

General Framework for Investigation and Response of Legionella Infections

Background

Legionnaires' disease is a serious type of pneumonia caused by legionella bacteria. Legionella can also cause a milder illness called Pontiac fever. People can get sick when they breathe in mist or aspirate water containing legionella into the lungs. Most people exposed to legionella do not get sick. However, people 50 years or older, current or former smokers, and people with a weakened immune system or chronic disease are at increased risk.

Causes and Common Sources of Infection

Legionella is a type of bacterium found naturally in freshwater environments, like lakes and streams. It can become a health concern when it grows and spreads in human-made building water systems including:

- Showerheads and sink faucets
- Cooling towers (structures that contain water and a fan as part of centralized air cooling systems for building or industrial processes)
- Hot tubs that aren't drained after each use
- Decorative fountains and water features
- Hot water tanks and heaters
- Large plumbing systems

Home and car air-conditioning units do not use water to cool the air, so they are not a risk for legionella growth. The legionella bacteria form biofilms in plumbing and water features and are moderately resistant to temperature changes and chlorination.

How It Spreads

After legionella grows and multiplies in a building water system, water containing legionella then has to spread in droplets small enough for people to breathe in. People can get Legionnaires' disease or Pontiac fever when they breathe in small droplets of water in the air that contain the bacteria.

Less commonly, people can get sick by aspiration of drinking water containing legionella. This happens when water accidentally goes into the lungs while drinking. People at increased risk of aspiration include those with swallowing difficulties.

In general, people do not spread Legionnaires' disease and Pontiac fever to other people.

People at Increased Risk

Most healthy people exposed to legionella do not get sick. People at increased risk of getting sick are:

- People 50 years or older
- Current or former smokers
- People with a chronic lung disease (like chronic obstructive pulmonary disease or emphysema)
- People with weak immune systems or who take drugs that weaken the immune system (like after a transplant operation or chemotherapy)
- People with cancer
- People with underlying illnesses such as diabetes, kidney failure, or liver failure

Reporting of Legionella Infections

Legionella is one of many infections that are mandated to be reported to the health department by doctors and laboratories. This usually occurs within a day of diagnosis.

Several tests can be used to make the diagnosis, for example: respiratory specimen culture, urine antigen, or polymerase chain reaction (PCR) testing of a clinical specimen. These have different test characteristics. Culture is considered the gold standard but is not often performed.

Epidemiological Investigation of Legionella Infections

All legionella infections are investigated by Arkansas Department of Health (ADH) staff. This involves contacting the physician/hospital and attempting to collect exposure information (standard investigation form appended). Often if the physician is unable to fully complete the investigation form, and it cannot be answered by medical documentation, ADH staff will contact the patient or their household contacts (e.g. spouse, parents, children, etc.) to get the information. A detailed patient history in the 10 days prior to illness onset is of particular interest including whether/when the patient spent any time in a hotel, on a cruise ship, or in a hot tub, and if he or she can recall any of the other exposures outlined earlier.

The vast majority of patients do not recall an exposure to a potential public source, but if a patient does recall, for example, a hotel exposure, an environmental investigation is initiated.

Environmental Investigation

In the majority of patient histories, patients do not recall possible public exposure to legionella. If, however, a patient does recall possible public exposure, like at a hotel, an environmental investigation will be initiated. Depending on the type of possible exposure, a plumber inspector, HVAC-R (heating and air conditioning) inspector,

environmental health specialist, or combination of inspectors will make a site visit to assess exposure risks. Owners/operators will be notified in-person that a legionella exposure may have occurred at their location. Relevant systems, such as cooling towers, hot tubs, or plumbing systems, and their maintenance schedules will be evaluated. Any deficiencies will be brought to the attention of the owner, and recommendations will be made to bring the system back into expected operating conditions. Relevant CDC-related guidelines will be provided to the owner/operator. If the system in question is a pool or hot tub, the EHS will conduct a complaint inspection. Plumbers and HVAC-R inspectors will document findings via email.

Potential Legionella Clusters

If two or more legionella cases are identified within close proximity to each other and illness onset times are within a 3-month period, an additional site visit will be made by ADH personnel. Depending on comparisons of patient histories, the investigation may broaden to include new possible public exposures or become more focused to specific possible risks. For example, if a patient recalls a possible hot tub exposure, the environmental health specialist will check the hot tub and assure that it has adequate chlorine levels and is maintained properly. If the patient recalls an exposure to mist from a cooling tower, the cooling tower will be inspected to determine whether it has been appropriately maintained. If the system in question was one that had been identified previously, ADH will confirm that the owner/operator is following recommended guidelines for operation. If the system is a newly identified system, recommendations will be made regarding maintenance and operation. Depending on specific outbreak conditions and consensus of ADH staff, environmental sampling for legionella via culture or PCR may occur at this time. If legionella is detected in environmental samples, ADH will mandate remediation of the affected system by the owner/operator. Remediation will follow standard best practices for the type of system affected.

Notification of Exposed Persons and the Public

Public notification is sometimes necessary to assure that people are aware of the risks, know what symptoms to look for, and can inform their physicians of potential exposure. Notification serves an important purpose for the individual and the public but is not without consequence. Indiscriminate notification can damage businesses and cause unnecessary alarm and anxiety in those informed.

Generally speaking, the ADH will not inform the public or hotel customers if a single case is identified and no concerns are found during on-site inspection. If standard policies regarding cooling tower/hot tub maintenance were not being followed, and the deficiencies are thought to be of significant risk to the public, customers and/or the public may be informed.

If legionella is found in environmental cultures, customers will be informed.

If two cases are reported within 3 months and intensive investigation yields no significant environmental concerns, customers will not be informed. However, if investigation does identify failures to follow standard policies or cooling tower/hot tub maintenance or positive environmental cultures, then customers will be informed.

If three or more cases are reported, customers and the public will be informed.

Limitations of this Framework

One cannot always predict the exact scenario that may arise and what information will be available in order to develop a precise algorithm to follow in legionella outbreak investigations. Situations that differ from the above framework are likely to arise and may necessitate deviating from the framework on a case-by-case basis. In those cases, expert judgement and available evidence will drive the response strategy.

Much of the information was adapted from information found at the following CDC website (<https://www.cdc.gov/legionella/about/causes-transmission.html>).