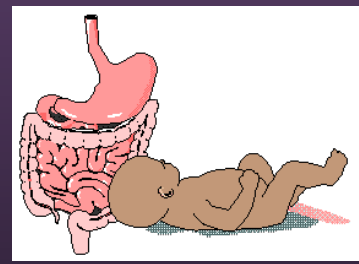
VIRAL GASTRO-ENTERITIS



Dr Esam Ibraheem Azhar
(BSc, MSc, Ph.D Molecular Medical Virology)
Asst. Prof. Medical Laboratory Technology Department

Introduction (1)

- **Paediatric diarrhoea remains one of the major causes of death in young children. This is especially so in Asia, Africa and Latin America where it causes millions of deaths in the age group 0-4 years.**

- **The main factors for high incidence and mortality are unsafe water or inadequate sanitation, requiring social, economic and political solutions.**

- **The immediate causes are often of an infectious nature and include a variety of pathogenic micro-organisms. A range of bacteria and parasites has been identified = enterotoxigenic *E. coli*, salmonella, shigella, cholera, other vibrio bacteria, as well as cryptosporidium, but these account for well below half of investigated cases.**

Introduction (2)

- A number of different viruses cause diarrhoea, of which the most important is the family of **ROTAVIRUSES.**
- Rotaviruses have been estimated to cause 30-50% of all cases of severe diarrhoeal disease in man.
- Two strains of **adenovirus (40 and 41)** have also been associated with diarrhoeal disease.
- A group of "**small round viruses**" (discovered by electron microscopy) have been linked by genetic techniques as closely related to the previously described "**Norwalk**" agent, associated with vomiting and diarrhoea.

Viruses Found in the GIT (1)

A. Associated with gastroenteritis:

- Rotaviruses
- Adenoviruses 40, 41
- Caliciviruses
- Norwalk like viruses or SRSV (Small Round Structured Viruses)
- Astroviruses
- SRV (Small Round Viruses)
- Coronaviruses

Viruses Found in the GIT (2)

B. Found in the GIT, not normally associated with gastroenteritis

- **Polio**
- **Coxsackie A**
- **Coxsackie B**
- **Echo**
- **Enteroviruses 68-71**
- **Hepatitis A**
- **Hepatitis E**
- **Adenoviruses 1- 39**
- **Reoviruses**

C. Found in the GIT as opportunistic infection

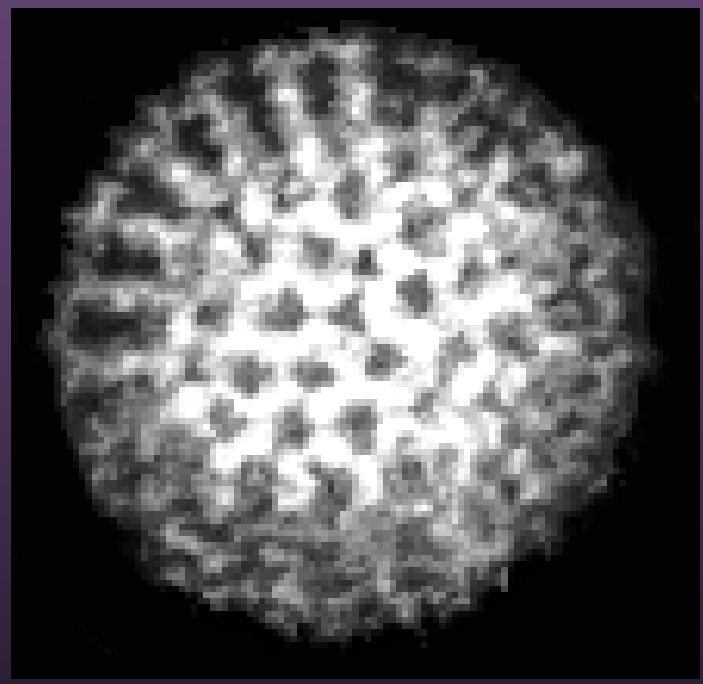
- **CMV**
- **HSV**
- **VZV**
- **HIV**

ROTAVIRUS - *(REO virus family)*

- **Group A** subtypes 1, 2, 3, 4 (main human pathogens) (Further 7 subtypes) also infect animals (monkey, calf, mouse)
- **Group B** Infects pigs and rats
  Found to cause extensive outbreaks in China in past decade
- **Group C** Infects Pigs (Occasionally Man)
- **Group D** Infects birds
- **Group E** Infects pigs

Virus Morphology

- **Particles are naked 70 nm in diameter, double shelled, enclosing a genome of 11 segments of double stranded RNA.**
- **The virus may survive in sewage, despite stringent treatment.**
- **Human rota virus has proved difficult to culture *in vitro*, but the serologically related monkey and calf rotaviruses grow easily in cell culture.**



Clinical

Essentially an ingestion disease (faecal-oral route)

- **Incubation is short : 1 to 3 days.**
- **Illness: Sudden onset watery diarrhoea, with or without vomiting. May last up to 6 days (or longer if immunocompromised). The disease is self limiting.**
- **Complications: Dehydration may result, this can be severe and life threatening in young children.**
- **Treatment: No specific treatment of viral infection is available nor is it really required.**
  Treatment is aimed at prevention and/or treatment of dehydration by oral and/or intravenous fluids and electrolytes

Epidemiology

Infection is found world-wide.
All ages can be infected and reinfection can occur (usually asymptomatic).

- **Age*:* Infections at < 6 months age and > 5 years of age tend to be asymptomatic and give degrees of protection against diarrhoeal infection.**
  Maternity hospitals commonly have resident strains which readily cause asymptomatic infections of new-born.
- **Seasons*:* In temperate '1st world' populations rota virus is the main cause of winter gastroenteritis.**
  In tropical and developing countries, rotavirus diarrhoea occurs all the year round ,but with a peak in summer. However, it is only one of a variety of pathogens causing diarrhoea.

Diagnosis

Detection of virus in stools (peaks at day 3 or 4 of diarrhoea):-

1. **Latex agglutination**
2. **ELISA**
3. **Electron Microscopy (labour intensive, relatively insensitive)**
4. **Electrophoresis of RNA segments**

(Antibody can be detected but is not clinically useful)

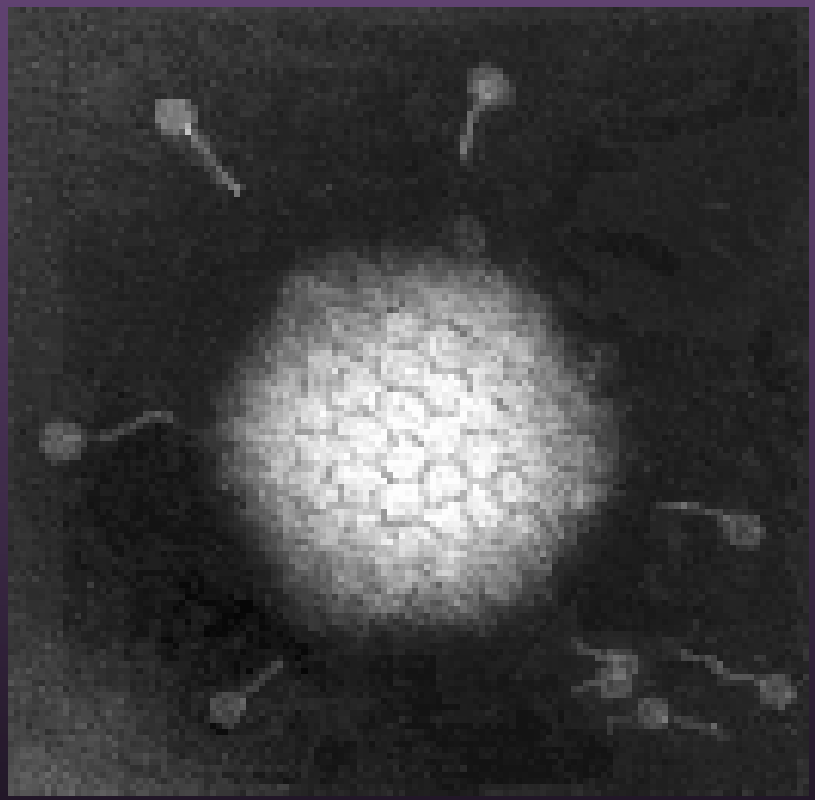
Prevention

- Non specific factors*:* improved hygiene, education, clean water
- Specific - Breast feeding helps to provide passive immunity in the newborn (from maternal antibodies),
- Vaccination is still experimental.

Adenovirus

- A limited number of strains of ADENOVIRUS have been causally related to childhood diarrhoea.
- They do not grow in cell cultures and were discovered by Electron Microscopy.
- They are classified in the 40/41 serogroup of adenoviruses.

Adenovirus Particle

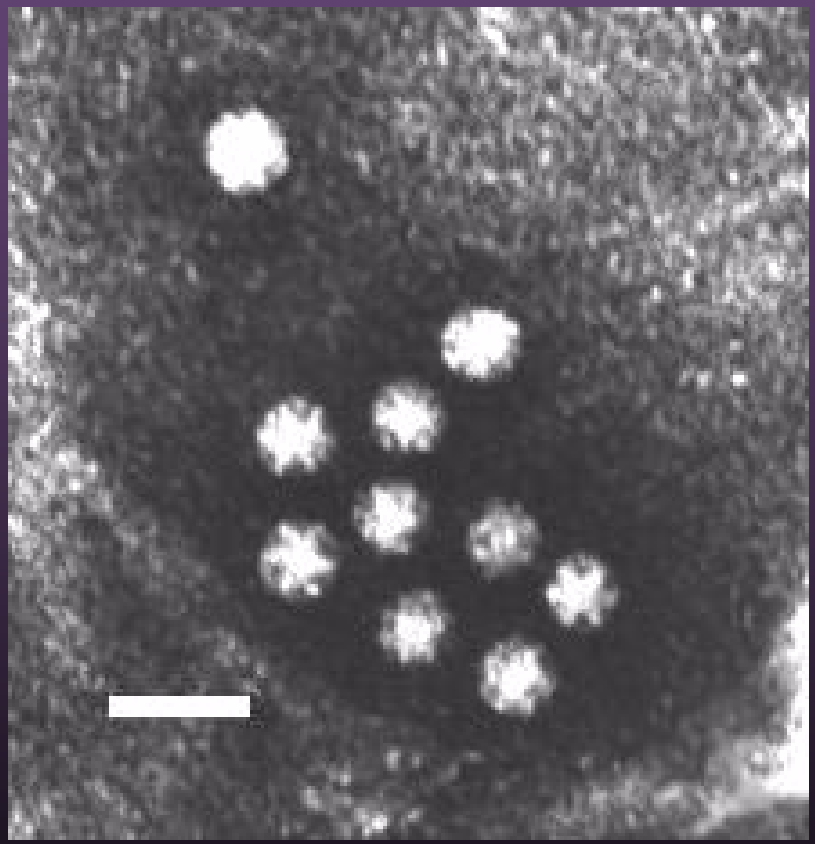


(Courtesy of Linda Stannard, University of Cape Town, S.A.)

Enteric Adenoviruses

- **Naked DNA viruses, 75 nm in diameter.**
- **Fastidious enteric adenovirus types 40 and 41 are associated with gastroenteritis.**
- **Associated with cases of endemic gastroenteritis, usually in young children and neonates. Can cause occasional outbreaks.**
- **Possibly the second most common viral cause of gastroenteritis (7-15% of all endemic cases).**
- **Similar disease to rotaviruses**
- **Most people have antibodies against enteric adenoviruses by the age of three.**
- **Diagnosed by electron microscopy or by the detection of adenovirus antigens in faeces by ELISA or other assays.**

Astrovirus Particles

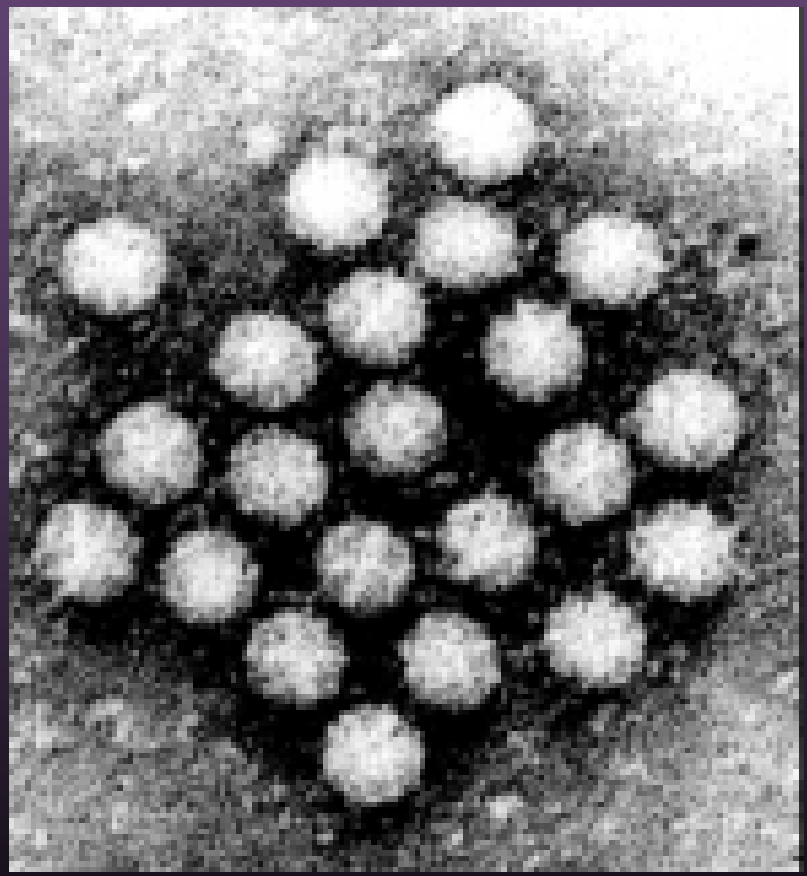


(Source: ICTV database)

Astroviruses

- **Small RNA viruses, named because of star-shaped surface morphology, 28 nm in diameter.**
- **Associated with cases of endemic gastroenteritis, usually in young children and neonates. Can cause occasional outbreaks.**
- **Responsible for up to 10% of cases of gastroenteritis.**
- **Similar disease to rota and adenoviruses.**
- **Most people have antibodies by the age of three.**
- **Diagnosed by electron microscopy only, often very difficult because of small size.**

Norwalk-like Virus Particles

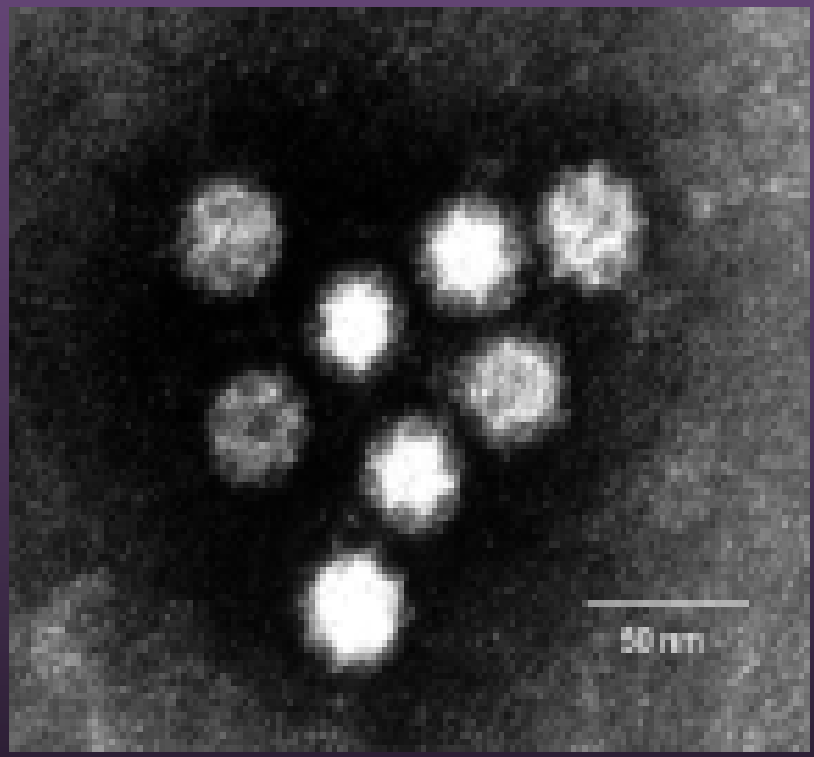


(Source: ICTV database)

Norwalk-like Viruses

- **Small RNA viruses, with ragged surface, 35 nm in diameter, now classified as Calicivirus.**
- **Always associated with epidemic outbreaks of gastroenteritis, adults more commonly affected than children.**
- **Associated with consumption of shellfish and other contaminated foods. Aerosol spread possible as well as faecal-oral spread.**
- **Also named "winter vomiting disease", with vomiting being the prominent symptom, diarrhoea usually mild.**
- **Antibodies acquired later in life, in the US, only 50% of adults are seropositive by the age of 50.**
- **Diagnosis is made by electron microscopy and by PCR.**

Calicivirus Particles



(Source: ICTV database)

Calicivirus

- Small RNA viruses, characteristic surface morphology consisting of hollows. particles 35 nm in diameter.
- Associated mainly with epidemic outbreaks of gastroenteritis, although occasionally responsible for endemic cases.
- Like Norwalk type viruses, vomiting is the prominent feature of disease.
- Majority of children have antibodies against Caliciviruses by the age of three.
- Diagnosed by electron microscopy only, often difficult to diagnose because of small size.

Laboratory Diagnosis

- Immune electron microscopy can be used to concentrate and identify the virus from stool.
- Detection of viral antigens by ELISA.
- RT-PCR.

Treatment, Prevention, and Control

- No specific treatment for infection with the Calicivirus or other small, round gastroenteritis viruses is available.

- Outbreaks may be minimized by handling food carefully and by maintaining the purity of water supply.