International Vaccine Institute

Developing Countries Vaccine Manufacturers Network

Annual General Meeting
16 to 18 October 2024
Sao Paulo, Brazil

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IVI

IVI: Who we are -- where we work -- what we do

Our mission

Next step

Together

IVI is an UN-chartered international organization dedicated to accelerating vac R&D for global health

… is to discover, develop and deliver safe, effective and affordable vaccines to enable the world's most vulnerable people to have full, productive lives

… is to expand our global presence and expand our partnerships and innovative capabilities

… we can achieve our ***VISION*** of developing countrie of suffering from infectious disease

	Discover	Develop	Deliver	Epi. Surveillance
Vaccine Development Services*	Pre-Clinical Study & Support: Material production, test & release for toxicology studies; Protocol dev.; CMO/CRO identification	Assay Validation & Clinical Samples Evaluation: Critical assay development & optimization; Method validation according to ICH guidelines; Clinical sample evaluation in GCLP lab	Health Economic Study: Field-based data collection incl. costing & willingness to pay; Global/country analyses incl. invest., budget impact, cost-effectiveness, demand & disease burden	Epidemiology/ Observational Study Support: Protocol dev. incl. definition of endpoint, bio investigation, & database; Prevalence & incidence est. of infection/disease severity; Data for decision on vaccine introduction; Site preparedness for Ph.3 trial & effectiveness study
	Process & Analytical Dev.: Scalable & optimized processes for candidate Ag; Analytical methods for qual. testing; *In vivo* animal studies	Tech Transfer Support: Candidates & process transfer to CMOs & stability plan dev.		AMR Monitoring: AMR assessment & public database creation
		Mfg. Support: Process scale-up & ensuring of commercial-scale mfg. & vaccine candidate supply		
		Clinical Dev. & Regulatory Support: IPDP & CDP development; Clinical trial implementation & management in HIC & LMIC; Regulatory affairs consultation	Policy & Advocacy Research	Vaccine Impact & Effectiveness Study: Mass vaccination campaign; Vaccine intro through health authorities; Real-life vaccine performance assessment
			Modeling: Vaccine impact & disease risk mapping etc.	
Diseases	• iNTS • Group A strep • SFTSV • Shigella • Hepatitis A, B • Tuberculosis • HAdV-55 • COVID-19	• Paratyphoid A • Zika • Hantavirus Pulmonary • Syndrome (HPS) • Lassa fever • MERS	• Invasive Non-typhoidal Salmonella (iNTS) • MERS-CoV • Chikungunya • Schistosomiasis • Typhoid • COVID-19 • Cholera • Micro-needle array (MAP) Hep-B	• Human Papilloma Virus (HPV) • Hepatitis E • Cholera • COVID-19	• Typhoid • Cholera • COVID-19 • RSV • GAS • Shigella • AMR

*in-progress application

Impact for a healthier future

IVI's model of market access:

- Affordability (global access requirements)
- Work with global, regional and local entities
- Facilitation with data generation (surveillance, economics, impact assessment, clinical)
- Advocacy and coordination: GTFCC, TyVAC, PDVI, DVI
- Collaboration and technology transfer for local access
- Innovative technologies to reach the last-mile (MAP)

First ever low-cost oral cholera vaccine → **150 million+** doses shipped globally

Vaccine discovery and development → **180+** projects completed since 2015

Epidemiology and impact studies → **20+** projects completed since 2015

Technology transfer and Clinical development → **14** tech transfer projects with **6** vaccines and **40+** clinical trials sponsored by IVI since 2005

Prequalification → **5** vaccine products pre-qualified by the WHO

Training → **8,000+** professionals trained on-site and online

Knowledge production → **1,400+** publications, **625** since 2015

IVI Vaccines Bring *Affordable* Innovation to Global Health

	Cost	Funder	Manufacturer
Vaccine #1 **Oral cholera vaccine**	Cost thru PQ: **$28M**	BILL & MELINDA GATES foundation	 Shanchol PQ 2011  Euvichol® PQ 2016 Euvichol®- Plus PQ 2018 Euvichol®-S PQ 2024
Vaccine #2 **Vi-DT TCV (Typhoid)**	Cost thru PQ[1] : **$29M**	BILL & MELINDA GATES foundation	SK bioscience KMFDS approved, WHO PQ 2024 bioFarma BPOM approved 11/23
Vaccine #3 **Non-typhoidal Salmonella Shigella**	IVI internal invest. preclinical POC; Wellcome: **$3.2M**	IVI Wellcome	SK bioscience

1. Estimated

Salmonella Vaccine Development Status

Maclennan et al 2023

Different stages of development:

- Multiple TCVs licensed and WHO PQed
- iNTS (Typhimurium and Enteritidis) alone or in combination with TCV in early clinical trials
- Paratyphi A alone in pre-clinical/ early clinical development
- Pan-Salmonella vaccine (TCV, Para A + iNTS) concept stage work in progress

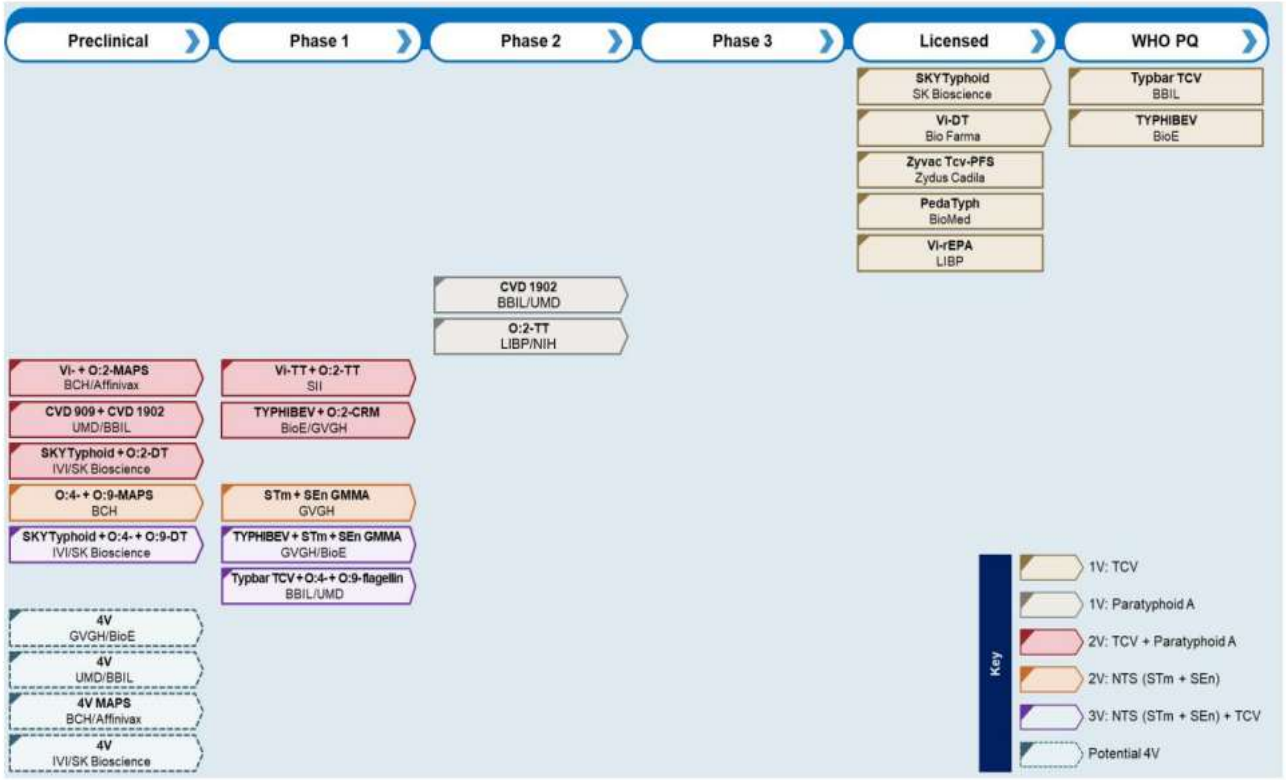
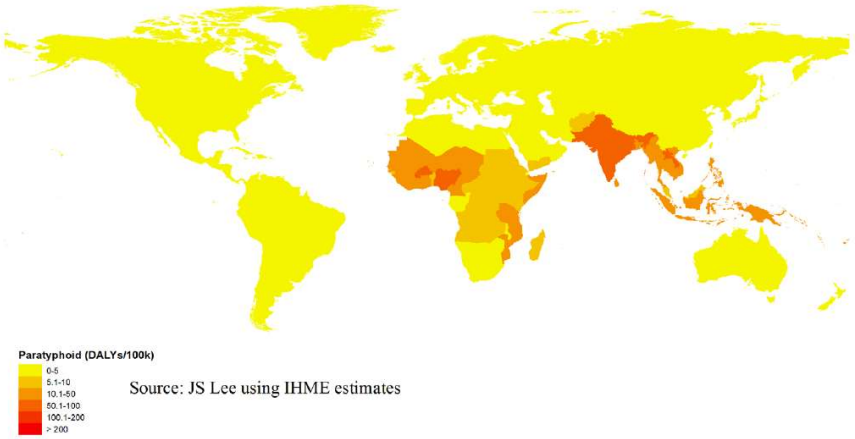


Figure 1. *Salmonella* combination vaccine pipeline including licensed and World Health Organization–prequalified typhoid conjugate vaccines, monovalent paratyphoid A vaccines in clinical development, and potential quadrivalent *Salmonella* vaccines. Arrowed boxes indicate ongoing development. Abbreviations: 1V, monovalent; 2V, bivalent; 3V, trivalent; 4V, quadrivalent; BBIL, Bharat Biotech International Ltd; BCH, Boston Children's Hospital; BioE, Biological E; GMMA, generalized modules for membrane antigens; GVGH, GlaxoSmithKline Vaccines Institute for Global Health; IVI, International Vaccine Institute; LIBP, Lanzhou Institute of Biological Products; NIH, National Institutes of Health; NTS, nontyphoidal *Salmonella*; PQ, prequalified; SEn, *Salmonella* Enteritidis; STm, *Salmonella* Typhimurium; SII, Serum Institute of India; TCV, typhoid conjugate vaccine; UMD, University of Maryland; WHO, World Health Organization.

Salmonella Vaccine Development Strategy Considerations

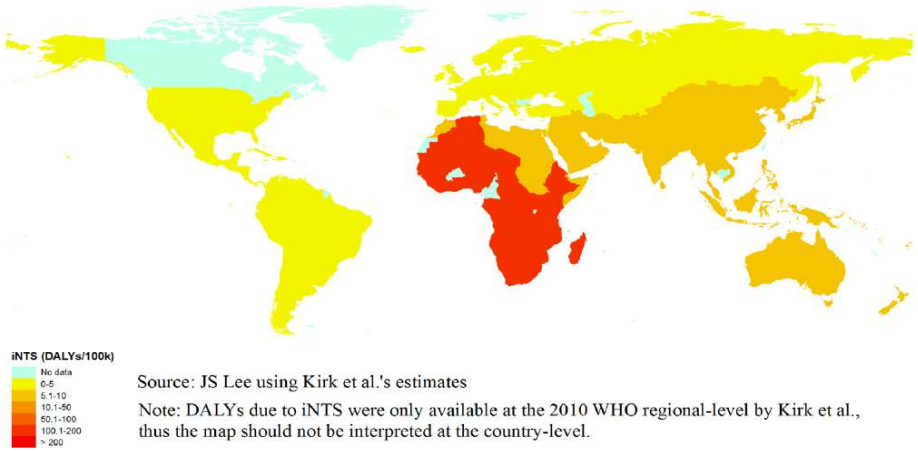
DALYs due to paratyphoid in 2016



Source: JS Lee using IHME estimates

Different Geographic distribution

DALYs due to iNTS in 2010



Source: JS Lee using Kirk et al.'s estimates

Note: DALYs due to iNTS were only available at the 2010 WHO regional-level by Kirk et al., thus the map should not be interpreted at the country-level.

- **Unclear Regulatory pathway for licensure:** Need for efficacy study? Possible for iNTS, but not for Para A. Role of CHIM?
- **Unclear use-case scenario:** TCV monovalent vs TCV-Para A bivalent vs TCV-iNTS trivalent vs Pan-Salmonella (TCV-Para A-iNTS)
- **Immune inhibition for multiple combination antigens:** Need for process optimization and adjuvants
- **Different target age-groups and vaccination regimes**
- **Longevity of immune responses and need for multiple/ booster doses**
- **COGS for combination vaccines:** Too expensive for targeted countries?
- **Financing**: TCV under Gavi funding, iNTS potentially can, but unclear on Para A based on the endemic countries