Epidemic Meningitis and Meningitis outbreak

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World Health Organization
What is Meningitis?

- Meningitis is an inflammation of the meninges, the thin lining that surrounds the brain and the spinal cord.

- Different origins:
  - Mechanical: eg. tumours
  - Infectious: Cerebrospinal fluid (CSF) found infected
    - Viruses
    - Fungi
    - Parasites
    - BACTERIA
Bacterial causes of Meningitis

Many bacteria but some are of specific importance in public health:

*Streptococcus pneumoniae*

*Haemophilus influenzae*

*Neisseria meningitidis (Nm)*
The meningococcus

ADN Sequence Type ST

Capsule
Outer membrane
Cytoplasmic membrane

Polysaccharide serogroups A, B, C, W135, Y...

Very fragile

Source: IMTSSA, Marseilles
Spread of *Nm A* of the ST-5 clonal complex

1996-1997: 250,000 cases in the Belt
Key points

- Strictly a human disease
- Direct transmission, person to person, respiratory droplets
- Close (2m) and prolonged contact
- Average incubation period 4 days, ranging between 2 and 10 days.
- Carried in the pharynx – can overwhelm the body’s defenses allowing infection to spread through the bloodstream and to the meninges. Risk factors
- 1-10% of asymptomatic carriers. Up to 10-25% during epidemics.
SYMPTOMS

- Stiff neck (babies opposite: "the rag doll")
- High fever
- Headaches
- Vomiting
Meningococcal meningitis

- Worldwide distribution
- Sporadic, cluster or large epidemic ("epidemic meningitis")
- 12 serogroups:
  - Europe, Americas: B, C
  - Asia: A
  - Africa: A, C, W135, X
- Africa: 80% of the burden
The Meningitis Belt

- 21 countries and 300 million people at risk
- 700,000 cases in the past 10 years
- 10-50% case fatality rates
- 10-20% of survivors suffer permanent brain damage
Current WHO Strategy
How to reduce the burden of meningitis?

The WHO strategy in the Belt

Based on:

- Characteristics of meningitis in the Belt
- Technical and financial capacities of the concerned countries
- Performance and Availability of vaccines
The Meningitis Belt: a region presenting distinct epidemiological features

- **Hyper incidence**
  - 10-150 per 100,000 in non-epidemic yrs
  - 250-1000 per 100,000 in epidemic yrs
  (Europe-USA: 1-3 per 100,000)

- **Seasonal increase**

- **Large epidemics during the dry season**
Classical Epidemic Curve at District level

Weekly attack rates, Banfora District, Burkina Faso 1997

Epidemic and Pandemic Alert and Response
WHO strategy: Capacities of the concerned countries

Multiple endemic and epidemic diseases
Limited resources
Lack of laboratory capacities
WHO strategy: Performance and Availability of vaccines

- PS vaccines
  - Poorly immunogenic in children < 2y
  - Immunity short lived: requires multiple doses
  - Does not protect from carriage
  - Routine immunization not feasible in the Belt countries

- Limited supply, affordability
  - bivalent AC
  - trivalent ACW
  - tetravalent ACWY
Outbreak control: 2 Core Components

- To prevent the lethality = case management
- To prevent the cases = reactive vaccination
case management

- Presumptive treatment
- Cheap and efficient on the most probable causative agent
Treatment of bacterial meningitis in the African meningitis belt in the absence of laboratory support

In non-epidemic situations
Treatment should be adapted according to patients’ age and most likely causative pathogen

See Table 1

In meningococcal epidemic situations
Use of ceftriaxone
Single dose as presumptive treatment
See Table 3

Use of oily chloramphenicol
Single dose as presumptive treatment
See Table 4

In children aged 0–23 months
Treatment should be adapted according to patients’ age and most likely causative pathogen

See Table 2

In children over 2 years and adults
N. meningitidis is the most likely pathogen. Presumptive treatment is justified

OR

Figure 1: How to choose a treatment – a decision tree according to the situation and the age of the patient

< 2 months: Ceftriaxone 100 mg/kg/day 7 days
> 2 months: the same, 5 days
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100mg/kg
2nd dose if no improvement after 24h

Figure 1: How to choose a treatment – a decision tree according to the situation and the age of the patient
Reactive Vaccination

60% of cases averted when vaccination is implemented within 2-4 weeks (Leake et al)

- District level
- District in epidemic + neighbouring districts in alert
- Targeted on the high risk population: usually < 30yrs (refugees!)
- Targeted on the responsible Nm serogroup: A, C, W
- Timely
Reactive vaccination: the good timing

expected incidence rise or beginning of an outbreak?
the principle of the thresholds

Alert threshold
5/100 000/week
Clinical samples + lab confirmation

Epidemic threshold
10/100 000/week
Immediately conduct district mass vaccination
Strengthen case management
**the principle of the thresholds**

**Alert threshold**
5/100,000/week
- Clinical samples + lab confirmation

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- Immediately conduct district mass vaccination
- Strengthen case management

*African belt only!*
To immunize with the right vaccine: a rational choice

epidemic threshold reached

laboratory test results available

yes

Mainly Nm identified

in 10 or more samples

W135 not identified

>30% of W135 out of 10-19 Nm positive samples, OR
>20% of W135 out of 20 or more Nm positive samples

W135 not identified

W135 epidemic in a neighboring district

AC PS

no

Specimens obtained

Conduct active field investigation and obtain specimens

W135 identified

AC PS

at least one W135 identified

in less than 10 samples

W135 not identified

W135 not identified

>30% of W135 out of 10-19 Nm positive samples, OR
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Epidemic and Pandemic Alert and Response

World Health Organization
Ensuring a vaccine emergency stock: The International Coordinating Group for Vaccine Provision

- Established in 1997
- Executive sub-group
- Objectives:
  - ensure optimal use of vaccine, drugs and injection materials
  - set up a mechanism with vaccine manufacturers to lessen the risk of a crisis in supply
- Revolving stock: Vaccine + Oily chloramphenicol

30 million doses of vaccine channelled since 1997
ICG request process

1. **Country submission of ICG request**
2. **Verification by receiving agency** (MSF UNICEF, IFRC, WHO)
3. **Submission to ICG secretariat**
4. **Circulation to ICG members**
   - **ICG Decision**
     - Yes: **Inform the country or requesting agency**
     - No: Loop back to **Submission to ICG secretariat**

- **Arrival of vaccine in country**
  - **Shipping**

- **Procurement Process**
  - **Request for more info**

- **Epidemic district**
  - **Vaccination**

- **48 h**
- **10 days max**

**Epidemic and Pandemic Alert and Response**

**World Health Organization**
From the reaction to the prevention...

The reactive vaccination: a frustrant strategy

Toward a true prevention: a conjugate A vaccine for Africa...
Out of the African Belt

Assessment of the situation:

- Stay pragmatic, Forget the thresholds
- Refugees camp: 2 confirmed cases a week
- Who, where and when?
- What aetiology?
  - Cloudy or purulent CSF?
  - Gram stain
  - Agglutination test (Pastorex*, Slidex*)
  - Lab confirmation (transport media)
Out of the African Belt

Control:

- Case management: presumptive treatment / lab based ttt
- Chemoprophylaxis
- Prevention of nosocomial transmission
- Vaccination
- Health education