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Tools From the Centers for Disease Control and Prevention Can Help Prevent and Control *Legionella* Growth and Spread

Editor's Note: The National Environmental Health Association strives to provide up-to-date and relevant information on environmental health and to build partnerships in the profession. In pursuit of these goals, we feature this column on environmental health services from the Centers for Disease Control and Prevention (CDC) in every issue of the *Journal*.

In these columns, authors from CDC's Water, Food, and Environmental Health Services Branch, as well as guest authors, will share tools, resources, and guidance for environmental health practitioners. The conclusions in these columns are those of the author(s) and do not necessarily represent the official position of CDC.

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Assessing and Controlling *Legionella* in Complex Water Systems Is an Important Way to Prevent Illness

Legionella bacteria are naturally found in freshwater. In the right environment, these bacteria can cause illness when people inhale or aspirate aerosolized droplets of water containing *Legionella*. Legionnaires' disease (LD) is a lower respiratory illness characterized by severe pneumonia from these bacteria. This infection often causes hospitalization and is fatal in 1 out of 10 cases (Dooling et al., 2015). The incidence rate of LD is increasing in the U.S. due to a variety of factors, including aging infrastructure and population, increased awareness and testing, and urinary antigen test availability (Barskey et al., 2022). Pontiac

fever is a milder illness caused by *Legionella* bacteria that does not cause pneumonia and usually does not require hospitalization.

Legionella bacteria are known to grow in large, complex water systems that are not adequately maintained. Internal and external factors contribute to *Legionella* growth in building water systems. Studies show that approximately 90% of LD outbreaks associated with buildings are due to a preventable environmental deficiency, including:

- Process failure (e.g., permissive temperatures in the favorable range for *Legionella* growth)
- Needed equipment repair (e.g., an automatic feeder no longer supplying disinfectant in a hot tub; Photo 1)
- Unmanaged external change (e.g., nearby construction that results in pressure

drops that can dislodge biofilm containing *Legionella*)

- Human error (e.g., a person forgetting to change a water filter [Clopper et al., 2021; Garrison et al., 2016])

Legionella Assessment Tools Can Help Support Environmental Health Investigators

Environmental health knowledge is critical in preventing and controlling *Legionella* outbreaks, but many jurisdictions lack environmental health capacity. The Centers for Disease Control and Prevention (CDC) developed the *Legionella* Environmental Assessment Form (LEAF) to help environmental health practitioners and public health officials assess and understand facility water systems and aerosolizing devices. LEAF was originally developed as a printable PDF, but in 2022, CDC converted it to an electronic, fillable PDF. These options allow investigators to use LEAF in either digital or print formats.

LEAF assists facility water management teams with minimizing the risk of LD by identifying areas at risk for *Legionella* growth and spread. There are three main sections of LEAF that address facility characteristics, water supply sources, and premise plumbing systems. There are also five setting- or device-specific appendices:

- Healthcare, Assisted Living, and Senior Living Facilities
- Cooling Towers and Evaporative Condensers (Photo 2)
- Hot Tubs, Whirlpool Spas, and Hydrotherapy Spas
- Other Water Devices
- Recent or Ongoing Major Construction



Photo 1. Staff from the Centers for Disease Control and Prevention (CDC) visually inspect a hot tub during a Legionella outbreak investigation. Legionella can grow and multiply in hot tubs that are not disinfected, cleaned, and properly maintained. Photo courtesy of Nakia Clemmons, CDC.



Photo 2. Staff from the Centers for Disease Control and Prevention (CDC) inspect a poorly maintained cooling tower during a Legionella outbreak investigation. Inadequately maintained cooling towers can aerosolize water containing Legionella bacteria. Photo courtesy of Nakia Clemmons, CDC.

In addition, CDC created the LEAF Marking Guide to provide users with instructions and additional considerations for each LEAF question. These considerations provide more context and background on relevant risk factors for *Legionella* growth and spread, and they educate users conducting the assessment. The marking guide includes key definitions, in-depth details about each question, and information that can help the user collect appropriate data. LEAF data can help improve water management programs, identify the need for environmental sampling, and develop life-saving interventions.

Using Legionella Assessment Tools Improve Environmental Health Decision Making

A *Legionella* environmental assessment should be performed by an environmental health specialist or epidemiologist who is knowledgeable of *Legionella* ecology, building water systems, and water treatment. The assessment should also involve a person, such as a facility manager, who is familiar with the building's systems and maintenance. Environmental health specialists or epidemiologists who have taken CDC's PreventLD training, watched our sampling videos, and studied the *Legionella* Control Toolkit will have the appropriate knowl-

edge to perform an assessment and complete the assessment form.

Information from LEAF should be paired with relevant epidemiological information such as who was exposed or infected and where and when the exposure possibly happened. This information can guide the user to determine which environmental deficiency might have occurred and help them decide if environmental sampling is necessary and where sampling should occur. In addition, findings from LEAF can also be used to implement preventive measures in areas at high risk for *Legionella* growth or spread, and they might be used to develop or improve a water management program.

To learn more, visit our website for additional information and resources at www.cdc.gov/nceh/ehs/water/legionella/index.html. ❁

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Legionella Resources

Explore these links to learn more about the *Legionella* Environmental Assessment Form (LEAF) and other *Legionella*-related resources.

- LEAF: www.cdc.gov/legionella/downloads/legionella-environmental-assessment-p.pdf
- LEAF Marking Guide: www.cdc.gov/legionella/downloads/legionella-environmental-assessment-marking-guide-508.pdf
- Preventing Legionnaires' Disease Training: www.cdc.gov/nceh/ehs/elearn/prevent-LD-training.html
- Sampling and Environmental Assessment Videos: www.cdc.gov/legionella/videos.html
- Additional *Legionella* and Legionnaires' Disease Resources: www.cdc.gov/nceh/ehs/water/legionella/index.html

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