

# **Introduction to HIV for the Newly Diagnosed Patient**

This educational program is funded and developed by ViiV Healthcare.

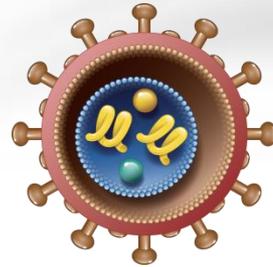
# Outline

- HIV Basics
- HIV-1 Lifecycle
- Medicines That Treat HIV-1
- Understanding Lab Tests
- Getting the Most Out of Your Healthcare Visits
- Transmission and Disclosure

# **HIV Basics**

# What Is HIV?

- **HIV** stands for:
  - **H**: human
  - **I**: immunodeficiency
  - **V**: virus

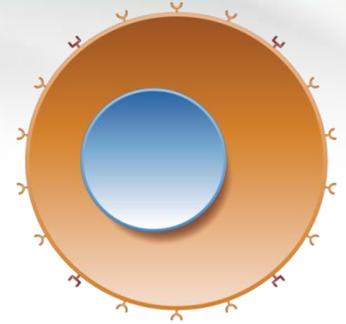


**HIV**

- *Immunodeficiency* means that your immune system doesn't work as well as it should
  - Your immune system helps your body fight infections
- The most common type of HIV is HIV-1
- The only way to know if you are infected with HIV-1 is to be tested

# What Are CD4<sup>+</sup> T-Cells?

- Your immune system has many parts, including white blood cells
- One type of white blood cell is called a CD4<sup>+</sup> T-cell
  - T-cells recognize viruses and bacteria and help the body fight infections
  - The number of CD4<sup>+</sup> T-cells in a sample of your blood is an important indicator of how well your immune system is working



**CD4<sup>+</sup> T-Cell**

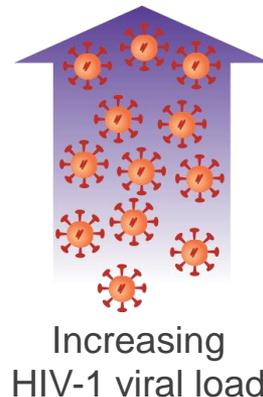
People with *higher* numbers of CD4<sup>+</sup> T-cells are *less* likely to get sick

People with *lower* numbers of CD4<sup>+</sup> T-cells are *more* likely to get sick

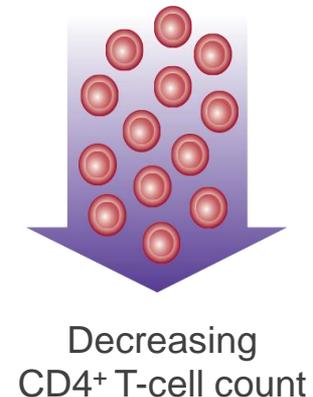
# HIV-1 Attacks CD4<sup>+</sup> T-Cells

- In people with HIV-1, the virus enters healthy CD4<sup>+</sup> T-cells and uses the CD4<sup>+</sup> T-cells to make more copies of itself, and then destroys them
- Over time, if untreated, HIV destroys so many of the CD4<sup>+</sup> T-cells that the body cannot fight infections and diseases
- As a result:

- The amount of HIV-1 virus in the blood (**HIV-1 viral load**) increases



- The number of CD4<sup>+</sup> T-cells in the blood (**CD4<sup>+</sup> T-cell count**) decreases



# What Is AIDS?

- People with healthy immune systems have CD4<sup>+</sup> T-cell counts between 500 and 1600 cells/mm<sup>3</sup> (the number of cells in a cubic millimeter of blood—about a drop)
- Once your CD4<sup>+</sup> T-cell count drops below 200 cells/mm<sup>3</sup>, you are said to have a stage of HIV-infection called **AIDS** (**A**cquired **I**mmune **D**eficiency **S**ndrome)
- You can also be diagnosed with AIDS if you have certain kinds of opportunistic infections (infections that can happen when your immune system is weak), even if your CD4<sup>+</sup> T-cell count is over 200 cells/mm<sup>3</sup>

## **AIDS:**

CD4<sup>+</sup> T-cell count  
under  
200 cells/mm<sup>3</sup>

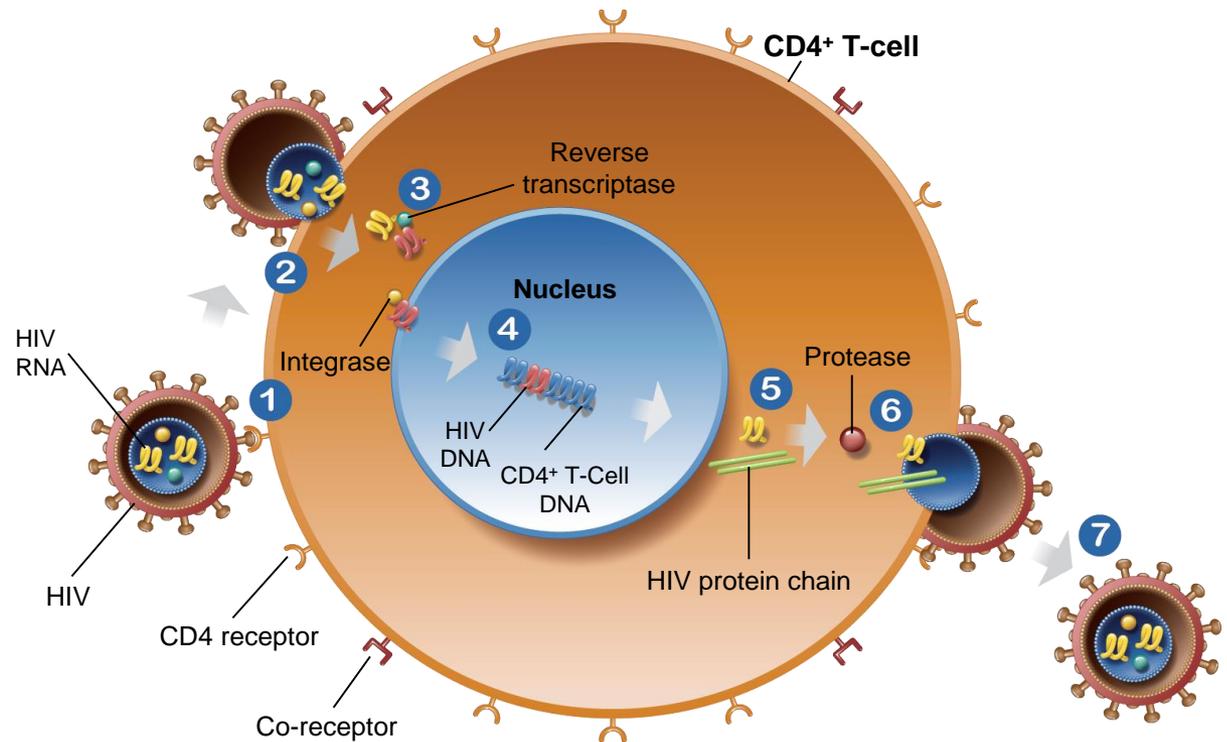
– or –

one or more  
opportunistic  
infections present

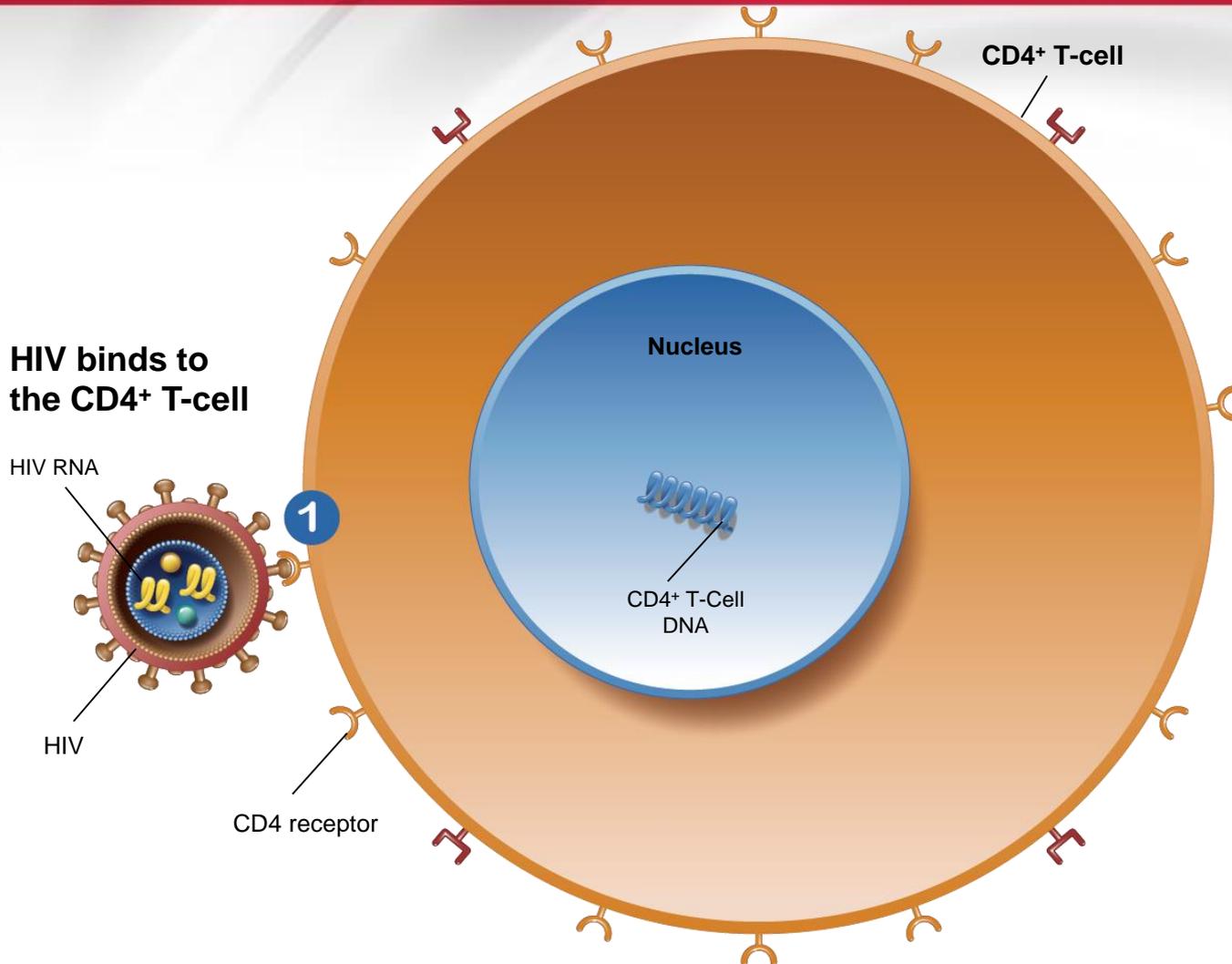
# **HIV Lifecycle**

# HIV-1 Lifecycle: Overview

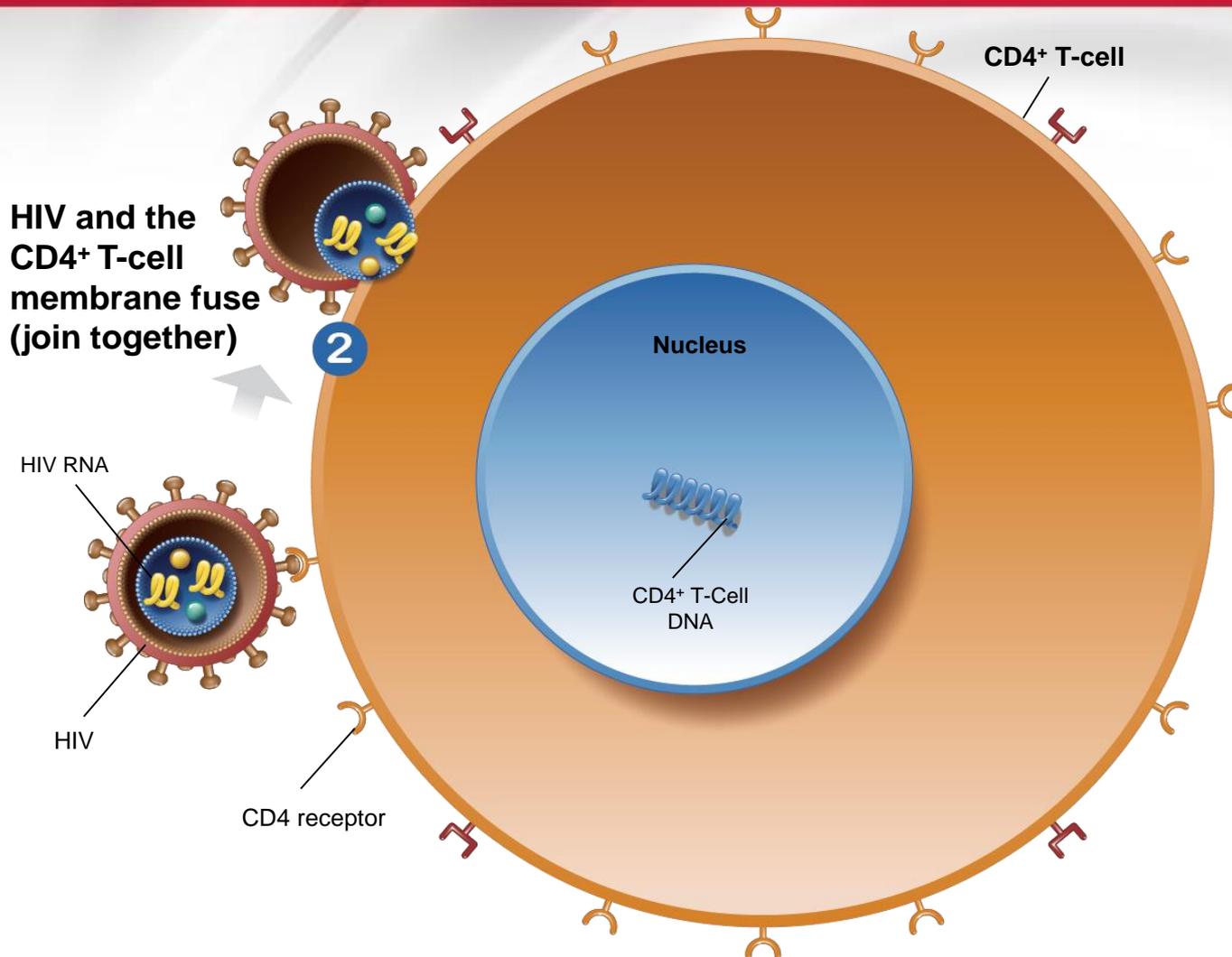
- The HIV-1 lifecycle is the process by which more copies of the HIV-1 virus are produced by CD4<sup>+</sup> T-cells
- There are many steps in the HIV-1 lifecycle
- We'll review each separately



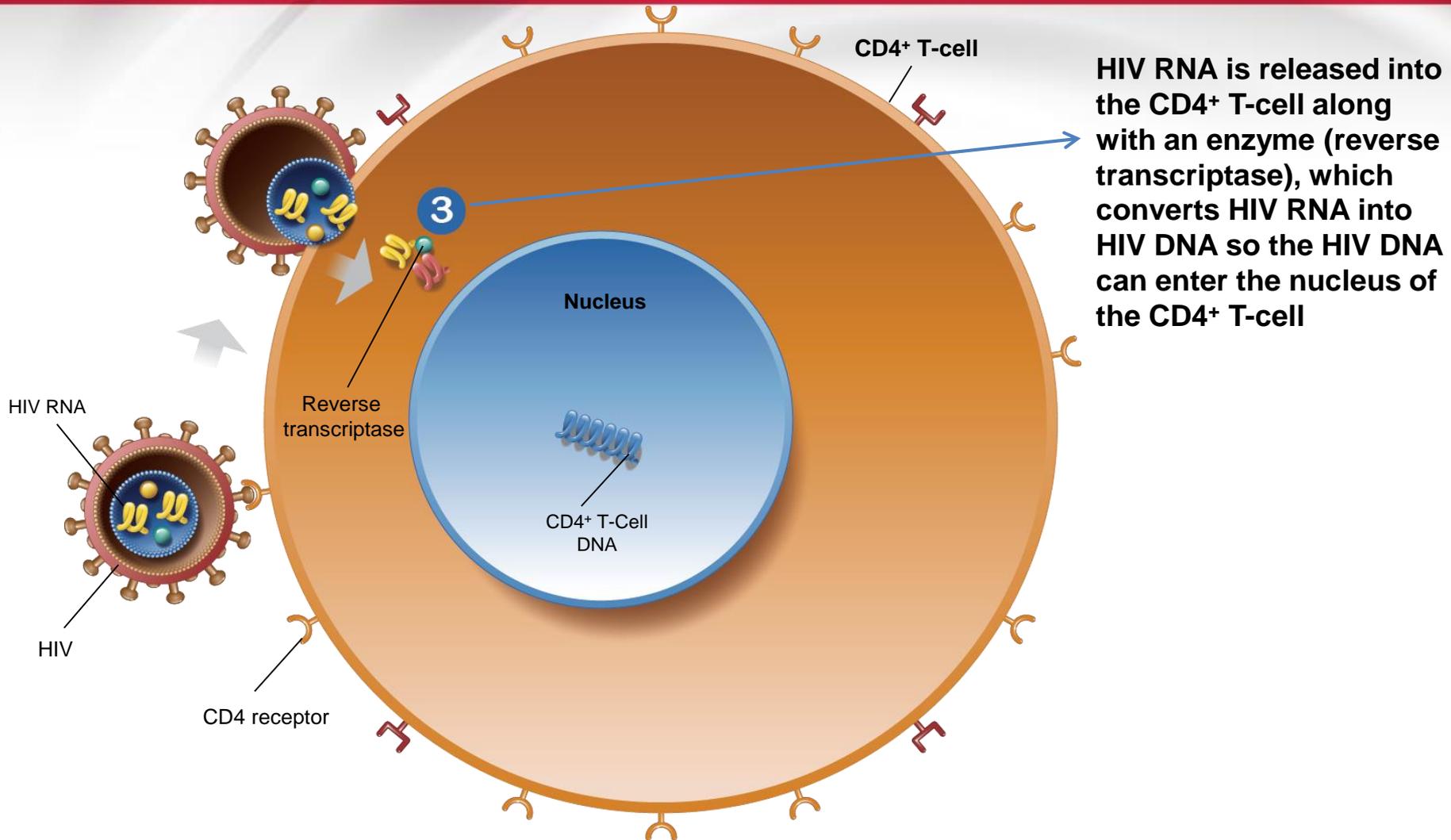
# HIV-1 Lifecycle: Step 1–Binding



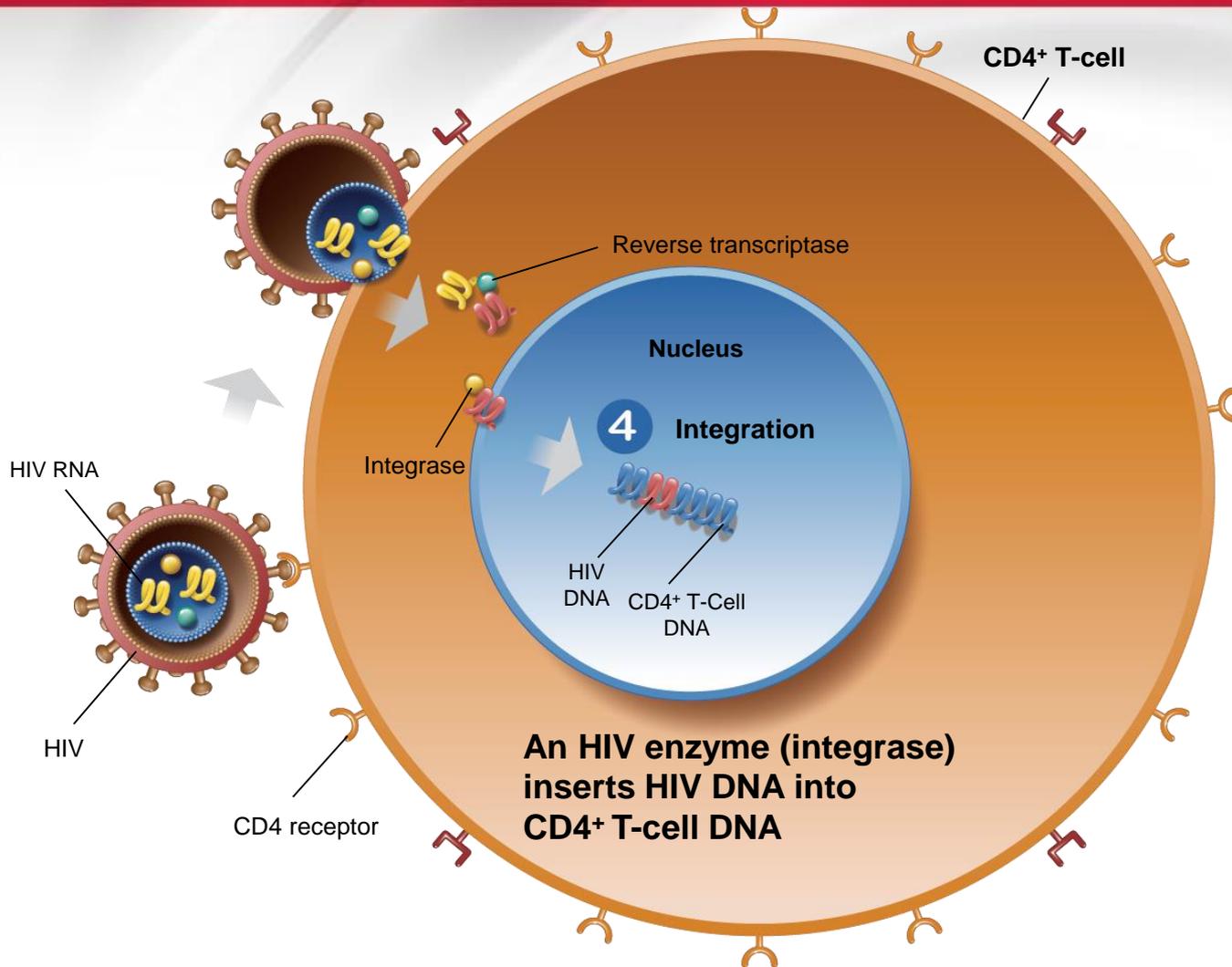
# HIV-1 Lifecycle: Step 2–Fusion



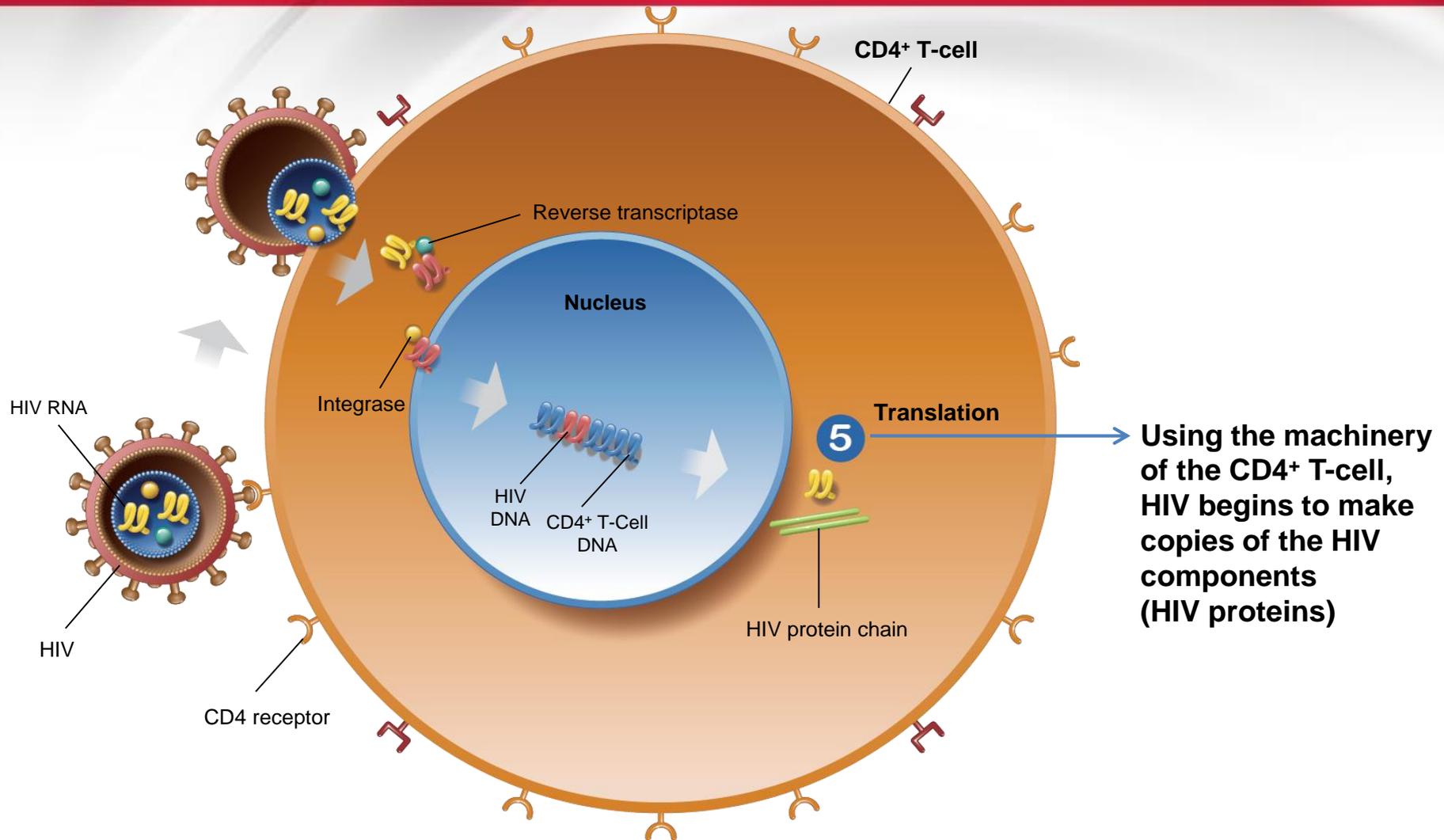
# HIV-1 Lifecycle: Step 3— Reverse Transcription



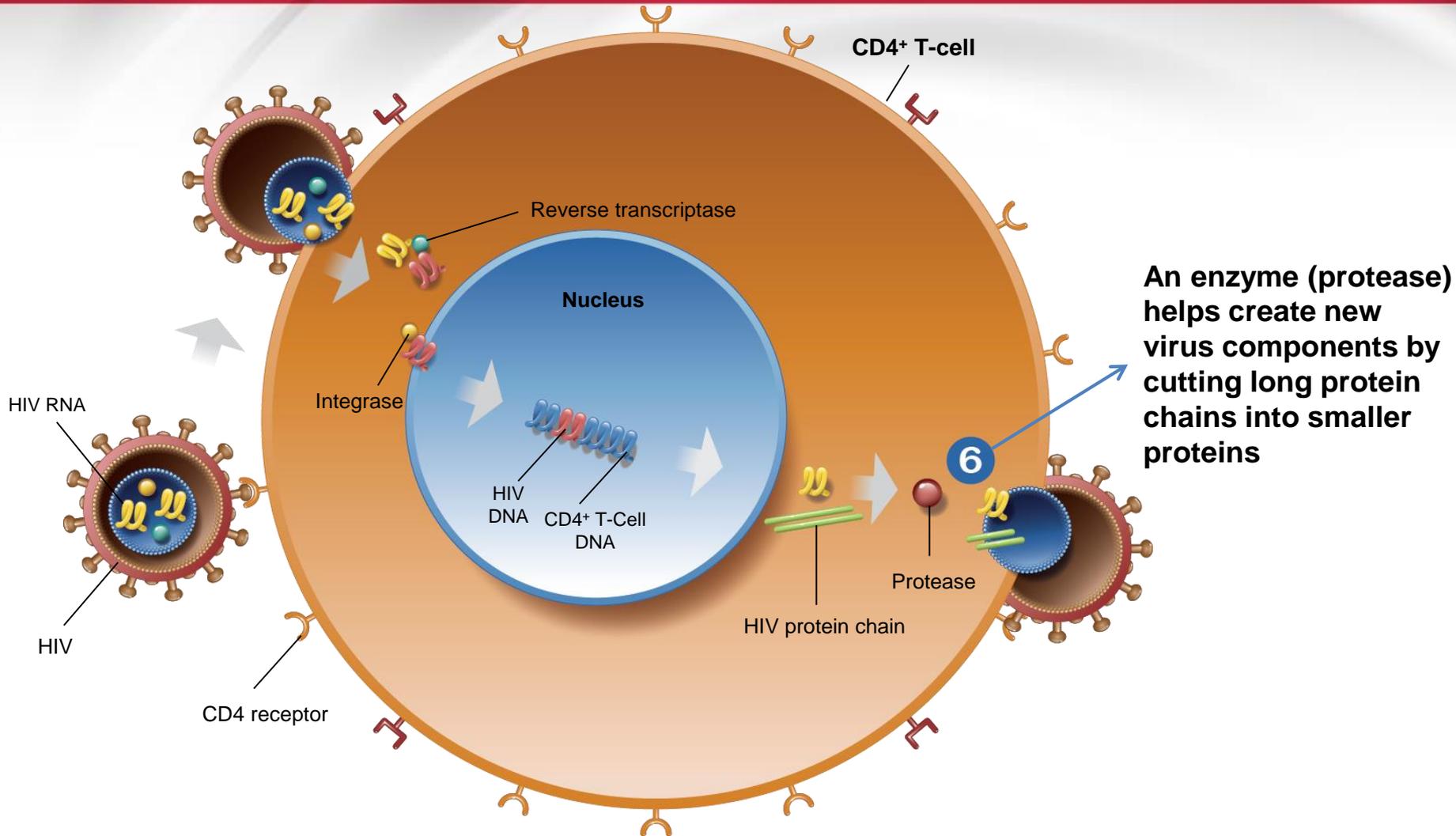
# HIV-1 Lifecycle: Step 4–Integration



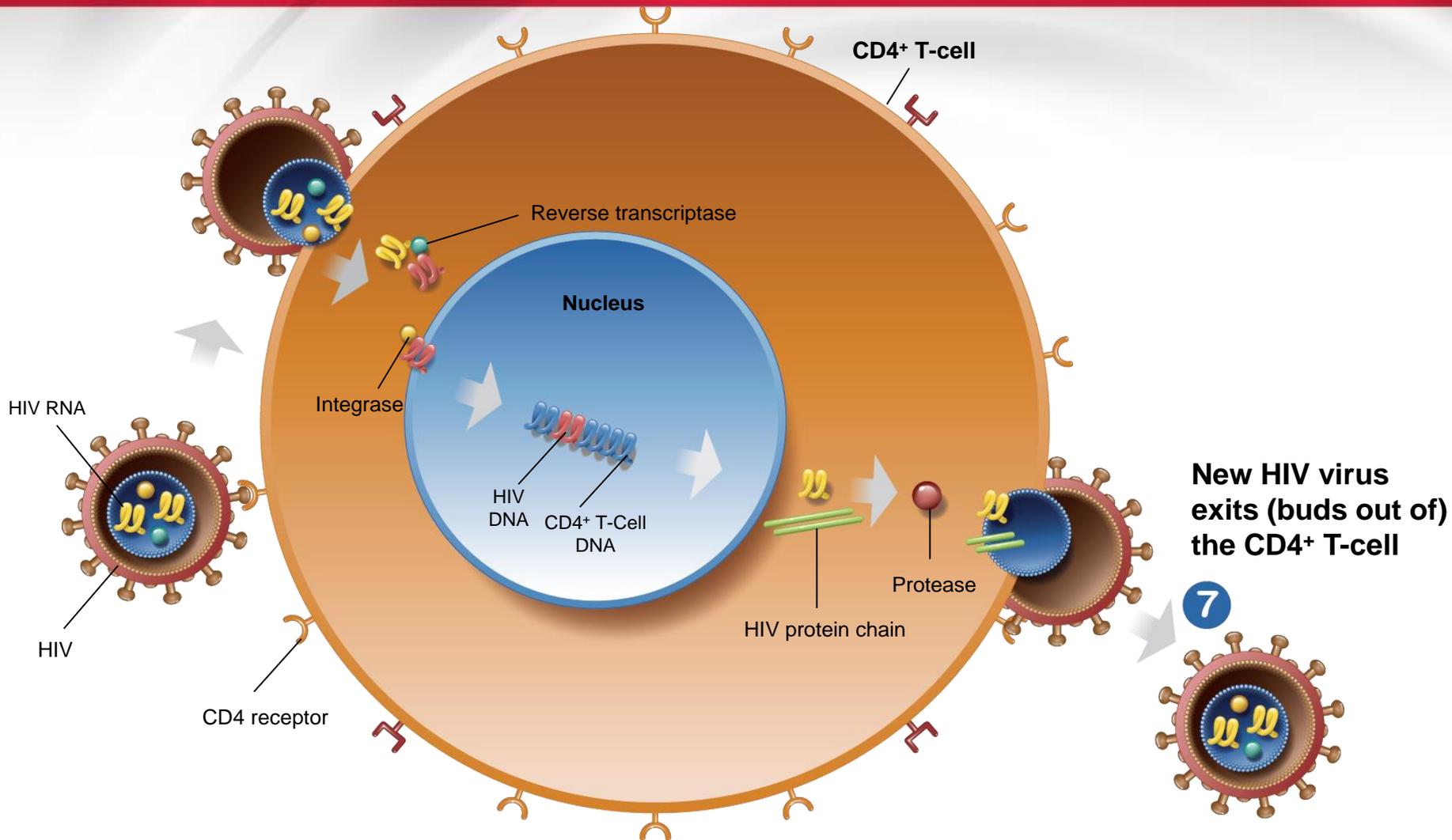
# HIV-1 Lifecycle: Step 5– Transcription and Translation



# HIV-1 Lifecycle: Step 6–Assembly



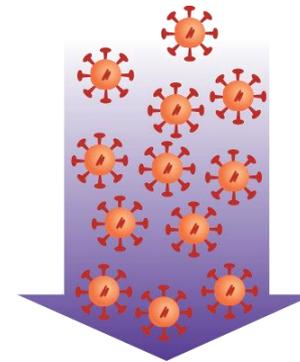
# HIV-1 Lifecycle: Step 7–Budding



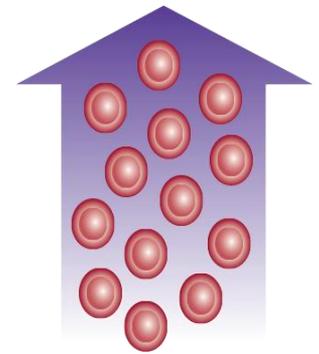
# **Medicines That Treat HIV-1**

# HIV-1 Medicines

- Medicines used to treat HIV-1 are called **antiretrovirals** (because HIV-1 is a type of virus called a retrovirus)
- HIV-1 medicines help stop HIV-1 from making more copies of itself—a process known as replication
- HIV-1 medicines, when taken as directed and in combination, help:
  - **Decrease HIV-1 viral load**
  - **Increase CD4<sup>+</sup> T-cell count**



Decreasing  
HIV-1 viral load



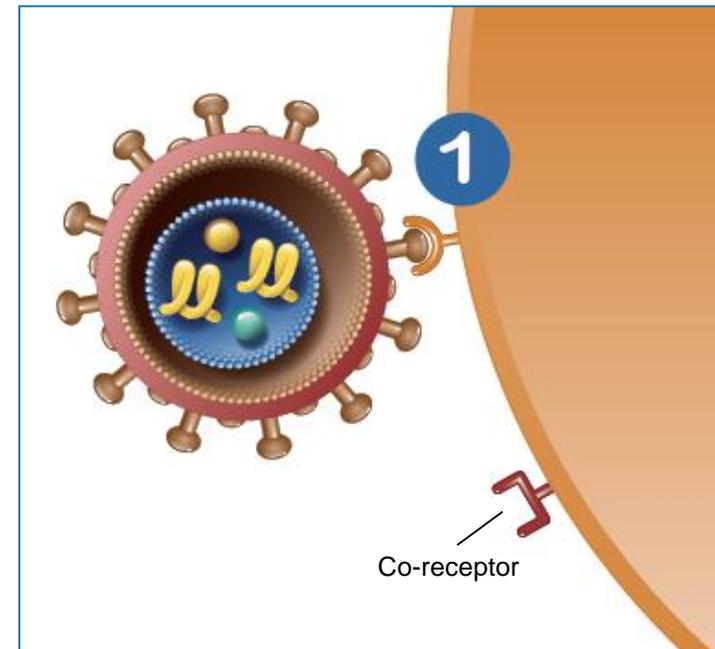
Increasing  
CD4<sup>+</sup> T-cell count

# Types of HIV-1 Medicine

- HIV-1 medicines are grouped by how they affect the HIV-1 lifecycle
- There are currently 6 classes of HIV-1 medicines:
  1. Entry inhibitors
  2. Fusion inhibitors
  3. Nucleoside/nucleotide reverse transcriptase inhibitors (**NRTIs**)
  4. Non-nucleoside reverse transcriptase inhibitors (**NNRTIs**)
  5. Integrase strand transfer inhibitors (**INSTIs**)
  6. Protease inhibitors (**PIs**)

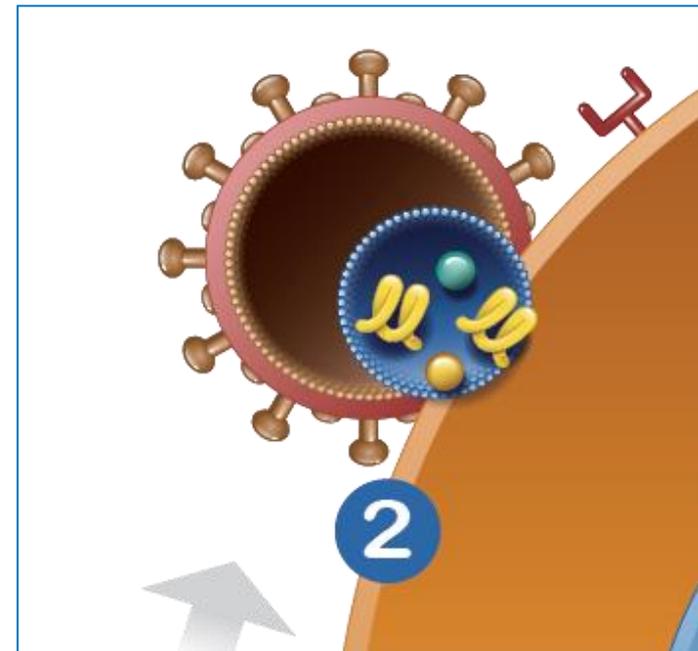
# Entry Inhibitors

- **Entry inhibitors** interfere with the virus's ability to bind to the outer surface of the CD4<sup>+</sup> T-cell co-receptor



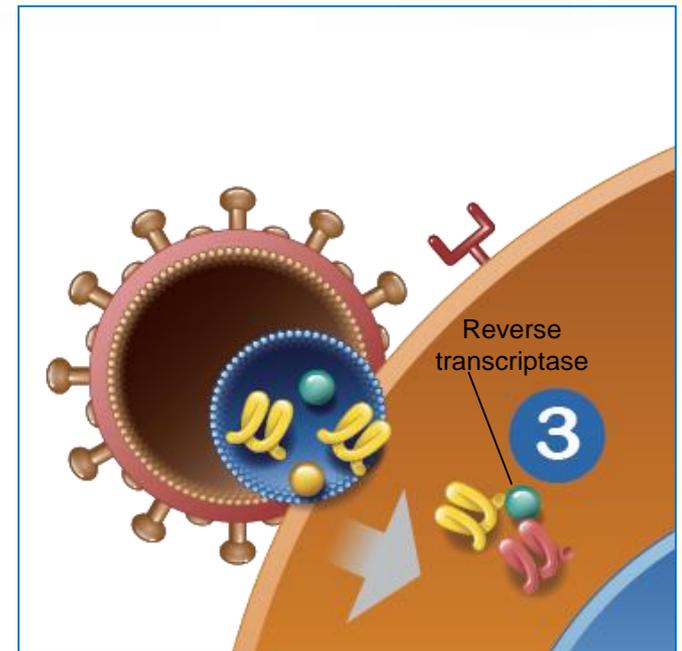
# Fusion Inhibitors

- **Fusion inhibitors** interfere with the virus's ability to fuse with the outer surface of the CD4<sup>+</sup> T-cell membrane



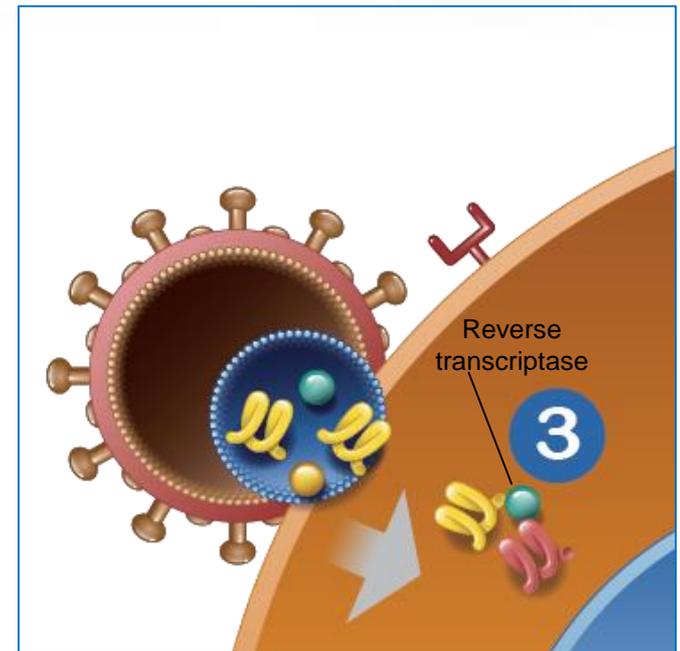
# Nucleoside/Nucleotide Reverse Transcriptase Inhibitors

- Nucleoside/nucleotide reverse transcriptase inhibitors (**NRTIs**) are faulty DNA building blocks
- When one of the faulty building blocks is added to a growing HIV-1 DNA chain, the right DNA building blocks cannot be added on and the building of HIV-1 DNA stops



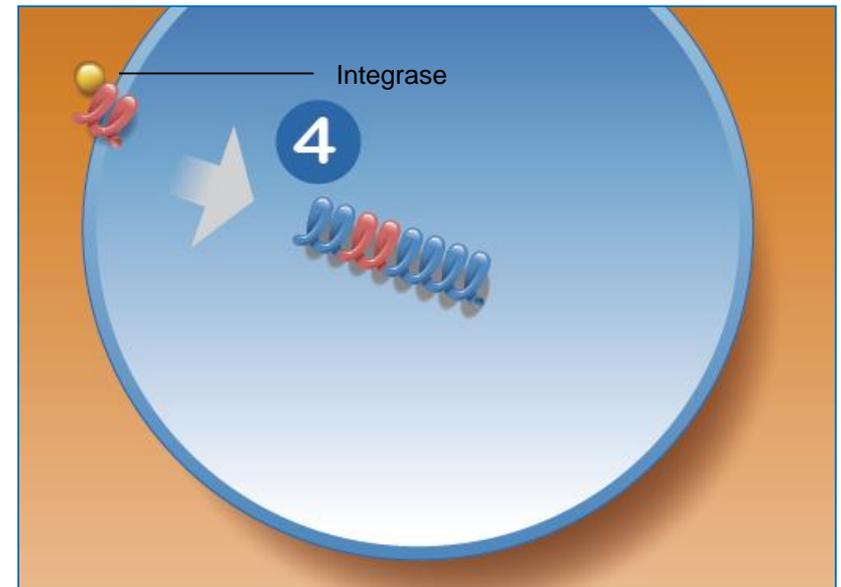
# Non-nucleoside Reverse Transcriptase Inhibitors

- Non-nucleoside reverse transcriptase inhibitors (**NNRTIs**) bind to the reverse transcriptase (RT) enzyme, interfering with its ability to convert HIV-1 RNA into HIV-1 DNA



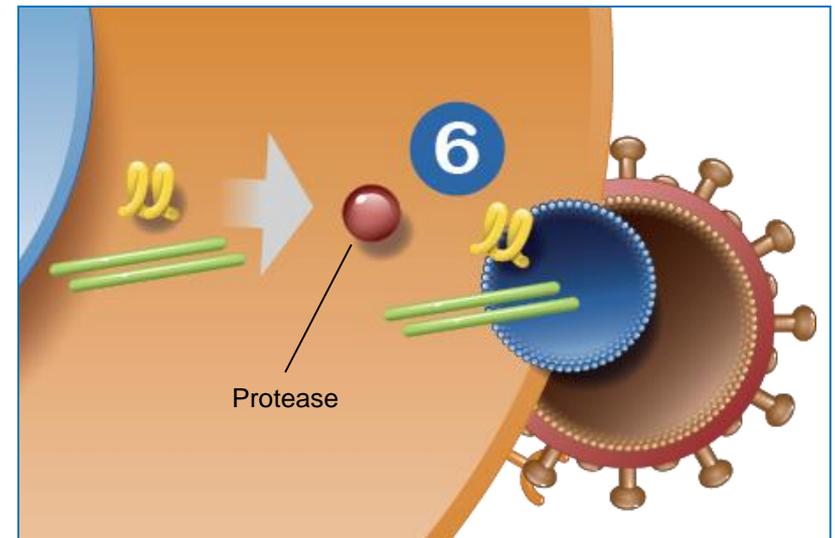
# Integrase Strand Transfer Inhibitors

- **Integrase strand transfer inhibitors (INSTIs)** interfere with the HIV enzyme integrase, which the virus uses to insert (“integrate”) its genetic material into the genetic material of the CD4<sup>+</sup> T-cell it has infected



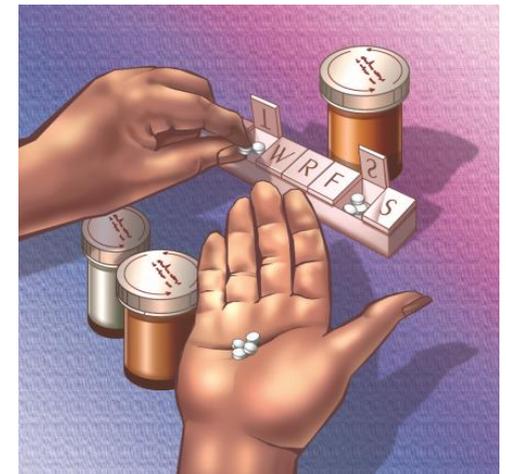
# Protease Inhibitors

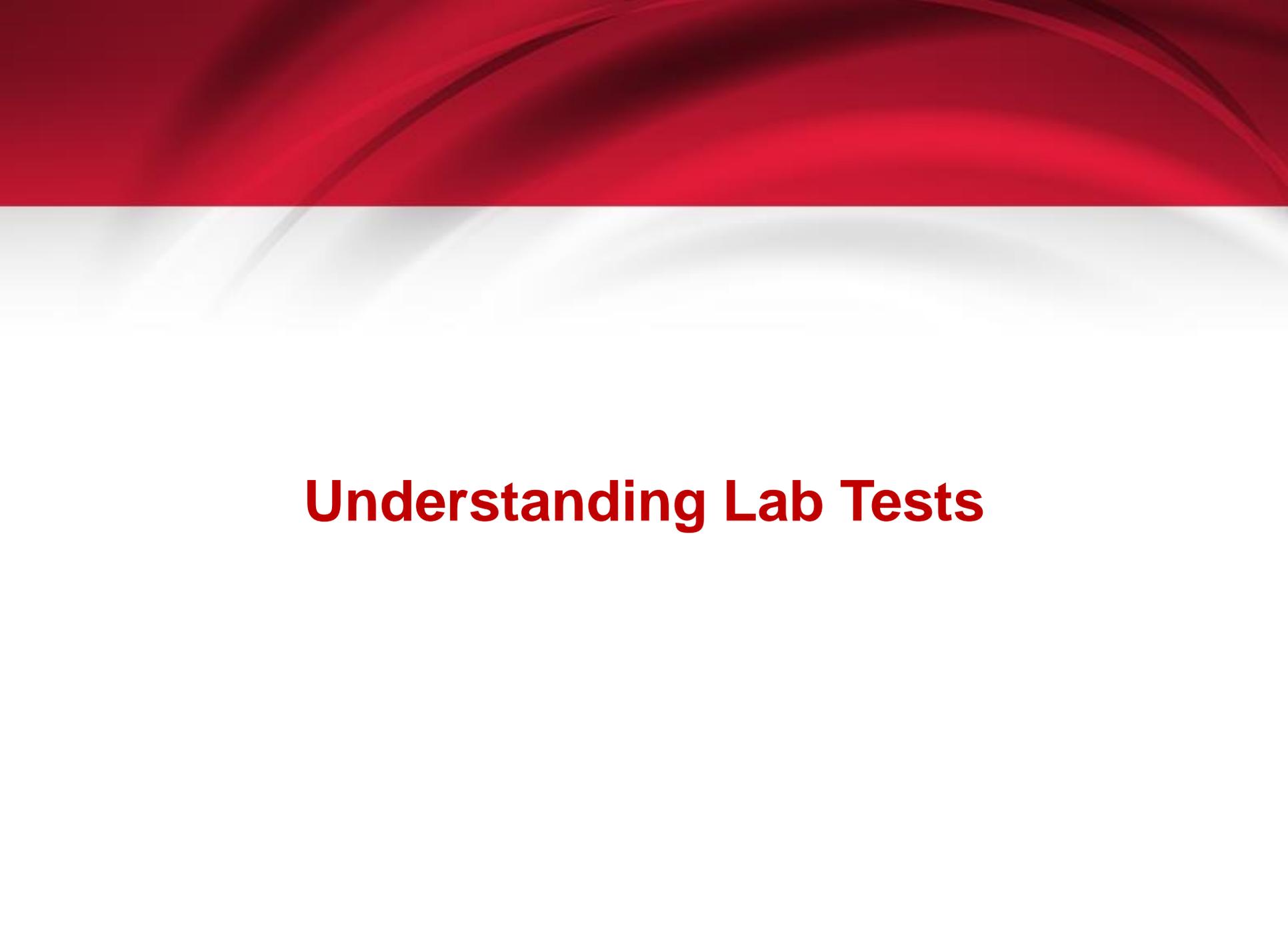
- **Protease inhibitors (PIs)** interfere with the HIV enzyme called protease. When protease does not work properly, new virus particles cannot be assembled



# HIV-1 Medicines

- Effective treatment of HIV-1 requires a combination of HIV-1 medicines taken every day to:
  - Protect your immune system
  - Reduce the risk of getting infections that can happen when the immune system is weak (opportunistic infections)
  - Reduce the risk of death
- HIV-1 medicines **do not cure** HIV-1 infection or AIDS





# **Understanding Lab Tests**

# Types of Lab Tests

- Your healthcare provider may use several types of lab tests to guide your healthcare
  - Most, but not all, of the tests are done on blood



# HIV-1 Viral Load

- **Viral load** is a measure of how much HIV-1 is in a person's blood
- The key goal of treatment with HIV-1 medicines is to reduce viral load as much as possible and keep it low
  - When a person infected with HIV-1 takes effective medicines every day, the HIV-1 viral load will be less than 50 copies in a milliliter of blood
  - Having a lower viral load means that fewer copies of the virus are attacking and destroying CD4<sup>+</sup> T-cells

# CD4+ T-Cell Count

- Higher **CD4+ T-cell counts** (more cells in the blood) mean that the immune system is better able to fight infections



**LESS THAN 200 cells/mm<sup>3</sup> (AIDS)**

**Low CD4+ T-cell count:** Higher risk of opportunistic infections or other health problems

**BETWEEN 200 cells/mm<sup>3</sup> and 500 cells/mm<sup>3</sup>**

**Below normal CD4+ T-cell count:** May be at higher risk of some opportunistic infections or other health problems

**MORE THAN 500 cells/mm<sup>3</sup>**

**Normal CD4+ T-cell count:** Lower risk of infections

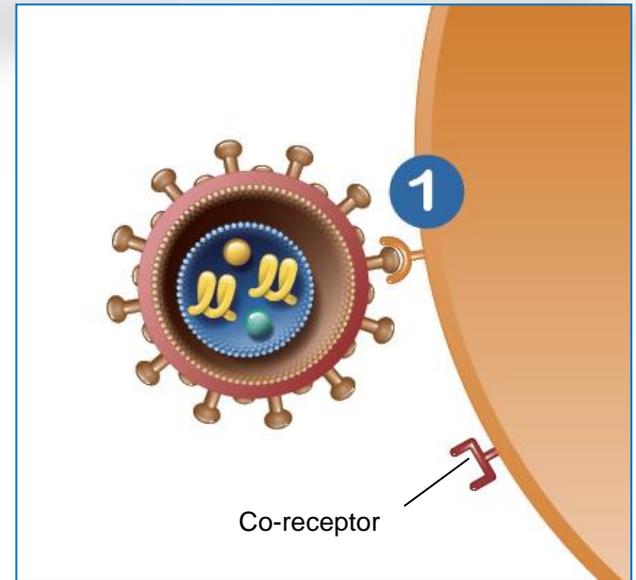
- Healthcare providers look at CD4+ T-cell count to help determine how advanced your HIV disease is and the health of your immune system

# Resistance Testing

- Drug resistance means that HIV has changed (mutated) so one or more medicines in your treatment regimen may no longer work as well to stop the virus from multiplying
- Resistance tests are used to:
  - Identify which medicines in a failing treatment regimen no longer work or no longer work well
  - Help determine which medicines may work best in a patient with drug resistance
- Guidelines recommend resistance testing:
  - If the first regimen is not working and the amount of HIV in your blood is detectable by the viral load test
  - If the current regimen stops working and the amount of HIV in your blood is detectable by the viral load test

# Tropism Testing

- HIV enters a CD4<sup>+</sup> T-cell by attaching to one of two types of “locks” called co-receptors:
  - R5 (or CCR5)
  - X4 (or CXCR4)
- **Tropism** means the type of lock HIV-1 uses to enter the CD4<sup>+</sup> T-cell
  - A person can have R5-tropic HIV-1, X4-tropic HIV-1, or a mixture of both (mixed- or dual-tropic HIV-1)



# HLA-B\*5701 Testing

- HLA-B\*5701 is a marker on a person's genes that indicates whether a person is at an increased risk for a serious allergic reaction (*hypersensitivity reaction*) to an HIV medicine
- A **positive result** for this gene means a person is at a much higher risk for this allergic reaction and should not take certain HIV medicines
- HLA-B\*5701 screening only needs to be done once; the result should be included in your medical chart

# Other Lab Tests

- Guidelines recommend that several lab tests be performed when a person is diagnosed with HIV
- Many of these tests will be repeated over time to help your healthcare provider keep track of your overall health

Lab Test	Description	Importance
<b>Complete blood count</b>	Measures a number of cell types in the blood (red blood cells, white blood cells, and platelets)	Diagnosing anemia (low red blood count), low platelet count, or some infections
<b>Blood chemistry panel</b>	Measures different elements and waste products in the blood	Helps determine how well some organs (for example, liver or kidneys) are working

*Table continues on next slide.*

# Other Lab Tests (cont'd)

Lab Test	Description	Importance
<b>Urinalysis</b>	Evaluation of your urine	Checks for diabetes, urinary tract infections, or other conditions
<b>Fasting blood glucose</b>	Measures sugar in your blood	Diagnosing or monitoring diabetes
<b>Lipids</b>	Measure fats in your blood	High cholesterol or other lipids are related to your risk of heart disease
<b>Hepatitis A, B, and C</b>	Tests for these infections	Hepatitis affects your liver and can complicate HIV treatment
<b>Sexually transmitted diseases (STDs)</b>	Tests for syphilis, chlamydia, gonorrhea, and other STDs	If untreated, these infections can make your HIV get worse faster

DHHS Guidelines. May 1, 2014. <http://aidsinfo.nih.gov/guidelines>. Accessed November 14, 2014.

U.S. National Library of Medicine. Urinalysis. <http://www.nlm.nih.gov/medlineplus/ency/article/003579.htm>. Accessed November 14, 2014.

U.S. National Library of Medicine. Blood Sugar. <http://www.nlm.nih.gov/medlineplus/bloodsugar.html>. Accessed November 14, 2014.

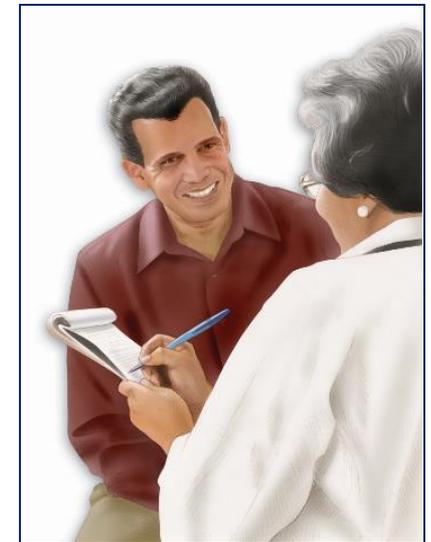
U.S. Department of Veterans Affairs. Laboratory tests and HIV. <http://www.hiv.va.gov/patient/diagnosis/labtests-single-page.asp>. Accessed November 14, 2014.



# **Getting the Most Out of Your Healthcare Visits**

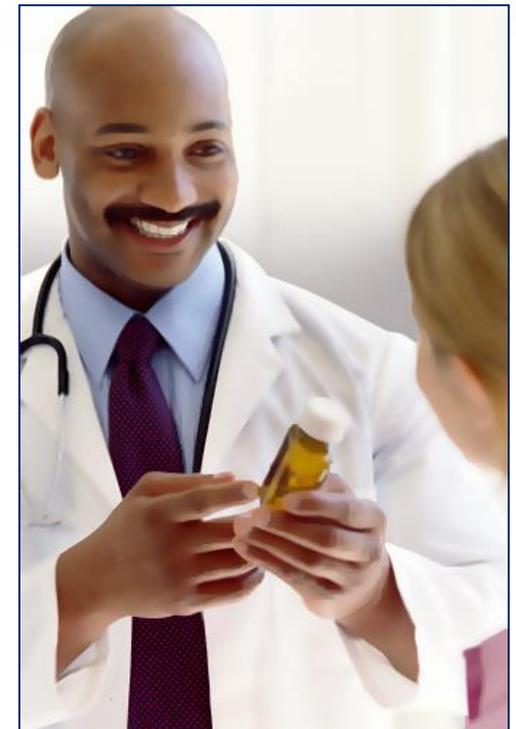
# Working As a Team

- When it comes to treating HIV-1, you and your healthcare provider are a team
- To give you the best care, your healthcare provider needs to know the truth about your health and lifestyle
  - While it may be hard to talk to your healthcare provider about private matters such as sex, drug use, or relationships, that information helps the provider make better recommendations for your health
- Communication goes both ways: be sure to ask questions and tell your healthcare provider when you have concerns about your health or treatment



# Preparing for an Appointment

- To make the most of each appointment:
  - Know why you are going (Is it a regular checkup? Do you feel sick? Do you need medicine refills?)
  - Bring all the medicines you take, or a list of medicines (including prescription medicines, over-the-counter medicines, herbals, vitamins, and other supplements)
  - Ask what lab tests you need and what your results mean
  - Make a list of the questions you have and be ready to write down the answers



# **Transmission and Disclosure**

# HIV Transmission

- People taking HIV-1 medicines can still transmit (spread) the virus to others
  - However, people with *very low* HIV-1 viral loads are *less likely* to transmit HIV-1 than people with higher viral loads
- HIV is transmitted through:
  - Having sex (anal, vaginal, oral) with someone who has HIV
  - Sharing needles with someone infected with HIV
- HIV is ***not*** transmitted through other body fluids such as saliva, tears, or sweat, or via air, water, or insects (including mosquitoes)



# Protecting Others from HIV

- Protect others from HIV by:
  - Using a condom or dental dam correctly every time you have any kind of sex (oral, vaginal, or anal)
  - Choosing less risky sexual behavior (for example, oral sex is less risky than anal or vaginal sex)
  - Getting treatment for any sexually transmitted diseases (STDs)
  - Not sharing or re-using needles or other injection equipment
  - Not breast-feeding (if applicable)
- Ask your healthcare provider if you have any questions about how to prevent passing HIV to other people



# Telling Others About Your HIV Status

- Deciding to tell others that you have HIV can be difficult
- In most cases, it is your choice to share your status
  - If you work, you are not required by law to tell your boss or coworkers that you are HIV positive
- However, telling your sexual partner(s) that you have HIV is the responsible thing to do
  - In some states, you are required to tell your sex partner(s) if you have HIV
- If you need help deciding who to tell or how to tell them, talk to your healthcare provider or local AIDS Service Organization



# Summary

- HIV-1 is a virus that destroys CD4<sup>+</sup> T-cells, which play a major role in protecting the body from infection
- When taken as directed and in combination, HIV-1 medicines help:
  - Decrease HIV-1 viral load
  - Increase CD4<sup>+</sup> T-cell count
- However, HIV-1 medicines **do not cure** HIV-1 infection or AIDS. HIV-1 can still be passed to others
- Your healthcare provider may use several types of lab tests to guide your treatment
- *Remember:* when it comes to treating HIV-1, you and your healthcare provider are a team

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