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RNA non envelope viruses

Reo or Rota viruses of **Reoviridae** are most important human pathogens in this family because causing gastroenteritis in high risk peoples (children 6 month - 2 years old)

DS-RNA genome segmented (11 segment)

Surrounding by double layered icosohedral capsid without envelope

Virion contain RNA-dependant RNA polymerase which in required because human cells don’t have such enzyme that synthesized mRNA from ds-RNA templet.

There are seven *species* of rotavirus, referred to as A, B, C, D, E, F, and G. Rotavirus A, which is responsible for more than 90% of rotaviral infections in humans, is further subdivided into strains called *serotypes*. All seven species cause disease in animals.

There is a diagram showing the structure of rotavirus and its components, including the DS-RNA genome, capsid, and hemagglutinin activity.
Transmission and epidemiology of Rota v.

- Feco-oral route for transmission
  - Usually occur in 6 years old children (high risk peoples is children 6 month 2-years old)

The majority of children have antibodies to at least one serotype

Pathogenicity and immunity

- The virus Replicate in mucosal cells of small intestine
  - Damaging the transport mechanism
    - Consequently
      - Loss of
        - Diarrhea
        - Salt
        - Glucose
        - H₂O

Diarrhea is non-Bloody

No inflammation
Virulence of certain Rota viruses in mice has been associated with proteins encoded by specific genome segments. One genome responsible for tissue tropism whereas other one controls the inhibition of cellular RNA of protein synthesis. It's likely that intestinal IgA directed against specific serotypes which protect against reinfection with its serotype and the colostrum's IgA protect newborns for up to age of 6 months.

**Immunity in unclear**

Gastroenteritis is most risky in young children.

**Clinical finding**

- Watery non bloody Diarrhea
- Nausea
- Vomiting

**Rotaviral enteritis**, is the leading severe diarrhoeal disease of infants and young children, affecting nearly every child at least once by the age of five. It is caused by rotavirus, a genus of double-stranded RNA virus in the taxonomic family Reoviridae. Rotavirus infects cells that line the small intestine, and produces an enterotoxin. The toxin causes gastroenteritis with severe diarrhoea and potentially fatal dehydration. There are seven species of rotavirus, referred to as A, B, C, D, E, F, and G. Rotavirus A, which is responsible for more than 90% of rotaviral infections in humans, is further subdivided into strains called serotypes. Although rotavirus was discovered in 1973, and is now known to account for up to 50% of infants and children hospitalised with severe diarrhoea, the importance of rotavirus is not widely recognised within the public health community, particularly in developing countries. Rotaviral enteritis is spread by the fecal–oral route; large numbers of rotavirus are excreted by infected people. With each infection, immunity develops and subsequent infections are less severe. Public health campaigns to reduce morbidity and mortality from rotaviral enteritis focus on the benefits of oral rehydration therapy and vaccination. There are seven species of rotavirus, referred to as A, B, C, D, E, F, and G. Humans are primarily infected by species A, B and C, most commonly by species A. All seven species cause disease in animals.
Detection of virus in stool by using

Original demonstration of Rota v. in stool by using immune-electronic microscope in which antibody aggregated the virions

Serum
Rise Ab titre

Tissue culture

No antiviral chemotherapy & Oral rehydration therapy may use

Best sanitation

Treatment and Prevention

Now vaccine is available

In 2006, a new, monovalent vaccine called RotaRix was licensed in a number of countries (the US not included. Soon after that, RotaTeq, a human-bovine reassortant, pentavalent, live attenuated, oral vaccine, was approved for use in the United States. RotaShield, the original vaccine for rotavirus, was a tetravalent reassortant rhesus rotavirus vaccine
Virus attaches to the B-adrenergic receptor.

Entry to the cell → v. RNA dependent RNA polymerase → Synthesis of mRNA within the cytoplasm from each of the 10 or 11 segment, i.e., 10-11 mRNA are synthesized.

Translated into corresponding 12 structural and nonstructural protein by RNA polymerase.

Reo viruses Replicative cycle (Rota viruses)

Virus release from cytoplasm by cell lysis.

Capsid protein forms around (-) strand.

(+)-strand of the progeny genome segments are synthesized.

Synthesis of strand RNA.
**Diagnosis**
- Rapid diagnosis
  - Antigen detection in stool by ELISA

**Biological properties**
- 80-60 nm
- Icosahedral
- Naked
- Capsid: Possess two concentric capsid shells, icosahedral
- Core: Possess a double-stranded segmented RNA genome

**Pathogenesis**
- Rotavirus
  - one of the most common causes of infantile diarrhea worldwide.
  - High risk people:
    - children 6 months - 2 years old
  - Route of transmission: fecal-oral route

**Pathogenesis**
- Viral shape and size
- Route of Transmission
- Season of Disease
- Clinical feature
- Rotavirus
  - Spherical, 60-80 nm
  - dsRNA
  - Fecal-oral
  - Late autumn, winter
  - Infantile diarrhea
- Enteric Adenovirus
  - Spherical, 70-90 nm
  - dsDNA
  - Fecal-oral
  - Whole year
  - Infantile diarrhea
- SRSV
  - Spherical, 27 nm
  - +ssRNA
  - Fecal-oral, respiratory tract
  - Winter
  - Any age
- Classic calicivirus
  - Spherical, 31-38 nm
  - +ssRNA
  - Fecal-oral
  - Whole year
  - Infantile watery diarrhea
- Astrovirus
  - Spherical, 28-30 nm
  - +ssRNA
  - Fecal-oral
  - Winter
  - Infantile (<5Y) diarrhea

**Treatment**
- Supportive - rehydration (oral/intravenous)
  - Antiviral agents not known to be effective
- Prevention of spread
  - Handwashing with good technique
  - Disinfection of surfaces, toilets, toys
- Vaccine
  - Rotashield was first licensed for use in infants in 1998

**Pathogenesis**
- Many cases and outbreaks are nosocomial
- Incubation period 1-4 days
- Contagious Period - Before onset of diarrhea to a few days after end of diarrhea
- Spread via fecal - oral route through fomites

**Acute gastroenteritis virus**

**Oral Rehydration Therapy (ORT)**