

\*\*\*\*New release Jan 2012\*\*\*\*

## MarketVIEW: meningococcal serogroup B vaccines (CAT: VAMV031)

<b>Product Name</b>	:	<b>MarketVIEW: meningococcal</b> serogroup B vaccines
<b>Description</b>	:	Global vaccine commercial opportunity assessment
<b>Contents</b>	:	Executive presentation + 3 forecast models
<b>Therapeutic Area</b>	:	Novel pediatric vaccines
<b>Publication date</b>	:	January 2012
<b>Catalogue No</b>	:	VAMV031

## Background

With the introduction of vaccines to prevent invasive *meningococcal* disease due serogroups ACWY, serogroup B now remains a major contributor to current disease burden, especially in Europe where it accounts for >50% of cases. Outer membrane vesicle (OMV) based vaccines have been used successfully to tackle clonal epidemics most recently in New Zealand and Normandy, however, these vaccines are strain specific and have limited utility on a global scale. Novartis and Pfizer vaccines are currently developing broader acting protein based vaccines, the former (4CmenB) is current undergoing registration in the EMA region.

This **MarketVIEW** product is a comprehensive commercial opportunity assessment which forecasts the potential of new menB vaccines to 2030. The product contains three forecast models (LO, BASE, HI) which examine different adoption scenarios across 40 countries. Detailed coverage of Novartis (4CMenB) and Pfizer (rLP2086) is included with a focus on development history to date and coverage of latest cost effectiveness issues. Other novel menB vaccine approaches are discussed. The product is an ideal source of analysis for those wishes to assess the field of new meningococcal vaccines.

## Methodology

**VacZine Analytics** has closely monitored all significant source material pertaining to meningococcal disease epidemiology/vaccines. Example, secondary source materials used are literature articles, government websites/databases, medical bodies and associations, conference proceedings and previously analyses (where publically available). Previously published research by **VacZine Analytics** in field of pediatric vaccines has also been utilised. \*\*\*See Bibliography for exact sources.

### PRODUCT CONTENTS:

**Published January 2012 (CAT No: VAMV031)**

\*\*\*\*This product is composed of three models and an Executive presentation

#### Contents – Executive presentation (MS PowerPoint based)

Author's note  
Executive summary  
Commercial model – key outputs  
Total available global market to 2030: menB vaccine(s)  
menB vaccine: available market (<1 yrs) to 2030  
menB vaccine: available market (1-5 yrs) to 2030  
menB vaccine: available market (11 - 18 yrs) to 2030  
menB vaccine: country adoption groupings (BASE) to 2030  
menB vaccine: early adopter MCC countries (BASE) to 2030  
menB vaccine: region summary (2018) - base scenario  
Novartis Vaccines revenues per scenario to 2030  
Pfizer Vaccines revenues per scenario to 2030  
Disease background and latest epidemiology  
Importance of serogroup B  
N. meningitidis dominant serotype(s) per region  
N. meningitidis % serotype per region  
Global ranking of N. meningitidis (all) incidence  
Global ranking of N. meningitidis (serogroup B) incidence  
US - N. meningitidis incidence: serogroup distribution by age  
US - N. meningitidis incidence: by year 1997 – 2009  
Serogroup B: importance of global strains  
Importance of meningococcal carriage  
Discussion of meningococcal serogroup C vaccination  
Case study for serogroup B?  
N. meningitidis incidence (EU), 1999 – 2006  
N. meningitidis (all) and serogroup C incidence (EU), 1999  
Serogroup C vaccination impact on EU incidence: 1999-2006  
Serogroup C vaccination impact on incidence – UK  
Global Men C conjugate vaccine programs  
Global Men A/C conjugate vaccine programs  
Global Men ACWY conjugate vaccine programs  
Meningococcal serogroup B vaccine: modelling commercial potential  
Overall modeling rationale  
Serogroup B epidemiology: methodology used  
Serogroup B vaccine: rationale for country inclusion

**Continued.....**

Serogroup B vaccine: Predicted early adopter countries  
Serogroup B vaccine: Predicted later adopter countries  
Serogroup B vaccine: Predicted limited/or no adoption countries  
Serogroup B vaccine: proposed indications  
Serogroup B vaccine: modeling methodology  
Early adopter countries: vaccine uptake scenarios  
All other countries: vaccine uptake scenarios  
Coverage level assumptions: 1-5 yrs (early adopters)  
Coverage level assumptions: 1-5 yrs (later adopters)  
Coverage level assumptions: 11-18 yrs (early adopters)  
Coverage level assumptions: 11-18 yrs (later adopters)  
Coverage level assumptions: USA (all ages)  
UK cost effectiveness analysis: overview  
UK cost effectiveness analysis: direct protection model  
UK cost effectiveness analysis: alternative strategies  
UK cost effectiveness analysis: conclusions  
Serogroup B vaccine - pricing scenarios  
Serogroup B vaccine – vaccinology and summary of major competitor programs  
Timeline of serogroup B vaccine development progress  
The challenge of developing a serogroup B vaccine  
New Zealand: impact of serogroup B OMV vaccine  
Issues with OMV vaccines  
A new serogroup B vaccine - which protein antigens?  
Surface proteins of Neisseria meningitidis  
Review of selected major protein antigens  
Focus on Factor H binding protein (fHbp)  
4CMenB: Novartis Vaccines - vaccine components  
4CMenB: Novartis Vaccines - late development history  
4CMenB: Phase III data in infants  
4CMenB: summary of late stage development program  
4CMenB: coverage prediction UK  
Bivalent rLP2086: Pfizer - vaccine components  
rLP2086: Pfizer Vaccines - strain pool  
Phylogenetic tree of fHBP/LP2086 variants  
rLP2086: bactericidal activity  
rLP2086: Pfizer Vaccines - development history  
rLP2086: Pfizer Vaccines - B1971005  
rLP2086: summary of late stage development program (Nov 11)  
rLP2086: Pfizer Vaccines - B1971009  
Pfizer versus Novartis vaccines approaches  
Surrogate markers of protection: key issues and challenges  
menB vaccine(s): R&D pipeline / other approaches  
Appendix I – back up and source material  
UK NHS immunization statistics, England 2010-2011  
Bibliography  
Disclaimer  
About **VacZine Analytics**

**PAGES: 110 MS PowerPoint slides, fully referenced/sourced. Available in .pdf form**

Continued.....

**Contents – Vaccine demand model(s) (MS Excel-based)**

**\*\*\*NOTE\*\*\* - there are 3 models (LO, BASE & Hi scenarios) each with ~ 90 individual sheets**

Title sheet  
Notes  
CHARTS – VAL (pub)  
Region summary (2018)  
Grand value sum (pub)  
Grand volume sum (pub)  
Grand vol val (priv)  
Country value summary (all ages)  
Early adopters 0 – 5 yrs value  
Early adopters 11-18 yrs value  
Later adopters 0 – 5 yrs value  
Later adopters 11-18 yrs value  
Global price summary  
Early adopters 0 – 5 yrs volume  
Early adopters 11-18 yrs volume  
Later adopters 0 – 5 yrs volume  
Later adopters 11-18 yrs volume  
Country worksheets  
0 – 5 yrs and 11 – 18 yrs worksheets per country (included for 40 countries)  
Country 1  
LATAM private  
Russia private  
Populations =>>  
Birth cohorts  
Adolescents  
Epidemiology =>>  
Country men (all) rankings  
Country men B rankings  
% pub/priv  
Back page

## PRODUCT COST:

**VacZine Analytics** will grant a [enter region] license to [enter client name], for the price of:

- o USD \$10995.00/ GBP £7330.00<sup>#</sup> (Region license)\*

\*A region is North America, Europe or ROW

For orders in the UK, VAT at 20% will be added to final invoice total

*# indicative only rate will be applied on date of transaction*

## HOW TO ORDER:

To order please contact your region account manager or order direct at [orders@vaczine-analytics.com](mailto:orders@vaczine-analytics.com)

This report can also be purchased on-line. Please review the **TERMS and CONDITIONS** of purchase.



**VacZine Analytics (R)** is a trading division of Assay Advantage Ltd, UK Company Number: 5807728

**VacZine Analytics (R)** and the “**spiral logo**” are UK Registered Trademarks, 2009

## BIBLIOGRAPHY:

1. Rosenstein NE., et al 2001. Meningococcal disease. NEJM. 344 (18) 1378-1388
2. Cartwright KAV. Meningococcal disease. Chichester: John Wiley & Sons Ltd; 1995.
3. Gordon MH. The inhibitory action of saliva on growth of the meningococcus. Great Britain Medical Research Committee, Special Report Series 3, 1917: 106-111
4. REFs within. Raclouz VN., et al. The elusive meningococcal meningitis serogroup: a systematic review of serogroup B epidemiology BMC Infectious Diseases. 2010, 10: 175
5. Adapted from: Halperin SA., et al. The changing and dynamic epidemiology of meningococcal disease. Vaccine (2011) In Press
6. Centers for Disease Control and Prevention. Active Bacterial Core Surveillance Report, Emerging Infections Program Network, Neisseria meningitidis, 1999-2009. Available at: <http://www.cdc.gov/abcs/reports-findings/survreports/mening09.html>. Accessed: December 2011
7. Yazdankhah SP, et al. 2004. Neisseria Meningitidis: An Overview of the Carriage State. J Med Microbio. 53, 821-832
8. Caugant DA. et al. 1992. Transmission of Neisseria meningitides among asymptomatic recruits and antibody analysis. Epidemiol Infect. Oct;109(2): 241-53
9. Trotter CL., et al. Vaccination against meningococcal disease in Europe: review and recommendation for use of conjugate vaccines. FEMS Microbiol. Rev. 31, 101-107 (2007)
10. Borrow R., et al. Prevention of meningococcal serogroup C disease by NeisVac-C. Expert Rev.Vaccines 8(3) 265-279 (2009)
11. Trotter CL. Meningococcal vaccines and immunity: lessons learned from serogroup C conjugate vaccination programs. Expert Review Vaccines. 2009;8(7) 851-861
12. EU-IBIS Network. Invasive Neisseria meningitidis in Europe 2006. Available at: <http://www.hpa-bioinformatics.org.uk/euibus/reports.htm>. Accessed: December 2011
13. Ishola D et al. Prevalence of 965 serum bactericidal antibody to serogroup C Neisseria meningitidis in Eng- 966 land, a decade after vaccine introduction (pages 174–5). The 11th European 967 Meningococcal Group Meeting (EMGM) Congress 2011: Ljubljana, Slovenia, 968 Abstract available at: <<http://emgm.eu/meetings/emgm2011/abstracts.pdf>> 969 Accessed 04.10.11]
14. UK Joint Committee on Vaccination and Immunization. *Meningococcal* Sub-Committee. Meeting Minutes to 8<sup>th</sup> June 2011. Available at: [http://www.dh.gov.uk/prod\\_consum\\_dh/groups/dh\\_digitalassets/@dh/@ab/documents/digitalasset/dh\\_131104.pdf](http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@ab/documents/digitalasset/dh_131104.pdf) Accessed December 2011
15. Meningococcal reference unit isolates of Neisseria Meningitidis: England and Wales, by serogroup & calendar year, 1989-2006. Available at: <http://www.hpa.org.uk/>. Accessed December 2011.
16. WHO Vaccine Preventable diseases monitoring system. Available at: [http://apps.who.int/immunization\\_monitoring/en/globalsummary/ScheduleResult.cfm](http://apps.who.int/immunization_monitoring/en/globalsummary/ScheduleResult.cfm). Accessed December 2011
17. New Zealand Ministry of Health. The epidemiology of meningococcal disease in New Zealand. Available at: [http://www.surv.esr.cri.nz/PDF\\_surveillance/MeningococcalDisease/2010/2010AnnualRpt.pdf](http://www.surv.esr.cri.nz/PDF_surveillance/MeningococcalDisease/2010/2010AnnualRpt.pdf) Accessed December 2011
18. Considerations for Use of Meningococcal vaccines in Infants and Toddlers. Presentation by Amanda Cohn. ACIP Working Group, 25<sup>th</sup> October 2011. Available at: <http://www.cdc.gov/vaccines/recs/acip/downloads/mtg-slides-oct11/04-MCV-Cohn.pdf>. Accessed December 2011
19. Prospects for use of Novartis 4CMen B vaccine. Presentation by Peter Dull. MRF Conference. Meningitis and Septicaemia in children and adults 2011. London. November 2011
20. Internal estimate based on analysis of Peabody RG et al. Uptake of pneumococcal polysaccharide vaccine in at-risk populations in England and Wales 1999-2005. Epidemiol Infect. 2008 Mar;136(3):360-9. Epub 2007 Apr 20.
21. UK Joint Committee on Vaccination and Immunization. *Meningococcal* Sub-Committee. Meeting Minutes to 18<sup>th</sup> February 2011. Available at: [http://www.dh.gov.uk/prod\\_consum\\_dh/groups/dh\\_digitalassets/@dh/@ab/documents/digitalasset/dh\\_128724.pdf](http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@ab/documents/digitalasset/dh_128724.pdf) Accessed December 2011
22. Presentation by Dr Hannah Christensen. MODELLING THE POTENTIAL IMPACT OF MENINGOCOCCAL B VACCINES IN ENGLAND. Presentation available at: [http://www.meningitis.org/conference/day-one-abstracts2011#Hannah\\_Christensen\\_Bio](http://www.meningitis.org/conference/day-one-abstracts2011#Hannah_Christensen_Bio) Accessed December 2011
23. Christensen H., et al. Meningococcal carriage by age: a systematic review and meta-analysis. Lancet Infect Dis 10(12):853-61
24. **Adapted from:** Sadarangani M., et al. Serogroup B meningococcal vaccines—an unfinished story. Lancet Infect Dis 2010; 10: 112–24

25. Wyle FA, Artenstein MS, Brandt BL, et al. Immunologic response of man to group B meningococcal polysaccharide vaccines. *J Infect Dis* 1972; 126: 514–21.
26. Tappero, J. W., et al. (1999) *J. Am. Med. Assoc.* 281, 1520–1527
27. Feavers IM et al. Meningococcal protein antigens and vaccines. *Vaccine* 27S (2009) B42 – B50
28. Fletcher LD, Bernfield L, Barniak V, Farley JE, Howell A, Knauf M, et al. Vaccine potential of the *Neisseria meningitidis* 2086 lipoprotein. *Infect Immun* 2004;72(4):2088–100.
29. Pizza M, Scarlato V, Masignani V, Giuliani MM, Arico B, Comanducci M, et al. Identification of vaccine candidates against serogroup B meningococcus by whole-genome sequencing. *Science* 2000;287(5459):1816–20.
30. *Neisseria* Factor H binding protein sequence typing . Available at: <http://pubmlst.org/neisseria/fHbp>. Accessed December 2011
31. Findlow J et al. Multicenter, open-label, randomized Phase II controlled trial of an investigational recombinant meningococcal serogroup B vaccine with and without outer membrane vesicles, administered in infancy. *Clin. Infect. Dis.* 51, 1127–1137 (2010).
32. Giuliani MM, Adu-Bobie J, Comanducci M et al. A universal vaccine for serogroup B meningococcus. *Proc. Natl Acad. Sci. USA* 103, 10834–10839 (2006)
33. Bambini S, Muzzi A, Olcen P, Rappuoli R, Pizza M, Comanducci M. Distribution and genetic variability of three vaccine components in a panel of strains representative of the diversity of serogroup B meningococcus. *Vaccine* 27, 2794–2803 (2009).
34. Snape MD, Dawson T, Oster P et al. Immunogenicity of two investigational serogroup B meningococcal vaccines in the first year of life: a randomized comparative trial. *Pediatr. Infect. Dis. J.* 29, e71–e79 (2010)
35. Findlow J, Borrow R, Snape MD et al. Multicenter, open-label, randomized Phase II controlled trial of an investigational recombinant meningococcal serogroup B vaccine with and without outer membrane vesicles, administered in infancy. *Clin. Infect. Dis.* 51, 1127–1137 (2010)
36. Novartis Corporate News Release. November 2010. Available at: [http://www.novartisvaccines.com/newsroom/media-releases/2010/04112010\\_menb.pdf](http://www.novartisvaccines.com/newsroom/media-releases/2010/04112010_menb.pdf). Accessed January 2011
37. Donnelly J et al. Qualitative and quantitative assessment of meningococcal antigens to evaluate the potential strain coverage of protein based-vaccines (2010). *PNAS* 107 (45): 19490-5
38. Novartis Corporate News Release. December 2010. Available at: [http://www.novartisvaccines.com/newsroom/media-releases/2010/411340\\_Bexsero\\_MenB.pdf](http://www.novartisvaccines.com/newsroom/media-releases/2010/411340_Bexsero_MenB.pdf). Accessed January 2011
39. Novartis Corporate News Release. June 2011. Available at: [http://www.novartisvaccines.com/newsroom/media-releases/2011/06092011\\_Bexsero\\_ESPID.pdf](http://www.novartisvaccines.com/newsroom/media-releases/2011/06092011_Bexsero_ESPID.pdf) . Accessed January 2011
40. Novartis presentation by R.Rappuoli at ECDC Eurovacine 2010. Available at: [http://ecdc.europa.eu/en/eurovacine/2010/Documents/Eurovacine2010\\_Rappuoli.pdf](http://ecdc.europa.eu/en/eurovacine/2010/Documents/Eurovacine2010_Rappuoli.pdf) . Accessed January 2011
41. Novartis presentation by R.Rappuoli. Vaccines for the 21<sup>st</sup> Century. Available at: <http://www.quebecinternational.ca/media/8010/6%20-%20Pr%20C3%A9sentation%20Dr%20Rino%20Rappuoli%20-%20Nov%202009.pdf> Accessed December 2011
42. Borrow R. Vaccines against meningitis, current issues and future possibilities. Available at: <http://www.slideshare.net/meningitis/borrow-for-web>. Accessed January 2011
43. Murphy E et al. 2009. Sequence diversity of vaccine candidate LP2086 in epidemiologically relevant strains of serogroup B *Neisseria meningitidis*. *J Infect Dis*;200(3):379-389.
44. Jiang HQ et al. Broad vaccine coverage predicted for a bivalent recombinant factor H binding protein based vaccine to prevent serogroup B meningococcal disease. *Vaccine* Volume 28, Issue 37, 23 August 2010, Pages 6086-6093
45. McNeil LK, Murphy E, Zhao XJ, et al. Detection of LP2086 on the cell surface of *Neisseria meningitidis* and its accessibility in the presence of serogroup B capsular polysaccharide. *Vaccine*. 2009;27(25-26):3417-3421.
46. *Neisseria Meningitidis* serogroup B vaccine. Vaccine and Related Biological Products Advisory Committee. Pre-Meeting Background Document. Available at: <http://www.fda.gov/downloads/AdvisoryCommittees/CommitteesMeetingMaterials/BloodVaccinesandOtherBiologics/VaccinesandRelatedBiologicalProductsAdvisoryCommittee/UCM249479.pdf> Accessed December 2011
47. Prospects for Prevention of menB Disease. Presentation by Kathrin U Jansen. MRF Conference. Meningitis and Septicaemia in children and adults 2011. London. November 2011
48. A Global Phase 3 Safety Study of 120 Mcg rLP2086 Vaccine in Adolescents and Young Adults Aged 11 to 25 Years. Available at: <http://clinicaltrials.gov/ct2/show/NCT01352793>. Accessed December 2011
49. Borrow R et al., Meningococcal surrogates of protection – serum bactericidal antibody activity. *Vaccine* 2005; 23:2222-27
50. Holst J, Feiring B, Fuglesang JE, et al. Serum bactericidal activity correlates with the vaccine efficacy of outer membrane vesicle vaccines against *Neisseria meningitidis* serogroup B disease. *Vaccine* 2003; 21: 734–37.
51. Sierra GV, Campa HC, Varcacel NM, et al. Vaccine against group B *Neisseria meningitidis*: protection trial and mass vaccination results in Cuba. *NIPH Ann* 1991; 14: 195–207.

52. Milagres LG, Ramos SR, Sacchi CT, et al. Immune response of Brazilian children to a Neisseria meningitidis serogroup B outer membrane protein vaccine: comparison with efficacy. *Infect Immun* 1994; 62: 4419–24.
53. Weynants V et al. Genetically modified L3,7 and L2 lipooligosaccharides from N.meningitidis serogroup B confer a broad cross-bactericidal response. *Infect Immun* 2009;77: 2084–93.
54. Group B Meningococcal Vaccine (HOPS). Available at: <http://www.clinicaltrials.gov/ct2/show/NCT00678652?term=8570+hops-g&rank=1>. Accessed December 2011
55. Weynants VE et al. Additive and synergistic bactericidal activity of antibodies directed against minor outer membrane proteins of Neisseria meningitidis. *Infect Immun* 2007; 75: 5434–5442.
56. van den Dobbelaars GP et al. Immunogenicity of a combination vaccine containing pneumococcal conjugates and meningococcal PorA OMVs. *Vaccine* 2007;25(13):2491–6.
57. Serogroup B Neisseria meningitidis vaccine development. Presentation by Jan T Poolman. Available at: <http://www.meningitis.org/assets/x/52425>. Accessed December 2011
58. UK NHS immunization statistics, England 2010-2011. Available at: <http://www.ic.nhs.uk/statistics-and-data-collections/health-and-lifestyles/immunisation/nhs-immunisation-statistics-england-2010-11>. Accessed December 2011
59. Annual HPV vaccine uptake: England 2008/09. Available at: [http://www.dh.gov.uk/prod\\_consum\\_dh/groups/dh\\_digitalassets/@dh/@en/@ps/documents/digitalasset/dh\\_111676.pdf](http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/@ps/documents/digitalasset/dh_111676.pdf) Accessed December 2011

## TERMS and CONDITIONS:

VacZine Analytics – a trading division of Assay Advantage Ltd UK Company Number: 5807728 (Herein referred to as “The Company”). (Herein [enter client name] to as “The Client”).

1. This finished research product is provided as a Service. Any additional Service required by the client will be subject to a new proposal being prepared.
2. The Service will commence after written (e-mail) or Fax confirmation stating the Client's acceptance of the Service according to the description proposed by the Company.
3. **Cancellation policy.** The Company's cancellation policies are in accordance with the EU Consumer Protection (Distance Selling) Regulations 2000 (DSRs). Prior to acceptance of an order the Company will make available written information regarding Clients cancellation rights. This is posted on the Company website and is available for public review.
4. **Cancellation rights:** For finished documents - a Clients cancellation rights will last for **seven working days** counting from the day that the order was concluded. If the Services i.e. provision of the documents has taken place with the Clients agreement before this period the Client's cancellation rights have ended.
5. Invoicing will **100%** after submission of deliverables to the Client in a form reasonably acceptable to the Client.
6. If not purchased on line invoices are payable within **thirty days** of the invoice date.
7. All proposals are quoted in **\$USD dollars or £GBP** and invoices are to be settled in the same currency.
8. The Company agrees not to disclose to any third party confidential information acquired in the course of providing the services listed without the prior written consent of the Client. Exception occurs when the information is already in the public domain or when disclosure is necessary to help the Company's employees and agents with the performance of the Company's obligations to achieve satisfactory completion of the project and approved in writing by the Client.
9. **Force Majeure:** The Company will not be liable for any delay or failure to perform any obligation under this Agreement insofar as the performance of such obligation is prevented by an event beyond our reasonable control, included by not limited to, earthquake, fire, flood or any other natural disaster, labour dispute, riot, revolution, terrorism, acts of restraint of government or regulatory authorities, failure of computer equipment and failure or delay of sources from which data is obtained.
10. Please also refer to Master **TERMS and CONDITIONS** available upon request.

### VacZine Analytics

Warren House  
Bells Hill  
Bishops Stortford  
Herts  
CM23 2NN  
United Kingdom  
Tel: +44 (0) 1279 654514 / +44 (0) 7952470582 / Fax: +44 (0) 1279 655926  
E-mail: [info@vacZine-analytics.com](mailto:info@vacZine-analytics.com)

## 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.

For more information please visit our website [www.vacZine-analytics.com](http://www.vacZine-analytics.com)

**VacZine Analytics (R)** is a trading division of Assay Advantage Ltd, UK Company Number: 5807728

**VacZine Analytics (R)** and "the spiral logo" are UK Registered Trademarks, 2009