

Meningococcal Infection

Group C vaccine introduced 2000

NOTIFIABLE

Introduction

Meningococcal infection is the spectrum of disease caused by *Neisseria meningitidis* and includes meningitis, septicaemia and, less commonly, other invasive infections such as septic arthritis or endophthalmitis. The meningococci are Gram-negative diplococci and are divided into at least 13 antigenically distinct serogroups; most disease-associated strains belong to serogroups A, B, C, Y or W₁₃₅. In Ireland serogroup B and C strains accounted for over 99% of all invasive meningococcal disease prior to the introduction of the serogroup C conjugate vaccine in 2000.

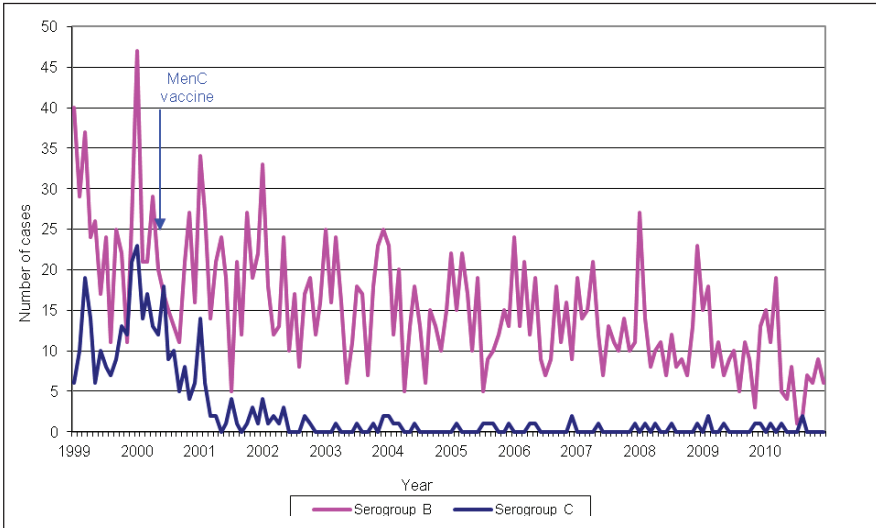
The significance of the meningococcus as a pathogen lies in the potential severity of the illness, the absence of effective vaccines against all individual meningococcal serogroups, the unique ability of the organism to cause outbreaks or epidemics, and the intense public anxiety that follows a case or outbreak. In Ireland the majority of cases of meningococcal infection are sporadic.

Epidemiology

N. meningitidis is a human-only pathogen and is carried in the nasopharynx. Overall approximately 10% of the population is asymptomatic carriers. Carriage is uncommon in infancy and early childhood with peak carriage rates (up to 25%) occurring in the 15-19 year age group. Transmission occurs from person-to-person via respiratory droplets or direct mucosal contact with respiratory secretions of a person carrying the organism. Naturally acquired serum bactericidal antibodies to *N. meningitidis* result from carriage, the duration of immunity induced is unknown.

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Figure 9.1 Notifications of serogroup B and serogroup C meningococcal infection in Ireland, by month and year 1999-2010. Source: HPSC



A small minority of individuals who pick up *N. meningitidis* develop invasive infection after an incubation period which is typically 1-10 days, usually less than four days. The reasons why invasive infection develops in some individuals but not in others are unclear. Factors that have been identified as increasing the risk of invasive infection include active or passive smoking, a preceding severe respiratory tract infection particularly influenza A, and living in closed or semi-closed communities such as military barracks or halls of residence, often in the setting of dormitory accommodation.

Individuals with late complement or properdin deficiencies, or those with functional or anatomic asplenia, have an increased risk of invasive and/or recurrent meningococcal disease. There is a strong association with susceptibility to meningococcal disease and deficiencies in the early complement components (C1, C4, C2 but especially C3) and the late lytic components (C5 – C9) of the complement pathway. C2 deficiency is the most common familial complement deficiency detected in Ireland.

- Individuals with C3 defects are at risk of severe infection with encapsulated bacteria including *N. meningitidis*.
- Meningococcal disease in individuals with deficiencies of late complement components (C5-C8) is almost always caused by serogroup W₁₃₅, Y or 29E (serogroups B and C are less common).
- Recurrent meningococcal disease is typical in persons with C5-C8 deficiencies.

Individuals who have had recurrent meningococcal infection should be tested for complement deficiency; investigations should ideally be performed some weeks following infection.

Properdin deficiency is a very rare X-linked defect. Screening for properdin deficiency should be considered when there is a family history of meningococcal disease occurring in accordance with an X-linked pattern (many males affected).

Invasive meningococcal disease occurs in all countries worldwide. The infection is endemic in Northern Europe, with a background incidence of 2-3 culture confirmed cases per 100,000 per annum. In Ireland the infection shows a seasonal variation, the majority of cases occurring in winter and early spring. Periodic upsurges in meningococcal activity resulting in hyperendemic disease occur, associated with increased circulation of distinct subtypes and/or a hypervirulent strain or strains.

There have been many large epidemics of meningococcal disease following introduction and spread of hypervirulent strains. Epidemic disease is characterised by an increased case-attack rate and altered age distribution, with increased numbers of cases seen in adolescents and adults. Examples include serogroup A epidemics in England and Wales that coincided with each of the two world wars, and large epidemics involving serogroup A or serogroup W₁₃₅ strains have occurred in association with the annual pilgrimage (Hajj) to Mecca, Kingdom of Saudi Arabia, with importation into other countries by returning pilgrims.

However, in the last 100 years, the highest burden of disease has been in the so-called 'meningitis belt' of sub-Saharan Africa, due mainly to serogroup A or less commonly, serogroup W₁₃₅ with attack rates of up to 1/1,000 and reported mortality rates of up to 40%. Epidemic disease with distinct serogroup B strains has also occurred, including a large epidemic in Norway in the 1970s and in New Zealand in the last 15 years.

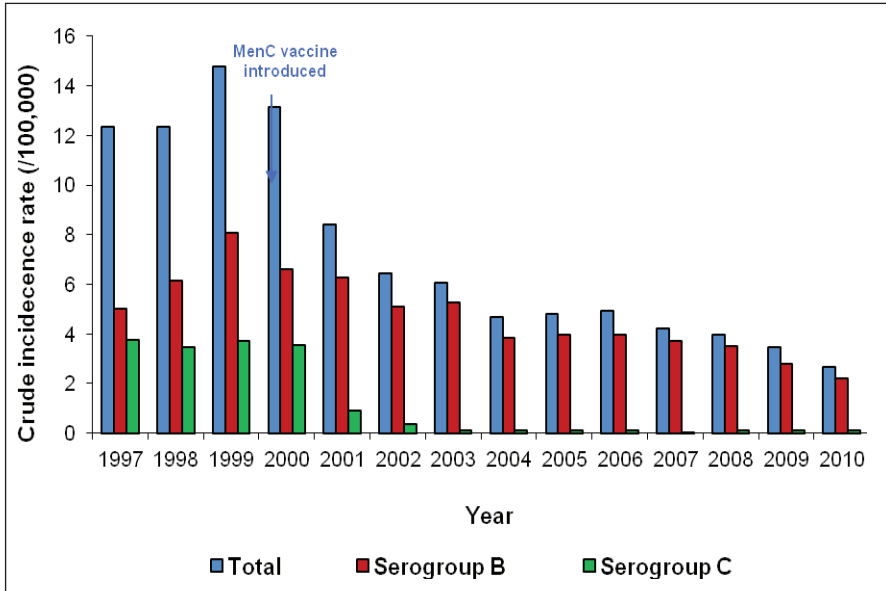
Invasive meningococcal disease may occur at any age but in endemic countries, sporadic infection is most common in infancy and early childhood, with a second smaller peak of incidence in adolescents and young adults. Outbreaks or epidemics are typically associated with a shift in the age groups affected with increased numbers of cases in older individuals.

In Ireland, the overall case-fatality rate is less than 5%. Serogroup C infection is typically associated with higher morbidity and mortality rates

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in adolescents and young adults than in other age groups. Overall, the mortality rates are higher in individuals with septicaemia than in those with meningitis alone. Survivors may have permanent morbidity including skin scarring, digit and/or limb amputation, seizures, hearing loss, brain damage or chronic renal failure.

Figure 9.2 Crude incidence rate (per 100,000) of invasive meningococcal disease in Ireland, by year, 1997-2010. Source: HPSC



Impact of *N. meningitidis* serogroup C conjugate vaccine in Ireland

Since the introduction of the *N. meningitidis* serogroup C conjugate (MenC) vaccine into the Irish schedule in 2000, the incidence of serogroup C disease has shown a 97% reduction, from 132 culture and/or PCR confirmed cases in 1999 to 4 culture and/or PCR confirmed cases in 2010 (Figure 9.1 and Figure 9.2). In the same period the number of culture and/or PCR confirmed cases of serogroup B disease fell from 285 in 1999 to 93 in 2010.

Effects of meningococcal disease

The onset of disease may be fulminant, with abrupt onset of fever, prostration, shock, a rapidly progressing purpuric rash and death; or it may be insidious, with a mild upper respiratory prodrome of 2 or 3 days. In an infant or young child the common early symptoms (reluctance to feed, trivial fever and irritability) are non-specific. Clinical recognition of meningococcal disease in the initial phase of the illness is problematic.

The patient's skin may appear blotchy or pale. A typical non-blanching petechial or purpuric rash may be present with meningococcal septicaemia; however, the rash may be very scanty and may initially be erythematous.

One review of the course of illness in children prior to admission to hospital found that most had only non-specific symptoms in the first 4-6 hours, with the classic features of haemorrhagic rash, meningism and impaired consciousness developing later (median onset 13-22 hours). In contrast, early symptoms of sepsis (leg pains, cold hands and feet, abnormal skin colour) were present in 72% at a median time of 8 hours. The signs and symptoms of meningococcal meningitis are indistinguishable from the signs and symptoms of bacterial meningitis caused by other pathogens, with the exception of the rash, which may be present in some 40% of patients.

Meningococcal vaccines

There are currently three meningococcal vaccines available in Ireland:

- A) Conjugate Meningococcal C Vaccine
- B) Conjugate Quadrivalent (ACW₁₃₅Y) Vaccine
- C) Polysaccharide Quadrivalent (ACW₁₃₅Y) Vaccine

Indications

Individuals for whom meningococcal vaccines are recommended

Routine programme

Conjugated meningococcal C (Men C) vaccine is recommended as part of the routine childhood immunisation programme and for individuals 12 months to 23 years who have not had a dose after 12 months of age.

Contacts of cases- detailed below

Children and adults with asplenia or splenic dysfunction or complement or properdin deficiency

Children and adults with asplenia or splenic dysfunction are considered to be at increased risk of invasive meningococcal disease (detailed above). However, these individuals may have a sub-optimal response to meningococcal vaccines. Administration of quadrivalent conjugate ACW₁₃₅Y vaccine is now recommended for these individuals. See below for details.

Meningococcal vaccines information

A. Meningococcal serogroup C conjugate vaccine (MenC)

The serogroup C polysaccharide antigen is attached to a carrier protein. The conjugated vaccines induce a T-cell dependent memory response from 2 months of age. For optimal and long-lasting priming of the immune system, a booster is recommended in the second year of life.

Dose and route of administration

The dose at all ages is 0.5 ml, given by intramuscular injection in the anterolateral thigh or the deltoid region.

In patients with thrombocytopenia or bleeding disorders, MenC vaccine may be given subcutaneously (see Chapter 2).

Indications

Primary schedule

Infants under 12 months require 2 doses, at 4 and 6 months, with a booster at 13 months. Those over 12 months who have not received MenC vaccine when under 1 year of age need only 1 dose.

Contacts of cases of serogroup C disease

Close contacts of cases of meningococcal infection have an increased risk of developing the disease in subsequent weeks. MenC vaccine should be given to all previously unimmunised close contacts (of all ages), in addition to chemoprophylaxis. Close contacts who are only partially immunised should complete the course of vaccine. Those who completed a course more than one year before should be offered a booster.

Index Cases of serogroup C disease

Index cases should be offered conjugate quadrivalent (ACW₁₃₅Y) vaccine to provide protection against all four groups, even though recurrent meningococcal infection is rare.

Local outbreaks of serogroup C disease

Immunisation has been shown to be effective in controlling outbreaks in institutions (e.g. schools) and communities, reducing the incidence of infection.

For confirmed serogroup C infection, MenC conjugate vaccination should be offered to all close contacts who had not previously been immunised with MenC conjugate vaccine. Close contacts who are partially vaccinated should complete the course of MenC vaccination. Close contacts of any age who were only immunised in infancy and those

who completed the recommended immunisation course (including the 13 month booster) more than one year before should be offered an extra dose of MenC conjugate vaccine.

Children and adults with asplenia or splenic dysfunction or complement or properdin deficiency

Children and adults with asplenia or splenic dysfunction are at increased risk of invasive disease with capsulated organisms including meningococcal disease. However, these individuals may have a sub-optimal response to meningococcal vaccines. Quadrivalent conjugate ACW₁₃₅Y vaccine instead of MenC vaccine is now (2011) recommended for these individuals. See section B on quadrivalent conjugate ACW₁₃₅Y vaccine.

Those children who may have commenced the routine immunisation schedule with MenC but are identified to have asplenia or splenic dysfunction or complement or properdin deficiency prior to completion of the primary schedule of MenC vaccination are recommended the conjugate ACW₁₃₅Y vaccine instead of MenC vaccine to complete the course. See section B on conjugate ACW₁₃₅Y vaccine

Contraindications

Anaphylactic reaction to a preceding dose or any of the constituents, including meningococcal serogroup C polysaccharide, or the carrier protein (diphtheria toxoid or CRM197).

Precautions

Acute severe febrile illness, defer until recovery.

Pregnancy: There is no evidence of risk from immunising pregnant women or those who are breast-feeding, with inactivated viral or bacterial vaccines or with toxoids. Hence, MenC vaccine may be given when there is a high risk of the individual developing the disease.

Adverse reactions

Local: Injection site reactions may occur, are generally mild and last for approximately 24-48 hours.

General: Generalised reactions are rare.

B. Conjugate quadrivalent (ACW₁₃₅Y) vaccine (newly licensed in Ireland in 2011)

Conjugate quadrivalent (ACW₁₃₅Y) vaccine is made from capsular polysaccharide extracted from cultures of serogroup A, C, W₁₃₅ and Y

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Neisseria meningitidis. The polysaccharides are conjugated to CRM197. Conjugation improves the immunogenicity, especially in young children and older people

The vaccine is licensed in Ireland for those aged 11 years and older. It is not currently licensed for infants or children < 11 years of age. However, data show a better antibody response to all serogroups after two doses of conjugate vaccine than seen with the polysaccharide vaccine; the response to serogroup C is comparable with that seen with the monovalent MenC conjugate vaccine. Based on this and experience with other conjugate vaccines, immunity is expected to be higher, longer-lasting and confer less risk of immunological tolerance than the polysaccharide vaccine.

For this reason, conjugate vaccine is recommended in preference to polysaccharide vaccine in children under five years of age and is the preferred vaccine for individuals five years of age or older at risk of exposure to *Neisseria meningitidis* groups A, C, W₁₃₅ and Y, to prevent invasive disease (see table 19.1)

Dose and route of administration

The dose at all ages is 0.5 ml, given by intramuscular injection in the anterolateral thigh or the deltoid region.

Schedules

Infants 2 months and over

Two doses of 0.5 ml given with at least one month interval. Children at continued increased risk (see below "Indications") should additionally receive a third dose after 12 months of age (these doses replace the MenC vaccine)

Children > 12 months and adults

Single dose of 0.5 ml given by intramuscular injection.

Booster

The conjugate quadrivalent (ACW₁₃₅Y) vaccine is likely to provide longer lasting protection than the polysaccharide vaccine. However, the need for and the timing of booster dose has not been determined.

For children who have previously received any dose of conjugate quadrivalent (ACW₁₃₅Y) vaccine as infants should be given an additional dose if they are at continued risk or travelling to an area that puts them at risk of meningococcal disease. A routine booster is not currently recommended for children who received one dose after the age of 12 months.

Indications

Children and adults at increased risk of meningococcal disease (due to congenital or acquired asplenia, hyposplenism, or complement or properdin deficiency)

- These under 13 months of age should be immunised in accordance with the routine schedule, but replacing the MenC vaccine with conjugate quadrivalent (ACW₁₃₅Y) vaccine. The vaccine can be administered at 1 month intervals. A further booster dose of conjugated quadrivalent (ACW₁₃₅Y) vaccine should be given after 12 months of age.
- Children over 1 year of age, and adults, should be immunised with 2 doses of conjugate quadrivalent (ACW₁₃₅Y) vaccine at least 1 month apart.
- Children who have been fully immunised with MenC should be given a dose of conjugate quadrivalent (ACW₁₃₅Y) vaccine at least one month after the MenC vaccine

Travel related (further detail in Meningococcal vaccination recommendations for Travel below)

- All children < 5 years who are travelling to an area with an increased risk of A, W₁₃₅ or Y
- For children aged 5 years to 10 years, conjugate quadrivalent (ACW₁₃₅Y) vaccine is preferred to polysaccharide due to better immune response
- For individuals aged 11 years and older who are travelling to an area with an increased risk of A, W₁₃₅ or Y conjugate quadrivalent (ACW₁₃₅Y) vaccine is preferred to polysaccharide due to better immune response

Cases of confirmed serogroup A, W₁₃₅ or Y infections

Index cases who have not been immunised with the conjugate quadrivalent (ACW₁₃₅Y) vaccine should complete an immunisation course with conjugate quadrivalent (ACW₁₃₅Y) vaccine. Those who received the conjugate quadrivalent (ACW₁₃₅Y) vaccine more than 12 months previously should be given a second dose.

Contacts of confirmed serogroup A, W₁₃₅ or Y infections

Vaccination with conjugate quadrivalent (ACW₁₃₅Y) vaccine should be offered to all close contacts of any age (two doses, one month apart if aged between 2 – 12 months; one dose in older individuals).

Contraindications

Anaphylactic reaction to a preceding dose or any of the constituents of the vaccine, including the meningococcal polysaccharide, diphtheria toxoid or the CRM197 carrier protein or tetanus toxoid.

Precautions

Acute severe febrile illness, defer until recovery. The presence of a minor infection is not a contraindication.

Adverse reactions

Local: Injection site reactions and malaise occur in approximately 10% of recipients.

Pregnancy and breast-feeding

Meningococcal vaccines may be given to pregnant women when clinically indicated.

Although insufficient clinical data on the use of conjugate quadrivalent (ACW₁₃₅Y) vaccine during breast-feeding are available, it is unlikely that secreted antibodies in milk would be harmful when ingested by a breastfed infant. Therefore, conjugate quadrivalent (ACW₁₃₅Y) vaccine may be used during breast feeding.

Individuals with latex allergies

The tip cap of the syringe contains 10% Dry Natural Rubber. Although the risk for developing allergic latex reactions is very small, healthcare professionals should consider the benefit- risk balance prior to administering this vaccine to patients with known history of hypersensitivity to latex.

C. Polysaccharide Quadrivalent (ACW₁₃₅Y) Vaccine -Plain polysaccharide (PS)

Polysaccharide quadrivalent (ACW₁₃₅Y) vaccine is effective against serogroup A, C, W135 and Y meningococci. Immunity develops in more than 90% of recipients within 5-7 days of a single injection. However, young children respond less well than adults, with limited or short-lived response before five years of age. For these reasons, and following the availability of the conjugate quadrivalent (ACW₁₃₅Y) vaccine, the polysaccharide quadrivalent (ACW₁₃₅Y) vaccine is no longer recommended for children less than five years. The polysaccharide quadrivalent (ACW₁₃₅Y) vaccine is an alternative to the conjugate vaccine in individuals older than 5 years of age.

Dose and route of administration (see table 9.1)

For individuals aged older than 5 years

A single dose of 0.5 ml is given by intramuscular injection.

Booster dose of vaccine

For those at continued risk, a reinforcing dose should be given every five years.

Children who were immunised with polysaccharide quadrivalent vaccine, prior to the availability of the conjugate quadrivalent (ACW₁₃₅Y) vaccine (in 2011) should receive a dose of the conjugate vaccine if further doses are required (travel or at risk). (See travel section below).

Contraindications

Anaphylactic reaction to a preceding dose or any of the constituents.

Precautions

Acute severe febrile illness, defer until recovery.

Adverse reactions

Local: Injection site reactions occur in approximately 10% of recipients and last for approximately 24-48 hours.

General: Generalised reactions are rare although pyrexia occurs more frequently in young children than in adults.

Pregnancy and breastfeeding. Meningococcal vaccines may be given to pregnant women when clinically indicated.

Meningococcal vaccination recommendations for Travel

Quadrivalent ACW₁₃₅Y vaccines are indicated for immunisation of individuals travelling to high risk areas where epidemics or hyperendemic disease with serogroup A, C or W135 infection occur, particularly those visitors who live or travel rough such as hitchhikers or trekkers.

Conjugate quadrivalent (ACW₁₃₅Y) vaccine is recommended in preference to plain polysaccharide vaccine for individuals travelling to high risk areas because of the better immune response, particularly in children and older people. . It is the recommended vaccine for children under five years of age, and is the preferred vaccine for individuals five years of age or older (see table 19.1).

High-risk travelers are those who live or work with local people, and those who live or travel 'rough'. At present this recommendation includes travel to sub-Saharan Africa and the Kingdom of Saudi Arabia (for the latter, ACW₁₃₅Y vaccination is now a visa entry requirement).

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From time to time, meningococcal disease outbreaks occur in various parts of the world. Where such outbreaks are due to vaccine-preventable strains, vaccination may be recommended for some groups of travelers to the affected areas. The advice of an appropriate Specialist should be sought.

Note: Visa entry requirements should be checked in good time prior to travel to individual countries.

Table 9.1. Summary of recommendations regarding use of quadrivalent ACW₁₃₅Y vaccines for travel, by age group

Age	Quadrivalent vaccine	
	Conjugate quadrivalent (ACW ₁₃₅ Y)	Polysaccharide quadrivalent (ACW ₁₃₅ Y)
Infants aged 2-12 months *	(Off label) Two 0.5 ml doses, 1 month apart	Not recommended
Children aged one year to four years	(Off label) One dose of 0.5 ml	Not recommended
Children aged five years to ten years	Off-label (but preferred) One dose of 0.5 ml	Single dose of 0.5 ml
Individuals aged 11 years and older	(Preferred) One dose of 0.5 ml	One dose of 0.5ml

*Note: Replace the MenC vaccine with conjugate quadrivalent (ACW₁₃₅Y) vaccine if the infant requires the conjugate quadrivalent (ACW₁₃₅Y) vaccine at the same time as the routine MenC vaccinations. If the infant has already had two MenC vaccines then two conjugate quadrivalent (ACW₁₃₅Y) vaccines should also be given

Serogroup B vaccines

The serogroup B capsule is weakly immunogenic and also contains antigens that may cross-react with human neurological tissue. No vaccine for international use has yet been licensed but vaccine trials of a new MenB vaccine are currently underway.

Management of suspected cases, contacts, carriers and outbreaks

A Initial management of suspected cases

Primary care

In view of the often rapid progression and high mortality rate of meningococcal disease, early treatment of suspected cases with penicillin may be life-saving. It is recommended that GPs carry supplies of this drug in an emergency bag.

Recommended dosage of Benzylpenicillin

Adults and children >10 years 1,200 mg

Children 1-9 years 600 mg

Children <1 year 300 mg

This should be given intravenously when possible. It can be given by the intramuscular route in shocked patients but is not as effective.

Penicillin should not be given if there is a history of penicillin anaphylaxis (which is extremely rare) and patients should go to hospital as quickly as possible.

Hospital care

Each acute hospital should have readily available guidelines in place for the management of suspected invasive meningococcal disease.

Advice should be sought from the local Department of Public Health for management of suspected outbreaks. The most up-to-date information on management of contacts is available from Departments of Public Health.

Chemoprophylaxis

Close contacts of all individuals with invasive meningococcal disease are at increased risk of developing infection. This risk is highest in the first 7 days following onset of symptoms in the index case, and falls during the following weeks. If prophylaxis is not given, the absolute risk to an individual in the same household one to 30 days after an index case is about one in 300. Chemoprophylaxis should be given as soon as possible after identification of the index case, but can be given up to 1 month later if a contact is not immediately identified or traced. The aims of chemoprophylaxis are to eliminate carriage from recently colonised susceptible individuals in the period before invasive disease may develop, and to reduce spread of the organism.

The following persons should be given prophylaxis:

1. The index case should be given chemoprophylaxis when able to take oral medication and before discharge from hospital, unless the disease had already been treated with ceftriaxone. When the disease has been treated with cefotaxime it may be prudent to give chemoprophylaxis until studies are available on its effectiveness in eradicating carriage.
2. Those who in 7 days prior to the onset of illness of the index case

- shared living or sleeping accommodation with the patient; including child-minders and baby-sitters
- had mouth kissing contact with the patient
- were in the same nursery/crèche as the patient, where the nature of nursery/crèche contact is similar to that for household contacts. This includes adult carers.

3. HCWs (including those present at autopsy) who did not wear a (surgical) mask and whose mouth or nose was directly exposed to infectious airborne droplets or secretions within one metre of a probable or confirmed case of meningococcal disease, who has not received at least 24 hours appropriate antibiotic treatment.

HCWs should wear surgical masks when in close contact with an infectious case for the first 24 hours after the initiation of effective antimicrobial treatment.

4. Chemoprophylaxis is not necessary for classmates of an index case unless a number of cases occur during the same term:
 - If two or more cases of infection with the same strain occur in one class all class members and staff should receive prophylaxis
 - If the cases occur in different classes, management is more difficult but should be guided by such considerations as
 - the interval between the cases
 - the size of the contact group
 - the carriage rate in the school
 - whether the cases are due to a vaccine-preventable strain
 - the degree of public concern, particularly if a death has occurred
 - the incidence of the disease in the wider community.

In such situations management should be discussed with a relevant Specialist.

5. Special consideration is needed when an index case has attended a house party in the preceding 7 days, especially if pre-school children were present. If chemoprophylaxis is appropriate it should be given to all attendees, both adults and children.
6. Special consideration should be given to situations in which there is greater than usual interaction between members of the extended family and an index case, particularly where overcrowding or adverse environmental living conditions exist.
7. Ideally chemoprophylaxis should be given to all contacts as soon as possible after notification of the index case. However, it can be given

up to a month after identification of an index case, as carriage may persist for a long period.

It is not recommended that prophylaxis be given routinely to passengers on public transport, e.g. bus, train, where an index case has been identified.

Prophylactic antibiotics

Rifampicin

This is the drug of choice in most circumstances, and should be given promptly and preferably within 24 hours of diagnosis of the index case.

All close contacts should be advised that infection can occur even if prophylaxis is given. This is because the antibiotic may not be effective if the contact is incubating disease, or because the contact may become recolonised and then develop the disease. Contacts should be advised to seek medical advice should symptoms develop.

Dose of Rifampicin

Children 0-12 months	5 mg/kg 12 hourly for 2 days
Children 1-12 years	10 mg/kg 12 hourly for 2 days
Children over 12 years & adults	600 mg 12 hourly for 2 days

Side-effects

Rifampicin recipients should be informed about the following possible side-effects:

- interference with contraceptive pill
- interference with anticoagulants
- red coloration of urine, sweat and tears
- permanent discolouration of soft contact lenses

Precautions and contraindications to Rifampicin

Anaphylaxis to a previous dose, severe liver disease or pregnancy.

Alternative prophylaxis

- Ceftriaxone as a single intramuscular dose (250 mg in adults, 125 mg in children under 12 years).
- Although not licensed for this purpose a single dose of ciprofloxacin (500 mg orally for adults) has been shown to be effective. Ciprofloxacin is the preferred chemoprophylaxis agent for women on the contraceptive pill as rifampicin can affect the efficacy of oral contraceptive therapy.

Pregnancy

While no drug can be regarded as absolutely safe in pregnancy, harmful effects on the foetus have not been documented in relation to use of ceftriaxone.

Meningococcal vaccines

Contacts of a case of infection with a vaccine-preventable strain should be immunised with the appropriate vaccine (see above). The aim of immunisation is to prevent late secondary cases.

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