Viruses and Viral Diseases

Impact on human health has been great--Influenza pandemic of 1918 killed more people than WW I (500,000 Americans in 10 months)
What is a virus?

- Infectious, but non-cellular disease agent
  - no nucleus,
  - no cytoplasm,
  - no organelles,
  - no metabolism
- Obligate intracellular parasites
  - (Chlamydia and Rickettsia have nuclei & cytoplasm)
- Cells= DNA & RNA
  - viruses have one or the other
Viral Components

- Nucleic acid core
- Protein coat
  - capsid
  - capsomeres
  - nucleocapsid
- Virion
- Envelope
  - naked
  - budding
- Bacteriophages
  - viruses of bacteria

“...bad news wrapped in a protein”
Host Range and Specificity

- Infect all living things
- Tissue & host specific
  - cell receptors
  - varied specificity
    - HPV
    - CMV
- Primary replication
- Secondary replication
- Viral spread in body
  - cell to cell
  - Proviruses & latency
  - transplacental

Poliomyelitis
Classification of Viruses

- Type of nucleic acid
  - RNA viruses
    - ssRNA, ds RNA
    - Retroviruses
  - DNA viruses
    - ssDNA, dsDNA
Viral Replication

- Generally 5 stages:
  - Adsorption
    - receptor attachment
  - Penetration
    - endocytosis, fusion
  - Synthesis
    - control of cell functions
  - Maturation
    - assembly of new virions
  - Release
    - cell lysis
    - budding
  - Kills or alters cells
    - transformation

Viruses budding from cell
Pathogenesis of Viral Infections

- **Nature of host**
  - age, in utero, etc

- **Mode of entry**
  - mucus membranes
  - *why not skin?*
  - Respiratory, GI, sexual
  - Arbovirus injection
  - Transplacental

- **No toxins**
  - cell death & alterations
  - teratogens
  - transformations
    - 6 known cancer viruses

*Burkitt's Lymphoma*
Responses to Viral Infections

- **Host responses:**
  - Interferons
    - promotes immunity
- **Viral responses**
  - syncytial bridges
  - neural transmission
  - latency
  - proviruses
Some Important RNA Viruses

- **Picornaviruses**
  - enteroviruses
  - hepatoviruses
  - rhinoviruses
- **Togaviruses**
  - encephalitides
  - rubella
- **Flaviviruses**
  - yellow fever
  - Hepatitis C
- **Retroviruses**
  - transforming (HTLVs)
  - cytopathic (HIV)
- **Paramyxoviruses**
  - mumps, measles, viral pneumonia
- **Rhabdoviruses**
  - rabies
- **Orthomyxoviruses**
  - Influenza A & B
- **Filovirus**
  - Ebola & Marburg
- **Bunyaviruses**
  - Hantavirus
- **Reoviruses**
  - rotaviruses
Some Important DNA Viruses

- Adenoviruses
  - 80 different types
- Herpes viruses
  - proviruses
  - varicella/zoster, etc.
- Poxviruses
  - small pox, et al.
- Papovaviruses
  - polyoma, papilloma
- Hepadnaviruses
  - Hepatitis B

Mumps, a viral disease