Anbar University

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Biotechnology Department

RNA non-enveloped viruses

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Virology, Stephen N.J. Korsman, Gert U. van Zyl, ... Wolfgang Preiser 2012

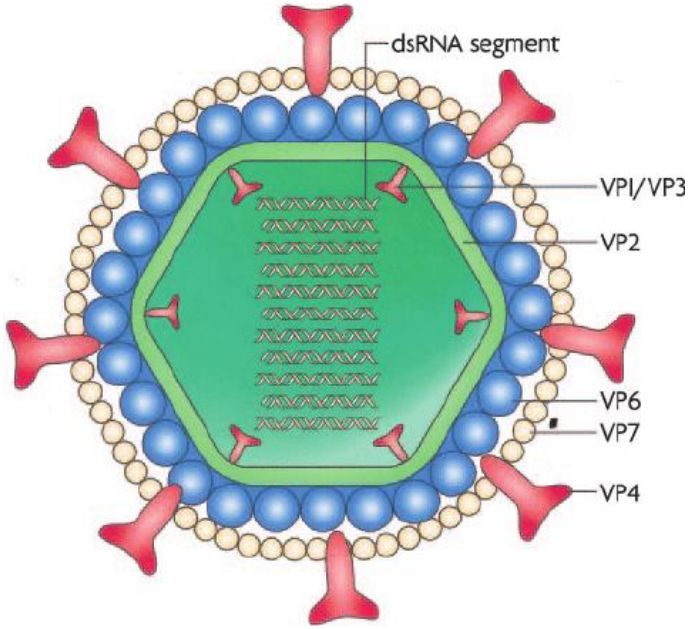
Jawetz Melnick & Adelbergs Medical Microbiology, Stefan Riedel (Author), Stephen Morse (Author), Timothy Mietzner (Author), Steve Miller.

Viruses, Pandemics, and Immunity, By Arup K. Chakraborty and Andrey S. Shaw

RNA non envelope viruses

Rotavirus

- Icosahedral, 60–80 nm in diameter, double capsid shell
- Composition: RNA (15%), protein (85%)
- Genome: Double-stranded RNA, linear, segmented.
- Proteins: there are structural proteins; core contains several enzymes
- Envelope: None (transient pseudoenvelope is present during rotavirus particle morphogenesis)
- Replication: Cytoplasm; virions not completely uncoated
- has hemagglutinin activity



Replication

Viral particles attach to specific receptors on the cell surface. The cell attachment protein for the virus is the viral hemagglutinin, which is a minor component of the outer capsid. After attachment and penetration, uncoating of virus particles occurs in lysosomes in the cell cytoplasm. Only the outer shell of the virus is removed, and a core-associated RNA transcriptase is activated. This transcriptase transcribes mRNA molecules from the minus strand of each genome double-stranded RNA. Rotavirus cores contain all enzymes necessary for transcribing, capping, and extruding the mRNAs from the core, leaving the double-stranded RNA genome segments inside. After being extruded from the core, the mRNAs are translated into primary gene products. Some of the full length transcripts are encapsidated to form immaturvirus particles.

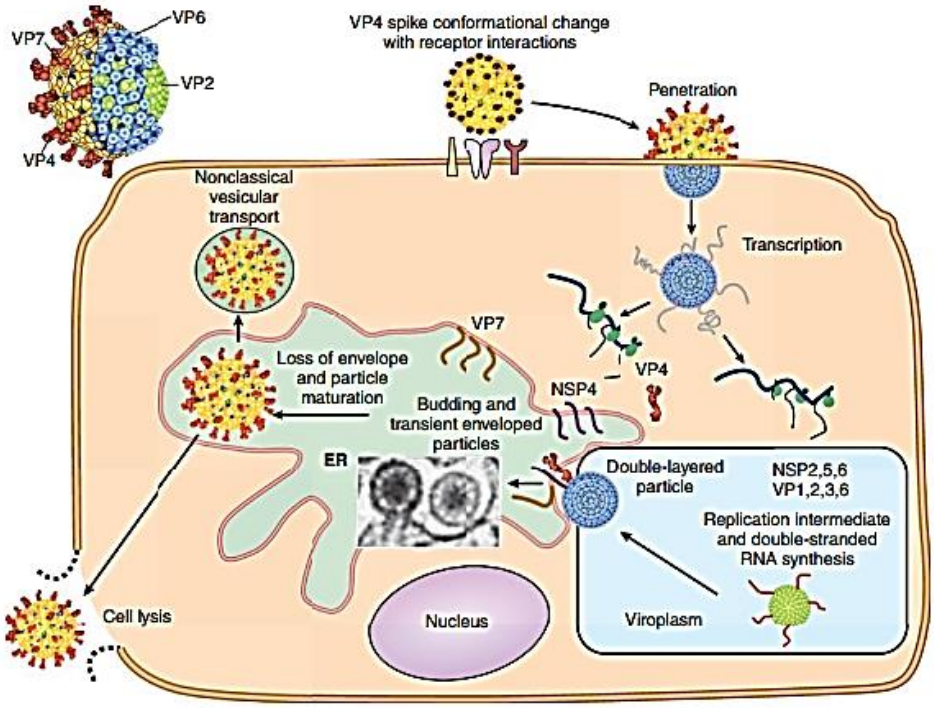
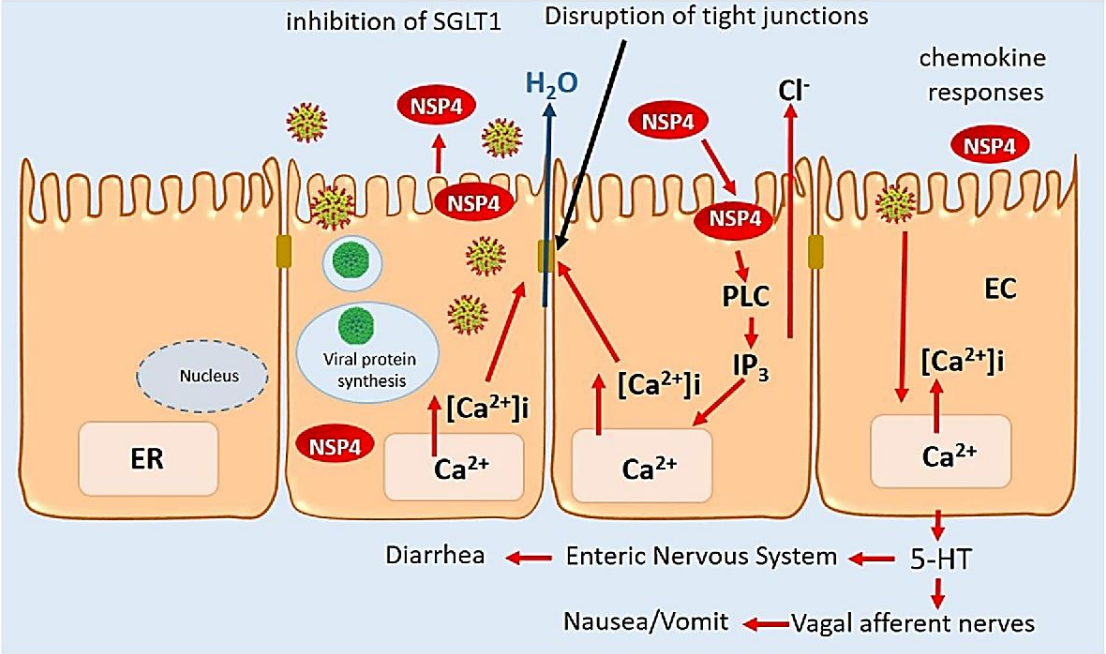


FIGURE 37-3 Overview of the rotavirus replication cycle. ER, endoplasmic reticulum. (Courtesy of MK Estes.)

Pathogenesis

They produce inclusion bodies in the cytoplasm in which virus particles are found. Rotaviruses are a major cause of diarrheal illness in human, infants and young animals, including calves and piglets. Infections in adult humans and animals are also common. Among the rotaviruses are the agents of human infantile Diarrhea.

Rotaviruses infect cells in the villi of the small intestine (gastric and colonic mucosa are spared). They multiply in the cytoplasm of enterocytes and damage their transport mechanisms. Damaged cells may slough into the lumen of the intestine and release large quantities of virus, which appear in the stool (up to 1012 particles per gram of feces). Viral excretion usually lasts from 2 to 12 days in otherwise healthy patients but may be prolonged in those with poor nutrition and immunocompromised patients. Diarrhea caused by rotaviruses may also be due to decrease sodium and glucose absorption as damaged cells on villi are replaced by non-absorbing immature cells. It may take from 3 to 8 weeks for normal function to be restored.



Virus entry, formation of viroplasms and replication, and release of virions and viral proteins such as NSP4; this protein mobilizes intracellular calcium from endoplasmic reticulum (ER). Released NSP4 affects uninfected cells, resulting in mobilization of intracellular calcium that activates chloride secretion.

Lab diagnosis

Rotavirus can be detected in stool specimens from children with gastroenteritis by several techniques, including antigen detection assays, reverse transcription polymerase chain reaction (RT-PCR), and virus isolation.