

Meningococcal meningitis

OVERVIEW

Meningitis is an infection of the meninges, the thin lining that surrounds the brain and the spinal cord. Several different bacteria can cause meningitis and *Neisseria meningitidis* is one of the most important because of its potential to cause epidemics. Meningococcal disease was first described in 1805 when an outbreak swept through Geneva, Switzerland. The causative agent, *Neisseria meningitidis* (the meningococcus), was identified in 1887.

Twelve subtypes or serogroups of *N. meningitidis* have been identified and four (*N. meningitidis*. A, B, C and W135) are recognized to cause epidemics. The pathogenicity, immunogenicity, and epidemic capabilities differ according to the serogroup. Thus the identification of the serogroup responsible of a sporadic case is crucial for epidemic containment.

HOW IS THE DISEASE TRANSMITTED

The bacteria are transmitted from person to person through droplets of respiratory or throat secretions. Close and prolonged contact (e.g. kissing, sneezing and coughing on someone, living in close quarters or dormitories (military recruits, students), sharing eating or drinking utensils, etc.) facilitate the spread of the disease. The average incubation period is 4 days, ranging between 2 and 10 days.

N. meningitidis only infects humans; there is no animal reservoir. The bacteria can be carried in the pharynx and sometimes, for reasons not fully known, overwhelm the body's defences allowing infection to spread through the bloodstream and to the brain. It is estimated that between 10 to 25% of the population carry *N. meningitidis* at any given time, but of course the carriage rate may be much higher in epidemic situations.

FEATURES OF THE DISEASE

The most common symptoms are stiff neck, high fever, sensitivity to light, confusion, headaches and vomiting. Even when the disease is diagnosed early and adequate therapy instituted, 5% to 10% of patients die, typically within 24-48 hours of onset of symptoms. Bacterial meningitis may result in brain damage, hearing loss, or learning disability in 10 to 20% of survivors. A less common but more severe (often fatal) form of meningococcal disease is meningococcal septicaemia which is characterized by a haemorrhagic rash and rapid circulatory collapse.

DIAGNOSIS

The diagnosis of meningococcal meningitis is suspected by the clinical presentation and a lumbar puncture showing a purulent spinal fluid; sometimes the bacteria can be seen in microscopic examinations of the spinal fluid. The diagnosis is confirmed by growing the bacteria from specimens of spinal fluid or blood. More specialised laboratory tests are needed for the identification of the serogroups as well as for testing susceptibility to antibiotics.

TREATMENT

Meningococcal disease is potentially fatal and should always be viewed as a medical emergency. Admission to a hospital or health centre is necessary. Isolation of the patient is not necessary. Antimicrobial therapy must be commenced as soon as possible after the lumbar puncture has been carried out (if started before, it may be difficult to grow the bacteria from the spinal fluid and thus confirm the diagnosis).

A range of antibiotics may be used for treatment including penicillin, ampicillin, chloramphenicol, and ceftriaxone. Under epidemic conditions in Africa, oily chloramphenicol is the drug of choice in areas with limited health facilities because a single dose of this long-acting formulation has been shown to be effective.

EPIDEMIOLOGY OF MENINGOCOCCAL MENINGITIS: WHO IS AFFECTED AND WHERE

Meningococcal meningitis occurs sporadically in small clusters throughout the world with seasonal variations and accounts for a variable proportion of endemic bacterial meningitis. In temperate regions the number of cases increases in winter and spring. Serogroups B and C together account for a

large majority of cases in Europe and the Americas. Several local outbreaks due to *N. meningitidis* serogroup C have been reported in Canada and USA (1992-93) and in Spain (1995-97). For 10 years, the meningococcal meningitis activity has particularly increased in New Zealand where an average of 500 cases occurs every year. Most of these cases are now due to serogroup B.

Major African epidemics are associated with *N. meningitidis* serogroups A and C and serogroup A is usually the cause of meningococcal disease in Asia. Outside Africa, only Mongolia reported a large epidemic in the recent years (1994-95).

There is increasing evidence of serogroup W135 being associated with outbreaks of considerable size. In 2000 and 2001 several hundred pilgrims attending the Hajj in Saudi Arabia were infected with *N. meningitidis* W135. Then in 2002, W135 emerged in Burkina Faso, striking 13,000 people and killing 1,500.

THE AFRICAN MENINGITIS BELT

The highest burden of meningococcal disease occurs in sub-Saharan Africa, which is known as the "Meningitis Belt", an area that stretches from Senegal in the west to Ethiopia in the east, with an estimated total population of 300 million people. This hyperendemic area is characterized by particular climate and social habits. During the dry season, between December and June, because of dust winds and upper respiratory tract infections due to cold nights, the local immunity of the pharynx is diminished increasing the risk of meningitis. At the same time, the transmission of *N. meningitidis* is favoured by overcrowded housing at family level and by large population displacements due to pilgrimages and traditional markets at regional level. This conjunction of factors explains the large epidemics which occur during this season in the meningitis belt area. Due to herd immunity (whereby transmission is blocked when a critical percentage of the population had been vaccinated, thus extending protection to the unvaccinated), these epidemics occur in a cyclic mode. *N. meningitidis* A, C and W135 are now the main serogroups involved in the meningococcal meningitis activity in Africa.

In major African epidemics, attack rates ranges from 100 to 800 per 100 000 population, but individual communities have reported rates as high as 1000 per 100 000. While in endemic disease the highest attack rates are observed in young children, during epidemics, older children, teenagers and young adults are also affected.

In 1996, Africa experienced the largest recorded outbreak of epidemic meningitis in history, with over 250 000 cases and 25 000 deaths registered. Between that crisis and 2002, 223,000 new cases of meningococcal meningitis were reported to the World Health Organization. The countries most affected countries have been Burkina Faso, Chad, Ethiopia and Niger; in 2002, the outbreaks occurring in Burkina Faso, Ethiopia and Niger accounted for about 65% of the total cases reported in the African continent. Furthermore, the meningitis belt appears to be extending further south. In 2002, the Great Lakes region was affected by outbreaks in villages and refugees camps which caused more than 2,200 cases, including 200 deaths.

PREVENTION

Several vaccines are available to prevent the disease. Polysaccharide vaccines, which have been available for over 30 years, exist against serogroups A, C, Y, W135 in various combinations. A monovalent conjugate vaccine against serogroup C, has recently been licensed in developed countries for use in children and adolescents. This vaccine is immunogenic, particularly for children under 2 years of age whereas polysaccharide vaccines are not. All these vaccines have been proven to be safe and effective with infrequent and mild side effects. The vaccines may not provide adequate protection for 10 to 14 days following injection.

VACCINATION IS USED IN THE FOLLOWING CIRCUMSTANCES:

Routine vaccination: Routine preventive mass vaccination has been attempted and its effect has been extensively debated. Saudi Arabia, for example, offers routine immunization of its entire population. Sudan and other countries routinely vaccinate school children. Preventive vaccination can be used to protect individuals at risk (e.g. travellers, military, pilgrims).

Protection of close contacts: When a sporadic case occurs, the close contacts need to be protected by a vaccine and chemoprophylaxis with antibiotics to cover the delay between vaccination and

protection (see above). Antibiotics used for chemoprophylaxis are rifampicin, minocycline, spiramycin, ciprofloxacin and ceftriaxone.

Vaccination for epidemic control: In the African Meningitis Belt context, enhanced epidemiological surveillance and prompt case management with oily chloramphenicol are used to control the epidemics. Routine immunization is not possible with the current available vaccines as the polysaccharide vaccines provide protection for only three to five years and cannot be used in children under 2 years of age because they lack the ability to develop antibodies. Furthermore, even large scale coverage with current vaccines does not provide sufficient "herd immunity". Consequently, the current WHO recommendation for outbreak control is to mass vaccinate every district that is in an epidemic phase, as well as those contiguous districts that are in alert phase. It is estimated that a mass immunization campaign, promptly implemented, can avoid 70 % of cases.

Emergence of W135: Bivalent AC vaccine is commonly used in Africa but the emergence of *N. meningitidis* W135 as an epidemic strain involves revising this control strategy. A tetravalent ACYW135 polysaccharide vaccine exists but its high price and limited availability restricts its use in the African context. In 2003, WHO reached an agreement with a manufacturer to produce an affordable polysaccharide vaccine for Africa which would protect against A, C and W135 strains.

WHO'S STRATEGY

WHO promotes a two-pronged strategy which involves epidemic preparedness and epidemic response. Preparedness focuses on surveillance, from case detection and investigation and laboratory confirmation. This implies strengthening of surveillance and laboratory capacity for early detection of epidemics, the establishment of national and sub-regional stocks of vaccine, and the development or updating of national plans for epidemic management (including preparedness, contingency and response). WHO regularly provides technical support in the field, in the countries facing epidemics.

Following large outbreaks in Africa in 1995-96, WHO was instrumental in establishing the International Coordinating Group (ICG) on Vaccine Provision for Epidemic Meningitis Control to ensure rapid and equal access to vaccines, injection material and oily chloramphenicol, as well as for their adequate use when the stocks are limited. The ICG is composed of partners from the UN, including WHO, nongovernmental organizations, technical partners and the private sector.

WHO is committed to eliminating meningococcal disease as a public health problem and ensuring control of sporadic cases through routine health services in the shortest possible time. The only way to reach this goal will be with an improved vaccine. WHO supports the development of such a vaccine.

TRAVELLERS' HEALTH INFORMATION

Travellers to areas affected by meningococcal outbreaks are advised to be vaccinated. For pilgrims to the Hajj and Ramadan Omra, Saudi Arabia requires visitors obtain a tetravalent vaccine (against A, C, Y, W135) at least ten days prior to their arrival in the country. (Ref: WHO International Travel and Health. Vaccination requirements and Health Advice).