

\*\*\*\*Published March 2018\*\*\*\*

## MarketVIEW: Shigella vaccines (CAT: VAMV067)

<b>Product Name</b>	:	<b>MarketVIEW: Shigella vaccines</b>
<b>Description</b>	:	Vaccine opportunity assessment
<b>Contents</b>	:	Executive presentation (.pdf) and MS forecast model (.xls)
<b>Therapeutic Area</b>	:	Novel enteric vaccines
<b>Publication date</b>	:	March 2018
<b>Catalogue No</b>	:	VAMV067

### Background

**Shigella** are a highly infectious Gram-negative, non-sporulating, facultative anaerobic bacteria. They produce toxins, which cause a clinical presentation known as Shigellosis. Shigellosis comprises of systemic symptoms such as fever, headache, malaise, anorexia and occasional vomiting. Although shigellosis in otherwise healthy individuals is generally self-limiting, persistent diarrhoea in young children can be serious with the additional risk of seizures, haemolytic uraemic syndrome and other rare complications, which include encephalopathy. Most importantly, Shigella is the fifth most common known cause of diarrhoeal death in children aged <5 years, mostly in the developing world. In 1999, there were estimated to be 164.7 million cases of shigellosis annually globally in 1999, with 1.1 million deaths (WHO Figures).

A Shigella vaccine that can protect against all strains that produce clinically important disease is needed (i.e. a multivalent vaccine). International agencies such as PATH, WHO, and major national agencies such as the NIH are co-funding vaccine development to speed the development of safe, effective and affordable vaccines against Shigella. Some candidates e.g. WRAIR, GSK and PATH are in active clinical development. Approaches followed are cellular, glycol-conjugate, novel antigen and subunit candidates.

The **MarketVIEW** product is a comprehensive MS Excel-based model + summary presentation that forecasts the potential commercial value of Shigella vaccines across endemic and travelers markets to 2035. Each model contains value (\$ m) and volume (mio doses) predictions along with launch timeframe, TPP, pricing and penetration estimates. LO/BASE/Hi forecast scenarios are included based upon a risk classification of countries in terms of Shigella spp. disease incidence. An up to date review is also given for latest disease background and epidemiology, along with current R&D status.

## Methodology

**VacZine Analytics** has closely monitored all significant source material pertaining to Shigella spp, pediatric diarrhea, shigellosis and related indications. Source materials used are literature articles, government websites, medical bodies and associations, conference proceedings etc. Previously published research by **VacZine Analytics** in the field of novel bacterial vaccines has also been utilised.

### PRODUCT CONTENTS:

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\*\*\*\*This product is composed of **one** forecast model (.xls)<sup>1</sup> and a summary presentation (.pdf)

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**Continued.....**

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## BIBLIOGRAPHY

1. Ram PK, et al. Part II. Analysis of data gaps pertaining to Shigella infections in low and medium human development index countries, 1984–2005. *Epidemiol Infect* 2008;136:577.
2. Thompson CN, et al. The Rising Dominance of Shigella sonnei: An Intercontinental Shift in the Etiology of Bacillary Dysentery. *PLoS Negl Trop Dis* 2015;9(6):e0003708.
3. BACMAP. Shigella sonnei Ss046. 2016. <http://bacmap.wishartlab.com/organisms/262> [Accessed March 2018].
4. Carayol N & Van Nhieu GT. The Inside Story of Shigella Invasion of Intestinal Epithelial Cells. *Cold Spring Harb Perspect Med* 2013;3:a016717.
5. CDC. Travelers' Health. Shigellosis. 2015. <http://wwwnc.cdc.gov/travel/yellowbook/2016/infectious-diseases-related-to-travel/shigellosis> [Accessed Jan 2016].
6. NIAID. Shigellosis. 2015. <https://www.niaid.nih.gov/topics/shigellosis/Pages/shigellosis.aspx> [Accessed March 2018].
7. Böhles N, et al. Vaccines against human diarrheal pathogens. *Hum Vaccine Immunotherapeutics* 2014;10:1522.
8. Barry EM, et al. Progress and pitfalls in Shigella vaccine research. *Nat Rev Gastroenterol Hepatol* 2013;10:245.
9. Zaidi MB & Estrada-Garcia T. Shigella: A Highly Virulent and Elusive Pathogen. *Curr Trop Med Rep* 2014;1:81.
10. Lanata CF, et al. Global Causes of Diarrheal Disease Mortality in Children ,5 Years of Age: A Systematic Review. *PLoS One* 2013;8:e72788.
11. Horizon International Solutions Site. Realizing Water, Sanitation and Hygiene for All. 2014. <http://www.solutions-site.org/node/1255> [Accessed March 2018]
12. Livio S, et al. Shigella Isolates From the Global Enteric Multicenter Study Inform Vaccine Development. *Clin Infect Dis* 2014;59:933.
13. Kotloff KL, et al. Global burden of Shigella infections: implications for vaccine development and implementation of control strategies. *Bull World Health Organ* 1999;77:651.
14. Bardhan P, et al. Decrease in Shigellosis-related Deaths without Shigella spp.–specific Interventions, Asia. *Emerg Infect Dis* 2010;16:1718.
15. Scallan E, et al. Foodborne Illness Acquired in the United States—Major Pathogens. *Emerg Infect Dis* 2011;17:7.
16. Public Health England. Shigella cases 1992 to 2013. 2013. <https://www.gov.uk/government/statistics/shigella-cases-1992-to-2013> [Accessed March 2018]
17. WHO. Guidelines for the control of shigellosis, including epidemics due to Shigella dysenteriae type 1. 2005. <http://www.who.int/cholera/publications/shigellosis/en/> [Accessed March 2018]
18. George CM, et al. Shigella Infections in Household Contacts of Pediatric Shigellosis Patients in Rural Bangladesh. *Emerg Infect Dis* 2015;21:2006.
19. Haley CC, et al. Risk factors for sporadic shigellosis, FoodNet 2005. *Foodborne Pathog Dis* 2010;7:741.
20. Toro C, et al. Shigellosis in Subjects with Traveler's Diarrhea Versus Domestically Acquired Diarrhea: Implications for Antimicrobial Therapy and Human Immunodeficiency Virus Surveillance. *Am J Trop Med Hyg* 2015;93:491.
21. Warne B, et al. Travel-Related Infection in European Travelers, EuroTravNet 2011. *J Travel Med* 2014;21:248.
22. Trepanier S, et al. Travel-Related Shigellosis in Quebec, Canada: An Analysis of Risk Factors. *J Travel Med* 2014;21:304.
23. Baaten GG, et al. Fecal-Orally Transmitted Diseases Among Travelers Are Decreasing Due to Better Hygienic Standards at Travel Destination. *J Travel Med* 2010;17:322.
24. Rheingans R, et al. Determinants of Household Costs Associated With Childhood Diarrhea in 3 South Asian Settings. *Clin Infect Dis* 2012;55:S327.
25. Von Seidlein L, et al. A Multicentre Study of Shigella Diarrhoea in Six Asian Countries: Disease Burden, Clinical Manifestations, and Microbiology. *PLoS Med* 2006;3:e353
26. Central Intelligence Agency. The World Factbook. 2015. <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2119rank.html> [Accessed March 2018]
27. Scharff RL. Health-related costs from foodborne illness in the United States. 2010. <http://www.pewtrusts.org/en/research-and-analysis/reports/0001/01/01/healthrelated-costs-from-foodborne-illness-in-the-united-states> [Accessed March 2018]
28. Niyogi SK. Shigellosis. *J Microbiol* 2005;43:133.
29. Ashkenazi S, et al. Growing antimicrobial resistance of Shigella isolates. 2003;51:427.
30. Rahman M, et al. Increasing Spectrum in Antimicrobial Resistance of Shigella Isolates in Bangladesh: Resistance to Azithromycin and Ceftriaxone and Decreased Susceptibility to Ciprofloxacin. *J Health Popul Nutr* 2007;25:158.
31. Sadeghabadi AF, et al. Widespread antibiotic resistance of diarrheagenic Escherichia coli and Shigella species. *J Res Med Sci* 2014;19(Suppl 1):S51.
32. PATH. Shigellosis and enterotoxigenic Escherichia coli (ETEC). 2015. <http://www.path.org/vaccineresources/shigella-etec.php> [Accessed March 2018]

33. Levine MM, et al. Clinical trials of Shigella vaccines: two steps forward and one step back on a long, hard road. *Nat Rev Microbiol* 2007;5:540.
34. Orr N, et al. Community-Based Safety, Immunogenicity, and Transmissibility Study of the Shigella sonnei WRSS1 Vaccine in Israeli Volunteers. *Infect Immun* 2005;73:8027
35. Rahman KM, et al. Safety, dose, immunogenicity, and transmissibility of an oral live attenuated Shigella flexneri 2a vaccine candidate (SC602) among healthy adults and school children in Matlab, Bangladesh. *Vaccine* 2011;29:1347
36. Launay O, et al. Safety and immunogenicity of SC599, an oral live attenuated Shigella dysenteriae type-1 vaccine in healthy volunteers: results of a Phase 2, randomized, double-blind placebo-controlled trial. *Vaccine* 2009;27:1184
37. Barnoy S, et al. Characterization of WRSS2 and WRSS3, new second-generation virG(icsA)-based Shigella sonnei vaccine candidates with the potential for reduced reactogenicity. *Vaccine* 2010;28:1642
38. Kotloff KL, et al. Safety and immunogenicity of CVD 1208S, a live, oral DeltaguaBA Deltasen Deltaset Shigella flexneri 2a vaccine grown on animal-free media. *Hum Vaccin* 2007;3:268
39. Ranallo RT, et al. Immunogenicity and characterization of WRSF2G11: a second generation live attenuated Shigella flexneri 2a vaccine strain. *Vaccine* 2007;8:2269
40. Passwell JH, et al. Age-related efficacy of Shigella O-specific polysaccharide conjugates in 1-4-year-old Israeli children. *Vaccine* 2010;28:2231
41. <https://clinicaltrials.gov/ct2/show/NCT02646371>
42. Gerke C, et al. Production of a Shigella sonnei Vaccine Based on Generalized Modules for Membrane Antigens (GMMA), 1790GAHB, *PLoS One* 2015;10:e0134478
43. Riddle MS, et al. Safety and immunogenicity of an intranasal Shigella flexneri 2a Invaplex 50 vaccine. *Vaccine* 2011;29:7009
44. Hatz CF, et al. Safety and immunogenicity of a candidate bioconjugate vaccine against Shigella dysenteriae type 1 administered to healthy adults: A single blind, partially randomized Phase I study. *Vaccine* 2015;33:4594
45. Kaminski RW, et al. Development and Preclinical Evaluation of a Trivalent, Formalin-Inactivated Shigella Whole-Cell Vaccine. *Clin Vaccine Immunol* 2014;21:366
46. Heine SJ, et al. Shigella IpaB and IpaD displayed on L. lactis bacterium-like particles induce protective immunity in adult and infant mice. *Immunol Cell Biol* 2015;93:641
47. Das JK, et al. Vaccines for the prevention of diarrhea due to cholera, shigella, ETEC and rotavirus. *BMC Public Health* 2013;13(Suppl 3):S11
48. PATH. ETEC and Shigella vaccine development. <http://sites.path.org/vaccinedevelopment/diarrhea-rotavirus-shigella-etec/shigella-and-etec-vaccine-development/> [Accessed March 2018]
49. WHO. WHO recommendations for routine immunization - summary tables. 2015. [http://www.who.int/immunization/policy/immunization\\_tables/en/](http://www.who.int/immunization/policy/immunization_tables/en/) [Accessed March 2018]
50. Kim SY et al. Health and economic impact of rotavirus vaccination in GAVI-eligible countries. *BMC. Pub. Health* 2010;10:253
51. WHO. Immunization coverage. 2016. [http://apps.who.int/immunization\\_monitoring/globalsummary/timeseries/tscveragebcg.html](http://apps.who.int/immunization_monitoring/globalsummary/timeseries/tscveragebcg.html) [Accessed March 2018]
52. Lu PJ, et al. Hepatitis A vaccination coverage among adults 18-49 years traveling to a country of high or intermediate endemicity, United States. *Vaccine* 2013;31:2348.
53. Lopez-Velez R, et al. Spanish Travelers to High-Risk Areas in the Tropics: Airport Survey of Travel Health Knowledge, Attitudes, and Practices in Vaccination and Malaria Prevention. *J Travel Med* 2007;14:297.
54. Buhler S, et al. A Profile of Travelers—An Analysis From a Large Swiss Travel Clinic. *J Travel Med* 2014;21:324
55. Heywood AE, et al. A cross-sectional study of pre-travel health-seeking practices among travelers departing Sydney and Bangkok airports. *BMC Public Health* 2012;12:321.
56. Wilder-Smith A, et al. Travel Health Knowledge, Attitudes and Practices among Australasian Travelers. *J Travel Med* 2004;11:9.

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## About VacZine Analytics:

**VacZine Analytics** is an established strategic research agency based in the United Kingdom. Its aim is to provide disease and commercial analysis for the vaccine industry and help build the case for developing new vaccines and biologics.

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