



MICROBIOLOGY

DONE BY :

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Viral Gastroenteritis

→ gastroenteritis is caused by bacteria, viruses and other organisms.

- Viral gastroenteritis is an acute diarrheal disease that is caused by viruses, usually of rapid evolution (within hours), that lasts less than 3 weeks. غالباً الشفاء من المرض خلال 3 اسابيع كحد أقصى

- Viral gastroenteritis is the second most common viral illness after upper respiratory tract infection

- In addition to the bacterial and protozoal agents responsible for approximately 20 to 25 of these cases, viruses are a significant cause of acute diarrhoea It is thought that viruses are responsible for up to $\frac{3}{4}$ of all infective diarrhoea.

يعتقد ان اغلب عدوى الاسهال بسبب الفيروسات 75%

- Viral gastroenteritis causes major morbidity and mortality (لا تسبب فقط المرض وإنما قد تصل للوفاة)

worldwide, most significantly in young children in developing nations

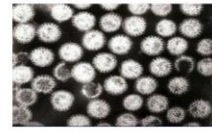
- Many viruses can be shed in stool but not all of them are responsible for gastroenteritis For example, **Poliovirus** and **Hepatitis** viruses can be found in stool however they cause different kinds of diseases.

ليست كل الفيروسات التي تنتقل عن طريق stool تفعل Gastroenteritis وانما هناك فيروسات مثل hepatitis الذي يسبب التهابات حاده او مزمنه في الكبد

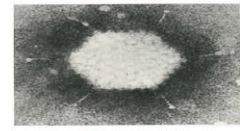
- Viral gastroenteritis treatment is manily **supportive**. replacement of fluids and electrolytes.

➤ Four groups of viruses have been clearly established as important causes of gastrointestinal disease

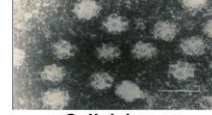
1. Rotaviruses
2. Caliciviruses
3. Astroviruses
4. Adenoviruses (serotypes 40 and 41)



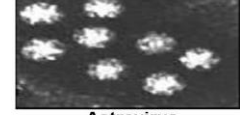
Rotavirus



Adenovirus



Calicivirus



Astrovirus

Rotavirus

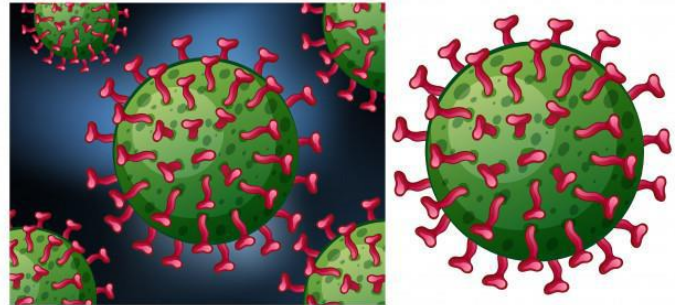
- The human intestinal rotaviruses were first found in 1973 by electron microscopic examination of duodenal biopsy specimens from infants with diarrhea.

أطفال مرضى ب اسهال حاد

اخذوا نزعاً وشافوها عن طريق EM

ف شافوه كائن دائري (بشبه العجل) وطالع منه شوك

Rotavirus



- Electron microscopic appearance a **wheel** with radiating **spikes**.

❖ احنا اخذنا بالجينييرال انه الفيروسات بتكون من ماده وراثيه RNA or DNA محاطه بغلاف نووي capsid وقد تكون محاطه بغلاف خارجي او لا envelope

- ❖ Family: Reoviridea
- ❖ Icosahedral (spherical)
- ❖ Three capsid layers (inner, middle and outercapsids).
- ❖ Non-enveloped virus
- ❖ Genome: segmented **double stranded RNA**

➤ Epidemiology

- Rotaviruses account for 40 to 60 of cases of acute gastroenteritis occurring during the cold weather in infants and children less than 2 years of age
- Older children and adults can also be affected, but attack rates are usually much lower it usually occurs in elderly adults in nursing homes
 - ❖ اغلب انواع الفيروسات تصيب الاطفال الصغار
 - ❖ ما عدا نوع واحد راح نعرفه بعد شوي
- Rotavirus is highly infectious (نسبة انه يعدي نسبة كبيره لهيك اذا فرد من العائله انصاب ف) and transmission is **feco oral** (غالبا كل العيله بتتصاب)
- By the age of 4 years, more than 90 of individuals have humoral antibodies suggesting a high rate of virus infection early in life.

اكثر من 90% من الناس عندهم بالدم ABs ضد هذا الفيروس لذا يدل على انه معدل الإصابة عالي جدا خلال السنوات الاربع الاولى

➤ Clinical Manifestations

- Incubation period of 1 to 3 days
 - Abrupt onset of vomiting, followed within hours by frequent, copious, watery, brown stools In severe cases, the stools may become clear (لانه يتقل كمية البراز وبتزيد كمية الماء)
 - Fever, usually low grade, is often present
 - Vomiting may persist for 1 to 3 days, and diarrhea for 4 to 8 days
 - The major complications result from severe dehydration which could lead to death
- لهيك لازم يصير replacement of fluids + electrolytes بأسرع وقت تجنبا للمضاعفات

➤ Diagnosis

- Diagnosis of acute rotavirus infection is usually by detection of virus particles or antigen in the stools during the acute phase of illness

* This can be accomplished by

بنوخذ كميته من stool وبنعمل تحقق اما عن طريق الميكروسكوب الالكتروني EM
او EIA

1. Direct examination of the specimen by electron microscopy

2. Immunologic detection of antigen with enzyme

immunoassays (which is the most convenient method

of detection→

اللي هي ELISA

بنجيب plate عليها الاجسام المضاده ABs للانتي جين تبع الفيروس

بنحط عينة stool على plate وبعديها بنعمل طرق اخرى زي مثلا اضافة جسم مضاد ثاني مرتبط بماده مشعه

اذا صار اشعاع يعني ايجابي واذا لا سلبي

➤ Treatment and Prevention

- There is **no** specific treatment
- **Vigorous replacement of fluids and electrolytes** is required in severe cases and can be life saving
- **Control** consists of strict hygienic measures, including careful hand

washing and adequate disposal of enteric excretions.

مدام fecal oral route لهيك النظاافه مهمه جدا وغسل الايدي بشكل جيد

وايضا التخلص من اي مواد تستخدم بالحمام مثل الفاين وغيره

- Vaccine

❖ Live attenuated vaccines have been developed

❖ CDC recommends routine vaccination of all infants especially who are in nursing home.

Caliciviruses

➤ Example **Noroviruses**

- The caliciviruses were the first to be clearly associated with outbreaks of gastroenteritis
- They were first associated with an outbreak in Norwalk, Ohio, in 1968 and their role was confirmed by production of disease in volunteers fed fecal filtrates The original virus was thus called the Norwalk virus.

❖ متطوعين شربوا عينه مفلتره من براز مصابين وكان اياهم ما عندهم الامكانيه يشوفوا الفايروس لهيك كانو يعتقدو فيه اشي غير البكتيريا بعمل المرض .

➤ Structure

- ◆ Icosahedral.
- ◆ Nonenveloped.
- ◆ Single stranded RNA viruses (not double and not segmented in contrast to rotavirus)
- ◆ Characteristic morphology is **cup shaped depressions or hollows** on the capsid surface.

➤ Epidemiology

- ◆ Family and community outbreaks (nursing homes or cruise ships) are common and can occur in **any season** (not only cold water). **First difference**
- ◆ Caliciviruses cause gastrointestinal illness in **older** children and **adults**. **Second difference**
- ◆ The prevalence of antibodies rises slowly, reaching approximately 50 by the fifth decade of life, a striking contrast to the frequent acquisition of antibodies to rotaviruses early in life.
- ◆ Transmission is primarily **fecal-oral** outbreaks have been associated with consumption of contaminated water, uncooked shellfish, and other foods.

➤ Clinical Manifestations

- ◆ The incubation period is 1 to 2 days but maybe as short as 10 hours. This is followed by abrupt onset مفاجئ of vomiting and diarrhea.
- ◆ Vomiting is the prominent feature of disease.
- ◆ The duration of illness is relatively brief (usually 1 2 days).

➤ Diagnosis and Treatment

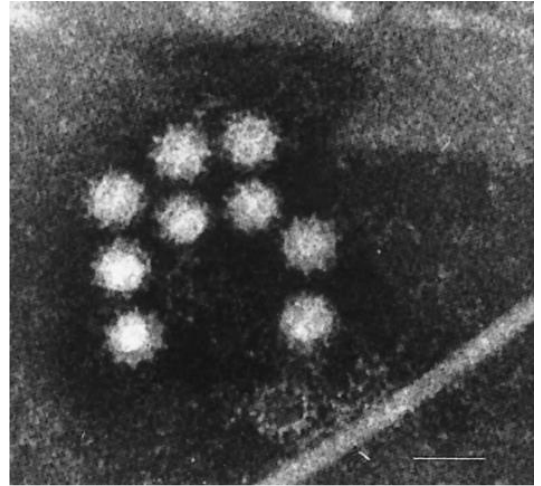
- ◆ These viruses can be detected by **electron microscopy or immunoelectron microscopy** in stools during the acute phase of illness.
- ◆ **EIA and PCR** methods have been developed.
- ◆ There is no specific treatment other than fluid and electrolyte replacement.
- ◆ Prevention requires good hygienic measures.

Adenoviruses:

- Associated with cases of gastroenteritis, usually in young children and neonates
- Adenoviruses are considered second to Rotavirus in terms of its significance as a cause of gastroenteritis
- Has a long incubation period 7 8 days

هذا الفرق الاول عن rota وتشابه كبير بينهم

- Disease is similar to rotavirus
- Most people have antibodies against enteric adenoviruses by the age of **three**.
- **Serotypes 40 and 41** – “enteric” adenoviruses the major serotypes causing gastroenteritis.



➤ Structure:

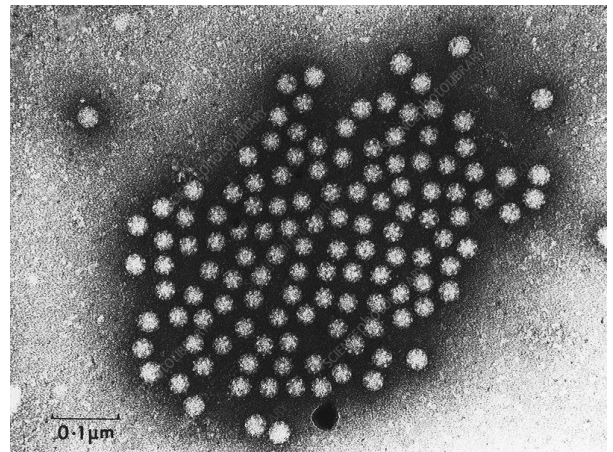
- Non enveloped
- Double stranded DNA virus الفرق الثاني

➤ Diagnosis

- **EM**
- Detection of adenovirus antigens in stool by **EIA**

Astroviruses: Astro يعني بشبه النجمه بالسمااء

- Small non enveloped single stranded RNA viruses, named because of star shaped surface morphology.
- In recent years astroviruses have been acknowledged as causes of often mild gastroenteritis outbreaks, primarily among toddlers and school children.
- Similar disease to rotaviruses and adenoviruses
- Most people have antibodies by the **age of three**.
- Diagnosed by **electron microscopy**.
- Note: the Electron microscopy is used for the four viruses that included in this lecture.



Biological and Epidemiologic Characteristics of Viruses that Cause Diarrhea

SPECIAL FEATURES	ROTAVIRUS	CALICIVIRUS	ASTROVIRUS	ADENOVIRUS
BIOLOGICAL				
Nucleic acid	Double-stranded RNA	Single-stranded RNA	Single-stranded RNA	Double-stranded DNA
Diameter, shape	65–75 nm, naked, double-shelled capsid	27–38 nm, naked, cup shaped depressions	28–38 nm, naked, star-shaped	70–90 nm, naked, icosahedral
Replication in cell culture	Usually incomplete	None	None	None or incomplete
PATHOGENIC				
Site of infection	Duodenum, jejunum	Jejunum	Small intestine	Small intestine
EPIDEMIOLOGIC				
Epidemicity	Epidemic or sporadic	Family and community outbreaks	Sporadic	Sporadic
Seasonality	Usually winter	None known	None known	None known
Ages primarily affected	Infants, children <2 y old	Older children and adults	Infants, children	Infants, children
Method of transmission	Fecal–oral	Fecal–oral; contaminated water and shellfish	Fecal–oral	Fecal–oral
Incubation period (days)	1–3	0.5–2	?1–2	8–10
Major diagnostic tests	EIA, EM ^a	EM, IEM, PCR	EM, PCR	EIA, EM