

► DIRECT FROM CDC ENVIRONMENTAL HEALTH SERVICES



Benjamin Clopper, MPH



CDR Jasen Kunz, MPH



Elizabeth Hannapel, MPH

Preventing Legionnaires' Disease: Frontline Tools for Environmental Health Practitioners

Editor's Note: The National Environmental Health Association (NEHA) strives to provide up-to-date and relevant information on environmental health and to build partnerships in the profession. In pursuit of these goals, NEHA features 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 insights and information about environmental health programs, trends, issues, and resources. The conclusions in these columns are those of the author(s) and do not necessarily represent the official position of CDC.

Benjamin Clopper is a fellow with the Oak Ridge Institute for Science and Education (ORISE). CDR Jasen Kunz is an environmental health subject matter expert for Legionnaires' disease at CDC's National Center for Environmental Health and the Water, Food, and Environmental Health Services Branch. Elizabeth Hannapel is an epidemiologist and Legionnaires' disease subject matter expert at CDC's Division of Bacterial Disease within the National Center for Immunization and Respiratory Diseases.

Environmental health practitioners play a critical role in the prevention, identification, and mitigation of Legionnaires' disease outbreaks (Kunz & Cooley, 2016). Over the last 20 years, Legionnaires' disease outbreaks have increased significantly and the Centers for Disease Control and Prevention (CDC) continues to learn about the disease and how to prevent it (Association of State and Territorial Health Officials, 2019; CDC, 2019). For example, CDC investigations show almost all (9 in 10) Legionnaires' disease outbreaks were caused by problems preventable with more effective building water management. Water management programs have become an important industry standard and are

now required in healthcare facilities nationwide (Centers for Medicare & Medicaid Services, 2018; Veterans Health Administration, 2014).

Updated Guidance on Preventing *Legionella* in Water Systems and Devices

ASHRAE recently released expanded and updated guidelines (Guideline 12-2020) to help prevent Legionnaires' disease (ASHRAE, 2020). These guidelines support water management programs and significantly expand previous guidance.

The ASHRAE Guideline 12-2020:

- provides design, operation, and control parameters for various devices and systems,

such as decorative fountains, hot tubs, cooling towers, and potable water systems;

- includes considerations for when *Legionella* testing is appropriate;
- reviews recent and evolving *Legionella* testing methods; and
- suggests response activities according to routine *Legionella* testing results.

New Toolkit for Controlling *Legionella* in Common Sources of Exposure From the Centers for Disease Control and Prevention

CDC created a series of six easy-to-use content modules to summarize the updated guidance. This toolkit aims to help environmental health practitioners, building owners and operators, and facility engineers:

- evaluate hazardous conditions quickly,
- implement *Legionella* control measures,
- strengthen water management programs, and
- support environmental assessments during public health investigations.

The toolkit's six content modules (Figure 1) summarize Guideline 12-2020 updates across common sources of *Legionella* exposure: potable water systems, cooling towers, hot tubs, decorative fountains, and other devices. Each content module includes essential information from Guideline 12-2020 regarding the design, operation, maintenance, and controls specific to the corresponding source of exposure. Module recommendations are anchored to four key factors that affect the ability of *Legionella* to grow in water: sediment and biofilm, temperature, water age, and disinfectant residuals. The importance of these four factors is highlighted in a quick-reference table of *Legionella* control measures for each respective device or system

FIGURE 1

Content Modules From the Centers for Disease Control and Prevention for the ASHRAE Guideline 12-2020



Potable Water Systems



Cooling Towers



Hot Tubs



Decorative Fountains



Other Devices



Testing

TABLE 1

Legionella Control Measures for Hot Tubs and Whirlpool Spas

Water Parameter	Control Measure	Recommendation*		
Sediment and biofilm	Cleaning frequency	Vigorously scrub all surfaces each time tub is drained.		
Temperature	Control limits	Hot tubs operate within <i>Legionella's</i> favorable growth range (77–113 °F). Additional measures are required to control <i>Legionella</i> . Water should not exceed 104 °F for health and safety reasons.		
Age	Bather load, frequency of use	Water replacement frequency (days) = (spa volume/3)/average number of users per day**		
Disinfectant residual	Control limits	pH: 7.2–7.8**	Free chlorine: 3–10 ppm**	Bromine: 4–8 ppm**

*See the Managing *Legionella* Risk in Display Hot Tubs section for recommendations to control *Legionella* in display-only hot tubs at www.cdc.gov/legionella/wmp/control-toolkit/hot-tubs.html.

**Recommendation based on guidance from the Centers for Disease Control and Prevention's Model Aquatic Health Code (www.cdc.gov/mahc/editions/current.html).

(Table 1). One additional module describes considerations if *Legionella* testing is conducted for routine purposes, such as water management program validation. The testing module contains practical information such as values for performance indicators and a multifactorial approach to understanding test results.

Updated *Legionella* Environmental Assessment Form for Building Water Systems From the Centers for Disease Control and Prevention

CDC has also updated the *Legionella* Environmental Assessment Form (LEAF) based on

Snapshot of Legionnaires' Disease (LD)

- LD is caused by inhalation of aerosols that contain *Legionella* bacteria.
- Nearly 1 in 10 cases is fatal (Shah et al., 2019).
- The Centers for Disease Control and Protection (CDC) reported 9,933 cases in 2018—an increase of almost 900% since 2000 (CDC, 2019).
- Of all waterborne outbreaks reported through CDC's National Outbreak Reporting System in 2017, 61% implicated *Legionella* bacteria (CDC, 2018).

field experience during outbreak responses and to better align with Guideline 12-2020. Public health officials can use LEAF to gain a thorough understanding of a facility's water systems and assist facility management with using environmental control measures to minimize the risk of Legionnaires' disease. It can also be used along with epidemiologic information to determine whether to conduct *Legionella* environmental sampling and to develop a sampling plan.

A key revision to LEAF includes an expanded cooling tower appendix refined over the course of multiple CDC-led field investigations. During an outbreak involving cooling towers, rapid identification and environmental assessment are essential to limit the number of people exposed. The updated LEAF supports CDC procedures developed in 2019 for identifying cooling towers during an outbreak investigation (Figure 2).

By sharing knowledge and developing easy-to-use resources, CDC hopes to empower local communities to prevent outbreaks of Legionnaires' disease. Explore CDC's free *Legionella* resources at www.cdc.gov/legionella/health-depts/environmental-inv-resources.html. 🐼

Corresponding Author: Benjamin Clopper, Oak Ridge Institute for Science and Education, Division of Environmental Health Science and Practice, National Center for Environmental Health, Centers for Disease Control and Prevention, 4770 Buford Highway, Mailstop S106-5, Atlanta, GA, 30341. Email: oyx5@cdc.gov.

References

ASHRAE. (2020). *Guideline 12-2020—Minimizing the risk of legionellosis associated with building water systems.*

Association of State and Territorial Health Officials. (2019). *Understanding Legionnaires' disease outbreak response gaps and resource needs: Results from a survey of state and territorial health agencies.* <https://www.astho.org/Programs/Environmental-Health/Documents/Legionnaires-Disease-Outbreak-Response-Gap-and-Resource-Needs/>

Centers for Disease Control and Prevention. (2018). *National Outbreak Reporting System (NORS): NORS dashboard.* <https://wwwn.cdc.gov/norsdashboard/>

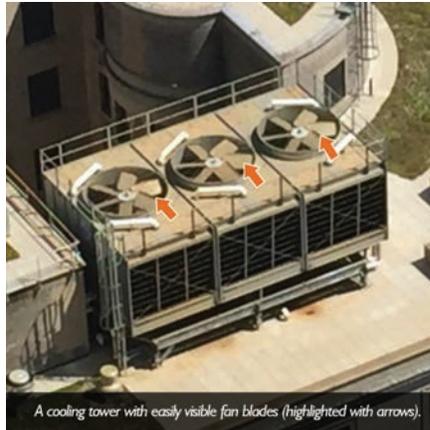
Centers for Disease Control and Prevention. (2019). *National Notifiable Diseases Surveillance System (NNDSS): Notifiable infectious diseases and conditions data tables.* <https://wwwn.cdc.gov/nndss/infectious-tables.html>

Centers for Medicare & Medicaid Services. (2018). *Requirement to reduce Legionella risk in healthcare facility water systems to prevent cases and outbreaks of Legionnaires' disease (LD).* <https://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/SurveyCertificationGenInfo/Policy-and-Memos-to-States-and-Regions-Items/Survey-And-Cert-Letter-17-30->

Kunz, J.M. & Cooley, L.A. (2016). Preventing Legionnaires' disease: Environmental health expertise is key. *Journal of Environ-*

FIGURE 2

Identifying Cooling Towers Using Aerial and Satellite Imagery



Cooling towers can cause outbreaks of Legionnaires' disease when they are not adequately maintained. The Centers for Disease Control and Prevention has tools for scanning aerial or satellite images to rapidly identify cooling towers.
Source: www.cdc.gov/legionella/health-depts/environmental-inv-resources/id-cooling-towers.html

mental Health, 79(1), 24-26. <https://www.cdc.gov/nceh/ehs/docs/jeh/2016/july-aug-legion.pdf>

Shah, P., Barskey, A., Binder, A., Edens, C., Lee, S., Smith, J., Schrag, S., Whitney, C., Cooley, L., & Division of Bacterial Diseases, National Center for Immunization and Respiratory Diseases. (2019). *Legionnaires' disease surveillance summary report, United States, 2014–2015.* Centers for

Disease Control and Prevention. <https://www.cdc.gov/legionella/health-depts/surv-reporting/2014-15-surv-report-508.pdf>

Veterans Health Administration. (2014, August 13). *Prevention of healthcare-associated Legionella disease and scald injury from potable water distribution systems (VHA Directive 1061).* https://www.va.gov/vhapublications/ViewPublication.asp?pub_ID=9181



REHS/RS

Choosing a career that protects the basic necessities like food, water, and air for people in your communities already proves that you have dedication. Now, take the next step and open new doors with the Registered Environmental Health Specialist/Registered Sanitarian (REHS/RS) credential from NEHA. It is the gold standard in environmental health and shows your commitment to excellence—to yourself and the communities you serve.

Find out if you are eligible to apply at neha.org/rehs.



A credential today can improve all your tomorrows.

