

## LECTURE: Viral Gastroenteritis

### Editing File

- Important
- Doctor's notes
- Extra explanation
- Only F or only M

"لا حول ولا قوة إلا بالله العلي العظيم" وتقال هذه الجملة إذا  
داهم الإنسان أمر عظيم لا يستطيعه ، أو يصعب عليه القيام به .

# OBJECTIVES:

- Def. of GE
  - Viral etiology of GE ( Structures )
  - Epidemiology
  - Clinical Features
  - Lab diagnosis
  - Treatment & Prevention (Vaccine)
  - Rotavirus , Adenovirus , calicivirus & Astrovirus
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# Gastroenteritis:

- **Definition:**

It is inflammation of the gastrointestinal tract which involves both **stomach and small intestine** and leading to acute **diarrhea** and **vomiting**.

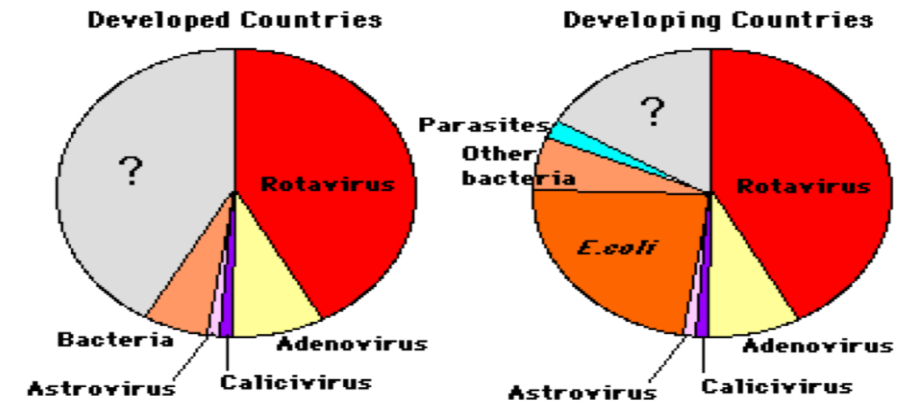
- **Viral etiology:**

- ✓ Rotavirus
- ✓ Adenovirus 40,41 types
- ✓ Calcivirus
- ✓ Astrovirus

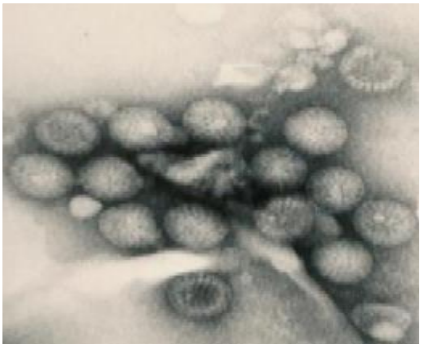
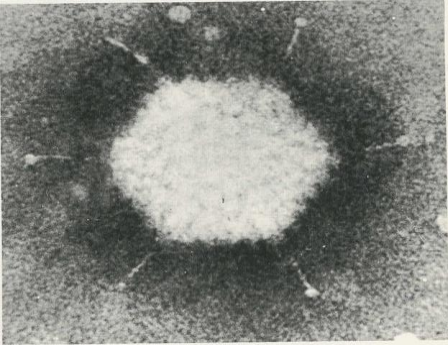
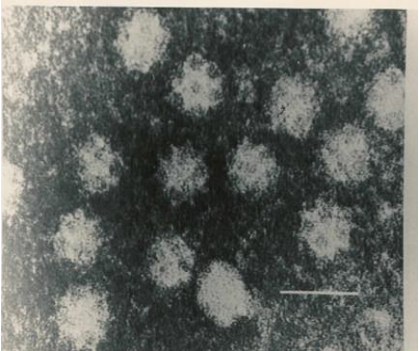
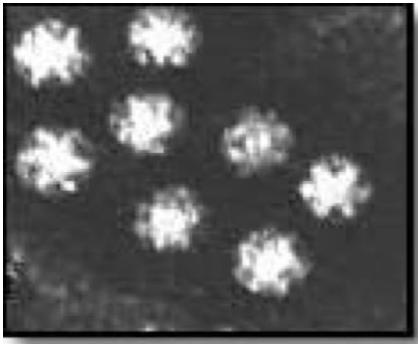
Etiologic agents in severe diarrheal illnesses requiring hygiene and rehydration of infants & young children.

- **Other viruses:** Coronaviruses, Toroviruses, and Enteroviruses

**Causes:** infectious or non-infectious (side effect of some drugs or allergy)



# Viral Gastroenteritis:

Viral etiology:				
Virus	Rotavirus MOST COMMON	Adenovirus 40,41 types 2 <sup>nd</sup> common	Calicivirus	Astrovirus
Genome	dsRNA	dsDNA	ssRNA (+)	ssRNA (+)
Morphological features	Double shelled with wheel like structure	Classical icosahedral capsid with fibers	Cup like depression on its surface	5 or 6 pointed star on its surface
Pictures:				

-One of the most important exceptions in virology is that all RNA viruses composed of ss genome except rotavirus Common characteristics: non enveloped , Icosahedral capsule

Adeno – DNA  
Rota – RNA

- Epidemiology

- ✓ **Distribution:** Worldwide, increased in poor hygiene, over crowding, and poverty
- ✓ **Age:** Infants & young children more likely than older children and rarely adults
- ✓ **Transmission:** Fecal-oral route through direct or indirect contact or contaminated surfaces
- ✓ **Season:** Winter months
- ✓ **Endemic infection:** Group A rotavirus & adenovirus serotype 40,41 in children
- ✓ **Epidemic infection:** Norovirus in adults “it’s the most common of NON-bacterial outbreaks”

- Clinical Features:

- ✓ **IP (incubation period) :** Short
- ✓ Dehydration (major complication) with decrease Na → Life threatening
- ✓ **Winter vomiting disease:**
  - ✓ Vomiting > Diarrhea
  - ✓ Calicivirus (especially norovirus)

Symptoms:

Diarrhea<sup>1</sup>

vomiting

fever

abdominal  
cramps

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<sup>1</sup> Acute onset of watery non-bloody diarrhea (presence of blood in stool excludes the diagnosis of viral GE)

- **Lab Diagnosis:**
  - ✓ Cell culture (C/C):
    - Not used because the sample grow poorly (**Fastidious**) (they require a special technique)
  - ✓ Electron microscopy (E.M):
    - **Catch all tech** (Can "catch all" viruses causing GE with a single examination)
    - Many disadvantages<sup>2</sup> so its not used
  - ✓ Specific test: **Immunoassay**
    - **ELISA for detection of viral Ag in stool** samples. [rota , adeno , astro & caliciviruses]
- **Management:**
  - ✓ **Treatment:** Self-limiting  
**Rehydration**<sup>3</sup> and supportive
  - ✓ **Prevention:** Sanitation<sup>4</sup> & hygiene measures  
**No vaccines except for rotavirus**

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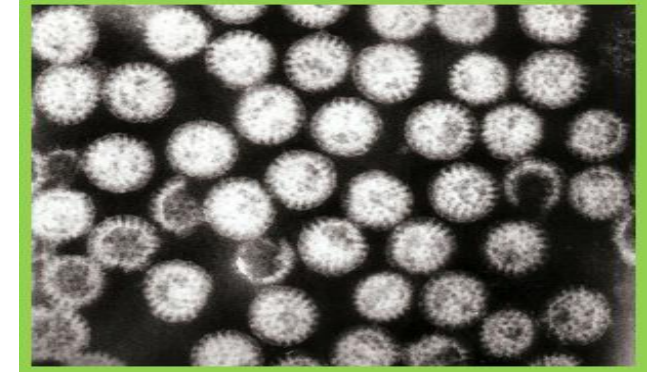
<sup>2</sup>Expensive , needs specialized technique , specific but not sensitive.

<sup>3</sup>Oral or IV depending on the severity

<sup>4</sup>Proper disposal of human feces and protection of water supply

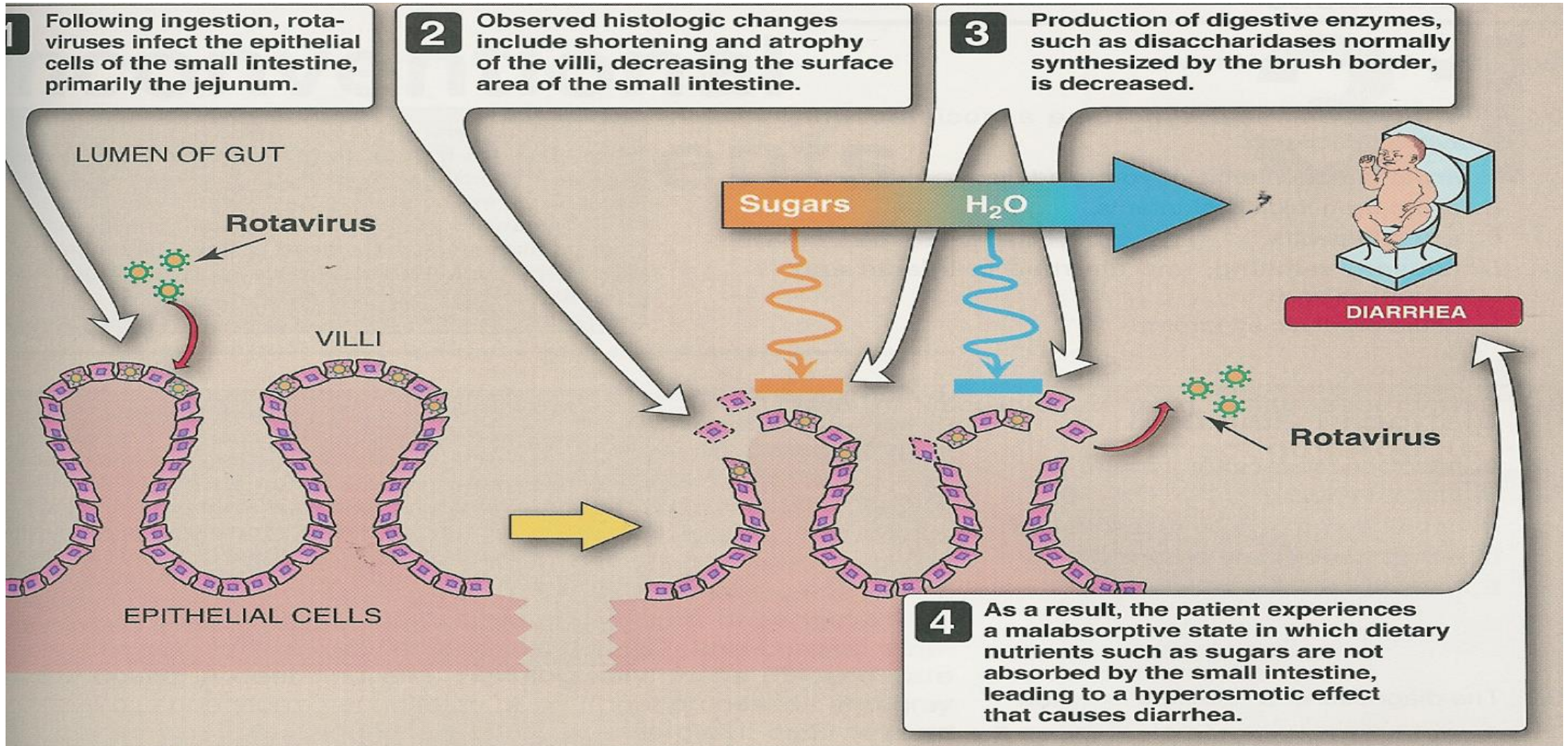
- **Rotavirus:** (most common cause of viral GE)

Family:	<i>Reoviridae</i> [Respiratory & Enteric Orphan]
Description:	<ul style="list-style-type: none"> <li>• 11 segments ds-RNA</li> <li>• Double-layered icosahedral capsid</li> <li>• Non-enveloped</li> <li>• ~ 70 nm</li> <li>• RNA – dependent RNA polymerase<sup>5</sup></li> <li>• 7 groups [A-G] only A-B-C affect humans-</li> <li>• Group A → most common 95% of the cases</li> </ul>
<b>Epidemiology</b>	
Spread (or mode of transmission):	Fecal-oral route through contaminated food or water
Age:	all age groups
Symptomatic infection:	mostly in infant 6 -24 months.
Peak:	Winter months
Infection:	Endemic



<sup>5</sup>Special enzyme for transcription of mRNA for viral replication

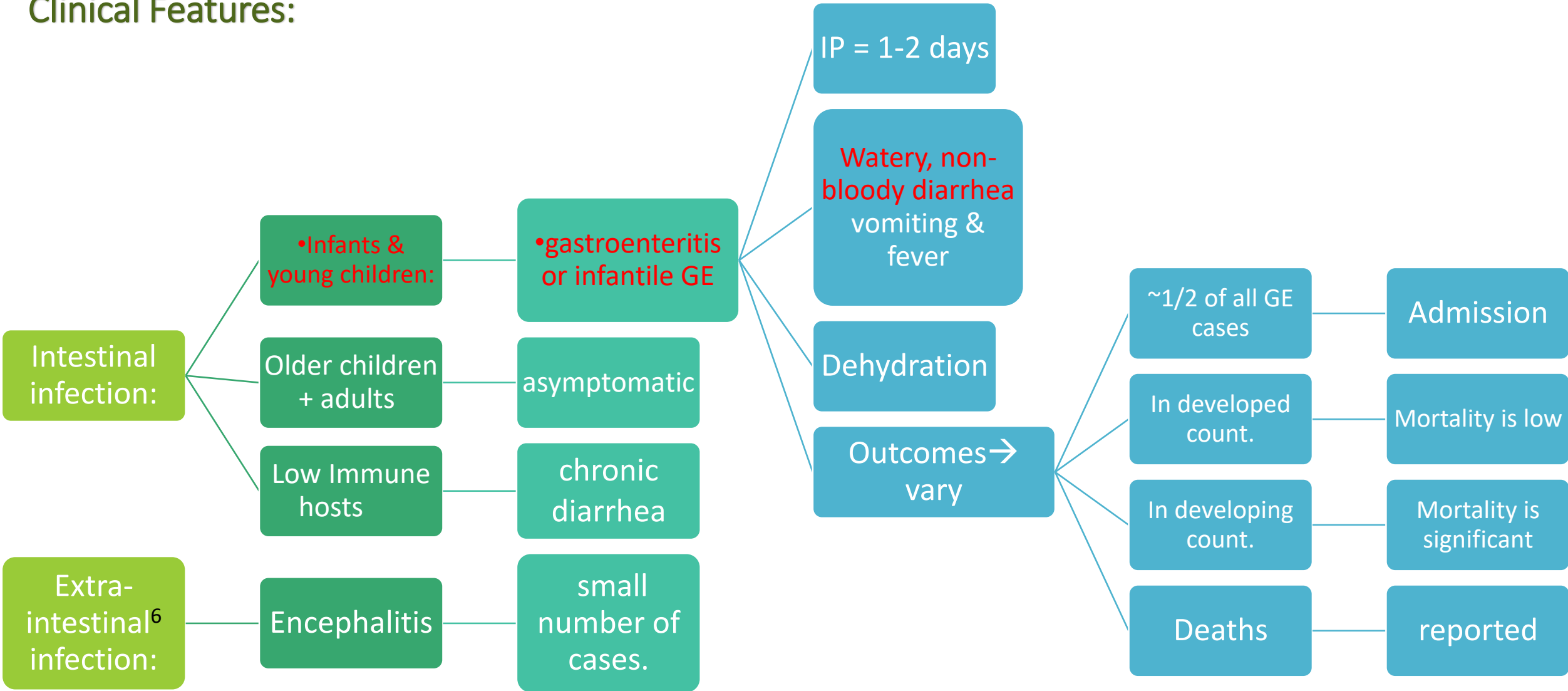
# Pathogenesis:



Ingestion of Rotavirus → affect the epithelial cells (tips of the villi, crypts are not infected) of small intestine (jejunum) → atrophy of villi and decreased production of digestive enzyme (disaccharides) → sugars are not absorbed and accumulated in the lumen (leads to increase water level) → diarrhea



# Clinical Features:



<sup>6</sup> In immunocompromised host

- **Lab Diagnosis:**

- ✓ **Sample:** stool
- ✓ **Immunoassay** (most used):
  - ELISA
  - Immunochromatography & latex agglutination
- ✓ EM
- ✓ Gel electrophoresis<sup>7</sup>
- ✓ RT-PCR<sup>8</sup>
- ✓ Cell culture

- **Management:**

- ✓ **Treatment:** Self-limiting and rehydration
- ✓ **Prevention:** Sanitation & hygiene measures
- ✓ **Vaccine:** live attenuated vaccine oral
  - Rotashield (withdrawn)
  - Rotarix
  - RotaTeq



Immunochromatography assay

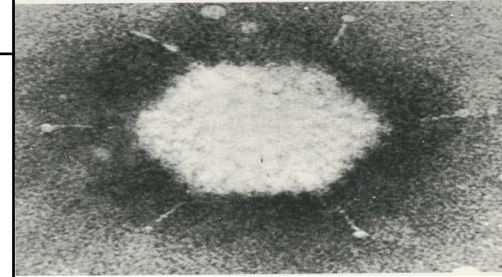
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<sup>7</sup> For typing and grouping of the virus

<sup>8</sup> Reverse Transcription Polymerase Chain Reaction (Another way or typing more sensitive than gel electrophoresis)

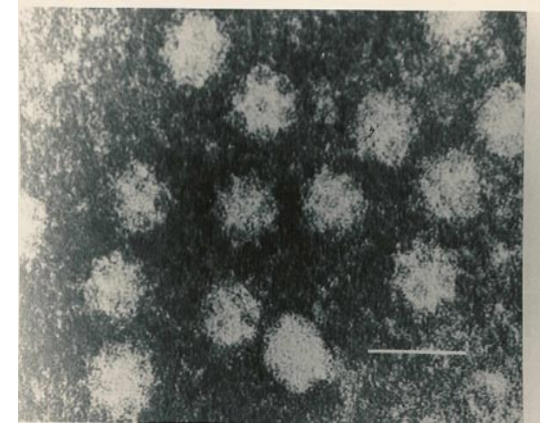
- **Enteric Adenovirus:** (second most common cause of viral GE)

Family:	Adenoviridae	
Description:	<ul style="list-style-type: none"> <li>• Non-enveloped</li> <li>• icosahedral capsid</li> <li>• ds-DNA</li> <li>• Only a virus with a fiber protruding from each of the vertices of the capsid</li> </ul>	
Fiber	Is important for: <ul style="list-style-type: none"> <li>• Attachment</li> <li>• Hemagglutinin</li> <li>• Type-specific Ag</li> </ul>	
Classification:		
Adenovirus		Enteric adenoviruses
<ul style="list-style-type: none"> <li>• 6 subgenera[A-F] / 7 subgenera[A-G]</li> <li>• 51 serotypes / &gt; 50 serotypes</li> <li>• Grow in C/C</li> </ul>	<ul style="list-style-type: none"> <li>• Subgenus F</li> <li>• 40 &amp; 41 serotypes</li> <li>• Fastidious “dosn’t grow in cell culture”</li> </ul>	
Clinical feature:		
Longer IP than rotavirus	Less severe than rotavirus	Prolonged illness than rotavirus
Diagnosis:		
Ag detection in stool samples by ELISA or Immunochromatography Tech.		



- **Caliciviruses:**

Family:	Caliciviridae [Calyx =cup]	
Description:	<ul style="list-style-type: none"> <li>• Non-enveloped</li> <li>• ss-RNA with +ve polarity</li> <li>• Icosahedral capsid</li> </ul>	
<b>Two morphologic types:</b>		
	Typical caliciviruses	Small Rounded smooth Structured Viruses
	<ul style="list-style-type: none"> <li>• Sapoviruses</li> </ul>	<ul style="list-style-type: none"> <li>• Noroviruses (most common cause of non-bacterial outbreaks of GE worldwide)</li> </ul>

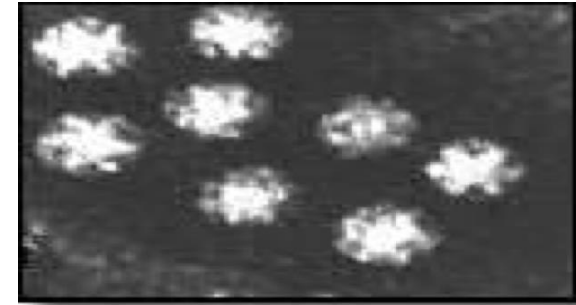


**Norovirus (Norwalk virus):**

Epidemiology:	<ul style="list-style-type: none"> <li>• Fecal-oral route [water, shellfish(major source)]</li> <li>• Outbreaks of GE in schools, camps &amp; cruises</li> <li>• All age groups</li> </ul>
Clinical features:	<ul style="list-style-type: none"> <li>• Children: vomiting [projectile]</li> <li>• Adults: diarrhea</li> </ul>
Diagnosis:	<ul style="list-style-type: none"> <li>• Viral Ag in stool samples by ELISA</li> </ul>

- **Astroviruses:**

Family:	Astroviridae [astro= a star]
Description:	<ul style="list-style-type: none"><li>• <b>Non-enveloped</b></li><li>• <b>ss-RNA with +ve polarity</b></li><li>• <b>Icosahedral capsid</b></li><li>• 8 serotypes</li></ul>
Clinical feature:	
<ul style="list-style-type: none"><li>• <b>Mild GE</b></li><li>• <b>Outbreak of diarrhea &lt;5 ys.</b> (usually endemic)</li></ul>	
Lab Diagnosis:	
Ag detection in stool by <b>ELISA</b>	



# QUIZ:

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1. Which of the following is the most common cause of non-bacterial endemic gastroenteritis outbreak?  
A)Norovirus                      B)Rotavirus                      C)astrovirus
2. 26y/o man with history AIDS , if infected with Rotavirus what would be the most prominent symptom (main complain) ?  
A)Asymptomatic                  B)Gastroenteritis                  C)Chronic diarrhea
3. Which of the following has fibers protruding from its capsid?  
A)Adenovirus                      B)Astrovirus                      C)Rotavirus
4. Which of the following viruses you can prevent it by vaccination?  
A)Adenovirus                      B)Astrovirus                      C)Rotavirus
5. Which of the following is associated with Winter disease?  
A)Adenovirus                      B)Calicivirus                      C)Rotavirus
6. Which one of the following is the most common cause on non-bacterial epidemic gastroenteritis outbreak?  
A)Norovirus                      B)Rotavirus                      C)Adenovirus

1)	B	C
2)	C	A
3)	A	C
4)	C	B
5)	B	A
6)	A	

# SUMMARY:

Etiology	Morphological features	Genome	Epidemiology	Vaccine
1 <sup>st</sup> : Rotavirus most common: GpA <b>Most common cause viral GE</b>	Double-Shelled With Wheel-Like Structure	ds RNA 11 Segments	- <b>Endemic</b> -Infants & young children	Vaccine; LAV, oral Rotarix RotaTeq*
2 <sup>nd</sup> : Enteric Adenovirus Subgenus F <b>40,41 types</b> (Fastidious)	Classical Icosahedron with fibers	ds DNA	- <b>Endemic</b> -Less severes -Prolonged illness -Longer IP	-
Calicivirus (Winter vomiting disease) <b>Noroviruses</b>	Cup-Like depression on its surface -has <b>Fiber</b> (for: Attachment Type & specific ag)	ss RNA(+)	- <b>Epidemic</b> inf. -(its the most common cause of nonbacterial Epidemic (Outbreaks) GE)	
Astrovirus	5 or 6-Pointed Star on its surface	ss RNA(+)	<b>Mild</b> GE	

FOR ALL: **structure:** Nonenveloped, icosahedral  
**Lab diagnosis:** Immunoassay: **ELISA** for detection of **viral Ag** in stool  
**Treatment:** Rehydration  
**Prevention:** Sanitation & hygiene measures  
 major **complication** : **Dehydration**  
**Transmission** ; Faecal-oral route  
**Clinical Features:** Watery, **nonbloody** D,V & F

# THANK YOU FOR CHECKING OUR WORK, BEST OF LUCK!



Doctors slides



Hamad Alkhudhairy



Shrooq Alsomali  
Rawan Alqahtani  
Najd Altheeb  
Ghada Alskait  
Ghadah Almazrou