



NICED LIBRARY NEWSLETTER

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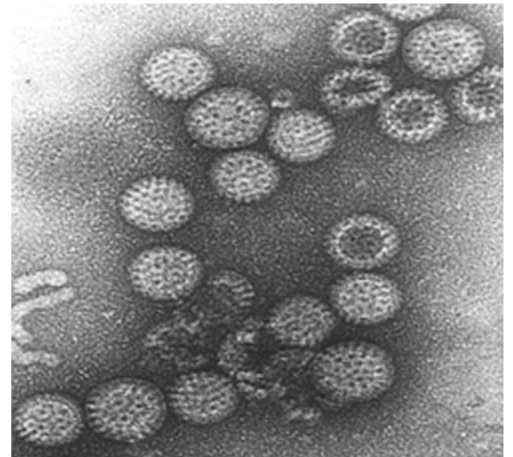
Brief Introduction to Rotavirus: A Major Cause of Childhood Diarrhea

Introduction: No medical condition can demonstrate the health and economic disparity between countries and populations in the current era of globalization better than the diarrheal diseases and gastro-intestinal infections. There is a strong relationship between poverty, unhygienic environment and the number and severity of diarrheal episodes. Despite much progress in the understanding of pathogenesis and of disease management by widespread use of oral rehydration therapies (ORT), diarrheal illness still remains one of the most important causes of global childhood mortality and morbidity.

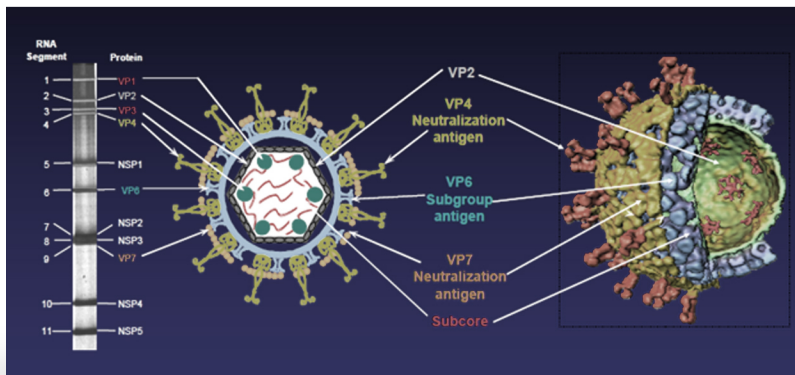
Among children, rotavirus is solely responsible for overall 114 million episodes of gastroenteritis requiring only home care, 24 million clinic visits, and 2.4 million hospitalizations¹. It is estimated that every child in the world gets infected by rotavirus at least once, though death toll of around 611,000 per year, occurs predominantly in the resource poor settings of Africa and Asia due to inadequate health care facilities.

Structural organization: Rotavirus is a double-stranded RNA virus belonging to the family Reoviridae. In 1973, Ruth Bishop and colleagues discovered virus particles within epithelial cells in the duodenal mucosa of children with acute non-bacterial gastroenteritis. In 1974, these viral particles, owing to their wheel-like ('rota' in Latin) appearances under electron microscope, were named rotavirus by Thomas Henry Flewett. The name, however, was officially recognized by the International Committee on Taxonomy of Viruses four years later.

There are eight species of this virus, referred to as A, B, C, D, E, F, G and H among which group A rotavirus (GARV) causes more than 90% of rotavirus infections in humans. The genome of rotavirus consists of 11 unique double helix molecules of RNA. Each helix, or segment, is a gene, numbered 1 to 11 by decreasing size. Each gene codes for one protein, except the gene 9, which codes for two. Altogether, rotavirus genome codes for six structural (VP1-VP4, VP6 and VP7) and six non-structural proteins (NSP1-NSP6). The RNA is surrounded by a three-layered icosahedral protein capsid.



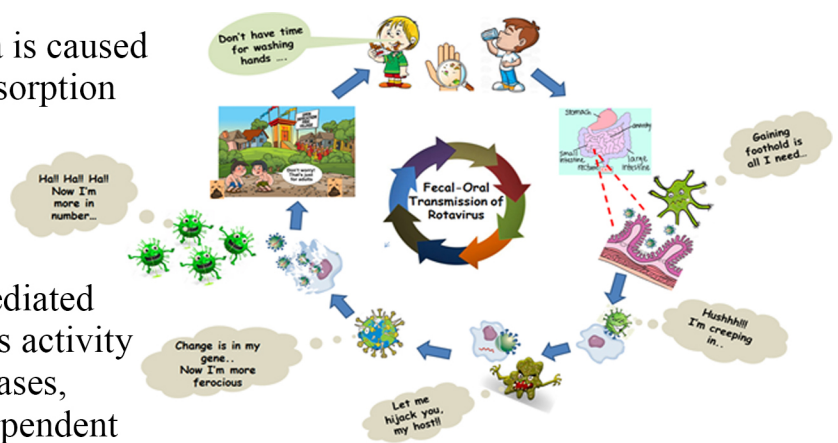
Viral particles are up to 76.5 nm in diameter and are not enveloped. These viruses are genetically diverse, and RVA VP4 and VP7 encoding genes have been classified into at least 28 G genotypes (G1–28) and 39 P genotypes (P[1]–[39]), respectively, based on differences in their nucleotide sequences. The segmented nature of rotavirus genome provides the mechanism for the generation of genetic diversity by the process of genetic reassortment, which may occur during co-infections of circulating human and animal strains.

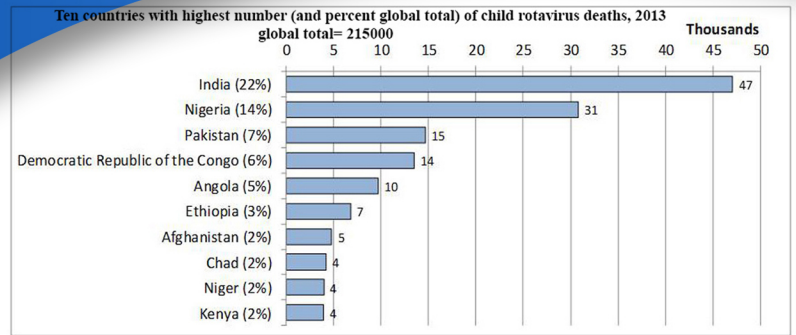


Symptoms & Transmission: Once a child is infected by GARV, there is an incubation period of two days before symptoms appear. The period of illness is acute. Symptoms often start with nausea, vomiting and low grade fever followed by four to eight days of profuse diarrhea. Dehydration is the most common cause of death related to rotavirus infection.

GARV is transmitted by the faecal-oral route, via contact with contaminated hands, surfaces and objects. Viral diarrhea is highly contagious. The faeces of an infected person can contain more than 10 trillion infectious particles per gram; fewer than 100 of these are required to transmit infection. Sanitary measures adequate for eliminating bacteria and parasites seem to be ineffective in control of rotavirus, as the incidence of rotavirus infection in countries with high and low health standards is similar².

Pathogenesis & Detection: The diarrhea is caused by multiple activities of the virus. Malabsorption occurs because of the destruction of gut cells called enterocytes. The toxic rotavirus protein NSP4 induces age- and calcium ion-dependent chloride secretion, disrupts SGLT1 transporter-mediated reabsorption of water, apparently reduces activity of brush- border membrane di-saccharidases, and possibly activates the calcium ion-dependent secretory reflexes of the enteric nervous system³. Specific diagnosis of infection with GARV is made by finding the virus in the child's stool by enzyme immunoassay. There are several licensed test kits on the market which are sensitive, specific and detect all serotypes of rotavirus A. Other methods, such as electron microscopy, Polyacrylamide gel electrophoresis and Reverse transcription-polymerase chain reaction (RT-PCR), are used only in research laboratories. RT-PCR can detect and identify all species and serotypes of human rotaviruses.





Source: Estimated rotavirus deaths, WHO IVB as of April 2016

Prevention: Two live attenuated, orally administered rotavirus vaccines were commercially available since 2006, Rotarix® (RV1; monovalent G1P[8]; GlaxoSmithKline Biologicals, Rixensart, Belgium) and RotaTeq® (RV5; pentavalent G1, G2, G3, G4,P[8]; Merck Vaccines, Whitehouse Station, NJ, USA). These vaccines were recommended by the World Health Organization (WHO) for inclusion into routine immunization programs in all countries. In post-licensure efficacy studies in South Africa and Malawi, the Rotarix vaccine had 59-64% efficacy in the first year against severe rotavirus diarrhea, but in the second year of life, efficacy was reduced to 3-33% in two dose and three dose recipients⁴. With Rotateq, the efficacy was 51% against severe rotavirus disease during the first year of life in Africa (Ghana, Kenya, and Mali) and, was 64% in Asia (Bangladesh and Vietnam)^{5,6}. These post-licensure studies also demonstrated sustained protection against a range of strains not included in the vaccines⁴. Recently, another oral live attenuated vaccine ROTAVAC®, derived from a G9P[11] human bovine reassortant strain 116E, has been evaluated in phase III studies and demonstrated its safety and efficacy, therefore licensed in India⁷. This vaccine is also introduced phase wise into the national immunization program in India during 2016 by The Ministry of Health and Family Welfare.

Although these vaccines have a significant impact in developed countries, the efficacy is challenged in low income countries of Africa and Asia, though over all, these vaccines have decreased the morbidity and rates of hospitalizations associated with rotavirus. Several reasons have been proposed for lower efficacy including high levels of maternal antibodies, environmental enteropathy, and malnutrition or micronutrient deficiencies. In spite of major progress global access to vaccines and implementation of therapy is a major challenge, which still leaves nearly half a million people without treatment options with 100 thousand deaths each year, only in India. To address this, other companies in India are also working on rotavirus vaccines, with Serum Institute of India, Shantha Biotechnics and Hilleman Laboratories all having rotavirus vaccine programs at various stages of development. Overall, rotavirus has been one of the successful vaccine preventable infectious disease.

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Open Access Information Sources:

Open access is a movement to increase visibility of scholarly literature to the readers at large. There are several issues of open access publication one of which is that of peer-review. However several initiatives have been taken by Government, International organizations, Associations of publishers to promote open access publication. The information sources in the form of repositories, databases have proved to be invaluable source of information to the research community. Some of these sources are:

- **The Shodhganga: a reservoir of Indian Theses-** Shodhganga@INFLIBNET Centre provides a platform for research students to deposit their Ph.D. theses and make it available to the entire scholarly community in open access. The repository has the ability to capture, index, store, disseminate and preserve ETDs submitted by the researchers.

Website: shodhganga.inflibnet.ac.in

- **ShodhGangotri** : Repository of Indian Research in Progress details (Synopses/Research Proposals for PhD programme)- Under the initiative called “ShodhGangotri”, research scholars / research supervisors in universities are requested to deposit electronic version of approved synopsis submitted by research scholars to the universities for registering themselves for the Ph.D programme. Synopsis are made available in this repository so as to avoid duplication of research.

Website: shodhgangotri.inflibnet.ac.in

- **Directory of Open Access Journals (DOAJ):** DOAJ is a community-curated online directory that indexes and provides access to high quality, open access, peer-reviewed journals.

Website: <http://doaj.org>

- **IndMed:** This is a bibliographic database indexing 100 Indian peer-reviewed medical journals published from India from 1985 onwards.

Website: indmed.nic.in

- **Directory of Open Access Books (DOAB):** DOAB is a service of OAPEN Foundation. The OAPEN Foundation is an international initiative dedicated to open access monograph

publishing. The primary aim of DOAB is to increase discoverability of Open Access Books.
Website: www.doabooks.org

Library News

NICED library committee meeting is held once in every three months. Apart from the regular course of meet, Library committee members also meet if their advice is required for any situation or work-related decision making. Last Library Committee Meeting was held on 3rd January 2017 under the Chairmanship of Dr. Shanta Dutta, Director, NICED.

