



# ROTAVIRUS

## COMMON, SEVERE, DEVASTATING, PREVENTABLE

THE LATEST EVIDENCE & WHAT'S NEEDED TO STOP ILLNESSES AND DEATHS

## EXECUTIVE SUMMARY

ROTA COUNCIL
Rotavirus Organization of Technical Allies

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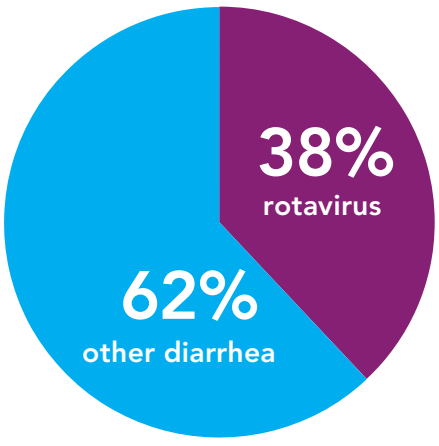
# Overview

**Diarrhea is one of the world's leading causes of child illness and death, and rotavirus is the most common cause of severe diarrhea.** Every child everywhere is vulnerable. Each year, rotavirus diarrhea kills about 200,000 children in countries around the world (1, 2) and hospitalizes hundreds of thousands more, despite the fact that safe, effective vaccines exist that can protect children from this disease.

Rotavirus is highly contagious, and every child is at risk. Infants and children under the age of 2 years face the greatest risk of infection. Rotavirus causes gastroenteritis, an inflammation of the stomach and intestines. It primarily infects the small intestine, destroying the surface tissue and preventing the absorption of nutrients, causing diarrhea (4). Typical symptoms can range from mild, watery diarrhea to severe diarrhea with vomiting and fever.

**FIGURE 1:** Global Diarrhea Hospitalizations (2, 3)




While mild to moderate dehydration caused by rotavirus infections can be treated with oral rehydration therapy (ORT), children who develop severe dehydration often require intravenous fluids (which can be given in outpatient centers) and hospitalization. Despite the fact that ORT is inexpensive and effective, many of the world's poorest children do not have access to it. In fact, ORT coverage is only about 30% in many of the places where the most diarrhea deaths occur (5). And without access to ORT or the urgent medical care severe infections require, rotavirus can be deadly.

# High disease burden

**Two out of every five diarrhea-related hospitalizations among children under age 5 are caused by rotavirus (2, 3)—it is not your typical "stomach bug" or "flu."** For those who survive, rotavirus infections can have a lasting impact:

- It can take up to two months for the intestine to fully repair itself after a moderate-to-severe case of rotavirus. As the intestine repairs, children cannot absorb nutrients as well, which means that during crucial stages of development, they grow significantly less than children who have not been sick with rotavirus diarrhea (6).
- Children who suffer from an episode of moderate-to-severe diarrhea—from infections like rotavirus—are weakened and malnourished. They are more susceptible to the next illness that strikes, and have a more than eight-fold increase in their risk of death from any cause in the two to three months following an episode of diarrhea (6).
- Treating rotavirus is expensive. In Bangladesh, treating just one episode of rotavirus can amount to nearly 85% of the average family's monthly income (7). In Malaysia, rotavirus hospitalization costs more than one quarter of the average monthly income (8). In Uganda, the cost for inpatient admission for one episode of severe rotavirus diarrhea amounts to 10% of the average family's monthly income (9, 10).

Because children can become infected with rotavirus and other causes of diarrhea more than once, preventing illness in the first place is critical.

# Rotavirus vaccines save lives and improve health

**There are two World Health Organization (WHO) prequalified, orally administered rotavirus vaccines available today: Rotarix®, manufactured by GlaxoSmithKline, and RotaTeq®, manufactured by Merck & Co., Inc.** Both vaccines have been shown to be safe and effective in large-scale clinical studies in Asia, Africa, the Americas and Europe. Based on this

The impact of the two currently licensed vaccines on severe rotavirus and all-cause diarrhea has been dramatic in countries that have introduced the vaccine.

body of research, WHO recommends that all countries introduce rotavirus vaccines into their national immunization programs. New rotavirus vaccines are in development in many countries. ROTAVAC®, manufactured by Bharat Biotech, was licensed in India in January 2014 and introduced into India's private market in March 2015; it could receive WHO prequalification by 2018.

- Rotavirus vaccines are already saving lives and improving health in the countries where they are in use, with countries in every region of the world reporting major reductions in hospitalizations and deaths due to severe diarrhea (11).
- Rotavirus vaccines have been shown to provide broad protection, even against strains not included in the vaccine (12-17).
- Rotavirus vaccines have also been shown to reduce hospitalization from all-cause diarrhea (18-29).
- They have also been shown to reduce rotavirus-related hospitalizations among children and adults who are too old to be vaccinated—providing herd immunity (30-40).

Unlike other forms of diarrhea, improvements in water, sanitation and hygiene alone do not adequately prevent the spread of rotavirus. Vaccination is the best way to protect children, and rotavirus vaccines are essential to a comprehensive approach to preventing and treating diarrhea.

- The benefits of vaccination are substantial and far exceed any low-level risk associated with vaccination (41-43). While most children do not experience any side effects following vaccination, there is a slight chance of minor symptoms including diarrhea, vomiting and irritability. In extremely rare cases, intussusception, a bowel blockage, may occur.

Not only does vaccination reduce the health burden of rotavirus, it also reduces the economic burden that families face when their children get sick.

The cost-effectiveness of rotavirus vaccines has been evaluated in numerous studies in low-, middle- and high-income countries. Rotavirus vaccines are projected to be highly cost-effective, particularly in regions suffering from the highest levels of rotavirus mortality (44).

**FIGURE 2:** Real-world impact: rotavirus hospitalizations reduced by half or more

| COUNTRY | VACCINE USED | VACCINE IMPACT: REDUCTION IN HOSPITALIZATIONS |
|---|---|---|
| Australia | Rotarix, RotaTeq | 45-88% |
| Austria | Rotarix, RotaTeq | 74-79% |
| Belgium | Rotarix, RotaTeq | 50-80% |
| El Salvador | Rotarix | 69-86% |
| Finland | RotaTeq | 78% |
| USA | Rotarix, RotaTeq | 55-94% |

Source: PATH summary of impact studies:
http://sites.path.org/rotavirusvaccine/vaccine-impact-data

Note: Studies vary in time period and age group, and therefore are not directly comparable. However, when taken together, they demonstrate the significant impact of the vaccine.

**FIGURE 3:** Reductions in deaths in early adopter countries

| COUNTRY | ROTAVIRUS VACCINE INTRODUCTION YEAR | REDUCTION IN ALL-CAUSE GASTROENTERITIS DEATHS AMONG CHILDREN UNDER AGE 5 FOLLOWING INTRODUCTION |
|---|---|---|
| Bolivia | 2008 | 36-43% |
| Brazil | 2006 | 22% |
| El Salvador | 2006 | 0-36% |
| Honduras | 2009 | 16-20% |
| Mexico | 2007 | 43-55%* |
| Panama | 2006 | 50%** |
| Venezuela | 2006 | 57-64% |

References: 19, 27, 29, 45

*Measured from 2009-2011. While methodologies differ, and some studies aren't directly comparable, it is clear the vaccine has had a significant impact.

**Among children aged 0-4

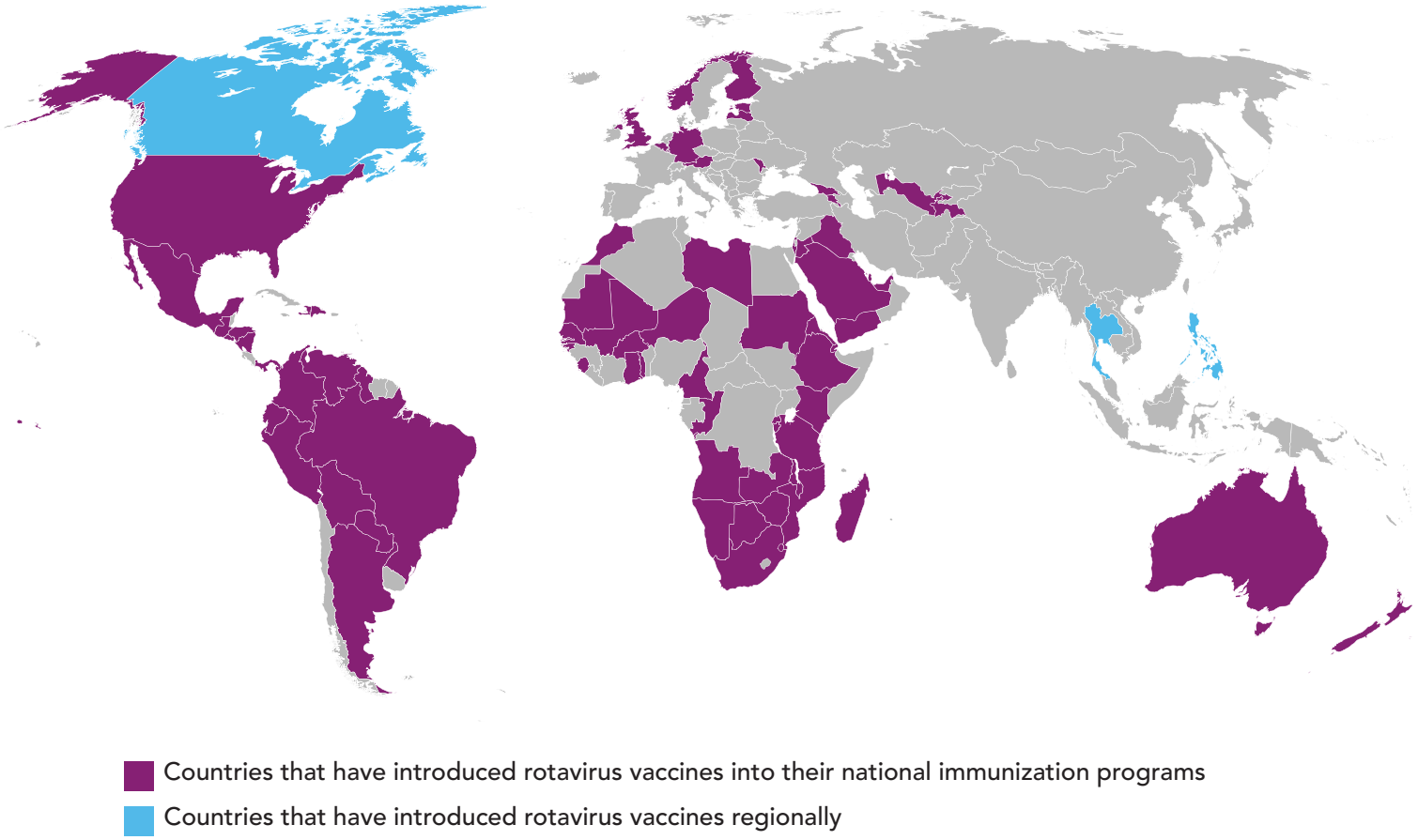
WHO recommends that rotavirus vaccines be introduced into every country's national immunization program, particularly those where diarrhea is a leading cause of child death (46).

While at least 80 countries have introduced rotavirus vaccines nationally, more than 100 have not. Very few countries in Asia have introduced the vaccine. Over 94 million infants lack access to rotavirus vaccines (47). Less than 25% of infants in Gavi-eligible countries currently have access to the vaccine (47).

More must be done to reach children living in the places where diarrhea, such as rotavirus, is a major public health issue.

Millions of illnesses and tens of thousands of deaths could be prevented through rotavirus vaccination.

**FIGURE 4:** Countries that have introduced rotavirus vaccines as of December 2015



# Integrated Global Action Plan for the Prevention and Control of Pneumonia and Diarrhea (GAPPD)

Prevention, protection and treatment make up the framework of the GAPPD, a 2013 global plan from UNICEF and WHO and endorsed by the ROTA Council (48). The GAPPD represents the first-ever effort to protect children simultaneously from pneumonia and diarrhea. Rotavirus vaccines are essential to a comprehensive approach to fighting diarrhea, which consists of:

- **Treatment**. When children do become sick with rotavirus, mild to moderate cases can be treated with oral rehydration solution (ORS)—which is a simple mixture of appropriately constituted electrolytes and water—and with zinc supplements and appropriate case management. However, diarrhea that results in severe dehydration may require IV fluids and urgent medical care. Rotavirus cannot be treated with antibiotics or other drugs.

- **Prevention**. Rotavirus vaccines are the best tool available today to prevent rotavirus. Rotavirus vaccines are a critical tool in fighting rotavirus because improvements in drinking water, sanitation and hygiene, which can prevent other forms of diarrhea, do not adequately prevent the spread of rotavirus.

- **Protection**. Good health practices can help protect children from diarrhea. These practices include exclusive breastfeeding for the first six months of a baby's life and providing appropriate complementary feeding after six months.

# Conclusion

**Rotavirus is the most common cause of severe diarrhea, and every child is vulnerable.** Vaccines are safe, effective and the most powerful tool to protect children from rotavirus. In countries where they are in use, vaccines are already saving the lives and improving the health of countless numbers of children. Despite the WHO recommendation that rotavirus vaccines be introduced into every country's national immunization program, 94 million infants still do not have access to this critical intervention. These countries should prioritize the vaccines now—millions of illnesses and tens of thousands of deaths can be prevented through rotavirus vaccination.

# Recommendations for global action to prevent rotavirus illnesses and deaths

**The ROTA Council strongly endorses the recommendation by WHO that all countries introduce rotavirus vaccines.** In addition, to accelerate the introduction of lifesaving, health-improving rotavirus vaccines, the ROTA Council recommends that key stakeholders undertake actions in the following areas:

- **Gavi-eligible countries** that have not yet introduced rotavirus vaccines into their childhood immunization schedules should strongly consider applying to Gavi for new vaccine support for rotavirus vaccine as soon as possible.

- **Governments and funding agencies** should continue to support the research and development of new, low-cost rotavirus vaccines using public, social business and public-private models. Emerging market manufacturers have demonstrated the ability to develop and license low-cost rotavirus vaccines (Rotavin and ROTAVAC®) with technology transfer and public funding support.

- **Global health entities** (e.g. UNICEF, WHO, Gavi) **and NGOs influential in vaccine programs** (e.g., Médecins Sans Frontières and Save the Children) should expedite initiatives to ensure prices paid for rotavirus vaccines reflect true manufacturing costs, provide reasonable returns on manufacturers' investment and take into account an individual country's ability to pay. Additional mechanisms may be required to provide innovative funding options for low-middle income, non-Gavi eligible countries. To enable countries of all income groups to include rotavirus vaccines in their national immunization programs, transparent and flexible pricing mechanisms are required.

- **National governments, global health entities, funding agencies, manufacturers and other stakeholders** should facilitate the development of new, live oral vaccines that address barriers to global supply for Gavi and low- and middle-income countries; implementation challenges (cold chain, volume of administration and storage, delivery systems, safety concerns) and cultural sensitivity; and that are safe, efficacious and available at low cost.

- In conjunction with the introduction of rotavirus vaccine, **countries should work with WHO, UNICEF and other partners** to plan and implement a comprehensive set of interventions to reduce illnesses and deaths from diarrheal disease, consistent with the GAPPD.

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