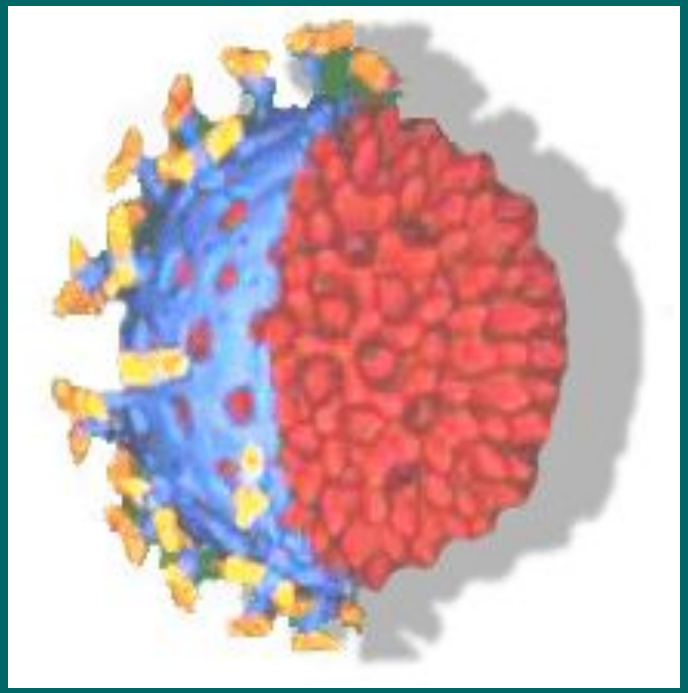
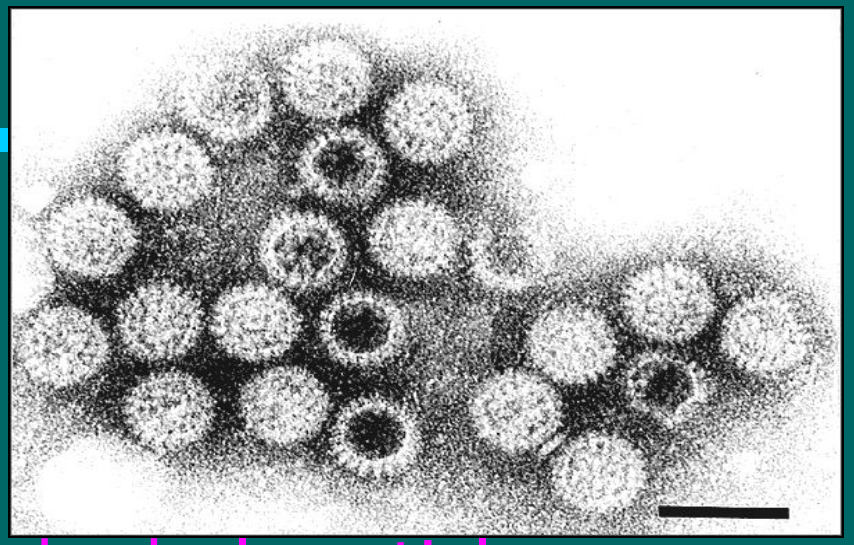
ROTAVIRUSES

by
WINDA ZULAIHA SHAHABUDIN
GROUP 24

Rotaviruses



Morphology



- Family Reoviridae
- 70-85 nm diameter
- Nearly spherical icosahedral particle
- Non-enveloped, double-shelled viruses
- Wheel-like distinct appearance under EM

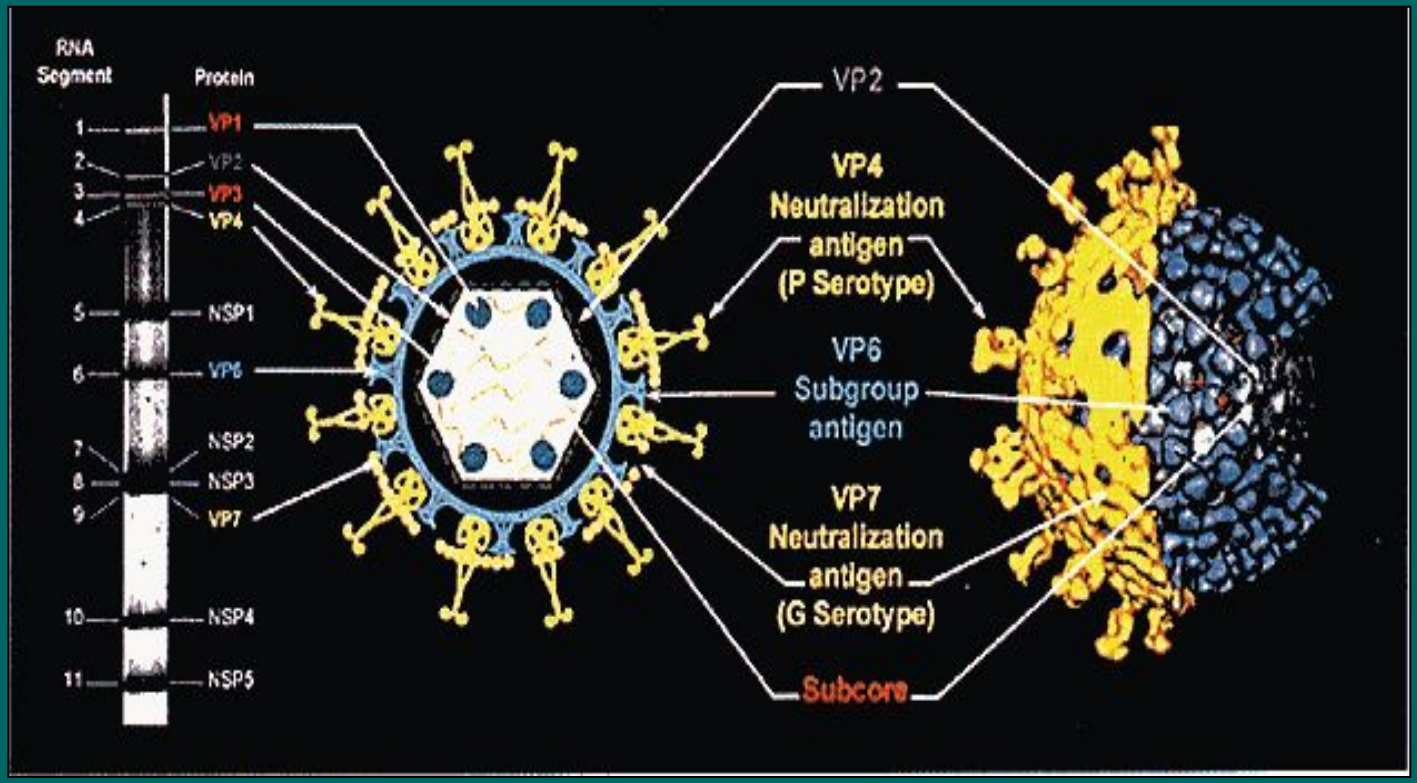
Genome

- 11 segments of double-stranded RNA

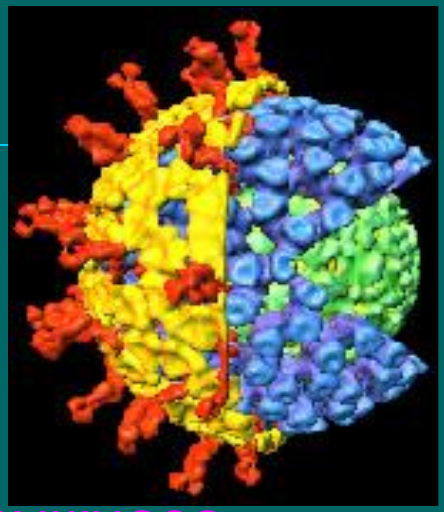
  structural viral proteins (VP):
  outer/inner capsids: VP4 and
  VP7core: VP2, VP6, VP1, VP3

- nonstructural proteins (NSP): NSP1-5

Genome

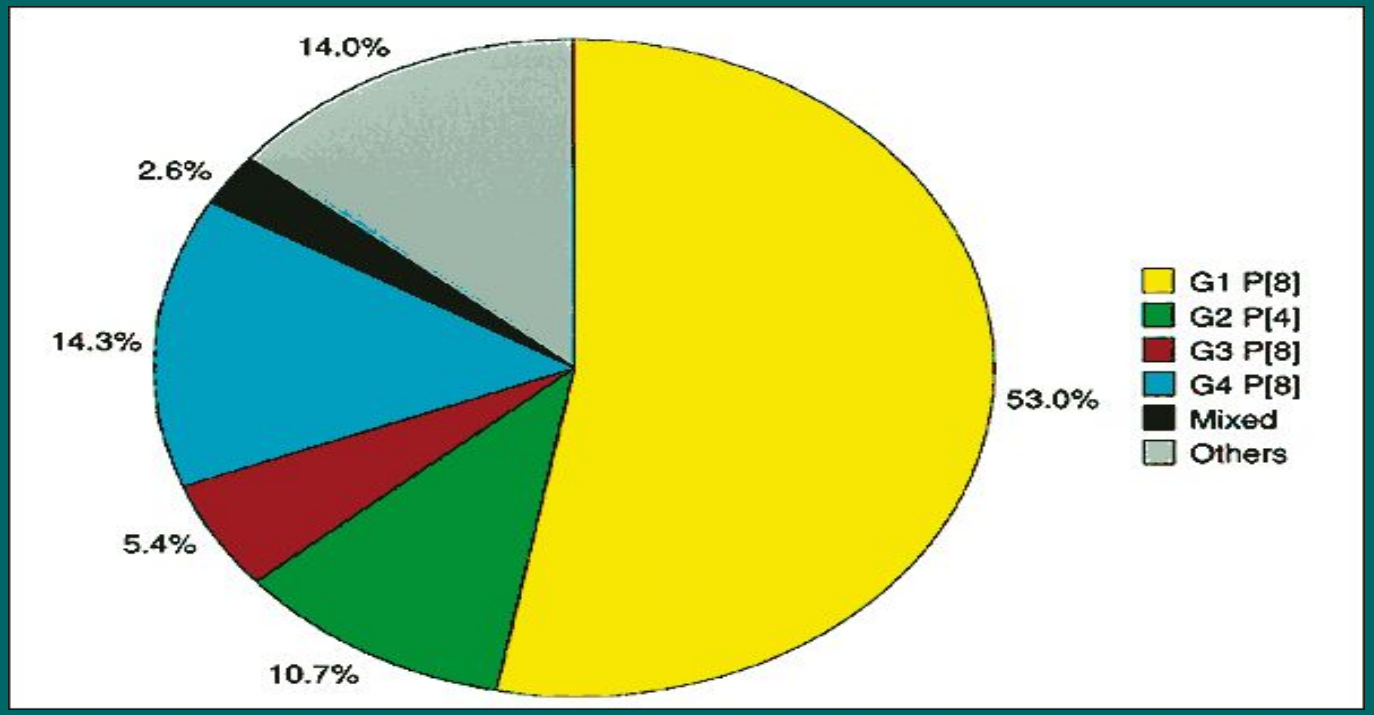

RNA Segment
Protein
1
2
3
4
5
6
7
8
9
10
11
VP1
VP2
VP3
VP4
NSP1
VP6
NSP2
NSP3
VP7
NSP4
NSP5
VP2
VP4
Neutralization
antigen
(P Serotype)
VP6
Subgroup
antigen
VP7
Neutralization
antigen
(G Serotype)
Subcore

Classification



- defined by cross-neutralization with polyclonal antibodies of antigenic specificities (glycoproteins)
- VP4 antigen: P serotype; 8 human rotaviruses
- VP7 antigen: G serotype; 10 human rotaviruses
- commonly found strains: P[8]G1; P[8]G3; P[8]G4; and P[4]G2

Classification



Distribution of rotavirus strains from a global collection of 2,748 strains. "Others" includes strains that were not typable.

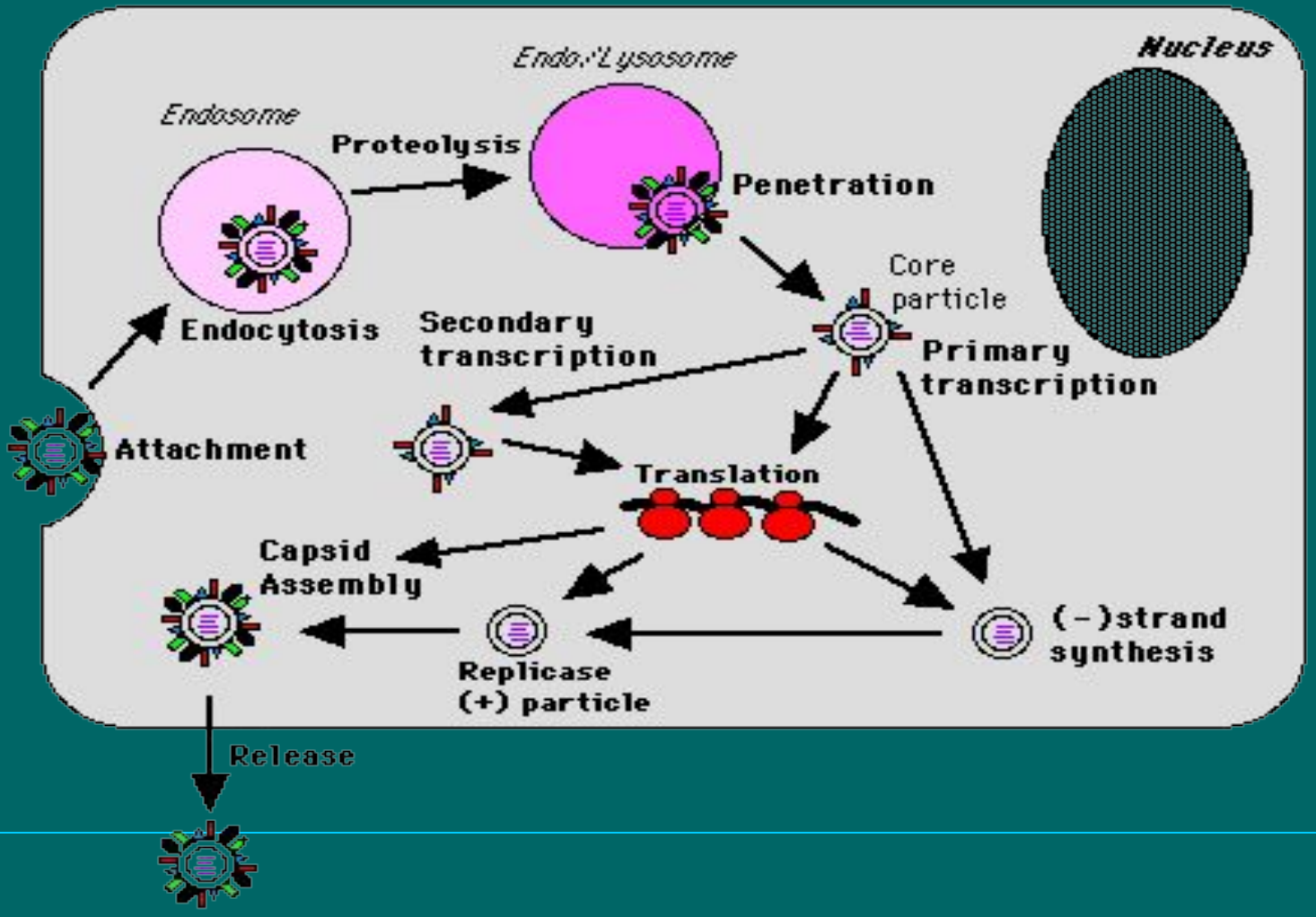
Replication

- Attached to cell receptors contained sialic acid
- Internalized and uncoated via endolysosomes
- Early transcription by viral RNA polymerase occurs inside sub-viral particle
- Resulted in synthesis of (+) mRNAs and are translated in the cytoplasm.
- Reassortment occurs during Early transcription.

Replication

- Secondary transcription occurs in cytoplasm in later infection in a conservative fashion.
- Uncapped non-polyadenylated transcripts
- Particles assemble in the cytoplasm 6-7 h after infection
- Budding from the E.R. into internal spaces & are eventually released when the cell lyses.

Replication



Pathogenesis

- infect upper two-third of duodenal epithelial cell
- infectious particles are released to intestinal lumen and undergo further replication in distal areas
- cause severe diarrhea, vomiting and abdominal pain among children
- 2 days incubation with 3-8 days watery diarrhea
- death of over 600,000 children annually worldwide

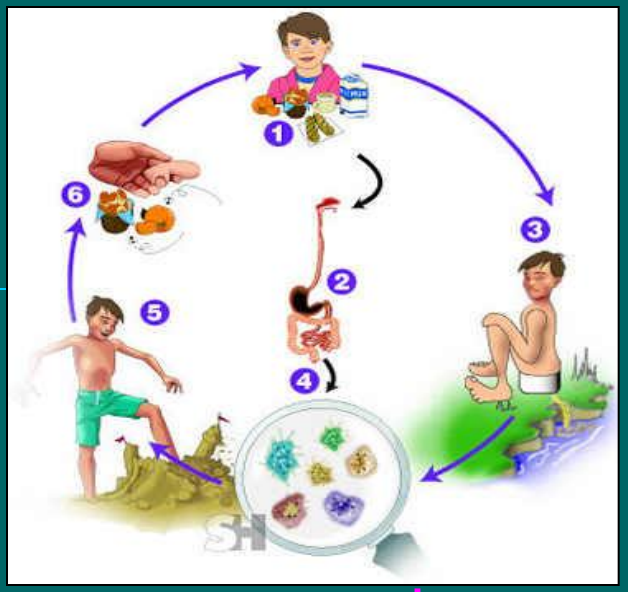
Pathogenesis

Mouse model of rotavirus infection (PAS/Alcian Blue staining)

Control small intestine

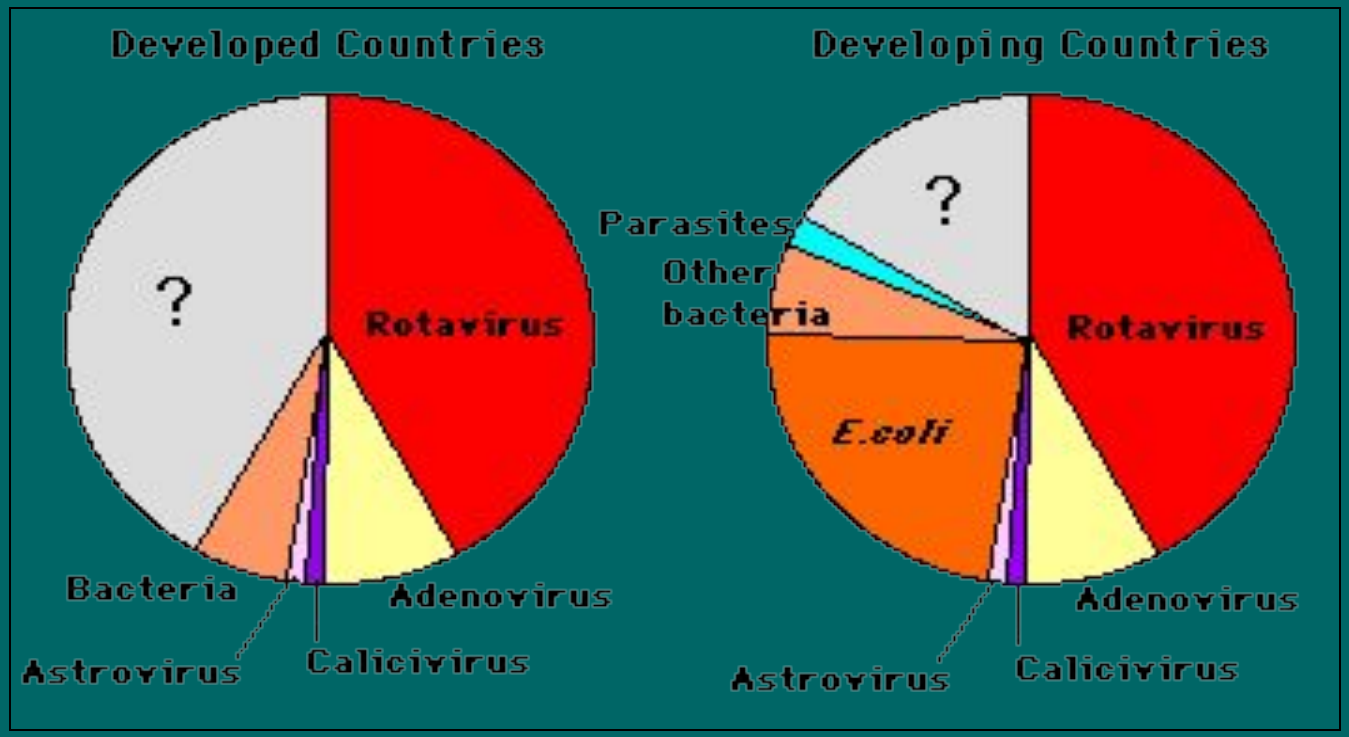
Rotavirus infected small intestine

Epidemiology



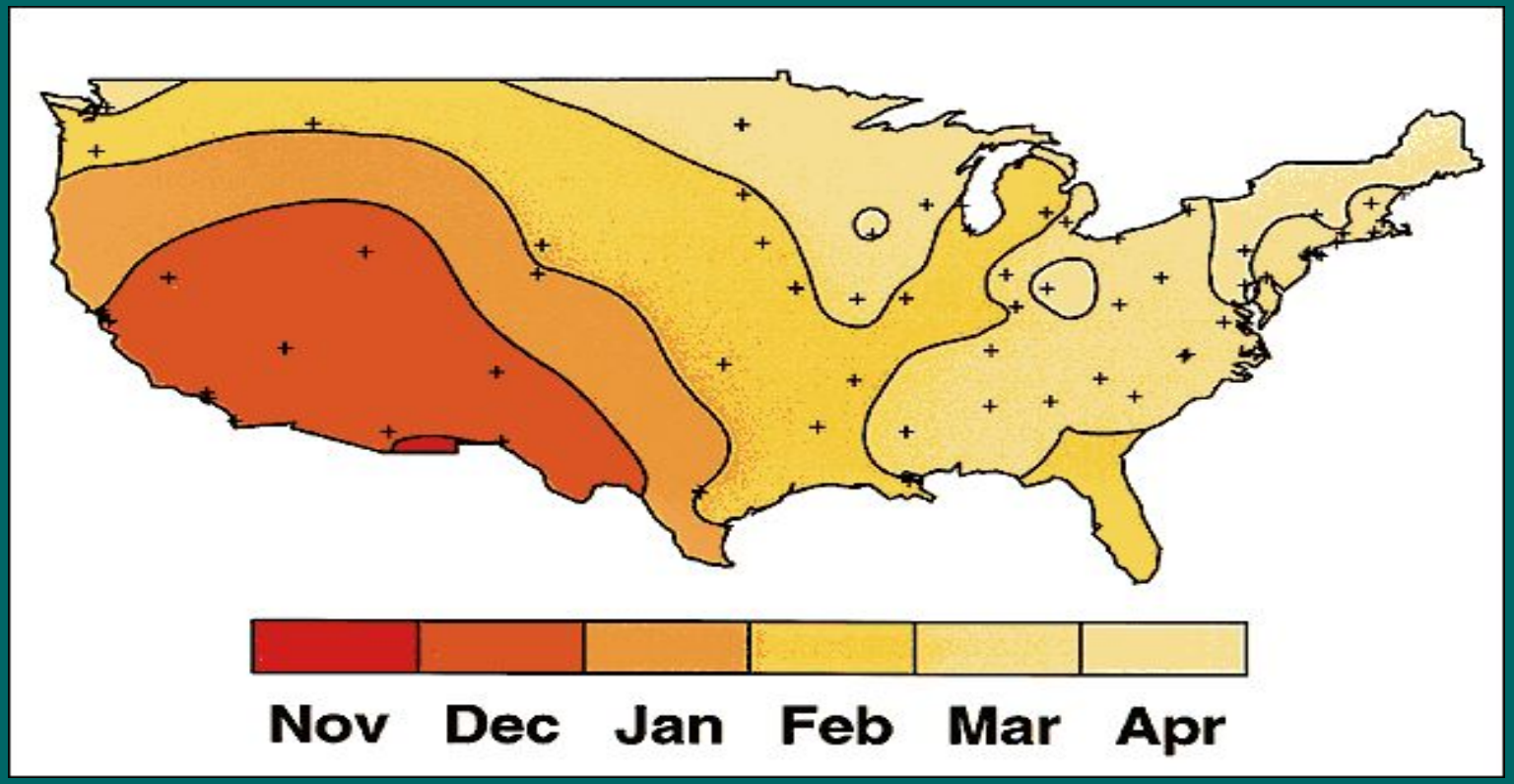
- Primary transmission mode is fecal-oral
- ingestion of contaminated food or water and contact with contaminated surfaces
- Annual epidemics occurring from November to April
- high rates of illness among infants and children below 2 years old, but mild among adults

Epidemiology



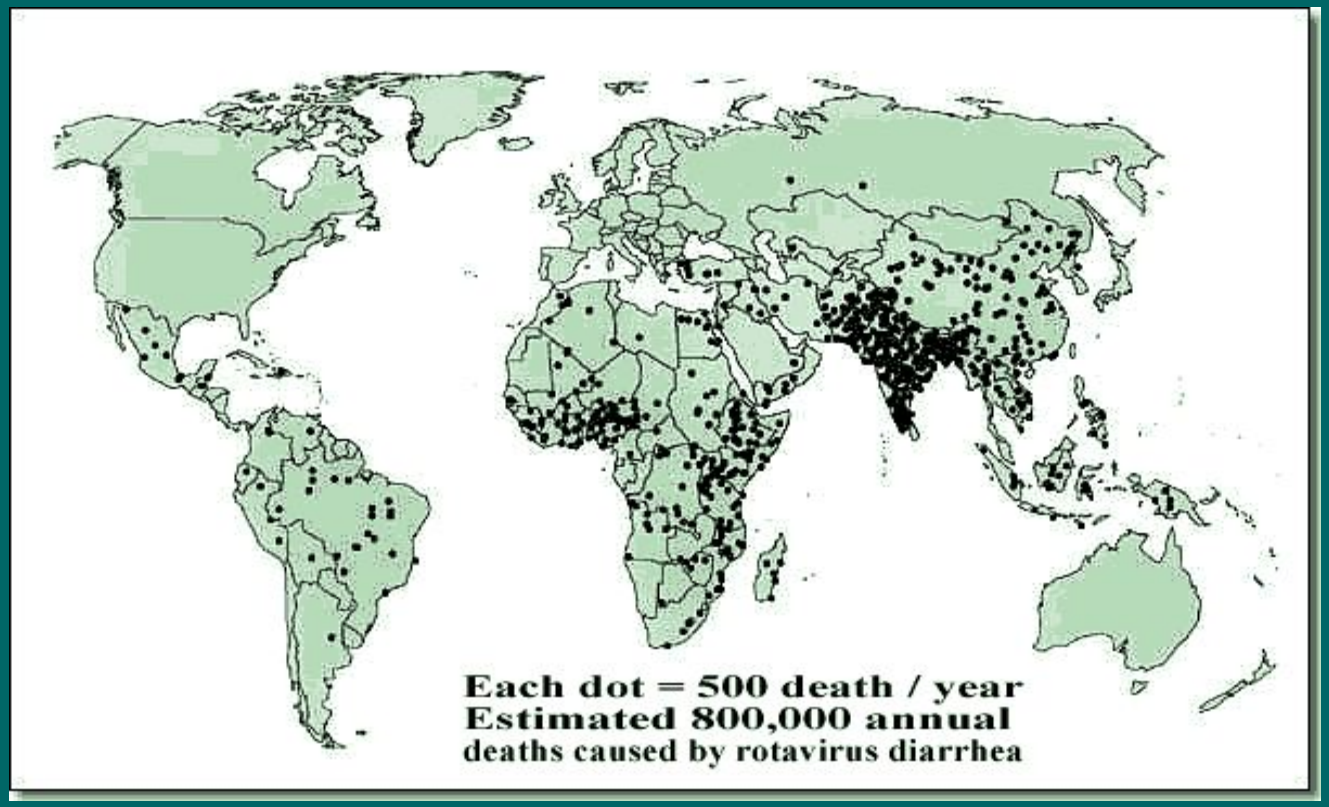
Rotavirus causes the highest level of diarrhea among developed and developing countries

Epidemiology



Average time of peak rotavirus activity
in the contiguous 48 states,
United States, July 1991 to June 1997.

Epidemiology



Estimated global distribution of the 800,000 annual deaths caused by rotavirus diarrhea.

Diagnosis and Treatment

- Antigen Enzyme Immunoassay (EIA) of stool specimens
- RT-PCR; not commonly done
- Non-specific treatment: oral rehydration therapy to prevent dehydration
- Intravenous fluid is required in severe infant cases
- Immunization by vaccines

Diagnosis and Treatment

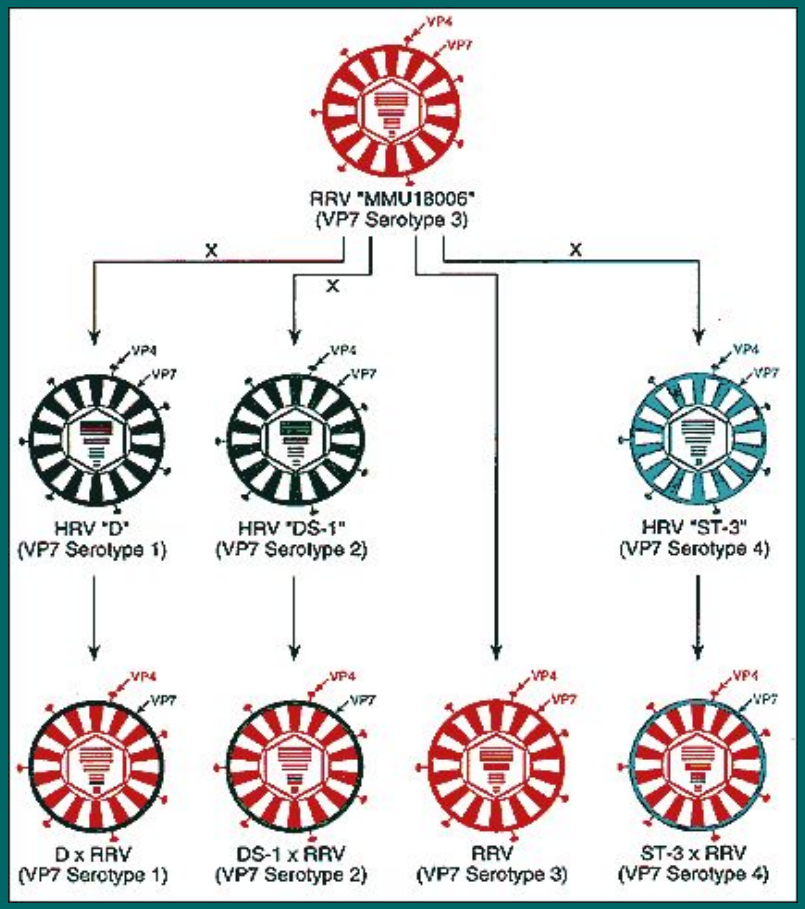
A Doctor Examining a Dehydrated Child

Rotavirus vaccine

- Monovalent Vaccines
  - Live attenuated vaccine derived from nonhuman host rotaviruses such as bovine and rhesus

- Reassortant Vaccines
  - animal-human reassortants expressing VP7 proteins used as immunogens such as rhesus-human reassortant or bovine-human reassortant vaccines

Rotavirus vaccine



- Production of reassortant tetravalent vaccine with VP7 serotype 1-4 specificity
- co-infection of RRV with HRV serotype 1,2, and 3
- safe and immunogenic

PREVENTION

- **CDC program**

1) Hand washing

2) Proper sanitation

3) Safe drinking water and food

"Boil it, cook it, peel it, or forget it"