VISION

DEVELOPING COUNTRIES FREE OF SUFFERING FROM INFECTIOUS DISEASE
MISSION

DISCOVER, DEVELOP AND DELIVER SAFE, EFFECTIVE AND AFFORDABLE VACCINES FOR GLOBAL PUBLIC HEALTH
WELCOME TO THE NEW IVI
I began my tenure as IVI’s third Director General in March 2015, and I’m proud to be leading this venerable organization. IVI has made remarkable contributions to vaccinology and global health since its establishment in 1997.

IVI is the first international organization hosted by the Republic of Korea, which has since seen the establishment of several international organizations and UN offices. We are pleased to South Korea’s partner in international cooperation efforts, particularly in global health. We also appreciate the long-standing support and trust of our other key funders, Sweden and the Bill & Melinda Gates Foundation.

Shortly after my appointment, it was universally agreed that IVI was in need of revitalization so we underwent a strategic refresh in 2015. With support from the Boston Consulting Group (BCG), we reviewed and reevaluated our core capabilities and redefined our direction. The eight-month long process resulted in major organizational and strategic changes for the organization:

- **Revised mission statement** to reflect our expanded focus on new and emerging diseases of global health importance such as MERS.

- **Articulation of a more clear direction** that builds on our best-in-class product development and translational capabilities.

- **Renewed focus on diseases** where we have exceptional expertise and experience, such as cholera, typhoid, dengue, hepatitis E, and MERS.

- **Reorganized scientific structure** designed to facilitate cross-departmental communication and to focus talent against highest priority activities.

- **Streamlined core cost structure** that ensures financial sustainability and operational efficiency.

- **Renewed focus on strengthening relationships with key funders and stakeholders** to ensure IVI will be at the forefront of efforts to develop affordable vaccines for global health.

The new organization went live on January 1, 2016. Work continues on roll-out and change management as we transition to a more robust IVI. Key to our success is rebuilding a new leadership and management team. Our immediate priorities are to finalize senior-level hires, strengthen relationships with partners and donors, deliver on existing project commitments, and develop a pipeline of future project funding.

At the same time, we continued to make progress in our Cholera, Enteric Fever and Dengue Programs, and in the lab. There were many highlights in 2015, such as the launch of a new MERS-CoV vaccine development program, the WHO prequalification of the IVI-developed oral cholera vaccine, Euvichol®, and three oral cholera vaccination campaigns led by IVI in Ethiopia, Malawi and Nepal that protected more than 180,000 people from cholera. We also concluded a major typhoid surveillance program that established a considerable typhoid burden in Africa, and launched a follow-on new study to get a better picture of severe typhoid disease in Africa.

In closing, we are excited about the changes taking place at IVI. The new team and direction will make IVI a stronger organization to deliver greater impact in global health. Again, I would like to thank our friends and supporters, the Bill & Melinda Gates Foundation and the governments of Sweden and Republic of Korea for their commitment to IVI. I also would like to thank the Korea Support Committee for IVI (KSC) and our many partners and collaborators.

Sincerely,

Jerome H. Kim, MD
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IVI
FORWARD
IVI is the world’s only nonprofit international organization exclusively dedicated to vaccines and vaccination for global public health. The Institute was established in 1997 in Seoul, Republic of Korea as an initiative by the United Nations Development Programme (UNDP).

In the 1990s, the international community was concerned about the unacceptably high number of childhood deaths in developing countries. Mortality rate of children under the age of five was 12.9 million per year, and many of the deaths were vaccine-preventable.

IVI was created with the promise of developing and introducing vaccines for children in developing countries. Over the years, IVI has kept to that promise.

In 2015, IVI went through several organizational and leadership changes, emerging as a stronger and more focused organization that will deliver greater impact in global health in years to come.
NEW LEADERSHIP

In June 2015, Jerome Kim became IVI’s third Director General. Under his leadership, a new leadership team was established.

JEROME KIM, MD

Prior to IVI, Dr. Kim was Principal Deputy and Chief, Laboratory of Molecular Virology and Pathogenesis at the U.S. Military HIV Research Program (MHRP) and Project Manager for the HIV Vaccines and Advanced Concepts Evaluation Project Management Offices, U.S. Army Medical Materiel Development Activity. He led the Army’s Phase III HIV vaccine clinical trial (RV144), the first to indicate protection by an HIV vaccine, and studies on laboratory correlates of protection and sequence changes in breakthrough HIV infections after vaccination. He has over 200 publications. Dr. Kim was also a Professor at the Division of Infectious Diseases, Department of Medicine of the Uniformed Services University of the Health Sciences. He received his Medical Degree from Yale University and completed his training and fellowship at Duke University. He was the 2013 recipient of the John Maher Award for Research Excellence from the Uniformed Services University of the Health Sciences.
Dr. Yoon oversees IVI’s Laboratory Sciences Unit, and is director of the Dengue Vaccine Initiative (DVI), as well as the institute’s MERS-CoV program. Dr. Yoon was Chief of the Department of Virology, Armed Forces Research Institute Medical Sciences in Bangkok, Thailand, where he investigated arbovirus and respiratory virus infections, and clinical trials of vaccine candidates. He has conducted research on the epidemiology, pathophysiology and immunology of dengue virus, Zika virus and other emerging pathogens; and has authored over 70 publications. He was a faculty member of the Uniformed Services University of the Health Sciences. Dr. Yoon graduated magna cum laude with a Bachelor of Science degree from Yale University and received his Medical Degree from New York University. He completed his residency and fellowship at the Walter Reed Army Medical Center.

Dr. Digilio is a clinical scientist with extensive experience in pharmaceutical vaccine development; and a successful track record of managing clinical trials in early-phase (MenABCWY, HIV, polio) and late-phase development (rotavirus, MMRV, HPV, MenB). She was the senior director for the HIV and Polio Vaccine Programs at Crucell (Janssen Vaccines), and led a variety of teams in vaccine research at Merck, GlaxoSmithKline Biologicals and Novartis. Dr. Digilio brings ten years’ experience in basic virology and immunology working on HIV transmission and pathogenesis, HIV/SIV cellular co-receptor utilization, and novel HTLV/STLV isolation and characterization. She received her Medical Degree from the University of Naples where she graduated cum laude.

LAURA DIGILIO, MD  
Deputy Director General,  
Development & Delivery

IN-KYU YOON, MD  
Deputy Director General, Science
As a finance professional with extensive global pharmaceuticals experience, Mr. Driver has served in increasingly senior finance positions during a 25-year career with GlaxoSmithKline (GSK). Most recently, he was Senior Vice President Finance and Global Lead Analytics in London, UK. Prior, he held positions as Senior Vice President Finance of Global Consumer Healthcare and spent 6 years as Finance Head of European Pharmaceuticals. He has also been responsible for finance in GSK’s Asia Pacific and Latin American operations, after commencing his pharmaceutical career with GSK in Canada. Mr. Driver was born in England and has lived in England, Canada, the United States, Mexico, as well as five years in Asia, during his career. He holds a C.P.A. from Canada and an A.C.A from the United Kingdom.

Dr. Han has more than 30 years’ experience as a senior official in the South Korean government in areas that include economic policy, planning and budgeting, and public-private partnership. Among his positions were Director General of the Technology & Safety Policy Bureau, Ministry of Construction and Transportation; Director General of the Policy Analysis Bureau, National Economic Advisory Council; and Chief Executive Auditor of the Korea Credit Guarantee Fund. He is an Adjunct Professor at the College of Business and Technology of Seoul National University of Science and Technology. Dr. Han has a Ph.D. in economics from the University of Hawaii; Master of Science degree in management science from the Korea Advanced Institute of Science and Technology (KAIST); and Master of Public Administration degree and Bachelor of Arts degree in economics from Seoul National University. He is an Internal Auditor certified by the Institute of Internal Auditors, U.S.A.
Dr. Lynch served 29 years in the U.S. Army. She was Director of the Division of Viral Diseases at the Walter Reed Army Institute of Research during which significant studies were conducted for Japanese encephalitis, adenovirus and dengue vaccines. She was appointed Director of the Military Infectious Disease Research Program at Fort Detrick, Maryland, a product development program targeting vaccines against malaria, dengue and enteric pathogens, as well as new anti-parasitic drugs and infectious disease diagnostics for resource limited settings. She later became the Science Director for the Armed Forces Research Institute of Medical Sciences in Bangkok, Thailand, where she was responsible for activities spanning eight countries in South-East Asia that included bio-surveillance, basic science, pre-clinical studies and human clinical trials. Dr. Lynch received her Medical Degree from Columbia University and completed a Pediatric Residency and Infectious Disease fellowship at the Walter Reed Army Medical Center.

Prior to IVI, Ms. Hong managed health education at the Charles B. Wang Community Health Center in New York City, where she managed several health communication projects in collaboration with the New York City Department of Health, New York University Center for the Study of Asian American Health, March of Dimes Foundation, What to Expect Foundation, and Bristol-Myers Squibb. Ms. Hong worked in China as a consultant in the pharmaceutical and fine chemicals industries. She has a Master in Public Administration in Health Policy & Management from New York University and a Bachelor of Science in Zoology from the University of British Columbia. She is a member of the Asia Pacific Association of Communications Directors.
NEW COMMITMENTS

A revised mission statement to reflect expanded focus on new and emerging diseases of global health importance.

Articulation of a more clear direction, building on best in-class product development and translational capabilities.

Renewed focus on diseases where IVI has exceptional expertise and experience such as cholera, typhoid, dengue, hepatitis E and MERS.

Reorganized scientific structure to facilitate cross-unit communication and to focus talent against priority activities.

Renewed focus on strengthening relationships with key stakeholders to ensure IVI will be at the forefront of efforts to develop vaccines for global public health.
OUR ROADMAP

VISION
Developing countries free of suffering from infectious disease.

MISSION
Discover, develop and deliver safe, effective and affordable vaccines for global public health. To deliver with the greatest impact.

MANDATE
Development and uptake of affordable vaccines important to Asian, African, and global public health.
TO ACCOMPLISH THESE GOALS

BUILD BEST-IN-CLASS VACCINE DEVELOPMENT CAPACITY IN ASIA

- Hire and retain the best talent.
- Nurture core capabilities in vaccine development.
- Deliver on commitments.
- Implement cross-cutting project management structure.

STRENGTHEN VACCINE PARTNERSHIPS WITH KEY FUNDERS AND STAKEHOLDERS FROM GOVERNMENT AND PUBLIC SECTOR, PRIVATE SECTOR, CIVIL SOCIETY, AND GLOBAL HEALTH

- Engage and communicate.
- Mobilize resources and commitments.
- Align and coordinate actions and resources.

ENSURE FINANCIAL SUSTAINABILITY

- Streamline core costs.
- Develop pipeline of future projects.
- Continue to communicate with and engage current funders.
- Identify and engage new funders.

PREVENT INFECTIOUS DISEASES
### OUR TARGET DISEASES

#### Disease Criteria
- High global health burden
- Matches IVI capabilities
- Disease relevance in Asia
- Donor interest

## TWO-WAY APPROACH

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<tr>
<th>Lead</th>
<th>The Disease</th>
<th>IVI Leads</th>
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<td></td>
<td><strong>Typhoid Fever</strong></td>
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</table>
|      | Systemic infection caused by *Salmonella Typhi*. Symptoms include fever, headache, nausea, loss of appetite, and constipation or diarrhea; often non-specific from other febrile illnesses. Severe cases may lead to serious complications or death. Usually spread through ingestion of contaminated food or water, and occurs mainly in settings with poor sanitation and lack of clean drinking water. About 21 million cases and 222,000 deaths occur annually worldwide. |  · Accelerate development and introduction of typhoid conjugate vaccines  
· Conduct disease surveillance and measure burden of typhoid in Africa  
· Develop next-generation vaccines (typhoid/paratyphoid) |
|      | Two vaccines available but not for use in young children and infants (a high-risk group). IVI is developing typhoid conjugate vaccine candidates for infant immunization. |          |
|      | **Cholera** |          |
|      | Acute diarrheal infection caused by ingestion of food or water contaminated with *Vibrio cholerae*; occurs mainly in settings with poor sanitation and lack of clean drinking water. Extremely virulent and can kill within hours if untreated. Roughly 1.4 to 4.3 million cases and 28,000 to 142,000 deaths per year worldwide. |  |  · Optimize use of oral cholera vaccines.  
· Support vaccine introduction in countries.  
· Provide support to manufacturers.  |
|      | There are two WHO prequalified oral cholera vaccines, both developed by IVI. The vaccines have been used in mass vaccination campaigns with WHO support. To ensure sufficient supply, IVI is partnering with manufacturers to increase global vaccine production and availability. |          |
| Dengue, Zika | · Accelerate introduction of new dengue vaccines to poor
| Mosquito-borne viral diseases, transmitted by *Aedes aegypti* mosquito. | · Support development of new vaccine candidates
| | Dengue causes flu-like illness, and occasionally develops into severe dengue. Global incidence has grown in recent decade, and about half of the world’s population is at risk. The first dengue vaccine was registered in countries in 2015. | · Partner with Korean companies on vaccine development
| Zika virus disease symptoms include mild fever, skin rash, conjunctivitis, muscle and joint pain, malaise or headache. Potential complications are neurological and auto-immune complications and microcephaly in newborn babies although more investigation is needed. Outbreaks first reported in the Pacific in 2007 and 2013; and major outbreaks in 2015 in the Americas and Africa. Cases reported in 64 countries since 2007. No vaccine or treatment is available. |
| MERS-CoV | · Support development of new MERS vaccine candidates |
| Viral respiratory disease; symptoms include fever, coughing and shortness of breath. Can be severe in the elderly and people with weakened immune system or chronic diseases. The virus is spread from human to human although camels may be an animal source of infection in humans. First emerged in 2012 in the Arabian peninsula and cases reported in 27 countries since. No vaccine or treatment is available. |
| Hepatitis E | · Assess disease burden and evaluate vaccination as a tool to prevent and control hepatitis E
| Viral liver disease. Spread primarily through contaminated water, and occurs mainly in settings with poor sanitation and lack of clean water. Infected pregnant women are at greater risk of complications and mortality; 20% of infected pregnant women die. There are about 20 million infections and 57,000 deaths every year worldwide; most prevalent in East and South Asia. A vaccine is registered in China but not available globally. | · Support development and WHO prequalification of hepatitis E vaccines |
### OUR TARGET DISEASES

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<tr>
<th>The Disease</th>
<th>IVI Supports</th>
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<tr>
<td><strong>Rotavirus, Enterotoxigenic E. coli (ETEC), Shigella</strong>&lt;br&gt;They are the leading causes of diarrheal disease in children in the developing world, killing nearly 600,000 children under the age of five every year. While there are rotavirus vaccines, they are not as available as they should be in developing countries. There are no licensed vaccines against ETEC or Shigella.</td>
<td>· Support partners in Asia-based activities for development of new vaccines against rotavirus, ETEC and <em>Shigella</em>.&lt;br&gt;· Develop a new universal <em>Shigella</em> vaccine candidate in partnership with PATH.</td>
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<td><strong>Tuberculosis (TB)</strong>&lt;br&gt;TB is the top infectious disease killer worldwide ~ 9.6 million cases and 1.5 million deaths in 2014 and over 95% of deaths in low- and middle-income countries. Multidrug-resistant TB is a concern. The BCG vaccine is only partially effective; there is a need for new, safe and effective vaccines that protect against all forms of TB, including drug-resistant strains.</td>
<td>· Support partners in Asia-based activities for development of new TB vaccines.&lt;br&gt;· Support South Korea’s activities in TB vaccine research and development.</td>
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<tr>
<td><strong>Pneumococcal diseases</strong>&lt;br&gt;<em>Streptococcus pneumoniae</em> causes diseases ranging from meningitis and pneumonia to sinusitis and otitis media. A common cause of illness and death worldwide but rates are higher in developing countries, particularly in sub-Saharan Africa and Asia. Pneumonia is a major killer of children in the developing world, and is responsible for 922,000 deaths in 2015. Pneumococcal conjugate vaccines are available but they are not widely used in developing countries.</td>
<td>· Support partners in Asia-based activities for development and WHO prequalification of pneumococcal conjugate vaccine.</td>
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<td><strong>Norovirus</strong>&lt;br&gt;Known as the stomach flu, norovirus infection is caused by a very contagious virus that can infect anyone and is the most common cause of viral gastroenteritis. It affects around 267 million people and causes over 200,000 deaths each year - deaths are usually in developing countries and in the very young, elderly and immunosuppressed. There is no vaccine available.</td>
<td>· Support South Korea’s activities in norovirus vaccine research and development.</td>
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**OUR ACHIEVEMENTS**

**Developed the world’s first low-cost cholera vaccine**
Partnered with manufacturers from Vietnam, India, South Korea and Bangladesh for development and production. Vaccine approved by World Health Organization for global use.

**>2 million people protected from cholera**
Vaccine deployed in several countries worldwide. Stockpiled by the WHO for use in emergency situations and outbreaks.

**Demonstrated typhoid fever is a serious problem in sub-Saharan Africa and South Asia that affects mainly children, and warrants public health action including vaccination for disease prevention and control.**

**Helped pave the way for introduction of the world’s first dengue vaccine in dengue-endemic countries in South America and Southeast Asia through policy and advocacy.**

**Countries where cholera vaccine has been deployed**
INCREASED CAPACITY IN DEVELOPING COUNTRIES TO PROMOTE VACCINE SUSTAINABILITY AND SUFFICIENCY
OUR ACHIEVEMENTS

Trained >1,000 developing country vaccine professionals through our annual Vaccinology Course.
Transferred technology and provided technical support to six manufacturers in Asia.
Helped strengthen health care systems in 10 African countries by building capacity in infectious disease detection, reporting and response.
Preclinical development:
- Improve existing vaccine candidates
- Toxicology and efficacy studies
- Process development

Clinical development

Clinical assay development

Manufacturing-scale process development

Technology transfer

Regulatory & licensure assistance

Quality management

Epidemiologic studies

Post-introduction studies

Evidence generation to demonstrate vaccination impact:
- Vaccination campaigns
- Financial & economic studies

Available and accessible vaccines in low-income countries

Vaccination sustainability in low-income countries

Available and accessible vaccines in low-income countries

National infrastructure strengthening / policy
OUR APPROACH

South Korea (host country)  Partner A  Partner B  Bill+Melinda Gates Foundation  Sweden

Manufacturer X  Manufacturer Y  Manufacturer Z

- Tech transfer
- Process development
- Preclinical
- Clinical (Phase 1-3)
- Registration

- Epidemiologic and disease burden studies
- Health economics
- Vaccination campaigne
- Capacity-building
1997

the year IVI was established. South Korea is IVI’s host country, and IVI was Korea’s first international organization.

36

35 countries and World Health Organization (WHO) are signatories to IVI’s Establishment Agreement.

2

vaccines developed through IVI prequalified by WHO. IVI is only one of two nonprofits to achieve this global health feat.

27

countries number of countries in Asia, Africa and Latin America that IVI has recently conducted field projects in.

127

staff employed at IVI

15

different nationalities represented on IVI’s workforce.

Sweden, South Korea, Bill & Melinda Gates Foundation, and the Korea Support Committee for IVI (KSC) key funders.
ADVANCING
FORWARD
VACCINE CANDIDATES IN CLINICAL DEVELOPMENT PIPELINE.

4

SHIGELLA
Launched a new program to discover and develop a universal vaccine against Shigella in partnership with PATH.

MERS - COV
Launched a new program to accelerate development of MERS vaccines with support from Samsung and Korean Ministry of Health & Welfare.

TYPHOID
Through our Typhoid Surveillance in Africa Program (TSAP), we definitively established typhoid is a major public health problem in Africa and we launched a new program, Severe Typhoid in Africa (SETA) to further study the outcomes of severe typhoid on the continent.

TOOLS
Developed a new vaccine safety software tool in collaboration with WHO’s Global Vaccine Safety Initiative (GVSI) that was launched in Sri Lanka for use by their Ministry of Health; and developed a new costing tool, CHOLTOOL, that will help governments estimate costs for cholera vaccine delivery in their countries.
IVI-AUTHORED SCIENTIFIC PUBLICATIONS IN PEER REVIEWED JOURNALS.

ORAL CHOLERA VACCINES DEVELOPED THROUGH IVI NOW PREQUALIFIED BY WHO.

PRODUCT DEVELOPMENT PARTNERSHIPS TO DEVELOP NEW CHOLERA AND TYPHOID VACCINES.

CHOLERA VACCINATION CAMPAIGNS CONDUCTED IN ETHIOPIA, MALAWI, AND NEPAL, VACCINATING >180,000 people

PARTNERSHIP
Established partnership with Gyeongbuk Institute of Bio Industry (GBI) of South Korea to collaborate on adjuvants, immune-monitoring platform technology and preclinical vaccine research.
IVI’s Cholera Program is our oldest program, running since July 2006. Using a public-private partnership approach, we aim to accelerate the development and introduction of oral cholera vaccines for use against endemic and epidemic cholera.

We reformulated an inactivated oral cholera vaccine (OCV) from Vietnam (VaBiotech’s ORC-Vax). The vaccine was modified to meet developing country needs and WHO standards, and the technology was transferred to several manufacturers that include Shantha Biotechnics of India, EuBiologics of South Korea, and Incepta Vaccine of Bangladesh. IVI has been working with each of the partners on clinical testing and the regulatory approval process in order to register and prequalify the vaccines by WHO. We also continue to work with VaBiotech.

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<tr>
<th>Our Pipeline</th>
<th>Manufacturer</th>
<th>Status</th>
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<tr>
<td><strong>Shanchol™</strong></td>
<td>Shantha Biotechnics</td>
<td>Shanchol was licensed in India in 2009 and WHO-prequalified in 2011. As the first oral cholera vaccine out of the pipeline, it was used in vaccination campaigns against endemic and epidemic cholera, such as in Ethiopia, Nepal and Malawi where IVI helped coordinate vaccinations last year and continue to work in 2016 in gathering evidence on use of the vaccine in real-life situations. IVI continues to optimize vaccine use and is partnering with icddr,b on a study to evaluate if one dose is sufficient for protection against cholera. The oral cholera vaccine is administered in two doses over a 14-day interval therefore a single-dose regimen would be advantageous for use in outbreaks, refugee camps and other emergency situations.</td>
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<tr>
<td><strong>Euvichol®</strong></td>
<td>EuBiologics</td>
<td>Euvichol was licensed in South Korea in February, 2015 and WHO-prequalified in December, 2015. As the second oral cholera vaccine for global health, it will help ensure a sufficient supply for the WHO cholera vaccine stockpile and meet the global demand for cholera vaccines. Anticipating market demand, EuBiologics has significantly scaled up production. They also modified the vaccine, making it thimerosal-free. However subsequent changes to the product require a second submission to WHO for prequalification, and a clinical bridging study will be conducted in 2016.</td>
</tr>
<tr>
<td><strong>Cholvax®</strong></td>
<td>Incepta Vaccine</td>
<td>Cholvax is the third OCV in the pipeline, and is intended for licensure and use in Bangladesh, which has a high burden of cholera. IVI has been partnering with Incepta since 2015 and plans are underway to initiate a clinical trial in Bangladesh in 2016.</td>
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We made significant progress with WHO prequalification of the oral cholera vaccine, Euvichol, making it the second vaccine from the IVI pipeline to be WHO-prequalified.

We also introduced the oral cholera vaccine through demonstration campaigns in Ethiopia, Malawi and Nepal, vaccinating more than 180,000 people and generating evidence on use of the vaccine.

Following the vaccinations in Malawi, we launched a new project, Cholera Surveillance in Malawi (CSIMA), to establish a cholera surveillance platform in Malawi to measure vaccine effectiveness. Besides building local surveillance capacity, this study will provide useful data to measure vaccine effectiveness in an outbreak situation.
In addition to generating OCV evidence in the field, IVI is a member of StopCholera, (StopCholera.org), an initiative led by Johns Hopkins University to reduce cholera mortality and morbidity and to halt outbreaks. The group is focused on providing practical tools and new resources to facilitate OCV use in countries. IVI has documented lessons learned and best practices on OCV use from previous campaigns and has developed practical guidelines on social mobilization and vaccine communications. As well, IVI has developed CHOLTOOL, a relatively easy-to-use tool for policymakers to estimate the cost-effectiveness of oral cholera vaccination under several scenarios.

Finally, work continued on the oral cholera vaccine (OCV) single-dose study in Dhaka, Bangladesh conducted in collaboration with icddr,b. The study involves 225,000 participants, one of the largest clinical studies coordinated by IVI. Six months after vaccination, findings show the single dose is mildly protective for all cholera cases, while it is more protective for severe cholera. The 12-month analysis is ongoing and the subjects will be followed up for an additional 12 months.

The manuscript describing results of the six-month follow-up was published in *The New England Journal of Medicine*.


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IVI’s Enteric Fever Program aims to accelerate the development and introduction of new-generation typhoid vaccines. The program consists of two major components: 1) development of new typhoid conjugate vaccines in collaboration with manufacturers; and 2) generation of evidence on the burden of typhoid in Africa.

Like our Cholera Program, vaccine development is done through a public-private partnership approach. IVI originally developed a typhoid conjugate vaccine using conjugation technology from U.S. National Institutes of Health, conjugating the *Salmonella Typhi* Vi polysaccharide to diphtheria toxoid (Vi-DT). Unlike other typhoid vaccines, the typhoid conjugate should protect infants (a high-risk group) against typhoid. We transferred the technology to SK Chemicals of South Korea and Biofarma of Indonesia and are working with each of the partners on preclinical and clinical development for vaccine licensure and WHO-prequalification.
More recently, we started a partnership with Incepta Vaccine of Bangladesh to develop the Vi-DT vaccine. Other typhoid conjugate vaccines are now on the market (e.g., Bharat Biotech International Ltd.’s Typhbar TCV® was licensed in India), and we will work with manufacturers on getting their vaccines WHO-prequalified to ensure the vaccine is globally available and accessible.

IVI is also developing a bivalent enteric fever vaccine to protect against typhoid and paratyphoid fever. There is reportedly a high burden of paratyphoid fever in South Asia therefore a single vaccine that can protect against both diseases would be extremely beneficial. IVI has developed new conjugation methodologies for the Paratyphoid conjugate. Proof of concept was established for a bivalent (Typhoid/Paratyphoid A) and preclinical toxicology studies will be conducted in 2016.

We are also conducting typhoid surveillance in Africa in order to close the knowledge gap on the disease burden in the continent. While typhoid is recognized as a public health problem in Asia and Africa, information on its true burden is lacking, making it difficult to justify vaccination policy and to assess the impact of typhoid vaccination effective. For the past four years, we conducted the Typhoid Fever Surveillance in Africa Program (TSAP), which aimed to evaluate the typhoid burden through standardized surveillance at 13 sites in 10 sub-Saharan African countries. TSAP wound down in 2015, and we worked with the Wellcome Trust Sanger Institute on analyzing the Salmonella isolates collected from the program. The findings were published in 2016 in a Clinical Infectious Diseases supplement containing 15 original research articles.²

One of the major findings of TSAP is confirmation that enteric fever caused by Salmonella Typhi and non-typhoidal Salmonella is a significant problem in Africa. Consequently IVI will launch Severe Typhoid in Africa (SETA) in 2016, a follow-on study that will assess severe disease outcomes of typhoid and its economic burden in Africa.

In summary, we continued to make progress in 2015.

Funders: Bill & Melinda Gates Foundation, Government of Sweden, Government of Republic of Korea, Robert Koch Institute, Fondation Mérieux

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IVI is the lead agency for the Dengue Vaccine Initiative (DVI), a consortium of four organizations – IVI, World Health Organization (WHO), Johns Hopkins University, and Sabin Vaccine Institute – that aims to accelerate the introduction of dengue vaccines. DVI focuses on laying the groundwork for dengue vaccine decision-making and introduction in endemic areas. Each organization is responsible for a specific component: WHO – information and guidance documents, and regulatory training activities; Johns Hopkins – dengue vaccine financing and strategic demand forecasting; and Sabin – communications and advocacy. Besides leading the consortium, IVI is responsible for generation of evidence for decision-making such as disease burden, country vaccine introduction cases and a global investment case. DVI is supported by the Bill & Melinda Gates Foundation, as well as by smaller grants from Sanofi Pasteur and Takeda.

The current consortium model is being re-assessed, and an agreement was made to combine DVI with the Partnership for Dengue Control, which will be known as the Global Dengue and Aedes-Transmitted Diseases Consortium (GDAC). It is likely the model will expand its focus from dengue vaccines to a broader scope on prevention and control measures of Aedes-transmitted diseases (e.g., dengue, Zika and chikungunya). IVI will remain the lead agency in the new partnership.

In addition, funding was received from the German Federal Ministry of Education & Research (BMBF) to support preclinical development of dengue vaccines by manufacturers in Brazil (Instituto Butantan) and Vietnam (VaBiotech). The grant was concluded in 2015, and efforts are being made to obtain funding to continue vaccine development activities with the manufacturers. The scope has been expanded to also work with two companies from India (Serum Institute and Panacea).

In summary, IVI continued to make progress in dengue through DVI in 2015 by coordinating the disease burden field studies in Asia and South America. New studies were launched in Africa to assess the burden of dengue in Africa. As well, it continued to support activities to increase readiness of low- and middle-income countries to introduce dengue vaccines, particularly in light of licensure of Sanofi Pasteur’s CYD-TDV vaccine (Dengvaxia®). IVI is seeking new funding and is looking to expand the scope from dengue to Aedes-transmitted diseases in cooperation with consortium partners.

IVI launched a MERS Program in late 2015 with funding from Samsung. The three-year grant will accelerate the development of MERS vaccines, with the aim of having two MERS vaccines demonstrated to be safe and immunogenic in Phase II trials conducted in South Korea, and that can be deployed in clinical efficacy trials at possible outbreak sites. IVI will partner with two vaccine manufacturers on early-stage clinical development of their MERS vaccine candidates by providing technical and financial support, as well as support in project management and coordination.

We also received funding from the Korean Ministry of Health & Welfare to support the development of MERS vaccines candidates, assays, animal models and vaccine evaluation.

IVI hosted an international MERS-CoV symposium in Seoul on September 10 that gathered leading scientists and experts in public health, infectious diseases and vaccine development from South Korea, China, Europe, the Middle East and the United States that included the Deputy Minister of Health of Saudi Arabia and representatives from the U.S. Centers for Disease Control and Prevention, Walter Reed Army Institute of Research, World Health Organization. They presented the latest translational and clinical research and discussed opportunities for the development of disease countermeasures, particularly vaccines.

This was followed by a MERS-CoV vaccine development workshop co-organized by IVI, the Saudi Ministry of Health and King Abdulaziz City for Science and Technology on November 14-15 in Riyadh, Saudi Arabia, which gathered scientific experts and donors to discuss coordination of funding and research efforts for a MERS vaccine. A follow-up meeting was convened by WHO in December, the proceedings of which were published in *Nature Medicine*.  


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IVI sponsored and supported a Hepatitis E Symposium in Kathmandu, Nepal that was organized by the Nepali government on November 6-7, 2015. Following the massive earthquakes that struck Nepal earlier in the year, there were concerns about outbreaks of waterborne diseases such as cholera, typhoid, and hepatitis E. While cholera and typhoid are well-known, less is known about hepatitis E. The symposium aimed to present and share hepatitis E data among local public health and medical professionals and government officials and to discuss how to prevent, control and manage the disease in Nepal. Topics such as hepatitis E epidemiology and surveillance, diagnostics, clinical presentation and management, impact on pregnant women, and preventive measures and vaccination were presented.

IVI’s nascent Hepatitis E Program aims to accelerate the development and introduction of the hepatitis E vaccine in developing countries. As a part of this program, IVI works with developing countries fighting hepatitis E such as Nepal through technical and financial support. Hepatitis E is a liver disease caused by the hepatitis E virus, which is transmitted fecal-oraly, principally via contaminated water. Found worldwide, its prevalence is highest in East and South Asia, especially Nepal. Pregnant women, in particular, are at high risk of complications and mortality from hepatitis E, which can induce a mortality rate of 20% among pregnant women in their third trimester. China has produced and licensed the first vaccine (Hecolin®) to prevent hepatitis E virus infection however it is not yet available globally. We recently started to work with the manufacturer, Xiamen Innovax Biotech, to assess the vaccine’s readiness for WHO prequalification.

Funders: Bill & Melinda Gates Foundation, Government of Sweden, Government of Republic of Korea, Export-Import Bank of Korea
LAB RESEARCH HIGHLIGHTS
Conjugation technology platform

Based on our work with the typhoid conjugate vaccine (Vi polysaccharide conjugated to diphtheria toxoid; Vi-DT), we have been developing a Vi conjugate technology platform and using it as a presentation vehicle for poorly immunogenic proteins. The concept is based on early observations that the Vi polysaccharide conjugated to a protein carrier enhances the response to the protein if the conjugate is constructed in a certain way, possibly causing slow release of the antigen resulting in an enhanced and prolonged immune response.

Some preliminary conjugates we are working on include: Vi-PspA, Vi conjugated to PspA, a common pneumococcal protein expressed on the surface of Streptococcus pneumoniae strains; typhoid-malaria conjugate, developed in collaboration with the U.S. National Institutes of Health; and Vi conjugated to virus-like particles of rotavirus VP8, developed in collaboration with the University of Queensland.
New vaccine candidate against Shigella

*Shigella* infection (shigellosis) represents a major burden of diarrheal disease in infants and young children in developing countries. About 1.1 million people die from *Shigella* infections annually in developing countries, and 60% percent are children under five.

A vaccine is currently not available. There are challenges in developing a *Shigella* vaccine due to wide genetic variation of the *Shigella* bacterium, comprising of four species and more than 50 serotypes, as specified by the composition of the surface polysaccharide O antigen. Due to serotypic differences and increasing reports of antibiotic-resistant *Shigella* strains, the development of a universal *Shigella* vaccine is needed.

IVI has been working on the construction of a mutant *Shigella* bacterium in which the genetically modified bacterium expresses a shorter lipopolysaccharide (LPS) with one unit of O-antigen on the bacterial cell wall. This in turn increases exposure of membrane antigens, including protein antigens that are conserved across different species and serotypes of *Shigella*. Vaccination using genetically modified *Shigella* with enhanced exposure of common outer-membrane proteins could be an efficacious approach to developing a universal vaccine. Work is ongoing in mice challenge models to assess cross-protection and to see if the mutated construct can induce cytokine and humoral responses to *Shigella*.

In 2015, this work got a boost with support from PATH. IVI will be partnering with PATH to see if this potentially promising candidate can be developed into a vaccine.
**PROVIDE: Performance of oral rotavirus and poliovirus vaccines in developing countries**

PROVIDE is a research study funded by the Bill & Melinda Gates Foundation (BMGF) that seeks to uncover the role of tropical enteropathy on the immune response to oral vaccines. It has been observed that children from low-income countries have a decreased immune response to oral vaccines compared with children from developed countries.

With India’s National Institute of Cholera and Enteric Diseases (NICED), University of Virginia, and University of Vermont, IVI conducted an observational study to see if there is a relationship between children with tropical enteropathy and those who do not respond well to oral polio and rotavirus vaccines. The study also identified if maternal breast milk has a role in the child’s immune response to vaccines, and how a child’s nutritional status is related to this problem.

The study enrolled 372 infants at the hospital study site in Kolkata, India. All infants, as part of their routine immunization, received the EPI vaccines, as well as the oral rotavirus vaccine (Rotarix). For the polio vaccine, infants were randomized into two groups with one group receiving the injectable polio vaccine (IPV) and the other group receiving the oral polio vaccine (OPV).

All of the lab tests were conducted at the IVI /NICED immune-monitoring laboratory.

As the project winds down in 2016, preliminary and secondary analyses have been ongoing to make sense of the tremendous amount of data generated. Preliminary analyses suggest there is a poor immune response to oral rotavirus vaccines with immunogenicity less than 40 percent. Furthermore, there appears to be a negative correlation between maternal breast milk antibody titers and the infant’s immune response to vaccination, suggesting that breast milk antibodies may interfere with the infant’s gut immune response. Other factors such as infant’s age at enrollment, maternal BMI, maternal zinc supplementation and poor breast feeding were associated with the child’s antibody response to the rotavirus vaccine.

Finally, two new projects were initiated with Korean research partners, National Research Foundation of Korea (NRF) and Gyeongbuk Institute of Bio Industry. With support from NRF, IVI will study the virulence of *Vibrio cholerae*, which will help inform the discovery and development of new cholera vaccines. In collaboration with Gyeongbuk Institute of Bio Industry, IVI will embark on establishing an immune-monitoring platform technology and enhancing immune response to vaccines through adjuvants.
**Vaccine Safety**

In 2015, IVI launched a new software tool, the Vaccine Adverse Events Information Management System (VAEIMS), in Sri Lanka. VAEIMS was developed by IVI to efficiently transfer vaccine safety data from periphery health care centers to a central database. This will help improve reporting, monitoring, and management of vaccine safety data by public health authorities, enabling them to respond more quickly to public vaccine safety issues. Sri Lanka was the first site to test the software, and there are plans for roll-out in other developing countries. VAEIMS was developed as part of the WHO Global Vaccine Safety Initiative (GVSI), of which IVI is a participating partner. GVSI aims to ensure that all countries have at least a minimal capacity to ensure vaccine safety. VAEIMS was written up in the GVSI bulletin.¹

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**15th Vaccinology Course, May 11-15, 2015**

For the past 15 years, IVI has been conducting its annual vaccinology course. One of the longest running vaccinology courses in Asia, IVI’s Vaccinology Course has trained more than 1,000 people so far. The course aims to promote vaccine sustainability in developing countries by capacity-building. The course trains vaccine professionals from low- and middle-income countries (LMICs) in vaccinology and fosters development of collaborative networks and partnerships among LMICs. Fellowships are competitively awarded to individuals from low-income countries with demonstrated financial need.

The five-day course, based at IVI’s headquarters in Seoul, provides a comprehensive overview of vaccinology starting with fundamentals in epidemiology and immunology and moving from concepts and issues related to vaccine discovery, development, and introduction. The course is a combination of lectures and interactive case studies that are presented and facilitated by international experts from academia, industry, and global public health.
Coursesurveyevaluationsfromtheparticipants
foundthequalityofthecourseoveralltobevery
goodbutwithsomeroomforimprovement.There
wereseveralcommentsformorelecturesand/orcase
studiesonclinicaltrialdesign,vaccinesafetyand
pharmacovigilance.

Planningisunderwayforthe16theditionofthe
vaccinologycourse,whichisscheduledonSeptember
26-30,2016atIVI.

Lastyear’svaccinologycoursesaw91participantsof
29differentnationalities,and10fellowshipsawarded.
Morethan30expertsfrominternationalagencies(e.g.,
IVI,WorldHealthOrganization);researchinstitutions
(e.g.,U.S.NationalInstitutesofHealth);universities
(e.g.,LondonSchoolofHygiene&TropicalMedicine,
Oxford);industry,andnon-profitorganizationsserved
asfacultymembers.IVI’sDirectorGeneral,Dr.Jerome
Kim,wasthek keynote speaker.

Coursesurvey evaluations from the participants
found the quality of the course overall to be very
good but with some room for improvement. There
were several comments for more lectures and/or case
studies on clinical trial design, vaccine safety and
pharmacovigilance.

Planningisunderwayforthe16theditionofthe
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<tr>
<td>Chungnam National University, Republic of Korea</td>
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<tr>
<td>Coalition against Typhoid</td>
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<tr>
<td>Developing Countries Vaccine Manufacturers Network (DCVMN)</td>
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<tr>
<td>Duke University Medical Center</td>
<td>USA</td>
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<tr>
<td>Embassy of the United States to the Republic of Korea</td>
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<tr>
<td>Emory University</td>
<td>USA</td>
</tr>
<tr>
<td>Ethiopian Health and Nutrition Research Institute, Ethiopia EuBiologics</td>
<td>Republic of Korea</td>
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<tr>
<td>Ewha University</td>
<td>Republic of Korea</td>
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<tr>
<td>Fred Hutchinson Cancer Research Center</td>
<td></td>
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<tr>
<td>Gavi, the Vaccine Alliance</td>
<td>Switzerland</td>
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<tr>
<td>Global Health Investment Fund</td>
<td>USA</td>
</tr>
<tr>
<td>Green Cross</td>
<td>Republic of Korea</td>
</tr>
<tr>
<td>Group for Technical Assistance</td>
<td>Nepal</td>
</tr>
<tr>
<td>Hallym University</td>
<td>Republic of Korea</td>
</tr>
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<td>Republic of Korea</td>
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<tr>
<td>icddr,b</td>
<td>Bangladesh</td>
</tr>
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<td>Incepta Vaccine</td>
<td>Bangladesh</td>
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<tr>
<td>Indian Council of Medical Research</td>
<td>India</td>
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<tr>
<td>Institut Pasteur</td>
<td>Korea</td>
</tr>
<tr>
<td>Institut Pasteur</td>
<td>Senegal</td>
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<tr>
<td>Institut Supérieur des Sciences de la Population (ISSP)</td>
<td></td>
</tr>
<tr>
<td>Instituto Butantan</td>
<td>Brazil</td>
</tr>
<tr>
<td>International Society for Vaccines (ISV)</td>
<td>U.S.A.</td>
</tr>
<tr>
<td>Johns Hopkins University – International Vaccine Access Center (IVAC)</td>
<td>USA</td>
</tr>
<tr>
<td>John Snow, Inc.</td>
<td>USA</td>
</tr>
<tr>
<td>Kangwon National University</td>
<td>Republic of Korea</td>
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<tr>
<td>Kenya Medical Research Institute</td>
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<tr>
<td>Kilimanjaro Christian Medical Centre</td>
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<tr>
<td>Konkuk University</td>
<td>Republic of Korea</td>
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<tr>
<td>Korea Center for Disease Control</td>
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</tr>
<tr>
<td>Korea Institute of Tuberculosis</td>
<td>Republic of Korea</td>
</tr>
<tr>
<td>Korea National Institute of Health (KNIH)</td>
<td>Republic of Korea</td>
</tr>
<tr>
<td>Korea Research Institute of Bioscience and Biotechnology (KRIIB)</td>
<td>Republic of Korea</td>
</tr>
<tr>
<td>Kumasi Centre for Collaborative Research in Tropical Medicine</td>
<td>Ghana</td>
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<tr>
<td>Kyunghee University</td>
<td></td>
</tr>
<tr>
<td>Mahidol University</td>
<td>Thailand</td>
</tr>
<tr>
<td>Metrosalud ESE / Unidad Hospitalaria comunna Santa Cruz, Medellín</td>
<td>Colombia</td>
</tr>
<tr>
<td>Ministry of Food and Drug Safety</td>
<td></td>
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</table>
Republic of Korea
Ministries of Health
Ethiopia, Malawi, Sudan

Ministries of Public Health
Brazil, Colombia, Thailand

Ministry of Health and Population
Nepal

National Institute for Communicable Diseases (NICD)
South Africa

National Institute of Cholera & Enteric Diseases (NICED)
India

National Institute of Hygiene and Epidemiology (NIHE)
Vietnam

National Institutes of Health (NIH)
USA

Oromia Regional Health Bureau
Ethiopia

Oxford Economic Forecasting
United Kingdom

Pan American Health Organization (PAHO)

Patan Hospital
Nepal

PATH
USA

Pohang University of Science and Technology (POSTECH)
Republic of Korea

Programa de Estudio y Control de Enfermedades Tropicales (PECET), Universidad de Antioquia
Medellín, Colombia

Sabin Vaccine Institute
USA

Sanofi Pasteur
France

Secretaria de Salud

Sejong University
Republic of Korea

Seoul National University
Republic of Korea

Shantha Biotechnics
India

SK Chemicals
Republic of Korea

Stanford University
USA

Takeda Pharmaceutical Company Limited
Japan

Technical University of Berlin (TUB)
Germany

Transgovernment Enterprise against Pandemic Influenza of Korea (TEPIK)

UNICEF
Nepal

United States Centers for Disease Control and Prevention (CDC)
USA

University of Alabama at Birmingham, USA

University of Antananarivo
Madagascar

University of Antioquia
Columbia

University of Florida
USA

University of Gezira
Sudan

University of Gothenburg
Sweden

University of Melbourne
Australia

University of Ouagadougou
Burkina Faso

University of Oxford
UK

University of Queensland
Australia

University of Vermont
USA

University of Virginia
USA

University of Wisconsin
USA

VaBiotech
Vietnam

Walter Reed Army Institute of Research (WRAIR)
USA

Washington University
USA

Wellcome Trust Sanger Institute
UK

WHO Initiative for Vaccine Research (IVR)

WHO Programme for Immunization Preventable Diseases (IPD)
Nepal

WHO Regional Office for Europe (EURO)

WHO Regional Office for South-East Asia (SEARO)

WHO Regional Office for the Western Pacifi (WPRO)

World Health Organization (WHO)

Yonsei University


## 2015 FINANCIAL SUMMARY

### Financial Summary YTD Dec 2015 vs. 2014

<table>
<thead>
<tr>
<th>Revenue (in USD)</th>
<th>2015</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bill &amp; Melinda Gates Foundation (BMGF)</td>
<td>12,380,328</td>
<td>13,915,719</td>
</tr>
<tr>
<td>Government of the Republic of Korea</td>
<td>3,631,659</td>
<td>3,192,405</td>
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<tr>
<td>Swedish International Development Cooperation Agency (Sida)</td>
<td>720,420</td>
<td>-</td>
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<tr>
<td>Corporations / Individuals / Others</td>
<td>3,095,397</td>
<td>4,485,623</td>
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<tr>
<td>Korean Government Laboratory Support</td>
<td>1,294,612</td>
<td>1,947,422</td>
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<tr>
<td>Investments (Interest Income)</td>
<td>35,005</td>
<td>72,912</td>
</tr>
<tr>
<td><strong>Total Revenue</strong></td>
<td><strong>21,157,421</strong></td>
<td><strong>23,614,082</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Expense (in USD)</th>
<th>2015</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Service</td>
<td>16,634,140</td>
<td>20,130,889</td>
</tr>
<tr>
<td>Laboratory Support</td>
<td>1,287,420</td>
<td>1,095,012</td>
</tr>
<tr>
<td>Management &amp; General</td>
<td>3,081,691</td>
<td>3,042,427</td>
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<tr>
<td>Communications &amp; Advocacy</td>
<td>831,373</td>
<td>802,065</td>
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<tr>
<td><strong>Total Expense</strong></td>
<td><strong>21,834,624</strong></td>
<td><strong>25,070,394</strong></td>
</tr>
<tr>
<td>Foreign Exchange Gain (Loss)</td>
<td>(480,939)</td>
<td>(778,584)</td>
</tr>
<tr>
<td><strong>Net Surplus (Deficit)</strong></td>
<td><strong>(1,158,141)</strong></td>
<td><strong>(2,234,896)</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assets</th>
<th>2015</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash and Cash Equivalents</td>
<td>5,126,466</td>
<td>19,727,307</td>
</tr>
<tr>
<td>Bank Deposits</td>
<td>21,409,144</td>
<td>8,056,188</td>
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<tr>
<td>Other Current Assets</td>
<td>1,031,521</td>
<td>860,065</td>
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<tr>
<td>Other Assets</td>
<td>1,090,148</td>
<td>762,415</td>
</tr>
<tr>
<td><strong>Total Assets</strong></td>
<td><strong>28,657,279</strong></td>
<td><strong>29,405,975</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Liabilities and Net Assets</th>
<th>2015</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grant Funds-Deferred Support</td>
<td>23,079,592</td>
<td>23,604,226</td>
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<tr>
<td>Other Current Liabilities</td>
<td>1,843,335</td>
<td>909,256</td>
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<tr>
<td>Other Liabilities</td>
<td>-</td>
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<tr>
<td>Net Assets</td>
<td>3,734,352</td>
<td>4,892,493</td>
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<tr>
<td><strong>Total Liabilities and Net Assets</strong></td>
<td><strong>28,657,279</strong></td>
<td><strong>29,405,975</strong></td>
</tr>
</tbody>
</table>
2015
- Bill & Melinda Gates Foundation (BMGF): 15%
- Government of the Republic of Korea: 14%
- Swedish International Development Cooperation Agency (Sida): 6%
- Corporations / Individuals / Others: 3%
- Korean Government Laboratory Support: 17%
- Investments (Interest Income): 6%
- Program Service: 76%
- Laboratory Support: 4%
- Management & General: 15%
- Communications & Advocacy: 3%

2014
- Bill & Melinda Gates Foundation (BMGF): 19%
- Government of the Republic of Korea: 14%
- Swedish International Development Cooperation Agency (Sida): 8%
- Corporations / Individuals / Others: 5%
- Korean Government Laboratory Support: 14%
- Investments (Interest Income): 3%
- Program Service: 80%
- Laboratory Support: 12%
- Management & General: 5%
- Communications & Advocacy: 3%
SIGNATORIES TO IVI’S ESTABLISHMENT AGREEMENT

- Bangladesh
- Bhutan
- Brazil
- China
- Israel
- Jamaica
- Kazakhstan
- Kyrgyzstan
- Burma
- Nepal
- Netherlands
- Oman
- Philippines
- Republic of Korea
- Belgium
- Senegal
- Turkey
- Uzbekistan
- Vietnam
- WHO