Epidemic meningitis: Surveillance and response activities during the 2002–2003 season in the countries of the African meningitis belt

Report on an informal WHO consultation

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1. Summary

During the 2002–2003 epidemic season, epidemics of meningitis were detected in Burkina Faso, in Niger and in northern Nigeria, together with an epidemic focus in northern Ghana. From bacteriological analyses, serogroup A was by far the predominant pathogen (40–70% isolates) followed by pneumococcus and serotype W135 (10–20% isolates). Molecular biology analyses have demonstrated the predominance of ST-7 and ST-11 clones in serotypes A and W135 respectively. In most countries in the region, the proportion of serogroup W135 among the germs isolated increased. Serogroup W135 has epidemic potential in future years in countries such as Mali, Niger and Nigeria.

Reinforced surveillance of meningitis has been extended to nine countries in the African belt, and a regional technical team has been established in Ouagadougou. Epidemiological surveillance has proved effective in three countries –: Burkina Faso, Mali and Niger – despite the absence of standardized notification and occasionally inappropriate use of thresholds at the district level. Surveillance remained inadequate in the six other countries.

The number of samples increased significantly in comparison with previous years and the polymerase chain reaction test (PCR) played a significant role in Burkina Faso and in Niger. As a whole, however, bacteriological surveillance was not effective because of the absence of a laboratory network in most countries, the high proportion of contaminated samples, difficulties sending samples and nominative lists, lack of resources at the peripheral level (transport media, Gram stains …), despite the distribution by WHO of laboratory kits and material in the nine countries.

For the first time, a trivalent A/C/W135 vaccine was used in mass immunization campaigns in Burkina Faso, alongside bivalent or tetravalent vaccines. A study of vaccine efficacy has shown the trivalent vaccine to be effective in preventing meningitis due to serogroups A and W135, but its effectiveness in preventing that due to group W135 in particular has yet to be proved. Logistic difficulties and the lack of clearly defined epidemiological and bacteriological criteria for choosing a vaccine have led to delays in implementing immunization in the countries concerned.

The participants recommend extending and improving the quality of reinforced surveillance in countries in the African meningitis belt and providing special support to Chad, Ethiopia and Nigeria. The standard operating procedures should be widely publicized. Integrated epidemiological and bacteriological surveillance tools should be developed to optimize intervention times and criteria to facilitate the choice of vaccine at the onset of the epidemic phase should be determined. In view of the risk of epidemics caused by the W135 serogroup, meningitis epidemics in which this serogroup is involved must be carefully documented and the availability of the trivalent vaccine ensured.
2. Opening statement, presentation of the meeting's objectives

On 24 and 25 July 2003, an informal meeting on epidemic meningitis surveillance and response activities during the 2002–2003 season in the countries of the African meningitis belt was held in Geneva at the invitation of WHO.

Dr Guenaël Rodier, Director, Department of Communicable Disease Surveillance and Response at WHO, Geneva, declared the meeting open. The Chair for the first day was taken by Dr Marc LaForce, Meningitis Vaccine Project/Project for Appropriate Technology in Health (MVP/PATH). Dr Geoffroy Jouslin de Noray was the rapporteur for the meeting.

Dr Rodier first of all welcomed participants and drew attention to the success of reinforced meningitis surveillance during the 2002–2003 season, thanks to the efforts and collaboration of the ministries of health concerned and of WHO.

The consultation had the following objectives:

• to provide an overview of epidemiological and laboratory data for the 2002–2003 epidemic season;

• to present a summary of the epidemiological surveillance activities for meningitis implemented by the regional team based at Ouagadougou (MDSC);

• to evaluate the implementation and efficacy of the standard operating procedures for reinforcing meningitis surveillance;

• to make recommendations for the implementation of surveillance activities in 2003–2004;

and the expected outcomes:

• epidemiological profile of the 2002–2003 season in the region and in particular of the epidemics in Burkina Faso and Niger;

• analysis of response activities (surveillance, laboratory and immunization) at the district level;

• identification of epidemiological trends for the 2003–2004 season;

• review of the standard operating procedures for reinforced meningitis surveillance for the 2003–2004 season.
3. Overview of epidemiological surveillance of meningitis for the 2002–2003 season

3.1 Reinforced meningitis surveillance in Africa in 2003
(Dr Alice Croisier)

The purpose of reinforced meningitis surveillance is to detect, confirm and respond to meningitis epidemics in eight countries in the African meningitis belt. Epidemiological and biological surveillance data, collected as rapidly as possible during the epidemic phase, must direct the immediate response.

During the 2002–2003 epidemic season, Burkina Faso, Niger and Nigeria were affected by a meningitis epidemic (Table 1). The epidemic reached its peak in week 8 in Burkina Faso and in week 14 in Niger (see Annex 4). Reinforced laboratory surveillance, which for the first time covered eight countries in the region, showed the predominance of *Neisseria meningitidis* (*Nm*) A and the presence in most countries of *Nm* W135 and of *Streptococcus pneumoniae* (*Sp*) throughout the season (Table 2)

For the first time, one country – Burkina Faso – used two million doses of trivalent A/C/W135 polysaccharide vaccine (trivalent vaccine) in a mass campaign. Niger and Nigeria also organized mass immunization campaigns and used 700 000 and 850 000 doses of bivalent A+C vaccine respectively.

The organization of an integrated regional and international surveillance network made it possible to detect the pathogens at an early stage in the three countries most affected and to determine the importance of the W135 serogroup in Burkina Faso and in Niger. Integrated data management, notification and the time taken to intervene still need to be improved.

<table>
<thead>
<tr>
<th>Countries</th>
<th>Population 2003</th>
<th>No. of cases</th>
<th>No. of deaths</th>
<th>CAT (cases/100 000)</th>
<th>Case fatality rate (%)</th>
<th>Districts crossing the ET</th>
<th>No. of districts crossing the AT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidemic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Niger</td>
<td>12 496 422</td>
<td>8 082</td>
<td>636</td>
<td>64.7</td>
<td>7.9%</td>
<td>42</td>
<td>9</td>
</tr>
<tr>
<td>Burk. Faso</td>
<td>12 490 971</td>
<td>7 859</td>
<td>1 181</td>
<td>62.9</td>
<td>15.0%</td>
<td>53</td>
<td>12</td>
</tr>
<tr>
<td>Nigeria</td>
<td>123 013 539</td>
<td>3 508</td>
<td>428</td>
<td>2.8</td>
<td>12.2%</td>
<td>774</td>
<td>20</td>
</tr>
<tr>
<td>Ghana b</td>
<td>18 972 414</td>
<td>1 454</td>
<td>184</td>
<td>7.7</td>
<td>12.7%</td>
<td>110</td>
<td>4</td>
</tr>
<tr>
<td>Benin</td>
<td>6 977 025</td>
<td>367</td>
<td>78</td>
<td>5.3</td>
<td>21.3%</td>
<td>77</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>197 938 282</td>
<td>23 091</td>
<td>2 728</td>
<td>11.7</td>
<td>11.8%</td>
<td>1 198</td>
<td>47</td>
</tr>
</tbody>
</table>

| Alert      |                 |              |               |                     |                        |                           |                                  |
| Mali       | 10 679 083      | 888          | 58            | 8.1                 | 6.7%                   | 56                        | 0                               |
| Chad c     | 8 332 857       | 614          | 92            | 7.4                 | 15.0%                  | 51                        | 0                               |
| Togo d     | 4 975 971       | 339          | 71            | 6.8                 | 20.9%                  | 35                        | 0                               |
| Total      | 197 938 282     | 23 091       | 2 728         | 11.7                | 11.8%                  | 1 198                     | 47                              |

* Up to week 23, b up to week 24, c up to week 20 (incomplete data), d up to week 25, e for Nigeria, only districts that submitted weekly reports are taken into account.
3.2 Meningitis epidemic in 2003 in Burkina Faso
(Dr Sylvestre Tiendrebeogo)

Faced with the risk of a meningitis epidemic in 2003, Burkina Faso drew up a preparedness and response plan in October 2002. During the 2003 season, the epidemic was on a smaller scale than in 2002 and mainly affected districts in the centre of the country.

The first suspect cases were notified during the first week of 2003. The epidemic threshold was crossed in week 5, the peak being attained earlier than the previous year, in week 8. The case–fatality rate was 15%. The number of samples of cerebrospinal fluid (CSF) analysed by the laboratories increased in comparison with 2002 (14.3% as against 4.6%). Almost half of these were positive. Serogroup A accounted for half the positive samples, followed by NmW135 and Sp in some 20% of cases. Reinforced surveillance was instituted in six districts, and drugs and consumables were pre-located in the districts.

Immunization was carried out in 12 districts in which there was an epidemic, using tetravalent vaccine (household vaccination) in three of them, bivalent vaccine in one and trivalent vaccine in eight, starting in the month of March (2 million doses). The average period before vaccination was 3.7 weeks and vaccination coverage ranged from 88 to 126%. Coverage values might be affected by the vaccination of people coming from neighbouring districts. For the first time in the region, vaccination cards were used during a mass meningitis vaccination campaign.

Difficulties were encountered in using and submitting the case description cards and transport media, and in providing treatment for patients (lack of drugs, of consumables, lack of treatment completely free of charge …). The first batch of trivalent vaccine arrived late. In most districts, there were insufficient staff for the mass immunization campaigns. Lastly, the process for submitting applications

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Table 2. Number of samples collected and pathogens identified in cerebrospinal fluid of suspect cases in Benin, Burkina Faso, Chad, Niger, Nigeria and Togo, obtained by culture on TI, culture on Agar medium, Pastorex® or PCR, notified to WHO. Weeks 1 to 26 (Dec. 30 to June 29)

<table>
<thead>
<tr>
<th>Country</th>
<th>No. Samples</th>
<th>No. positive</th>
<th>% of positive</th>
<th>% Nm among positive</th>
<th>No. NmA</th>
<th>No. Nm W135</th>
<th>No. Nm Y</th>
<th>No. NI Nm</th>
<th>No. pneumo</th>
<th>No. HIB</th>
<th>No. others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niger</td>
<td>1 714</td>
<td>808</td>
<td>47.1</td>
<td>81.2</td>
<td>536</td>
<td>59</td>
<td>3</td>
<td>58</td>
<td>96</td>
<td>17</td>
<td>39*</td>
</tr>
<tr>
<td>3 Burk. Faso, Togo</td>
<td>1 473</td>
<td>615</td>
<td>41.8</td>
<td>69.8</td>
<td>285</td>
<td>144</td>
<td>0</td>
<td>n/a</td>
<td>131</td>
<td>55</td>
<td>-</td>
</tr>
<tr>
<td>Mali</td>
<td>341</td>
<td>91</td>
<td>26.7</td>
<td>48.3</td>
<td>31</td>
<td>11</td>
<td>0</td>
<td>2</td>
<td>32</td>
<td>11</td>
<td>4*</td>
</tr>
<tr>
<td>Ghana</td>
<td>51</td>
<td>29</td>
<td>56.9</td>
<td>96.6</td>
<td>26</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nigeria</td>
<td>42</td>
<td>14</td>
<td>33.3</td>
<td>57.1</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Benin</td>
<td>11</td>
<td>(100)</td>
<td>(100)</td>
<td>8</td>
<td>3</td>
<td>0</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>-</td>
</tr>
<tr>
<td>Chad</td>
<td>3</td>
<td>2</td>
<td>66.7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>3 910</td>
<td>1 674</td>
<td>42.8</td>
<td>72.1</td>
<td>892</td>
<td>221</td>
<td>3</td>
<td>91</td>
<td>319</td>
<td>86</td>
<td>62</td>
</tr>
</tbody>
</table>

* a Charles de Gaulle and Yalgado laboratories (weeks 1-26) Centre Muraz laboratory (weeks 1-15). Excluding patients admitted to Ouagadougou Hospital.

* b Gram-negative bacillus.

* c Other unidentified Haemophilus influenzae or HiB and other streptococcus.

HIB : Haemophilus influenzae B.

NI Nm : unidentified Nm.
3.3 Prospective study of suspect cases of bacterial meningitis in the region of Bobo-Dioulasso, Burkina Faso 2002–2003
(Prof Judith Mueller)

From April 2002 to April 2003, the Association pour la Médecine préventive (AMP) carried out a prospective study in the region of Bobo-Dioulasso. The primary purpose of the study was to evaluate the distribution of the principal meningitis pathogens among the population of Burkina Faso. The study was also designed to evaluate the meningitis surveillance system and the use of PCR as a tool for diagnosis. The results, which are currently being analysed, point to the presence of serogroups A and W135 and of Sp.

3.4 2003 meningitis epidemic in Niger
(Prof Garba Soga)

In Niger, nine districts out of 42 reached the epidemic threshold in the departments of Zinder and Maradi. Notification of suspect cases, which was well correlated with the results of spinal tap, was satisfactory. The regional teams at Zinder and Maradi, of the ENIR (Equipe Nationale d’Intervention Rapide) and of CERMES (Centre de Recherche sur les Meningites et les Schistosomoses) conducted five investigations. Stocks of bivalent vaccine and of oily chloramphenicol and 400 transport media (Trans-Isolate, TI) were pre-located before the epidemic period. The case–fatality rate was below 10%. These departments used a total of 700 000 doses of bivalent vaccine. The level of vaccination coverage apparently exceeded 70% (evaluation under way). CERMES played a major role in bacteriological surveillance: use of PCR improved the results of diagnosis by some 15–20%. Out of 735 positive samples (48%), NmA predominated (72%), followed by NmW135 (8%).

The health authorities and their different partners are deeply committed to the response effort (funds, material …). In some districts, however, chloramphenicol, TIs and vaccine were in short supply. The lack of training and motivation of some health personnel, the absence of bacteriological analyses of CSF at the district level and the delay in the vaccination response (from 1 to 2 weeks) are weakness that need to be made good in future.

3.5 Meningitis in Nigeria in 2003
(Prof Alice Croisier)

In 2003, the number of cases of meningitis increased in northern Nigeria, essentially in the states of Jigawa, Kano and Katsina. A total of 3481 suspect cases were detected, including 343 fatalities, i.e. a case–fatality rate of 9.9%. Of 62 samples of CSF analysed, 25 were negative or contaminated (40.3%). There were six strains of NmA and two of NmW135. The epidemics in northern Nigeria and in the region of Zinder are part of the same epidemic focus, with a marked predominance of serogroup A.

Surveillance and response proved to be unsuited to the epidemic situation. There is no active surveillance in the Nigerian states at greatest risk. It was possible to collect epidemiological and bacteriological surveillance data only thanks to investigation missions from the central federal laboratory and a team from AFRO. This means that decentralization of epidemiological surveillance in Nigeria is a priority. As regards response, the Ministry of Health purchased 13 million doses of bivalent A+C polysaccharide vaccine during the epidemic. In Nigeria, only physicians and anaesthetists are
authorized to perform spinal taps. This is a major obstacle to rapid bacteriological confirmation of the epidemic – and one of the hurdles that will have to be overcome in respect of bacteriological surveillance.

3.6 Epidemiological surveillance and choice of vaccine
(Dr Alice Croisier)

A study of the epidemic situation in the sub-districts was conducted in three districts of Burkina Faso. Surveillance at the sub-district level is more sensitive and makes it possible to detect areas that cross the alert or epidemic threshold 1 or 2 weeks earlier than surveillance at the district level.

4. Results of molecular analysis of the isolates collected in 2002–2003

4.1 Results of the analyses carried out at the Multidisease Surveillance Centre (CSPP) in Ouagadougou
(Dr Laurent Toe)

In 2002–2003, CSPP benefited from a transfer of technology from the meningitis collaborating centre in Oslo to enable it to perform PCR on the spot. Of a total of 88 TIs on which culture was negative, PCR made it possible to detect 11 \( \text{Nm} \) \( W135 \). The CSPP molecular biology laboratory possesses considerable diagnostic and research potential that could be developed with the assistance of international institutions, for the benefit of the entire region.

4.2 Microbiological surveillance of meningitis in Niger, 2003 season
(Dr Pascal Boisier)

CERMES, the reference centre for meningitis in Niger, started to use PCR for microbiological surveillance in November 2002. Of a total of 1700 CSF samples taken, 1216 could be analysed only by PCR. The results for 735 positive samples (46.1%) showed a marked predominance of \( \text{Nm of serogroup A} \) (72%), followed by \( \text{Sp} \) (11.6%), \( \text{Nm W135} \) (7.9%), \( \text{Haemophilus influenzae} \) (4.9%) and \( \text{Nm Y} \) (0.4%). Serogroup W135 was detected in 16 out of 30 districts that sent samples, so far without epidemic implications or links with a pilgrimage or trip to Burkina Faso. In Niamey, \( \text{Nm W135} \) accounts for 38% of the isolates analysed. All the strains of \( \text{Nm} \) are sensitive to amoxicillin, oily chloramphenicol and ceftriaxone.

4.3 Institut de Médecine tropicale du Service de Santé des Armées (IMTSSA), meningococci unit, WHO collaborating centre
(Dr Pierre Nicolas)

The molecular epidemiology of meningococci makes it possible to track the circulation of strains throughout the world and to identify clones with epidemic potential. Since 1966, in the countries of the African meningitis belt, the emergence of meningococcus A Type 7 sequence (ST-7) has been noted together with the disappearance of ST-5. Since 2000, W135 ST-11 strains have been isolated more frequently, especially in Benin, Burkina Faso, Cameroon, the Central African Republic, Chad, Niger and Senegal. In 2003, out of 46 strains received from Niger, 22 belonged to group A (47.8%), 12 to group W135 (26%) and 2 to group Y (4.3%). They are currently being sequenced. The emergence of W135 poses the threat of an epidemic to the region, especially for Niger.
The meningococcal strains are sensitive to betalactamines, chloramphenicol and resistant to sulfamides.

4.4 Neisseria meningitidis in Africa – recent data on the strains analysed by the Oslo National Public Health Institute, a WHO collaborating centre (Dr Dominique Caugant)

The Institute provided 3000 TI transport media, although the rate of return was very low. Out of 47 TIs received, 25 cultures were positive (53.2%). Among these, serogroup A was still predominant (68%), followed by W135 (20%). Both W135 strains in Nigeria are different from the 2000 Mecca clone. It should be pointed out that certain (five or six) meningococcus clones are responsible for epidemics. This is the case of ST-11 (Mecca) or of ST-7 sub-group III, which makes it important to monitor these clones.

The sequencing capacity of the WHO collaborating centres is 200–300 strains per year.

5. Ad hoc studies

5.1 Short-course treatment of meningococcal meningitis (Dr Nicolas Nathan)

A randomized clinical trial to compare oily chloramphenicol with ceftriaxone in 1 or 2 injections was conducted from week 13 to week 17 in the regions of Zinder and Maradi in Niger. The results, which concern 510 suspect cases of meningitis, 354 of which are confirmed cases of meningococcal meningitis, are being analysed; the preliminary findings seem to indicate that, on the basis of clinical criteria, the two treatments are equivalent. The very low case–fatality rate registered by the study (5% of all suspect cases) may be explained by proper case management and the fact that the most serious cases were excluded. Short-course treatment with ceftriaxone offers an interesting alternative treatment for epidemic meningitis, although its use must be restricted to epidemics to avoid the spread of resistance. Short-course treatment with ceftriaxone is also more effective against pneumococcus than short-course treatment with chloramphenicol (unpublished data from an epicentre study in Niger in 1995). The cost of ceftriaxone is similar to or lower than that of oily chloramphenicol.

5.2 Evaluation of the impact of trivalent A/C/W vaccine in controlling meningitis epidemics in Africa. Study of vaccine efficacy – preliminary results (Dr Montserrat Soriano)

From March to April 2003, a case–control study was conducted in six districts of Burkina Faso to evaluate the efficacy of polysaccharide A/C/W135 vaccine. The initial objective of the study was changed on account of the insufficient number of strains of Nm W135 (5 out of 52 meningococci isolated by culture). The revised objective was to evaluate vaccine efficacy on serogroups A + W135. The preliminary findings point to high vaccine efficacy (>85%), which will need to be confirmed by ad hoc studies for serogroup W135.
Discussion

Participants drew attention to the following points:

*Epidemiological data*

- During the 2002–2003 epidemic season, reinforced surveillance showed the predominance of serogroup A together with a significant progression of serogroup W135, especially in Niger.

- Pneumococcus is endemic and is responsible for a significant proportion of bacterial meningitis throughout the year.

- Carrier strains are identical to those of patients (study in Oman). The initial results from studies under way in Burkina Faso and Niger show that carriage increases during the season and affects 20% of the population under 30 years of age in epidemic areas.

*Operational problems*

- Data collection needs to be improved and standardized to ensure better longitudinal surveillance. Solution of minor logistic problems in the field (such as transport), significantly improves the productivity of bacteriological examinations.

- There are still two major obstacles to simple etiological diagnosis – the frequent absence of reagents for Gram stain, especially at the peripheral level, and the fact that, in the English-speaking countries (Nigeria), only physicians are authorized to perform spinal tap.

- Delays between notification of the first suspect cases and the vaccination campaign are still too long. Districts should not be systematically adopted as the base unit and their size should be taken into account in order to detect an epidemic outbreak in time. The alert and epidemic thresholds are suited to populations of between 30,000 and 100,000 persons. Beyond that, the sub-district would seem to be more suitable.

- The benefits of PCR for bacteriological surveillance in Niger have been pointed out. It is easy to package samples, as the CSF is collected in a dry tube which is deep-frozen or preserved at between 0 °C and +4 °C until it reaches the laboratory. However, the question arises of whether PCR may be considered as a tool for epidemiological surveillance. PCR has been used in routine surveillance in Niger to make up for the lack of a laboratory network. In fact, it is more an a posteriori diagnostic tool on account of the time necessary to obtain a result (time taken for transport to a central laboratory). Reference laboratories alone are capable of using the technique (risk of contamination). It is a highly effective technique which should be developed at the regional level.
Response: possible settings

− Do we need a trivalent vaccine?

− Even though \textit{Nm} A still predominates, there is a strong likelihood of an epidemic from W135 in one of the countries in the African meningitis belt. Serogroup W135 is endemic throughout the region and has undisputed epidemic potential, especially in countries close to Burkina Faso such as Mali, Niger and Nigeria. A reserve of trivalent vaccine is essential. In order to make judicious use of it, confirmed laboratory findings need to be received in good time. This requires increasing the diagnostic capacity of laboratories to allow the right decisions rapidly to be taken.

− The question of choice of vaccine valence for reactive immunization – and of the choice criteria – has been raised. This is a complex issue, particularly because of the very short response deadline and because there is a problem regarding the representativeness and interpretation of samples. An informal consultation under the aegis of WHO is under way to determine criteria for the use of antimeningococcal vaccines.

− Immunization cards were distributed in Burkina Faso when immunization with trivalent vaccine was carried out. Could their use be generalized during future campaigns, to optimize vaccine use?

− Use of immunization cards in Niger was not conclusive: there were logistic problems, and cards were hidden. Moreover, the rapid decline in vaccine protection in children given polysaccharide vaccine raises doubts about the value of deciding whether to vaccinate them during an epidemic on the basis of their case history.

6. Overview of the implementation of reinforced surveillance

6.1 Standard operating procedures for reinforcing surveillance of meningitis from \textit{Nm} W135 in nine countries in the meningitis belt

(Dr Denis Kandolo)

Since the appearance of epidemics due to \textit{Nm} W135, reinforced meningitis surveillance has been introduced in nine countries in the African meningitis belt in order to ensure early detection of epidemics and the adoption of a suitable immunization strategy. Epidemiological surveillance was effective in Benin, Burkina Faso, Mali and Niger, despite the lack of a standardized notification procedure. CSPP in Ouagadougou played an important role at the regional level. Laboratory surveillance was less effective on account of the lack of a laboratory network in the countries, transport delays, the shortage of TIs in the districts, the large number of contaminated samples and insufficiently motivated staff.

6.2 Reinforced meningitis surveillance in Burkina Faso: strategy, operational and logistic aspects 2002–2003

(Dr M Dabal)

After the W135 meningitis epidemic in 2002, Burkina Faso, with the assistance of WHO, continued reinforced surveillance during the 2002–2003 season. The standard operating procedures were distributed to health facilities. Laboratories at the different levels were provided with better diagnostic
equipment (TIs, Pastorex …). Longitudinal surveillance was carried out in six districts during the epidemic period. Performance indicators show that detection was rapid at the district level in districts crossing the alert and epidemic thresholds. However, the initial laboratory results were inadequate. Only 22% of districts under alert sent their nominative lists (line listing) from laboratories. Less than 10% of districts with an epidemic confirmed the serogroup of 10 suspect cases within 10 days of crossing the alert threshold, as required by the standard operating procedure. Among the difficulties encountered, the most significant were use of TIs, a shortage of flasks, high levels of contamination, transport problems and lack of motivation among staff.

6.3 The role of laboratories in meningitis surveillance. Niger in 2003
(Dr Pascal Boisier)

Pending improvement in the bacteriological skills of the peripheral laboratories, CERMES assumed primary responsibility for the bacteriological component of meningitis surveillance in Niger. Samples, together with an epidemiological questionnaire, were collected actively around Niamey and passively elsewhere in the country. They were then included in a database and used to provide systematic feedback. PCR was used for routine surveillance and offers a very valuable alternative. However, its use should be restricted to centres able to master the technique.

6.4 Implementation of the standard operating procedure
(Dr Alice Croisier)

The following points emerged from the review of the main problems posed in the field by the standard operating procedures, whether in terms of introducing laboratory surveillance or of managing information at the national and regional levels:

− Overall, epidemiological surveillance performed well, especially in the three countries involved in 2001–2002.

− The countries in the meningitis belt are not able to operate two parallel surveillance systems. The same tools should be used in the field as for integrated disease surveillance (IDS).

− Bacteriological surveillance was the “weak link”. Laboratory results were too few and difficult to interpret at the beginning of the epidemic phase. For example, in Burkina Faso, less than 10% of districts were able to identify theNm serogroup responsible. The bacteriological skills of the laboratories need to be improved. This could also serve for other bacterial diseases (shigellosis, cholera …).

− The contribution made by bacteriological data was emphasized. Should selected sites be used for systematic surveillance of strains or would it be better to rely on one or two mobile teams with epidemiological and bacteriological investigation capacity?

The idea of mobile teams was presented as an alternative means of improving the efficacy of epidemiological and bacteriological surveillance. The experience of AMP shows that this is feasible, although the experiment is not yet complete.

The investigative capacity of mobile teams seems to be an interesting avenue for ensuring a rapid response. However, their implementation poses problems of distance and simultaneous occurrence of epidemic foci. The question of where to locate them (regions? districts?) needs to be resolved.
Autonomy is an important objective for the districts, with staff trained in investigation and the capacity to perform basic laboratory examinations such as Gram staining.

6.5 Operational aspects of reinforced meningitis surveillance in the African meningitis belt: Support from WHO Headquarters
(Mr M. K. Ait-Iklef)

Since January 2003, WHO has provided nine countries in the African meningitis belt with material for taking and analysing CSF, in “lumbar puncture” (50 LP) and “diagnosis” kit form, as well as material for the national laboratories. The assistance received required significant resources – human (one full-time logistician), logistic and financial (>US$ 150 000). There are still too few TIs, but it is impossible to supply nine countries with enough for each district. The question of repackaging the kits was raised. Each country is free to repack the kits at the national or regional level, depending on the local circumstances, as is done by Burkina Faso.
Conclusions and recommendations

1. Epidemiological data for the 2002–2003 season showed a marked predominance of *Nm* serogroup A in the region. Nevertheless, the large proportion of *Nm* serogroup W135 observed in several countries confirms the spread of W135 in the meningitis belt and makes probable the development of epidemics from this serogroup in coming years.

2. From the information available, the participants in the meeting considered that the risk of epidemics from W135 alone or mixed A/W135 epidemics in the 2003–2004 season will be greater in Burkina Faso, Mali and Niger, where the vast majority of *Nm* W135 strains have been isolated.

3. On account of the increase in meningococcal activity in Nigeria this year, where it has been the highest since 1997, the risk of the country being affected by a large-scale epidemic in the next two years is considerable. With the assistance of its partners, WHO needs to ensure that resources are available to provide the Ministry of Health with the assistance it requires to implement the surveillance and response measures needed effectively to control any epidemic.

4. Given the risk of epidemics due to W135 alone and of mixed A/W135 epidemics, provision of a suitable stock of trivalent A/C/W polysaccharide vaccine must be given priority by WHO and needs the support of Member States, donors and partner agencies. Estimating vaccine requirements is a difficult exercise; however, participants believed that 3–5 millions doses will make it possible to respond satisfactorily to an emergency.

5. Choice and supply of vaccine for the countries affected will need to be based on the epidemiological and bacteriological criteria established by WHO, using the results of an informal consultation currently under way.

6. Supply of laboratory equipment to collect, transport and analyse CSF samples is a key factor in epidemic meningitis surveillance and response. However, it will not be possible to repeat on the same scale the efforts made in 2002–2003 by WHO and its collaborating centres. WHO will need to explore alternative sources of cheaper supplies, such as suppliers based in Africa. Moreover, it would be desirable for the Member States concerned, with the support of their partners, gradually to increase their participation in providing supplies.

7. All Member States concerned by epidemic meningitis should actively take part in identifying and mobilizing resources, so as to prepare and effectively implement plans for epidemic surveillance and response.

Reinforced surveillance

The efforts made to reinforce meningitis surveillance since 2002 have yielded tangible results. These efforts need to be pursued for the coming season, while at the same time ensuring that the following recommendations are borne in mind when planning and implementing activities connected with epidemiological surveillance:

- Improve the quality of surveillance and develop surveillance tools to facilitate the integration of epidemiological and bacteriological data.
• Provide specific support to countries whose surveillance systems are inadequate or that face problems in providing meningitis surveillance (for example Nigeria, Chad and Ethiopia).

• Provide national staff with training in the methods and tools required to reinforce meningitis surveillance.

• Maintain a regional team inside CSPP at Ouagadougou to provide technical support for surveillance activities in countries and to analyse and disseminate the information needed to organize and implement epidemic control measures.

More specifically:

**Epidemiology**

• Amend the standard operating procedures on the basis of the recommendations made by the working groups at the meeting (see below).

Encourage use in all health facilities of the case definition recommended by WHO. Explain/promote the application of epidemic thresholds to geographical units (sub-district), whose population is below 100 000 inhabitants, so as to optimize intervention time. Limit the submission of weekly data to the number of cases and of fatalities, the attack rate and the case–fatality rate per district. Determine the purpose of the nominative lists (a posteriori analysis of specific epidemiological aspects) and, when they are complete, transmit them only to the district/province level. Encourage the adoption of a single identification number per patient or the systematic use of the EPED number (polio number).

• Introduce a system of regular feedback based on the experience garnered during the 2002–2003 season.

**Bacteriology**

• Strengthen national laboratory networks by improving supply to the peripheral level of material for sampling and bacteriological diagnosis.

• Pre-locate TIs and spinal tap kits at the district or province level to shorten the time taken for bacteriological confirmation.

• Encourage the use of the following diagnostic examinations depending on the level of health facility:
  – District: Gram and latex.
  – Regional: Gram, latex and culture if infrastructure is adequate.
  – National: Gram, latex, culture and serogrouping, PCR if available.

• Include in the weekly epidemiological telegram the number of samples taken and the laboratory results available (Gram/latex if available).
• Promote and ensure systematic transmission of the strains isolated by the national laboratories to the collaborating centres (Atlanta, Marseilles, Oslo), for further analysis and to permit biomolecular surveillance of meningitis in the region. More specifically, it was recommended that 10% of the strains isolated be sent at the beginning of the year, 10% in the middle of the epidemic season and 10% at the end of the season, and that part of the sterile samples be sent for further analyses. The matter of how to transport the samples under satisfactory conditions remains to be solved. One solution could be to sign agreements with courier or air transport companies.

• Use the following indicators to monitor the operation of the laboratories:
  – Number of laboratory examinations performed per week.
  – Number of Gram stain/latex tests performed.
  – Number of samples sent.
  – Capacity of the laboratory to perform Gram staining and culture per week (stock).
  – Number of TIs contaminated per week.

• Standardize notification of laboratory results within the countries belonging to the meningitis belt.

• Improve the quality of laboratory examinations by:
  – Training staff (use of TIs, of latex tests…).
  – Supervision for the purpose of training.
  – Motivation (feedback, participation in meetings …).
  – Improving technical facilities.

• Support the development of research laboratory capacity in the region and the use of PCR to complement bacteriological diagnosis.

• Define a feasible sampling strategy – what are its objectives? what time frame should it adopt (where? when? how many?). As a starting point, participants suggested taking a maximum of 15 samples per district/sub-district within a period of no more than 10–15 days (the samples should be tested or transferred as quickly as possible, even if there are fewer than 15).

• If the laboratory results are to be correctly interpreted, a rapid investigation should be carried out using a large enough number of samples taken under proper technical conditions.
Epidemic response

- Support training for staff at the peripheral level to provide case management for and handle epidemics.

- Cooperate with ministries in countries in the meningitis belt in order to update national plans of action for epidemic response, and forecast with them their needs in terms of vaccines, oily chloramphenicol and other consumables.

- Ensure that an international emergency stock of oily chloramphenicol is available.

- Monitor the following performance indicators of epidemic response:
  - Number of investigatory/supervisory visits.
  - Number of weeks oily chloramphenicol is out of stock.
  - Time taken (weeks) between the epidemic threshold being reached and the beginning of mass immunization (objective: <1 week).
## Annex 1: Agenda

**Thursday 24 July 2003**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Presenter(s)</th>
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| 9:00–9:30  | Opening of the meeting  
Objectives and expected outcome  
*Dr G. Rodier* |                                                                 |
| 9:30–10:00 | Epidemiological analysis of the 2002–2003  
epidemic season in the countries of the  
African meningitis belt  
*Dr A. Croisier* |                                                                 |
| 10:00–10:30 | Meningitis epidemic in Burkina Faso:  
– Results of epidemic surveillance and  
response activities  
– Surveillance activities in the region of  
Bobo-Dioulasso  
*Dr S. Tiendrebeogo*  
*Dr J. Mueller* |                                                                 |
| 10:30–11:00 | Coffee break |                                                                 |
| 11:00–11:30 | Meningitis epidemic in Niger:  
– Epi descriptive  
– The use of surveillance for response  
*Dr S. Garba* |                                                                 |
| 11:30–11:45 | Epidemic in Nigeria: results of  
epidemiological investigation  
*Dr A. Croisier* |                                                                 |
| 11:45–12:00 | Surveillance at the sub-district level:  
case study  
*Dr A. Croisier* |                                                                 |
| 12:00–12:30 | Discussion |                                                                 |
| 12:30–14:00 | Lunch |                                                                 |
| 14:00–15:00 | Results of molecular analysis of the isolates  
collected in 2002–2003  
– MDSC, Burkina Faso  
– CERMES, Niger  
– IMTSSA, Marseilles  
– NIPH, Oslo |                                                                 |
15:00–16:00  Presentation of the results of the epidemiological studies on meningitis undertaken in the region in 2002–2003
  – Study of carriage in Niger, CERMES  Dr P. Boisier
  – Ceftriaxone study in Niger, Epicentre  Dr N. Nathan
  – Evaluation of the efficacy of trivalent vaccine, Burkina Faso  Dr M. Soriano

16:00–16:30  Coffee break

16:30–17:30  Discussion: epidemiological trends in epidemic meningitis in the meningitis belt:
  What's to be expected in the years to come?  Chair: Dr M. LaForce

17:30–18:00  Conclusions

**Friday 25 July 2003**

9:00–9:15  Reinforced epidemic meningitis surveillance: general principles  Dr D. Kandolo

9:15–10:30  Reinforced surveillance at the national level
  – Burkina Faso: strategies, operational and logistic aspects  Dr D. Moumouni
  – Niger: the role of the laboratory  Dr P. Boisier

10:30–11:00  Coffee break

11:00–11:30  Reinforced surveillance: support from the regional level  Dr D. Kandolo
  Dr A. Croisier

11:30–12:00  Operational aspects: management of laboratory material at the WHO/HQ level  Mr M. K. Ait-Iklef

12:00–13:30  Lunch

13:30–15:30  Revision of the standard operating procedures
  Group work

15:30–16:00  Coffee break

16:00–16:30  Plenary meeting: reports from the working groups  Chair: Dr M. Birmingham

16:30–17:30  Recommendations for the 2003–2004 season

17:30  Close
Annex 2: List of participants

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Annex 3: List of presentations

1. Reinforced surveillance of meningitis in Africa in 2003
2. 2003 meningitis epidemic in Burkina Faso
4. 2003 meningitis epidemic in Niger
6. Epidemiological surveillance and choice of vaccine
7. Results of the analyses carried out at MDSC
8. Microbiological surveillance of meningitis in Niger, 2003 season
9. IMTSSA, meningococcal unit, WHO collaborating centre
10. *Neisseria meningitidis* in Africa - recent data on the strains analysed by the Oslo collaborating centre
11. Short-course treatment of meningococcal meningitis
12. Evaluation of the impact of trivalent A/C/W vaccine on control of meningitis epidemics in Africa. Study of vaccine efficacy – preliminary results
13. Standard operating procedures for reinforcing surveillance of meningitis epidemics linked to *Nm* W135 in countries in the meningitis belt
15. The role of the laboratory in meningitis surveillance. Niger in 2003
16. Implementation of the standard operating procedures
17. Operational aspects of reinforced meningitis surveillance in the countries of the African meningitis belt: support from Headquarters
Annex 4: Graphs

**Meningitis in Burkina Faso, 2003**
*Number of cases and case–fatality rate per week*

![Graph showing number of cases and case-fatality rate per week in Burkina Faso, 2003.](image)

**Meningitis in Niger, 2003**
*Number of cases and case–fatality rate per week*

![Graph showing number of cases and case-fatality rate per week in Niger, 2003.](image)
Map 1. Cumulative incidence rate of suspect meningitis cases (cases per 100 000) in countries under surveillance: weeks 1 to 26. 2003
Copies of presentations available on request:

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