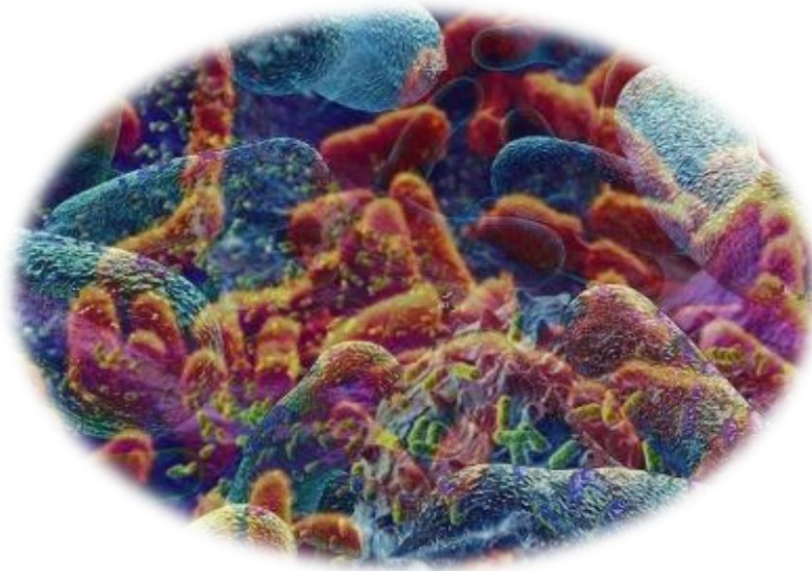


431
Microbiology Team

Viral Gastroenteritis

GIT & HAEMATOLOGY BLOCK



Leaders:

Faisal Al Rashid , Eman Al-Shahrani

Done by:

Abeer Al-Suwailem , Tareq Aljurf



Important



Doctor mentioned but not in the slides



Not important

GastroEnteritis (GE): is the inflammation of mucosal lining in the GIT.

- Etiologic agents in severe **diarrheal illnesses** requiring hospitalization of infants & young children are **Rotavirus, Adenovirus, Calicivirus** and **Astrovirus** (Diarrhea is the 2nd common cause of mortality in children and it's mostly because of the rotavirus).
- All of those viruses are **non-enveloped** and have an **icosahedral capsid**, which make them survive the acidity.
- **The most common viral ENDEMIC cause of GE among infants and young children is Rotavirus.**
- **The most common viral EPIDEMIC (outbreaks) cause of GE among all age groups is Norovirus (Caliciviruses).**
- Other viruses; Coronaviruses, Toroviruses, Adenovirus & Enteroviruses

✚ Epidemiology of Viral GastroEnteritis (VGE)

- Distribution: **Worldwide** (in poor hygiene, overcrowding, and poverty)
- Age: in **Infants & young** >> Older children
- Transmission: **Faecal-oral route**
- Season: **Winter months**
- Endemic inf: **Gp A rota & adeno 40,41**
- Epidemic inf: **Norovirus**

✚ Clinical Features

- **IP (Incubation Period) is Short**
- **Symptoms: Mostly Diarrhea, Vomiting, Fever & abdominal cramps**
- **Dehydration with decreased Na is Life threatening. Therefore, rehydration is the treatment.**
- **Winter vomiting disease:** occurs with **Calicivirus** infections in which **Vomiting** > Diarrhoea (If the Pt is vomiting more, suspect a caliciviral infection)

✚ Lab diagnosis

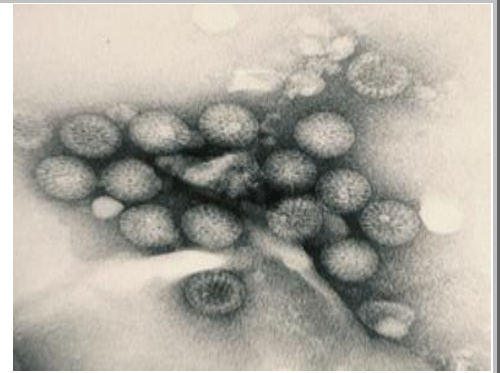
- **Viral isolation using cell culturing is not used** anymore because the viruses are fastidious (growing poorly).
- **Catch all technique using an Electron microscopy is the original test but it is also not used** because it's expensive and needs high concentration of the virus.
- **For diagnosing, a STOOL sample is collected, we detect the viral ANTIGEN using IMMUNOASSAY tests such as: ELISA, ICT (ImmunoChromatography Tech) & latex agglutination**

✚ Management

- Treatment: **Rehydration and supportive** (Supportive such as painkillers... but **NOT ANTIBIOTICS**)
- Prevention:
 - **Sanitation & hygiene measures**
 - **No vaccines except for rotavirus (Group A)**

Rotavirus (Genus)

Family: **Reoviridae** [Respiratory & Enteric Orphan] (Discovered in asymptomatic patients in respiratory & enteric systems)



+ Description

- 11 segments **dsRNA** (The only RNA virus which has a **double strand**)
- **Double-layered icosahedral** which gives the virus a **Wheel-like appearance**.
- Nonenveloped
- ~ 70 nm (medium sized)
- RNA – dependent RNA polymerase (It has its own enzyme to synthesize the mRNA)
- **7 groups [A-G]** and **Group A** is the most common. (Only group A-B-C can affect people)

+ Epidemiology

The virus peaks in the **winter** time, spreads through the **fecal-oral route**, affects **all age groups** but gives **symptomatic endemic infections in infants between 6-24m**.

+ Pathogenesis

The virus attaches to the tip of the epithelial cells, mainly the jejunum, which leads to some histological changes like the atrophy of the villi; therefore, production of some enzymes like the disaccharidases is reduced. Then, the patient undergoes a malabsorptive state which cause diarrhea.

Infects jejunum → villi atrophy and ↓ digestive enzymes → malabsorption → hyperosmotic effect → diarrhea.

+ Clinical features

- ❖ Intestinal infections in infants & young children (gastroenteritis or infantile GE)
 - **IP = 1-2 ds**
 - **Watery, non-bloody Diarrhea, Vomiting & Fever (Dehydration)**
 - **Outcomes vary:**
 - In developed countries > Mortality is low (Hospital staff work to rehydrate them and get their electrolytes back to normal)
 - In developing countries > Mortality is sig (Not enough resources for rehydration)
 - 1/2 of all GE cases needs Admission
 - Deaths have been reported
- ❖ Intestinal infections:
 - **Infants & young children > GE**
 - **Older children+ adults > asymptomatic**
 - **Immunocompromised hosts > chronic D**
- ❖ Extra-intestinal infections:
 - **Encephalitis** in small number of patients.

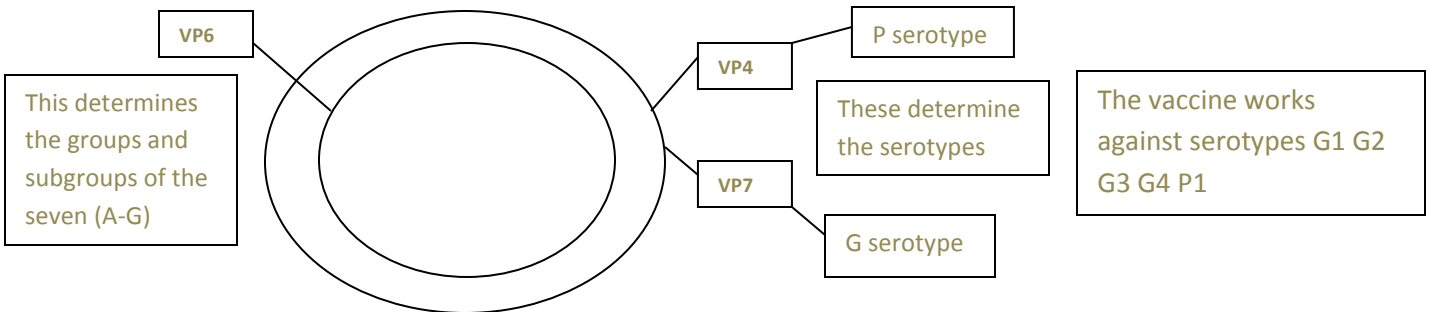
+ Diagnosis

- **Sample; stool**
- **Immunoassay (Most used); ELISA , ICT & latex agglutination**
- EM - Gel electrophoresis - RT.PCR (expensive) - Cell culture

Management

- Treatment: **Rehydration**
- Prevention:
 - Sanitation & hygiene measures
 - Vaccine; LAV (live attenuated vaccine), oral (Rotashield – withdrawn-, Rotarix and the one used in our hospital, RotaTeq.) (No need to memorize the names of the vaccines)

Extra Information about the vaccine mentioned by the females' doctor (not important)



Enteric Adenoviruses (Serotype 40 and 41)

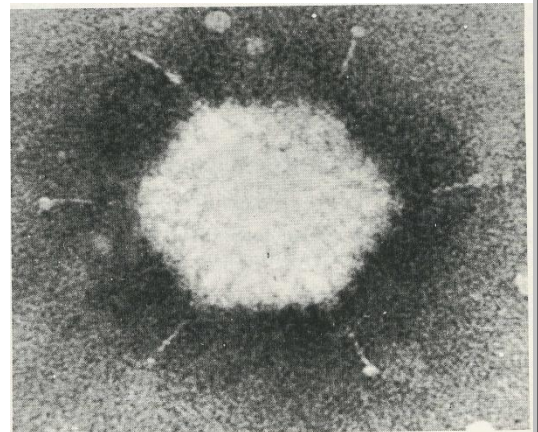
Family: Adenoviridae

Description

- Nonenveloped, icosahedral, dsDNA
- The only virus with **fibers protruding** from each of the vertices of the capsid for: Attachment, Hemagglutinin, Type-specific ag.

Classification

- Adenoviruses (in general) are of:
 - 6 subgenera [A-F]
 - 51 serotypes
 - Grow in C/C (cell culture)
- Enteric adenoviruses:
 - 40&41 serotypes
 - Subgenus F
 - Fastidious (Do not grow on C/C)



Clinical feature

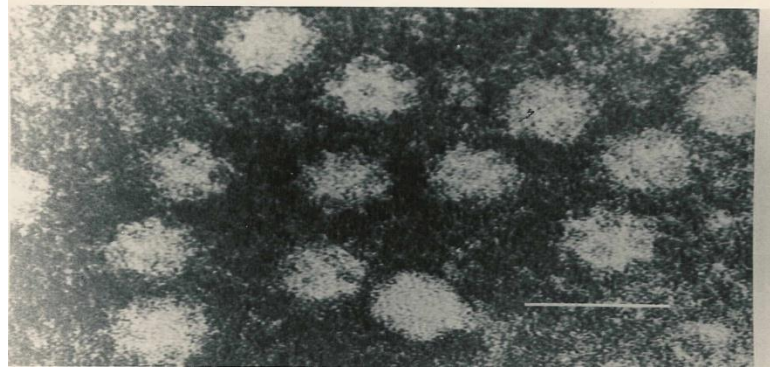
They are the 2nd most common cause of GE in children, have longer IP, Less severe than rotavirus causing a Prolonged illness

Diagnosis

Ag detection in stool by: ELISA, Immunochromatography Tech.

Caliciviruses

Family: Caliciviridae [Calyx =cup] (Typically, It has a cup-like depression on its surface)



+ Description

- ssRNA, +ve polarity
- Nonenveloped
- Icosahedral capsid
- Two morphologic types:
 - Typical caliciviruses with a cup like depression (**Sapoviruses**)
 - Small Rounded Structured Viruses which have a smooth surface lacking a depression (**Noroviruses**)

+ NOROVIRUS (Norwalk virus):

+ Epidemiology

- Faecal-oral route, in [water, shellfish]
- Outbreaks of GE in schools, camps & cruise
- All age groups

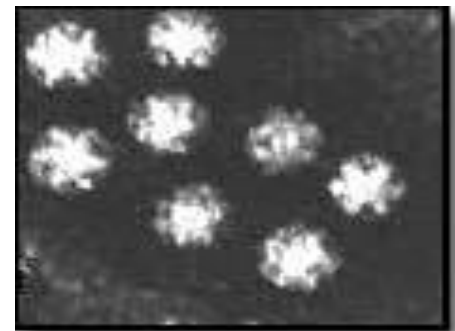
+ Clinical features

- In children projectile vomiting (In contrast with the Rotaviral infections) (The winter vomiting disease)
- In adults diarrhea

+ Diagnosis: Viral Ag in stool by ELISA

Astroviruses

Family; Astroviridae [astro= a star] (Has 5 or 6-Pointed Star on its surface)



+ Description:

- ssRNA,+ve polarity
- 8 serotypes
- Nonenveloped
- Icosahedral capsid

+ Clinical features: Mild GE, Outbreak of diarrhea <5 years

+ Lab Diagnosis: Ag detection in stool by ELISA

- + Note: Caliciviruses (Norovirus) cause epidemic outbreaks in all age groups causing vomiting in children, Astrovirus cause epidemic outbreaks of diarrhea only in children. THE MAJOR CAUSE OF EPIDEMICS ARE CALICIVIRUSES. Whereas the commonest cause of diarrheal endemics is rotavirus.

	Rotavirus Group A	Adenovirus Types 40 and 41	Calicivirus Norovirus (Atypical)	Astrovirus
Genome	dsRNA	dsDNA	ssRNA	ssRNA
	Non-enveloped, Icosahedral capsid, Fecal-oral route			
Morphology	Wheel-like Structure	Typical Icosahedral with fibres	Typical Calicivirus: Cup-like depression Atypical (noro): Small Rounded Structure	5 or 6 pointed star on its surface
Cause	Endemic	Endemic	Epidemic (in schools, camps, cruises)	Epidemic (in children <5yrs)

Summary:

Gastroenteritis mostly affects **infants and young children**, usually in winter. Mainly causes **diarrhea**, in addition to **vomiting, fever, and abdominal cramps**. Viral Ag detection in the **stool** by **ELISA** is used for diagnosis. Management consists of **rehydration and supportive treatment**. **Life attenuated vaccine for rotavirus. DO NOT USE ANTIBIOTICS**

Rotavirus: **dsRNA, Group A** most common. Short IP. Mainly watery diarrhea.

Adenovirus: **dsDNA, types 40 and 41** cause GE. Longer IP and less severe than rotavirus.

Calicivirus (norovirus) : **ssRNA**, causes **outbreaks in schools, camps or cruises**. Projectile vomiting in children, diarrhea in adults.

Astrovirus: **ssRNA**, mild GE, outbreak in children <5yrs.

The 4 viruses are **non-enveloped**, have an **icosahedral capsid** and are transmitted by **fecal-oral route**.

Questions:

1. What is the most common cause of viral Gastroenteritis:
 - a. Norovirus
 - b. Adenovirus
 - c. Rotavirus
 - d. Astrovirus

2. An outbreak of gastroenteritis has been reported in a school, which of the following viruses is most likely the cause:
 - a. Adenovirus
 - b. Norovirus
 - c. Rotavirus
 - d. Astrovirus

3. Which ONE of the following test is recommended for the diagnosis of viral gastroenteritis:
 - a. Electron microscopy
 - b. Cell culture
 - c. ELISA
 - d. RT-PCR

Answers: 1-C, 2-B, 3-C