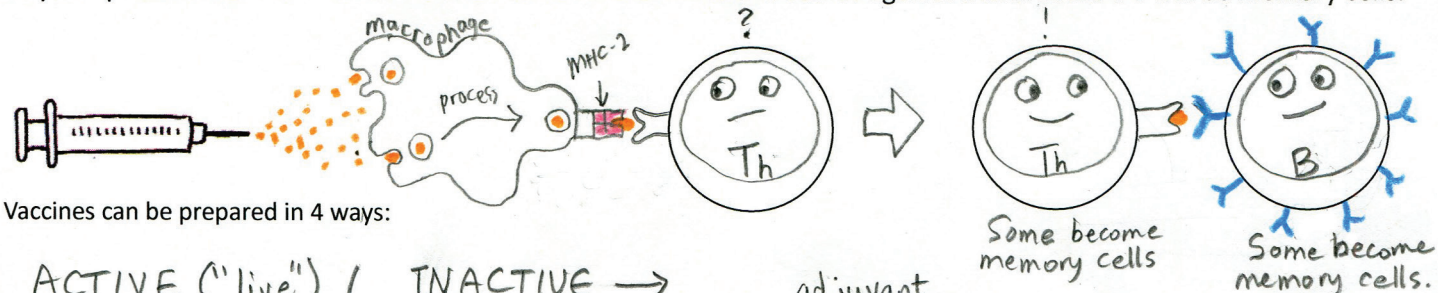
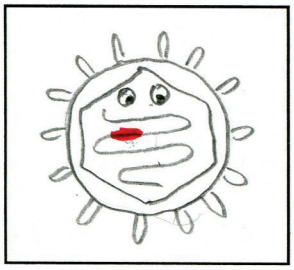
10: VACCINES and ANTI-VIRALS

VACCINE: The goal is to imitate an infection by giving the macrophages viral antigens (either parts or whole) so they can present them to T cells who then tell B cells to make antibodies against them. Some B's will be memory cells.



Vaccines can be prepared in 4 ways:

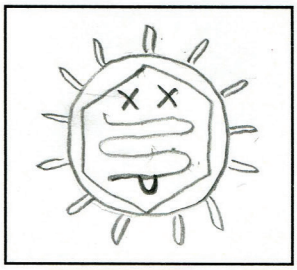
ACTIVE ("live") | INACTIVE →



1) Attenuated

The genome has mutated so the virus can't cause illness. Virus retains some ability to replicate.

EX: oral polio (Sabin), y.f., M, M, R, chickenpox



2) Whole virus

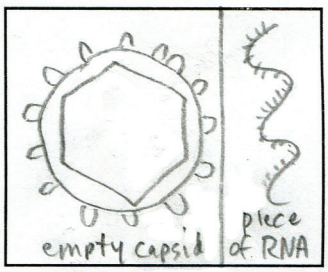
The virus has been treated with chemicals to "kill" it, but the T cells still recognize the proteins.

EX: injected polio (Salk), Hep A, rabies

3) Fractional

Only small parts of the virus are used, such as a piece of the spike, or one capsid protein.

EX: influenza, Hep B, papilloma (HPV)



4) Recombinant

Cloning techniques are used to make yeast cells produce either empty capsids, spikes, or strands of RNA.

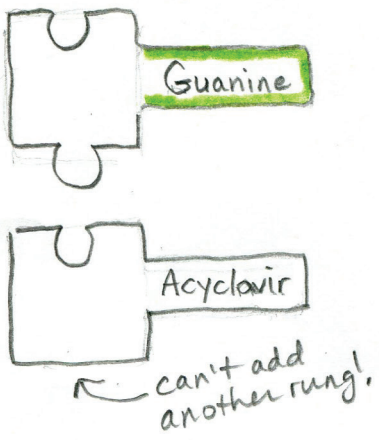
EX: influenza, Hep B, papilloma

ANTI-VIRALS: The goal is to block or break a viral structure without harming any host cells. This is tricky! Here are three of the most successful strategies so far (though resistance is already a problem).

Strategy #1: Nucleoside analogue (mimic)

These try to stop the replication of viral DNA or RNA by giving the virus a supply of fake rungs that do not have a sugar.

Ex: Acyclovir is a guanosine (G) mimic

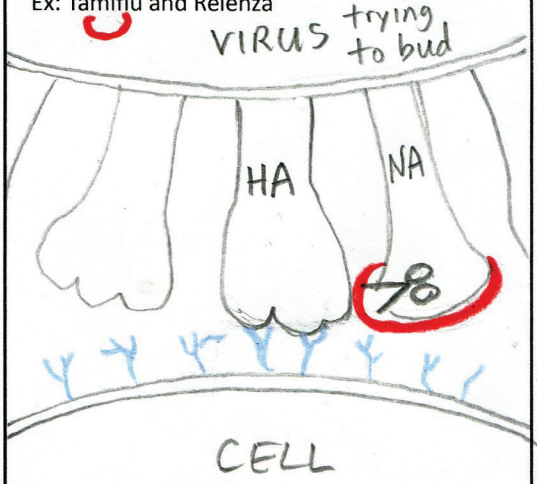


Other examples:
1) AZT (for HIV) mimics "T."
2) Remdesivir (for Ebola) mimics "A."

Strategy #2: Block action of NA (Influenza)

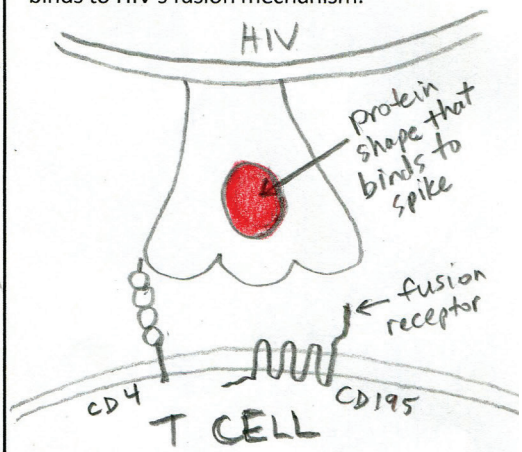
Block the snipping action of neuraminidase so influenza viruses can't bud out of cell.

Ex: Tamiflu and Relenza



Strategy #3: Stop fusion (HIV)

The HIV drug Fuzeon is a protein that binds to HIV's fusion mechanism.



Can't prevent attachment, but prevents fusion.

Strategy that used to work: Block Influenza's M2 ion channel

Influenza viruses are now resistant to Amantadine, so it is no longer used.