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Rotavirus Gastroenteritis

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Description

The most prevalent cause of severe diarrhoea in newborns and young children is rotavirus gastroenteritis. Rotavirus is a genus of double-stranded RNA viruses that belongs to the Reoviridae family. Almost every child in the world has been infected with rotavirus at least once by the age of five. Immunity builds with each infection, making subsequent infections less severe; adults are rarely affected. There are five different types of this virus: A, B, C, D, and E. The most common rotavirus, Rotavirus A, is responsible for more than 90% of human infections.

The virus is spread by the feces-oral pathway. It causes gastroenteritis by infecting and damaging the cells that lining the small intestine (which is often called "stomach flu" despite having no relation to influenza). Despite the fact that rotavirus was identified in 1973 and is responsible for up to 50% of hospitalizations for severe diarrhoea in infants and children, its significance is still underappreciated in the public health community, particularly in developing nations. Rotavirus not only affects human health, but it also infects animals and is a livestock pathogen. Despite the fact that rotavirus is normally a manageable childhood disease, about 500,000 children under the age of five die each year from rotavirus infection, and almost two million more become extremely unwell.

In the United States, rotavirus caused roughly 2.7 million episodes of severe gastroenteritis in children, about 60,000 hospitalizations, and around 37 deaths each year before the rotavirus immunisation programme was implemented. To tackle rotavirus, public health programmes include oral rehydration therapy for affected children and vaccination to prevent the sickness. In nations where rotavirus vaccine has been included to normal childhood vaccination regimens, the incidence and severity of rotavirus illnesses has decreased dramatically. Vomiting, watery diarrhoea, and a low-grade fever are symptoms of rotavirus gastroenteritis, which can range from mild to severe. After a child is infected with the virus, there is a two-day incubation period before symptoms show. Vomiting is generally the first symptom, followed by severe diarrhoea after at least four days. [1-5]

Dehydration is more common in rotavirus infections than in most bacterial pathogen infections, and it is the leading cause of death in rotavirus infections. Rotavirus Infections can happen at any time in one's life; the first usually causes symptoms, but subsequent infections are usually mild or asymptomatic since the immune system protects you. As a result, symptomatic infection rates are highest in children under the age of two and gradually decline as they approach 45 years of age. Although infections in newborn children are prevalent, they are frequently linked with mild or asymptomatic disease; the most severe symptoms are seen in children aged six months to two years, the elderly, and those with impaired or missing immune systems. Most adults are immune to rotavirus because of childhood immunity; gastroenteritis in adults is usually caused by something other than rotavirus, but asymptomatic infections in adults may continue infectious transmission in the community.

Rotavirus is spread by the feces-oral route, as well as through contact with contaminated hands, surfaces, and objects, and probably through the respiratory route. Infected people's faeces can contain more than 10 trillion infectious particles per gramme; just about 100 of these are needed to infect another person. Rotaviruses are stable in the environment, with levels as high as 1–5 infectious particles per US gallon reported in estuary samples. Because the frequency of rotavirus infection is equal in nations with high and low health standards, sanitary measures appropriate for eradicating germs and parasites appear to be useless in controlling rotavirus. Rotavirus is classified into five types: A, B, C, D, and E. Species A infects the majority of humans. Other animals are infected by all five kinds. There are several strains of rotavirus A known as serotypes.

A dual classification method is utilised, similar to the influenza virus, based on two proteins on the virus's surface. G serotypes are defined by the glycoprotein VP7, while P serotypes are defined by the protease-sensitive protein VP4. Different combinations are found because the two genes that determine G-types and P-types can be passed on individually to progeny viruses. Rotaviruses reproduce mostly in the gut and infect enterocytes in the villi of the small intestine, causing epithelial morphological and functional alterations. The triple protein coatings protect them from the stomach's acidic pH and digesting enzymes in the intestine. The virus enters cells through receptor-mediated endocytosis and forms an endosome, a vesicle. Proteins in the third layer (VP7 and the VP4 spike) disrupt the endosome membrane, causing a calcium concentration differential. The VP7 trimers are broken down into single protein subunits, leaving the VP2 and VP6 protein coatings around the viral dsRNA, resulting in a double-layered particle (DLP). The eleven dsRNA strands are protected by the two protein shells, and the viral RNA-dependent RNA polymerase converts the double-stranded viral genome into mRNA transcripts.

The viral RNA avoids innate host defence responses called RNA interference, which are activated by the presence of double-stranded RNA, by remaining in the core. Rotavirus creates mRNA for both protein production and gene replication during infection. The majority of rotavirus proteins are found in the viroplasm, which is also where the RNA is duplicated and the DLPs are built. Viroplasm forms around the cell nucleus as soon as two hours after virus infection and is made up of viral factories that are hypothesised to be generated by two viral nonstructural proteins: NSP5 and NSP2. When NSP5 is inhibited by RNA interference, rotavirus replication is drastically reduced. DLPs migrate to the endoplasmic reticulum, where they get their third and final layer (formed by VP7 and VP4). By lysis, the offspring viruses are expelled from the cell.

Conflict of Interest

None.

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