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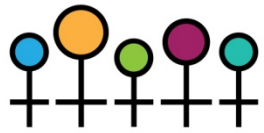
HIV Drugs and the HIV Lifecycle

Together, we can change the course of the HIV epidemic...one woman at a time.

#onewomanatatime

www.thewellproject.org

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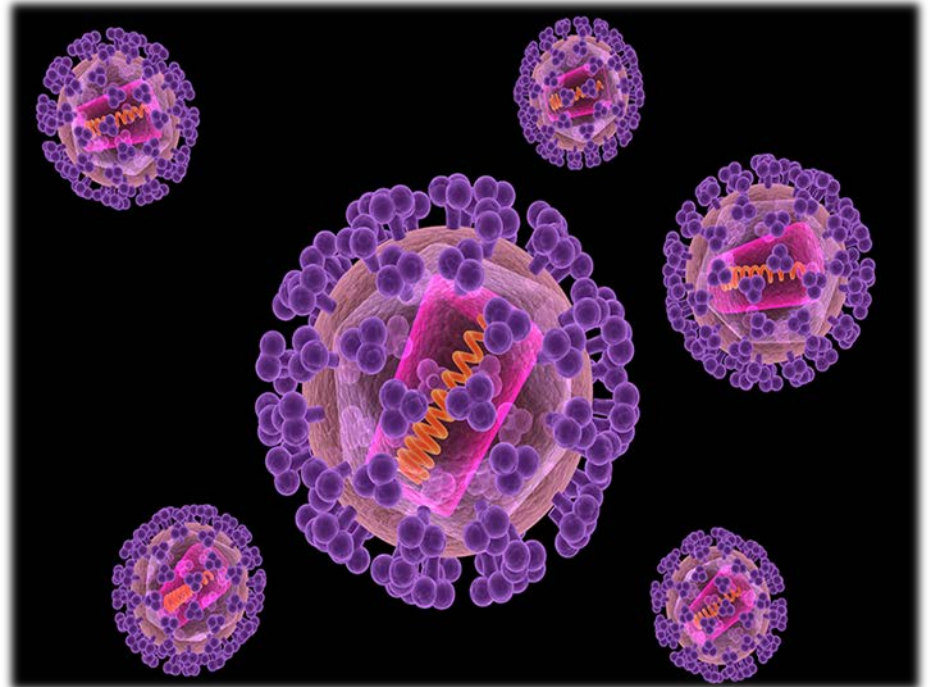


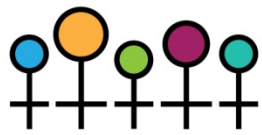
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HIV Drugs and the HIV Lifecycle

HIV must go through a number of steps to make copies of itself; these steps are called the ***HIV lifecycle***

- **All HIV drugs work by interrupting different steps in HIV's lifecycle**
- HIV drugs can't cure HIV, but can help you stay healthy by preventing HIV from reproducing
- Once HIV is in the body, it infects CD4 cells (a type of white blood cell) and other cells
- HIV turns CD4 cells into factories, producing thousands of copies of HIV



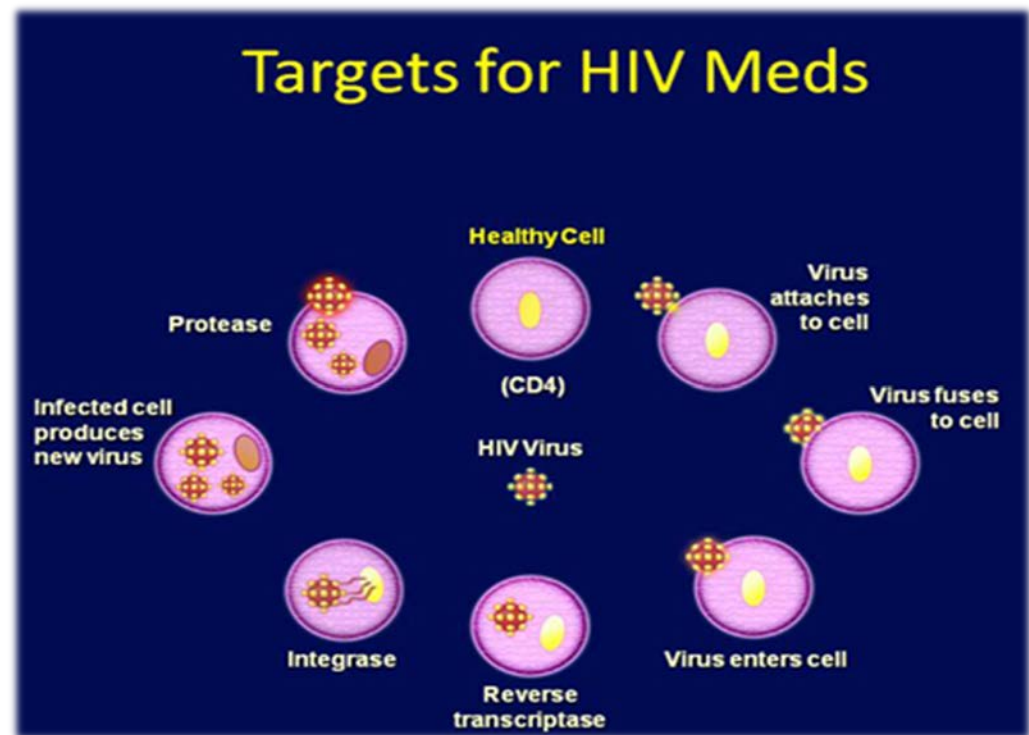


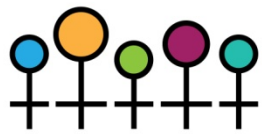
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The HIV Lifecycle

The steps HIV goes through to complete the reproduction process are:

- Binding and fusion
- Reverse transcription
- Integration
- Transcription
- Assembly
- Budding



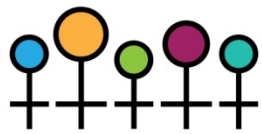


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The HIV Lifecycle

Binding and Fusion: HIV begins to enter a CD4 cell by binding or attaching itself to a specific point, called a **CD4 receptor**, on the cell's surface

- HIV must then bind to a second **co-receptor**, either the CCR5 co-receptor or the CXCR4 co-receptor
- This allows the virus to join or merge with the CD4 cell in a process called **fusion**
- After fusion, HIV releases its **RNA** (HIV's genetic material) and **enzymes** (proteins causing chemical reactions) into the CD4 cell



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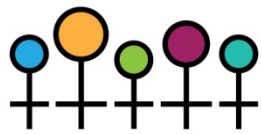
The HIV Lifecycle

Reverse Transcription: HIV's RNA contains the "instructions" that will reprogram the CD4 cell to produce more virus

- In order to be effective, HIV's RNA must be changed into DNA
- An HIV enzyme called **reverse transcriptase** changes the HIV RNA into HIV DNA

Integration: Next, the newly formed HIV DNA enters the nucleus (command center) of the CD4 cell

- Another HIV enzyme called **integrase** combines or “integrates” HIV's DNA with the CD4 cell's DNA



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The HIV Lifecycle

Transcription: Once the virus is integrated into the CD4 cell, it commands the CD4 cell to start making new HIV proteins

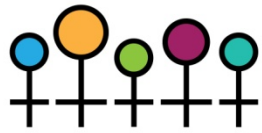
- The proteins are the building blocks for new HIV viruses
- They are produced in long chains

Assembly: An HIV enzyme called **protease** cuts the long chains of HIV proteins into smaller pieces

- As the smaller protein pieces come together with copies of HIV's RNA, a new virus is assembled

Budding: The newly assembled virus pushes ("buds") out of the original CD4 cell

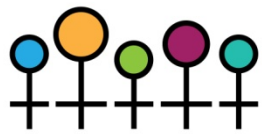
- This new virus is now able to target and infect other CD4 cells



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HIV Drugs

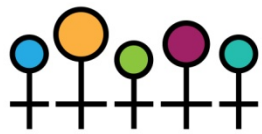
- Different **classes or groups** of HIV drugs block different steps of HIV's lifecycle
- There are currently **six classes of HIV drugs** approved by the U.S. Food and Drug Administration (FDA):
 - Entry Inhibitors
 - Integrase Inhibitors
 - Nucleoside and Nucleotide Reverse Transcriptase Inhibitors (NRTIs or "nukes")
 - Non-Nucleoside Reverse Transcriptase Inhibitors (NNRTIs or "non-nukes")
 - Protease Inhibitors (PIs)
 - Boosting Agents



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Combining HIV Drugs

- Health care providers combine drugs from different classes in order to attack HIV at more than one step in its lifecycle
 - HIV can **mutate** when it reproduces, which could stop HIV drugs from working
 - When this happens, we say that HIV has become **resistant** to that drug
- If you take only one drug (monotherapy) or a few drugs that belong to one class, HIV can develop mutations making it resistant to that drug or drug class
- **HIV has a much harder time changing enough to develop drug mutations and resistance when you take a combination of drugs from different classes**



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Entry and Integrase Inhibitors

Entry Inhibitors:

Stop (inhibit) HIV from entering a CD4 cell

There are 2 different types of entry inhibitors and each has one approved drug

- **Fusion inhibitor:** Fuzeon (enfuvirtide or T-20)
- **Receptor blockers** (CCR5 antagonists): Selzentry (maraviroc)



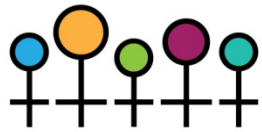
Integrase Inhibitors:

Interfere with HIV's **integrase** enzyme

There are 3 approved integrase inhibitors:

- Isentress (raltegravir)
- Tivicay (dolutegravir)
- Vitekta (elvitegravir)



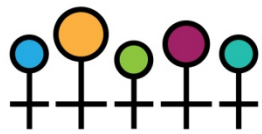


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NRTIs (“Nukes”)

Nucleoside and Nucleotide Reverse Transcriptase Inhibitors (NRTIs or “nukes”):

- Interfere with HIV's **reverse transcriptase** enzyme
- There are many approved NRTIs:
 - Emtriva (emtricitabine or FTC)
 - Epivir (lamivudine or 3TC)
 - Retrovir (zidovudine or AZT)
 - Videx (didanosine or ddI)
 - Viread (tenofovir)
 - Zerit (stavudine or d4T)
 - Ziagen (abacavir)

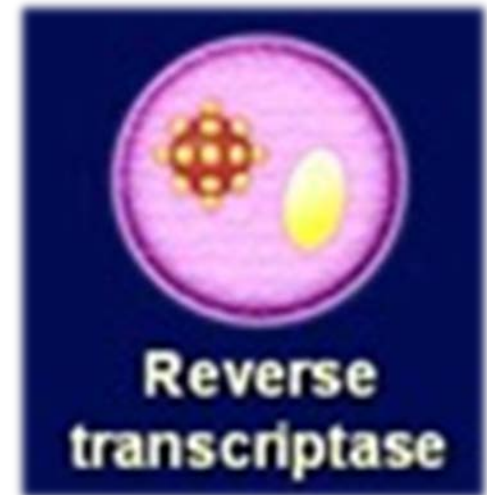


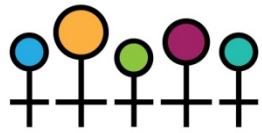
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NNRTIs (“Non-Nukes”)

Non-Nucleoside Reverse Transcriptase Inhibitors (NNRTIs or “non-nukes”):

- Like NRTIs, interfere with HIV's reverse transcriptase enzyme
- There are a number of approved NNRTIs:
 - Edurant (rilpivirine or RPV)
 - Intelence (etravirine or ETR)
 - Rescriptor (delavirdine)
 - Sustiva (efavirenz)
 - Viramune (nevirapine)





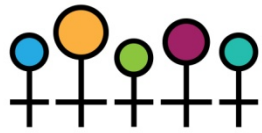
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Protease Inhibitors ("PIs")

Protease Inhibitors (PIs):

- Interfere with HIV's **protease** enzyme
- There are many approved PIs:
 - Aptivus (tipranavir)
 - Crixivan (indinavir)
 - Invirase (saquinavir)
 - Kaletra (lopinavir plus ritonavir)
 - Lexiva (fosamprenavir)
 - Norvir (ritonavir)
 - Prezista (darunavir)
 - Reyataz (atazanavir)
 - Viracept (nelfinavir)



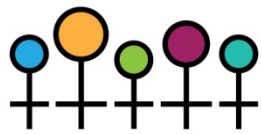


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Boosting Agents

Boosting Agents:

- These drugs do not affect HIV's lifecycle
- Instead, they improve, or 'boost' the level of other HIV drugs in the blood stream so they can be taken at a lower dose
- Approved boosting agents:
 - Norvir (ritonavir)
 - Tybost (cobicistat)



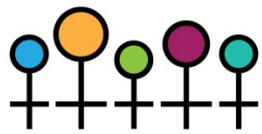
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Fixed-Dose Combinations

Although not a separate class, there are fixed-dose drugs that **combine 2 or more HIV drugs from 1 or more classes in just 1 pill**, for easier dosing.

There are **10 combination pills approved** – 4 of which contain a full day's HIV meds in one pill (single-tablet regimens, underlined and italicized in this):

- Atripla (Sustiva plus Emtriva plus Viread)
- Combivir (Retrovir plus Epivir)
- Complera (Emtriva plus Viread plus Edurant)
- Epzicom (Epivir plus Ziagen)
- Evotaz (Reyataz plus Tybost)
- Prezcobix (Prezista plus Tybost)
- Stribild (Emtriva plus Viread plus Vitekta plus Tybost)
- Triumeq (Ziagen plus Tivicay plus Epivir)
- Trizivir (Retrovir plus Epivir plus Ziagen)
- Truvada (Emtriva plus Viread)

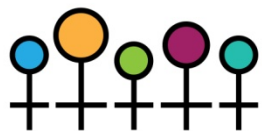


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What Does This Mean for You?

Combination therapy with drugs that block HIV at different steps of its lifecycle can prevent most of the production of new HIV.

Most important, it means **slower disease progression and longer life** for people living with HIV.



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Learn More!

- To learn more, please read the full fact sheet on this topic:
 - [HIV Drugs and the HIV Lifecycle](#)
- For more information on approved HIV drugs:
 - The Well Project's [HIV Drug Chart](#)
- For more fact sheets and to connect to our community of women living with HIV, visit:
 - www.thewellproject.org
 - www.facebook.com/thewellproject
 - www.twitter.com/thewellproject