

## Meningococcal Disease

**Meningococcal disease is a rare, but potentially devastating infection in travellers caused by the bacteria *Neisseria meningitidis***

### Key Messages

**Meningococcal disease is a rare, but potentially devastating infection in travellers. It is caused by the bacterium *Neisseria meningitidis*.**

**The most common forms of meningococcal disease are meningitis (infection of the protective lining around the brain and spine) and septicaemia (blood poisoning).**

**The highest incidence of meningococcal disease is in the 'meningitis belt' of sub-Saharan Africa, particularly during the dry season.**

**Travellers whose planned activities or medical conditions put them at increased risk of meningococcal disease should consider vaccination with the quadrivalent conjugate vaccine that protects against four major meningococcal groups: A, C, W and Y.**

**Pilgrims travelling to the Kingdom of Saudi Arabia for the Hajj or Umra are required to show proof of vaccination with the quadrivalent MenACWY vaccine in order to obtain a visa.**

**To reduce the risk of meningococcal disease, travellers should practice good hand hygiene and to avoid activities that promote exchange of respiratory secretions, such as sharing drinks and eating utensils.**

### Overview

Invasive meningococcal disease is a serious disease caused by the Gram-negative bacterium *Neisseria meningitidis*, which is also known as the meningococcus. Approximately 10 percent of the general population in the UK carry the bacterium at the back of their nose and throat, with the highest rates of carriage among adolescents and young adults [1]. Carriers are asymptomatic (do not have symptoms) but, very rarely, can develop invasive disease including septicaemia (blood poisoning) and/or meningitis (infection of the lining of the brain and spine). According to the World Health Organization (WHO), meningitis is fatal in 50 percent of cases if left untreated. Even when the disease is diagnosed early and adequate treatment is started, 5-10 percent of individuals die. Up to 20 percent of survivors may have long-term complications such as hearing loss and speech impairment [2]. Meningococcal septicaemia has a higher fatality rate and may lead to amputation, usually of digits or limbs.

N. meningitidis is divided into 12 'serogroups' according to the structure of its outer polysaccharide capsule. Six major serogroups are responsible for the majority of invasive disease: A, B, C, W, X and Y. The distribution of each serogroup varies geographically and also changes over time [3]. Effective vaccinations are available against groups A, B, C, W and Y [4].

## Risk areas

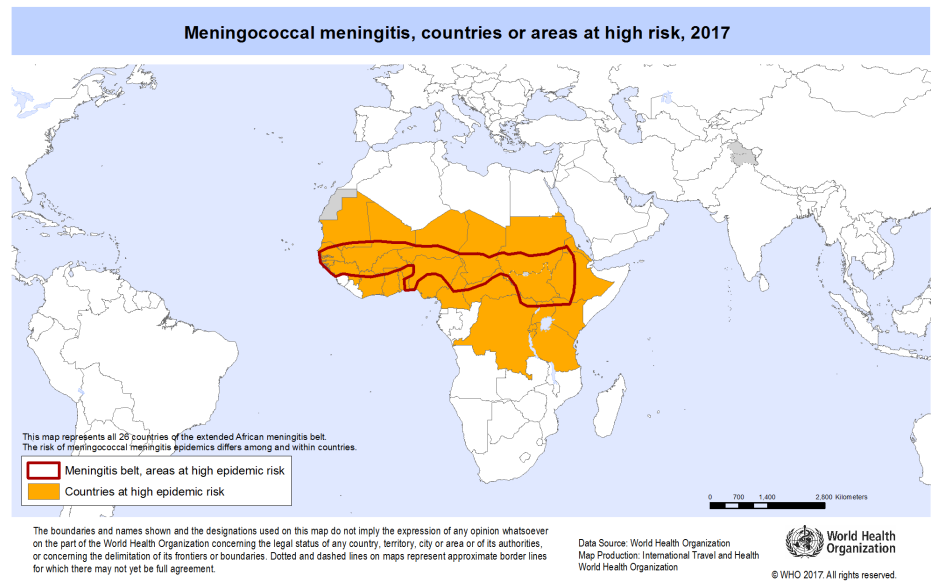
Meningococcal disease occurs worldwide. In most areas disease occurs either sporadically or in small clusters with marked seasonal variations. The predominant serogroup varies by geographic region (Table 1) and over time [3].

### Meningococcal disease in sub-Saharan Africa

Worldwide, the highest rates of disease occur in the 'meningitis belt' of sub-Saharan Africa (Figure 1) [4]. This area includes 26 countries and extends across the dry savannah regions from Senegal in the west, to Ethiopia in the east [2]. In recent years there has been an extension to the traditional meningitis belt, moving southwards and now including the countries of Tanzania, Burundi and Rwanda. The baseline incidence in the meningitis belt varies from 10-20 cases per 100,000 population annually; during epidemics, however, the incidence can rise as high as 1,000 cases per 100,000 population per year (i.e. 1 percent of the total population) [5].

Epidemics in the meningitis belt usually occur in the dry season: in West Africa this is usually between December and June, while in East Africa the season is variable. A combination of factors helps facilitate this seasonal transmission including: dust winds, increased incidence of upper respiratory tract infections, overcrowding and seasonal population displacement [4]. Historically serogroup A has been the most common cause of meningococcal disease in the meningitis belt, with epidemics occurring at intervals of 7-14 years [6]. The largest recorded serogroup A epidemic in this region occurred between 1996 and 1997 and resulted in over 25,000 deaths. However, since the introduction of large scale vaccination campaigns against serogroup A from 2010, most meningococcal infections have been due to serogroups other than A [7].

**Figure 1: Meningococcal disease, areas at high risk, 2017 (note the 'extended meningitis belt' comprises 26 countries and includes Tanzania,**



## Burundi and Rwanda)

**Source:** [World Health Organisation 2017](#)

Please check our [Country Information pages](#) for individual country vaccine recommendations.

## Meningococcal disease in the UK and Europe

Rates of invasive meningococcal disease in Europe are generally low. In 2014, incidence ranged from 0.2 – 3.1 cases per 100,000 population, with the majority of cases caused by serogroup B [8]. In England, during the 2015/16 epidemiological year (July 2015 to June 2016), Men B was responsible for 55 percent of 805 laboratory-confirmed cases, followed by Men W (26 percent), Men Y (13 percent) and Men C (5 percent) [9]. Incidence of serogroup C cases has been extremely low since the introduction of meningococcal C vaccination in 1999. Within Europe, serogroup C is more common in countries that do not have routine vaccination against this serogroup [8].

Within the UK and other temperate zones, most cases of meningococcal disease occur in the winter

months [8].

**Table 1: Predominant serogroups of meningococcal disease worldwide**

Country/Region	Predominant serogroup
Europe including the UK	Serogroup B, followed by serogroup C (mainly in countries without routine MenC vaccination). Increasing number of cases of serogroup W [8, 10]
Australia and New Zealand	Serogroup B, followed by serogroup C [4]. Increasing cases of serogroup W in Australia [11].
US and Canada	Serogroups B and C, followed by serogroup Y [12, 13].
Latin America, South America, Caribbean	Distribution of serogroups varies; B and C predominate in some countries; W and Y in others [13].
Sub-Saharan Africa	Historically, serogroup A before mass vaccination in 2010; outbreaks of serogroups C, W and X still occur [4].
Asia	Limited data suggest most disease is caused by serogroups A and C [4].

## Meningococcal disease and mass gatherings

Mass gatherings provide the potential for large outbreaks, particularly of respiratory and gastrointestinal pathogens. Although meningococcal outbreaks are rarely reported from mass gatherings, there are a number of notable examples. The annual Hajj pilgrimage to Mecca in Saudi Arabia is one of the largest gatherings of its kind in the world. Crowded conditions increase the risk of meningococcal disease transmission, and carriage rates during the Hajj can rise up to 80 percent due to intense overcrowding, high humidity and dense air pollution [14]. A number of outbreaks of meningococcal disease have been associated with the annual Hajj pilgrimage [15]. In 1987, an outbreak caused by serogroup A resulted in Saudi Arabia requiring vaccination against serogroup A as a condition of entry for those travelling for the Hajj. In the year 2000, more than 400 cases of serogroup W disease were reported. In this outbreak, cases were identified both in pilgrims and their close contacts across at least 16 countries around the world [16]. Since 2002, as a consequence of this outbreak, pilgrims to the Hajj or Umrah require proof of vaccination with quadrivalent (ACWY) vaccine in order to obtain a visa for entry into Saudi Arabia.

- [General advice for pilgrims to the Hajj or Umrah](#)

A further example of a meningococcal outbreak associated with mass gatherings occurred in the summer of 2015. On this occasion an outbreak of serogroup W meningococcal disease was reported among participants of a World Scout Jamboree held in Japan. Over 33,000 scouts from 162 countries attended. Four cases of serogroup W meningococcal disease were identified among returning scouts in Scotland. All were associated with one particular scout unit; two other confirmed cases caused by the same strain were also identified in Sweden [17].

## **Risk for travellers**

The risk of meningococcal disease in travellers is generally considered to be low [6]. Anecdotal reports of cases in travellers suggest that disease may occur in any part of the world and in various types of travellers. Travellers who may be at higher risk can be identified through risk assessment taking into account the destination, planned activities and individual (i.e. host) factors [18].

### **Destination and activity**

Meningococcal disease risk may be increased for those travelling to areas within the meningitis belt of Africa or to an area where a known outbreak is occurring. Within these areas, environmental factors that increase exposure to the organism include crowding and prolonged close contact with a carrier. Risk of exposure will therefore vary, depending on living conditions, mode of transport and activities at the destination. Long stay travellers who have close contact with the local population, health care workers and those visiting friends and relatives are considered at greater risk of disease.

Those who live or travel 'rough' such as backpackers may also be considered at increased risk of disease. These travellers may visit remote areas which have limited or delayed access to high quality medical care. Because the impact of disease can be devastating due to its sudden onset and rapid course, the potential for a fatal or disabling outcome may be increased for this group [18].

It is recognised that pilgrims and seasonal workers to Hajj and Umrah are at increased risk due to overcrowded conditions and close contact with people from countries with higher rates of meningococcal carriage and disease [19].

### **Host factors**

A number of host factors such as asplenia (absent spleen) or hyposplenia (reduced splenic function) and those with certain complement disorders are risk factors for invasive meningococcal disease [7, 10]. Medications that inhibit the complement component of the immune system (e.g. eculizumab) are also risk factors.

- [General advice on vaccinations for individuals without a spleen or with a dysfunctional spleen and complement disorders \(including those regularly taking complement inhibitors, such as Eculizumab\)](#)

## **Meningococcal disease in travellers from the UK**

In England, Wales and Northern Ireland, there is currently no routine surveillance for travel-related meningococcal disease. Determining whether a case of meningococcal disease is travel-related can be difficult but may be important to ensure that any subsequent public health action will target the appropriate contacts. Rather than acquiring infection in another country, a traveller can be colonised with meningococcal bacteria prior to travel and develop symptoms whilst abroad. A link with travel can be inferred through a short interval between returning from abroad and symptom onset or when a strain of *N. meningitidis* rarely seen in the UK is isolated (e.g. serogroup A). An example of this occurred in 2000 when a total of 27 confirmed cases of serogroup W meningococcal disease were reported in England and Wales. These were found to be associated with pilgrims returning from the Hajj; 10 cases were in pilgrims themselves, the others were contacts of the pilgrims [20].

### **Transmission**

Humans are the only natural hosts for *N. meningitidis*: there is no animal reservoir. Transmission usually requires frequent and/or prolonged contact and occurs between individuals via the respiratory route, from coughing, sneezing, kissing and other close contact with a carrier. Most infections do not cause clinical disease and many people carry the bacteria without any symptoms; they may serve as a reservoir of infection for others. Such carriage may provide some immunity to the host against invasive disease [3].

In the UK, between 5 and 11 percent of adults and up to 25 percent of adolescents are asymptomatic carriers. Rates of carriage are increased in closed populations such as military barracks and university halls of residence [1, 21-22]. First year college students who live in halls of residence have a higher risk of disease than non-college students of a similar age [7].

Invasive meningococcal disease is rare, occurring only when bacteria invade the bloodstream from the nasopharynx. Damage to the lining of the nose resulting from smoking and upper respiratory tract infections may facilitate bacterial invasion from the nasopharynx [15].

### **Signs and symptoms**

Typically, the incubation period for meningococcal disease is 2-7 days. The most common clinical presentations of invasive meningococcal disease are meningitis and/or septicaemia. Meningococcal meningitis usually presents with sudden onset of fever, intense headache, neck stiffness, nausea and vomiting. These symptoms can develop within hours or over several days. The person is often irritable and prefers to lie still. Septicaemia usually presents with fever and a non-blanching petechial or purpuric rash. Severe muscular or joint pains, vomiting and diarrhoea can occur. Confusion, shock and coma may ensue. The symptoms can appear in any order and not everyone develops the more common signs and symptoms associated with meningococcal disease. Infants and young children are more likely to present with non-specific symptoms and signs. These are serious diseases with high morbidity and mortality, particularly if antibiotic treatment is delayed.

Even with prompt antimicrobial treatment the case fatality rate can be 5 – 10 percent. Up to 20 percent of survivors have long-term complications including neurological disabilities, seizures, hearing or visual loss and loss of fingers or limbs [23]. A study looking at the outcomes of invasive meningococcal serogroup B disease in children and adolescents found that most children survive without major sequelae [24]. However, about 10 percent had major disabling deficits and more than 33 percent had one or more deficits in physical, cognitive, and psychological functioning, with the additional burden of memory deficits and executive function problems [24].

Less common manifestations of meningococcal disease include myocarditis (inflammation of the heart), pericarditis (inflammation of the sac that surrounds the heart), arthritis, pharyngitis (sore throat) or conjunctivitis (pink eye) [25]. In rare cases, the infection may present as a chronic form of invasive meningococcal disease, with prolonged, intermittent fevers, as well as a rash, joint pains and headaches [3].

## Diagnosis and treatment

Early diagnosis and treatment is critical because meningococcal disease is potentially fatal.

Diagnosis can be confirmed by isolation of the organism from the blood or cerebrospinal fluid through culture. Antigen detection techniques or polymerase chain reaction (PCR) can also be used. Suspected meningococcal infection is a medical emergency. Treatment with intravenous antibiotics should be commenced as soon as possible. Admission to intensive care for close monitoring and supportive treatment is usually necessary. Medical resources in countries where meningococcal disease is most common may be limited.

Meningococcal meningitis and septicaemia are [notifiable diseases](#) in England and Wales.

## Preventing meningococcal disease

Travellers should be advised about disease transmission and activities that may put them at higher risk (see 'Risk for travellers' section above). Travellers should be advised to practice good hand hygiene and to avoid activities that promote exchange of respiratory secretions, such as sharing drinks and eating utensils. Overcrowded and confined spaces should also be avoided where possible [13].

Vaccination is the most effective measure for preventing invasive meningococcal disease.

## Vaccine information

Some meningococcal vaccinations are administered as part of the routine NHS vaccination schedule. Meningococcal C (Men C) vaccination was introduced into the UK schedule in 1999, and has been successful in reducing the incidence of invasive Men C disease [10]. The MenC conjugate vaccine is offered to infants around the first birthday, while the group B meningococcal (Bexsero®) and the quadrivalent ACWY conjugate vaccine (that protects against serogroups A, C, W and Y)

have been offered to infants and teenagers, respectively, since Autumn 2015.

Where vaccine is recommended for travel, individuals should be immunised with the conjugate Men ACWY vaccine. This vaccine can be given even if individuals have previously received MenC conjugate vaccine as it protects against three more serogroups. There is currently no recommendation for meningococcal group B vaccination for those travelling abroad [10].

Meningococcal vaccines provided for overseas travel cannot be given as an [NHS service](#) [26, 27].

## Indications for use of meningococcal ACWY vaccine

### a) Routine immunisation:

The travel consultation provides an opportunity to ensure all routine immunisations are up to date. Meningococcal vaccinations are provided in the childhood immunisation programme and young adults remain eligible for the ACWY vaccination up to the age of 25 years [10]. Vaccination is also recommended for individuals whose underlying medical condition puts them at increased risk of meningococcal disease:

- Individuals with no spleen or a poorly functioning spleen
- Individuals with certain immune deficiencies e.g. certain types of complement deficiencies (including those on complement inhibitor therapies such as eculizumab)

### b) Immunisation for travel:

Vaccine may also be recommended for those travelling to areas prone to outbreaks (the meningitis belt of Africa) or to an area where a known outbreak is occurring. These travellers include:

- long stay travellers who have close contact with the local population
- healthcare workers
- those visiting friends and relatives
- those who live or travel 'rough' such as backpackers
- pilgrims and seasonal workers travelling to Saudi Arabia for the purpose of Hajj or Umrah [see part c) below]

Outbreaks of meningococcal disease may also be reported from other parts of the world. If an outbreak is known to be caused by a vaccine-preventable strain, then the appropriate vaccine may be recommended, depending on the risk to the individual. Country-specific information on the risk of meningococcal disease can be found on our [Country Information pages](#) and [Outbreak Surveillance pages](#).

### c) Immunisation for pilgrims and seasonal workers for Hajj and Umrah

Meningococcal ACWY conjugate vaccine is recommended for all travellers to Hajj or Umrah.

To obtain a visa for entry into KSA, all those arriving to perform Hajj or Umrah, or undertake seasonal work, are required to submit proof of vaccination (as a vaccination certificate) for



meningococcal disease.

Details of the vaccine name and type (i.e. conjugate vaccine) should be recorded in a patient held vaccine record showing the traveller's full name. It is advisable that the proof of vaccination record is issued by the traveller's doctor, nurse or pharmacist and should reflect accurately details of the vaccine administered and be authenticated with the healthcare provider's official stamp.

Meningococcal ACWY conjugate vaccine should be given at least 10 days before planned travel. For visa purposes, KSA consider the 'proof of vaccination' for the conjugate Men ACWY vaccine to be valid for 5 years.

Pilgrims and seasonal workers must carry vaccination certificates with them for inspection by the Saudi Authority at port of entry.

### Available quadrivalent ACWY vaccines

There are currently two quadrivalent meningococcal conjugate vaccines licensed in the UK:

- Menveo (marketing authorisation from 2 years of age, adolescents and adults) [28]
- Nimenrix (marketing authorisation in individuals from 6 weeks of age) [29]

Polysaccharide ACWY vaccine (ACWY Vax) has not been available in the UK since 2014.

### Table 2: Meningococcal ACWY vaccine schedule for travel: recommendations from the 'Green Book' [10] \*

Age	ACWY schedule
Birth to less than one year*	<ul style="list-style-type: none"><li>• First dose of 0.5ml</li><li>• Second dose of 0.5ml one month after the first dose</li></ul>
From one year of age (including adults)	<ul style="list-style-type: none"><li>• Single dose of 0.5ml</li></ul>

**\* The Summary of Product characteristics (SPC) for each vaccine is available via the electronic Medicines Compendium (eMC) and should be consulted for specific information relating to these products. Please note, manufacturers' information may differ from that in the 'Green Book', in these situations the Green Book should be followed. The use of these vaccines in some infant age groups is off-license.**

## Reinforcing immunisation

The Joint Committee on Vaccination and Immunisation (JCVI) Committee reviewed information on length of protection following ACWY conjugate vaccination [29]. Antibody against serogroup A disease was the first to wane, and this meant boosting was important for travel, but less important for the routine MenACWY programme in the UK. For travellers at continued risk, the Committee agreed that boosting every five years would be a sensible approach until data became available [30].

## Intervals between Men ACWY conjugate vaccine and other meningococcal vaccines

Evidence from data currently available indicates that Bexsero® (MenB vaccine) can be safely administered at the same time as Men ACWY conjugate vaccine or at any interval without affecting the immune response to either vaccine [26, 31].

As a travel vaccine, the MenACWY conjugate vaccine can be given at any time before or after administration of a MenC-containing vaccine (including the Hib/MenC combination given to 1 year-olds) – this will help protect against four major meningococcal serogroups during travel. However, where possible, leaving an interval of at least two weeks and ideally at least four weeks between the two vaccines will help boost the antibody response against serogroup C [personal communication, Public Health England, July 2017].

## Contraindications

Known hypersensitivity to any components of the vaccine, or to a previous dose. Vaccination should be delayed during an acute febrile illness [10].

## Adverse Reactions

For Menveo, injection site reactions (including pain, erythema, induration and pruritus), headache, nausea, rash and malaise have been commonly reported.

For Nimenrix, injection site reactions (including pain, erythema and swelling), irritability, drowsiness, headache, nausea and loss of appetite have been commonly reported.

Details of all adverse reactions can be found in the SPC of individual vaccines.

## Resources

- [Hajj and Umrah](#)
- [NHS Choices: Meningitis](#)
- [PHE: Immunisation against infectious disease 'The Green Book': Chapter 22 Meningococcal](#)

- [PHE: Meningococcal disease: guidance, data and analysis](#)

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