Acute meningococcal disease is a life-threatening infection, it may present as a meningitis and/or sepsicaemia. More rarely other forms of invasive meningococcal disease are encountered. Overall, the mortality for meningococcal infection is approximately 5-10%, but can reach as high as 20-40% in severe sepsis/meningitis. Meningococcal meningitis is the most common cause of bacterial meningitis presenting to hospitals in Ireland. The speed with which meningococcal infections are recognised and treated is critical to achieving a successful outcome and clinical suspicion alone mandates treatment.

Clinical Evaluations for suspected bacterial meningitis or meningococcal sepsicaemia

<table>
<thead>
<tr>
<th>History</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache/Photophobia</td>
<td>Airway is clear</td>
</tr>
<tr>
<td>Neck and back stiffness</td>
<td>Breathing pattern is satisfactory</td>
</tr>
<tr>
<td>Off feeds/vomiting</td>
<td>Circulation pulse rate and volume, BP,</td>
</tr>
<tr>
<td>Irritability</td>
<td>Pyrexia</td>
</tr>
<tr>
<td>Lethargy/altered consciousness</td>
<td>Characteristic rash</td>
</tr>
<tr>
<td>Fever</td>
<td>Meningism</td>
</tr>
<tr>
<td>Rash</td>
<td>Bulging Fontanelle</td>
</tr>
<tr>
<td></td>
<td>Decreased level of Consciousness</td>
</tr>
</tbody>
</table>

**Suspect Septicaemia if**

- Rapid, low volume pulse
- Slow capillary refill time
- Skin to core temperature difference
- Evolving characteristic rash
- Oliguria
- Hypotension rate sign

**Beware: Bad Prognostic Signs include**

- Differential skin/core temp >3°C (children)
- Systolic BP <85 mm Hg (adults)
- Low white cell count
- Metabolic acidosis. Base deficit >8.0
- Coagulopathy
- Rapidly evolving characteristic rash
- Absence of Meningitis
- These patients constitute a very high risk group and warrant vigilant monitoring and early aggressive therapy
Monitoring in Casualty: Non-invasive blood pressure monitoring, Oxygen saturation monitoring, Core and peripheral temperature monitoring.

**HOSPITAL MANAGEMENT OF MENINGOCOCCAL INFECTION**
(For additional detail on each point see similarly numbered appendix)

1. **ADMINISTER** ≥ 40% O₂
2. **SUMMON HELP** (Ideally > 1 doctor should be present to optimise initial management)
3. **ORDER FIRST DOSE ANTIBIOTICS TO BE DRAWN UP**

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Age</th>
<th>0-1 month</th>
<th>1-3 months</th>
<th>&gt; 3 months</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cefotaxime</td>
<td></td>
<td>50mg/kg</td>
<td>75 mg/kg</td>
<td>75 mg/kg (max 2g)</td>
<td>2 g</td>
</tr>
<tr>
<td>Ampicillin</td>
<td></td>
<td>75 mg/kg</td>
<td>100 mg/kg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gentamicin</td>
<td></td>
<td>2.5mg/kg</td>
<td>2.5 mg/kg</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In true penicillin allergy (hx.Anaphylaxis/urticaria) use chloramphenicol 25mg/kg/dose (max. 1g.)

4. **SITE I.V. CANNULAE** (as large as practical, ideally 2)

5. **DRAW BLOODS** In order of priority: if delayed > 5 mins, give antibiotics

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2. FBC, diff, meningo PCR</td>
<td>5. Blood culture</td>
<td>8. Serum store</td>
</tr>
<tr>
<td>3. INP/PT, AFTT</td>
<td>6. U &amp; E</td>
<td></td>
</tr>
</tbody>
</table>

6. **ADMINISTER ANTIBIOTICS WITHOUT DELAY**
(re. Dexamethasone therapy see appendix 6).
(7) IV FLUID RESUSCITATION: bolus 20 mls/kg Hartmann’s; repeat if necessary.

If fluid bolus >40 ml/kg required: **Intubate & ventilate**
Fluid bolus > 40-60 ml/kg **Intubate & insert central line**
(keep CVP 10-15 mmHg) Insert arterial line
Unstable after 60 ml/kg bolus **Commence inotropes**
Adrenaline 0.1 – 1.0 mcg/kg/min or
Dopamine 1.0 – 20.0 mcg/kg/min

Reassess crystalloid fluid requirements hourly. Monitor blood glucose & assess need for dextrose.

(8) INTUBATION also required if there is an altered level of consciousness

(9) SKIN SCRAPINGS and/or NEEDLE ASPIRATION

(10) THROAT SWAB and/or PERNASAL SWAB

(11) FURTHER CONSULTATION: consider tertiary centre referral (appendix 11)

(12) LUMBAR PUNCTURE when haemodynamically stable (usually day 2-3)

(13) FURTHER MANAGEMENT (coagulation, renal failure et al: appendix 13)

(14) NOTIFY public health and initiate CHEMOPROPHYLAXIS if necessary.

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**Appendix 1: Oxygen**

Remember ABC: if not breathing, clear airway and initiate artificial ventilation.
Hypoxaemia is common and rapidly fatal: better to give too much oxygen than too little. Do not wait to document hypoxaemia before administering oxygen.

---

**Appendix 2: Summon Help**

Ideally two physicians (anaesthetic and medical) and nursing support should be available.
Meningococci remain exquisitely sensitive to penicillin and 3rd generation cephalosporins. A 3rd generation cephalosporin is usually chosen for initial empiric therapy as, rarely, other organisms insensitive to penicillin can give rise to an identical clinical picture, thus the empiric therapy for meningococcus will additionally cover other common aetiologic organisms in each age group. While some clinicians favour the use of penicillin in addition to cefotaxime or ceftriaxone, evidence supports the use of these cephalosporins as monotherapy in this situation.

As soon as the susceptibility of the isolated organism is available the choice of antibiotics should be reviewed and appropriate changes made e.g. substitution of penicillin G for cefotaxime.

### Appendix 3: Antibiotic therapy (N.B. Doses listed are mg/kg/dose)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Usual adult doses:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cefotaxime</td>
<td>2.0 gm every 4 or 6 hours</td>
</tr>
<tr>
<td>Penicillin</td>
<td>2.4 gm every 4 hours</td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>1.0 gm every 6 hours</td>
</tr>
</tbody>
</table>

**Empiric therapy for children is age-related:**

<table>
<thead>
<tr>
<th>Age</th>
<th>Drug</th>
<th>mg/kg/dose</th>
<th>frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 1 mos</td>
<td>Ampicillin</td>
<td>75 mg/kg</td>
<td>Q6 Hrs</td>
</tr>
<tr>
<td></td>
<td>Cefotaxime</td>
<td>50 mg/kg</td>
<td>Q8 Hrs</td>
</tr>
<tr>
<td></td>
<td>Gentamicin</td>
<td>2.5 mg/kg</td>
<td>Q8Hrs *(Modify if premature)</td>
</tr>
<tr>
<td>1 – 3 mos</td>
<td>Ampicillin</td>
<td>75-100 mg/kg</td>
<td>Q6 Hrs</td>
</tr>
<tr>
<td></td>
<td>Cefotaxime</td>
<td>75 mg/kg</td>
<td>Q8 Hrs</td>
</tr>
<tr>
<td></td>
<td>Gentamicin</td>
<td>2.5 mg/kg</td>
<td>Q8 Hrs (Not to exceed 12g/day)</td>
</tr>
<tr>
<td>&gt; 3 mos</td>
<td>Cefotaxime</td>
<td>75mg/kg</td>
<td></td>
</tr>
</tbody>
</table>
Additional antibiotic doses that may be indicated for children

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>dose</th>
<th>frequency</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzyl Penicillin</td>
<td>50 mg/kg</td>
<td>Q4 Hrs (Max 2.4g Q4 Hrs)</td>
<td></td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>25 mg/kg</td>
<td>Q6 Hrs (not to exceed 4g/day)</td>
<td></td>
</tr>
<tr>
<td>Vancomycin</td>
<td>15 mg/kg</td>
<td>Q6 Hrs (not to exceed 4g/day)</td>
<td></td>
</tr>
</tbody>
</table>

(1) Ceftriaxone may be used in place of cefotaxime, and can be administered once or twice daily.

(2) A clear history of penicillin anaphylaxis is a contraindication to use of penicillin or cephalosporin antibiotics. A history of skin rash or GIT upset is not a contraindication to penicillin therapy. Chloramphenicol is indicated if there is a history of penicillin anaphylaxis.

(3) In neonatal meningitis, once the susceptibility of the organism is known and the CSF is sterilized, antibiotics may be modified to the most active and least toxic. For GBS this is penicillin G, for Listeria this is ampicillin. With gram negative organisms choice will depend on susceptibility data.

(4) If initial CSF gram stain results show gram positive cocci, consistent with pneumococcal meningitis, add vancomycin at dose listed above pending confirmation of sensitivity of isolate to penicillin and cephalosporins.

Duration of IV antibiotic therapy (total course must be given intravenously)

<table>
<thead>
<tr>
<th>Infection</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncomplicated meningococcal infection</td>
<td>7 days</td>
</tr>
<tr>
<td>Uncomplicated Haemophilus infection</td>
<td>7 days</td>
</tr>
<tr>
<td>Uncomplicated pneumococcal infection</td>
<td>10 days</td>
</tr>
<tr>
<td>Group B streptococcal infection</td>
<td>14-21 days</td>
</tr>
<tr>
<td>Listeria Monocytogenes infection</td>
<td>10-14 days, 21 days in immunocompromised</td>
</tr>
<tr>
<td>Gram negative infection</td>
<td>21 days (minimum 14 days post sterilization of c.s.f.)</td>
</tr>
</tbody>
</table>

Appendix 4: Intravenous access

Ideally site two large intravenous cannulae. Remember the intraosseous route can be used in children < 7 years.
Appendix 5: Blood Sampling

This should be carried out at time of cannula insertion and should not be permitted to delay overall management. As colour coding of tubes can be institution-specific it is suggested that each institution list local requirement clearly in this appendix.

1. Venous blood gas: 0.3ml in a heparinised syringe
2. FBC, differential & meningococcal PCR: EDTA tube
   Blood for PCR must be collected on admission as following antibiotic therapy the specimen will rapidly revert to negative. The minimum sample size is 0.5ml collected in EDTA tube. This should be stored frozen at –20°C pending results of culture. If cultures are negative the specimen should be sent to the Meningococcal Reference Laboratory at The Children’s Hospital, Temple Street. Meningococcal DNA is liable to autolyse if left unprocessed for more than 48-72 hours, therefore delays in dispatching the specimen should be minimised. Specimens do not require refrigeration during transport.
3. INR/PT, APTT: Coagulation tubes
   Additional parameters of coagulation status, e.g. fibrinogen, d-dimers, and protein C level can be useful adjuncts in the management of patients if available.
4. Dextrostix
5. Blood culture – Aerobic bottles only
6. U & E. Some may choose to obtain Calcium, and LFT’s if readily available.
7. Blood Group and Hold, serum tube
8. Meningococcal serology – may be convenient to take on admission, but can be obtained any time in first 48 hours.

Acute and convalescent serum samples
Seroconversion in association with the acute illness will allow the clinical diagnosis to be made in bacteriologically negative cases. The acute serum sample should be obtained within 48 hours of admission and stored. If a bacteriological diagnosis is not made, a second serum sample must be obtained, ideally 14-21 days after presentation (but take prior to discharge if there is concern that patient may not return for follow-up). These paired specimens will be sent to the Meningococcal Reference Laboratory at The Children’s Hospital, Temple Street for testing for IgG and IgM antibody against meningococcal outer membrane proteins. The acute specimen will be stored and not sent until the matched convalescent specimen is available.

Appendix 6: Antibiotic Administration & Role of Dexamethasone

It is critical that antibiotics are given without delay
There is no evidence to support a benefit for steroids in meningococcal septicaemia, however if the patient remains unresponsive to i.v. fluid and inotropic therapy consider adrenal compromise (Waterhouse Fridericksoa Syndrome) and administer physiological steroid replacement therapy (hydrocortisone 1 mg/kg 6 hourly)
Early use of corticosteroids, ideally given before administration of antibiotics, has been associated with lower rates of neurological sequelae and deafness following H. influenza meningitis in children. There is experimental evidence to support a similar benefit in pneumococcal meningitis, however data regarding meningococcal infection are lacking. Many clinicians use steroids for the possible benefit they might afford in meningococcal meningitis. Originally recommended for 4 days, similar outcome with 2 and 4 day regimens have been demonstrated.

The recommended dose is Dexamethasone 0.15 mg/kg, (4 mg in adults) every 6 hours for 2 days.

Appendix 7: Fluid and inotropetherapy

Fluid resuscitation should start immediately with Hartmann’s, normal saline, or colloid (whichever is most readily available). In the presence of septicaemic shock in infants and children colloid fluid therapy in the form of 4.5% albumin may be used in the early resuscitation period. There is no advantage for using albumin in place of crystalloids in adults. Fresh frozen plasma should be reserved for patients with significant coagulopathy or very low fibrinogen. Crystalloid fluid (Hartmann’s) administration should be at 100% of maintenance requirements until cardiovascular stability is restored. If there is continued evidence of haemodynamic instability repeat boluses of 20mls/kg at 10-minute intervals. Maintain Hb > 8 g/dl. If unresponsive to adrenaline or dopamine consider adding noradrenaline.

Appendix 8: Intubation

If indicated, tracheal intubation should take place before moving the patient e.g. from A&E to ICU. Drowsiness alone should be considered an indication for intubation in these patients. Doses of anaesthetic induction agents will need to be modified in shocked cases. Intubation is a prerequisite for inter-hospital transfer. If considering insertion of a central line, intubate first (regardless of level of consciousness).

Mechanical ventilation lessens the risk of severe hypoxaemia precipitating cardiac arrest, reduces oxygen consumption and lessens cardiovascular instability.

Appendix 9: Skin Scraping/Needle Aspiration

The characteristic rash of meningococcal infection evolves from an early erythematous maculo-papular eruption to the more characteristic purple lesions, misnamed purpura. These lesions do not represent skin haemorrhage, but rather clotting of small vessels in the skin resulting in ischaemia, that may progress to skin necrosis. The severest manifestation of this necrosis has been called “purpura fulminans”. Similar pathology also occurs internally.
Technique for taking skin scrapings
1. Obtain glass microscope slides with frosted glass ends and plastic slide holders.
2. Wearing Latex gloves, pinch a skin lesion between index finger and thumb in order to exclude circulating blood.
3. Pick the surface of the lesion with a sterile scalpel blade.
4. Apply more pressure to obtain a drop of tissue fluid and blood, this is spotted directly onto a glass slide by pressing the slide against the lesion. Several small smears are better than one large one.
5. The procedure should be repeated with a second skin lesion.
6. Label the frosted end of the slide in pencil with the patient’s name. Place in the slide holder and send to the laboratory for staining.
7. the excoriated lesion should also be swabbed with a culture swab.

Procedure for needle aspiration of skin lesions
Aspiration should be performed using a needle and syringe containing 1-2 ml sterile saline. Insert the needle into the centre of a lesion at angle almost parallel to the skin, followed by a gentle up and down movement of the bevel of the syringe. The aspirate should be injected aseptically into a blood culture bottle, labelled clearly, and submitted for culture.

Appendix 10: Throat Swab / Pernasal Swab
In order to optimise the chances of obtaining an isolate for antibiotic susceptibility, grouping and typing, throat swab (a full sweep of the pharyngeal wall and tonsils) should be taken in all patients. If this is not possible a pernasal swab rotated on the posterior pharyngeal wall is an appropriate alternative. Consideration may be given to taking throat swabs from family members prior to giving prophylaxis, with a view to finding the causative organism, particularly where the index case is < 5 years old. To prevent any possible feeling of guilt, it should be clearly explained the intention is simply to identify the strain causing illness.

Appendix 11: Further Consultation
If there is persisting cardiovascular instability, evolving skin lesions, limb ischaenia, acute renal failure or ARDS, consider referral to a tertiary centre.

Appendix 12: Lumber Puncture
A samples of CSF (8 – 10 drops per tube) cell count, protein and glucose and ------ meningo PCR.
Lumber puncture is contraindicated in the following situations:
    Signs of raised intracranial pressure.
    Cardiorespiratory instability.
Sepsis in the area which the lumber puncture needle will pass.

Appendix 13: Further Management

(a) COAGULATION MANAGEMENT

Background
Intravascular coagulation plays a major role in the pathogenesis of meningococcal septic shock, a clinical syndrome associated with severe meningococcal infection. This results in the deposition of fibrin strands in the microvasculature of the skin and viscerae leading to poor tissue perfusion and local ischaemia. This can evolve rapidly to “purpura fulminans” haemodynamic instability, end organ failure and death in certain patients. A severe depletion of Protein C at presentation has been associated with such a rapid and fulminant course and a poor outcome in meningococcal septic shock.

Protein C is a naturally-occurring anticoagulant that, when activated by thrombin, can inactive coagulation factors V and VIII. Acute depletion of protein C can potentiate disseminated intravascular coagulation by causing a loss of this negative feedback mechanism.

Fresh Frozen Plasma (FFP) and Cryoprecipitate
FFP is the standard coagulation factor product used to correct consumptive coagulopathy in bleeding patients, as it contains a wide selection of coagulant and anticoagulant factors, although poor in Protein C.

One unit of cryoprecipitate (c. 100ml) is derived from one unit of plasma (c. 250ml). Cryoprecipitate should be submitted for FFP when fluid restriction is crucial or when fibrinogen supplementation in particular is required. Fibrinogen levels should be kept above 1.0 g/l in the absence of bleeding, and above 1.5 g/l where there is active bleeding.

Doses: FFP: 10 – 20 ml/kg; cryoprecipitate: 2 bags per 5 kg.

Platelet transfusion
Platelet transfusion should be reserved for patients with active bleeding, and for those with a platelet count of less than 20 x 10^9 /l and severe consumptive coagulopathy on coagulation testing. In meningococcal infection the skin rash indicates micro-infarcts and does not indicate platelet deficiency or dysfunction.

Heparin
Heparin is commonly used to counteract small vessel thrombosis in severe systems meningococcal infection. It is also advised where protein C therapy is used. Heparinization is part of CRRT.

Administration: after a loading dose of 30 units kg, commence an i.v. infusion of 1.5 units/kg/hour.
Heparin is not contraindicated by prolonged coagulation indices unless there is active bleeding or extreme thrombocytopenia (\( < 20 \times 10^9 / L \)). Note that confluent apparent purpura does not signify bleeding and should strengthen the argument for anticoagulation.

**Protein C**

Replacement of protein C with protein C concentrate from pooled multiple blood donations is an experimental therapy which has been used in an attempt to reverse the coagulation disorder in meningococcal infection. Protein C is an unlicensed agent and randomised controlled trials of its efficacy are awaited. As with other pooled blood products there are concerns about blood transmitted diseases. Protein C is available through the BTSB at Pelican House and is also kept at some regional centres. It should only be used in consultation with a haematologist experienced in its use.

Protein C therapy is usually reserved for patients with rapidly progressive of extensive skin lesions (purpura fulminans), septic shock, protein C activity \(< 20\%\) and severe consumptive coagulopathy.

As this is an unlicensed product informed consent (sample form given) must be obtained from the next of kin.

(b) **CONTINUOUS RENAL REPLACEMENT THERAPY (CRRT)**

This is now the standard method of managing acute renal failure in critically ill patients and in general will be mandatory within 48 hours of onset of oliguria. Given evidence that haemofiltration can attenuate the severity of the septic process (particularly cardiovascular and coagulation effects) it is now normal practice to commence CRRT in severe cases within hours of diagnosis. CRRT involves low-dose heparinization which may be beneficial in its own right.

These considerations raise the question of transfer to a tertiary centre ICU within hours of diagnosis

(c) **PLASMAPHERESIS / PLASMA EXCHANGE / WHOLE BLOOD EXCHANGE**

In some centres these “blood purifying” therapies have been advocated in severe meningococcal sepsis, particularly with extensive skin lesions. Generally they are not used in addition to CRRT which has become routine in the most severe cases.

(d) **OTHER THERAPIES**

RBPI 21 (recombinant bactericidal permeability-increasing protein) has been used in severe meningococcal infection. Thrombolysis with RTPA for ischaemic limbs has been performed but its role is uncertain. Likewise anti-endotoxin antibody (HA-IA) and ---- ---- supplementation are under consideration but of uncertain benefit.
INFORMED CONSENT

Protein C is a protein normally found in human blood that prevents the formation of clots in the circulation. A reduction or absence of this protein results in blood clots that block small vessels in different parts of the body and cause severe damage in various organs. It can lead to skin lesions that may require skin grafting or amputation.

As your doctor has explained to you, your child/spouse/relative has a disorder resulting from a severe bacterial infection that causes the protein C in his/her body to be used up. In addition to the well-established methods for treating the severe infection, this condition may also benefit by replacing protein C in the patient’s plasma. A company named Immuno-AG, Vienna, Austria, has developed a highly purified concentrated form of protein C from human plasma called Protein C Concentrate (Human). This contains large amounts of protein C in a small volume of fluid and this enables your doctor to replace the Protein C and obtain the desired levels without the risk of overloading the patient with excess fluid. Furthermore, this product is highly purified and should contain no other proteins from the plasma (e.g., clothing factors). Preliminary results of treatment with Protein C Concentrate (Human) have been encouraging. However, this product has not been approved for use in severe infections in Ireland. Therefore, its use in treating patients with such severe bacterial infections must be considered investigational. Although the preliminary studies have shown promising results in the treatment of other illnesses with Protein C deficiency, there is no guarantee that Protein C Concentrate (Human) will be successful in the treatment of your child/spouse/relative’s condition.

Protein C Concentrate (Human) is prepared from whole human plasma. When medicinal products such as this (i.e. prepared from human blood or plasma) are administered, disease due to the possible transmission of infectious agents cannot be totally excluded. To reduce the risk of transmission of such infectious agents, stringent controls are applied to the selection of blood donors and donations, and in addition, certain virus removal and/or inactivation procedures are included in the production process. However, the risk of transmission of viral infections from this product cannot be totally eliminated.

As with all infused plasma derived medicines, there is a possibility that your child/spouse/relative will experience an allergic reaction. Minor allergic reactions include fever, rashes, nausea, upset stomach and dizziness. Anaphylactic shock (resulting in shortness of breath, cough, chest pain, fever), although very rare, cannot be ruled out. Your child/spouse/relative will be kept under strict supervision and if any of these reactions should occur, he/she will receive prompt appropriate treatment. In addition, if he/she receives a Protein C concentrate blood samples will need to be taken frequently to monitor Protein C levels. The drawing of blood is sometimes associated with, but need not include, pain and bruising at the site where the blood is drawn. Occasional light-headedness and rarely fainting may occur during the drawing of blood.

If you do not wish your child/spouse/relative to receive Protein C Concentrate (Human) it will in no way affect subsequent treatment at this institution.
I have read the above and fully understand the potential risks and benefits associated with my child/spouse/relative receiving Protein C. I feel that I have had enough time to consider the decision to allow my child/spouse/relative to receive Protein C. I have been given an opportunity to ask questions that I may have, and all my questions have been answered to my satisfaction.

I give permission for ………………………………………..to receive Protein C.

I am aware that Dr. …………………………………. or his associates will be available to answer any questions regarding treatment that I may have during the course of treatment.

______________________   ______________________
Patient’s Name     Next of Kin’s Signature

_______________________   ______ / _______ / ______
Signature of Physician    Date
Rifampicin is the standard chemotherapylactic agent

Recipients should be warned that it may:

- interfere with the contraceptive pill and with anticoagulants
- discolour urine, sweat and tears (red discolouration) and permanently discolor soft contact lenses.

Rifampicin is contraindicated in pregnancy and in the presence of severe liver disease.

Dose Schedule for rifampicin: **Note:** **Max single dose 600mg**

<table>
<thead>
<tr>
<th>Age</th>
<th>H. Influenzae</th>
<th>N. Meningitidis</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 12 months</td>
<td>20 mg/kg once daily for 4 days (for infants &lt;1 month 10mg/kg/day)</td>
<td>5 mg/kg twice daily for 2 days</td>
</tr>
<tr>
<td>1 – 12 years</td>
<td>20 mg/kg once daily for 4 days 600 mg once daily for 4 days</td>
<td>10 mg/kg twice daily for 2 days 600mg twice daily for 2 days</td>
</tr>
<tr>
<td>Children &gt;12 &amp; Adults</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TREATMENT OF INDEX CASES:**

In cases of meningococcal or *Haemophilus influenza* infection initiate oral rifampicin as soon as the patient can tolerate oral antibiotics. Should be initiated prior to discharge.

**TREATMENT OF CONTACTS:** *Meningococcal infection*

When to give? Within 24 hours if possible, and up to 30 days post identification of index case.

Who should receive prophylaxis:

1. Close contacts: i.e., those who in the 7 days preceding the hospital admission
   - shared living/sleeping accommodation
   - were baby-sitters/baby minders of the index case
   - were mouth kissing contacts (not cheek kissing contacts)
   - were in the same nursery/ètreche (includes adult carers)
   - gave mouth to mouth resuscitation to the index case.

2. Chemoprophylaxis is not necessary for classmates of an index case unless there are two or more cases of the same strain in the school during the same term.
   If the cases occur in the same class members and staff should receive prophylaxis.
   If the cases occur in different classes discuss management with the ID/Public Health service.

3. Special consideration should be given to situations where there is greater than usual interaction between members of the extended family or adverse living conditions exist may wish to give prophylaxis.

Appendix 14: N.MENINGITIDIS & H. INFLUENZAE PROPHYLAXIS

To be given to contacts (see below) and must be given to the index case prior to hospital discharge.
4 Prophylaxis is not recommended for co-passengers on public transport.

**TREATMENT OF CONTACTS:** *Haemophilus Influenza* infection.

*When to give?* Within 24 hours if possible.

*Who should receive prophylaxis?* All household contacts, irrespective of age of immunisation status, in those households with at least one contact <48 months or where all <48 months are fully immunised.

**ALTERNATIVE CHEMOPROPHYLACTIC AGENTS:**

In cases of meningococcal infection if rifampicin is contraindicated alternative agents include:

- **Ceftriaxone one dose I.V./I.M:** Children < 12 yrs give 125mg. Adults give 250mg.
- Ciprofloxacin, 500mg PO is effective, but is not licensed for this purpose.

**PREGNANCY:**

For close contacts who are pregnant, options following counselling include giving no prophylaxis, giving Ceftriaxone, or taking a throat swab and giving prophylaxis if meningococcus is cultured. Harmful effects on the foetus have not been demonstrated with Ceftriaxone.

**VACCINATION:**

For vaccine preventable strains; A, C, Y, W-135, vaccination will be offered by the public health service.

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**Notification of Infectious Disease**

All suspected cases of bacterial meningitis or meningococcal septicaemia must be notified to the relevant Medical Officer of Health. Telephone notification should be used initially to the appropriate AMO and is the responsibility of the admitting team. All telephone notifications should be followed by written notification.
**MENINGOCOCCAL DISEASE**

**PROTOCOL FOR INITIAL TREATMENT, NOTIFICATION, DIAGNOSIS AND CHEMOPROPHYLAXIS**

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**Initial Treatment**
Early treatment of suspected cases substantially reduces the mortality from meningococcal disease. General Practitioners and Casualty Officers should treat suspected cases immediately with parenteral Benzyl penicillin before admission to hospital (1200mgs for adults and children aged 10 years and over, 500mgs for children). Chloramphenicol is a suitable alternative for patients who are allergic to penicillin.

**NOTIFICATION**
All suspected cases should be notified immediately to the Director of Community Care/Medical Officer of Health or the Senior Area Medical Officer. Initial notification should be by telephone.

**DIAGNOSIS**
The ‘Gold Standard’ is to obtain a culture of the organism from blood or CSF. Hence blood cultures and CSF (if thought appropriate) should be taken as soon as possible. If penicillin has already been given it is likely to render blood cultures negative but is less likely to affect CSF results. *Always send full clinical details with the lab specimens.*

In order to optimise the chances of demonstrating the organism and obtaining an isolate for sensitivity testing and epidemiological purposes, the following additional specimens should ideally be collected on admission.

- Throat Swab*
- Rash Aspirate**
- Sero-diagnosis (0.5-1ml of blood is required for antibody detection). Ideally paired specimens of serum are required, if the diagnosis remains unconfirmed (one on admission and one after 14 – 21 days or on discharge from hospital).
- PCR Examination
  - (A) CSF – part of the CSF specimen taken for culture can be sent for polymerase chain reaction examination (PCR). This is important especially in cases where nothing is cultured from the CSF or blood. Specify PCR on lab request form.
  - (B) Blood – 2.5mls of EDTA or citrated specimen of blood should also be sent for PCR examination.

**THROAT SWAB**
A sweep of the pharyngeal wall and tonsils should ideally be taken from all patients. If this is impossible – for example, from a baby or unco-operative patient – a per-nasal swab rotated on the posterior pharyngeal wall is a practical alternative. Fluffy charcoal impregnated swabs are preferred and should be placed immediately in transport medium and sent for culture "N. Meningitidis". These specimens should be processed urgently by the laboratory.

**RASH ASPIRATE EXAMINATION**
In a patient with a petechial rash, skin scrapings may be taken using the following method :-

Obtain glass microscope slides with frosted ends and plastic slide holders.

Wearing latex gloves, pinch a purpuric skin lesion between index finger and thumb in order to exclude circulating blood.

“Pick” the surface of the lesion with a sterile scalpel blade.

Apply more pressure to express a drop of tissue fluid and blood, this is spotted directly onto a glass slide by pressing the slide against the lesion – several small smears of 3 - 4 mm in diameter are better than one large one. The procedure should be repeated with a second skin lesion.

Label the frosted end of the slides in pencil with the patient’s name. Place in a slide holder and send to the laboratory for staining.
TO ALL WARDS AND DEPARTMENTS:

RE: CHEMOPROPHYLAXIS TO CONTACTS OF MENINGITIS.

Meningococcal and Haemophilus influenza meningitis are special cases in that chemoprophylaxis may be given to contacts of the case. This can be arranged through the Director of Community Care’s office. If outside normal Retail Pharmacy hours the Hospital should provide a prescription for the close contacts of the case, and also inform them that by contacting 088-526800 they will find out the name of the Retail Pharmacist on call.

WHO SHOULD RECEIVE PROPHYLAXIS?

1. HOUSEHOLD CONTACTS:
   Chemoprophylaxis should be offered to all those sharing living accommodation with the case in the preceding 10 days.

2. “KISSING” CONTACTS:
   Chemoprophylaxis should be offered to all mouth and kissing contacts in the preceding 10 days.

3. NURSERY SCHOOL AND DAY CARE CONTACTS:
   This situation should be assessed by the Public Health Doctor involved and prophylaxis given as necessary.

4. HOSPITAL STAFF:
   Generally speaking Hospital are NOT at risk of infection unless there has been close contact such as:
   
   (a) Mouth to Mouth resuscitation has been performed.
   
   (b) The Blood / body fluid / CSF of the patient has been in direct contact with the non-intact skin or mucous membranes of the staff member.

   ONLY IN SUCH CASES WOULD PROPHYLAXIS BE NECESSARY.

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Copy of Original available through Infection control office.
MENINGITIS

Meningitis is a serious infection of the outer membrane of the brain. It can occur at all ages, although children are most frequently infected.

Meningitis may be either bacterial or viral and both can be differentiated by their clinical presentation and the results of lumbar puncture and other investigations. The most common cause of bacterial meningitis is Neisseria Meningiridis. Less frequent causes include haemophilus influenzae and Strep. Pneumoniae. All patients with meningitis should be isolated according to the standard isolation protocol. If the meningitis is bacterial, isolation is unnecessary after 48 hours of treatment with the appropriate antibiotic.

Meningitis is a notifiable disease and the Director of Community Care should be informed of each case as soon as possible. A notification slip should also be filled in and returned to Director of Community Care.

Meningococcal and haemophilus influenzae meningitis are special cases in that chemoprophylaxis may be given to contacts of the case. This can be arranged through the Director of Community Care’s office. If outside office hours the hospital should provide chemoprophylaxis for close contacts of the infected patient.

Who should receive Prophylaxis?

1. **Household Contacts:** Chemoprophylaxis should be offered to all those sharing living accommodation with the case in the 10 days preceding admission.

2. **“Kissing Contacts”:** Chemoprophylaxis should be offered to all mouth kissing contacts of the case in the preceding 10 days.

3. **Nursery School and Day Care Contacts:** The situation should be assessed by the Public Health Doctors involved and prophylaxis given as necessary.
4. **Hospital Staff:** Generally speaking hospital staff are not at risk of infection unless close contact such as mouth to mouth resuscitation has occurred. In such cases prophylaxis would be necessary.

5. **Index Case:** As the antibiotic therapy for the disease does not eradicate carriage of the infecting organism, the chemoprophylactic regime of antibiotic should be given to the patient at discharge.

**Antibiotic Regime**

Rifampicin is the antibiotic of choice for both meningococcal and Haemophilus influenza chemoprophylaxis. The dose of Rifampicin is 10mg./kg (5mg./kg for babies less than three months) 12 hourly for two days up to a maximum of 600mg per dose.

In Haemophilus influenza disease chemoprophylaxis is not indicated for children under three months of age as carriage rates are very low in this group. All other contacts who need chemoprophylaxis should receive 20mg/kg of Rifampicin once daily for four days up to a maximum of 600mg per day.

Rifampicin should be preferably be taken at least thirty minutes before a meal or two hours afterwards to ensure rapid and complete absorption.

**Precautions to be observed with patients with Meningococcal Meningitis**

**Single Room:** Necessary – Door to be kept closed

**Hands:** Must be washed with an antiseptic soap on entering and before leaving the. Hibisol can be used at the bedside.
Masks: Necessary for those who come in close contact with patients, e.g. During physiotherapy.

Plastic Apron & Gloves: Necessary when dealing with sputum and respiratory secretions.

Sputum & Secretions: Use impervious disposable container with tightly fitting lid. Dispose of in yellow clinical waste bag. Label to alert laboratory personnel.

Crockery & Cutlery: No special precautions necessary.


Terminal Disinfection of Room: Use Presept 0.1% for cleaning all surfaces and furniture.

Length of Isolation: For 48 hours after start of effective treatment.

Observe same precautions for Haemophilus influenza meningitis.