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Game Changer In Vaccine Storage

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Not only do they have the potential to eradicate diseases, vaccines also offer the best hope for tackling infectious diseases in developing countries. That being said, numerous life-saving vaccines are expensive and/or poorly suited for tropical climates. The World Health Organisation (WHO) estimates that between 10 and 50 percent of vaccines may be wasted globally every year due to cold storage, shipping and other logistical problems. To address this challenge, Hilleman Laboratories' is developing a thermostable oral rotavirus vaccine which maintains its potency even in high temperatures like 45 degrees Celsius, thus escaping its reliance on exact storage timing and refrigeration. It is also cheap, safe and easy to administer. All in all, a vaccine perfectly suited for a tropical country like India.

Vaccination

Disease Burden of Rotavirus

The WHO estimates that rotavirus diarrhea results in approximately half a million deaths and approximately 2.4 million hospitalizations in developing countries each year. While rotavirus is the leading cause of diarrhea-related deaths, the disease was practically unheard of until the early 2000s. Rotavirus vaccines were first introduced in national immunization programs in 2006 as a key intervention to address the burden of diarrheal disease. Within just a couple of years of introduction in the United States, vaccines reduced hospitalizations for severe rotavirus by as much as 80 percent.

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In the Indian context, these vaccines have the potential to significantly alleviate the disease and financial burden, where each year approximately 113,000 under-fives die from rotavirus (39 percent of diarrhea cases). Indians spend between USD 37.4 million and USD 66.8 million annually on direct medical costs of rotavirus diarrhea hospitalizations in children under five (457,000–884,000) and outpatient treatment (2 million visits). In June 2009, WHO placed the rotavirus vaccine on its list of critical immunisations for all national programmes. Last year, Indian Government announced that it will be including it in its National Immunization Program.

Hilleman Laboratories's CEO Dr. Davinder Gill, explains, "If you look at the mortality of the children in poor countries such as India, the two chief reasons for death and mortality are either pulmonary/ respiratory infections or gastric/enteric infections. In order to really improve the mortality and morbidity in infants/ children in India, we felt this was the area to tap. Rotavirus is an important agent that causes severe diarrhea amongst children."

An Alliance with a Noble Goal

The mastermind developing this formulation, Hilleman Laboratories, is a not-for-profit 50:50 venture floated by U.S. pharma giant Merck and Merck & Co and London based Wellcome Trust charity; a global vaccine R & D organization focused on developing unique technology towards containing life-threatening diseases by creating safer and more effective vaccines. The heart of Hilleman Laboratories' vision is the creation of a sustainable R&D organization that operates like a business, but with a not-for-profit operating model, to address the vaccine needs of low-income countries. In addition, developing new vaccines in areas of unmet need, the Hilleman Laboratories works on optimizing existing vaccines, an important and powerful way of increasing the impact of vaccination in resource-limited settings.

It is commited to developing high impact, affordable vaccines for people in developing countries in an innovative and sustainable manner

By working in partnership, The Wellcome Trust and Merck seek to achieve what neither can do single-handedly. "The idea was incubated about 6 years ago. Wellcome Group and Merck were independently thinking of a portable vaccine for the developing world. They came to know about each other through mutual interest and joined hands to do it together. That is how the concept of Hilleman Laboratories was founded. Vaccine R & D scientists, founders and shareholders felt that as very few organization which focused on taking research vaccine from the idea stage to a performance concept. This is one of the reasons why traditional vaccine sometimes took 10 to 15 or 20 years to become available to the poor countries. We are addressing a very important need with the portable vaccine," says Dr. Gill. The laboratory was launched in 2010 with USD 144 million in start-up funds to cover its first seven years of operation. Based in New Delhi, the R & D facility is spread across 52,000 sq ft of space and has a staff strength of about 40 R & D scientists.

Traditional Vs Hilleman's Vaccine

Currently available rotavirus shots, made by Merck & Co. and GlaxoSmithKline, need to be kept in cold storage (refrigerated between 2 to 8 degree Celsius) making their transportation and delivery complex and costly. It has to be administered as soon as the vial is removed from the refrigerator. "Some estimate that In India, wastage can reach up to 50 percent. One half of the product can go to waste which is such a shame because we have so many millions to vaccinate and therefore it subsequently affects the vaccination rate," remarks Dr. Gill.

Hilleman's formulation will be based on thin strips or granules that dissolve in the mouth and can be easily transported, stored and administered. In 2014 Hilleman Laboratories initiated research and development of thermostable formulations of oral rotavirus vaccine, which offered longer stability of the vaccine even in varying temperature across diverse environment. With the use of dry powder technologies, it is now possible to engineer formulations that can demonstrate many months of stability under ambient temperatures including extreme conditions of 45 degree Celsius or higher. Such formulations will be ideal for conditions in India where summer temperatures can soar very high in parts of the country while vaccine distribution can still take several months. In fact, with such new thermostable formulations it is possible that vaccine could be maintained completely outside of the cold chain all the way from shipment from the manufacturer to vaccination in the field.

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Another gold star: Hilleman's thermostable vaccine is not only portable, it is also cheap. Thermostability, ease-of-administration, reduced footprint and affordability are the founding principles of this non-profit organization. Stressing on its affordability, Dr. Gill says, "The cost will be close to other vaccines being developed, for example the Biotac vaccine, in the range of Rs. 60-100 and will be portable." Early this year, Hyderabad-based company Bharat Biotec introduced Rotavac, an indigenous rotavirus vaccine which they promised to sell at 1 dollar per dose vaccine to governments in low income countries.

Indigenous All the Way

Most vaccines are formulated with developed countries in mind, thus may not be sustainable in low-resource countries. What makes Hilleman unique is its commitment to developing high impact, affordable vaccines for people in developing countries in an innovative and sustainable manner. With the push for 'Make in India', this vaccine fits the indigenous profile well and can expect a warm welcome.

"It is a product which is not only made in India but also made for India"
Dr. Davinder Gill, CEO, Hilleman Laboratories

"The way we like to think about our vaccine is that it is a product which is not only made in India but also made for India. It is a portable vaccine which is easy to store, easy to manufacture and easy to administer in rural and remote areas. Plus, it is not too demanding logistic-wise and not too sensitive to climate changes. We are in discussion with the Government and have received a very positive and a very welcome approach from the Government. They can see very clearly that it is these kinds of products that will make a difference," says Dr. Gill.

Hilleman chiefly focuses on early stage development of projects, and once proof-of-concept is established, approaching multiple vaccine manufacturers to scale up production and take the product to market. "Our plan of distribution of vaccine is to approach the Indian Government to include it in the National Immunization Program. We ourselves are not going to do the commercial manufacturing because we don't have the capacity. We are going to partner with the commercial vaccine manufacturers, who we will able to mass-produce as per the Government need. Our goal is to develop affordable vaccines and we would like to do it in a collaborative and partnership model because we are a small company. Thus, partnering with the Government, stakeholders, policy

makers, vaccine manufacturers, physicians with whom we can discuss interesting ideas and develop products is extremely important to us," he explains.

Many More in the Making

In addition to Rotavirus, Hilleman is focusing on other enteric diarrheal diseases like Cholera. Hilleman Laboratories in collaboration with Swedish biopharmaceutical company Gotovax AB is developing a high impact oral Cholera vaccine at a significantly more affordable price than the ones currently available in the market. Easy to administer, with cross protection against ETEC diarrhea and enhanced with a longer shelf life, this vaccine candidate will be most suited for geographies with the highest cholera burden such as Africa and South Asia. For this vaccine, tthey have also partnered with two immunization organizations– International Centre for Diarrheal Disease Research and Incepta Vaccine Ltd., a vaccine manufacturer, both based in Dhaka, to manufacture an affordable cholera vaccine. Hilleman also has research ongoing for low-cost combination vaccine for treatment of invasive meningococcal disease. "As we grow, we look forward to developing more vaccines that are in our R & D portfolio. We have an interest in partnering with other developing countries for immunization and to include it in their programs and develop more vaccines that they are interested in whether it is measles vaccine or influenza or rabies," concludes Dr. Gill.