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Meningococcal meningitis

Prevention in travellers

This article is the first in a series providing a summary of prevention strategies and vaccination for infections that may be acquired by travellers. The series aims to provide practical strategies to assist general practitioners in giving travel advice, as a synthesis of multiple information sources which must otherwise be consulted.
The risk of travel associated meningococcal disease is generally small for travellers, and epidemics are difficult to predict. However, it is a potentially very serious infection with high mortality. Vaccination is recommended for travellers to high risk or endemic areas, particularly arid sub-Saharan regions and areas with current or recent epidemics. Internet based resources are available for up-to-date outbreak information.

Keywords: general practice, immunisation, preventive medicine, communicable/infectious diseases; travel

Infections caused by *Neisseria meningitidis*, a Gram-ve diplococcus, can cause severe febrile illness associated with meningitis, sepsis or a combination of both, with a high risk of mortality (approximately 10% in Australia with appropriate antibiotic treatment). Uncommonly, pneumonia, arthritis and other localised infections can occur.[1] Spread is via respiratory droplets, with an incubation period of 1–14 days.[2] Often infection does not cause clinical disease,[3] and 5–25% of the population are asymptomatic respiratory tract carriers,[1,4,5] with greater prevalence in those who smoke or live in crowded conditions.[1] Invasive disease occurs at a background rate of 0.5–10.0 cases per 100 000 population/year, and up to 1000 per 100 000 population/year in epidemic areas.[5,6]

Epidemiology

Thirteen Neisseria serogroups exist based on differences in capsular polysaccharide composition. Most commonly, five of these: A, B, C, W135 and Y, are pathogenic. Serogroups B and C are most frequent in Australia, the Americas and Europe, with peak disease incidence in winter and spring. Serogroups A, and C to a lesser extent, occur predominantly in developing populations of Africa and Asia. Serogroup W135 has been associated with epidemics in Saudi Arabia and Burkina Faso, while Y has emerged in Northern America.[1,6–8] An additional pathogenic serogroup, X, has recently emerged in Niger.[6] The overall estimated risk of disease due to all serogroups among travellers is 0.4 per 100 000 travellers per month.[6]

Children under the age of 5 years and young adults in the 15–24 years age group are at greatest risk. Travellers to industrialised countries may be exposed to sporadic outbreaks in schools, universities, military barracks, camps or dormitories.[3,8] In the sub-Saharan semiarid 'meningitis belt', which stretches across Africa from Senegal to Ethiopia, outbreaks of serogroup A disease occur approximately every 10–12 years[9] (*Table 1, Figure 1*), mainly during the dry season of December to June, when a combination of dust winds (Harmattan) and upper respiratory tract infections associated with low night temperatures decrease local respiratory tract immunity.[10] Countries south of the meningitis belt, including the Greater Lakes Area (Burundi, Rwanda, Tanzania) are also at risk,[6] mainly in refugee camp settings (*Table 2*). Risk to travellers is low unless they live in close contact with the local population, especially in crowded conditions, or are taking part in large population movements such as pilgrimages.[3,6,8] This situation would place a traveller at maximum risk of exposure.[6]

Prevention of meningococcal meningitis in travellers

Advice may include avoidance of overcrowding, especially in confined spaces,[3] and avoidance

Table 1. Countries in the African meningitis belt

Benin Burkina Faso Northern Cameroon Chad	Northern Cote d'Ivoire Western Eritrea Ethiopia Ghana	Gambia Guinea Guinea Bissau Mali	Niger Northern Nigeria Senegal Sudan

Adapted from: World Health Organization. Control of epidemic meningococcal disease. WHO practical guidelines. 2nd edn. Geneva: World Health Organization, 1998

Note: Burkina Faso, Mali, Niger, and Nigeria accounted for 95% of all cases and deaths in 1996. From: Tikhomirov E, Santamaria M, Esteves K. Meningococcal disease: public health burden and control. World Health Stat Q 1997;50:173

Figure 1. Areas with frequent epidemics of meningococcal meningitis[20]

of places where an epidemic is known to be occurring. Current information and risks should be discussed with the traveller (useful websites are included in *Resources*).

Chemoprophylaxis

Chemoprophylaxis is indicated for close contacts of an individual with meningococcal disease,[1] where relevant in the travel setting.[6] High risk short term travellers to epidemic regions (if travel is within 10–14 days of vaccination or the traveller is immunocompromised) may consider single dose ciprofloxacin 500 mg orally upon leaving the area of risk. Ciprofloxacin is contraindicated in pregnancy (Category C) and in children under 12–18 years of age.[8] Rifampicin (also Category C) can be given for 2 days (children more than 1 month old at a dose of 10 mg/kg twice daily, and 5 mg/kg twice daily for neonates less than 1 month old) if travel is unavoidable. The adult dose is 600 mg twice daily for 2 days.[8]

Vaccination

Vaccination is preferable to chemoprophylaxis as the risk of contracting disease from a close contact is only 1–2%.[8] The small risk of travel associated meningococcal disease for the general traveller and the unpredictable nature of epidemics mean evidence based vaccine recommendations are difficult to provide.[6] It is reasonable to recommend the vaccine where the risk factors of remote location and close contact with the local population are combined.[3,6,8] Risk is increased further if immune suppressive conditions are present, including alcoholism.[8]

Which vaccine?

In Australia, a tetravalent polysaccharide vaccine is available to cover sergroups A, C, W135 and Y (4vMenPV). This may be given in addition to the meningococcal C conjugate vaccine (MenCCV) currently on the Australian Immunisation Schedule.[1]

A longer lasting tetravalent conjugate vaccine was licensed for the 2–55 years age group in the United States and Canada in 2005 for use as part of their immunisation schedule. It is not available in Australia. Where available, this is the preferred tetravalent vaccine,[5] as conjugate vaccines have greater immunogenicity in younger children, induce T-cell dependent immunity and are protective long term, and reduce nasopharyngeal carriage.[6,10]

Surveillance for Guillain-Barre syndrome is continuing after a small increase in risk was observed in 2005–2006.[6,11–13] A New Zealand specific serogroup B vaccine exists but is no longer routinely offered there.[14] Other vaccines are being developed for use in Africa (meningococcal A conjugate vaccine) and elsewhere (other meningococcal B vaccines).[10]

Adverse effects to 4vMenPV are uncommon and mild, and consist mainly of localised erythema lasting 1–2 days. Up to 2% of young children may develop transient fever. Uncommonly, febrile convulsions 2–4 hours after vaccination have been reported, as well as headache, neck stiffness and myalgia within 48 hours. Systemic reactions are uncommon and generally mild.[8]

Who should be vaccinated?

Vaccination with tetravalent meningococcal polysaccharide vaccine is recommended for:

- persons travelling to parts of the world where epidemics of serogroup A, W135 or Y disease frequently occur. This includes countries in and south of the meningitis belt (*Table 1, 2*)[3,5,7,8,15,16]
- at risk travellers to countries with relatively recent epidemics (*Table 3*), although much of this information dates back to the 1980s and 1990s and does not necessarily reflect the current situation. This may include trekkers or travellers to remote regions in these countries, which include South Asia (Nepal, India, Pakistan, Bangladesh), Bhutan and Mongolia[4,8]
- travellers to areas actively experiencing outbreaks or epidemics of vaccine preventable disease (see *Resources*)
- Pilgrims attending the Hajj or Umra in Saudi Arabia. Proof of vaccination at least 10 days and less than 3 years before arrival in Saudi Arabia is a visa requirement[4,8]

- travellers over the age of 2 years with immunodeficiencies,[6] functional or anatomical asplenia[1,6] or with inherited defects of properdin[1,17] or complement.[1,6]

In addition, college freshmen living in dormitories and military recruits in the USA are considered to be at moderately increased risk.[18] Other risk groups include long term travellers and expatriates, especially if backpacking or in close contact with the local population.[8]

Special recommendations for children requiring 4vMenPV

In sporadic outbreaks children are at greatest risk, with peak incidences occurring in children aged less than 2 years.[7,16] Vaccination recommendations depend on the child's age:

- age >2 years – single dose of 0.5 mL regardless of age, given subcutaneously as in adults. 4vMenPV is approved for use in Australia in children over 2 years of age. Protective antibodies are induced in 90% of people within 10–14 days. Duration of protection is 3 years in school aged children and adults, who should be revaccinated 3 years later, but wanes quickly in infants and young children[1]
- age <2 – if travel cannot be deferred and vaccination is necessary, give meningococcal C conjugate vaccine as per schedule and consider using 4vMenPV in two doses at least 6 weeks apart.[8] Duration of protection is limited.[1,7] There is little response to the serogroup C component of the quadrivalent vaccine before 18 months of age; response to the serogroup A component before 3 months of age is poor,[1] and diminished between 3–11 months.[8] Hyporesponsiveness to the C component may occur in subsequent doses of polysaccharide vaccine, so its judicious use and appropriate administration of group C conjugate vaccine are important.[1,8] Specialist advice may be indicated in this age group
- co-administration of serogroup C conjugate (MenCCV) and quadrivalent polysaccharide vaccine (4vMenPV) – MenCCV should be given first. Wait at least 2 weeks before giving 4vMenPV.[8] If for some reason 4vMenPV is given first, wait 6 months before giving MenCCV. Data on the most appropriate interval is limited.[1]

Table 2. African countries outside the usual boundaries of the meningitis belt in which epidemics were reported in the late 1980s through the 1990s[7,15,16]

Angola (1998)	Rwanda
Burundi	Somalia[6]
Central African Republic	Tanzania
Democratic Republic of the Congo (1998)	Togo
Kenya	Uganda
Malawi	Zambia
Mozambique	Zimbabwe (1997)

Table 3. Countries where group A or C meningococcal epidemics have occurred since 1984[8]

Africa	Ivory Coast	Tanzania
Benin	Kenya	Togo
Burkina Faso (Upper Volta)	Liberia	Uganda
Burundi	Mali	Zambia
Cameroon	Mauritania	Zimbabwe
Central African Republic	Mozambique	**Outside Africa**
Chad	Niger	India (eg. Delhi, 2005)[4,19]
Democratic Republic of Congo	Nigeria	Mongolia (1994–1995)[19]
Ethiopia	Rwanda	Nepal (1983–1985)[19]
Gambia	Senegal	Persian Gulf States
Ghana	Sierra Leone	Saudi Arabia
Guinea	Somalia	Bhutan (1985)[19]
Guinea Bissau	Sudan	

4vMenPV in pregnancy

Avoidance of vaccines in the first trimester of pregnancy is preferable. Studies have shown no adverse effects to mothers or neonates, so 4vMenPV is recommended after the first trimester if there is significant risk of infection.

Summary

Travel advice and prevention of meningococcal disease in travellers requires a risk assessment based on numerous factors including itinerary, current outbreak information, individual risk factors and legal requirements. In Australia, serogroup C conjugate and tetravalent polysaccharide vaccines are available for prevention.

Resources

- Centers for Disease Control and Prevention. Information on meningococcal disease: wwwnc.cdc.gov/travel/yellowbook/2010/chapter-2/meningococcal-disease.aspx
- Menigococcal disease outbreak information: www.who.int/csr/don/en/ or wwwnc.cdc.gov/travel/default.aspx.

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