

Notes—HIV & AIDS

I. Vocabulary

- **CD4 T cell**—also called “helper T cells”; the primary target of HIV; normally they are “in charge” of the immune response; normally there are about 1000/ mm³ of blood
- **HIV-1b, HIV-1c**—The 2 main strains of HIV; North Americans are mainly 1b; in Thailand, it is mainly 1c
- **Kaposi’s sarcoma**—a type of skin cancer that affects HIV+ people
- **Long-term nonprogressor**—someone who has been HIV+ for over a decade and yet shows no signs whatsoever of AIDS
- **opportunistic infections**—a viral, bacterial, or cancerous illness that does not normally cause infections in people with healthy immune systems; (the T-cell count must drop below 200 /mm³)
- **receptor**—a molecule on the surface of a cell that serves as a recognition site for...
- **reverse transcriptase**—an enzyme produced by retroviruses that produces DNA from the viral RNA (reverse transcription)
- **SIV**—simian immunodeficiency virus—similar to HIV, but infects only monkeys
- **viral load**—the number of viruses in the blood
- Discovery began in San Francisco with drastic increase in cases of a rare type of pneumonia and bouts of herpes that were taking months rather than days to clear up

II. HIV Infection: Cellular Level

- 1—The virus (HIV) binds to a receptor (called CCR5 receptor) on the cell surface
- 2—The virus injects its RNA into the cell
- 3—The enzyme reverse transcriptase is used to make DNA from the viral RNA
- 4—The enzyme integrase is used to integrate the viral DNA into the cell’s DNA
- 5—The cell makes mRNA from this DNA (as usual)
- 6—The cell makes protein chains from this mRNA (as usual)
- 7—The enzyme protease breaks apart these protein chains into proteins that can be used by the virus

III. Treatments and Research

A. Misc. Info

- 12% of NIH’s total budget goes toward AIDS research
- HIV is fairly sensitive to many common viricidal solvents and to radiation
- The sooner after infection you start medication, the more effective the treatment is

B. Drugs

1. interferon
2. reverse transcriptase inhibitors (block step 3) – e.g. AZT
 - a-Part of the molecule looks like nucleotides, so it gets hooked onto replicating DNA, which can’t continue replication because the *rest* of the molecule doesn’t look like a nucleotide
 - b- If HIV+ pregnant woman takes AZT for the 2nd & 3rd trimesters AND baby takes it for the 1st 6 weeks of life, the rate of transmission drops to 6%
 - c-When given to recently-poked health care workers, it decreased infection rate (~morning -after pill)
3. **Interleukin-2 (IL-2)**
 - a protein made by white blood cells — increases T cell activity & production
 - the drug made by bacteria through recombinant DNA technology
4. **protease inhibitors** (block step 7)
 - used in triple drug therapy (a “cocktail”): 1 protease inhibitor + 2 reverse transcriptase inhibitors can drop the viral load to near-zero; costs \$10,000 per year

C. Vaccines

- Difficult because so few people survive
- Most current vaccines do not prevent infection, just the disease, whereas the HIV vaccine must be a sterilizing agent (it must prevent even the *first* cell from being *infected*)
- In SIV, the “nef” gene determines the rate at which the virus reproduces
- We tried infecting macaques with nef-deficient SIV
- A year later, they *could not be infected* with regular SIV

D. Future Research

1. Gene therapy—CCR5 receptor (more common in long-term nonprogressors)
2. Integrase blockers (step 4)—so far we have nothing that can be used to block this
3. transplants—WBC's or bone marrow
4. Possible infection via kissing?

Additional Notes

% of babies born HIV+ when moms are HIV⁺:

	Mom takes HIV drugs during pregnancy	No medication
vaginal delivery	7	19
elective caesarian	2	10

misc. China AIDS Facts (c.2004)

- 1 in 5: Chances that a resident has never heard of AIDS
- 100: Estimated number of doctors in China with experience treating HIV/AIDS