Secondary and Tertiary Prevention in the Control of Communicable Diseases

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Secondary and tertiary prevention is important in the control of many communicable diseases, and comprises four modalities: infection prevention and control, vaccination, chemoprophylaxis and immunoglobulin therapy. Such preventive measures aim at reducing both transmission of disease from the ill person (the index case) and occurrence of disease in vulnerable exposed contacts.

INFECTION PREVENTION AND CONTROL

INFECTION PREVENTION AND CONTROL (IPC) IN THE PRE-HOSPITAL HEALTH CARE SETTING

Standard precautions
Health care workers should perform standard precautions when attending to all patients, independent of their infectious status. This includes:
- Hand hygiene with liquid soap and water, or with an alcohol-based handrub in the following situations: before and after patient contact, before aseptic tasks, after glove removal and after contact with contaminated environmental surfaces/equipment.
- Use of personal protective equipment (PPE), which includes gloves, aprons, masks and visors where appropriate. Selection of PPE is based on a risk assessment. Is there a risk of transmission of micro-organisms to the patient, or is there a risk of contamination of the health care worker’s clothing or skin by contact with the patient? As a general guide:
  - Gloves must be worn for invasive procedures, contact with sterile sites and non-intact skin or mucous membranes
  - Disposable plastic aprons should be worn when there is a risk that clothing may be exposed to blood, body fluids, secretions or excretions (with the exception of sweat).
  - Surgical face masks should be worn when there is a risk of blood, body fluids, secretions or excretions splashing into the face.
- Surgical face masks should also be worn to protect the health care worker from diseases transmitted through respiratory droplets (e.g., respiratory infections, notably influenza and meningococcal disease) when dealing with patients with illness suggestive of such diseases.

INFECTION PREVENTION AND CONTROL IN THE HOME SETTING

Family members and caregivers should be educated regarding appropriate IPC practices, depending on the disease, as follows:

Hand hygiene
This is one of the most important ways to prevent transmission of communicable diseases. Use soap and water, or alcohol handrub. Wash hands after using the toilet, before eating or handling food, and after changing nappies or handling soiled linen. Cover all cuts or abrasions with waterproof dressings.

Cough etiquette
Cover your mouth and nose with a tissue when coughing or sneezing. Throw the tissue away, and wash hands thoroughly.

Environmental cleaning
A general-purpose detergent can be used for cleaning most surfaces; use a cream cleaner/hard surface cleaner for sinks and washbasins. Use separate cloths for kitchen- and toilet/bathroom-cleaning. Re-usable household gloves should be worn for cleaning activities; always wash gloves and hands after use. Work from clean to dirty: always leave the toilet, potty or bedpan until last, to prevent cross-contamination. Use disposable cloths or paper towels for any spills, followed by cleaning.

COMMUNICABLE DISEASES

Note: “Index case” refers to the patient with the disease and “pre-school” is used synonymously with playgroup, nursery school, day care, crèche, and pre-primary school.

MENINGOCOCCAL DISEASE (NEISSERIA MENINGITIDIS)

Occurrence: Sporadic cases throughout the year in South Africa, with a seasonal increase in late winter and early spring. Rarely, outbreaks may occur in closed communal settings, e.g., mines, correctional/detention facilities, academic institutions, pre-schools.

Mode/s of transmission: N. meningitidis colonises the nasopharynx and is transmitted through direct contact with large-droplet respiratory secretions (from the nose or throat) from patients with asymptomatic carriage.

Incubation period: Usually three to four days (range: two to 10 days)

Period of infectiousness: Until live meningococci no longer present in nasopharyngeal secretions; usually after 24 hours of appropriate antibiotic therapy. Note that unlike cephalosporins, penicillin does not eradicate meningococci from the nasopharynx; patients receiving penicillin therapy for meningococcal disease should also be given ciprofloxacin/ritampicin to eradicate nasopharyngeal carriage.

Susceptibility: Household and household-like contacts are at higher risk of developing meningococcal disease. Persons with certain complement deficiencies and splenectomised patients at risk for recurrent/bacteraemic illness.

Control measures:

a. Index case:
   - Patients with suspected meningococcal disease should be admitted to hospital for care, and isolated on admission. Standard precautions and droplet precautions (wearing a surgical face mask) to be practised in the pre-hospital setting for patients with suspected meningococcal disease. Patients receiving penicillin therapy for meningococcal disease should also be given ciprofloxacin or rifampicin to eradicate nasopharyngeal carriage.

b. Contacts
i. Chemoprophylaxis
   - All close contacts should be offered post-exposure chemoprophylaxis. Any one of three effective antibiotics may be used (Table 1).

   ii. Close contacts include:
   - Those with prolonged close contact with respiratory droplets (from nose or throat) of the index case in a household-type setting during the seven days before onset of illness. This includes those living and/or sleeping in the same household; those such as scholars, students, military/police personnel who sleep in the same dormitory and so on, or share a kitchen where they prepare food together or share the same bathroom in a hostel/residence or barracks. Any overnight visitors who slept in the same household within seven days before the onset of illness are also included.
   - Those with transient close contact who have been directly exposed to large droplet secretions (from nose or throat) within 10 days of a patient becoming ill or being admitted to hospital. This includes intimate partners, as well as health care workers and ambulance/emergency personnel.

   b. Communal settings:
   - Educational settings
     - University students/scholars: Identify close contacts as per definitions above. This will usually include close friends who may share eating utensils or meet the other criteria for a close contact – i.e., selected individuals within the patient’s class and not the entire class.
- Pre-school settings: Identify close contacts as far as possible. This is often difficult since young children may have had close contact with many classmates and teachers/attendants during the seven days before onset of illness.

- Workplace: The risk is less in educational settings, and chemoprophylaxis is not recommended except for unusual circumstances where individuals meet the criteria for a close contact.

Chemoprophylaxis is not routinely indicated for the following (unless already identified as close contacts, defined above (see Table 1)):
- All staff and children attending the same pre-school
- All scholars/students in the same school or classroom or tutorial group
- All work or school colleagues
- All friends
- All residents of nursing/residential homes
- Dry kissing on the cheek or mouth
- All individuals attending the same social function
- All passengers travelling in the same plane, train, bus or car.

ii. Vaccine

Meningococcal vaccine is not indicated for routine post-exposure prophylaxis. Vaccination does not offer immediate protection, and is only effective against select meningococcal serogroups. Close contacts of cases that have been given chemoprophylaxis can later be offered appropriate vaccine once the meningococcal serogroup has been confirmed, in order to extend the period of protection if needed. Vaccination may sometimes be used in addition to chemoprophylaxis during outbreaks.

Table 1. Meningococcal disease: recommended post-exposure chemoprophylactic regimens

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Adult dose</th>
<th>Paediatric dose</th>
<th>Route</th>
<th>Duration (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ciprofloxacin</td>
<td>500 mg</td>
<td>10 mg/kg</td>
<td>Orally</td>
<td>Single dose</td>
</tr>
<tr>
<td>Ceftiraxone</td>
<td>&gt;12 years: 250 mg</td>
<td>&lt;12 years: 125 mg</td>
<td>IM</td>
<td>Single dose</td>
</tr>
<tr>
<td>Rifampicin</td>
<td>600 mg</td>
<td>&lt;1 month: 5 mg/kg per dose twice daily</td>
<td>Orally</td>
<td>Two days</td>
</tr>
<tr>
<td></td>
<td>twice daily</td>
<td>&gt;1 month: 10 mg/kg per dose twice daily</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Close contacts who are pregnant should receive ceftriaxone 250 mg IM as a single dose.

from the nasopharynx; patients with Hib disease must also be given rifampicin to eradicate nasopharyngeal carriage.

Susceptibility: Household and pre-school contacts are at higher risk of developing Hib disease, especially those under two years of age.

Control measures

a. Index case:

Patients admitted to hospital must be isolated on admission. Standard precautions and droplet precautions (wearing a surgical face mask) to be practised in the pre-hospital setting for patients with suspected Hib disease. Patients with confirmed or probable Hib disease must be given rifampicin chemoprophylaxis to eradicate carriage, since beta-lactam antibiotics (including cephalosporins) may not reliably eradicate carriage. Index cases themselves also have a small but significant risk of a second episode of invasive Hib disease, mainly within the first six months of the initial episode. Therefore, unimmunised or incompletely immunised patients >10 years must complete their primary Hib immunisation schedule. It is acceptable to offer all patients >12 months but <10 years an extra dose of Hib-containing vaccine prior to hospital discharge if there is concern that the patient may be lost to follow-up.

b. Contacts

i. Chemoprophylaxis

All close contacts should be offered post-exposure chemoprophylaxis with rifampicin (Table 2).

Close contacts include:

- Those with prolonged close contact with respiratory droplets (from nose or throat) of the index case in a household-type setting during the seven days before onset of illness. This includes those living and/or sleeping in the same household; those such as scholars or students who sleep in the same dormitory/flat and so on; intimate partners.
- Health care workers who have had unprotected close contact with respiratory droplets.
- Pre-school and primary school contacts: Identify close contacts as far as possible, which may include the same playgroup/class/social activity group and so on as the index case.

All eligible contacts should be offered chemoprophylaxis up to four weeks after the onset of illness in the index case (see Table 2). Note: Close contacts who are pregnant or breastfeeding should also receive rifampicin chemoprophylaxis.

ii. Vaccine

Hib conjugate vaccine is not indicated for routine post-exposure prophylaxis. However, it is an opportunity to check Hib immunisation status in contacts, and all unimmunised/incompletely immunised patients and contacts <10 years should complete their primary immunisation schedule.

iii. Immunoglobulin

There is no role for immunoglobulin therapy in post-exposure prophylaxis.

Immediate environment: Routine cleaning and disinfection.

Comments: Meningococcal disease (both clinically suspected and laboratory-confirmed) is a notifiable medical condition in South Africa.

HAEMOPHILUS INFLUENZAE SEROTYPE B (HIB)

Occurrence: Occasional sporadic cases in South Africa. Most cases in children under five years; majority of these are children under one year of age. Mode/s of transmission: Hib colonises the nasopharynx and is transmitted through direct contact with large-droplet respiratory secretions (from the nose or throat) from patients or asymptomatic carriers. The portal of entry is usually the nasopharynx.

Incubation period: Unknown, but likely short (two to four days).

Period of infectiousness: Until live organisms no longer present in nasopharyngeal secretions; usually after 24-48 hours of isolation on admission. Standard precautions and droplet precautions (wearing a surgical face mask) to be practised in the pre-hospital setting for patients with suspected Hib disease. Patients with confirmed or probable Hib disease must be given rifampicin chemoprophylaxis to eradicate carriage, since beta-lactam antibiotics (including cephalosporins) may not reliably eradicate carriage. Index cases themselves also have a small but significant risk of a second episode of invasive Hib disease, mainly within the first six months of the initial episode. Therefore, unimmunised or incompletely immunised patients >10 years must complete their primary Hib immunisation schedule. It is acceptable to offer all patients >12 months but <10 years an extra dose of Hib-containing vaccine prior to hospital discharge if there is concern that the patient may be lost to follow-up.

b. Contacts

i. Chemoprophylaxis

All close contacts should be offered post-exposure chemoprophylaxis with rifampicin (Table 2).

Close contacts include:

- Those with prolonged close contact with respiratory droplets (from nose or throat) of the index case in a household-type setting during the seven days before onset of illness. This includes those living and/or sleeping in the same household; those such as scholars or students who sleep in the same dormitory/flat and so on; intimate partners.
- Health care workers who have had unprotected close contact with respiratory droplets.
- Pre-school and primary school contacts: Identify close contacts as far as possible, which may include the same playgroup/class/social activity group and so on as the index case.

All eligible contacts should be offered chemoprophylaxis up to four weeks after the onset of illness in the index case (see Table 2). Note: Close contacts who are pregnant or breastfeeding should also receive rifampicin chemoprophylaxis.

ii. Vaccine

Hib conjugate vaccine is not indicated for routine post-exposure prophylaxis. However, it is an opportunity to check Hib immunisation status in contacts, and all unimmunised/incompletely immunised patients and contacts <10 years should complete their primary immunisation schedule.

iii. Immunoglobulin

There is no role for immunoglobulin therapy in post-exposure prophylaxis.

Immediate environment: Routine cleaning and disinfection.

Comments: Meningococcal disease (both clinically suspected and laboratory-confirmed) is a notifiable medical condition in South Africa.

PERTUSSIS (BORDETELLA PERTUSSIS, BORDETELLA PARAPERTUSSIS)

Occurrence: Sporadic cases throughout South Africa. Most cases in children under five years; of those, highest frequency in children under three months. Clusters and outbreaks do occur.

Table 2. Hib: recommended post-exposure chemoprophylactic regimens

<table>
<thead>
<tr>
<th>Age</th>
<th>Rifampicin dose</th>
<th>Route</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;3 months</td>
<td>10 mg/kg once daily</td>
<td>Orally</td>
<td>4 days</td>
</tr>
<tr>
<td>&gt;3 months</td>
<td>20 mg/kg (maximum 600 mg) once daily</td>
<td>Orally</td>
<td>4 days</td>
</tr>
</tbody>
</table>
**Primary Prevention**

**Mode/s of transmission:** Pertussis is transmitted through direct contact with large-droplet respiratory secretions (from the nose or throat) from patients or asymptomatic carriers by the airborne route.

**Incubation period:** Average seven to 10 days (range: five to 21 days)

**Period of Infectiousness:** Patients are highly infectious during the initial catarrhal stage of illness (i.e., the first two weeks of illness, characterised by rhinorrhoea, nonpurulent conjunctivitis, occasional cough and low-grade fever) and still infectious during the first three weeks after the onset of cough.

Patients are no longer infectious after five days of appropriate treatment with erythromycin/azithromycin/clarithromycin.

**Susceptibility:** Nonimmunised or incompletely immunised persons at highest risk; most importantly, infants too young to have received vaccination and young children who have not completed their primary pertussis vaccination series. School-aged children, adolescents and adults are also susceptible due to waning vaccine-induced immunity.

**Control measures:**

- **Index case:**
  - Patients admitted to hospital must be isolated on admission. Standard precautions and droplet precautions (wearing a surgical face mask) to be practised in the pre-hospital setting for patients with suspected pertussis. Patients with suspected or confirmed pertussis must be isolated until they have completed five days of appropriate treatment with erythromycin/azithromycin/clarithromycin. Unvaccinated or incompletely vaccinated cases up to 10 years of age must complete their course of primary immunisation and booster vaccine once they have recovered from their acute illness.
  - Health care workers who have had unprotected direct face-to-face contact (<two metre distance) for greater than a cumulative period of one hour with an infectious case (i.e., during the 21 days after onset of illness if patient not treated with antibiotics, or during the first five days of appropriate antibiotic treatment) OR direct contact with respiratory secretions from an infectious case, e.g., performing an aerosol-generating procedure or examination of the nose and throat without appropriate personal protective equipment (see Table 3).

**Secondary and Tertiary Prevention**

**Close contacts** include:

- Family/other persons living in the same household during the 21 days after onset of illness in the index case. This includes those such as scholars/students and so on who sleep in the same dormitory/final etc., and also any persons who may have stayed overnight in the household during the 21 days after onset of illness.
- Persons who have had transient contact with the index case during the 21 days after onset of illness who are either at high risk of developing severe illness themselves, or who will have close contact with persons at high risk of developing severe illness. These include:
  - Infants under one year of age who have received less than three doses of pertussis-containing vaccine.
  - Pregnant women >32 weeks’ gestation.
  - People who share a household with an infant too young to be fully vaccinated (under four months of age).
  - People whose work involves regular, close or prolonged face-to-face contact with persons too young to be fully vaccinated (under four months of age).
  - Health care workers working with infants or pregnant women.
  - All contacts in high-risk settings who include infants aged <12 months or women in their third trimester of pregnancy: this includes neonatal intensive care units, childcare settings, and maternity wards.

**Health care workers who have had unprotected direct face-to-face contact (<two metre distance) for greater than a cumulative period of one hour with an infectious case (i.e., during the 21 days after onset of illness if patient not treated with antibiotics, or during the first five days of appropriate antibiotic treatment)**

**Vaccine**

Pertussis vaccine is not indicated for routine post-exposure prophylaxis. However, it is an opportunity to check pertussis immunisation status in contacts, and ensure that all unimmunised/incompletely immunised contacts <10 years should complete their primary immunisation and booster dose schedule. In addition, a booster dose of pertussis-containing vaccine can also be offered to contacts aged ≥10 years (including pregnant women) who have not received a dose of pertussis-containing vaccine in the last five years. Note that DTaP is indicated for the primary vaccination series in children. TdaP (with reduced diphtheria dosage) is indicated for use in persons over six years of age years as a booster dose following primary immunisation.

**Table 3. Pertussis: recommended post-exposure chemoprophylactic regimens**

<table>
<thead>
<tr>
<th>Age group</th>
<th>Clarithromycin</th>
<th>Azithromycin</th>
<th>Erythromycin</th>
<th>Cotrimoxazole</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Neonates (≤1 month)</strong></td>
<td>Preferred antibiotic in neonates</td>
<td>7.5 mg/kg twice a day for 7 days</td>
<td>10 mg/kg once a day for 3 days</td>
<td>Not recommended (associated with hypertrophic pyloric stenosis)</td>
</tr>
<tr>
<td><strong>Infants</strong> (1 month - 12 months)</td>
<td>Under 8 kg:</td>
<td>7.5 mg/kg twice a day for 7 days</td>
<td>1-12 months: 10 mg/kg once a day for 3 days</td>
<td>1-12 months: 125 mg every 6 hours for 7 days</td>
</tr>
<tr>
<td>8-11 kg:</td>
<td>62.5 mg twice a day for 7 days</td>
<td>8 weeks-6 months:</td>
<td>6 months-1 year: 240 mg twice a day for 7 days</td>
<td></td>
</tr>
<tr>
<td><strong>Children</strong></td>
<td>12-19 kg:</td>
<td>125 mg twice a day for 7 days</td>
<td>&gt;1 year: 10 mg/kg (max 500 mg) once a day for 3 days</td>
<td>1-2 years: 125 mg every 6 hours for 7 days</td>
</tr>
<tr>
<td>20-29 kg:</td>
<td>187.5 mg twice a day for 7 days</td>
<td>2-8 years: 250 mg every 6 hours for 7 days</td>
<td>6-12 years: 480 mg twice a day for 7 days</td>
<td></td>
</tr>
<tr>
<td>30-40 kg:</td>
<td>250 mg twice a day for 7 days</td>
<td>&gt;8 years: 500 mg every 6 hours for 7 days</td>
<td>12-18 years: 960 mg twice a day for 7 days</td>
<td></td>
</tr>
<tr>
<td><strong>Adults</strong></td>
<td>500 mg twice a day for 7 days</td>
<td>500 mg once a day for 3 days</td>
<td>500 mg every 6 hours for 7 days</td>
<td>960 mg twice a day for 7 days</td>
</tr>
<tr>
<td><strong>Pregnant women</strong></td>
<td>Not recommended</td>
<td>Not recommended</td>
<td>Preferred antibiotic</td>
<td>Contra-indicated in pregnancy</td>
</tr>
</tbody>
</table>
TREATMENT APPROACHES

PREVENTION OF INFECTIONS

Patients admitted to hospital with suspected diphtheria. Patients must be isolated until 24 hours after completion of antibiotic therapy, and at least 24 hours after completion of antibiotic therapy, are negative for C. diphtheriae. In the absence of such follow-up cultures, patients should be isolated until they have completed 14 days of antibiotic therapy. Patients must be vaccinated according to their age and immunisation history once they have recovered from their acute illness, because clinical infection does not always induce protective immunity. Children, adolescents or adults who are immunised or incompletely immunised should be offered an accelerated diphtheria vaccination series – contact a vaccine-preventable disease expert to discuss this. Children who have completed their primary diphtheria vaccination series plus routine booster/s, and adolescents and adults who have been previously immunised can be offered a diphtheria-containing vaccine booster dose.

Contacts

a. Chemoprophylaxis

Close contacts include:
- Those having close contact with the patient in a house- hold-type setting during the seven days before onset of illness. This includes those living and/or sleeping in the same household; those such as scholars/students etc. who sleep in the same dormitory/flat etc.; and kissing/sexual contacts of the patient.
- Child-minders/nannies and other carers who look after the patient.
- Health care workers who have given mouth-to-mouth resuscitation to the patient or have dressed the wounds of a cutaneous case.

Additionally, there may be other at-risk contacts whose risk of disease will depend on the duration of contact and their immunisation status. Examples of such contacts would include:
- Friends, relatives, and caregivers who regularly visit the home.
- School/pre-school class contacts.
- Those who share the same room at work.
- Other health care workers who have had contact with the index case.

b. Monitoring contacts and quarantine select contacts:

Close contacts and at-risk contacts should be monitored for signs/symptoms of diphtheria for at least seven days. Those whose work involves handling food (especially milk), or close association with unimmunised children should be excluded from work until laboratory tests confirm that they are not carriers.

C. Laboratory investigation of close contacts and at-risk contacts:

All close contacts and at-risk contacts should have nasal and pharyngeal swabs taken for culture to exclude that they are carriers. Should a contact test positive for toxigenic C. diphtheriae, the person will need to be isolated with standard, contact and droplet precautions until two cultures (taken at least 24 hours apart) taken from both nose and throat >24 hours after completing antibiotic therapy are negative for C. diphteriae.

d. Administer chemoprophylaxis:

All close contacts and at-risk contacts should be offered post-exposure chemoprophylaxis. Either benzylpenicillin or erythromycin may be used for chemoprophylaxis (see Table 4).

ii. Vaccine

Diphtheria vaccine is not indicated for routine post-exposure prophylaxis. However, it is an opportunity to check diphtheria immunisation status in contacts, and all unimmunised/incompletely immunised contacts <12 years should complete their primary immunisation and booster schedule. Adolescents and adults may also be offered a booster dose of diphtheria-containing vaccine. Note that DTaP is indicated for the primary vaccination series in children. Td or Tdap (with reduced diphtheria dosage) is indicated for use in persons older than six years as a booster dose following primary immunisation.

iii. Immunoglobin

There is no role for immunoglobin therapy in post-exposure prophylaxis.

Table 4. Diphtheria: recommended post-exposure chemoprophylactic regimens

<table>
<thead>
<tr>
<th>Group</th>
<th>Benzylpenicillin/Erythromycin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children &lt;6 years:</td>
<td>Single dose of 600 000 units IM</td>
</tr>
<tr>
<td>Children &gt;6 years:</td>
<td>Single dose of 1.2 million units IM</td>
</tr>
<tr>
<td>Children &lt;2 years:</td>
<td>125 mg every 6 hours for seven days</td>
</tr>
<tr>
<td>Children 2-8 years:</td>
<td>250 mg every 6 hours for seven days</td>
</tr>
<tr>
<td>Children &gt;8 years:</td>
<td>500 mg every 6 hours for seven days</td>
</tr>
<tr>
<td>Adults</td>
<td>Single dose of 1.2 million units IM</td>
</tr>
<tr>
<td></td>
<td>500 mg every 6 hours for seven days</td>
</tr>
</tbody>
</table>
Immediate environment: Routine cleaning. Disinfection of all articles in contact with patient and all articles soiled by discharges (nose/throat/eye, and skin lesions in the case of cutaneous diphtheria) of the index patient. Terminal disinfection.

Comments: Diphtheria (either clinically suspected or laboratory-confirmed) is notifiable in South Africa.

VARICELLA ZOSTER VIRUS (VZV): VARICELLA (CHICKENPOX) AND ZOSTER (SHINGLES)

Occurrence: Sporadic cases throughout South Africa. Primarily a disease of childhood, but all ages may be affected. Clusters and outbreaks do occur, both in the community and in health care facilities.

Mode/s of transmission:

VZV is transmitted from person to person through:
- Direct contact with or inhalation of:
  - vesicle fluid (both varicella and zoster vesicles). Note that scabs are not infectious.
  - large-droplet respiratory secretions (from the nose or throat) from patients with varicella or asymptomatic VZV carriers. The portal of entry is usually the nasopharynx.
- Indirect contact:
  - through articles freshly soiled by discharges from vesicles (both varicella and zoster vesicles) and mucous membranes of infected people (e.g., clothes, bed linen or furniture)
  - VZV enters through the upper respiratory tract or conjunctiva. The risk for VZV transmission from zoster lesions is about 20% of the risk for transmission from varicella lesions.

Incubation period: Average 14-16 days (range: seven to 21 days)

Period of infectiousness: Varicella: patients are infectious from one to two days before onset of rash until all lesions are crusted; this is usually four to seven days after onset of rash.
- Zoster: patients are infectious from the onset of rash until crusting of the lesions; is usually a week after onset of rash.

Susceptibility: All those not previously infected or vaccinated are susceptible to varicella disease. Ordinarily, disease is more severe in adults than children. Vaccinated persons might develop modified varicella disease with atypical presentation (typically, mild with few skin lesions, no fever, and rash often maculopapular instead of vesicular).

Control measures:

a. Index case:
   - Patients admitted to hospital must be isolated, and kept in isolation until all lesions have crusted over. Standard precautions, contact precautions (wearing gloves, plastic aprons and a surgical face mask) to be practised in the pre-hospital setting for patients with suspected VZV disease.

b. Contacts:
   - Contacts with significant exposure to the index case should be identified. Such persons must have been exposed during the infectious period (i.e., from two days before onset of rash until lesions have crusted over for varicella, and from onset of rash until lesions have crusted over for zoster). Significant exposures include:
     - In the case of zoster cases: direct contact with a zoster rash on an exposed part of the body when the lesions have not yet crusted over
     - In the case of varicella cases: direct contact with a zoster rash
   - Face-to-face contact with a case of varicella
   - Indirect contact:
     - through articles freshly soiled by discharges (varicella vesicles) and mucous membranes of infected people

Dosage of vaccine:
- Nine months to 12 years: one dose of 0.5 ml (one vial) followed by a second dose of 0.5 ml (one vial) approximately three months later.
- 13 years: one dose of 0.5 ml (one vial) followed by a second dose of 0.5 ml (one vial) four to eight weeks later

Varicella vaccine must be administered by deep subcutaneous injection. Varicella vaccine is 70-90% effective in preventing varicella disease in healthy contacts.

Persons in whom vaccination is contra-indicated:

a. Immunocompromised persons. This includes persons who:
   - Have primary immunodeficiencies (e.g., SCID)
   - Are currently being treated for malignant disease with immunosuppressive chemotherapy or radiotherapy, and for at least six months after terminating such treatment
   - All patients who have received a solid organ transplant and are currently on immunosuppressive therapy
   - Patients who received a bone marrow transplant, until at least 12 months after finishing all immunosuppressive treatment

b. Pregnant women

Dosage of ZIG:
- 0-5 years: 2 ml (one vial)
- 6-10 years: 4 ml (two vials)
- 11-14 years: 5 ml (two-and-a-half vials)
- 15 years and over: 6 ml (three vials)

ZIG must be administered IM. in the upper outer quadrant of the buttock or the anterolateral thigh.

There is still a risk for developing varicella despite receiving ZIG, even when VIG is given soon after exposure. ZIG should be given as soon as possible after exposure, and within 10 days.

Varicella zoster immune globulin (VZIG): Administer as soon as possible after exposure, and within five days.

Varicella zoster immune globulin (VZIG): Administer as soon as possible after exposure, and within five days.

Varicella vaccine:
- Administer as soon as possible after exposure, and within five days.

Nonimmune contacts should be offered post-exposure prophylaxis in the form of either varicella vaccine or varicella zoster immune globulin (VZIG) depending on their individual risk profile as follows:

Comments – contact group: post-exposure prophylaxis

1. Healthy:
   - Varicella vaccine:
     - Administer as soon as possible after exposure, and within five days.

2. Persons in whom vaccination is contra-indicated:
   - Immune-compromised patients.
   - Pregnancy.

This is usually four to seven days after onset of rash. Nonimmune contacts should be offered post-exposure prophylaxis in the form of either varicella vaccine or varicella zoster immune globulin (VZIG) depending on their individual risk profile as follows:

Comments – contact group: post-exposure prophylaxis

1. Healthy:
   - Varicella vaccine:
     - Administer as soon as possible after exposure, and within five days.

2. Persons in whom vaccination is contra-indicated:
   - Immune-compromised patients.
   - Pregnancy.

This is usually four to seven days after onset of rash. Nonimmune contacts should be offered post-exposure prophylaxis in the form of either varicella vaccine or varicella zoster immune globulin (VZIG) depending on their individual risk profile as follows:

Comments – contact group: post-exposure prophylaxis

1. Healthy:
   - Varicella vaccine:
     - Administer as soon as possible after exposure, and within five days.

2. Persons in whom vaccination is contra-indicated:
   - Immune-compromised patients.
   - Pregnancy.
MEASLES

Occurrence: Occasional sporadic cases and intermittent outbreaks in South Africa. Most cases in children under five years; the majority of these occur in children under one year.

Mode/s of transmission: Measles is transmitted from person to person through:
- Inhalation of large-droplet respiratory secretions (from the nose or throat) from infectious patients
- Direct contact with large-droplet respiratory secretions (from the nose or throat) from infectious patients
- Less commonly, by indirect contact through contact with articles freshly soiled by nose or throat secretions of infectious patients

Incubation period: Average 10-14 days (range seven to 18 days).

Period of infectiousness: Patients are infectious from one day before the onset of prodromal symptoms (usually about four days before the rash appears) until four days after the rash appears.

Susceptibility: All those not previously infected or vaccinated are susceptible to measles. Vaccine-induced immunity wanes over time, so adults who were vaccinated as children may also be susceptible. Acquired immunity after infection is long-lasting.

Control measures:

a. Index case
- Patients admitted to hospital must be isolated on admission. Standard precautions, contact precautions (wearing gloves, plastic aprons and so on) and droplet precautions (wearing a surgical face mask) to be practised in the pre-hospital setting for patients with suspected measles.

b. Contacts
- Identify contacts.
- Close contacts include the following persons exposed to the index case during the infectious period (four days before rash appears until four days after rash appeared):
  - Those having close contact with the index case in a household-type setting. This includes those living and/or sleeping in the same household; those such as scholars or students who sleep in the same dormitory/flats; and kissing/sexual contacts of the index case.
  - Child-minders/nannies who look after the index case.
  - Health care workers.
- Additionally, there may be other at-risk contacts whose risk of disease will depend on the duration of contact and their immunisation status. Examples of such contacts would include:
  - Friends, relatives, and caregivers who regularly visit the home.
  - School/pre-school class contacts.
  - Those who share the same room at work.
- Assess all contacts for immunity to measles. Persons with previous history of laboratory-confirmed measles infection, or laboratory evidence of immunity should be considered immune.
- In line with the current South African Department of Health recommendations, all contacts who do not have laboratory evidence of previous measles or measles immunity should be offered post-exposure prophylaxis.
  - This may take the form of measles vaccine or normal human immunoglobulin as follows:
  - If a second exposure occurs after three weeks of receiving VZIG, consider giving another dose.
  - Persons with HIV infection
    - There is still a risk for developing varicella despite receiving VZIG, even when VZIG is given soon after exposure.
    - VZIG may prolong the incubation period of varicella in exposed persons by one week, so contacts who receive VZIG must be monitored closely for 28 days after exposure. Antiviral therapy should be started immediately if signs of varicella occur.
    - If a second exposure occurs after three weeks of receiving VZIG, consider giving another dose.
- Consider varicella vaccination ≥five months after VZIG administration in HIV-infected children with age-specific CD4 percentages of 15-24%, and in adolescents and adults with CD4 count >200 cells/µl.
- Varicella vaccine is safe and immunogenic in these persons.
- Note that acyclovir and other nucleoside analogues (valaciclovir and famciclovir) are indicated for the treatment of varicella and zoster, but are not indicated for prophylaxis.

Immediate environment: Routine cleaning and disinfection. Disinfect any articles soiled by discharges from the nose, throat, and skin lesions.

Exclusion: Exclude infected children from school, medical offices, emergency rooms or public places until vesicles are crusted. Exclude infected adults from the workplace and avoid contact with susceptibles until vesicles are crusted.

Comments: Varicella zoster virus infections are not notifiable, but outbreaks of varicella should be reported to appropriate Department of Health officials.

MEASLES

Occurrence: Occasional sporadic cases and intermittent outbreaks in South Africa. Most cases in children under five years; the majority of these occur in children under one year.

Mode/s of transmission: Measles is transmitted from person to person through:
- Inhalation of large-droplet respiratory secretions (from the nose or throat) from infectious patients
- Direct contact with large-droplet respiratory secretions (from the nose or throat) from infectious patients
- Less commonly, by indirect contact through contact with articles freshly soiled by nose or throat secretions of infectious patients

Incubation period: Average 10-14 days (range seven to 18 days).

Period of infectiousness: Patients are infectious from one day before the onset of prodromal symptoms (usually about four days before the rash appears) until four days after the rash appears.

Susceptibility: All those not previously infected or vaccinated are susceptible to measles. Vaccine-induced immunity wanes over time, so adults who were vaccinated as children may also be susceptible. Acquired immunity after infection is long-lasting.

Control measures:

a. Index case
- Patients admitted to hospital must be isolated on admission. Standard precautions, contact precautions (wearing gloves, plastic aprons and so on) and droplet precautions (wearing a surgical face mask) to be practised in the pre-hospital setting for patients with suspected measles.

b. Contacts
- Identify contacts.
- Close contacts include the following persons exposed to the index case during the infectious period (four days before rash appears until four days after rash appeared):
  - Those having close contact with the index case in a household-type setting. This includes those living and/or sleeping in the same household; those such as scholars or students who sleep in the same dormitory/flats; and kissing/sexual contacts of the index case.
  - Child-minders/nannies who look after the index case.
  - Health care workers.
- Additionally, there may be other at-risk contacts whose risk of disease will depend on the duration of contact and their immunisation status. Examples of such contacts would include:
  - Friends, relatives, and caregivers who regularly visit the home.
  - School/pre-school class contacts.
  - Those who share the same room at work.
- Assess all contacts for immunity to measles. Persons with previous history of laboratory-confirmed measles infection, or laboratory evidence of immunity should be considered immune.
- In line with the current South African Department of Health recommendations, all contacts who do not have laboratory evidence of previous measles or measles immunity should be offered post-exposure prophylaxis.
  - This may take the form of measles vaccine or normal human immunoglobulin as follows:
  - If a second exposure occurs after three weeks of receiving VZIG, consider giving another dose.
  - Persons with HIV infection
    - There is still a risk for developing varicella despite receiving VZIG, even when VZIG is given soon after exposure.
    - VZIG may prolong the incubation period of varicella in exposed persons by one week, so contacts who receive VZIG must be monitored closely for 28 days after exposure. Antiviral therapy should be started immediately if signs of varicella occur.
    - If a second exposure occurs after three weeks of receiving VZIG, consider giving another dose.
- Consider varicella vaccination ≥five months after VZIG administration in HIV-infected children with age-specific CD4 percentages of 15-24%, and in adolescents and adults with CD4 count >200 cells/µl.
- Varicella vaccine is safe and immunogenic in these persons.
- Note that acyclovir and other nucleoside analogues (valaciclovir and famciclovir) are indicated for the treatment of varicella and zoster, but are not indicated for prophylaxis.
HANDBOOK OF INFECTIOUS DISEASES

- Severely immunocompromised patients:
  - Severe primary immunodeficiency
  - Bone marrow transplant until at least 12 months after completing immunosuppressive treatment
  - Patients on treatment for acute lymphocytic leukaemia until at least six months after completing immunosuppressive chemotherapy

Currently, there is no accepted minimum level of measles antibody required in normal human immunoglobulin, and levels of measles-neutralising antibodies have declined in recent years. The efficacy of currently available normal human immunoglobulin in preventing/modifying measles in exposed persons is therefore not known, and may be poor.

Pregnancy: There is no evidence that measles vaccine causes harm to the pregnant woman or her foetus, but it remains a theoretical risk. MMR vaccine is contra-indicated in pregnancy and should not be given. Consider normal human immunoglobulin for pregnant women without evidence of measles immunity, if risk of measles infection is high, provided it can be given within 6 days of exposure. Dosage: 0.5 ml/kg body weight (maximum dose = 15 ml) given IM. Measles infection in pregnancy is associated with high risk of maternal morbidity, foetal loss, prematurity and perinatal infection.

There is currently no accepted minimum level of measles antibody required in normal human immunoglobulin, and levels of measles-neutralising antibodies have declined in recent years. The efficacy of currently available normal human immunoglobulin in preventing/modifying measles in exposed persons is therefore not known, and may be poor.

HIV-infected children and adults: Measles vaccine or MMR may cause vaccine-related measles disease in HIV-infected persons with severe immunosuppression.

However, vaccination for such individuals must be considered, given the high risk of severe measles disease following measles infection in this group. There is currently no accepted minimum level of measles antibody required in normal human immunoglobulin, and levels of measles-neutralising antibodies have declined in recent years. The efficacy of currently available normal human immunoglobulin in preventing/modifying measles in exposed persons is therefore not known, and may be poor.

Immediate environment: Routine cleaning and disinfection.

Exclusion: Children and adults with measles must be excluded from school/work, medical offices, emergency rooms or public places for 4 days after the rash appears.

Comments: Measles (both clinically suspected and laboratory-confirmed) is notifiable in South Africa.

HEPATITIS A (HEPATITIS A VIRUS, HAV)

Occurrence: Sporadic cases throughout South Africa. Outbreaks do occur.

Mode/s of transmission: HAV is transmitted by the faecal-oral route, through:
  - Person-to-person spread
  - Contaminated food or water

Injecting drug abuse
Sexual intercourse

Incubation period: Average 28 days (range 15-50 days).

Period of infectiosity: Two weeks before onset of symptoms until one week after the onset of symptoms

Susceptibility: All those not previously infected or vaccinated are susceptible to HAV infection. Disease is often asymptomatic or mild in children under five years, whilst most infected adults will develop clinical illness.

Control measures:

a. Index case

Patients admitted to hospital do not usually require isolation, unless they are faecally incontinent. Standard precautions and contact precautions (wearing gloves, plastic aprons and so on) to be practised in the pre-hospital setting for patients with suspected HAV disease.

Outpatients: the patient and his/her family must receive guidance on the importance of hand-washing after using the toilet and before preparing food. Enhanced hygiene must be practised by all family members, since some may already have acquired HAV infection and be excreting HAV.

b. Contacts

Contacts with exposure to the index case should be identified. These include:
  - Household and household-type contacts: persons living in the same household or regularly sharing food or toilet facilities with the index case during the infectious period (i.e., from two weeks before onset of symptoms to one week after onset of symptoms). This includes extended family members who frequently visit the household, and child-minders/nannies.
  - A person who has regularly eaten food prepared by the index case during the infectious period
  - If the index case is a child in nappies or requires assistance with toileting, any person who has been involved in nappy-changing or assistance with toileting during the infectious period

Sexual contacts during the infectious period
Children and staff in pre-school settings
Contacts of index cases in institutions where hygiene is likely to be poor, such as care facilities for the mentally or physically disabled, or where individuals are in nappies or are incontinent.

Health care workers who have been exposed to faecal matter without appropriate standard and contact precautions.

Once identified, contacts must be assessed for immunity to HAV infection. Contacts who have previously received hepatitis A vaccine or who previously had laboratory-confirmed HAV infection can be considered immune. Contacts who are nonimmune should be offered post-exposure prophylaxis in the form of either hepatitis A vaccine or normal human immunoglobulin, depending on their individual risk profile and time since exposure as follows:

Comments – Contact group – Time since exposure to index case: Post-exposure prophylaxis

Healthy persons aged 12 months to 50 years (including pregnant or breastfeeding women): ≤14 days. Administer single dose of hepatitis A vaccine. Persons at continued risk of infection should receive a second dose of hepatitis A vaccine 6-12 months after the first dose.

Healthy infants <12 months: Normal human immunoglobulin (dosage 0.02-0.04 ml/kg) given IM.

Healthy persons aged >50 years: Normal human immunoglobulin (dosage 0.02-0.04 ml/kg) given IM and a single dose of hepatitis A vaccine. The efficacy of hepatitis A vaccine in this age group may be reduced, hence the need for simultaneous normal human immunoglobulin.

Persons at continued risk of infection should receive a second dose of hepatitis A vaccine 6-12 months after the first dose.
Persons at risk of severe disease from hepatitis A infection:
- Persons with chronic liver disease (e.g., cirrhosis, alcoholic liver disease)
- Persons with pre-existing hepatitis B or C infection
- Immunocompromised persons
- HIV-infected persons

Normal human immunoglobulin (dosage 0.02-0.04 ml/kg) given IM and a single dose of hepatitis A vaccine

The efficacy of hepatitis A vaccine in these patient groups may be reduced, hence the need for simultaneous normal human immunoglobulin.

Persons at continued risk of infection should receive a second dose of hepatitis A vaccine six to 12 months after the first dose.

Persons with history of severe anaphylactic reaction to a previous dose of hepatitis A vaccine
Normal human immunoglobulin (dosage 0.02-0.04 ml/kg) given IM

Healthy persons of any age

>14 days to 28 days – none. No evidence Healthy persons of any age

Normal human immunoglobulin (dosage 0.02-0.04 ml/kg) given IM and a single dose of hepatitis A vaccine

The efficacy of hepatitis A vaccine in these patient groups may be reduced, hence the need for simultaneous normal human immunoglobulin.

Persons at continued risk of infection should receive a second dose of hepatitis A vaccine six to 12 months after the first dose.

Persons at risk of severe disease from hepatitis A infection:
- Persons with chronic liver disease (e.g., cirrhosis, alcoholic liver disease)
- Persons with pre-existing hepatitis B or C infection
- Immunocompromised persons
- HIV-infected persons

Normal human immunoglobulin (dosage 0.02-0.04 ml/kg) given IM. Immunoglobulin may attenuate the severity of disease in such persons if given during the incubation period.

Immediate environment: Routine cleaning and disinfection.

Exclusion: Exclude infected persons from work, school or pre-school until seven days after onset of jaundice (or seven days after onset of symptoms if there is no history of jaundice).

Comment: Hepatitis A disease is notifiable in South Africa

HEPATITIS B (HEPATITIS B VIRUS, HBV)

Occurrence: Sporadic cases throughout South Africa. Outbreaks do occur.

Mode/s of transmission: HBV is transmitted by mucous membrane or percutaneous exposure to infected body fluids (predominantly blood, semen and saliva), including through:
- sexual exposure (unprotected vaginal or anal intercourse)
- perinatal mother-to-child transmission
- injecting drug abuse
- percutaneous exposures (contaminated needle-stick/sharps injuries, a bite which causes bleeding)
- mucocutaneous exposure to blood (contamination of nonintact skin, conjunctiva or mucous membrane)
- close contact in households: primarily from child to child

Incubation period:
Average 60-90 days (range 40-180 days).
Period of infectiousness:
All persons who are HBsAg (hepatitis B surface antigen)-positive are potentially infectious. Blood is likely to be infectious weeks before the onset of first symptoms of HBV infection.
Susceptibility:
All those not previously infected or vaccinated are susceptible to HBV infection following a significant exposure.

Control measures:
- Index case
Patients admitted to hospital do not require isolation. Standard precautions to be practised in the pre-hospital setting for patients with suspected hepatitis B disease. Outpatients: The patient and his/her family must receive guidance on the modes of transmission.

- Contacts
Contacts with significant exposure to the index case should be identified. These include:
- Sexual partners
- Persons who may have had percutaneous/mucocutaneous exposure to blood/body fluids of the infectious case. These may include:
  - Persons who have contaminated their eyes or mouth, or fresh cuts or abrasions of the skin, with blood from the infectious case
  - Persons who have suffered a bite which causes bleeding, from the index case
  - Health care workers with needle-stick/sharps/spash exposures
  - Babies born to mothers who have chronic HBV infection, or who have had acute hepatitis B during pregnancy

Once identified, contacts must be assessed for immunity to HBV infection. Contacts who have laboratory-confirmed evidence of previous or current infection with HBV can be considered immune. Contacts who have been previously vaccinated are not necessarily immune, since antibody responses to HBV vaccine vary widely between individuals. Only persons with documented anti-HBs levels ≥10 mIU/ml should be considered immune. Previously vaccinated persons should ideally have anti-HBs levels tested if levels are not known.

Contacts who are nonimmune should be offered post-exposure prophylaxis in the form of either hepatitis B (HB) vaccine or hepatitis B immunoglobulin (HBIG) or both as follows:

Comment – Type of contact – HBV status of contact: Post-exposure prophylaxis

Baby born to mother who has chronic HBV or who has had acute hepatitis B during pregnancy: Hepatitis B vaccine. HBIG** is indicated in most cases as well: Consult an infectious diseases specialist/virologist for advice. Consult an infectious diseases specialist/virologist for advice.

All other contacts:
- Newborns and children <10 years
- Children >10 years and adults
- Immunocompromised persons
- Immunocompromised persons
- HIV-infected persons

The only contra-indication to hepatitis B vaccine is a severe anaphylactic reaction to a previous dose of hepatitis B vaccine, which is extremely rare. It is safe to use in pregnancy and breast-feeding, children of all ages, HIV-infected persons, and immunosuppressed persons.

Immediate environment: Routine cleaning and disinfection. Disinfection of equipment contaminated with blood or infectious body fluids.

Comment: Hepatitis B infection is notifiable in South Africa

REFERENCES

Dosage of HBIG

<table>
<thead>
<tr>
<th>Age group</th>
<th>Dose</th>
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<tbody>
<tr>
<td>Newborns and children 0-4 years</td>
<td>200 IU</td>
</tr>
<tr>
<td>Children 5-9 years</td>
<td>300 IU</td>
</tr>
<tr>
<td>Children &gt;10 years and adults</td>
<td>400 IU</td>
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Rabies: Prevention and Management

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Rabies is one of the oldest known infectious diseases of mankind and although the mode of control and prevention has been known for more than two centuries, rabies is still a contemporary problem. The disease is caused by a virus species belonging to the genus Lyssavirus and family Rhabdoviridae. Currently, a total of 15 species are formally classified as lyssaviruses. The lyssaviruses are a fast expanding group of viruses, with eight of the viruses being discovered and described in the past 10 years alone, primarily due to increased surveillance of novel pathogens in bat species around the globe. The major source of the public health burden globally, however, remains the rabies virus (previously designated as genotype one lyssavirus), which is most commonly associated with domestic dogs in developing countries. The remaining lyssaviruses are often associated with bat reservoirs (except the Mokola virus which has been described from several African countries) and only a handful of human cases have been ascribed to these viruses to date.

The World Health Organization (WHO) estimated up to 55 000 human cases of rabies globally occur on an annual basis. This statistic computes to a human rabies death every 15 minutes. It is thought that up to 24 000 of these estimated cases occur in Africa alone. Surveillance and laboratory diagnosis of human rabies is most often lacking in African countries and therefore accurate figures are not available. It is important to realise that the rabies burden is not only measured against the number of human and animal lives lost, but the exorbitant cost of rabies post-exposure prophylaxis for prevention of human and control campaigns in animals, which include strict import- and export-control measures, which compounds the economic implication of rabies. The psychosocial effect of rabies virus exposures should also not be underestimated.

Rabies in South Africa

In South Africa, rabies has been recorded throughout the colonial period with the introduction of dog rabies, which caused transient outbreaks during this time. Dog rabies was established in South Africa in the 1960s when it was introduced to KwaZulu-Natal from neighbouring Mozambique. It was brought under control but once again introduced in this province in the early 1980s and has been raging ever since. A second biotype or biovar of rabies virus is described specifically from herpestid species. This most commonly includes yellow mongoose and is often referred to as “mongoose” or “meerkat” rabies. A molecular clocking analysis of isolates has revealed that it was introduced to South Africa some time before the introduction of dog rabies. Rabies in the animal species from all nine provinces of South Africa is described (see Table 1). Concomitantly, rabies in humans is also reported from all the provinces, except the Western Cape, where rabies is predominant in bat-eared foxes, supposedly with very limited direct human contact.

Although the coastal province of KwaZulu-Natal has historically been the most affected by rabies, the disease epidemiology in the...