MUMPS VIRUS
Mumps is a paramyxovirus and only one antigenic type is known. Transmission is via contact with aerosol droplet and the initial site of replication is in the respiratory tract. Following initial replication, the virus is spread to target tissues such as the salivary glands. Infectious virus is also excreted in the urine and transient, subclinical impairment of renal function is common in mumps infections. Generally, the host immune response resolves the infection within 14 days and life-long protective neutralizing antibody is generated.

A live, attenuated virus vaccine was introduced in 1968 and has been very effective (95% of recipients seroconvert from a single dose, immunity >10 years, probably life-long).

Complications of mumps infection, now rare since the introduction of the vaccine, include: meningitis (in approximately 10% of infected patients), encephalitis, pancreatitis, orchitis and oophoritis (although the inflammation generally resolves and subsequent sterility is quite rare).
Mumps virus can be isolated from the saliva, pharynx and urine and grown in tissue culture cells (producing diagnostic syncytial giant cells). Rapid diagnosis can also be made by direct detection of viral antigen in pharyngeal cells or urine sediment by direct immunofluorescence with anti-mumps virus antibodies. Enzyme immunoassays (EIA) can also be performed to detect patient IgM and IgG responses.

A study from NEJM (Barskey et al., 2012 NEJM 367:1704) found that high rates of two-dose vaccine coverage reduced the severity of mumps disease and reduced transmission in typical settings. In addition, they showed that intense exposure to an infected person (talking face-to-face for 6-8 hrs) may facilitate transmission and overcome vaccine-induced protection in some individuals. This study provides further support for the effectiveness of vaccination and provides an explanation for why some vaccinated individuals acquired infection with reduced symptoms.

MEASLES VIRUS

PATHOGENESIS
Measles virus is extremely infectious, especially 2-3 days before the rash appears. The virus is transmitted by aerosol (sneezing, coughing), with an incubation period of 10-14 days. Virus replicates in the respiratory epithelium, followed by spread through the blood (viremia) to distal sites. There is an inflammatory response to the virus antigens in the skin with edema and mononuclear infiltrate: exanthematous rash. Patients can also exhibit giant cell pneumonia. Measles infection is a major cause of death in malnourished children. Recent studies show that the majority of patient’s diagnosed with measles virus in the U.S.A. were actually infected in another country (i.e. children adopted from other countries, children of migrant workers, etc.)
VACCINE

Live, attenuated virus vaccine is available. The vaccine is very effective and is usually given around 15 months of age. Vaccine is usually given as MMR combination (mumps, measles, rubella vaccine).

You can also google for “Measles in the 21st Century” to get the article.

![Interactive Time Line on Measles](image)

SSPE: SUBACUTE SCLEROSING PANENCEPHALITIS

Rare. Produces scarring and demyelination of many areas of the brain, causing mental deterioration. Occurs mostly in children (5-14 years old) following natural measles infection and a long "incubation" period (months to years). Measles infection in very young children (less than 1 year old) increases risk of SSPE

Mutant measles virus can be isolated from the CNS years after initial measles infection. SSPE measles virus is selected within an individual and the mutant virus is not transmitted. Many of the SSPE virus isolates synthesize no M protein and therefore, little or no infectious virus is produced. SSPE patients usually produce antibodies to all measles proteins except M.

RUBELLA VIRUS

PATHOGENESIS

Rubella was considered a mild, benign childhood illness (frequently termed "German measles"), however, the major concern in a rubella epidemic is infection of pregnant women. The virus is transmitted to the fetus by viremia and the fetal infection becomes chronic. This results in congenital rubella syndrome (CRS) which is characterized by numerous malformations.

Rubella virus is classified as a togavirus (positive strand RNA virus with an envelope). There is only one serotype. The virus is transmitted via aerosol and is highly contagious. Initial infection occurs in
the upper respiratory tract and spreads by viremia. A mild skin rash is usually seen 15-20 days after infection and generally resolves with few complications (transient arthralgia is most common).

VACCINE

The introduction of the live, attenuated virus vaccine (the "R" in the MMR) has been very effective in reducing the incidence of rubella and CRS (Figure 5).

![Graph showing the reduction in rubella and CRS cases](image)

SEROLOGIC TESTING FOR IMMUNITY TO RUBELLA VIRUS

Because of the high risk for fetal damage if a pregnant woman is infected with rubella virus, it is important to determine the immune status of women who are pregnant or are contemplating pregnancy. The presence of antibodies above the technical threshold (1:10 in the hemagglutination inhibition test) indicate a very high probability of immunity.
**Parvovirus B19**

Parvoviruses are small (25 nm), single-strand DNA viruses with a protein capsid. This virus is spread by the respiratory route and can result in either a variety of clinical presentations:

1) Mild, flu-like illness
2) Erythema infectiosum (fifth disease) with classic “slapped check” appearance
3) Aplastic crisis in persons with chronic anemia
4) Arthropathy (polyarthritis; symptoms in many joints)
5) Risk of fetal loss as a result of B19 virus crossing the placenta, causing anemia-related disease but not congenital abnormalities

**Mechanisms of disease of B19 parvovirus**

- The virus spreads by respiratory and oral secretions.
- The virus infects mitotically active erythroid precursor cells in bone marrow and establishes lytic infection.
- The virus establishes a large viremia and can cross the placenta.
- Antibody is important for resolution and prophylaxis.
- Virus causes a bi-phasic disease: first, the viremia and flu-like symptoms and then the phase related to the immune response with complexes of antibody and virions that do not fix complement, which can result in the erythematous maculopapular rash, arthralgia and arthritis.
- Depletion of erythroid precursor cells and destabilization of erythrocytes initiates aplastic crisis in persons with chronic anemia.

There are no antiviral therapies or vaccines for human parvoviruses.
STUDY QUESTIONS

1. Why has it been so difficult to eradicate measles in the U.S.?

2. What are the potential consequences of infection with either rubella virus or parvovirus B19 on a pregnant woman?

EXAMPLE OF TEST QUESTION

Which viral infection is associated with SSPE?

A. Mumps virus.
B. Measles Virus.
C. Rubella Virus.
D. Human metapneumovirus.
E. Enterovirus.

CORRECT ANSWER TO ABOVE QUESTION: B