

Rotavirus Vaccine

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Abstract

Rotavirus is the most common cause of diarrhoeal disease among infants and young children. It is a genus of double-stranded RNA viruses in the family Reoviridae. Nearly every child in the world is infected with rotavirus at least once by the age of five. Immunity develops with each infection, so subsequent infections are less severe; adults are rarely affected. There are eight species of this virus, referred to as A, B, C, D, E, F, G and H. *Rotavirus A*, the most common species, causes more than 90% of rotavirus infections in humans. Rotavirus vaccine is a vaccine used to protect against rotavirus infections.

Keywords: Rotavirus; Vaccine.

Introduction

Rotavirus disease is highly contagious. The germ is present in the stool of an infected person and can remain viable for a long time on contaminated surfaces, including people's hands. Children catch it by touching something that's contaminated and then putting their hands in their mouth. The spread of rotavirus infection is a particular problem in hospitals and in day care settings, where it can be easily spread from child to child. It's also easily spread by day care workers, especially when they change diapers without washing their hands afterward. Rotavirus is a double-stranded RNA virus of the reovirus family. Viewed under an electron microscope, the virus is shaped like a wheel, hence its name (*rota* being Latin for "wheel"). Several species and subtypes of rotavirus cause disease in humans [1].

Under an electron microscope, the virus on several electron micrographs. Computer-aided reconstruction of a rotavirus based on several electron micrographs.

History

Rotaviruses were discovered in the 1960s in animals. The virus was first described in humans when it was found by electron microscopy in duodenal biopsies from children with acute gastroenteritis.

Rotavirus vaccine is a vaccine used to protect against rotavirus infections. These viruses are the leading cause of severe diarrhoea among young children. The vaccines prevent 15 to 34% of severe diarrhea in the developing world and 37 to 96% of severe diarrhea in the developed world. The vaccines appear to decrease the risk of death among young children due to diarrhea. Immunizing babies appears to decrease rates of disease among older people and those who have not been immunized [2].

The World Health Organization (WHO) recommends that rotavirus vaccine be included in national routine vaccinations programs, especially in areas where the disease is common. This should be done along with promoting breastfeeding, handwashing, clean water and good sanitation.

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The first vaccine for rotavirus, Human-rhesus RRV (Rota Shield). The first multivalent live oral reassortant vaccine developed was Rota Shield (a rhesus rotavirus tetravalent [RRV-TV] vaccine). This tetravalent vaccine contained a mixture of four virus strains representing the most commonly seen G types, G1 to G4: three rhesus-human reassortant strains containing the VP7 genes of human serotypes G1, G2, and G4 strains were substituted for the VP7 gene of the parent RRV, and the fourth strain comprised serotype G3 of rhesus RRV. RRV-TV was extensively evaluated in field trials in the United States, Finland, and Venezuela and proved highly effective (80 to 100%) in preventing severe diarrhea due to rotavirus in each of these settings. Due to the proven efficacy, the RRV-TV vaccine was licensed in August 1998 for routine use in children in the United States at 2, 4, and 6 months of age. Several cases of vaccine-associated intussusception were reported. The period of greatest risk of intussusception was shown to be 3 to 10 days after the first of three oral doses. As a consequence of this rare but potentially dangerous adverse effect, Wyeth, the manufacturer, withdrew Rota Shield from the market in the United States 14 months after its introduction. Unfortunately, the vaccine was not evaluated in terms of risk-benefit for children in resource-poor countries, as the ongoing trials in Asia (Bangladesh and India) and Africa (Ghana and South Africa) were stopped at that time [3].

There are currently three globally available vaccines against rotavirus: Merck's RotaTeq®, GlaxoSmithKline's Rotarix®, Rotavac®. Studies of these vaccines have demonstrated their safety and efficacy among children in every region of the world.

Clinical efficacy trials in Africa and Asia found that the vaccines dramatically reduced severe disease among infants in developing countries, where the majority of rotavirus deaths occur.

Rotarix is a monovalent, human, live attenuated rotavirus vaccine containing one rotavirus strain of G1P[8] specificity. ROTARIX is indicated for the prevention of rotavirus gastroenteritis caused by G1 and non-G1 types (G3, G4, and G9) when administered as a 2-dose series in infants and children [4].

RotaTeq® is an immunisation given to infants by mouth (orally) to protect them from severe rotavirus infection. RotaTeq® is free on the National Immunisation Schedule at 6 weeks, 3 months and 5 months of age.

Rotavac® should be administered as a 3-dose regimen, 4 weeks apart, beginning at 6 weeks of age

and should not be administered to children older than 8 months of age. Rotavac® has a shelf life of 5 years when stored at -20°C till the expiry date and can be stored for up to six months between 5°C ±3°C. Rotavac was licensed for use in India in 2014 and is manufactured by Bharat Biotech International Limited. It is a live attenuated, monovalent vaccine containing a G9P human strain isolated from an Indian child. It is given by mouth in a three-dose series, 4 weeks apart, beginning at 6 weeks of age up until 8 months of age [5].

Doses

RotaTeq® (RV5) is given in 3 doses at ages 2 months, 4 months, and 6 months

Rotarix® (RV1) is given in 2 doses at ages 2 months and 4 months.

Rotavac® (RV 116E) is given as a 3-dose regimen, 4 weeks apart, and should not be administered to children older than 8 months of age.

Adverse Effect

Common side effects of the rotavirus vaccines that may affect 1 to 10 in every 100 children includes: Irritability, loss of appetite, vomiting and diarrhoea (for up to 1 week after vaccination). A rare side effect of vaccination is an intestine (bowel) blockage (intussusception) within 7 days after the first vaccination [6].

Other Vaccine Approaches

Other approaches to the development of rotavirus vaccines are also being pursued. Rotavirus antigens for parenteral delivery have received some attention as virus-like particles prepared in baculovirus, expressed antigens, DNA vaccines, and killed virus. These novel approaches are being pursued using animal model [7].

Conclusion

Rotaviral gastroenteritis is associated with a substantial clinical and economic burden in both developed and developing countries. The disease burden is particularly considerable in infants and young children, producing infections that range from mild diarrhea to severe diarrhea, vomiting, and fever that result in hospitalization and death. The prevalence of the disease may be under-reported

because laboratory confirmation is not typically performed. Because there are currently no specific treatments for rotaviral infection, vaccination is the primary public health intervention for rotavirus infection. At present, approved vaccines (RotaTeq, Rotarix and Rotavaq) produce effective protection against disease (particularly severe disease), and decrease emergency room visits and hospitalizations [8].

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