Molecular Biology 7

- iClicker 28A
- HIV and AIDS
- iClicker 28B

- Due in Lab next week
  - Lab report #9
  - Pre-lab #10

- Register your iClicker!

HIV → AIDS
↳ virus ↳ loss of immune system

HIV-infected cells die after producing many viral particles

HIV only infects cells that have a protein CD4 on their surface → CD4+ cells

- Helper T-cells and macrophages
  → these cells are essential components

of your immune system

HIV is present in blood and some body fluids of infected people

without treatment
① immune system is disabled → AIDS
② uncontrolled replication of virus
③ death from opportunistic infections

pathogens that a normal immune system can fight off
- fungal pneumonia
- tuberculosis, and others...

HIV is dangerous because:
- it kills cells of immune system → host can not fight virus
- reverse transcriptase has a high error rate → introduces many mutations into HIV genome
  ∴ HIV is constantly changing → it is hard to become immune to HIV (hard to make vaccine)
- infectious for many years before death → widespread epidemic

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AIDS Treatments

① antibiotics for opportunistic infections
ex. rifampin
- inhibits RNA polymerase in bacteria
- has no effect on human RNA pol.
  human & bacterial RNA pol. are different
  → kills only bacteria
- has no effect on HIV

② anti-HIV drugs → target parts of HIV not found in normal human cells → kill virus, not the host

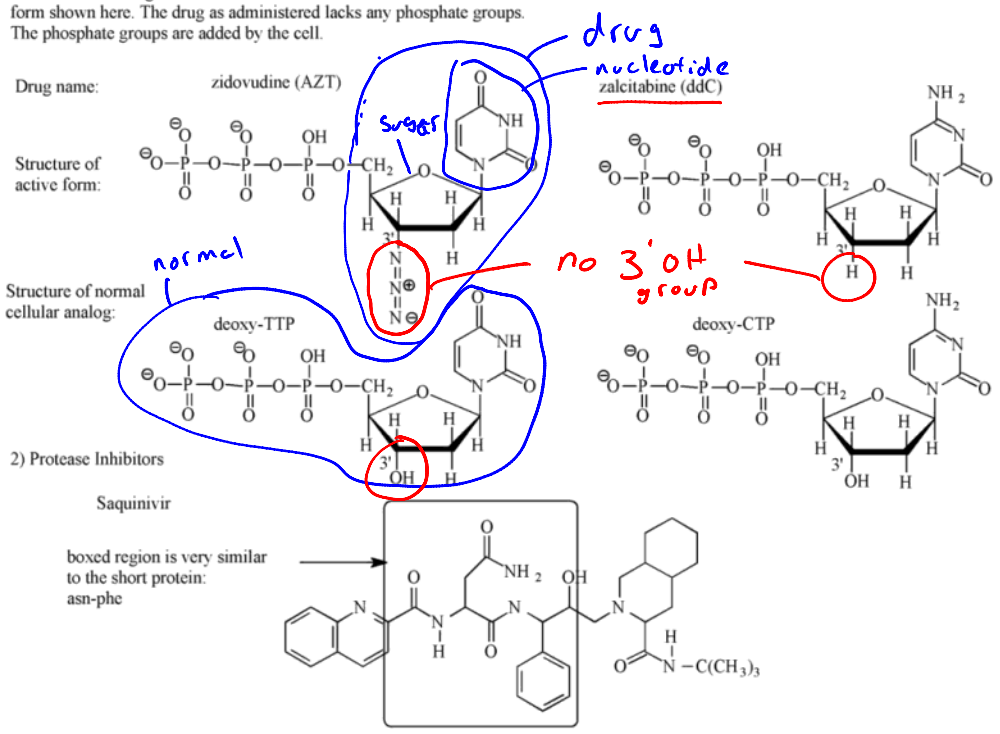
a) reverse transcriptase → makes a DNA copy of RNA genome

inhibit RTase with nucleoside analogs

Bio 111 Anti-HIV drugs

1) Nucleotide analogs

Note that these drugs are administered in a different form than the active form shown here. The drug as administered lacks any phosphate groups. The phosphate groups are added by the cell.



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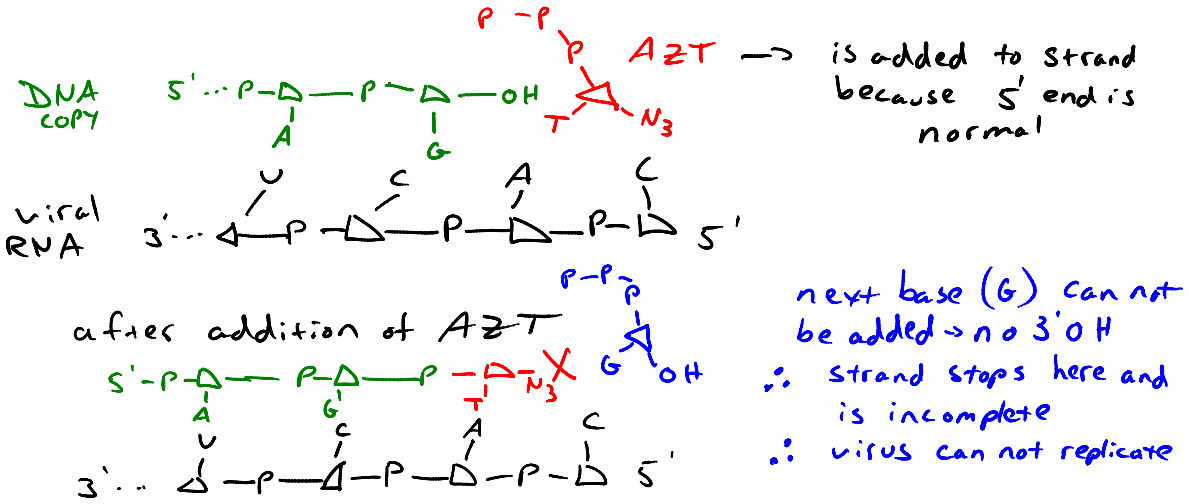
AZT inhibits reverse transcriptase by blocking polymerization once the nucleoside analog has been added to the strand



RTase uses AZT even though AZT has the wrong structure no (3'OH), because RTase is not "picky"

- in human DNA replication, DNA pol. is more "picky"

Sometimes HIV can mutate it's RTase to make it more "picky" → resistant to AZT

treat with a cocktail of many nucleoside analogs → hard to become resistant to all at once

b) HIV protease - processes HIV proteins into active forms (drug saquinavir)

drug binds to active site of HIV protease → inactivates it

→ viral proteins are not processed correctly → can not do their "job"