Diphtheria

Contents

Epidemiology in New Zealand 2

Case definition 2
   Clinical description 2
   Laboratory test for diagnosis 2
   Case classification 2

Spread of infection 3
   Incubation period 3
   Mode of transmission 3
   Period of communicability 3

Notification procedure 3

Management of case 3
   Investigation 3
   Restriction 3
   Microbiological clearance 4
   Treatment 4
   Immunisation 4
   Counselling 4

Management of contacts 4
   Definition 4
   Investigation 5
   Restriction 5
   Prophylaxis 5
   Immunisation 6
   Counselling 6

Other control measures 6
   Identification of source 6
   Disinfection 6
   Health education 6

Reporting 6

References and further information 7
Epidemiology in New Zealand

Diphtheria is caused by toxin-producing strains of *Corynebacterium diphtheriae*. Rarely, diphtheria-like illness may result from infection with toxigenic *Corynebacterium ulcerans*.

More detailed epidemiological information is available on the Institute of Environmental Science and Research (ESR) surveillance website at www.surv.esr.cri.nz

Case definition

Clinical description

Respiratory diphtheria is characterised by infection primarily involving the tonsil(s), pharynx and/or larynx, low-grade fever, with or without an asymmetrical greyish-white adherent membrane of the tonsil(s), pharynx and/or nose. In moderate to severe cases there can be marked neck swelling (enlarged anterior cervical lymph nodes and oedema of the surrounding tissues), resulting in a ‘bull neck’ appearance. Toxic effects can arise, including cardiac and neurological symptoms (for example, myocarditis and neuropathies).

Cutaneous diphtheria is characterised by secondary infection of other skin conditions or chronic ulcers with a grey membrane. Cutaneous diphtheria can act as a reservoir of bacteria capable of causing pharyngeal disease. Toxic sequelae in cutaneous cases are uncommon. Other extra-respiratory presentations have also been described, including septic arthritis, conjunctivitis, and vaginal and external auditory canal infections.

Laboratory test for diagnosis

*Laboratory confirmation requires* isolation of diphtheria toxin-producing corynebacteria from a clinical specimen such as nose, throat and skin swabs.

Laboratories must be informed that the sample is from a suspected case of diphtheria as selective media are required.

Case classification

All isolates of *C. diphtheriae* and *C. ulcerans* are notifiable until toxigenicity is determined, including cutaneous isolates. If the isolate is determined to be non-toxigenic (does not have the ability to produce diphtheria toxin), the case should be denotified.

- **Under investigation**: A case that has been notified, but information is not yet available to classify it as probable or confirmed.
- **Probable**: A clinically compatible illness that is not laboratory confirmed.
- **Confirmed**: A clinically compatible illness that is laboratory confirmed or is epidemiologically linked to a laboratory confirmed case.
- **Not a case:** A case that has been investigated and subsequently found not to meet the case definition.

**Spread of infection**

**Incubation period**

Usually 2–5 days, occasionally longer.

**Mode of transmission**

Contact with respiratory droplets or infected skin of a case or carrier or, more rarely, contaminated articles.

Unpasteurised milk has also been identified as a source of infection.

**Period of communicability**

Variable; usually 2 weeks or less, seldom more than 4 weeks. Effective antimicrobial therapy promptly terminates shedding.

**Notification procedure**

Attending medical practitioners or laboratories must immediately notify the local medical officer of health of suspected cases. Notification should not await confirmation.

**Management of case**

**Investigation**

Obtain history of vaccination, possible contacts, travel, any cutaneous lesions or existing skin conditions and consumption of unpasteurised milk.

Ensure laboratory is aware of suspected case and has attempted confirmation from clinical specimen(s) by nose, throat and/or skin swabs, including toxigenicity testing of *C. diphtheriae* or *C. ulcerans* isolates.

To date, most isolates in New Zealand have been non-toxigenic. The extent of public health action while awaiting laboratory confirmation should be based on available information and the judgement of the local medical officer of health.

**Restriction**

Standard and droplet precautions for toxigenic pharyngeal diphtheria (and standard and contact precautions for toxigenic cutaneous diphtheria) until microbiological clearance has been documented.
Exclude case from early childhood service, school, work and close contact with previously unexposed people until microbiologically cleared. See Health (Infectious Notifiable Diseases) Regulations 1966.

**Microbiological clearance**

Two cultures from both throat and nose (and from skin lesions in cutaneous diphtheria), taken not less than 24 hours apart and not less than 24 hours after finishing antimicrobials, fail to show *C. diphtheriae* or *C. ulcerans*.

**Treatment**

All cases should be under the care of an infectious diseases physician or paediatrician. Diphtheria antitoxin is usually indicated before laboratory confirmation when there is strong clinical suspicion of diphtheria.

**Immunisation**

Case should be immunised in the convalescent stage because clinical infection does not always induce adequate levels of antitoxin.

**Counselling**

Advise the case and their caregivers of the nature of the infection and its mode of transmission.

**Management of contacts**

Outbreak control measures should be instituted for each case. Every effort should be made to locate contacts and unreported cases of toxigenic diphtheria (including cutaneous infections).

Person-to-person transmission of *C. ulcerans* is rare, but contacts require the same management as for *C. diphtheriae*, described under ‘Management of case’ above.

Contacts who have a positive laboratory result should be managed as if they are a case until proven bacteriologically negative. This may include follow-up of their contacts.

**Definition**

Regardless of vaccination status, all those with a history of close contact with a case of diphtheria caused by toxigenic *C. diphtheriae* or *C. ulcerans* (whatever the clinical presentation) during the 7 days before onset of illness or during the subsequent period of communicability should be considered potentially at risk. Risk is directly related to the closeness and duration of contact. Close contacts include:

- household contacts
- kissing and/or sexual contacts
• students in halls of residence in the same corridor and/or sharing kitchen or bathroom facilities
• child minders and children regularly being supervised by the case
• health care staff (staff who have taken appropriate infection control precautions need not be considered contacts).

Depending on duration of contact and immunisation status of contact, others at risk of being contacts may include anyone:
• regularly visiting the case’s residence
• in the same workplace space, class or early childhood service room.

Contacts on forms of public transport are thought to be at low risk, especially if the journey is less than 8 hours’ duration.

Investigation
All contacts identified as at risk (regardless of immunisation status) should have nose and throat swabs taken for diphtheria culture. All close contacts should also have any skin lesions swabbed, regardless of whether there is clinically apparent infection. All contacts should receive follow-up checks for 7 days from the date of last contact. Such checks may be conducted daily, or the contact may be provided with an information sheet that includes a full and clear list of symptoms and a phone number to call if they become unwell. The primary health care practitioner should be kept informed of the management of contacts and laboratory results.

Restriction
Contacts who have a positive laboratory result should be isolated as if they are a case until proven bacteriologically negative.

Prophylaxis
• All contacts, after cultures have been taken and regardless of immunisation status: A single dose of intramuscular benzathine penicillin (600,000 units or 400 mg) for contacts under 6 years of age and 1.2 million units (900 mg) for contacts 6 years of age or over; or 7 to 10 days of oral erythromycin (children: 40 mg/kg/day, adults: 1 g/day, in four divided doses). Benzathine penicillin is preferred for contacts who cannot be kept under surveillance.

• Contacts with a positive culture: Two follow-up cultures obtained at least 24 hours apart after completion of therapy. If cultures are still positive following a course of antimicrobial therapy, discuss further management with an infectious diseases physician. The primary health care practitioner should be kept informed of the management of contacts and laboratory results.
Immunisation
All close contacts should also be offered a complete course of vaccine or a booster according to the following schedule.

- Fully immunised1 children up to and including 6 years of age who have only received three doses of diphtheria toxoid-containing vaccine within the last 5 years: give one injection of DTaP-IPV.

- Fully immunised individuals aged 7 years and older who have not received a booster dose of a diphtheria toxoid-containing vaccine within the last 5 years: If aged 7–15 years, give one injection of Tdap; if aged over 15 years, give one injection of Td or Tdap.

- Unimmunised individuals: Refer to the schedules in the Immunisation Handbook (Ministry of Health 2011).

Counselling
Advise all contacts to seek early medical attention if symptoms develop.

Other control measures

Identification of source
Check for other cases in the community. Notify doctors of the potential for outbreaks.

Disinfection
Disinfect all articles in contact with the case.

Health education
In early childhood services or other institutional situations, ensure that satisfactory facilities and practices are in place for hand cleaning; nappy changing; toilet use and training; food preparation and handling; and cleaning of sleeping areas, toys and other surfaces.

Reporting
Ensure complete case information is entered into EpiSurv.

On receiving a notification, medical officers of health should immediately notify the Ministry of Health Communicable Diseases Team and liaison staff at ESR, and complete the Outbreak Report Form.

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1 Full immunisation against diphtheria refers to the primary course, currently given at 6 weeks, 3 months and 5 months. The 4-year-old dose is a booster.
References and further information


