

Legionellosis

Queensland Health Guidelines for Public Health Units

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Infectious Agent

The infectious agents are *Legionella* species, predominantly *Legionella pneumophila* and *Legionella longbeacha* although other *Legionella* species may be involved.

Notification Criteria

Clinical evidence - confirmed case

1. Fever
or
2. Cough
or
3. Pneumonia

Clinical evidence - probable case

1. Fever AND Cough
or
2. Pneumonia

NB. clinical evidence is required for reporting to NOCS but does not by itself constitute a requirement for clinicians to notify.

Laboratory definitive evidence

1. Isolation of *Legionella*
or
2. Detection of *Legionella* urinary antigen

or

3. Seroconversion or a significant increase in antibody level or a fourfold or greater rise in titre to *Legionella*

Laboratory suggestive evidence

1. Single high antibody titre to *Legionella*
- or
2. Detection of *Legionella* by nucleic acid testing (various tests might not be validated)
- or
3. Detection of *Legionella* by direct fluorescence assay

Community outbreak criteria

More than one confirmed or probable case with a common exposure.

Notification Procedure

Pathology Laboratories

To notify on definitive or suggestive evidence, by **telephone** or **facsimile**.

Laboratory Aspects

In a cluster of *L. pneumophila* infections, PHUs should encourage 1. urinary antigen testing of patients suspected to have legionellosis because infection will be rapidly diagnosed and the test is specific, and 2. sputum (or, where available, bronchial washing or lung biopsy) culture to enable matching of any isolates with any available environmental samples.

There are currently more than 50 species, but the most commonly identified in Australia are *L. pneumophila*, which may be found in cooling towers (also known as cooling water systems), spa pools and warm water systems and *L. longbeachae*, which may be found particularly in potting mix and soil. Other species identified in Australia include *L. micdadei* and *L. bozemanii*.

Most urinary antigen test kits are sensitive for *L. pneumophila* serogroup 1 only but some may cover a broader range of *L. pneumophila* serogroups and *Legionella* species.

Many cases are diagnosed by serological tests, hence the diagnosis is usually retrospective. Seroconversion often does not occur until 3-6 weeks after onset.

Cultures can take up to 14 days. Though commonly found in aquatic habitats, *Legionella* species are fastidious organisms, requiring specific conditions and procedures for culture in the laboratory.

Reporting to NOCS

Report both confirmed and probable cases. Report potential outbreaks immediately to the Communicable Diseases Unit, Department of Health.

Confirmed case: A confirmed case requires **laboratory definitive evidence** AND **clinical evidence**

Probable case: A probable case requires **laboratory suggestive evidence** AND **clinical evidence**.

Objectives of surveillance

1. To identify and control environmental sources of infection
2. To monitor the epidemiology of legionellosis in order to inform better prevention strategies

Public Health Significance and Occurrence

Cases occur throughout the year, but are recognised more commonly in summer and autumn. *Legionella* accounts for between 0.5 and 5% of cases of community acquired pneumonia. Outbreaks of legionellosis usually occur with low attack rates in the population at risk.

Clinical Features

Initially anorexia, malaise, myalgia and headache. Rapidly rising fever associated with chills. A non-productive cough, abdominal pain and diarrhoea are common. Chest x-ray may show patchy or focal areas of consolidation that may progress to bilateral involvement and ultimately respiratory failure. Despite improvements in diagnostic and treatment options, the case fatality rate remains at approximately 15%.

Legionella spp. can also cause Pontiac fever. Clinical features include fever and myalgia. It does not progress to pneumonia. Patients recover spontaneously after 2-5 days without treatment. This clinical syndrome may represent reaction to inhaled antigen rather than bacterial invasion.

Reservoir

Legionella spp. are ubiquitous and can be found in creeks, ponds, and soil. Protozoa are an important vector for the survival and growth of *Legionella* within natural and artificial environments and help to protect *Legionella* from the effects of biocides and thermal disinfection.

The organism has been isolated from hot water systems, cooling towers, evaporative condensers, humidifiers, whirlpool spas, respiratory therapy devices, decorative fountains, hot and cold water taps and showers and usually exists in protective biofilms in these locations.

Mode of Transmission

Legionellosis is transmitted through inhalation of contaminated aerosols. Aerosols of <5 microns are particularly effective in reaching the lower depths of the lungs. Most *Legionella* spp. are associated with water, with the exception of *L. longbeachae*, which has been associated with potting mixes. In addition to airborne transmission, other modes of transmission are possible including aspiration of contaminated water or *Legionella* from pharyngeal colonisation.

Incubation Period

Legionellosis: 2-10 days, commonly 5-6 days.

Pontiac fever: 5-72 hours, usually 24-48 hours.

Period of Communicability

There have been no reports of person-to-person transmission.

Susceptibility and Resistance

Legionellosis has a low attack rate, with males 2.5 times more frequently affected than females. The mean age of patients affected has been in the mid-fifties. Though the disease can affect any age group, it is extremely rare in people under 20 years of age. Other groups at risk include the immunocompromised, diabetics, heavy smokers, heavy drinkers and those with chronic respiratory disease.

The prevalence of background antibody titre ≥ 64 to *Legionella pneumophila* 1-6 varies by geography and population throughout Australia and ranged from 21.5% in non-Indigenous urban populations up to 77% in remote Indigenous populations. Seroprevalence of antibody ≥ 64 to *Legionella longbeachae* was measured at 43.3% of potting media industry workers and 41.7% of blood donors in Queensland in 1992. A 1997 IMVS survey of 810 Adelaide blood donors showed 2% had antibody titres ≥ 64 to *Legionella pneumophila* serogroup 1 and 9% had antibody titres ≥ 64 to *Legionella longbeachae*. A 2006 Workplace Health and Safety Queensland (WHSQ) investigation at a suburban Brisbane police station tested workers at the station and WHSQ staff. Sera with total antibody titre ≥ 64 to *Legionella pneumophila* 1-6 was found in 50 of 98 people tested (51%), ≥ 28 or higher in 11 people (11%) and 256 in 2 people.

Management

Cases

Investigate all confirmed and probable cases to Stage 1.

Stage 1

Investigation

Ensure attending medical practitioner has obtained laboratory confirmation. Identify the organism where possible.

Trace the movements of the case in the ten days prior to illness. Include history of hospitalisation, travel and exposure to cooling towers and other aerosolised water sources. Inquire about the temperature of the case's domestic hot water system.

If it is known that the case lives or works near a cooling tower or towers (also known as cooling water systems), consider asking WHSQ to examine relevant systems and their maintenance records.

Inquire about the existence of other possible cases if the patient lives in a nursing or residential home.

Investigation to Stage 2 is needed when:

- there are two or more cases linked in time and place and when cases are infected with the same serotype where the serotype is known, OR
- a case spent the full 10-day incubation period in hospital OR spent part of the incubation period in a hospital where cases of nosocomial legionellosis had occurred previously.

Further investigation of other cases is at the discretion of the public health unit.

Stage 2

Investigation

Ascertain possible exposures by carefully interviewing cases/carers about all possible exposures; mapping movements of cases during the exposure period; and an urgent environmental assessment including a search for possible sources of aerosols that are likely to have travelled to where the cases were potentially exposed.

Inquire about:

- cooling towers
- warm water systems which supply water at <math>< 50^{\circ}\text{C}</math> at the point of use after one minute
- spa pools
- sources of aqueous aerosols, especially where water is recycled e.g. misting machines, car washes, fountains
- gardening activities (including potting mixes if *L. longbeachae*).

Implicated cooling towers are typically within 500 metres of the common exposure area but when determining the area of investigation consider:

- building height(s)
- cooling tower height(s)
- direction of discharge
- prevailing weather conditions at the time of likely exposures (temperature, inversion layers and relative humidity, wind direction).

Investigate in collaboration with WHSQ. WHSQ's role primarily relates to ensuring compliance with workplace health and safety legislation and involves inspection of cooling systems and maintenance/microbiological sampling records. WHSQ has a database of cooling towers registered in Queensland up until 2011. This database is becoming progressively outdated as registration of cooling towers is not required under the Work Health and Safety Regulation 2011.

Determine situations where there is a known history of poor performance / compliance with monitoring of cooling towers.

Assess the potential for higher levels of health risk, e.g. situations where many susceptible people could be exposed.

Liaise with the environmental testing laboratory regarding samples. Positive samples should be held and matched against isolates from linked cases. Do not accept results where samples from different sources have been composited.

To identify a common source of infection, search for further cases (eg. relatives, friends and work colleagues) who are ill. Consider issuing a media release to encourage people with symptoms who may have been exposed to a likely source to seek medical care.

Where there is the potential for a substantial outbreak, consider initiating active surveillance by:

- faxing GPs, respiratory and infectious disease physicians to assist in case finding
- reviewing emergency department data for cases of atypical pneumonia and
- issuing a fact sheet or letter to members of the group where well defined and readily contactable exposure groups can be identified (such as a workplace).

In a nosocomial case, conduct a case search throughout the hospital. Review the hospital's water and cooling tower maintenance program and sample all possible sources of infection.

Contacts

Definition

Any person who has experienced similar exposures as the case (in the situation of more than one linked case)

Investigation

Encourage early referral if symptoms develop.

Other control measures

Sampling

Possible sources of infection should be sampled.

Disinfection

Possible sources of infection should be cleaned and disinfected after samples have been collected.

Consider informing adjacent public health units of the notification(s).

NOTE: Where there has been a single case, unless it is a nosocomial infection, environmental sampling has not been found to be useful.

Preventive Measures

To reduce the risk of growth of bacteria such as *Legionella*, legislation requires that hot water storage systems should be maintained at a temperature of at least 60° Celsius. However to avoid scalds, the hot water should be delivered to taps and showers at a temperature of no more than 50° Celsius. Childcare centres, schools, hospitals and aged care facilities should reduce the temperature at the tap to no more than 45° Celsius.

Cooling towers are required to be maintained appropriately by law and maintenance records should be kept. Only sterile water should be used in respiratory therapy devices and the devices cleaned and dried after each use. When using potting mix, wear a particulate mask and wash hands afterwards.

Summary

For sporadic community acquired case, complete case report form for unit file. In the event of an outbreak, prepare a report of the investigation for the [Communicable Diseases Unit](#), Department of Health, on request.

References

Australian Department of Health and Ageing 2009. *Legionellosis. National guidelines for public health units.*

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