

Lessons from meningococcal carriage studies in West Africa

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Introduction

Conjugate vaccines have the ability to reduce carriage and thus, transmission of the target bacteria in the population. To be able to estimate the impact that meningococcal conjugate vaccines will have in Africa, it is necessary to better understand the pattern of meningococcal carriage in countries of the African meningitis belt.

The aim of this study was to provide preliminary information regarding meningococcal carriage in West Africa.

Materials and methods

- A total of 900 individuals (300 in Mali, 300 in The Gambia, and 300 in Senegal) from 2 to 19 years old were enrolled as part of phase II/III clinical trials of MenAfriVac. The volunteers were sampled four times, just before vaccination, and 1, 6, and 12 months later, in 2007-2008.
- Pharyngeal samples were plated directly on selective medium and incubated for 24-48 hours. Total growth was collected from the plate, suspended in Greaves solution and frozen immediately at -20°C.
- Samples were sent frozen to Oslo, Norway, where meningococci were identified by standard procedures. The strains were serogrouped and analysed by multilocus sequence typing (MLST), *porA* and *fetA* sequencing as described at <http://pubmlst.org/neisseria>. Non-serogroupable isolates were tested for capsular genes in PCR.

Country	Visit	No. of meningococci (% carriers)	A	B	W ₁₃₅	Y	X	NG
Mali	V1	48 (16.0)	1	0	11	7	1	28
	V2	38 (12.7)	0	0	8	8	1	21
	V3	42 (14.0)	1	0	9	6	0	26
	V4	32 (10.7)	0	0	6	8	0	18
Gambia	V1	23 (7.7)	0	0	0	9	0	14
	V2	39 (13.0)	0	2	0	13	0	24
	V3	29 (9.7)	0	1	0	7	0	21
	V4	24 (8.0)	0	1	0	8	0	15
Senegal	V1	6 (2.0)	0	0	1	2	0	3
	V2	7 (2.3)	0	0	0	2	0	5
	V3	4 (1.3)	0	0	0	1	0	3
	V4	35 (11.7)	0	0	0	10	0	25
Total		327 (9.1)	2	4	35	81	2	203

Table 1. Number of samples with meningococcal growth, percentage of meningococcal carriers and serogroup of the carried strains. The low carriage rates in the shaded samples were due to technical difficulties.

Results

- N. meningitidis* was recovered from 81 individuals in Mali (carriage rate 27%), 63 in The Gambia (21%), and 47 in Senegal (17%), in at least one of the 4 samples. In Senegal, the low carriage rates at visits 1, 2 and 3 were due to technical problems that were resolved at visit 4.
- Among the carriers, 59% in Mali and 48% in The Gambia were positive in two or more samples. In total, 5 of the 191 carriers switched strain during the sampling period, as determined by MLST.
- The majority (62%) of the isolates were non-serogroupable (Table 1). Among strains expressing a capsular polysaccharide, serogroup W135 predominated in Mali, while serogroup Y predominated in The Gambia and Senegal. Only two individuals from Mali were carriers of serogroup A isolates, both in a single sample.
- None of the non-groupable strains had the gene for the serogroup A capsule.
- MLST identified only 30 sequence types (STs) among the 327 isolates. Six STs were represented by 10 or more isolates (STs 23, 192, 767, 2880, 2881 and 6918). ST-23 was detected only in The Gambia, while ST-2881 and ST-6918 were only found in Mali. ST-192 was present in all three countries (14 to 36% of the carriers).
- Fourteen of the STs were assigned to 7 of the defined ST-complexes, while 16 were unassigned to a complex. Overall the ST-167 complex dominated, represented in 26% of the carriers (Fig. 1).

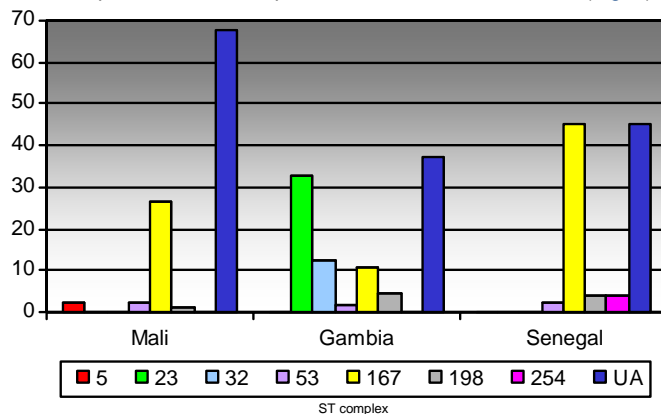


Fig. 1. Frequency of ST complexes represented among the carried strains in each country. UA = unassigned.



Conclusions

- Carriage rates from 8 to 16% per sampling were found. No significant seasonal variation was evidenced.
- Substantial serogroup heterogeneity was revealed between countries, but serogroup A isolates were nearly absent.
- The genetic diversity of the meningococcal strains carried in sub-Saharan Africa was low compared to that found in Europe.
- This low carriage of serogroup A is important to consider when planning carriage study to assess the potential indirect impact of MenA conjugate vaccine.

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