

****Published March 2018****

MarketVIEW: *Campylobacter jejuni* vaccines (CAT: VAMV071)

Product Name	:	MarketVIEW: <i>Campylobacter jejuni</i> vaccines
Description	:	Vaccine commercial opportunity assessment
Contents	:	Executive presentation (.pdf) + 1 commercial forecast model(s) (.xls)
Therapeutic Area	:	Endemic/travel vaccines
Publication date	:	March 2018
Catalogue No	:	VAMV071

Background

Campylobacter jejuni is a major cause of gastroenteritis worldwide and is also associated with Guillain-Barré syndrome (GBS) and other complications. The primary symptom, gastroenteritis occurs within 24–72 hours of ingestion. Infection usually manifests as acute watery or bloody diarrhoea, fever, weight loss and cramps that last ~6 days. *Campylobacteriosis* is the sixth most common known cause of diarrhoeal death in children aged <5 years. It is also the most common cause of bacterial gastroenteritis, responsible for 7.5 million DALYs in 2010. *Campylobacter* can also affect Western travellers to endemic countries

There is considerable potential value in a vaccine against *Campylobacter* for humans and animals. In humans, the potential relates to the prevention of not just acute infection, but also the sequelae of campylobacteriosis, which could lead to a significant reduction in the burden of disease. Potential target groups include children living in developing countries, travelers and the military.

This **MarketVIEW** product is composed of a comprehensive MS Excel-based model + Summary Presentation that forecasts the potential commercial value of *Campylobacter jejuni* vaccines across 47 endemic countries to 2035. Three scenarios (**LO, BASE and HI**) are included based upon successive targeting of endemic countries based upon **DALYs per WHO region**. A travelers forecast from major Western points of origin is also included. The report covers a detailed review of disease background and epidemiology along with current treatment, unmet needs and rationale for vaccine approach. An ideal **Target Product Profile (TPP)** is defined along with commercial model assumptions with pricing justification.

Methodology

VacZine Analytics has closely monitored all significant source material pertaining to endemic/travel vaccines and novel approaches to enteric/diarrhoeal pathogens. 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 bacterial/nosocomial vaccines has also been utilised.

PRODUCT CONTENTS:

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****This product is composed of [one forecast model \(.xls\)](#)¹ and [a summary presentation \(.pdf\)](#)²

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¹ Model contents available upon request

² Presentation titles may apply to more than one slide

Continued.....

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About **VacZine Analytics**

Slide number = 73

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BIBLIOGRAPHY

1. Kaakoush NO, et al. Global Epidemiology of *Campylobacter* Infection. Clin Microbiol Rev. 2015;28:687.
2. WHO. The global view of campylobacteriosis. 2013. <http://www.who.int/foodsafety/publications/campylobacteriosis/en/> [Accessed October 2016].
3. Stahl M & Vallance BA. Insights into *Campylobacter jejuni* colonization of the mammalian intestinal tract using a novel mouse model of infection. Gut Microbes. 2015;6:143.
4. Javid MH. Campylobacter infections. 2016. <http://emedicine.medscape.com/article/213720-overview> [Accessed March 2018].
5. Heikema AP, et al. Campylobacter jejuni capsular genotypes are related to Guillain–Barré syndrome. Clin Microbiol Infect. 2015;31:852.e1.
6. Poropatich KO, et al. Quantifying the Association between Campylobacter Infection and Guillain-Barré Syndrome: A Systematic Review. J Health Popul Nutr. 2010;28:545.
7. Nyati KK & Nyati R. Role of Campylobacter jejuni Infection in the Pathogenesis of Guillain-Barré Syndrome: An Update. Biomed Res Int. 2013;Article ID 852195.
8. Lanata CF, et al. Global Causes of Diarrheal Disease Mortality in Children ,5 Years of Age: A Systematic Review. PLoS One. 2013;8:e72788.
9. Murray CJ, et al. Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. 2012;308:2197.
10. Kirk MD, et al. World Health Organization Estimates of the Global and Regional Disease Burden of 22 Foodborne Bacterial, Protozoal, and Viral Diseases, 2010: A Data Synthesis. PLoS Med 2015;12(12):e1001921.
11. Platts-Mills JA & Kosek M. Update on the burden of Campylobacter in developing countries. Curr Opin Infect Dis. 2014;27:444.
12. Skirrow MB. A demographic survey of campylobacter, salmonella and shigella infections in England. Epidemiol Infect. 1987;99:647.
13. Scallan E, et al. Foodborne Illness Acquired in the United States—Major Pathogens. Emerg Infect Dis 2011;17:7.
14. Tam CC, et al. Longitudinal study of infectious intestinal disease in the UK (IID2 study): incidence in the community and presenting to general practice. Gut. 2012;61:69.
15. Havelaar AH, et al. Estimating the true incidence of campylobacteriosis and salmonellosis in the European Union, 2009. Epidemiol Infect. 2013;141:293.
16. Havelaar AH, et al. World Health Organization Global Estimates and Regional Comparisons of the Burden of Foodborne Disease in 2010. PLoS Med. 2015;12(12):e1001923.
17. Coker AO, et al. Human Campylobacteriosis in Developing Countries. Emerg Infect Dis. 2002;8:237.
18. Lee G, et al. Symptomatic and Asymptomatic Campylobacter Infections Associated with Reduced Growth in Peruvian Children. PLoS Negl Trop Dis. 2012;7(1):e2036.
19. Lengerh A, et al. Prevalence, associated risk factors and antimicrobial susceptibility pattern of Campylobacter species among under five diarrheic children at Gondar University Hospital, Northwest Ethiopia. BMC Pediatrics. 2013;13:82.
20. Osbjørk K, et al. Risk factors associated with Campylobacter detected by PCR in humans and animals in rural Cambodia. Epidemiol Infect. 2016;144:2979.
21. Food Standards Agency. Year 1 of a UK-wide survey of campylobacter contamination on fresh chickens at retail (February 2014 to February 2015). 2015. <https://www.food.gov.uk/science/microbiology/campylobacterevidenceprogramme/retail-survey> [Accessed March 2018].
22. Lawes JR, et al. Investigation of prevalence and risk factors for Campylobacter in broiler flocks at slaughter: results from a UK survey. Epidemiol Infect. 2012;140:1725.
23. Skarp CP, et al. Campylobacteriosis: the role of poultry meat. Clin Microbiol Infect. 2016;22:103.
24. Ravel A, et al. Description and Burden of Travel-Related Cases Caused by Enteropathogens Reported in a Canadian Community. J Travel Med. 2011;18:8.
25. Zenner D & Gillespie I. Travel-Associated Salmonella and Campylobacter Gastroenteritis in England: Estimation of Under-Ascertainment Through National Laboratory Surveillance. J Travel Med. 2011;18:414.
26. Gautret P, et al. Infectious diseases among travellers and migrants in Europe, EuroTravNet 2010. Euro Surveill. 2012;17(26):pii=20205.
27. Warne B, et al. Travel-Related Infection in European Travelers, EuroTravNet 2011. J Travel Med 2014;21:248.
28. Hoffmann S, et al. Annual cost of illness and quality-adjusted life year losses in the United States due to 14 foodborne pathogens. J Food Prot. 2012;75(7):1292.
29. Tam CC & O'Brien SJ. Economic Cost of Campylobacter, Norovirus and Rotavirus Disease in the United Kingdom. PLoS ONE. 2016;11(2):e0138526.
30. Mangen MJ, et al. Cost-of-illness and disease burden of food-related pathogens in the Netherlands, 2011. Int J Food Microbiol. 2015;196:84.

31. Schmutz C, et al. Estimating healthcare costs of acute gastroenteritis and human campylobacteriosis in Switzerland. *Epidemiol Infect.* 2016;Aug 12:[Epub ahead of print].
32. Guerry P, et al. Campylobacter polysaccharide capsules: virulence and vaccines. *Front Cell Infect Microbiol.* 2012;2:7.
33. Maue AC, et al. A capsule conjugate vaccine approach to prevent diarrheal disease caused by *Campylobacter jejuni*. *Hum Vaccin Immunother.* 2014;10(6):1499.
34. Pike BL, et al. Global Distribution of *Campylobacter jejuni* Penner Serotypes: A Systematic Review. *PLoS ONE.* 2013;8(6):e67375.
35. Poly F, et al. Updated *Campylobacter jejuni* Capsule PCR Multiplex Typing System and Its Application to Clinical Isolates from South and Southeast Asia. *PLoS ONE.* 2015;10(12):e0144349.
36. Riddle MS & Guerry P. Status of vaccine research and development for *Campylobacter jejuni*. *Vaccine.* 2016;34:2903.
37. Clinicaltrials.gov. Safety Study of a Capsule-Conjugate Vaccine to Prevent *Campylobacter*-Caused Diarrhea (CJCV1-01). 2016. <https://clinicaltrials.gov/ct2/show/NCT02067676> [Accessed March 2018].
38. Liu L, et al. [Evaluation of immunological efficiency induced by *Campylobacter jejuni* PEB1 DNA combined with PEB1 protein in mice]. *Xi Bao Yu Fen Zi Mian Yi Xue Za Zhi.* 2014;30(6):576.
39. Yasmin T, et al. In silico proposition to predict cluster of B- and T-cell epitopes for the usefulness of vaccine design from invasive, virulent and membrane associated proteins of *C. jejuni*. *In Silico Pharmacol.* 2016;4(1):5.
40. Annamalai T, et al. Evaluation of nanoparticle-encapsulated outer membrane proteins for the control of *Campylobacter jejuni* colonization in chickens. *Poultry Sci.* 2013;92:2201.
41. WHO. WHO recommendations for routine immunization - summary tables. 2015. http://www.who.int/immunization/policy/immunization_tables/en/ [Accessed March 2018].
42. WHO. Immunization coverage. 2016. http://apps.who.int/immunization_monitoring/globalsummary/timeseries/tscoveragebcg.html [Accessed March 2018].
43. Hamer DH et al. Travel health knowledge, attitudes and practices among United States travelers. *J Travel Med.* 2004 Jan-Feb;11(1):23-6.
44. Yanni EA et al. Knowledge, attitudes, and practices of US travelers to Asia regarding seasonal influenza and H5N1 avian influenza prevention measures. *J Travel Med.* 2010 Nov-Dec;17(6):374-81.
45. 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 May 2;12:321.
46. Yaita K, et al. Post-Travel Consultations in a Regional Hub City Hospital, Japan. *Intern Med.* 2016;55:739.
47. Yoo YJ, et al. Korean Travelers' Knowledge, Attitudes, and Practices Regarding the Prevention of Malaria: Measures Taken by Travelers Departing for India From Incheon International Airport. *J Travel Med.* 2007;6:381.
48. Van Herck K et al. Knowledge, attitudes and practices in travel-related infectious diseases: the European airport survey. *J Travel Med.* 2004 Jan-Feb;11(1):3.
49. Rovira C et al. Are French general practitioners consulted before travel to developing countries? A cross-sectional study conducted in a French airport. *Rev Epidemiol Sante Publique.* 2015 Aug;63(4):253.
50. Schunk M et al. Vaccination status and prophylactic measures of travelers from Germany to subtropical and tropical areas: results of an airport survey. *J Travel Med.* 2001 Sep-Oct;8(5):260.
51. 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 Sep-Oct;14(5):297.
52. Dahlgren AL et al. Prevention of travel-related infectious diseases: knowledge, practices and attitudes of Swedish travellers. *Scand J Infect Dis.* 2006;38(11-12):1074.
53. 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.
54. Buhler S, et al. A Profile of Travelers—An Analysis From a Large Swiss Travel Clinic. *J Travel Med* 2014;21:324
55. 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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