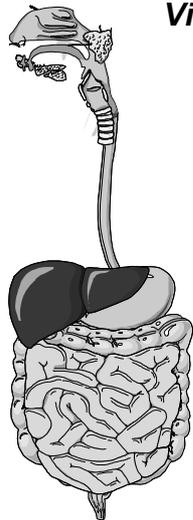


BBS2711

Virology

VIRAL INFECTIONS OF THE GASTROINTESTINAL TRACT

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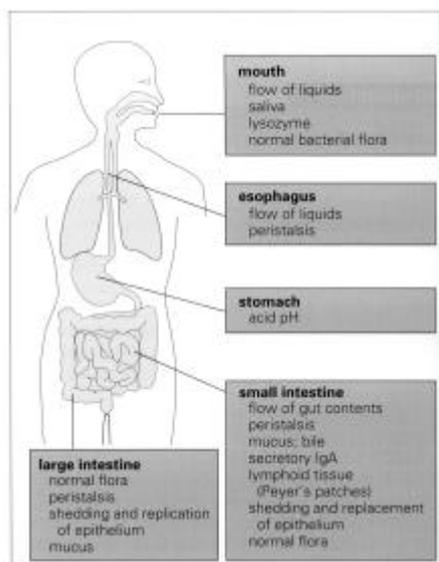
Viral gastroenteritis and diarrhoea

- Viruses are responsible for up to 75% of all infective diarrhoeas.
- Viral gastroenteritis is the second most common viral illness after upper respiratory tract infection.
- In developing countries, viral gastroenteritis is a major killer of infants who are undernourished.
 - Rotaviruses are responsible for half a million deaths a year.
- Many different types of viruses are found in the gut but only some are associated with gastroenteritis

Entry via GI tract may involve

- local infection (rotavirus, coronavirus, adenovirus) or
- invasion of the host to produce systemic illness (enteroviruses, hepatitis A)
 - due to invasion of tissues underlying the mucosal layer

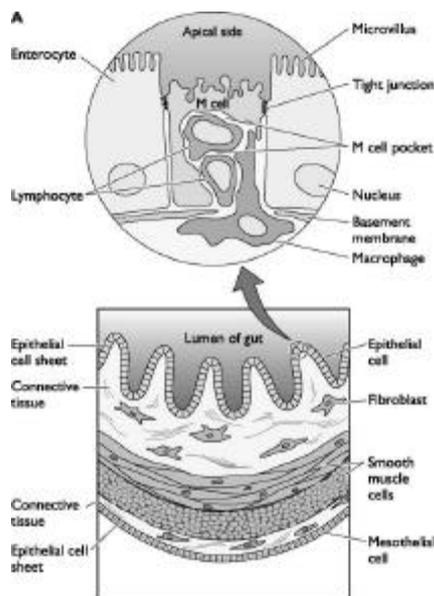
Alimentary tract



- Designed to mix, digest and absorb food
 - always in motion
 - good opportunity for viruses to encounter susceptible cells

- Is however a "hostile" environment
 - acid stomach, alkaline intestine, digestive enzymes, bile detergents.

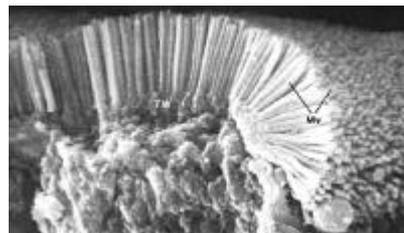
- *Picornaviruses* example of evolutionary adaptation
 - acid-labile members (*rhinoviruses*)
 - acid-resistant members (*polio*)



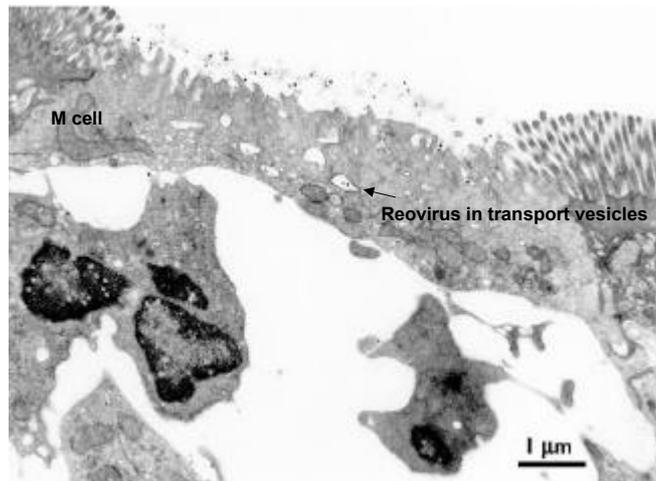
- intestinal surface covered by columnar villous epithelial cells
 - apical surface packed with microvilli

- surface coat of glycoproteins and glycolipid and an overlying mucous layer
 - viruses (adenovirus/Norwalk calicivirus) penetrate this layer

- lymphoid follicles point of entry for some
 - M cells ingest and deliver antigens to underlying lymphoid tissue by **transcytosis**



Reovirus transits across M cells in this fashion to infect underlying lymphoid cells
- here they replicate and spread to other tissues.



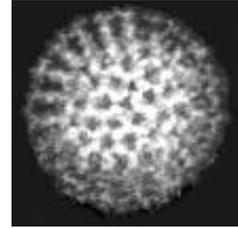
Some viruses (eg, rotavirus and coronavirus) replicate in M cells without spread to underlying tissue
- destruction of these cells results in mucosal inflammation and diarrhoea

Viruses found in the GIT

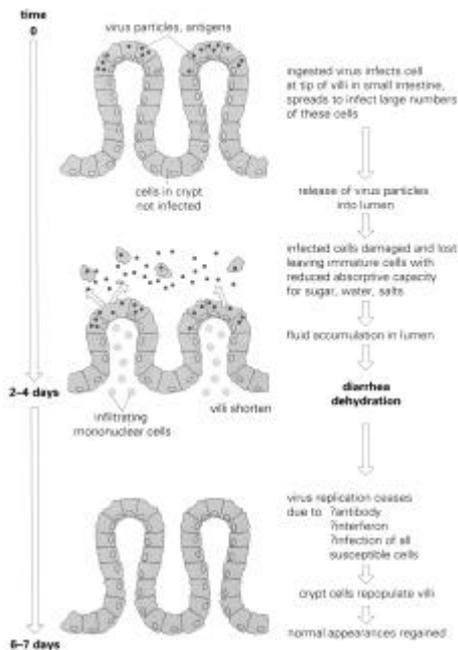
Associated with gastroenteritis and/or diarrhoea

- Rotaviruses
- Adenoviruses 40, 41
- Caliciviruses
- Norwalk virus
- Astroviruses
- SRV (Small Round Viruses)
- Coronaviruses
- Toroviruses

Rotavirus



- Naked double stranded RNA viruses, 80 nm in diameter
- also found in other mammals and birds, causing diarrhoea
 - 2 human serotypes
- account for 50-80% of all cases of viral gastroenteritis
 - average of 60 days of diarrhoea per year in under-developed countries (major effect on nutritional status and growth)
- usually endemic, but responsible for occasional outbreaks
- causes disease in all age groups but most severe symptoms in neonates and young children. Asymptomatic infections common in adults and older children. Symptomatic infections again common in people over 60
- up to 30% mortality rate in malnourished children, responsible for up to half a million deaths per year



- virus replicates in intestinal epithelial cells
- incubation period is 2-4 days
- replication damages transport mechanisms in gut leading to loss of water, salt and glucose
- acute onset of vomiting and diarrhoea
- large quantity of virus appear in faeces - $10^{10} - 10^{11}$ /gm

Viruses found in the GIT (2)

Found in the gut, not normally associated with gastroenteritis

Polio

Coxsackie A, B

Echo

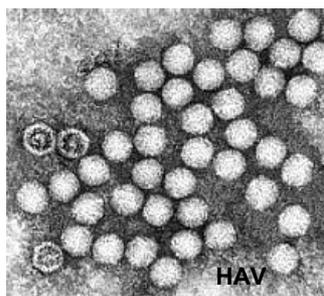
Enteroviruses 68-71

Hepatitis A, E

Adenoviruses 1-39

Reoviruses

Hepatitis A virus



- Member of the picornaviruses
 - enterovirus 72 (1 serotype)
- 27-32 nm, icosahedral non-enveloped
- heat, acid and ether stable
- grows poorly in TC

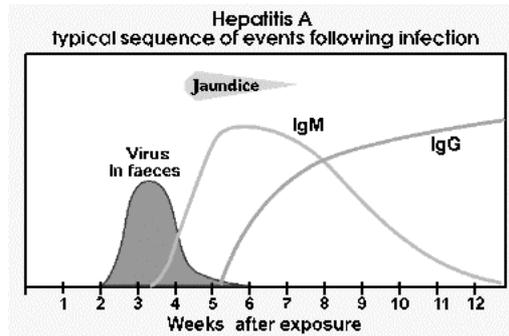
Viral genome is 7.5kb +ve sense ssRNA



VP1 is major virion surface immunogen

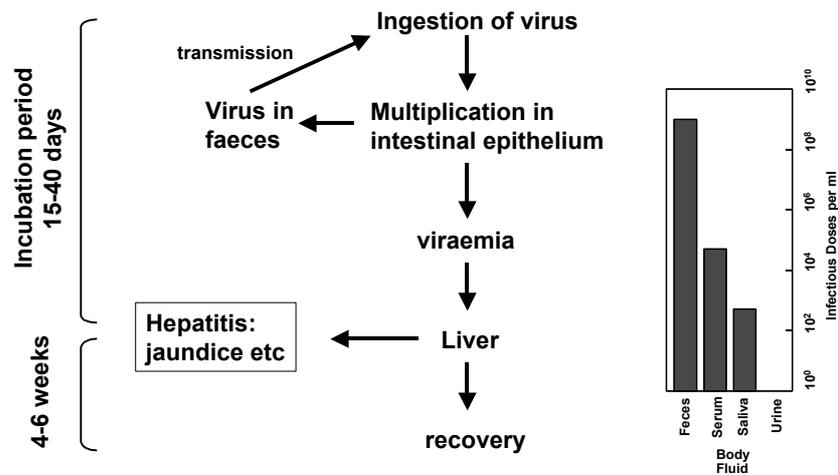
Clinical features:

- long incubation period - about 4 weeks
highest incidence of disease in adults (travellers)
mostly asymptomatic in young children
- acute onset, fever, jaundice
- virus replicates in alimentary tract
excreted in faeces for 2 weeks prior to symptoms



Pathogenesis:

- from gut epithelium virus is carried to liver in blood vessels



Geographic Distribution of HAV Infection



Patterns of Hepatitis A Virus Transmission

<u>Endemicity</u>	<u>Disease Rate</u>	<u>Peak Age of Infection</u>	<u>Transmission Patterns</u>
High	Low to High	Early childhood	Person to person; outbreaks uncommon
Moderate	High	Late childhood/ young adults	Person to person; food and waterborne outbreaks
Low	Low	Young adults	Person to person; food and waterborne outbreaks
Very low	Very low	Adults	Travelers; outbreaks uncommon

Learning objectives

- **The consequences of infection at GIT epithelial cell surfaces**
 - **distinction between localized and systemically spread infections (including representative viruses)**
- **Features and consequences of infection by rotavirus and hepatitis A**