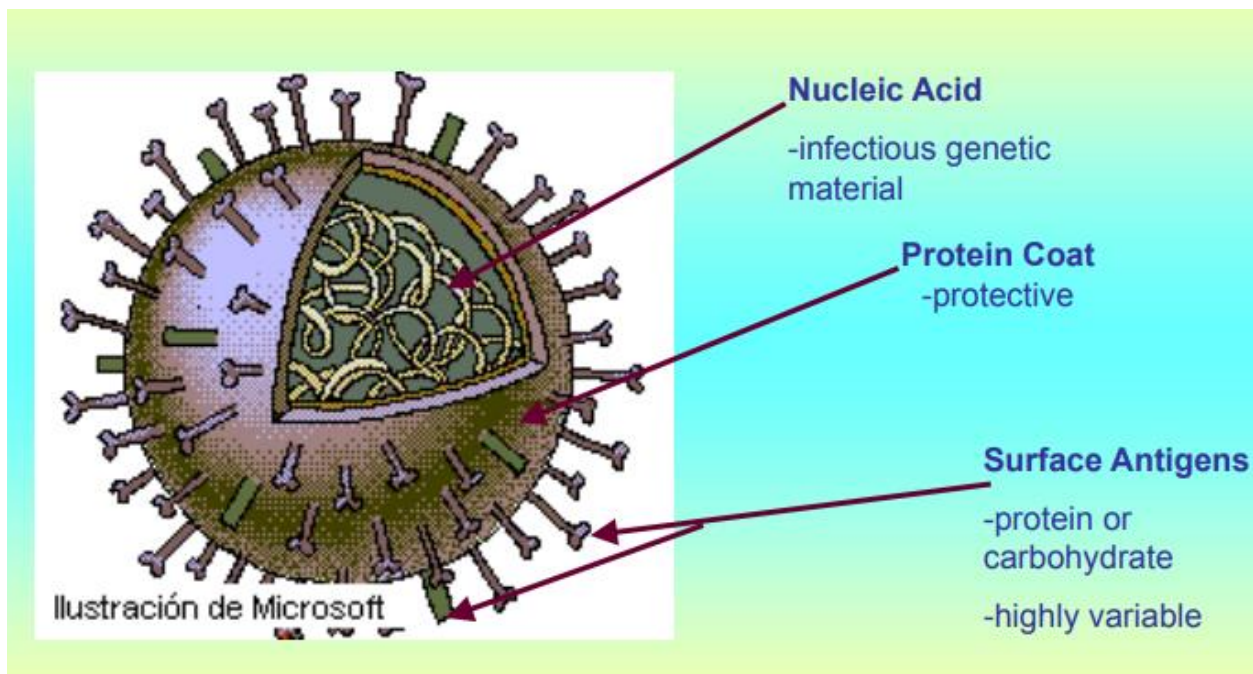


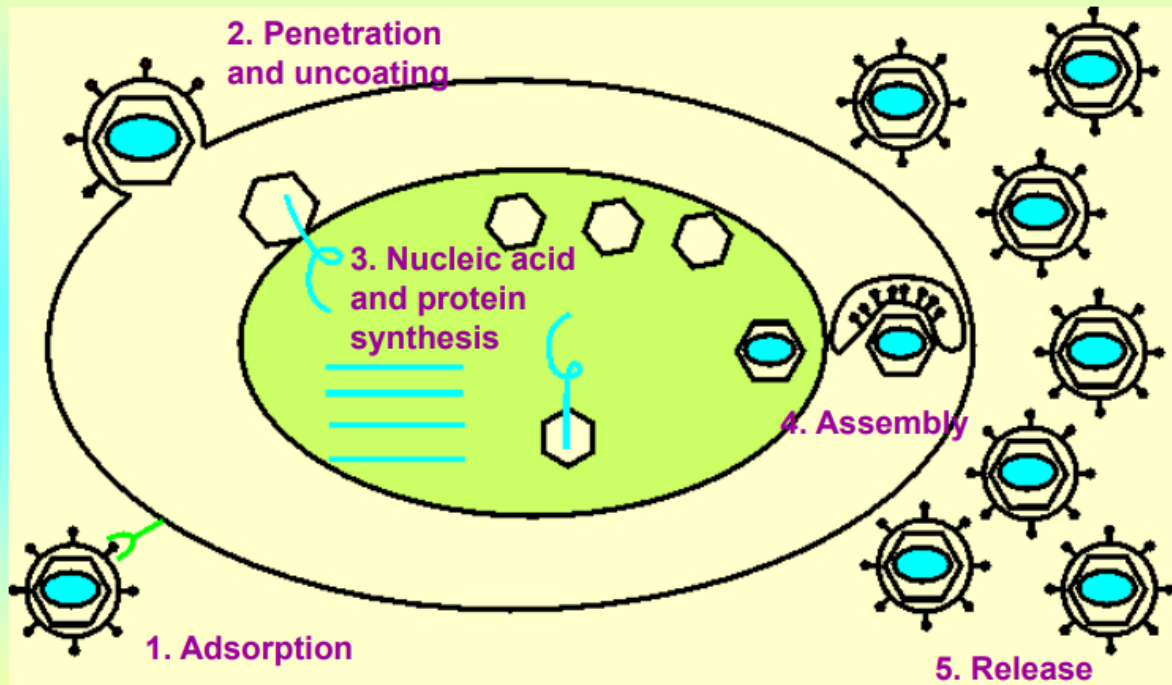
General Characteristics:

- Require LIVING cells for growth and replication (cell cultures, embryonated eggs, living animals and plants)
- Have DNA or RNA NOT BOTH!! And therefore rely on other living things so they can live
- Multiply by separate synthesis of nucleic acid and protein, combine to form virus particles
- Size: 10nm-300nm and need electron microscopes

What are viruses made of?



REPLICATION



**know steps

1. Receptor indicated the virus can enter the cell
2. Happens quickly after step 1
3. This is the longest step

Only way to culture viruses is with tissue cultures

How do we detect viral infections?

- Detect the virus itself!
- Detect the immune response...Antibodies against the virus

Viral diagnosis:

a. Detection in clinical specimens (visually)

- Visualization by electron microscopy
- Cell culture
 - cytopathic effects (when a virus kills a bunch of cells you can see the dead cells)

- hemagglutination (agglutination of red blood cells)
- immunofluorescence
- b. Detection of patients immune response (specific immunity)
 - Antibody detection, presence or absence (ELISA)
 - Immunity test
 - Rise in antibody titre of high antibody titre
 - Diagnostic test

Respiratory viruses:

Different families:

- Influenza viruses
- Parainfluenza viruses
- Respiratory syncytial viruses
- Rhinoviruses
- Adenoviruses
- Echoviruses, coxsackie viruses, herpes viruses (occasional respiratory tract infection) ignore these-they're no the main ones

Most infectious and most contagious

Influenza:

- Influenza virus type A: major epidemics*
- Influenza virus type B: milder diseases
- Produce haemagglutinin (diagnostic)
- Frequent recombination =higher antigenic variability=pandemics
- RNA
- **FLU**

Clinical:

- Fever, respiratory problems
- Infants and elderly more susceptible

Diagnosis:

- Throat washing, naso-pharyngeal aspirate inoculated in cell culture

Serum:

- Paired sera (acute and convalescent stage)
- Not necessary, we usually rely on symptoms for diagnosis

Prevention:

- Annual vaccination especially for high risk groups
- This is why there are many different strains

Disease severity:

- Greater disease burden in <25yrs that >65yrs
- Certain groups have risk of complications
- Pregnant women, asthma, diabetes

What does the virus look like?

- Has been named "swine flu"
- 8 genome segments

H1N1 (2009) vaccine

- Pandemic flu
- Vaccination to prevent

Adjuvanted vs Unadjuvanted vaccine: ****don't worry too much about this****

Why adjuvant?

- To reduce the amount of vaccine protein per dose

Why new adjuvant?

- Existing adjuvants have never worked well for flu shots

Why controversial?

- Little data on adjuvant in children, pregnant women
- New adjuvant had not been used in other vaccines

Parainfluenza viruses:

- Infants and young children
- Respiratory infection that could have serious complications
- **Croup** (barking cough, high pitch sound on inhalation)
- Bronchiolitis, bronchopneumonia
- No vaccine because there's not too many outbreaks

Respiratory syncytial virus (RSV)

- Major respiratory pathogen for children <2yrs
- Pneumonia and bronchiolitis; occasionally fatal

- Epidemics
- No vaccine; might be outdated now
- Antiviral: Ribavizine

Rhinovirus:

- Common **colds**
- >100 serotypes; no cross immunity
- Repeated infections
- Similar to influenza
- Easily mutates

Adenovirus:

- Pharyngitis and conjunctivitis; pneumonia in young children
- Children most commonly infected
- Asymptomatic infection common
- Vaccines used in military

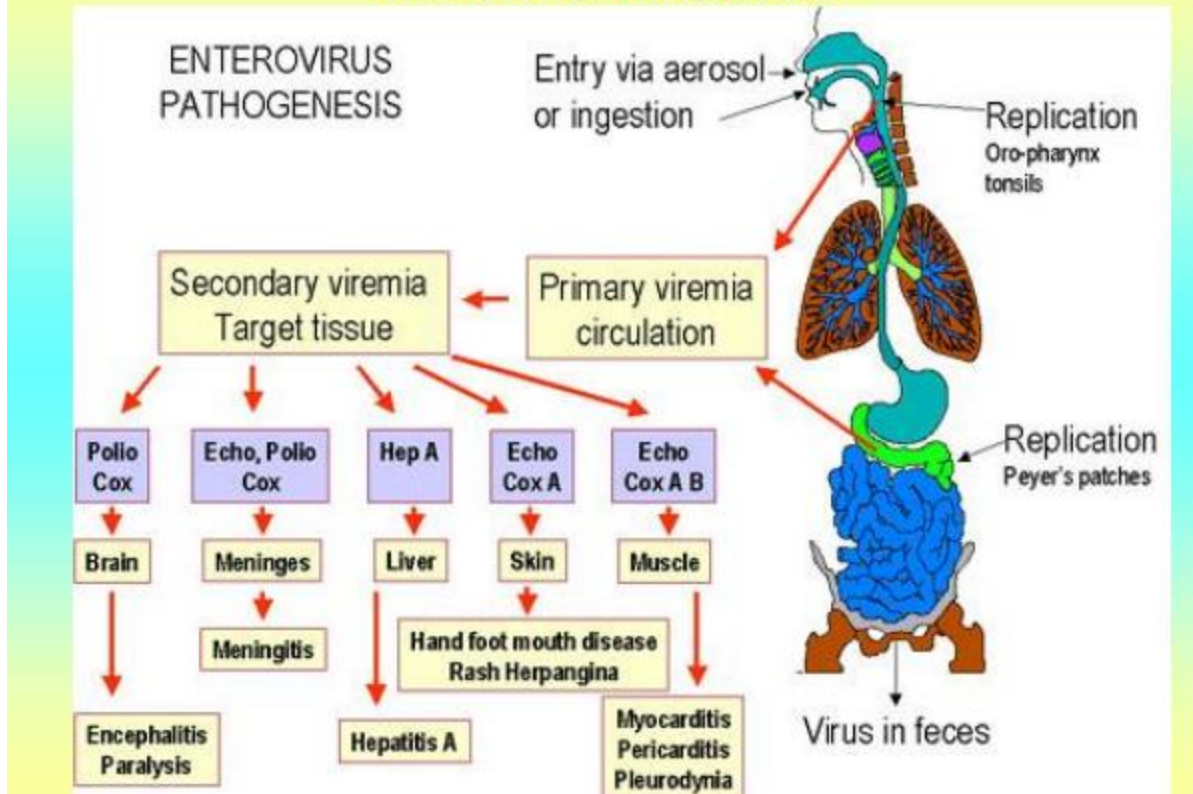
Enteric Viruses (enteroviruses)

Enterovirus = enteric virus

Infect intestinal/lymphoid cells

- Poliovirus, coxsackievirus, echovirus
- Multiply in GI tract, but rarely causes gastroenteritis
- Infection spread via respiratory tract or GI tract
- 95% inapparent symptoms
- 4-5% minor symptoms
- 1% serious illness
- Peyer's patches is where they're most commonly found

Enteroviruses



Poliovirus:

- Humans are the only natural host
- Types 1,2,3
- Causes poliomyelitis
 - Invades nervous system can cause total paralysis in a few hours
- Global Polio Eradication Initiative

Diagnosis: isolation from stool, CSF, and pericardial fluid

Carriers without symptoms can still spread!!

- Lives in Peyer's patches but doesn't infect the gut, it infects in the blood

Vaccination:

Salk vaccine:

- Killed/inactivated vaccine
- No live virus

- IgA meaning is doesn't produce immunity in the GI tract but the person will still be a carrier

Sabin vaccine:

- Live vaccine (attenuated)
- Kills virus in the gut and person will not be a carrier anymore
- Oral administration
- Dangerous because it's a live vaccine, don't give this to someone who is immunocompromised

Coxsackieviruses:

- Group a and b
- Multiply in the gut but cause diseases elsewhere
- Diagnosis by stool and paired sera
- NO vaccine

Echovirus:

- Several types
- Minor resp. illness
- Aseptic meningitis
- No vaccine

Viruses of Diarrhea:

Rotavirus:

- Epidemics in infants (6months-2 years) mainly in winter
- Replication in small intestines
- Acute gastroenteritis--> vomiting, diarrhea, fever
- Highly infectious!!!
- Children in daycare

Diagnosis:

- Stool sample

Epidemiology:

- Short incubation (2-3 days)

- Faecal-oral routes
- Daycare centers
- Fomite (carrier)

Prevention:

- Rapid diagnosis and isolation of patient
- Proper handwashing
- To vaccinate or not to vaccinate?
 - None has been found because its acute diarrhea

Norovirus:

- Outbreaks in gastroenteritis in older children and adults

Diagnosis:

- Exclude bacteria and differentiate from bacterial gastroenteritis

Epidemiology:

- VERY contagious; survives well on objects
 - Faecal oral route; food borne illnesses

Prevention:

- No vaccine, handwashing and isolation of infected individuals

Adeno virus (also a respiratory virus):

- Some types cause gastroenteritis in children
- Diagnosis by electron microscope
- The major symptom is ALWAYS respiratory!!!!!!

Calici- and Astro- viruses:

- Sporadic gastroenteritis in children
- Electron microscopy
- Faecal-oral route of transmission
- Not a true diarrheal virus!!

Viruses causing rashes:

Common epidemiology features of viruses causing rashes

- Highly contagious

- Humans are the only reservoir-you can only catch it from another human
- They can be airborne and inhaled

Measles:

- One of the highest infectivity rates

Clinical: rash appears behind ears, forehead and nostrils then whole body

- Lifelong immunity after natural infection

Complications:

- Encephalitis (rare)
- Exacerbation of TB and leukemia (rare)

Diagnosis:

- Serological

Prevention

- MMR vaccine (measles mumps and rubella)

Rubella:

- Very dangerous for non immune pregnant women--->birth defects
- Largest danger in first trimester
- Birth defects including:
 - Cataracts
 - Deafness
 - Heart defects
 - Low birth weight
 - Cleft palate
 - Mental deficiency

Clinical:

- Similar to measles but milder, lifelong immunity

Epidemiology and immunity:

- Most cases are in those 15 yrs and older
- No vaccine to pregnant women! It's a live attenuated vaccine

Prevention of congenital rubella:

- Boosters
- Serology screening
- Isolation of rubella cases

Varicella (chicken Pox):

- Childhood febrile illness with characteristic polk-a-dot rash
- Highly contagious
- Long incubation period
- **Herpes zoster:**
 - Shingles
 - Limited rash along nerve endings
 - Prevention: no vaccine, meds only helps pain
 - Not all chicken pox viruses were killed off they were hiding in the nerve endings

Herpes Simplex Virus:

- Wide spread
- Become latent after initial infection; lesions reappear periodically
- High percentage of inapparent infections
- Epidemiology:
 - HSV1: cold sores oral and ocular regions, transmitted via oral and respiratory secretions
 - HSV2: herpes genitalis associated with genital tract; infected females can transmit to newborn
- Clinical forms:
 - Genital infections; in both sexes
 - Herpetic encephalitis; RARE see CNS virus
 - Neonatal Herpes: acquired during birth from asymptomatic mother; difficult to prevent; can result in death or severe sequelae
 - Herpetic Whitlow: affects fingers, occupational hazard or health care workers; nosocomial infections in neonates
 - Corneal and Conjunctival Infection: can cause ulceration of cornea and blindness
- Treatment and Prevention:
 - Antivirals
 - C-Section for symptomatic mothers
 - Vaccines coming soon

Papilloma Virus:

- Causes different types of warts
 - Common on hands and feet
 - Genital warts: sexual transmission, asymptomatic carriers
 - Some associated with cancer: cervix, vulva, penis
- Diagnosis:
 - Immuno-techniques and DNA hybridization techniques; no cell cultures available
- Prevention:
 - Vaccine (Gardasil)
- Highly contagious
- Liquid nitrogen freezes the skin that the wart/virus is living so then the virus has no where to live and cant replicate