

Carriage of *Neisseria meningitidis* in 2-29 years old in Mali, Senegal and The Gambia

D. A. Caugant¹, B. Tamboura², M. Tapia², R. Dembele², O. N. Ikumapayi³, B.J. Okoko³, O. Idoko³, E. Bâ⁴, P. Senghor⁴, M. Faye⁴, E. Marchetti⁵, J. Chaumont⁵, M. Hassan-King⁵, M.-P. Préziosi⁵ and S. Viviani⁵

¹Norwegian Institute of Public Health, Oslo, Norway; ²CVD, Bamako, Mali; ³MRC, Banjul, The Gambia; ⁴IRD, Dakar, Senegal; ⁵MVP, Ferney, France

Introduction

A novel tetanus toxoid conjugate *Neisseria meningitidis* serogroup A vaccine (MenAfriVac) is under phase II/III clinical trials in several African countries. Conjugate vaccines have the ability to reduce carriage and thus, transmission of the bacterium in the population.

The aim of this study was to provide preliminary information regarding meningococcal carriage in West Africa and on the effect of MenAfriVac on carriage.

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 the clinical trial and sampled twice, just before vaccination and about one month later in the late summer/fall of 2007.

• Pharyngeal samples were plated directly on selective medium and incubated for 24-48 hours. 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.

Results

• *N. meningitidis* was recovered from 56 individuals in Mali (carriage rate 19%), 47 in The Gambia (16%), and 13 in Senegal (4%).

• In Mali about 50% of the carriers were positive in both samples, while less than a third of the individuals were stable carriers in The Gambia and none were in Senegal. All individuals positive in both samples kept the same strain, as determined by MLST.

• The majority 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. A single serogroup A isolate was identified in a carrier in Mali, but the individual was not carrier in the following sample.

• None of the non-groupable strains had the gene (for the serogroup A capsule (Table 2).

• MLST identified only 25 sequence types (STs) among the 161 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.

• Twelve of the STs were assigned to 6 of the defined ST-complexes, while 13 were unassigned to a complex. Overall the ST-167 dominated, comprising 22% of the isolates (Fig. 1).

Country	Visit	No. of samples with growth (%)	No. of meningococci (% carriers)	A	B	W ₁₃₅	Y	X	NG
Mali	V1	253 (84.3)	48 (16.0)	1	0	11	7	1	28
	V3	209 (69.7)	38 (12.7)	0	0	8	8	1	21
Gambia	V1	268 (89.3)	23 (7.7)	0	0	0	9	0	14
	V3	264 (88.0)	39 (13.0)	0	2	0	13	0	24
Senegal	V1	190 (63.3)	6 (2.0)	0	0	1	2	0	3
	V3	150 (50.0)	7 (2.3)	0	0	0	2	0	5
Total		1334 (74.1)	161 (8.9)	1	2	20	41	2	95

Table 1. Number of samples with bacterial and meningococcal growth, percentage of meningococcal carriers and serogroup of the carried strains.

PCR result of capsular gene	Mali V1	Mali V3	Gambia V1	Gambia V3	Senegal V1	Senegal V3	Total
B	0	0	1	2	0	0	3
W135	3	3	0	0	1	0	7
Y	3	1	3	5	0	2	14
Negative	22	17	10	17	2	3	72
Total	28	21	14	24	3	5	96

Table 2. Serogroup identification by PCR for non-serogroupable isolates.

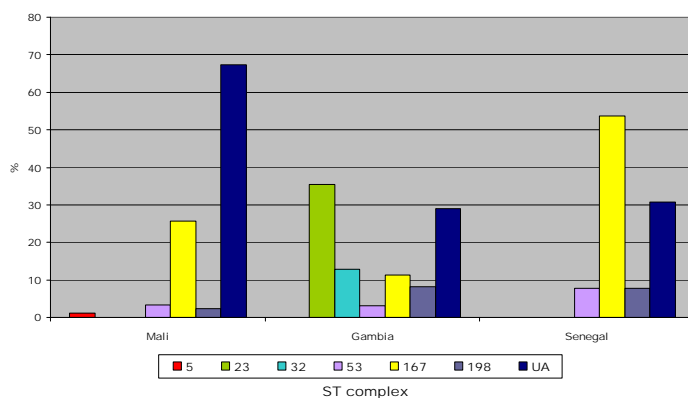


Fig. 1. Frequency of ST complexes represented among the carried strains in each country. UA = unassigned.

Conclusions

- Variable carriage rates were found between countries, but the low rate reported in Senegal might be due to technical difficulties.
- Substantial serogroup heterogeneity was revealed between countries.
- Serogroup A isolates were nearly absent, so no conclusion on the impact of MenA conjugate vaccine in these study populations can be drawn.
- The genetic diversity of the meningococcal strains carried in sub-Saharan Africa is low compared to that found in Europe.

Acknowledgements: Technical assistance was provided by Berit Nyland, Martha Bjørnstad, Anne-Marie Klem, Torill Alvestad, Ida Andreasson and Jan Oksnes. This work made use of the *Neisseria* MLST developed by Drs. K. Jolley and M. S. Chan and sited at the University of Oxford.