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Guidelines for public health management of meningococcal disease in the UK

**Public Health Laboratory Service Meningococcus Forum, endorsed
by the Public Health Laboratory Service, Public Health Medicine
Environmental Group and Scottish Centre for Infection and
Environmental Health**

This reprint made available by the Public Health Laboratory Service Meningococcus Forum,
James Stuart (Working Group Chairman).

These guidelines are also available on the guidelines website currently at
http://www.phls.co.uk/publications/cdph/issues/CDPHvol5/No3/Meningococcal_Guidelines.pdf

I. Introduction

Epidemiology of meningococcal carriage and disease

Neisseria meningitidis is a normal inhabitant of the human nasopharynx and is transmitted from person to person by droplets or secretions from the upper respiratory tract¹. Saliva is inhibitory to meningococcal growth, and transmission by fomites is considered insignificant^{2,3}.

Meningococci are classified according to characteristics of the polysaccharide capsule into serogroup, of outer membrane proteins into serotype and serosubtype, and of chromosomal DNA into genotype. Carriage of meningococci (all strains included) is relatively common. A large community survey in England in 1987 found carriage rates varying from 2% in children under five years to a peak of 25% in 15 to 19 year olds⁴. Conversely, carriage of *Neisseria lactamica*, a non-pathogenic organism believed to confer protection against meningococcal disease, is highest in young children⁵. Increased rates of meningococcal carriage have been observed in smokers, overcrowded households, and military recruits⁶⁻⁸. The mean duration of carriage in settings where prevalence is stable has been recently estimated to be about 21 months (C Trotter, unpublished data).

Systemic immunity, as measured by serum bactericidal antibodies, usually develops within 14 days of acquisition of meningococci⁹. Rarely, acquisition may progress to invasive disease before immunity develops. This incubation period is usually three to five days, based on data from studies of laboratory acquired infection¹⁰, from occasional clusters where the date of exposure is known¹¹ and from carriage studies among military recruits¹². Not surprisingly, established meningococcal carriers do not usually develop invasive disease¹². The risk of invasive disease following acquisition is likely to vary with environmental and host factors but will also depend critically on the characteristics of the strain acquired. Only a small proportion of carried strains are responsible for most cases of invasive disease¹³.

In the UK, annual rates of invasive disease usually vary between two and six per 100,000, with case-fatality rates of about 10%¹⁴. Most cases are caused by serogroup B or C strains. Disease usually presents as septicaemia, meningitis or both. Age-specific attack rates are highest in infancy, and decline during childhood with a secondary rise in teenagers and young adults. The highest incidence is seen in the winter months. Apart from age, risk factors include passive smoking¹⁵, preceding influenza A infection¹⁶ and overcrowding⁷.

Changing disease incidence

The reported incidence of meningococcal disease rose to historically high levels during 1998/99, particularly associated with serogroup C strains of the electrophoretic type 37 clonal complex^{17,18}. Following the introduction of the UK meningococcal C conjugate vaccination programme in November 1999, there was

a marked fall in disease caused by serogroup C strains^{17,19}. Two national outbreaks of disease due to W135 strains, previously rare in the UK, followed the Hajj pilgrimages in 2000 and 2001²⁰.

Existing guidance

The Public Health Laboratory Service (PHLS) last published comprehensive guidance on the control of meningococcal disease in England and Wales in 1995^{21,22}. More detailed guidance followed on cluster management²³, prophylaxis in dispersal settings²⁴, cases and clusters in universities²⁵, use of ciprofloxacin²⁶ pre-admission antibiotics²⁷ and prophylaxis for healthcare workers²⁸. This series of guidance documents was adopted in Northern Ireland and modified slightly for use in Scotland²⁹.

Review of guidance

In the light of the changes since 1995 in both the epidemiology and guidance, and to incorporate new evidence on risk and control measures³⁰, the PHLS Meningococcus Forum set up a Working Group to review the guidance for control measures in the UK. This review is based on available evidence, and the levels of evidence are graded according to published guidelines (table 1).

Where the Working Group considered that insufficient evidence was available on which to base guidance, agreement on recommendations was reached through consensus (expert opinion).

The Working Group comprised representatives of the PHLS Meningococcus Forum, the Public Health Medicine Environmental Group, the Scottish Centre for Infection and Environmental Health, PHLS Communicable Disease Surveillance Centre (CDSC) Colindale, CDSC Wales, CDSC Northern Ireland, the Association of Medical Microbiologists, and the Community Infection Control Nurses Network.

Objective

The objective of these guidelines is to present the rationale and recommendations for the control of meningococcal disease in the United Kingdom within one comprehensive document. Guidance is offered on pre-admission management to reduce mortality rate, investigation of suspected cases, case definitions, public health action after a single case, and management of clusters. These recommendations now form the definitive UK guidance on public health management of meningococcal disease.

2. Pre-admission management

(Recommendation 1)

Early treatment of suspected cases with benzylpenicillin is recommended in the UK to reduce case fatality²¹. The evidence for benefit from giving parenteral antibiotics before admission is inconsistent^{31,32}, and has been obtained from retrospective observational studies in which it is difficult to control for important confounding factors such as speed of progression and stage of illness at the

TABLE I Levels of evidence and grades of recommendation

Levels of evidence	
I++	High quality meta analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias.
I+	Well conducted meta analyses, systematic reviews of RCTs, or RCTs with a low risk of bias.
I-	Meta analyses, systematic reviews of RCTs, or RCTs with a high risk of bias.
2++	High quality systematic reviews of case-control, cohort studies. High quality case-control or cohort studies with a very low risk of confounding, bias, or chance and a high probability that the relationship is casual.
2+	Well conducted case-control or cohort studies with a low risk of confounding, bias, or chance and a moderate probability that the relationship is casual.
2-	Case-control or cohort studies with a high risk of confounding, bias, or chance and a significant risk that the relationship is not casual.
3	Non-analytic studies, e.g. case reports, case series.
4	Expert opinion.
Grades of recommendation	
A	At least one meta analysis, systematic review, or RCT rated as I++, and directly applicable to the target population; or a systematic review of RCTs or a body of evidence consisting principally of studies rated as I+, directly applicable to the target population, and demonstrating overall consistency of results.
B	A body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results; or extrapolated evidence from studies rated I++ or I+.
C	A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or extrapolated evidence from studies rated as 2++.
D	Evidence level 3 or 4; or extrapolated evidence from studies rated as 2+.
http://www.sign.ac.uk/guidelines/fulltext/50/section6.html	

RCT = randomised controlled trial

time of treatment (S Hahné, unpublished data). In the absence of data from randomised controlled trials,

RECOMMENDATION I Pre-admission management

Rapid admission to hospital is a priority when meningococcal disease is suspected.

Evidence grade C

All general practitioners should carry benzylpenicillin for injection and give it whilst arranging the transfer of the case to hospital,

Evidence grade D

unless there is a history of immediate allergic reactions after previous penicillin administration³⁸.

Evidence grade A

General practitioners do not need to carry an alternative antibiotic. However, if other antibiotics are available, a 3rd generation cephalosporin may be used. If there is a history of immediate allergic reactions to penicillin or cephalosporins, chloramphenicol may be used³⁸.

Evidence grade D

Immediate dose of iv/im benzylpenicillin for suspected meningococcal infections

Adults and children aged 10 years or over	1.2 g
Children aged 1 to 9 years	600 mg
Children aged under 1 year	300 mg

the Working Group endorses the recommendation to start treatment before admission to hospital. This opinion is based on the rapid clinical deterioration that can occur in meningococcal disease, on the established effectiveness of penicillin in hospital treatment and on the evidence for lack of harm³³.

Adverse effects from benzylpenicillin are unusual. Anaphylactic reactions are rare, occurring in one in 7,000 to one in 25,000 of treated patients³⁴. Anaphylaxis is more likely if there is a history of immediate allergic reactions (such as difficulty in breathing, collapse, generalised itchy rash) after previous penicillin administration^{34,35}, although most people with a history of 'penicillin allergy' do not have true hypersensitivity³⁶. Cross-reactivity between penicillin and cephalosporin allergy occurs in between 2% and 10% of cases³⁷.

3. Laboratory investigation of suspected cases (Recommendation 2)

Identification and characterisation of meningococci causing infection provides important information to assist the public health response. Whilst traditional microbiological techniques remain an important part of investigating suspected cases, molecular methods have been developed that assist diagnosis and further characterisation of strains from cases where isolates have not been obtained^{39,40,41}. Considerable advantages remain in having a cultured isolate available for testing, the most significant of which is a potentially infinite supply of the organism for further study.

RECOMMENDATION 2 Laboratory investigation

The following specimens should be collected on, or soon after, admission to hospital from all patients when meningococcal infection is included in the differential diagnosis.

- Blood for culture,
- Blood for PCR (EDTA or other unclotted blood specimen)
- Serum (on admission and 2-6 weeks later)
- * CSF for microscopy, culture, PCR
- Aspirate from other sterile sites suspected of being infected (e.g. joints) for microscopy, culture, PCR
- Pharyngeal swab (per-nasal if patient unable to cooperate)

Evidence grade D

* Lumbar puncture should not be done until the patient's condition has been stabilised and assessment made to rule out raised intracranial pressure.

NB. Where appropriate, specimens should be taken to check for alternative diagnoses, e.g. throat swabs and stool for viral culture.

Blood samples for culture and polymerase chain reaction (PCR) testing are essential. The chance of obtaining laboratory confirmation is increased by taking samples at the earliest available opportunity. If the possibility of meningococcal disease is not considered until some time after admission, it may still be possible to retrieve earlier specimens from haematology and chemistry departments.

When meningitis is present, cerebrospinal fluid (CSF) offers the best chance of yielding an organism for culture; meningococcal DNA can be found in the CSF up to 96 hours after commencing antibiotics⁴². Lumbar puncture should not be performed until the patient's condition has been stabilised and appropriate assessment has been made to rule out raised intracranial pressure. Material (preferably fluids) from any other normally sterile site, e.g. pericardial or synovial fluid can also be tested by culture and PCR.

Microscopy

Visualising Gram-negative intracellular diplococci in the CSF provides a highly specific confirmatory test. In other sites, e.g. synovial fluid, there is a greater possibility of encountering gonococci and the clinical presentation of the illness should provide important clues to correctly identify the aetiological agent. Specimen collection, prior use of antibiotics and experience of the person performing microscopy are other factors that can affect the sensitivity and specificity.

Cerebrospinal fluid (CSF)

Classically the CSF from a case of meningococcal meningitis reveals a raised neutrophil count and high

protein content along with lowered glucose concentration. Gram-negative diplococci (which are usually but not invariably intracellular) confirm meningococcal meningitis.

The typical picture will not always be present. Very occasionally, numerous organisms will be present in the absence of a raised neutrophil count, and in about 8% of culture positive cases meningococci may be cultured from CSF that is normal on initial analysis⁴³. Conversely, high white cell counts may be present in the CSF, but the number of organisms may be too low to be detectable by microscopy. Prior administration of antibiotics will decrease numbers and may alter the Gram staining characteristics of the organisms. CSF collected some time after presentation may contain a higher proportion of lymphocytes than typically is seen in more acute specimens.

The sensitivity of the Gram stain in CSF to detecting meningococcal meningitis is estimated as 65%⁴⁰. This is affected by the stage of disease, number of organisms present and timing of the procedure in relation to antibiotic administration.

Aspirates and biopsies from normally sterile sites

In patients with a clinically compatible illness, Gram stains of aspirates and biopsy material from sterile sites have high specificity and serve to confirm invasive meningococcal disease. However, as for CSF, they are insufficiently sensitive to exclude invasive meningococcal disease on the basis of negative microscopy.

Examination of material from skin lesions

There has been no systematic study of the optimal way to sample from skin. Techniques employed have ranged from simply disrupting and swabbing a rash-affected area to performing punch biopsies. The reported sensitivity of Gram stains of skin lesion aspirates or biopsies ranges from 30% to 70%. It is highest in haemorrhagic lesions of patients with meningococcal septicaemia in whom Gram stains of skin biopsies may remain positive for up to 48 hours after antibiotic administration. False positive Gram stain results may occur.

While these investigations have been employed successfully in a few centres abroad⁴⁴⁻⁴⁶, they have not found popularity in the United Kingdom. Several units which have undertaken assessments report no improved ascertainment over that provided by culture and PCR of blood and CSF (personal communications – R Read, Sheffield; G Jones, Southampton; R Heyderman Bristol and M Cafferkey Dublin).

Culture

Culture of *N. meningitidis* from blood, CSF or another normally sterile site represents the optimal confirmation of invasive meningococcal disease. Isolates are amenable to relatively straightforward strain characterisation and additional investigations such as antibiotic susceptibility testing. Isolates submitted to UK reference units are characterised phenotypically by serogroup, serotype and serosubtype.

Genotypic characterisation of some determinants can also be performed.

Blood culture

Blood for culture should be obtained from all suspected cases. However the sensitivity falls to 5% or less if antibiotics have been given more than one to two hours before collection⁴⁷. Other factors that affect the sensitivity of blood cultures include the number of blood cultures collected, the volume of the samples, and their timing, but perhaps most critically, the bacterial load, which can vary enormously⁴⁸.

CSF culture

The sensitivity of CSF culture is about 70% in cases of untreated meningococcal disease⁴⁷. Nevertheless while antibiotics take somewhat longer to act in CSF than in blood, successful culture is unlikely unless specimens are collected within two to three hours of treatment commencing.

Aspirate from a normally sterile site, skin rash aspirate or biopsy culture

Culture of meningococci from these sites confirms invasive infection.

Pharyngeal swabs

Pharyngeal swabs are less affected by prior antibiotic therapy and have been found to yield meningococci in 40-50% of cases of invasive meningococcal disease⁴⁷. They should be collected from all suspected cases and the request form should specify that meningococci are being sought. A review of patients on the PHLS Meningococcus Reference Unit (MRU) database between 1994 and 1997, where both oropharyngeal and systemic isolates were submitted, showed the organisms from both sites were identical in 97% (134/138) of cases. However, in 3% of cases they were different, and a pharyngeal isolate in the absence of a systemic isolate does not confirm invasive disease.

Non-culture diagnostic tests

Polysaccharide antigen testing

Demonstrating meningococcal polysaccharide antigen in CSF, blood or other normally sterile fluid using latex agglutination provides confirmatory evidence of invasive infection in patients with a clinically compatible presentation. The sensitivity of this test in its original format is poor and modified methodologies such as ultrasound enhancement have been used to improve performance characteristics⁴⁹⁻⁵¹.

PCR

PCR-based assays for detecting specific DNA sequences of *N. meningitidis* have been developed and made widely available through reference laboratories in the United Kingdom. Experience has been based largely on experience with CSF and blood specimens. Other material from sterile sites, however, and indeed throat swabs and material from rashes can also be tested. The sensitivity of the *ctrA* (screening) assay

currently used at the MRU has been estimated to be 89% for whole blood samples and 96% for CSF. Samples positive by this assay are submitted for further testing for serogroup determination, initially for serogroups B and C and, if negative for these, then for serogroups W135, Y and A^{40,41,52}.

For blood specimens, whole blood (unclotted) specimens are preferred and current DNA extraction methods mean that heparinised specimens can now be handled along with EDTA and citrated samples.

Serodiagnosis

Ideally, acute and convalescent specimens (collected two to six weeks after presentation) should be submitted together. A screening assay for antibodies to outer membrane proteins is performed and any reactive specimens are tested for serogroup specific antibodies. Results of these tests can occasionally provide helpful retrospective evidence in clusters of infection, particularly in being able to make judgements about the likelihood of recent serogroup C disease. In practice they are seldom available in time to influence decision making about individual cases and contacts. Carriage and invasive disease can result in equivalent antibody levels, thus the results of tests need to be interpreted in the light of clinical presentation and provide supportive evidence but are not definitively diagnostic⁵³.

Strain differentiation of *N. meningitidis*

Strain characterisation is generally performed at national reference laboratories. Attempts to more finely differentiate meningococcal strains from cases of invasive disease can be undertaken for public health reasons, e.g. to confirm or to exclude a suspected outbreak of cases. A true epidemiological link between cases can only be established by public health investigations. Laboratory typing results can categorically rule out true relatedness of apparently linked cases if they emerge as being distinct, but provide no more than supporting evidence when case isolates are indistinguishable.

The most widely applied differentiation techniques involve characterisation of surface structures in the capsule and outer cell membrane. Capsular polysaccharide antigens separate meningococci into serogroups among which A, B, C, W135 and Y account for the overwhelming majority of invasive infections worldwide.

Further differentiation can be made by identification of outer membrane proteins (OMPs). Of the five OMP classes present, three porin proteins have been used to produce reagents for an internationally recognised typing scheme. All meningococci have class 1 and also either class 2 or 3 OMPs – these last are mutually exclusive. Using monoclonal antibodies which detect the different antigens, the class 2/3 OMPs designate the serotype, while the class 1 porin OMPs define the serosubtype. The serogroup, serotype, and serosubtype together make up the most commonly used phenotypic

designation of meningococci. Panels of monoclonal antibodies used in the UK, most European countries and Australasia have been lodged with the National Institute for Biological Standards and Controls, who prepare and distribute the reagents to national reference centres^{54,55}.

Genotypic characterisation of strains (including non-culture-based applications)

Genotypic (molecular) procedures are now supplanting phenotypic (serology-based) typing methods. The best described and most widely available include pulsed field gel electrophoresis (PFGE), *porA* sequencing and multi-locus sequence typing (MLST).

PFGE is a technique which looks at the entire bacterial genome divided into sections by low frequency cutting enzymes. Materials and methods however are not standardised between laboratories, resulting in variations which obviate the possibility

of inter-laboratory comparisons. Nevertheless, when performed in a single centre, PFGE patterns can be usually useful in outbreak investigation.

The shortcomings of PFGE can be largely overcome by applying DNA sequencing. This gives results which are readily comparable between centres provided targets can be agreed. *PorA* sequence typing is becoming increasingly available and can also be applied for outbreak investigation. The antigens defined by *porA* stimulate production of bactericidal antibody and so represent potential vaccine candidates⁵⁶. The MRU and the Scottish Meningococcus and Pneumococcus Reference Laboratory have now developed *porA* sequencing as a non-culture-based method, which can be applied to the majority of 'non-viable' samples for which serogroup can be determined by PCR.

MLST can occasionally provide information useful for identifying outbreaks but is usually more appropriately applied to study long-term clonal

RECOMMENDATION 3 Role of public health

The CCDC/CPHM* should ensure that policies are in place and implemented through a mechanism such as a service level agreement that recognises the corporate responsibility of the NHS. Policies should ensure that

- cases are referred early to hospital
- cases are reported promptly to CCDC/CPHM
- cases in hospital are investigated appropriately
- contacts are traced and given appropriate chemoprophylaxis
- information is given to others including primary care, schools/universities, education authorities, National Health Service helplines, meningitis charities, employers
- communication with the media is appropriate and efficient.

Evidence grade D

All cases where a diagnosis of meningococcal disease is suspected should be promptly notified to the communicable disease control team without waiting for microbiological confirmation.

Evidence grade D

The CCDC/CPHM should ensure that comprehensive information on cases is gathered to contribute to local public health management and surveillance. Probable and confirmed cases, classified on the basis of information at discharge, should be reported into the national enhanced surveillance systems for meningococcal disease.

Evidence grade D

The data set should include epidemiological, laboratory and clinical information. The current minimum dataset for enhanced surveillance in the UK includes area of residence, patient identification, date of birth / age, gender, date of admission to hospital (or death if not admitted), source laboratory, laboratory confirmation, statutory notification, clinical features, whether part of cluster, and clinical outcome. Serogroup C cases are followed up for information on vaccination status both in the enhanced surveillance of meningococcal disease and through surveillance of potential vaccine failures. Further information on PHLS surveillance of the MenC programme is available at http://www.phls.org.uk/publications/annual_review/Ch05.pdf

Additional data for local management and audit programmes may include:

case – name and address including post code, telephone number, details of general practitioner, dates and times of disease onset / hospital admission / reporting, ethnic group, occupation/workplace, school/college/nursery attended, antibiotics given prior to admission, name of hospital/ward, name of consultant, specimens and dates and types of specimens;

contacts – addresses and telephone numbers, details of antibiotics/vaccine/information given and by whom; details of general practitioner;

notifier – name, address and occupation.

* CCDC – Consultant in communicable disease control
CPHM – Consultant in public health medicine

relationships of meningococcal populations since it examines parts of the genome defining cell components which are not surface expressed and hence not under selection pressure. MLST is now also being developed as a non-culture-based method⁵⁷⁻⁶⁰.

4. Role of public health (Recommendation 3)

Public health departments have a major role in the management of meningococcal disease, ensuring that there are adequate disease prevention and surveillance programmes, and in the prevention of secondary spread through contact tracing. Usually the lead is through the consultant in communicable disease control (CCDC)/consultant in public health medicine (CPHM).

Surveillance local and national

CCDCs/CPHMs receive reports of cases from local clinicians in the course of managing the public health aspects of cases. In addition, meningococcal meningitis and septicaemia are statutorily notifiable diseases under the Public Health (Infectious Disease) Regulations 1988, and under Scottish legislation as meningococcal infection. Therefore clinicians are

required to notify suspected cases to the proper officer, usually the CCDC/CPHM. An enhanced surveillance system records individual patient factors and links them to microbiological information from the national reference laboratories. This information is collected by the local CCDC/CPHM and sent to the regional and national epidemiology centres where it is further integrated with laboratory results.

5. Public health action after a case

Case definitions (Box 1)

Box 1 defines those cases that require public health action and those that do not.

Chemoprophylaxis (Recommendation 4)

Risk to household contacts

About 97% of cases are sporadic⁶⁴. Although the risk to contacts is low, the highest documented absolute and relative risk is to people who live in the same household as a case of meningococcal disease^{64,65}. The Office for National Statistics defines a household as one person living alone or a group of people who share common housekeeping or a living room. The risk is highest in the first seven days after a case and falls

BOX 1 Case definitions

Case requiring public health action

Confirmed case

Clinical diagnosis of meningitis, septicaemia or other invasive disease (e.g. orbital cellulitis, septic arthritis)*

AND at least one of:

- Neisseria meningitidis* isolated from normally sterile site
- Gram negative diplococci in normally sterile site
- Meningococcal DNA in normally sterile site
- Meningococcal antigen in blood, CSF or urine

* Although not meeting the definition of a confirmed case, *meningococcal infection of the conjunctiva* is considered an indication for public health action because of the high immediate risk of invasive disease⁶¹.

Probable case

Clinical diagnosis of meningitis or septicaemia or other invasive disease where the public health physician, in consultation with the physician and microbiologist, considers that meningococcal infection is the most likely diagnosis. Some microbiological tests (e.g. rising antibody levels) that are not considered sufficient to confirm the diagnosis of meningococcal disease may change the case category from 'possible' to 'probable'.

Case not requiring public health action

Possible case

Clinical diagnosis of meningitis or septicaemia or other invasive disease where the public health physician, in consultation with the clinician and microbiologist, considers that diagnoses other than meningococcal disease are at least as likely. This category includes cases who may have been treated with antibiotics but whose probable diagnosis is viral meningitis.

In such cases, prophylaxis for contacts is not indicated but giving out information about meningococcal disease may be helpful (see recommendation 7).

Infection in non-sterile sites

Isolation of meningococci from sputum or from swabs taken from nasopharynx or genital tract is not by itself an indication for public health action as asymptomatic carriage in the respiratory and genital tract is common. However, when assessed together with other clinical and microbiological parameters, a positive throat swab may increase the index of suspicion that this is a probable case, especially if the isolate is a virulent strain. Meningococcal pneumonia is not an indication for public health action but may carry a low risk of transmission in healthcare settings especially to the immunocompromised^{62,63} (see section 6).

RECOMMENDATION 4 Chemoprophylaxis and choice of antibiotic**Prophylaxis indicated**

Chemoprophylaxis should be offered to *close contacts* of cases, irrespective of vaccination status, that require public health action (see case definitions) in the following categories:

(a) those who have had *prolonged close contact* with the case in a *household type setting* during the seven days before onset of illness. Examples of such contacts would be those living and/or sleeping in the same household (including extended household), pupils in the same dormitory, boy/girlfriends, or university students sharing a kitchen in a hall of residence.

Evidence grade C

(b) those who have had *transient close contact* with a case *only* if they have been directly exposed to large particle droplets/secretions from the respiratory tract of a case around the time of admission to hospital (see section 6).

Evidence grade D

Prophylaxis NOT indicated (unless already identified as close contacts) for

- Staff and children attending same nursery or crèche
- Students/pupils in same school/class/tutor group
- Work or school colleagues
- Friends
- Residents of nursing/residential homes
- Kissing on cheek or mouth (intimate kissing would normally bring the contact into the close prolonged contact category)
- Food or drink sharing or similar low level of salivary contact
- Attending the same social function
- Travelling in next seat on same plane, train, bus, or car.

Evidence grade D

Prophylaxis uncertain

The Working Group recognised that the division between those who do and do not receive prophylaxis is arbitrary as evidence on risk and benefit is limited. CsCDC/CsPHM* will need to use their judgement in reaching a decision on whether or not to advise prophylaxis for those who do not clearly fall into the above categories. For example, when a case occurs in a group of children looked after by the same childminder or among a circle of close friends, an assessment should be made as to whether these exposures meet the definitions of a close contact.

Evidence grade D

Other situations:**Dispersal settings**

In settings where close contacts have been identified and *where contact has now finished*, e.g. those sleeping in the same room on holiday or at university, attempts should be made to arrange chemoprophylaxis within seven days of dispersal *if practicable*.

Evidence grade D

Post mortem contact with a case

Prophylaxis is not indicated. Kissing the body is not considered to be a risk. Body bags are not necessary, and transport to other countries for burial or cremation does not pose a risk.

Evidence grade D

Contacts of possible cases

Contacts of possible cases do not need prophylaxis unless or until further evidence emerges that changes the diagnostic category to confirmed or probable.

Evidence grade D

Timing

Antibiotic prophylaxis should be given as soon as possible (ideally within 24 hours) after diagnosis of the index case.

Evidence grade C

Delayed diagnosis

If the public health physician receives a delayed report of a case, close contacts (as defined above) should be offered chemoprophylaxis, and vaccine if appropriate, up to four weeks after onset of illness (*low risk of further cases after this period*).

Evidence grade D

Prophylaxis for the case

The case should receive chemoprophylaxis when able to take oral medication and before discharge from hospital, unless the disease has already been treated with ceftriaxone. Those treated with cefotaxime should still receive prophylaxis because it is not known whether cefotaxime eradicates carriage.

Evidence grade C

continued next page

* CsCDC – Consultants in communicable disease control
CsPHM – Consultants in public health medicine

RECOMMENDATION 4 Chemoprophylaxis and choice of antibiotics (continued)**Recommendations for choice of antibiotic**

Rifampicin, ciprofloxacin, and ceftriaxone are all recommended for use in preventing secondary cases of meningococcal disease, but rifampicin is the only antibacterial that is licensed for this purpose³⁸. Ceftriaxone must be given by injection. Information given out with antibiotics should include an explanation that such treatment is not fully protective.

Rifampicin

Recommended for use in all age groups.

Evidence grade B

Rifampicin is contraindicated in the presence of jaundice or known hypersensitivity to rifampicin. Interactions with other drugs, such as anticoagulants, anticonvulsants, and hormonal contraceptives should be considered. Side effects should be explained including staining of urine and contact lenses. Written information for patients should be supplied with the prescription (see box 3). This is the responsibility of the prescriber.

Dosage twice daily for 2 days:

Adults and children over 12 years of age	600 mg
Children 1-12 years	10 mg/kg
Infants (under 12 months of age)	5 mg/kg

Suitable doses in children based on average weight for age are:

0-2 months	20 mg (1 ml*)	} twice daily for two days
3-11 months	40 mg (2 ml*)	
1-2 years	100 mg (5 ml*)	
3-4 years	150 mg (7.5 ml*)	
5-6 years	200 mg (10 ml*)	
7-12 years	300 mg (as capsule)	

* Rifampicin syrup contains 100 mg/5 ml

Ciprofloxacin

Recommended as an alternative agent to rifampicin for chemoprophylaxis in adults and children aged five years and above.

Evidence grade C

Ciprofloxacin is useful when large numbers of contacts need prophylaxis. Ciprofloxacin has a number of advantages over rifampicin. It is given as a single dose (500 mg in adults and children over 12 years, 250 mg for children aged 5-12 years), it does not interact with oral contraceptives, and it is more readily available in community pharmacies.

It may, however, be followed by anaphylactic reactions^{60,61} (P Monk, M Evans, unpublished data). Healthcare staff should give out information sheets that include the risk of side effects (see box 3), and be prepared to deal with allergic reactions.

The manufacturers do not recommend using ciprofloxacin in children or growing adolescents unless benefits of treatment are considered to outweigh risks. Concern has been raised about the possibility of joint/cartilage damage seen in immature animals given ciprofloxacin. Such effects have not been observed in children despite extensive use^{62,63}, and ciprofloxacin is currently licensed for other indications in children above five years of age³⁸.

Pregnancy and breastfeeding

The Working Group considered on balance that chemoprophylaxis should now be recommended in pregnancy (with stronger evidence for benefit from prophylaxis to close contacts and expected benefit to the whole close contact group by treating all members of that group). Rifampicin and ceftriaxone can be used in pregnancy or in breastfeeding mothers, but ciprofloxacin is not recommended³⁸.

Evidence grade D

In pregnancy or when breastfeeding, mothers should be offered chemoprophylaxis with rifampicin (600 mg twice daily for two days) or ceftriaxone (250 mg single dose by intramuscular injection reconstituted with 2 ml 1% lignocaine).

rapidly during the following weeks⁶⁵. 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 300⁶⁶⁻⁶⁸. Beyond this four week period the risk is probably close to background levels⁶⁴. The increased risk in household members may be due to a combination of genetic susceptibility in the family,

increased exposure to virulent meningococci and environmental factors.

The case is likely to have acquired the invasive strain from a close contact, typically in the same household, who is an asymptomatic carrier^{69,70}. The incubation period is usually three to five days^{3,10} and cases do not usually have detectable carriage until

admission to hospital or shortly beforehand¹². As the highest risk of illness in untreated households is observed in the first 48 hours after onset of disease in the index case⁶⁵, the source of infection in these further cases is most likely to be from the same (or another) carrier and not from the case.

It follows that transient contact with the index case before acute illness is unlikely to be an important risk factor for disease, so that mere proximity to the case (e.g. during travel in a plane, bus or car) may not justify prophylaxis. Although guidance for the USA suggests that passengers seated next to the index case on a plane for more than eight hours should be offered prophylaxis, no published reports of cases in such contacts were found⁷¹.

No cases have been reported following post-mortem contact with a case of meningococcal disease.

Aim

Chemoprophylaxis aims to reduce the risk of invasive disease by eradicating carriage in the group of close contacts at highest risk. It may act in two ways: (i) by eradicating carriage from established carriers who pose a risk of infection to others and (ii) by eradicating carriage in those who have newly acquired the invasive strain and who may themselves be at risk. The short- and medium-term reduction in risk among household contacts who are given antibiotics suggest that both mechanisms may operate^{67,68,72}.

Risk reduction

Antibiotics such as rifampicin, ciprofloxacin, and ceftriaxone are highly effective in eliminating carriage⁷³⁻⁷⁶. A review of retrospective observational studies found a significantly reduced risk of further cases in the household during the month after a case among household members given rifampicin prophylaxis (B Purcell, unpublished data). The approximate number needed to treat to prevent a case was estimated to be about 200 individuals. In cases caused by vaccine preventable strains, vaccination would be expected to reduce the long-term risk of disease in close contacts. The number of unimmunised close contacts needed to vaccinate to prevent a case is approximately 1,000 in cases due to confirmed serogroup C infection (S Samuelsson, unpublished data).

Although benzylpenicillin suppresses meningococcal growth in the throat it does not reliably eradicate carriage. Around 5% of cases treated with benzylpenicillin still carry the invasive strain after completing treatment and before discharge from hospital⁷⁷⁻⁷⁹. Convalescent cases may then pose a risk to household contacts unless given a course of antibiotic treatment to eradicate carriage.

Contacts outside the household

After a single case of meningococcal disease, the risk of linked cases outside the household is low; this is presumably related to lower intensity of exposure to virulent strains⁷⁰. In England and Wales from 1995 to

2001, after one case in either a pre-school group, a primary or a secondary school, the absolute risks to each child/pupil in the same institution of becoming a case within the next four weeks were approximately one in 1,500, one in 18,000 and one in 33,000 respectively (K Davison, unpublished data).

The Working Group considered the revised estimates of risk particularly with reference to the treatment of pre-school groups. Although the absolute risk in this setting was higher than in previous estimates⁶⁴, the Working Group recommends that UK policy not to give antibiotics to pre-school groups after a single case should be maintained. The reasons are that: the benefit of giving antibiotics in this setting is not known; clusters in pre-school groups are rare (about three per annum in England and Wales); the potential for risk reduction by intervention is reduced according to the time from identification of a case to administration of prophylaxis within the institution; and harm may arise from drug side effects, development of antibiotic resistance, and eradication of naturally immunising strains from the nasopharynx. The further one goes outside the case household, the lower the chance of finding a carrier of a pathogenic meningococcal strain and the greater the chance of treatment doing harm by eradicating carriage of non-pathogenic organisms that may generate cross-protective immunity^{63,70}. This particularly applies in young children who are more likely to be carrying *Neisseria lactamica* than *Neisseria meningitidis*⁵.

Reports of clusters in other settings, e.g. the workplace, are rare and the level of risk is considered to be much lower than educational settings.

Vaccines (Recommendations 5 and 6)

Meningococcal serogroup C conjugate vaccines (MenC) were introduced into the UK childhood vaccination programme in late 1999¹⁷ and scheduled for all under the age of 18 years. In 2002 these vaccines were also made available to those aged 20-24 years. These vaccines confer high levels of serum bactericidal antibody and induce immunological memory in individuals from the age of two months¹⁷. Preliminary estimates of efficacy suggest that the vaccine is 88-96% effective against invasive meningococcal disease due to serogroup C infection.

Meningococcal polysaccharide vaccines offer protection against infection with serogroups A and C, or against serogroups A, C, W135 and Y. Protection against group A infection is highly effective from three months of age and lasts for around three years in older children and adults⁸⁴. Protection against serogroup C infection from these vaccines is believed to be of shorter duration than that conferred by the conjugate vaccine, and the level of protection is inferior in young children, particularly those under 18 months¹⁷. The protection conferred by the quadrivalent vaccine against serogroups Y and W135 infection is inferred by evidence of immunogenicity in adults and so efficacy in younger children is

RECOMMENDATION 5 Vaccines and dosage

Conjugate C vaccines (MenC)

Vaccine and dose: Wyeth-Ayerst Meningitec 0.5 ml
 Baxter NeisVac-C 0.5 ml
 Chiron Menjugate 0.5 ml

Schedule by age: According to current Department of Health recommendations

Suppliers: Farillon

Polysaccharide vaccines

AC Vax (GlaxoSmithKline) 0.5 ml
 (licensed from 2 months)

Meningivac A+C (Aventis Pasteur MSD) 0.5 ml
 (licensed from 18 months)

ACWYVax (GlaxoSmithKline) 0.5 ml
 (licensed from 2 years)

Schedule: Single dose

Suppliers: Pharmaceutical wholesaler, GlaxoSmith-Kline, Aventis Pasteur.

unknown, but is expected to be similar to protection against serogroup C disease.

Disseminating information (Recommendation 7 and Box 2)

Following a case of meningococcal disease, it is important to give out information because early diagnosis and treatment should improve outcome. There is a small but real risk of further linked cases⁶⁴. Accurate and timely information should help to limit the spread of false rumours and anxiety.

6. Prophylaxis in healthcare settings

(Recommendation 8)

Healthcare workers in contact with cases of meningococcal disease are at increased relative risk of disease in the 10-day period after exposure, although absolute risks are very low; in one study absolute risk was estimated as 0.8/10⁵ and relative risk as 25⁸⁶. The data were consistent with a higher (but unquantifiable) risk in those more heavily exposed to nasopharyngeal secretions of cases around the time of admission to hospital.

RECOMMENDATION 6 Vaccination

Close contacts of cases due to vaccine preventable strains of *N. meningitidis* who received chemoprophylaxis should be offered an appropriate vaccine once diagnosis has been confirmed and up to four weeks after illness onset.

For *confirmed serogroup C* infection, MenC vaccination should be offered to all close contacts (of all ages) previously unimmunised with MenC vaccine. Although the vaccine is only licensed from 2 months of age, an additional dose is advised for babies below this age.

Evidence grade B

For *confirmed serogroup A* infection, vaccination with polysaccharide vaccine (either bivalent or quadrivalent preparations) should be offered to all close contacts over two months of age.

Evidence grade B

For *confirmed serogroup W135 or Y* infections, vaccination with quadrivalent polysaccharide vaccine should be offered to all close contacts over two years of age.

Evidence grade B

For *all cases* the opportunity could be taken to recommend MenC vaccination to unimmunised contacts under the age of 25 years.

Evidence grade D

Vaccination of the index case

Previous serogroup C disease is not a contra-indication to MenC vaccination. As the immune response to natural infection may be inferior to that observed after conjugate vaccines⁸⁵, particularly in young children, MenC vaccine should also be offered to any unimmunised index cases under the age of 25 years. Although recurrent serogroup C disease is rare, this policy ensures that persons in this age group are given equivalent protection to their age-matched immunised peers.

Evidence grade D

Following the above rationale, cases of confirmed serogroup C disease who have previously been immunised with MenC (or polysaccharide) vaccines should be offered MenC vaccine around the time of discharge from hospital. Vaccine failure implies an inadequate response to the vaccine and may reflect host factors or sub-optimal storage or administration of the vaccine. A sample of convalescent serum prior to re-immunisation should be taken and sent to the PHLS Meningococcal Reference Unit. Immunological investigation of the case and review of vaccine storage and administration procedures should be considered. http://www.phls.org.uk/publications/annual_review/Ch05.pdf

Evidence grade D

Convalescent immunisation with polysaccharide vaccines is not recommended for cases due to A, W135 or Y serogroups (*natural infection is likely to offer greater protection than immunisation with polysaccharide vaccines*).

Evidence grade D

RECOMMENDATION 7 Disseminating information

Leaflets or other printed information about meningococcal disease should be widely available and quickly distributed after a case has occurred.

The CCDC/CPHM* should ensure that information about a case of meningococcal disease is shared with other NHS colleagues and external agencies as necessary. It is important to inform the appropriate general practitioner(s) and out-of-hours services so that they know what public health action has been taken and to promote early recognition of any further cases. The CCDC/CPHM may also wish to inform NHS helplines and the meningitis charities.

Evidence grade D

Cases in educational institutions

Heads of pre school groups, schools, colleges and universities should be informed when there is a case of meningococcal disease in someone attending their institution. With the advice of the CCDC/CPHM, letters are usually sent to other parents/students to inform them of the situation (see box 3). It is recommended to inform and seek support for this action from relatives of the case, as the letters may result in identification of the case. The purpose of the letter is to give information about meningococcal disease, assist parents and others in the early detection of the disease, allay anxiety and prevent uninformed rumours.

The information given should be sufficient to ensure that parents are aware of the situation whilst preserving the confidentiality of the patient. It is usually helpful to explain what public health action has been taken.

If a *possible* case attends an educational institution, it is still advisable to discuss the situation with the head of the institution at an early stage. The head will then be in a good position to respond immediately to parental concerns.

Evidence grade D

* CCDC – Consultant in communicable disease control
CPHM – Consultant in public health medicine

After starting treatment with intravenous benzylpenicillin, carriage rates decrease rapidly so that meningococci are undetectable by nasopharyngeal swabbing after 24 hours on treatment⁷⁹. Third

generation cephalosporin antibiotics would be expected to have a similar or more rapid effect on suppression of carriage. Both ceftriaxone and rifampicin are known to be effective in eradicating carriage^{74,76}, whereas penicillin is thought to suppress but not eradicate carriage⁷⁹.

BOX 2 Meningitis charities and NHS Direct

The meningitis charities may be contacted when there is a case of meningococcal disease. They need to have sufficient information so that they can support callers with appropriate advice. The information given to these bodies should include *anonymised* details of the case and of public health action taken.

Leaflets available from

Meningitis Trust	01453 768000
Meningitis Research Foundation	01454 281811
Meningitis Association Scotland	0141 427 6698
Meningitis Cymru	01656 646414

24 hour helplines

Meningitis Trust (UK)	0845 6000 800
Meningitis Research Foundation	0808 800 3344
Meningitis Association Scotland	0141 427 6698
Meningitis Cymru	0800 652 9996
NHS Direct	0845 4647
Meningitis Trust (outside UK)	0870 124 7000

Websites

Meningitis Research Foundation: <http://www.meningitis.org>
Meningitis Trust: <http://www.meningitis-trust.org>

Recently published UK guidelines for preventing hospital acquired infections recommend wearing face masks and eye protection when there is a risk of secretions splashing into face and eyes⁸⁷. In the USA, masks are recommended when working within 1 metre of patients known or suspected to be infected with micro-organisms transmitted by large-particle droplets (>5 micrometres diameter) that can be generated during coughing, sneezing, talking or the performance of clinical procedures⁸⁸. Laboratory studies suggest that surgical masks can protect the wearer against droplet transmission^{89,90}.

Meningococcal pneumonia may carry a low risk of transmission in healthcare settings especially to the immunocompromised^{62,63}.

7. Management of clusters

Outbreaks of meningococcal disease often generate high levels of public alarm^{91,92}. Contributing to this alarm are the lack of predictability and speed of development of outbreaks that can frustrate the efforts of public health authorities. The speed of public health response is thus important both to implement preventive measures and reduce public anxiety.

RECOMMENDATION 8 Prophylaxis in healthcare settings

Healthcare workers should reduce the possibility of exposure to large particle droplets (e.g. by wearing surgical masks, using closed suction) especially when carrying out airway management procedures, so that chemoprophylaxis is not needed.

Evidence grade D

Chemoprophylaxis is recommended only for those whose mouth or nose is directly exposed to large particle droplets/secretions from the respiratory tract of a probable or confirmed case of meningococcal disease around the time of admission to hospital. This type of exposure will only occur among staff who are working close to the face of the case without wearing a mask or other mechanical protection. In practice this implies a clear perception of facial contact with droplets/secretions and is unlikely to occur unless undertaking airway management or coughed in the face. General medical or nursing care of cases is not an indication for prophylaxis.

Rifampicin 600 mg orally twice daily for 2 days or ciprofloxacin 500 mg as a single dose are recommended for prophylaxis.

Evidence grade D

Exposure of the eyes to respiratory droplets is not considered an indication for prophylaxis. Such exposure may however carry a low risk of meningococcal conjunctivitis and subsequent invasive disease. Staff should be counselled about this risk and advised to seek early treatment if conjunctivitis should develop within 10 days of exposure.

Evidence grade D

Routine vaccination of healthcare workers with meningococcal C conjugate vaccines is not recommended for two reasons. First, at the time of exposure, the serogroup of the infecting strain is not usually known, so previous vaccination would not obviate the need for chemoprophylaxis. Second, as the UK vaccination programme takes effect, the incidence of serogroup C disease and the proportion of cases caused by such strains should diminish, thus reducing risk of secondary cases that are vaccine preventable.

Evidence grade D

The above recommendations also apply to contacts of cases in healthcare workers (including dentists), and to contacts of cases on a hospital ward where the diagnosis is initially unsuspected and not treated with systemic antibiotics. Chemoprophylaxis is not usually indicated for patient or staff contacts of such cases. A hospital ward is not equivalent to a household setting. However the threshold for giving prophylaxis should be lower for immunocompromised contacts who may be at increased risk of invasive disease. Risk assessment is advised.

Evidence grade D

RECOMMENDATION 9 Managing clusters in an educational institution

Assess the information

When 2 or more cases are reported from an educational institution, careful and rapid assessment should be made.

This should include a review of:

- clinical features of the cases
- microbiological data (serogroup/type/subtype)
- dates of onset of illness and of last attendance
- links between cases by age, school year, home address, social activities, and friends
- numbers of students in the school and in each school year.

Consider the options

The public health management options include:

- no further action (e.g. if two possible cases)
- giving out information only
- giving out information and offering wider prophylaxis in the institution.

The main decision to be taken by the CCDC/CPHM* is whether to offer wider prophylaxis, and, if so, when and to whom. The principle is to try to define a group at high risk of acquiring meningococcal infection and disease, and to target that group for prophylaxis in order to reduce risk. The target group should be a discrete group that contains the cases and makes sense to staff/parents/students, for example, children and staff of the same preschool group, children of the same school year, children or students who share a common social activity, or a group of friends. The evidence on risk suggests a need to act promptly.

Evidence grade D

continued next page

RECOMMENDATION 9 Managing clusters in an educational institution (continued)**Make a decision**

If two *possible* cases attend the same institution, whatever the interval between cases, prophylaxis to any contacts is not indicated.
Evidence grade D

If two *confirmed* cases caused by different strains attend the same institution, they should be regarded as two sporadic cases, whatever the interval between them. Only close contacts of each case should be offered prophylaxis.
Evidence grade D

If two *confirmed* or *probable* cases who attend the same preschool group, school, college or university arise within a four-week period and are, or could be, caused by the same serogroup, public health action is indicated. It is not necessary to wait for microbiological results on probable cases (*high immediate risk of further cases*).
Evidence grade D

Information should be given out widely within the institution to parents and students as appropriate (see box 3).
Evidence grade D

For clusters in preschool groups, both staff and children would normally be offered prophylaxis.

For clusters in schools/colleges/universities, if a clear subgroup can be defined that contains the cases, prophylaxis should be offered to that group. If a subgroup cannot be defined, then a decision may be needed on offering prophylaxis to the whole institution. This will depend on factors such as the size of the population, the time interval and age difference between cases, whether they are confirmed or not.

If uncertain, seek expert advice from CDSC** (tel: 020 8200 6868) or SCIEH† (tel: 0141 300 1100).

For clusters among children at preschool groups and primary schools, staff should normally be included in the target group (*some evidence of increased risk*) but not in clusters among students at secondary schools, colleges, universities (*no evidence of increased risk*).

Evidence grade D

For a cluster involving one or more cases of confirmed group Y or W135 infections: quadrivalent polysaccharide vaccine should also be offered to all individuals over the age of two years who were offered antibiotics.

Evidence grade D

For a cluster involving one or more cases of confirmed group C infection: MenC conjugate vaccine should also be offered to all previously unimmunised individuals who were offered antibiotics. If the cluster involves MenC vaccine failures, further investigation may be required and discussion with CDSC or SCIEH is recommended (see section 5, vaccines).

Implement the decision

If antibiotics +/- vaccine are to be offered, make urgent arrangements with:

- community medical/nursing staff to deliver medicines/vaccine/information
- head of the institution to inform parents/students and seek consent (see box 3)
- pharmacists to supply antibiotics (in correct formulation, dosage and information sheets) and vaccines¹⁰⁰.

Rifampicin or ciprofloxacin are the recommended antibiotics (see section 5, chemoprophylaxis).

NB Closing the school is not advised as no reduction in risk would be expected (*levels of contact among social networks are unlikely to be reduced and may be increased; application and success of intervention will be assisted if school attendance is high*).

Swabbing to measure carriage of outbreak strains is not usually recommended in acute outbreaks because decisions have to be taken before results are available and because carriage rates often bear no relationship to risk of further cases.

* CCDC – Consultant in communicable disease control, CPHM – Consultant in public health medicine

** CDSC – Communicable Disease Surveillance Centre

† SCIEH – Scottish Centre for Infection and Environmental Health

In educational settings, once a second case has occurred, the risk of a third case may be as high as 30-50% (K Davison, unpublished data)⁹³. The risks are highest in the week after the second case. The risk to staff in such

clusters is not known. However of six clusters that contained confirmed cases among both staff and children in educational settings in England and Wales 1995-2001, five involved pre-school groups

RECOMMENDATION 10 Managing clusters in the wider community

Assess carefully all the epidemiological information at your disposal: confirmed and probable cases, serotyping and/or molecular typing data, dates of onset, links between cases, size of population containing the cases, and MenC vaccination uptake rates (where relevant).

Calculate age specific attack rates.

The numerator is the number of confirmed cases in the population at risk caused by strains of the same serogroup and that are not distinguishable. Count multiple cases in the same household or in the same institutional setting (if this setting is considered to be the focus of a separate outbreak) as a single case.

The denominator is the population at risk. This population should be clearly defined and make sense to the people who live within and without the selected boundaries. It may not be easy to define such a population. Examples are a rural town/village or a secondary school with its feeder schools. The target age group within this population should contain all or most of the outbreak cases. If the outbreak is mainly in children, the denominator should be based on the age range of children at school or preschool and, where relevant, ages in whom vaccine should be effective (e.g. 2-11 year olds, 2-16 year olds).

Only consider intervention if the age-specific attack rate (number of confirmed outbreak strain cases [suggested minimum of four] divided by the number in target age group) in a three-month period is "high". Although a precise threshold for intervention has not been set, age-specific attack rates among 2 to 16 year olds targeted for intervention in two community outbreaks during the winter of 1995/6 caused by serogroup C strains were over 40/100,000. This figure was about 20 times the annual incidence of confirmed serogroup C disease in one to 19 year olds in England and Wales during 1995-96.

Evidence grade D

Seek advice from national experts through CDSC* (tel: 020 8200 6868) or SCIEH** (tel: 0141 300 1100) if attack rates approach this level.

Decide whether or not to embark on a community immunisation and/or chemoprophylaxis programme at a full meeting of the outbreak control team.

Disseminating information

It is essential that clear, consistent and accurate information is provided to parents, students and staff, and the wider community. The target group should be clearly identified and information to this group should emphasise the importance of early recognition of symptoms and prompt access to medical services.

Local general practitioners and out-of-hours services should be advised to be on the alert for any new cases associated with the cluster. It may also be helpful to alert receiving Accident and Emergency Departments and admitting clinicians.

As far as possible, information that may need to be disseminated should be prepared in advance. In preschool and school settings the public health physician should liaise closely with the manager or headteacher. In college/university settings liaison will be with a member of the senior management team. It is advisable for one person within the college/university to coordinate operations, and to receive and disseminate all information. Registry departments can aid in tracing students and getting information to them, and personnel or occupational health departments can help disseminate information to staff groups.

A public relations strategy will be required. If high levels of interest are anticipated or already evident, prepare to set up telephone helplines, to allow controlled media access to vaccination sites, to release regular coordinated press briefings and to hold press conferences¹⁰⁰.

Evidence grade D

See section 5, box 2, for helpline contact details.

* CDSC – Communicable Disease Surveillance Centre

** SCIEH – Scottish Centre for Infection and Environmental Health

or primary schools (N Syed, unpublished data), suggesting a greater risk to teachers of young children.

Relative risk of further cases in other settings hasn't been formally assessed, but outbreaks in definable social groups, civilian communities and military recruits are well described⁹².

Although one trial of mass chemoprophylaxis in a closed community (military barracks) showed a significant effect on disease reduction⁹⁴ whether such interventions work in schools or civilian communities is not known^{95,96}. The aim of such interventions is to

eradicate carriage of the outbreak strain from a population at high risk of invasive disease⁹⁷.

If an outbreak is caused by strains of a serogroup for which an effective vaccine exists, vaccination should be considered. Recent data from England and Wales showed that if the serogroup of one case had been identified and another case was diagnosed within four weeks in the same school, the second case was likely to be of the same strain as the first case (K Davison, unpublished data). In the USA vaccination of whole communities in community serogroup C outbreaks is considered when a defined threshold is reached⁹⁸.

Assessment of benefits and costs of interventions must then lead to a decision on public health action. External factors such as availability of staff, antibiotics, vaccine and feasibility of action (such as holidays just started) may well influence the decisions made⁹⁹. More evidence is needed on the effectiveness of such interventions.

Management of clusters in a single educational institution (Recommendation 9)

In this context, a cluster is defined as two or more cases of meningococcal disease occurring in the same preschool group, school, or college/university within a four-week period.

Management of clusters in the wider community (Recommendation 10)

One of the major difficulties in targeting a wider community for intervention is deciding on the population boundaries, often defined by age group and geography. Such boundaries will of necessity be arbitrary. As far as possible, use existing administrative boundaries that make sense to the people who live within and without them. In any case, there are likely to be people living on the other side of the boundary who may feel unjustifiably excluded. The extent of public concern and press interest should not be underestimated⁹⁷.

Although school outbreaks must be handled quickly in order to control alarm and reduce immediate risk of further cases, wider community outbreaks usually build up more slowly and by their nature are more diffuse. The same principles and management steps apply (see above).

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Review of guidelines

The guidelines will be reviewed by the PHLS Meningococcus Forum annually. Any modifications will be publicised in the *CDR Weekly* and the guidelines will be updated on the phls website: <http://www.phls.org.uk>

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BOX 3 Appendices

The three appendices below are currently available on the guidelines website (<http://www.phls.org.uk/publications/cdph/pages/current.html>) or will eventually be archived (<http://www.phls.org.uk/publications/cdph/index.htm>) under vol 5 issue 3, Guidelines article.

- Appendix A. Rifampicin information sheet
- Appendix B. Ciprofloxacin information sheet
- Appendix C. Sample letters

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APPENDIX A Rifampicin

The antibiotic you will be given is called Rifampicin. It comes as either tablets or syrup and is suitable for people of all ages. The meningococcal germs that cause meningitis and septicaemia can be carried in the nose and throat, this antibiotic will kill them.

Rifampicin must be taken twice a day for 2 days (morning and evening), the instructions will be clearly written on the box or bottle. **It is important that you take a 2-day course.** You may have extra medicine left over, which should be disposed of safely.

Rifampicin is a well-known antibiotic, which is used to treat many different conditions. It is recommended in the national guidelines for close contacts of someone with meningococcal disease.

The side effects of Rifampicin may include:

- Orange/reddish staining of body fluids such as urine, sputum and tears.
Beware - this may permanently stain some contact lenses & nappies. Therefore, do not wear contact lenses whilst on treatment.
- Tummy upset, diarrhoea and nausea
- Skin flushing and itching, with or without a rash
- Very rarely, jaundice (yellowing of the skin or whites of the eyes)

Do not take Rifampicin if:

- You are allergic to Rifampicin
- You are on medication for epilepsy (anticonvulsants)
- You are on blood thinning medication (anticoagulants)

Please tell the public health doctor or nurse if any of the above apply and they will arrange for you to have an alternative medicine.

IF YOU ARE PREGNANT OR MAY BE PREGNANT, YOUR TREATMENT WILL NEED TO BE DISCUSSED.

If you are taking the combined oral contraceptive pill (known as “the Pill”) or the progesterone only pill (known as the “mini pill”) you should take extra precautions (e.g. condoms), for the time that you are on Rifampicin and for 4 weeks after your medicine has finished. It is also important that if you only have 7 days of pills (or less) left in the packet, **do not** have your usual 7-day break between packs but instead start to take your new packet immediately after finishing the last one. You may or may not have a bleed that month. Please note - No other type of contraception will be affected by rifampicin.

If you are unclear or would like further information, please contact:

APPENDIX B Ciprofloxacin

The antibiotic you will be given is called Ciprofloxacin. The meningococcal germs that cause meningitis and septicaemia can be carried in the nose and throat, this antibiotic will kill them.

It comes in tablet form. You will receive either one or two tablets of Ciprofloxacin. It is taken as a one-off dose. It is important that you drink plenty of fluid for the rest of the day after having this antibiotic.

Ciprofloxacin is a well-known antibiotic, which is used to treat many different conditions. It is recommended in the national guidelines for close contacts of someone with meningococcal disease.

The side effects of Ciprofloxacin may include:

- Tummy ache, diarrhoea and nausea
- Tiredness
- Facial swelling
- Rarely, breathing difficulties are associated with the facial swelling. **You should seek medical attention urgently if this occurs.**

Do not take Ciprofloxacin if:

- You have previously had a reaction to Ciprofloxacin
- You are pregnant

Please tell the public health doctor or nurse if any of the above apply and they will arrange for you to have an alternative medicine.

If you are unclear or would like further information, please contact:

APPENDIX C Sample letters

Example of information letter to parents after a case

Dear Parent or Guardian,

I am writing to inform you that one **pupil/child* from the **school/nursery* has been admitted to hospital with **meningitis/septicaemia, probably/possibly* caused by the meningococcal bacteria. The child is (**status – responding well to treatment, etc.*). No further action is necessary at the present time. There is no reason to make any change in the **school/nursery* routine and no reason for children to be kept at home.

Meningococcal bacteria are carried in the back of the throat of about one in ten people at any one time but only very rarely cause illness. Most people who carry the bacteria become immune to them. The bacteria do **not** spread easily and those who have had prolonged, close contact with the person with **meningitis/septicaemia* are at a slightly greater risk of getting ill. These people have been identified and given antibiotics to stop the bacteria spreading.

Although the risk of another case in the **school/nursery* is very small, it is sensible to be aware of the signs and symptoms, **which are detailed in the attached leaflet/below*

Meningitis

- Fever
- Vomiting
- Severe Headache
- Stiff Neck
- Dislike of Bright Light

Septicaemia

- Fever
- Vomiting
- Bruising Rash
- Rapid Breathing
- Cold Hands and Feet
- Joint/Muscle Pain

NOT ALL OF THESE SIGNS AND SYMPTOMS MAY SHOW AT ONCE, but someone with this illness will become very ill. The illness may progress over one or two days **BUT IT CAN DEVELOP VERY RAPIDLY**, sometimes in a matter of hours.

Diagnosis in the early stages can be difficult. The early signs can be similar to bad 'flu' symptoms but be **WATCHFUL** and use your instincts. **IF SOMEONE BECOMES ILL WITH SOME OF THESE SIGNS OR SYMPTOMS, CONTACT THE DOCTOR URGENTLY** and ask for advice.

If you have individual worries about this case, you can speak to a member of the public health team on during normal working hours.

Further information is available from:

The Meningitis Research Foundation www.meningitis.org
 The National Meningitis Trust www.meningitis-trust.org
 NHS Direct www.nhsdirect.nhs.uk

0808 800 3344 (24hr Helpline)
 0845 6000 800 (24hr Support Line)
 0845 46 47

Yours sincerely

**Head Teacher/Manager/Public Health Physician*

Example of parent letter if antibiotics and/or vaccine programme

Dear Parent or Guardian,

I am writing to inform you that **two/three pupils/children* from the **school/nursery* have been admitted to hospital with **meningitis/septicaemia, probably/definitely* caused by the meningococcal bacteria. The children are (**status – responding well to treatment, etc.*).

In accordance with national expert guidance, we will be offering preventive antibiotics **and vaccination* to all pupils in the **school/school year*. A special session for this will be held on from to in

Your child should attend this session and bring with them the enclosed consent form, signed by you. I also enclose an information sheet on **meningitis/ciprofloxacin/rifampicin/vaccine* for your information.

For further information, a telephone helpline is available on

Yours sincerely

Public health physician

**Delete/modify as appropriate.*

Example of consent form

.....*School/Nursery

Name of pupil/student Date of birth...../...../.....

Address

School year

**I consent to my child[†] receiving meningococcal vaccine. / I consent to my child[†] receiving preventive antibiotic tablets.
I have read the information leaflet attached.*

[†]Relationship to child: (Mother, Father, Legal Guardian)

NAME (capitals, please)

Date: Signed:

*Delete/modify as appropriate.

