Carriage of Neisseria meningitidis Serogroup W135 ST-2881

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Serogroup W135 ST-2881 meningococci caused a cluster of meningitis cases in Niger in 2003. Of 80 healthy persons in the patients' villages, 28 (35%) carried meningococci; 20 of 21 W135 carrier strains were ST-2881. Ten months later, 5 former carriers were still carriers of W135 ST-2881 strains. The serum bactericidal antibody activity changed according to carrier status.

Niger is located in the African “meningitis belt” (1). Until recently, meningococcal meningitis epidemics in Niger were caused primarily by Neisseria meningitidis serogroup A. Since the first epidemic in Africa, caused by N. meningitidis serogroup W135 (NmW135) in Burkina Faso in 2002, Niger has enhanced its microbiologic surveillance. Few laboratories perform etiologic diagnoses, but health staff can send frozen cerebrospinal fluid (CSF) specimens to the national reference laboratory, Centre de Recherche Médicale et Sanitaire (CERMES), for microbiologic determination by PCR (2,3).

In March and April 2003, the district of Illela reported 154 suspected cases of meningitis. The epidemic threshold of 10 cases/100,000 inhabitants/week was crossed at week 12. The incidence decreased by week 14, with no vaccination campaign (Figure).

Etiologic diagnosis was not made immediately, but 15 frozen and stored CSF specimens were retrieved in May. Among the 11 specimens with positive PCR results for N. meningitidis, 5 were NmW135 and 6 were NmA. All cases caused by NmW135 were reported by the Illela health center (14°27′N, 05°14′E) and were in patients living in 5 surrounding villages.

To understand the limited size of this cluster of NmW135 cases in a population never vaccinated against this serogroup, we surveyed the prevalence and duration of meningococcal carriage among inhabitants of patients’ villages. We also assessed the seroprevalence and immunologic response induced by carriage.

The Study
Carriage studies carried out by CERMES were approved by the national ethics committee of Niger in February 2003. We conducted our first investigation in May 2003 in 4 of the 5 villages where the meningitis patients were living. In each village, we enrolled 20 consenting persons, 10 who lived in a patient’s household, considered close contacts, and 10 who lived in a remote part of the village and had limited contact with patients (controls). The mean ages were 12.9 years (range 2–65 years) in the close contacts group and 12.1 years (range 6–25 years) in the other group.

Oropharyngeal swab specimens were immediately plated on chocolate agar. Plates were incubated at 37°C in a candle jar. From each culture that showed macroscopic evidence of Neisseria, 3 colonies were subcultured onto chocolate agar plates. Gram-negative oxidase-positive and catalase-positive cocci were then inoculated onto cystine trypticase agar. N. meningitidis serogrouping was performed by using specific antisera (Difco Laboratories, Detroit, MI, USA).

We collected a second oropharyngeal swab specimen from the same persons in February 2004. The swabs were processed as before. Meningococcal strains were sent to the WHO Collaborating Centre for Meningococci (Marseille, France) for serogroup confirmation, serotyping, multilocus sequence typing (MLST) (4), and pulsed-
field gel electrophoresis (PFGE) (5). When 2 or 3 strains of the same serogroup were obtained from the 3 subcultured colonies, only 1 was sent for further analysis. An unpublished study by the meningococcus unit in Marseille showed that meningococci having the same PFGE fingerprint patterns belonged to the same sequence type (ST). However, not all meningococci belonging to the same ST had the same fingerprint pattern. Here, we attributed the same ST to all the isolates having the same fingerprint pattern. Here, we attributed the same ST to all the isolates having the same fingerprint pattern. Here, we attributed the same ST to all the isolates having the same fingerprint pattern. Here, we attributed the same ST to all the isolates having the same fingerprint pattern. Here, we attributed the same ST to all the isolates having the same fingerprint pattern. Here, we attributed the same ST to all the isolates having the same fingerprint pattern. Here, we attributed the same ST to all the isolates having the same fingerprint pattern. Here, we attributed the same ST to all the isolates having the same fingerprint pattern. Here, we attributed the same ST to all the isolates having the same fingerprint pattern. Here, we attributed the same ST to all the isolates having the same fingerprint pattern. Here, we attributed the same ST to all the isolates having the same fingerprint pattern.
date of emergence of this ST are unknown because of lack of microbiologic surveillance outside Niamey before 2002. We report a cluster of cases that did not spread, despite the absence of a vaccination campaign and a high prevalence of long-lasting carriage. Until now, most strains with a genotype closely related to ST-2881 were carrier strains (8). ST-2881, which has a possibly lower virulence than the ST-11 strains, should be investigated in mice (14). Extensive circulation and asymptomatic carriage of ST-2881 strains in Niger may have prevented an epidemic by the virulent clonal complex ST-11. Carriage was significantly associated with development of a presumably protective immunity to the local ST-2881 strain. The association was not statistically significant for the reference ST-184 strain, but the limited sample size was not suitable for a high statistical power. Would the immunity induced by carrier NmW135 ST-2881 strains be sufficient to prevent an epidemic caused by the ST-11? Did the long-term carriage of a less virulent strain hamper colonization by a hypervirulent one? Addressing these 2 questions might contribute to understanding why the Burkina Faso outbreak did not hit Niger. This study highlights the importance of tracing NmW135 strains by MLST to monitor changes in the epidemiology of NmW135 in Africa.

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Pascal Boisier is a medical epidemiologist and head of the epidemiology unit of CERMES in Niger. His research interests include the epidemiology and control of infectious diseases such as bacterial meningitis in Africa.

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Table. Association between asymptomatic carriage status for W135 ST-2881 strains in May 2003 and protective immunity to the local strain in February 2004, in persons without protective immunity in May 2003

| Carrier of W135 strain, May 2003 | Protective immunity to W135 ST-2881, February 2004 |
|---------------------------------|----------------------------------|
| No (%)                          | Yes (%)                          |
| No                              | 26 (78.8)                        | 7 (21.2)                         | 33 |
| Yes                             | 6 (46.2)                         | 7 (53.8)                         | 13 |
| Total                           | 32                               | 14                               | 46 |

*According to serum bactericidal antibody assay; Fisher exact test, p = 0.04; ST, sequence type.