

# Meningococcal seroepidemiology in Burkina Faso, one year after the MenAfriVac® mass campaign

S Yaro<sup>1</sup>, H Tall<sup>2</sup>, H Kpoda<sup>1</sup>, S Ouangraoua<sup>1</sup>, C Trotter<sup>3</sup>, B-M Njanpop Lafourcade<sup>2</sup>, H Findlow<sup>4</sup>, C Martin<sup>2</sup>,  
JB Ouedraogo<sup>1</sup>, BD Gessner<sup>2</sup>, R Borrow<sup>4</sup>, JE Mueller<sup>5</sup> (judith.mueller@ehesp.fr)

1 Centre Muraz, Bobo Dioulasso Burkina Faso; 2 Agence de Médecine Préventive, France and Burkina Faso; 3 University of Cambridge, UK;  
4 Public Health England, Manchester, UK; 5 EHESP French School of Public Health and Institut Pasteur, Paris, France

## Background

- To eliminate meningococcal meningitis epidemics, a meningococcal serogroup A conjugate vaccine (PsA-TT, MenAfriVac®) has been introduced in Burkina Faso via mass campaigns in December 2010, targeting the 1- to 29-year-old population.
- While the vaccine has shown good immunogenicity in clinical trials, the duration of persistence of vaccine-induced antibody is not known.
- The MRF Antibody Persistence Project (Figure 2) will inform on the optimal MenAfriVac® vaccination strategy by estimating the duration of immunity in the general population following the initial mass campaign. The objectives are to document population-level seroprevalence in Bobo-Dioulasso (Figure 1) during three surveys: in 2011, 2013 and 2015; to correlate immunity with disease epidemiology during the post-introduction period; and to describe individual risk factors for low antibody titers.



Figure 1. Localisation of Bobo-Dioulasso in Burkina Faso and within the African meningitis belt (dashed line).

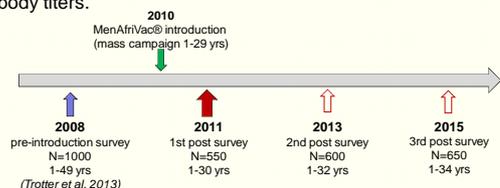


Figure 2. Design of the MRF Antibody Persistence Project

## Objective

In this report, we

- describe anti-meningococcal seroprevalence in the general population of Bobo-Dioulasso in 2011, 11 months after the MenAfriVac® mass campaign
- compare the results to pre-introduction data obtained from the same population during 2008, using the same methods [1].
- estimate MenAfriVac® coverage in the study population.

## Methods

- During October-November 2011, using two-stage cluster sampling, we included a representative sample of the population of urban Bobo-Dioulasso aged 6 months to 29 years (N=562).
- We collected blood samples and information on participants' vaccination status and residency at the time of the mass campaign.
- Using rabbit complement, serum bactericidal antibody (SBA) titers were measured against two serogroup A strains:
  - reference strain F8238 of immunotype L11 (all sera)
  - "Dutch" strain 3125 of immunotype L10 (200 randomly selected sera).
- Based on previous seroepidemiological results in this population [1, 2] we used SBA  $\geq 128$  or  $\geq 1024$  as cut-offs for seroprevalence estimation.

## Results

### Participants' vaccination status

- Among the 562 participants included with serum samples, 477 (85%) were  $\geq 23$ -month-old and had been eligible for the MenAfriVac® campaign; of them, 470 (99%) had complete information on vaccination status and 448 (94%) had resided in Bobo-Dioulasso during 2010.
- Vaccination coverage by recall for MenAfriVac® or "a meningitis vaccine received during a campaign in 2010" (no other campaigns during 2010) was similar among 2010 Bobo-Dioulasso residents and non-residents (88% vs. 86%). Among residents, coverage confirmed by card was 36% (Figure 3).

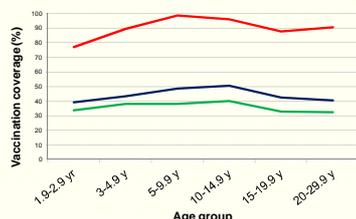


Figure 3. Age-specific vaccination coverage among participants residing in Bobo-Dioulasso during 2010 at the time of the MenAfriVac® mass campaign.

— MenAfriVac or meningitis campaign 2010, recall  
— MenAfriVac, recall  
— MenAfriVac or meningitis campaign 2010, with card

## Results (cont'd)

### Seroprevalence (Table 1)

- SBA geometric mean titers (GMT) and prevalence of titers  $\geq 128$  or  $\geq 1024$  were higher among 5- to 29-year-old than 2- to 4-year-old participants.
- There was a small insignificant tendency for higher titers among participants with confirmed MenAfriVac receipt compared to those relatively sure not to have received this vaccine (among persons aged 5-29 yrs).

Table 1. SBA titers and seroprevalence, by age group (N=562) and vaccination status (confirmed vs. no recall among 5-29 yrs; N=131).

	<2 yrs (N=85)	2-4 yrs (N=159)	5-29 yrs (N=318)
GMT ref (95%-CI)	8 (5-14)	1458 (1084-1960)	2355 (2058-2694)
SBA ref $\geq 128$	26%	95%	99%
SBA ref $\geq 1024$	7%	76%	88%
SBA Dutch $\geq 128$	7%	67%	92%
(subsample N=199)			
	MenAfriVac confirmed by card (N=102)	No recall of MenAfriVac or meningitis campaign during 2010 (N=29)	
(among 5-29 yrs)			
GMT ref (95%-CI)	2494 (1935-3214)	1270 (689-2338)	
SBA ref $\geq 128$	99%	97%	
SBA ref $\geq 1024$	86%	76%	
SBA Dutch $\geq 128$	94%	80%	
(subsample N=41)			

### Comparison of population immunity in 2011 to 2008 (pre-introduction) (Figure 4)

- Among 2- to 4-year-old children, GMTs against reference strain were 11 fold higher and GMTs against Dutch strain 42 fold higher in 2011 than 2008. Among 5- to 29-year-old persons, post-intro GMTs against reference strain were 8 fold higher and GMTs against Dutch strain 78 fold higher.
- According to reference strain assays, seroprevalence of SBA  $\geq 128$  increased by 17% from 2008 to 2011, while by "Dutch" strain assays, the increase was by 53%.

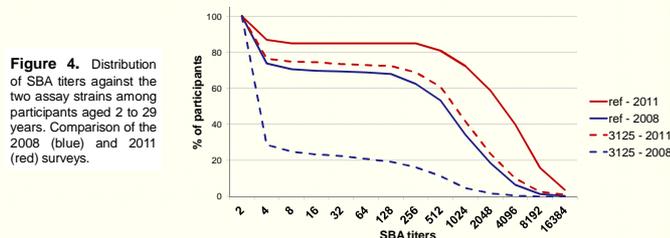


Figure 4. Distribution of SBA titers against the two assay strains among participants aged 2 to 29 years. Comparison of the 2008 (blue) and 2011 (red) surveys.

## Conclusions

- Since the MenAfriVac mass campaign, serogroup A meningococcal SBA titers in the targeted population of Burkina Faso have substantially increased. No meningitis case due to meningococcal serogroup A has been reported in the study population since 2011 (MoH Burkina Faso).
- The increase is more pronounced with SBA against the "Dutch" strain 3125 than against the reference strain, possibly as the latter is sensitive to natural immunity, as suggested by high pre-vaccination titers. SBA-3125 should therefore be included in studies on antibody persistence after meningococcal serogroup A vaccination in populations with substantial natural immunity.
- Upcoming surveys of the MRF Antibody Persistence Project, including serogroup-specific IgG concentrations will inform on how long these high antibody titers and high seroprevalence will persist in this population.
- In a neighbouring region in Burkina Faso, a coverage survey has shown MenAfriVac® coverage ranging from 71% (overall, card) to 89% (urban population, recall) and 94% (overall, recall) [3]. Our estimates in an urban population are similar, while confirmation by vaccination card is poor.

## References

- Trotter et al. Seroprevalence of bactericidal, specific IgG antibodies and incidence of meningitis due to group A *Neisseria meningitidis* by age in Burkina Faso 2008. PLoS ONE 2013; 8: e55486
- Mueller et al. Study of a localized meningococcal meningitis epidemic in Burkina Faso: incidence, carriage and immunity. J Infect Dis 2011; 204: 1787-95.
- Quattara S. Etude des déterminants de la couverture vaccinale de la campagne de vaccination contre la méningite à méningocoque A dans la région sanitaire de la Boucle du Mouhoun en 2010 (Burkina Faso). MPH dissertation, UCAD, Dakar (Senegal), 2012.