



Investigating Legionnaire's Disease

Introduction

Legionella pneumophila is a pathogen linked to water systems such as cooling towers. *L. pneumophila* infections are rare, which means finding expertise to assist an inquiry can be difficult. This form describes how to investigate a case of Legionellosis.

When a notification is received by the Department of Health, a Population Health Unit Nurse will usually interview the patient about their activities during the incubation period (two weeks prior to the onset of symptoms) e.g.:

- Where do they live and work?
- What hobbies do they have and where they practise them?
- Have they been travelling? Where did they stay, what locations did they visit?
- Where the patient has been, e.g. shops, businesses, rec centres or health care facilities such as hospitals, dentists etc.

The Environmental Health Officer can then use this data to identify potential sources of infection at these locations.

The Investigation

Using the sites identified above, we can now investigate as to whether they are near any water systems at risk of *Legionella* flourishing; e.g.:

- Domestic hot-water systems with heaters that operate below 60°C.
- Poorly maintained humidifiers or fountains that create sprays or mists.
- Spas with aerating features.
- Systems that allow water to stagnate in lines (especially those with flexible

hoses); e.g. fire sprinkler systems, eye washes, or private showers and hand wash basins that haven't been used for an extended period (e.g. mining camps or empty homes).

- Dental water lines, which can be maintained between 20°C - 37°C for patient comfort.
- Cooling towers, evaporative condensers, & coolers using evaporation to reject heat. Includes many industrial processes.
- Car washes, particularly those using recycled water
- Misting systems used in outdoor fans, hotels and supermarket vegetable sections.

The patient should be asked what contact they have had with any of these systems (or similar) during the incubation period. Giving them a list could jog their memory. All systems should be investigated.

Water sampling


The potential bacterial sources identified in the above step should be investigated, and tested for the presence of bacteria, including *Legionella*.

There is an assumption that *Legionella* sampling is the same as for routine bacteria, but there are some minor variations, i.e.:

1. Ensure personal safety during sampling. Avoid generating and breathing aerosols. Run taps gently to reduce splashing. High-risk individuals (those with weakened immunity, heavy smokers, etc) should not be involved. Wear gloves and a mask if you suspect the water is highly contaminated.



2. Use sterile, screw-capped plastic bottles from PathWest (with sodium thiosulphate) to collect **two** samples if possible, including the "pre-flush", by collecting the first 200mL of water from the taps or flushing drains into a bottle. Allow the water to run for roughly 60 seconds and collect the second sample. **Leave a one centimetre air space on top of all samples.**
3. Swabs of aerators or the inside of taps & shower heads may be taken. When sampling cooling towers or fountains etc, swab a sample of biofilm (if present).
4. For non-potable sources such as cooling towers, sprinklers, etc, collect a sample from the bottom or side of the reservoir. If sampling a cooling tower, consider taking a sample from the pack column. Record any biocides used.
5. Tightly cap bottles and place in an esky with an icepack.
6. Label sample numbers as normal. Take note to request a *Legionella* test in the "Sender's comments" Box (see picture). Keep a copy for your own records.

 PATH WEST <small>THE WESTERN AUSTRALIAN CENTRE FOR PATHOLOGY AND MEDICAL RESEARCH</small>	Water Examination Laboratory <small>Unwin Blvd, N. Road English Gardens, Midland Locked Bag 200 MIDLANDS WA 6100</small>	<small>Tel: (08) 9294 2000 Fax: (08) 9281 7139 ABN 248 024 0034</small>	WATER EXAMINATION LABORATORY REQUEST FORM	NATA
	Party Name: _____		Sender's Comments: + Legionella test	<input type="checkbox"/> Drinking Water (source to Consumer) <input type="checkbox"/> Treated Recreational Water (Pool, Spa, Hot tub) <input type="checkbox"/> Natural Water <input type="checkbox"/> Rain <input type="checkbox"/> Leach/Strata/Reservoir <input type="checkbox"/> Industrial Process Water <input type="checkbox"/> Irrigation Effluent <input type="checkbox"/> Air conditioning/Cooling Tower <input type="checkbox"/> Other (Specify in "Sender's Comments")
emp id: _____	supplied by: _____	Please specify in separate sheet if any		
RE: _____	signed: _____			

7. Schedule sampling so they arrive at PathWest no later than noon on Friday.

Periodic sampling is an effective way to check the efficacy of a water treatment program and is a valuable component of the overall risk management program. *Legionella* testing is also useful when:

- Investigating an outbreak;
- Validating the effectiveness of control measures; and
- Verifying the effectiveness of the decontamination process.

Interpreting the results

PathWest should return a result in 7-10 days. The following tables can be used to determine the level of action required based on the sample results:

Control strategies for the presence of *Legionella*

Test result (cfu*/mL) (<i>Legionella</i>)	Required control strategy
Not detected (<10)	System under control. Maintain monitoring & treatment program.
Detected as <1,000	Immediate online decontamination (alternative or higher dose biocide than usual). Review control strategy. Re-test within 3–7 days of plant operation. Assess if further remedial action is necessary.
Detected as ≥1,000	Immediate online decontamination (chlorine-based biocide). Review control strategy. Re-test water within 3-7 days of plant operation. Assess if further remedial action is necessary.

Adapted from Australian/New Zealand Standard, AS/NZS 3666.3. Refer to this standard for further information
 * cfu = colony forming units

Control strategies for the presence of other heterotrophic microorganisms

Test result (cfu*/mL) HPC (<i>heterotrophic plate count</i>)	Required control strategy
<100,000	System under control. Maintain monitoring & treatment program.
≥100,000 to <5,000,000	Immediate online decontamination (alternative or higher dose biocide than usual). Review control strategy. Re-test water within 3-7 days of plant operation. Assess if further remedial action is necessary.
≥5,000,000	Immediate online decontamination (alternative or higher dose biocide than usual). Review control strategy. Re-test water within 3-7 days of plant operation. Assess if further remedial action is necessary.

Adapted from Australian/New Zealand Standard, AS/NZS 3666.3. Refer to this standard for further information
 * cfu = colony forming units



If *Legionella* or HPC counts are high, further samples may be required to ascertain when the system has been effectively decontaminated. Failure to detect bacteria should not lead to the relaxation of control measures and monitoring.

Legionella bacteria are widespread in nature; samples often yield positive results, so any results should be interpreted with caution. The bacteria colonises many water systems without causing infections. The dynamic nature of *Legionella* makes it difficult to determine the risk, based on water sampling results alone, and results should be viewed as a 'snapshot' of the water at the specific time of sampling. Therefore sampling should be accompanied with an overall assessment, including maintenance checks, and inspecting the system for the presence of biofilm or rust, cleanliness, degree of aerosol exposure and effectiveness of the chemical dosing program if possible.

The risk of illness following exposure to a source of *Legionella* is influenced by a number of factors including

- The dose;
- Strain virulence (pathogenicity);
- Host susceptibility (often, but not always, a heavy smoker or drinker, over 55 years of age, with poor or immunocompromised health); and
- Droplet size (<5 micrometre drops are required to reach the deep alveoli within the exposed individual's lungs).

How these elements interact is still not fully understood.

If you would like more information regarding *Legionella* and Legionnaire's Disease, please consult these websites:

http://www.public.health.wa.gov.au/3/323/3/legionella_infection.pm

http://www.commerce.wa.gov.au/worksafe/PDF/Codes_of_Practice/Legionnaires-code.pdf

The [PathWest Waters Laboratory](#) can be contacted at 9346 2142 or via email: marketing@pathwest.com.au

You can download a PathWest water examination laboratory request form [here](#).

Further information on water testing for buildings can be obtained from Australian/New Zealand Standard, AS/NZS 3666.3 *Air-handling and water systems of buildings – Microbial control: Part 3: Performance-based maintenance of cooling water systems*

