

ROTAVIRUS INFECTIONS

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Since 1973, rotavirus has been recognized as the most common agent causing epidemic diarrhea, a disease associated with considerable morbidity and mortality. Rotaviruses are non-enveloped RNA viruses in the family *Reoviridae*.

Epidemiology

Rotavirus is the most common cause of severe gastroenteritis in infants and young children in the United States. Group A rotavirus is the most common cause of childhood diarrhea worldwide, infecting more than 90% of children by three years of age.

Transmission is via the fecal-oral route, so widespread infections are common in day care centers. Rotaviruses are shed in high concentrations in the stools of infected children and are transmitted by the fecal-oral route, both through close person-to-person contact and through fomites. Clinical rotavirus disease can be accompanied by shedding of greater than 10^{12} (1,000 billion) rotavirus particles/gm feces. Rotaviruses also might be transmitted by other modes, such as respiratory droplets. In the U.S., rotavirus causes seasonal peaks of gastroenteritis from November to May each year.

The infectious dose is extremely small, as low as one viral particle.

Every year, an estimated 3.0 million to 3.2 million children worldwide die as a result of severe diarrhea. Rotavirus appears to be responsible for approximately 5% to 10% of all diarrheal episodes among children younger than five years of age in the U.S., and for a much higher proportion of severe diarrheal episodes.

Although rotavirus gastroenteritis results in relatively few deaths in Louisiana per year among children younger than five years of age, it accounts for more than 8,000 physician visits and approximately 800 hospitalizations each year among children in this age group. Rotavirus is responsible for 30% to 50% of all hospitalizations for diarrheal disease among children younger than five years of age, and more than 50% of hospitalizations for diarrheal disease during the seasonal peaks. Among children younger than five years of age in the U.S., 72% of rotavirus hospitalizations occur during the first two years of life, and 90% occur by three years of age.

Virtually all children become infected in the first three to five years of life, but severe diarrhea and dehydration occur primarily among children aged three to 35 months.

Limited data suggest that children from disadvantaged socioeconomic backgrounds and premature infants have an increased risk for hospitalization from diarrheal disease, including rotavirus diarrhea. In addition, some children and adults who are immunocompromised because of congenital immunodeficiency, hematopoietic transplantation, or solid organ transplantation experience severe, prolonged, and sometimes fatal rotavirus diarrhea.

Although the role of rotavirus in diarrhea outbreaks in adults has not been well studied, it has been documented as the cause of adult diarrheal outbreaks in hospitals, nursing homes, isolated communities, and in travelers. Also, parents of children infected with rotavirus have been reported to experience acute gastroenteritis.

Rotavirus is also an important cause of nosocomial gastroenteritis.

Among adults in the U.S, rotavirus infection infrequently causes diarrhea in travelers, persons caring for children with rotavirus diarrhea, and the elderly.

The incubation period is from one to three days.

Clinical Description

The spectrum of rotavirus illness ranges from mild, watery diarrhea of limited duration to severe, dehydrating diarrhea with vomiting and fever, which results in death.

Because diarrhea is hardly a pathognomonic symptom of rotavirus or any other infection in children, and treatment is generally supportive, testing for rotavirus is not part of a routine diagnostic work-up.

Laboratory Tests

The most available method is antigen detection by enzyme immunoassay directed at a group antigen common to all Group A rotaviruses. Several commercial enzyme immunoassay test kits are available that are inexpensive, easy to use, rapid, and highly sensitive (approximately 90% compared with detection by electron microscopy); these properties make rapid antigen detection kits suitable for use in rotavirus surveillance systems.

Other techniques including electron microscopy, reverse transcription-polymerase chain reaction (RT-PCR), nucleic acid hybridization, polyacrylamide gel electrophoresis, and culture are used primarily in research settings.

Serologic methods that detect a rise in serum antibodies, primarily enzyme immunoassay for rotavirus serum immunoglobulin G (IgG) and immunoglobulin A (IgA) antibodies, have been used to confirm recent infections.

Surveillance

Rotavirus infection is not a reportable infection. Outbreaks of gastro-illnesses are reportable.

Case Definition

In the course of an outbreak investigation a case definition is established. A case of rotavirus is an illness characterized by watery diarrhea, (severe) vomiting, fever, and is laboratory confirmed or epidemiologically linked to a laboratory confirmed case.

Immunization

A vaccine to prevent rotavirus infection and disease is not available. The rhesus rotavirus tetravalent vaccine (Rotashield®) approved by the U.S. Food and Drug Administration in August 1998 and incorporated into the 1999 routine immunization schedule is no longer recommended for use because of the association of this vaccine and intussusception. This product was withdrawn voluntarily from the market in October 1999. Children who received rotavirus vaccine during the period of approval are not at increased risk for development of intussusception in the future.

Hospital precaution and isolation: Standard precautions.

Since the transmission is fecal-oral, only contact precautions are needed. Alcohol-based hand rubs are acceptable. Indirect transmission may occur with hands, fomites, air, water, and food.

Some facilities insist on donning masks. If they're donning masks, it will probably distract from the overall necessity of hand hygiene and waste their PPE.

In case of an outbreak, in addition to hand hygiene, it is useful to cohort the children in one area and have one dedicated nurse on each shift manage the care of the sick infants to prevent further person-to-person transmission.

Cleaning and disinfection are also important: "Prolonged survival of rotavirus on environmental surfaces (90 minutes to more than 10 days at room temperature), and hands (more than four hours), has been demonstrated. Rotavirus suspended in feces can survive longer. Products with demonstrated efficacy (more than 3 log₁₀ reduction in virus) against rotavirus within one minute include: 95% ethanol, 70% isopropanol, some phenolics, 2% glutaraldehyde, 0.35% peracetic acid, and some quaternary ammonium compounds." Whichever disinfectant is chosen should be EPA-approved.

All nurses need to have education surrounding Rotavirus. Many educational materials are available on the web.