



Rotavirus (RV)

Rotavirus diarrhoea

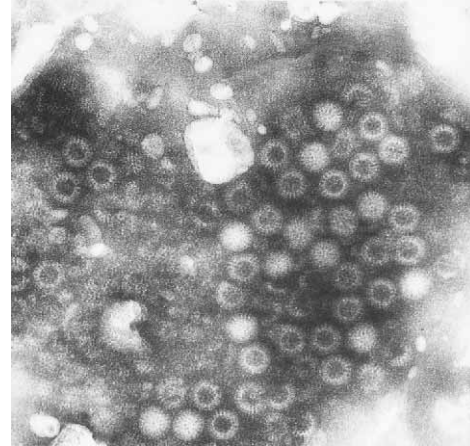
- Rotaviruses are the major agents causing endemic and epidemic diarrhea in young children in both developed and developing countries.
- In India, approximately 30% of hospitalised diarrhea cases are caused by rotaviruses.
- Rotavirus diarrhea is most common in children 6-24 months of age.
- Rotavirus infections display seasonal pattern with peak incidence in winter.
- Risk factors are overcrowding and malnutrition.
- Rotaviruses are transmitted by feco-oral route through contaminated environment. Respiratory route of transmission through aerosols is also suggested.



Close proximity with RV infected animals may facilitate transmission between humans and animals.

Clinical features

Low grade fever, vomiting, watery diarrhea, dehydration, and irritability. Tachycardia and shock, resulting in ischemic injury to the kidneys and CNS are rare complications.



The virus

Rotaviruses belong to family *Reoviridae*, genus *Rotavirus*. The virus measures 70nm in diameter. It has 3 shells, an outer capsid, inner capsid and core which surrounds 11 segments of double stranded RNA, 6 of which encode for 6 structural proteins (VP1-VP4, VP6, VP7) and the remaining 5 encode for non-structural proteins (NSP 1-5).

Groups / Serotypes

The rotaviruses are divided in seven groups A,B,C (human and animal viruses) and D,E,F,G (animal viruses). Group A rotaviruses are the most frequently identified pathogens.

Based on structural glycoprotein VP7, group A rotaviruses are classified in 15 G serotypes/genotypes. Based on protease sensitive protein VP4, these are classified in more than 20 P types.

Diagnosis

Detection of virus/antigen/RNA

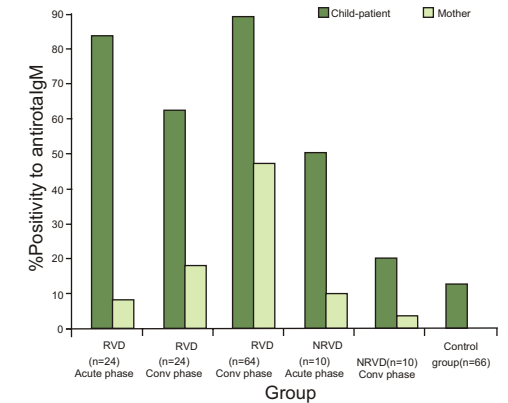
- Immune Electron Microscopy detects the full virus particles.
- ELISA detects VP6 protein of rotavirus.
- RNA-PAGE differentiates groups of rotaviruses on the basis of electrophoretic RNA migration pattern.
- RT-PCR detects viral RNA.

Detection of anti-rotavirus antibodies

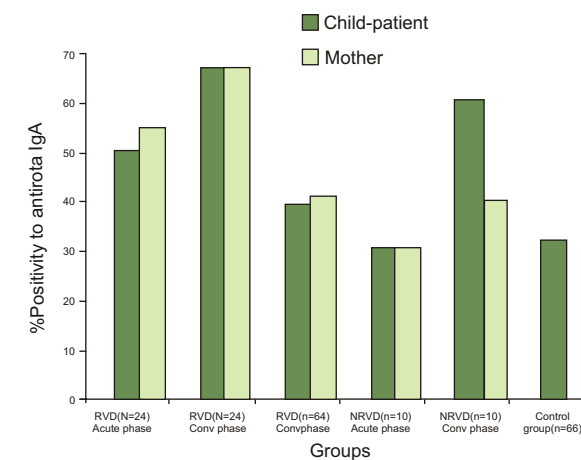
Class-specific immunoglobulin capture ELISA detects anti-rotavirus IgM and IgA antibodies.

Indirect ELISA detects anti-rotavirus IgG antibodies.

Comparative prevalence of anti-rotavirus IgM antibodies in mother-child pairs



Comparative prevalence of anti-rotavirus IgA antibodies in mother-child pairs

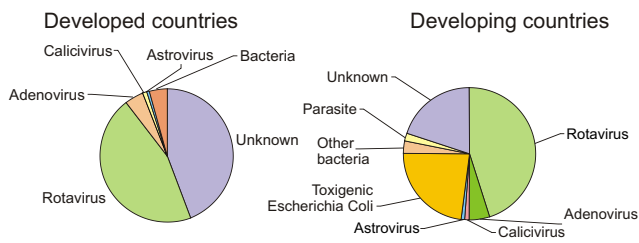


NIV has developed and standardized a new rapid ELISA test for detection of group A rotaviruses. The test is routinely used for providing diagnosis of referred cases of diarrhea. Class specific immunoglobulin capture ELISA has also been developed and used for comparison of maternal and infant anti-rotavirus antibodies.

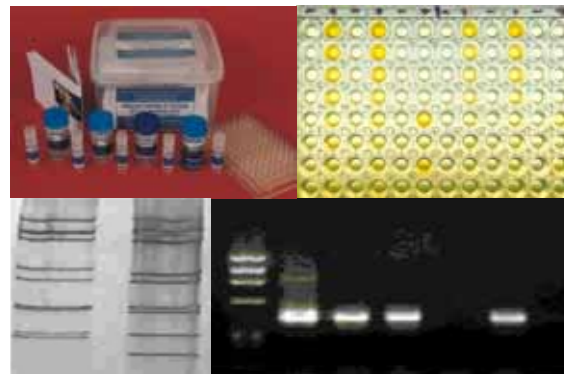
Neutralization test

The test has been developed to detect neutralizing antibodies to different rotavirus serotypes among children with severe rotavirus diarrhea and their mothers. Studies based on this assay indicated that low titers of serotype specific NABs among the mothers render the newborns susceptible to RV infection, apparently due to insufficient transfer of maternal antibodies.

Estimated proportion of etiologic agents causing severe diarrhea in infants and young children

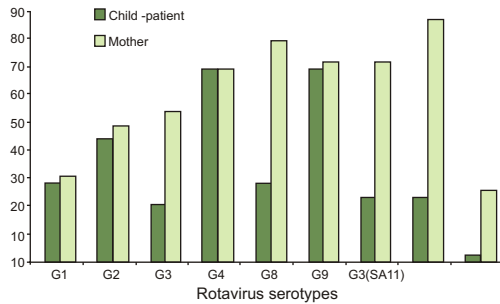


ELISA



Molecular diagnosis

Comparative prevalence of rotavirus neutralizing antibodies (NAb) in mother-child pairs



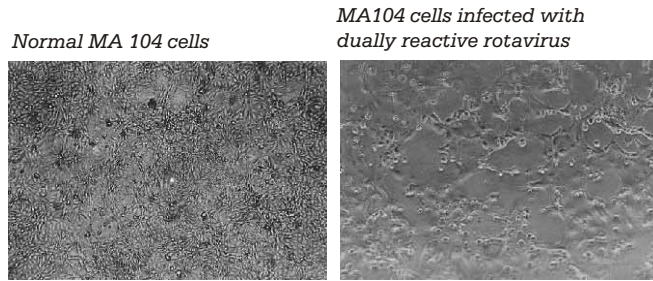
Isolation of rotaviruses in tissue culture

At NIV, Pune, several rotavirus isolates of human, simian and bovine origin have been obtained in tissue culture system.

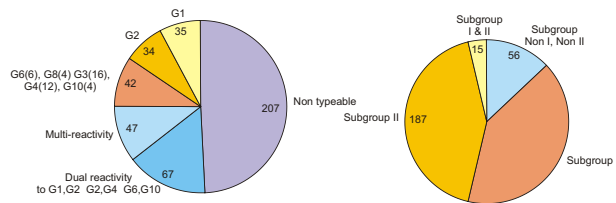
- Ten rotavirus isolates dually reactive with G1-G2 and G2-G4 were obtained in tissue culture from rotavirus positive fecal specimens.
- Four isolates of G6 rotavirus serotype were from multi-reactive specimens. G6 serotypes are normally associated with cattle.
- Six isolates from non-typeable fecal specimens characterized by ELISA/NAb assay/RT-PCR as rotavirus group A G9 serotype.

Epidemiology

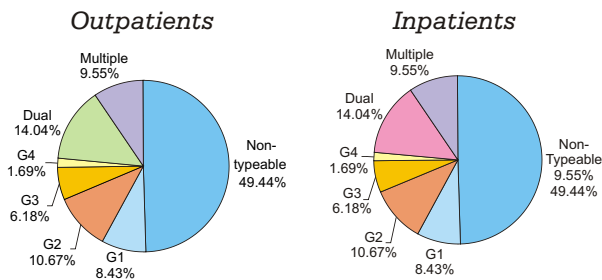
Rotavirus sub grouping was done on 432 group-A rotavirus positive fecal samples collected in Pune from October 1990 to December 1997.



Proportion of subgroups (SG) I and II strains was similar (40%-43%). No reactivity with SG I and II MAbs in 13%; dual reactivity in 3.5% cases was observed. SG I and II strains usually circulate simultaneously. Serotyping of same samples revealed G1-G4 in 22.5%; G6,G8 and G10 in 3.2%, dual reactivity in 15.5% (G6, G10/G1, G2/G2, G4), multireactivity in 10.8%, and non-typeable in 48%.

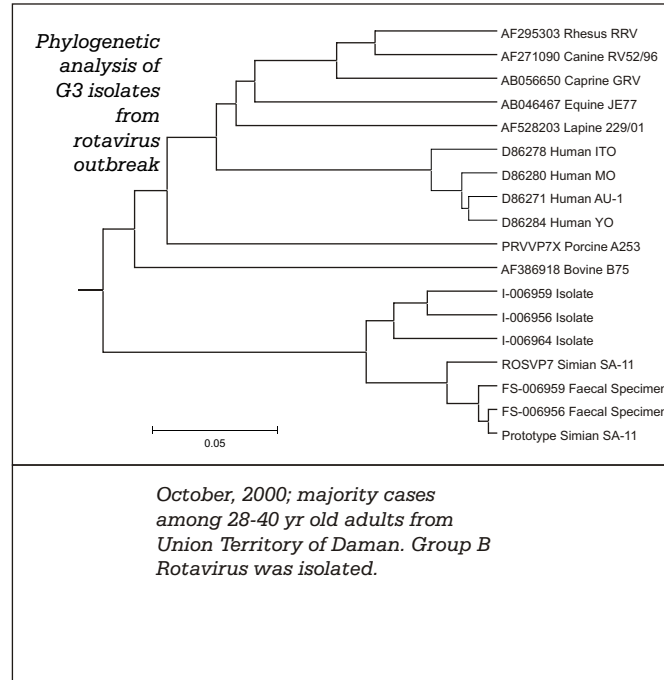


The major RV serotype among outpatients from Pune from October 1993 to September 1996 was G2. RV serotypes G1, G2, G3 accounted for hospitalised patients.



Outbreaks of rotaviral diarrhea

An outbreak in December 2000, among 6-24 month old children from tribal population residing in Jawahar, Thane district was investigated. Serotype G3 (simian SA-11 like) Group A rotavirus was isolated.



Development of goat colostrum for passive immunization

- Colostrum from cows immunized with rotavirus antigen is known to be clinically effective in reducing the duration and severity of childhood diarrhea due to rotavirus.
- At NIV, Pune, hyper immune goat colostrum was prepared against rotaviruses, which can be used to induce passive immunity among children.

- The results of a small scale clinical trial conducted using the immune colostrum were encouraging.
- Goat colostrum can be used for treatment during rotavirus diarrhoea.
- It also serves as an enriched food for babies.

Active immunization

Though effective vaccine is not available, efforts to develop live attenuated, oral vaccines for human rotavirus diarrhea are ongoing worldwide. This has resulted in identifying five probable candidates - bovine, rhesus, bovine-human reassortant, rhesus-human reassortant and nursery strain vaccines.

Treatment

Conventional treatment for diarrhea is oral rehydration therapy, such as diluted milk, ricewater (Kanji) salt and sugar solution (Sarbat), weak tea, soup (Dal).

Thrust areas

- Surveillance of rotavirus disease and strains in children and adults.
- Molecular characterization of the unusual rotavirus strains.
- Development of strategies for passive immunization in human.

Patents

- An Indian patent for ELISA - based rotavirus diagnostic technology obtained.
- US Patent filed for the technology for the preparation of immune goat colostrum against rotavirus.