Immunity And Infection

Health and Wellness

Announcements

Learning Mod 4 due tonight!

Due next Monday

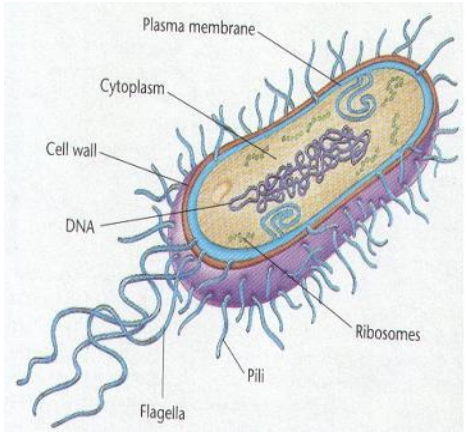
- Learning Module 5
  - Connect activities – do these first!!
  - Online Quiz - Elearning
- Campus Health Activity
  - Lecture Learning Module
  - Due in 1 calendar week of attending
  - Sign-in attendance sheet at workshop

http://wmich.edu/rec/dropgive20

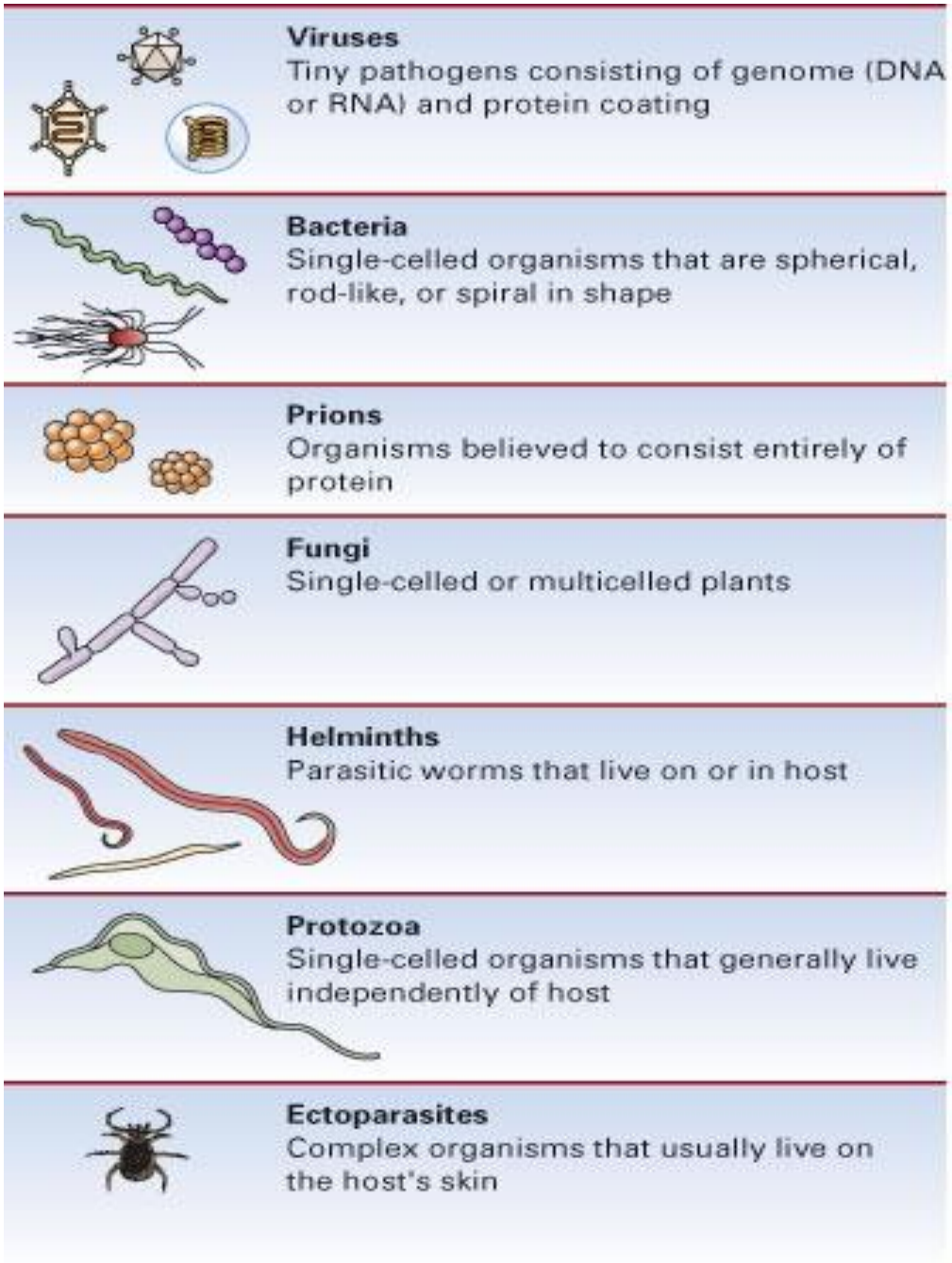
- Video
- What’s your biome?

Pathogen

- An organism that causes disease
  - bacteria, viruses, fungi, protozoa, parasitic worms, and prions



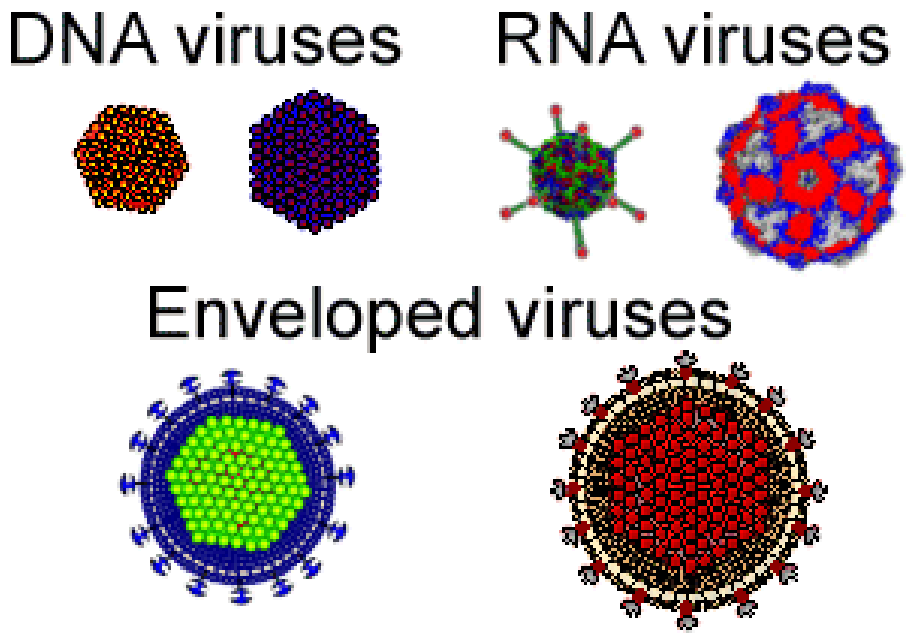
Types of Pathogens



Viruses

- Smallest pathogen
- Require host to reproduce
- Copy production

- Examples



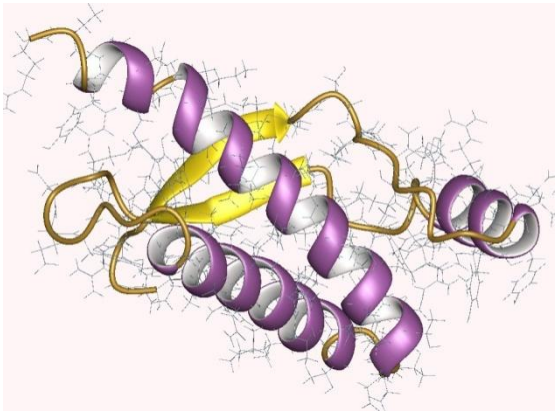
Bacteria

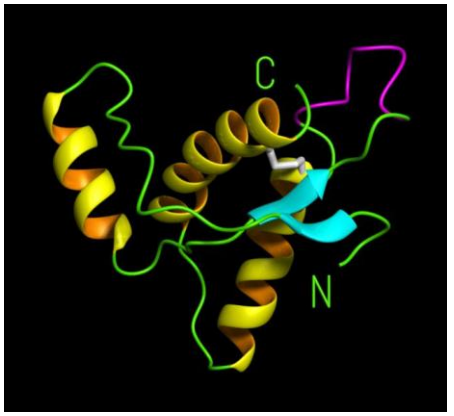
- Single-celled organism
- Shape
  - Rod
  - Spherical
  - Spiral

- May be normal flora
- Examples
  - E coli, Chlamydia

Prions

- Protein
- From proteinaceous infectious particle
- Spread by ingestion of infected brain or nerve tissue



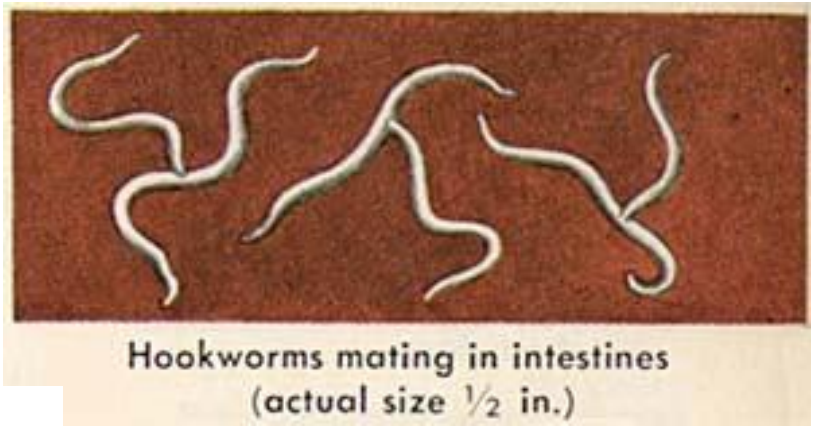


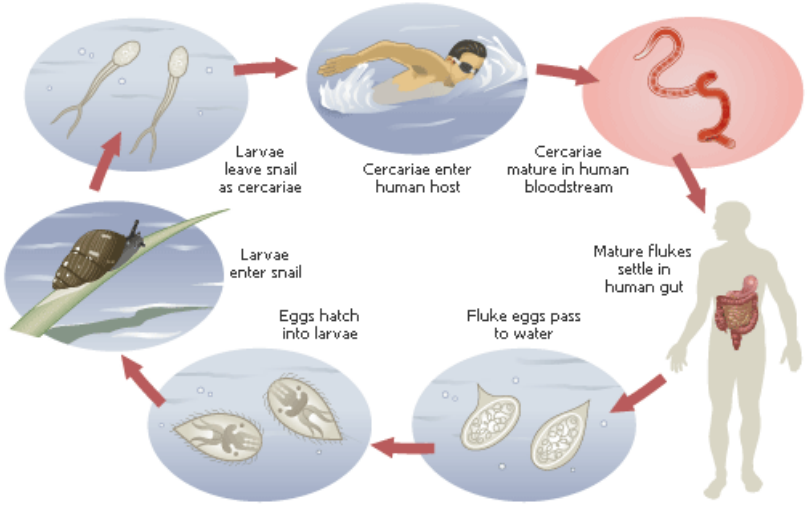
Fungi

- Single celled or multi-celled plant
- Yeast, mold
- Budding – mechanism of spread
- Rarely spread person to person
- Examples: tinea, dermatophytes, candida

Helminths – parasitic worms

- Roundworms
- Tapeworms
- Flukes





Contaminated Water

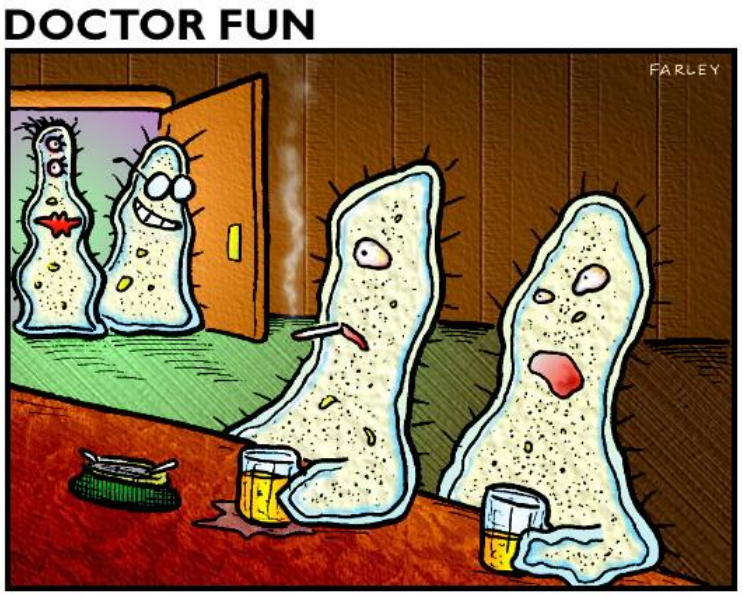
A leading cause of anemia

Contaminated food

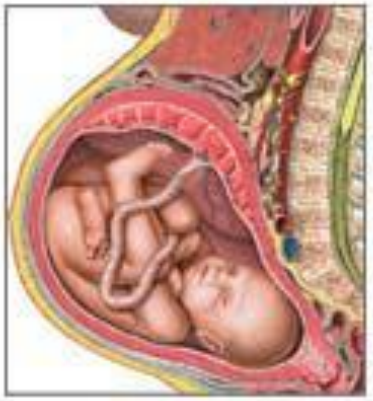
Uncooked meat

Protozoa

- Single-celled animals
- Live independently
- Transmission – water, feces, food, air, vector
  - Malaria, toxoplasmosis, giardiasis, dysentery



"Oh gawd - here comes Lenny with something he picked up off the toilet seat!"



A fetus may contract toxoplasmosis through the placental connection with its infected mother

The mother may be infected by:

Improper handling of cat litter

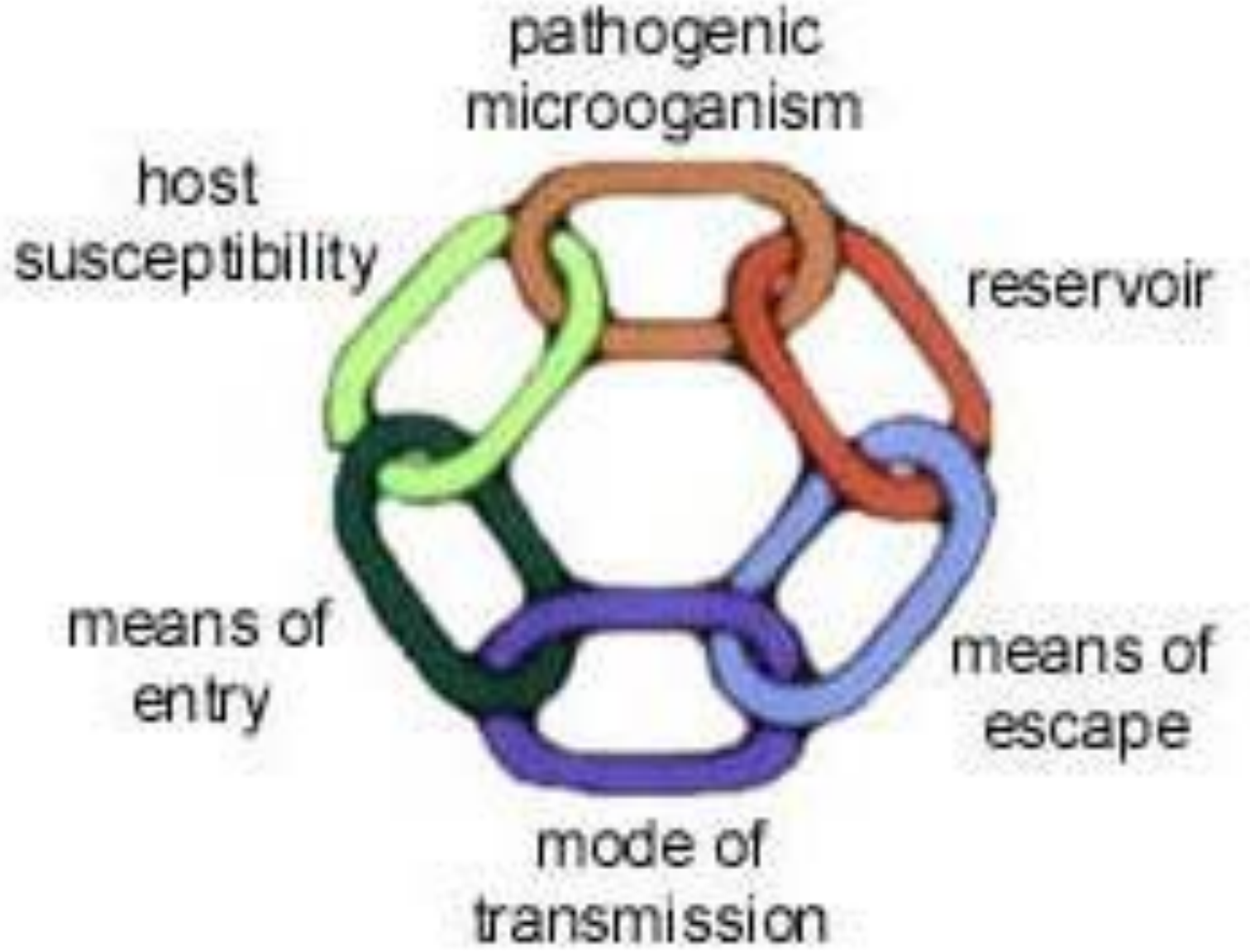
Handling or ingesting contaminated meat

A.D.A.M.

Foodborne, Animal-to-human, mother-to-child

Ectoparasites

- Complex organisms
- Live on host's skin
- Skin-to-skin contact with infected person


pathogenic
microoganism
host
susceptibility
reservoir
means of
entry
means of
escape
mode of
transmission

Reservoir

- The natural environment of the pathogen
  - **Person**
    - may not appear ill, but still be able to pass on (transmit) the pathogen
  - **Animal**
  - **Environmental component**
    - soil or water

Portal/Means of Exit

- Some way to ‘leave’
- If a human is the reservoir
  - Saliva
  - Mucous membranes
  - Blood
  - Feces
  - Nose or throat discharges
  - Open sores
  - Conjunctiva

Means of Transmission

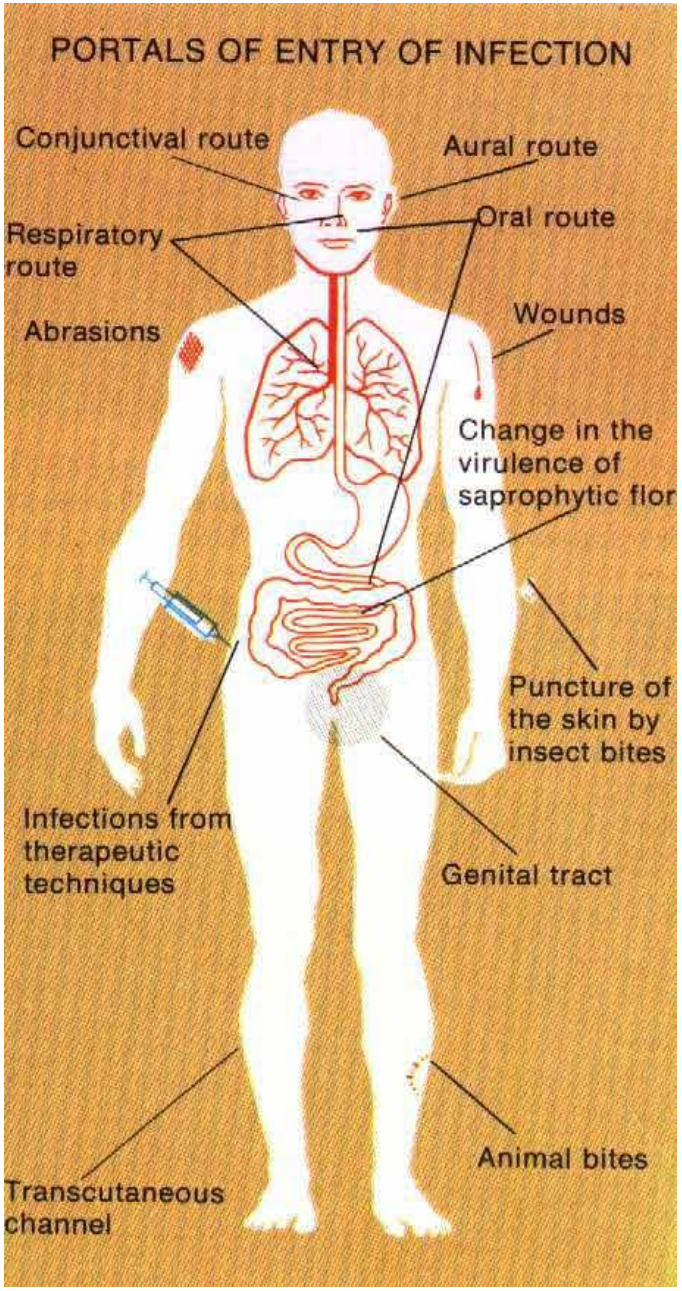
- Direct - without an intermediate component
  - Requires close proximity
    - coughing, sneezing, sexual contact, contact with blood
    - ingestion
  - Respiratory infections –
    - nose to hand and then shake hand
  - Intestinal infections - hand-to-hand contact

Indirect Transmission

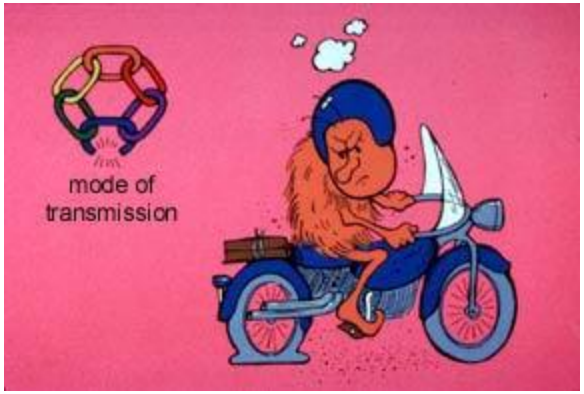
- Involves intermediate component or vector
  - Vectors: rodent, or other organism (ticks, mosquitoes, other animals)
  - Airborne droplets
  - Fomites
    - eating utensils, doorknobs, tissues, handkerchiefs

Portal/Means of Entry

- A way to get in
- One of three ways:
  - Penetration of the skin or direct contact
  - Inhalation
  - Ingestion
- Infections can be localized or systemic


PORTALS OF ENTRY OF INFECTION
Conjunctival route
Aural route
Oral route
Respiratory route
Abrasions
Wounds
Change in the virulence of saprophytic flor
Puncture of the skin by insect bites
Infections from therapeutic techniques
Genital tract
Animal bites
Transcutaneous channel

Breaking the Chain



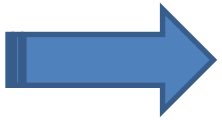
How Can You Break the Chain?

One sheet of paper, two people

1) Today's date and lecture hour

2) Print your names

3-7) List five steps you can take to stop the chain of infection

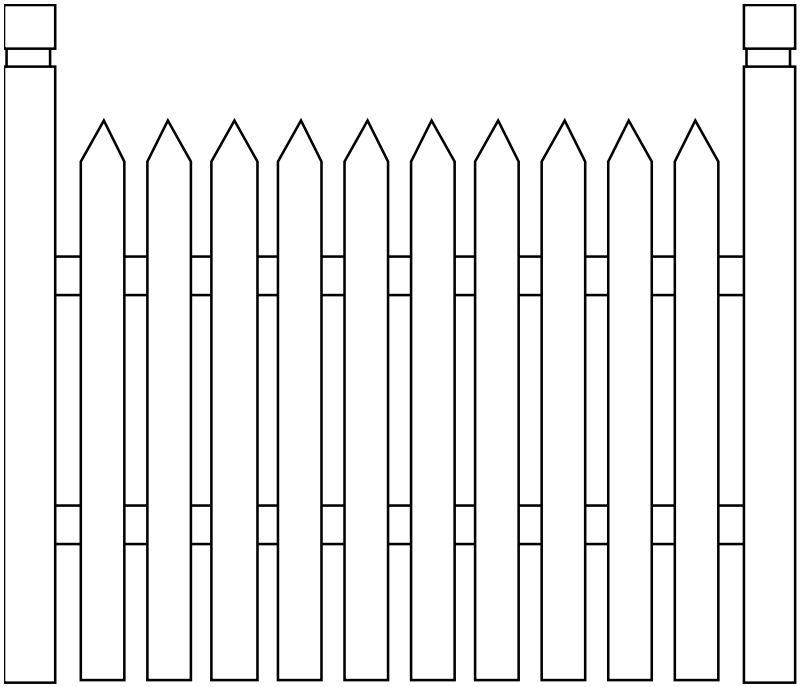


Global health

- http://www.cdc.gov/globalhealth/index.html
- http://www.who.int/diseasecontrol_emergencies/guidelines/CD_Disasters_26_06.pdf
- http://www.charitynavigator.org/index.cfm?bay=content.view&cpid=1659#.Uol7w_l2Gon

The Body's Defense Systems

- Physical and chemical barriers -→ First line of defense
- The immune system
  - Immunization
  - Allergic reactions

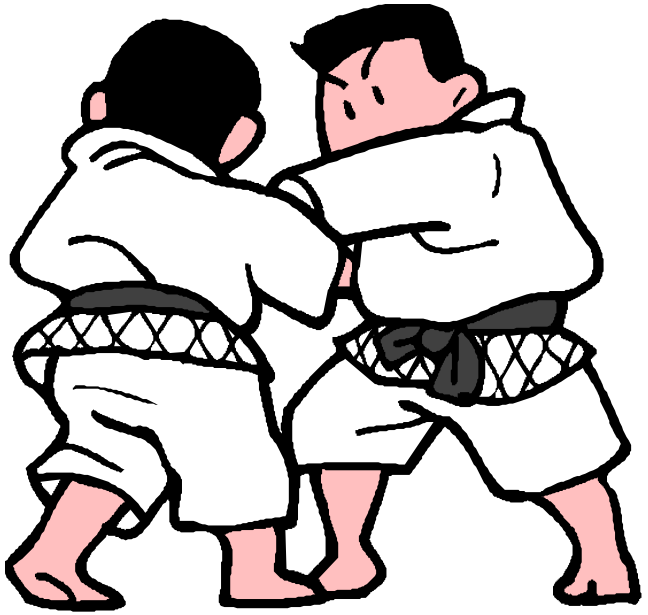


First line of Defense

- Skin
- Mucous membranes
- Hair in ears, nose
- Cilia
- Chemical Defenses
  - Saliva
  - Intestinal enzymes
  - pH
  - Excretion

The Immune System

- Immunological defenders
- The inflammatory response
- The immune response
- Immunity
- Symptoms and contagion



The Defenders – Inflammatory Response

Acute inflammatory response

5 cardinal signs of inflammation

- *Pain*
- *Redness*
- *Loss of function*
- *Warmth*
- *Swelling*

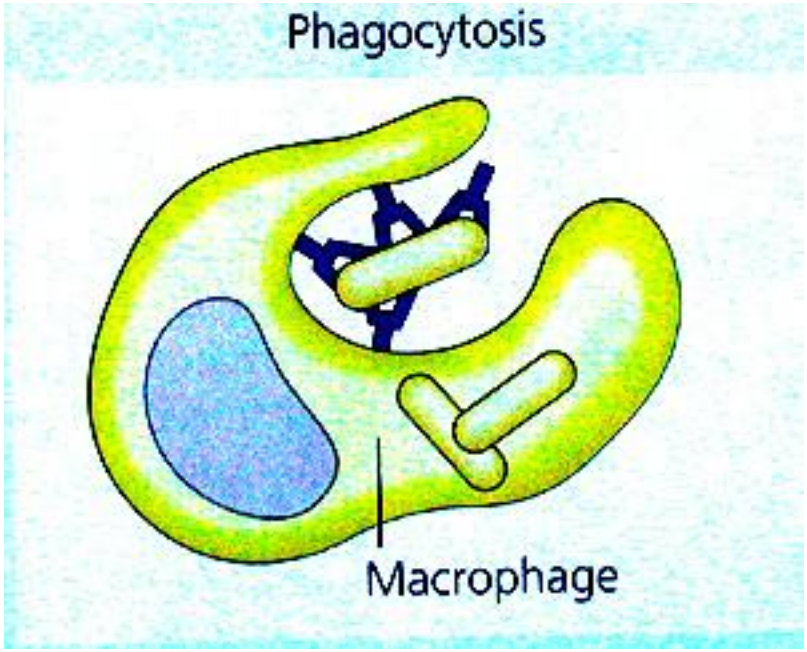
The Immune Response

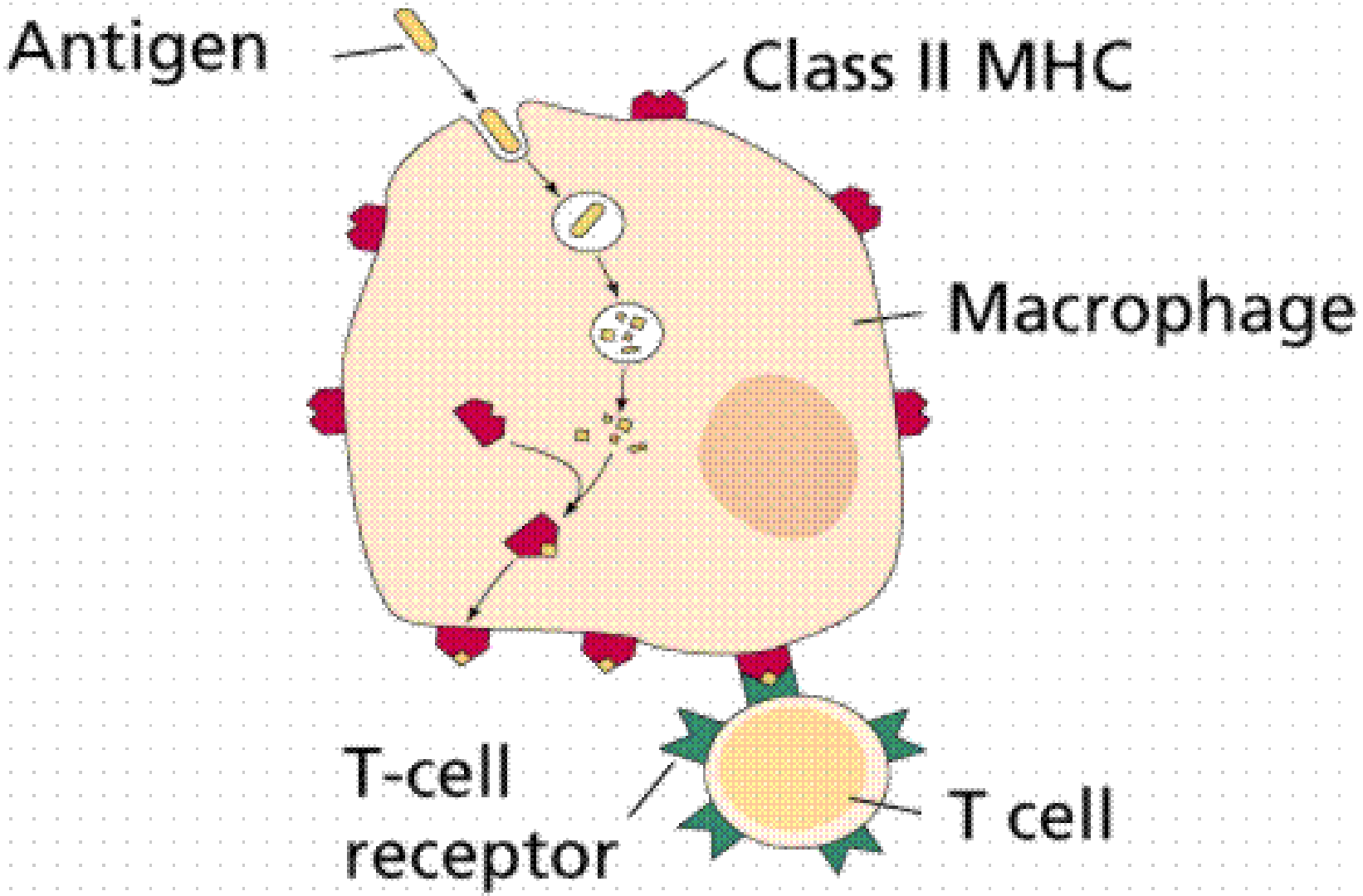
- Involves many substances
  - **Antigen**
    - Non self, cell marker
  - **Antibody**
    - Produced by B cells
  - Memory T and B Cells
    - Lymphocytes that quickly recognize specific antigen
  - Macrophage
  - Natural Killer cells
  - Helper T cells
    - Activates T cells
  - Killer T cells
    - Kills targeted cells and CA cells

The Immune Response

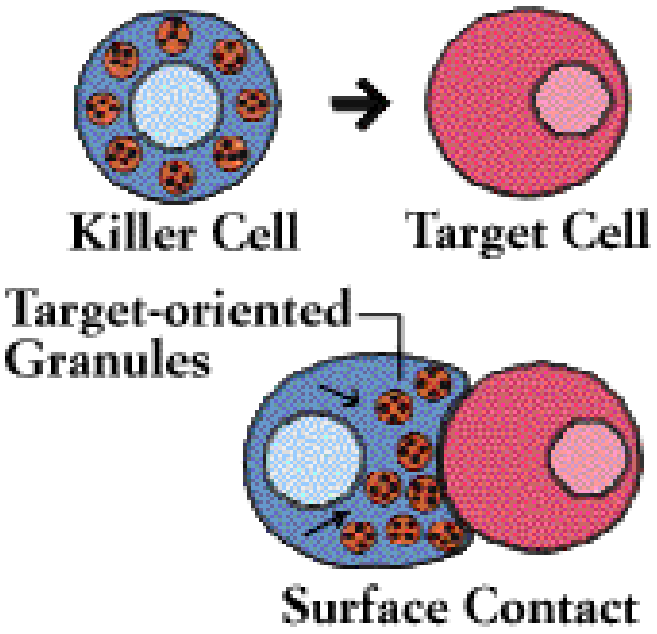
- Phase 1 –

Macrophages consume & **present** information to helper T cells




Antigen
Class II MHC
Macrophage
T-cell
receptor
T cell

Phase 2



- **Helper T cells multiply rapidly**
  → trigger production of killer T & B cells

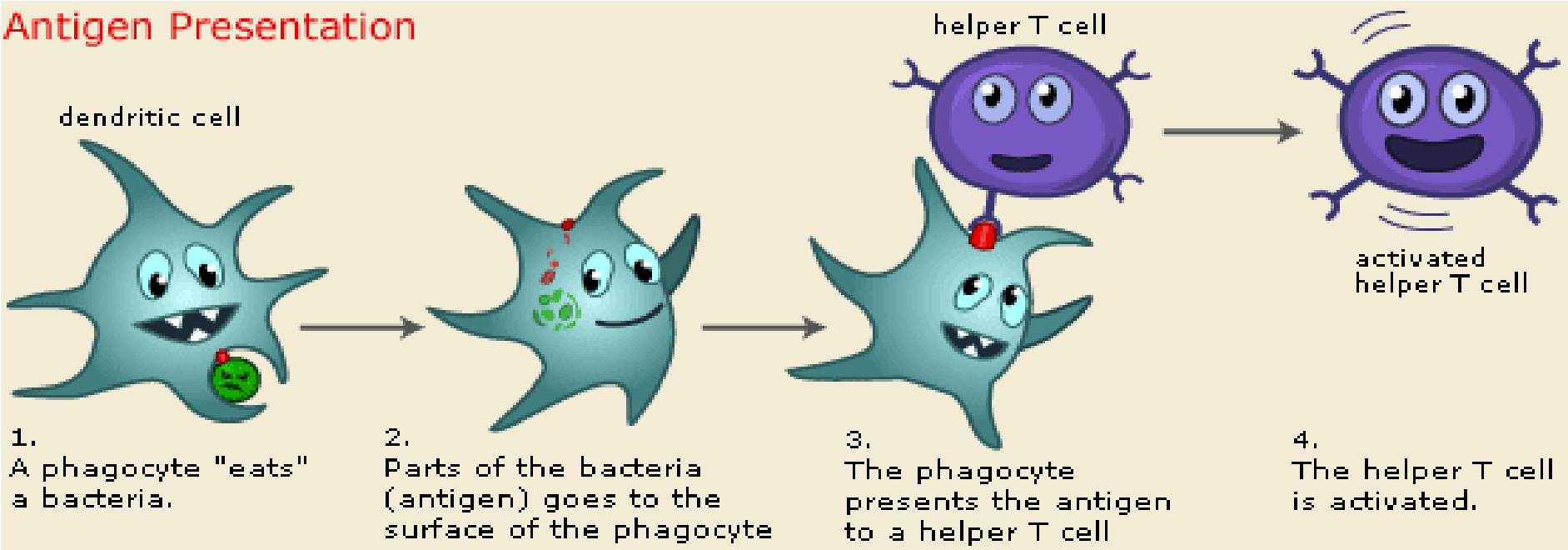
  - Cytokines **amplify** response
    - Interleukin, interferon

Phase 3- Cell & Antibody Mediated Response

- Killer T cells
  - destroy foreign and infected cells
    - (cell-mediated)
    - Amplify inflammatory response & clean up

- B cells
  - Stimulated by T-Helper
  - produce antibodies & mark for destruction
    - (antibody-mediated)
    - Bacteria, viruses, other substances outside of cells

Hello foreigner!! Let me introduce you to my friend the T-cell



Ps: a macrophage is a type of phagocyte

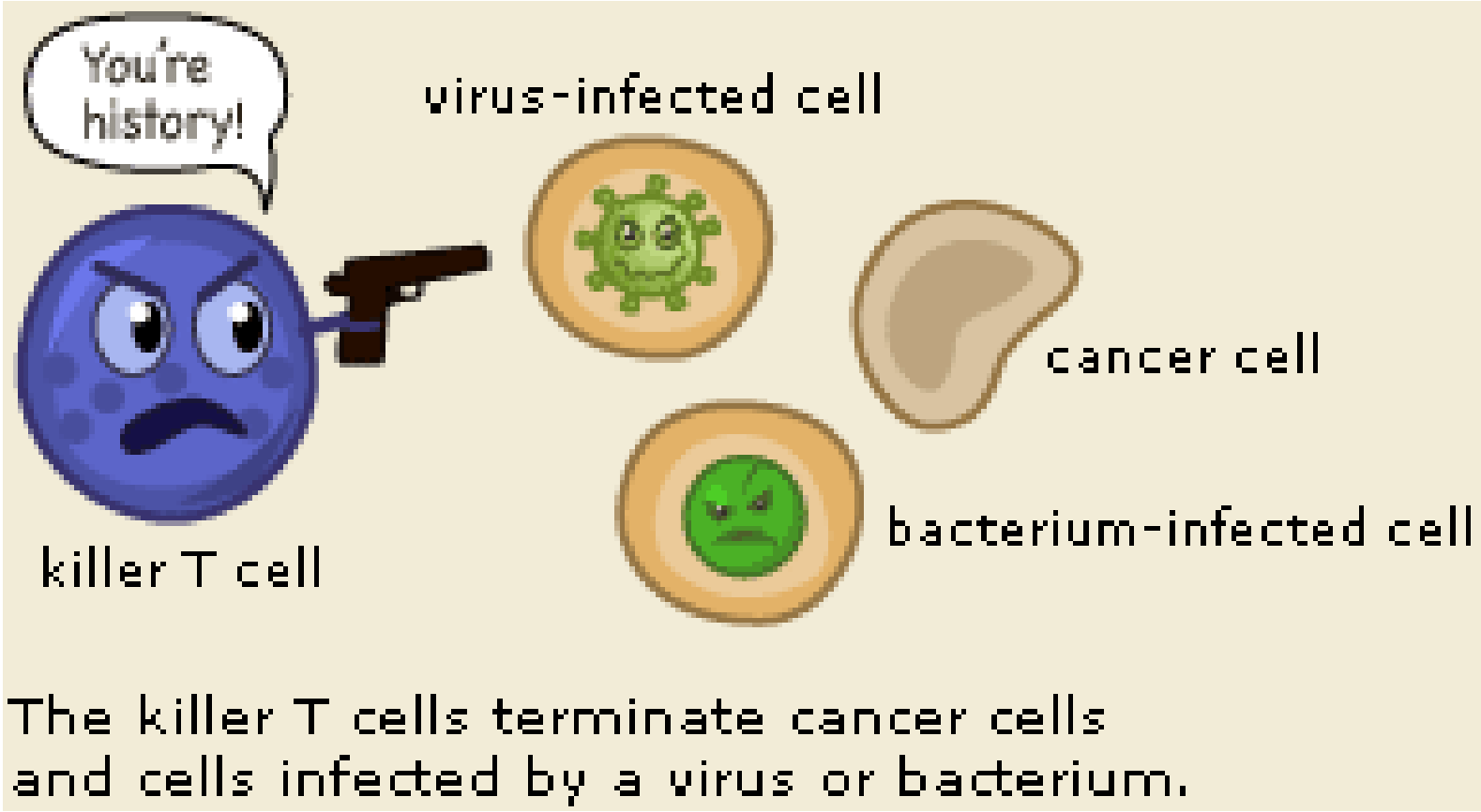
Three types of T cells

1. Helper T cell

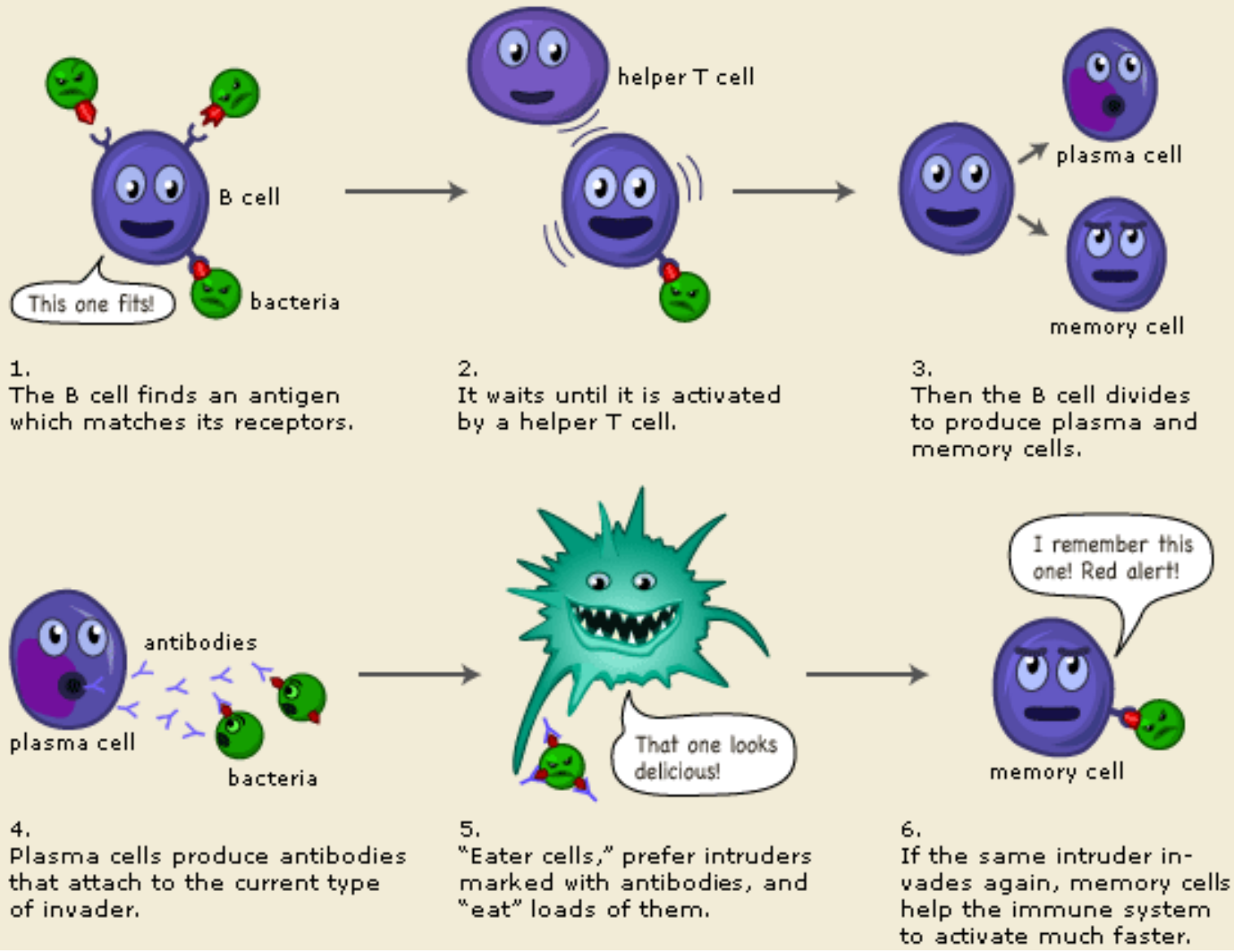
2. Cytotoxic T cell / Killer cell

3. Suppressor T cell

http://www.slideshare.net/mazz4/immune-system-ii-38000737

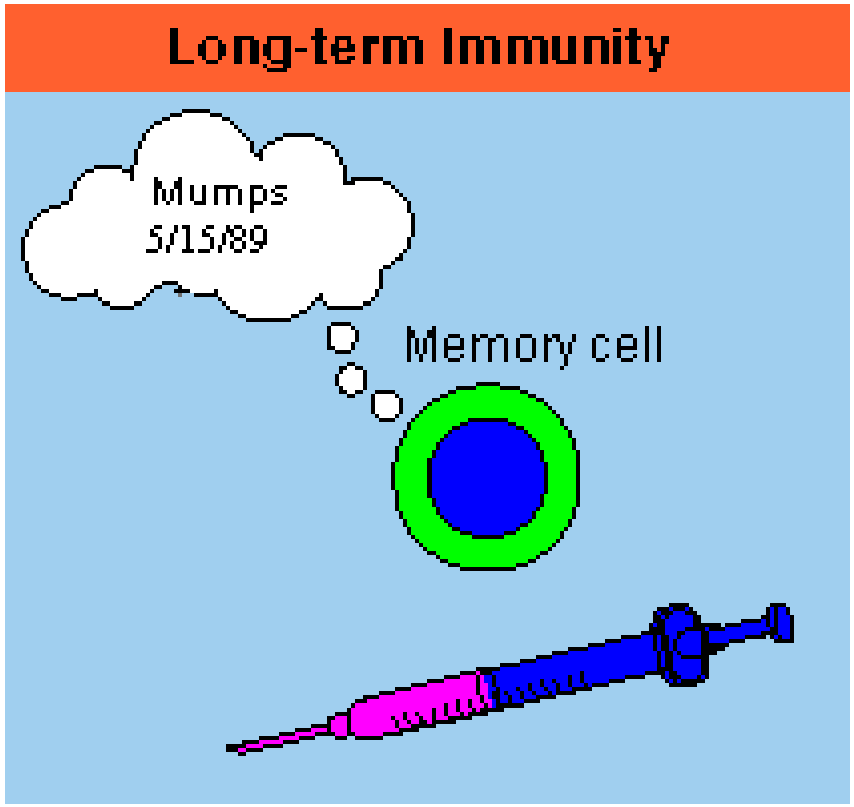


The killer T cells terminate cancer cells and cells infected by a virus or bacterium.

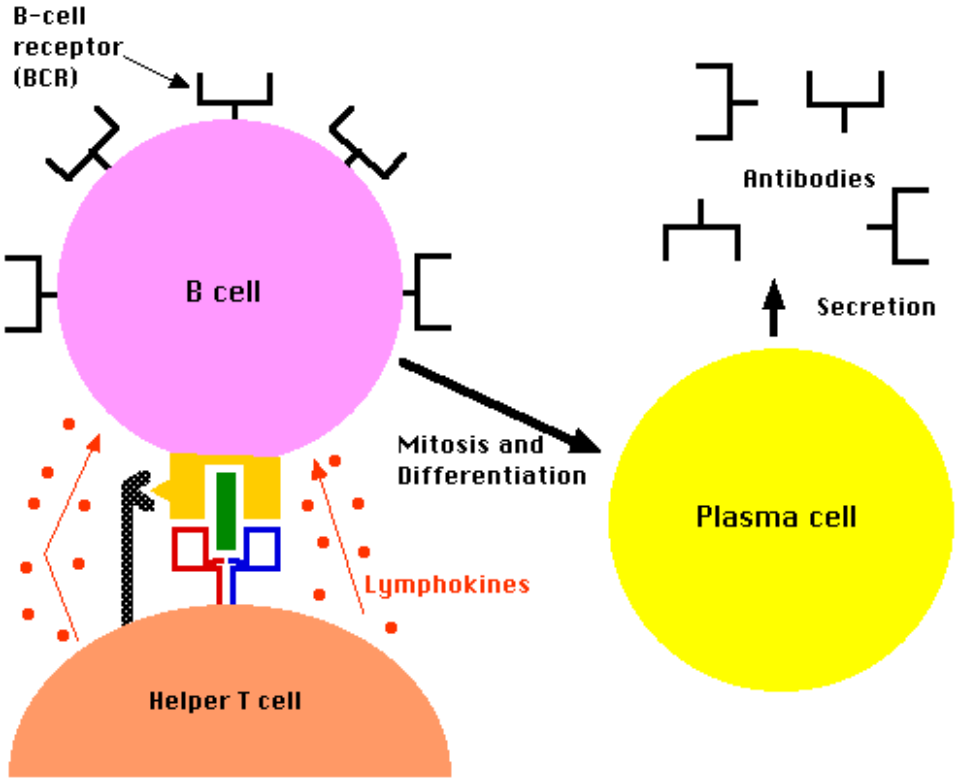


http://nobelprize.org/medicine/educational/immunity/immune-detail.html

Immune Memory



What does this look like?



Phase 4 - Under Control!

- Once the pathogen is under control, **suppressor T cells** stop immune response

Symptoms and Contagion
The Stages of Disease

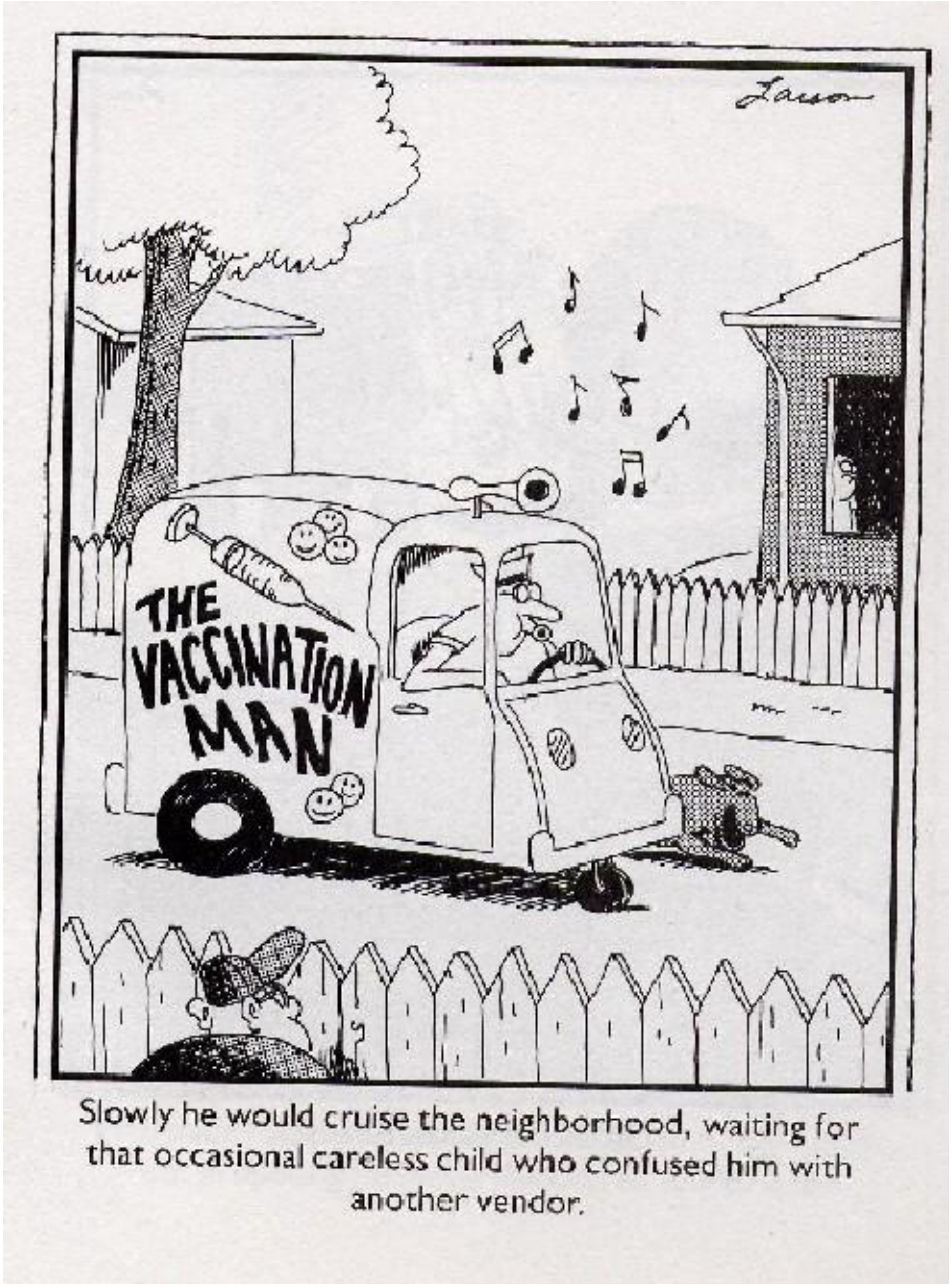
- Incubation
  - No symptoms, contagious, and watch it multiply!!!!
- Prodrome
  - Am I catching a cold??
- Clinical
  - I need sleep!!!
- Decline
  - Not contagious, but on the mend ☺
  - May relapse
- Convalescent
  - Recovered, but may be a carrier to others

Immunity via Immunization

- Vaccines
  - Attenuated or dead
- Active immunity
  - Produce own Ab
- Passive immunity
  - Injection of Ab
  - (from exposed/recovered person or animal)

Vaccination

- Grown in a lab (attenuated)
  - measles, mumps, and rubella
  - H1N1 nasal is live attenuated

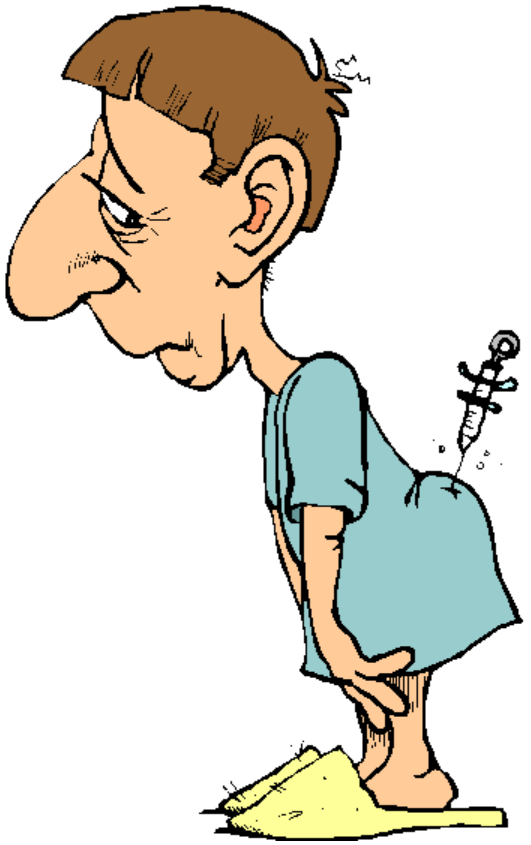


Active Immunity

- Vaccines of “killed” viruses

  produce own antibodies

  Vaccines of “killed” viruses
  are used against
  influenza “flu” viruses



Influenza Vaccine

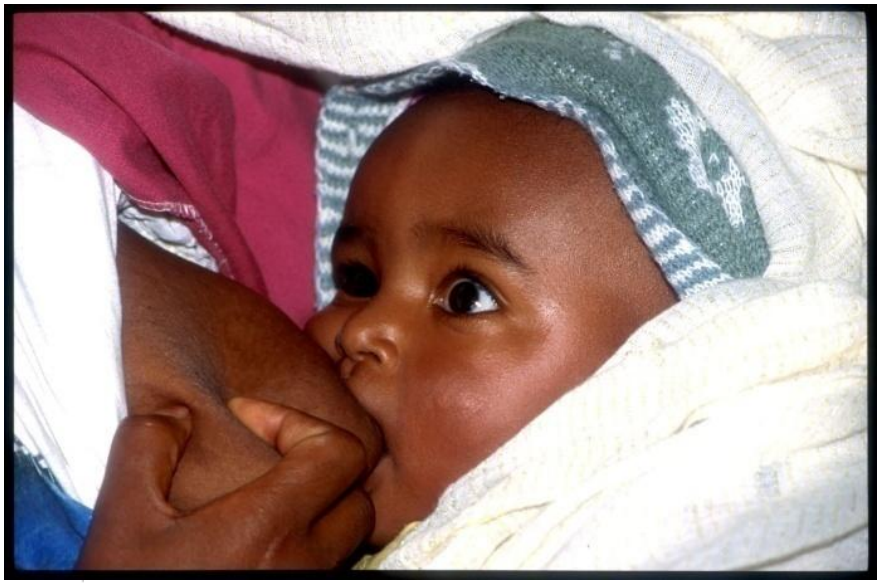
- Majority of vaccines are inactivated
- Produced in embryonic hen's eggs
- Change yearly due to antigen shift and drift
  - Point mutations

Flu Vaccine Candidates

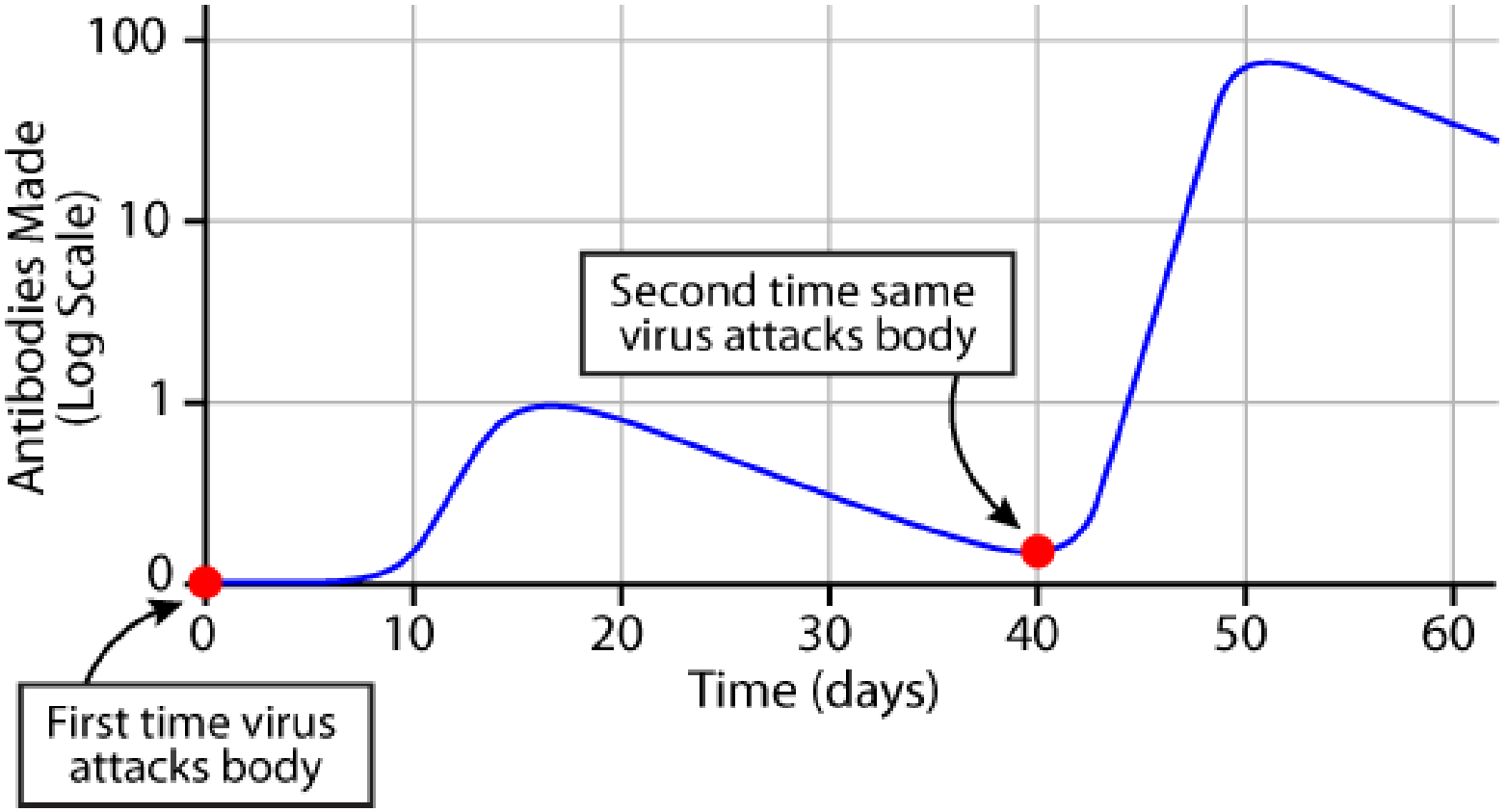
- > 50 yrs of age
- Residents and employees of nursing home or other chronic care facility
- Adults or children with chronic pulmonary or cardiovascular disease
- Individuals with metabolic disease, renal dysfunction, blood disorders, or immunosuppression disorders
- Women in 2nd or 3rd trimester during influenza season
- Heath Care workers
- Family members of high-risk groups

Passive Immunity

- Injected with the antibodies - produced by other humans or animals
  - Gamma globulin
  - Breast milk



www.doctorsecrets.com/ emergency/snake-bite.htm



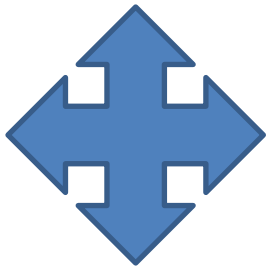
http://askabiologist.asu.edu/sites/default/files/resources/activities/body_depot/viral_attack/graph1.gif

A Fighting Chance

- Support Immune System
- Take public health measures
- Prepare food properly
- Live a healthy lifestyle
- with adequate nutrition, physical activity, and rest
- **WASH HANDS FREQUENTLY** while singing ‘happy birthday to you’ twice

A Fighting Chance:

- Be aware when people are most vulnerable
  - Newborns
  - Older adults
  - Times of high stress
- Manage your stress



#8) Participation:
What is your muddiest point???