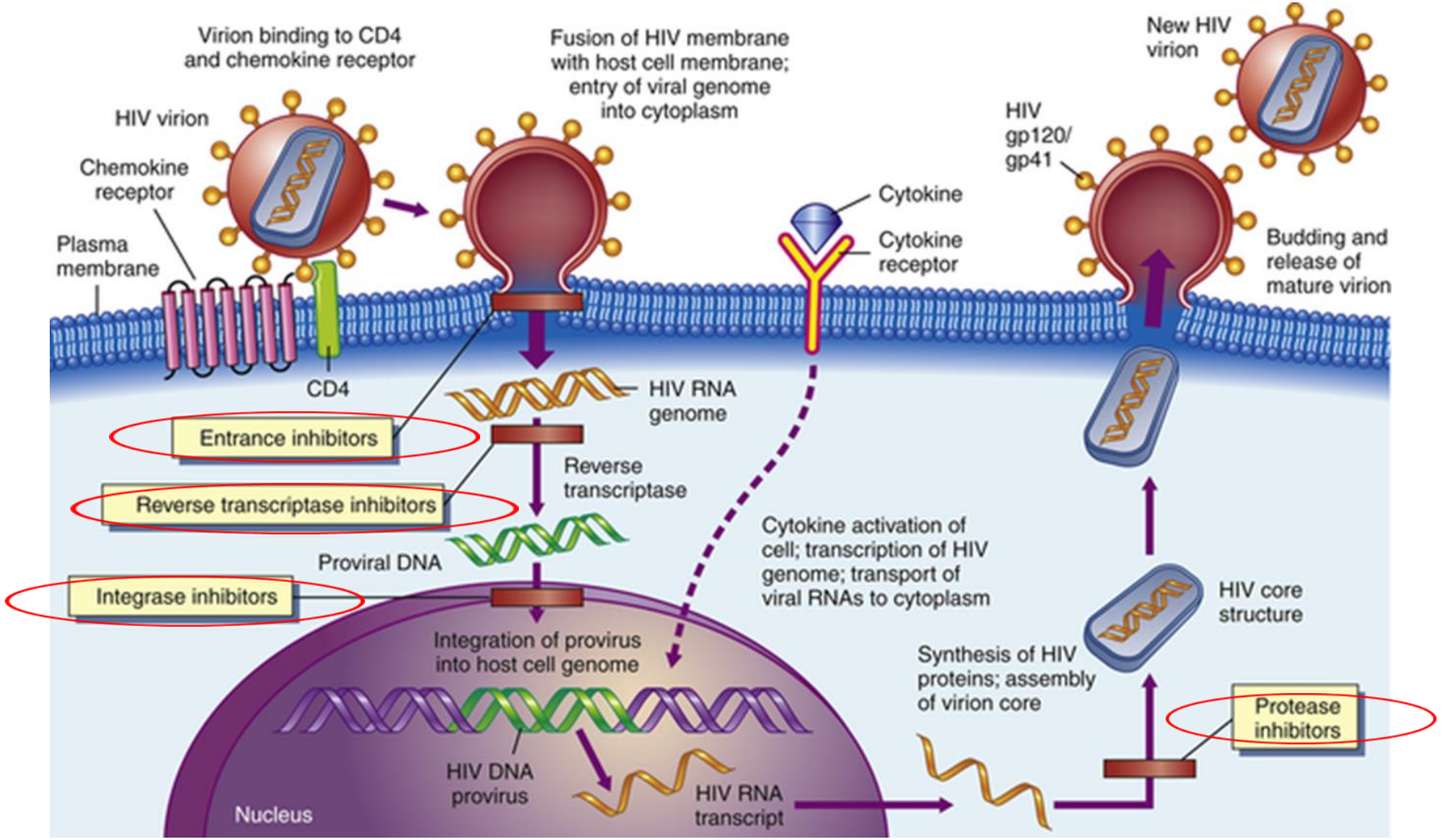
HIV treatment, HAART

- highly active antiretroviral therapy (HAART)
- efficient (usually causes viral suppresion – no viral RNA load is detectable), prevents transmission
- there is no effective cure for HIV, but treatment can control the disease, protect immune system and improve quality of life

- **combination of at least 3 drugs** (different mechanism of action: fusion inhibitors, reverse transcriptase inhibitors, protease inhibitors, integrase inhibitors…)*

- See slso https://www.ncbi.nlm.nih.gov/books/NBK554533/

Mechanisms of action of some HIV drugs



Source: https://basicmedicalkey.com/antiretroviral-medications

Pre-exposure prophylaxis (or PrEP)

- is when people at very high risk for HIV take daily medicine to prevent HIV.
- PrEP can stop HIV from taking hold and spreading throughout your body.
- When taken daily, PrEP is highly effective for preventing HIV from sex or injection drug use. PrEP is much less effective when it is not taken consistently.
- Studies have shown that PrEP reduces the risk of getting HIV from sex by about 99 % when taken daily.
- Among people who inject drugs, PrEP reduces the risk of getting HIV by at least 74 % when taken daily.

Pre-exposure prophylaxis (or PrEP)

- A combination of two HIV medicines:

- tenofovir disoproxil and emtricitabine, sold under the name Truvada® is approved for daily use as PrEP to help prevent an HIV-negative person from getting HIV from a sexual or injection-drug-using partner who's positive.

Post-exposure prophylaxis (or PEP)

- means taking antiretroviral medicines (ART) after being potentially exposed to HIV to prevent becoming infected.
- PEP should be used only in emergency situations and must be started within 72 hours after a recent possible exposure to HIV
- consists of combination of 3 drug, should be taken 28 days; e.g. Truvada® (tenofovir disoproxil and emtricitabine) + Isentress® (raltegravir)

It is indicated when people were

- recently been exposed to HIV during sex or
- through sharing needles and works to prepare drugs
- been sexually assaulted