

# Legionnaires' Disease Response Update – March 26, 2024

Rev. 4/4/2024

## Legionella Monitoring Summary:

In response to the recent Legionnaires' disease cases in Grand Rapids, MN, water testing and sampling has been launched. Common vectors of *Legionella* infections include cooling towers and other water fixtures that can aerosolize water and bacteria into the air (i.e., hot tubs, showerheads, and decorative fountains). Samples have been collected from Grand Rapids Public Utilities (GRPU) drinking water facilities and distribution system, as well as from plumbing systems inside buildings. These samples were tested for *Legionella* presence and quantified by Minnesota Department of Health (MDH) in December 2023 and by the University of Minnesota in February 2024. GRPU is working with the MDH and other partners to move forward with the best plan of action to further test the drinking water for *Legionella* and to prioritize and protect public health.

In March 2024, a public town hall meeting was held to inform the community of the risks and symptoms of Legionnaires' disease, as well as GRPU's plans moving forward to test for *Legionella*. In addition, GRPU discussed their future plans to initiate disinfection of the drinking water to help control future *Legionella* proliferation and reduce bacterial growth in the drinking water. Subsequent routine weekly testing for *Legionella* quantification in the GRPU drinking water is planned and expected to start within the month.

- *Legionella* sampling and testing has been conducted by the Minnesota Department of Health and the University of Minnesota
- *Legionella pneumophila*, a species of *Legionella* commonly implicated in Legionnaire's disease cases, has been detected in building cooling towers and inside of buildings in Grand Rapids
- *L. pneumophila* concentrations in some drinking water samples collected inside buildings exceed suggested World Health Organization (WHO) target risk values (these concentrations are not regulated)
- GRPU is planning to continue sampling and testing sites in the distribution network and inside buildings for *L. pneumophila*
- GRPU is working with MDH and engineers to determine the best plan moving forward, which will likely include water disinfection to address *Legionella* concerns

## Overview of Legionella sampling approaches and results

*Legionella*. More than 61 species of *Legionella* have been described, half of which have been isolated from patients.<sup>1</sup> In North America and Europe, *L. pneumophila* is the most dominant *Legionella* species isolated from patients. Other species can lead to disease, including *L. micdadei*, *L. bozemanii*, *L. dumoffi* and *L. longbeachae*.<sup>1</sup> However, not all *Legionella* species cause disease which is why it is important to distinguish between the different species of *Legionella* that are detected. More than 20 species have been proven to be causative agents of Legionnaires' disease (LD).<sup>2</sup> The species *Legionella pneumophila* accounts for approximately 90% of confirmed cases of legionellosis,<sup>2</sup> and *L. pneumophila* serogroup 1 (sg 1) has been

<sup>1</sup> National Academies of Sciences, Engineering, and Medicine. 2019. Management of Legionella in Water Systems. Washington, DC: The National Academies Press. doi: <http://doi.org/10.17226/25474>

<sup>2</sup> Lee, HK, Ji Shim, HE Kim, JY Yu, and YH Kang. (2010) Distribution of Legionella Species from Environmental Water Sources of Public Facilities and Genetic Diversity of *L. pneumophila* Serogroup 1 in South Korea. Appl Environ Microbiol. 2010 Oct; 76(19): 6547–6554. doi: 10.1128/AEM.00422-10

recognized as the most important serogroup. Considering the different *Legionella* species that exist, the testing conducted thus far by MDH has evaluated the presence of *Legionella pneumophila*, *Legionella pneumophila* serogroup 1 (sg1), and presence of *Legionella* in general. This discussion of *Legionella* species and serogroup types are intended to help bring some context for interpretation of the results provided below.

**Table 1.** Comparison of *Legionella* testing methods

Method	Potential for quantification	Level of Use	Form of Bacteria Measured	Pros	Cons
Culture	Yes	Routine	Culturable bacteria (MPN <sup>1</sup> or CFU <sup>2</sup> )	Standardized and historical data	Long wait time, can underestimate VBNC bacteria <sup>3</sup>
Legiolert	Yes	Routine, Research	Culturable bacteria (MPN)	Simple setup and specific to <i>L. pneumophila</i>	About 8 days to get results, more difficult to confirm
Molecular: PCR	No	Routine, Research	Inactivated bacteria (if the DNA and cell membrane are intact), VBNC bacteria, Culturable bacteria	Can support sequencing	Need to process gels
Molecular: qPCR	Yes	Routine, Research	Inactivated bacteria (if the DNA and cell membrane are intact), VBNC bacteria, Culturable bacteria	Rapid results, greater sensitivity and specificity	Measures inactivated cells, less historical use

\*Adapted from NASEM report, *Management of Legionella in Water Systems, on Legionella* (Table 3-2) (1) MPN: Most probable number, a method for quantifying estimations of bacteria in food or water samples. (2) CFU: Colony forming unit, a unit which estimates the number of microbial cells (bacteria, fungi, viruses etc.) in a sample that are viable. (3) VBNC bacteria are viable, but not culturable. Note: the MPN and CFU units for quantifying bacteria are roughly equivalent, but utilize different microbiological approaches for quantification.

**Table 2.** *L. pneumophila* concentration in plumbing fixtures that correspond to target risk levels

Device / Fixture	Critical Average Concentration (CFU/ L)
<b>US – Target Risk Value: 10<sup>-4</sup> infections / person / year</b>	
Conventional faucet	104,000
Conventional toilet	857,000
Conventional shower	1,410
<b>WHO – Target Risk Value: 10<sup>-6</sup> DALY / person / year</b>	
Conventional faucet	1,060
Conventional toilet	8,830
Conventional shower	14.4

\*Adapted from NASEM Report, *Management of Legionella in Water Systems, on Legionella* (Table 3-10). \*\*DALY: overall burden of disease is assessed using the disability-adjusted life year (DALY), a time-based measure that

combines years of life lost due to premature mortality (YLLs) and years of life lost due to time lived in states of less than full health, or years of healthy life lost due to disability (YLDs).

## Sampling Results

**Table 3.** Summary of select Legionella sampling results to date (December 2023 – March 2024)

Timeline	Who conducted testing?	What was sampled?	What types of tests were performed?	What were the results?
December 2023	Minnesota Dept. Health	Drinking water: -Distribution system -Inside buildings	- PCR - Culture - Legiolert	- PCR: positive for <i>L. pneumophila</i> sg1 in 1 of 22 samples, <i>L. pneumophila</i> in 4 of 22 samples - Culture: <i>L. pneumophila</i> sg1 in 8 of 22 samples - Legiolert: Not detectable/not tested in all samples
February 2024	University of Minnesota	Drinking water: -Distribution system -Inside buildings	- Legiolert*	- Legiolert: <i>Legionella</i> present in 3 of 11 samples (Range: 1 – 572 MPN / 100 mL)

\*In February 2024, U of M ran tests for Legiolert and PCR samples, but PCR results are not yet available

### MDH Testing: Drinking water (December 2023)

MDH collected the following samples and tested for *Legionella* in December 2023:

- Distribution system: 8 distribution system samples, all negative for culture and Legiolert
- Building samples: samples from 2 buildings
  - Legiolert: all absent or not tested
  - Culture: *Legionella pneumophila* serogroup 1 isolated (8 of 14 building samples)

**Table 4.** MDH Legionella drinking water sampling results for December 2023

Sample Location	Specimen Type	Legionella PCR	Legionella Culture	Legiolert (MPN/100 ml)
YMCA Mens Gen locker room shower	Swab	<i>L. pneumophila</i> serogroup 1 detected	<i>Legionella pneumophila</i> serogroup 1	not applicable
YMCA Mens Gen locker room shower	Water	<i>Legionella</i> species detected, <i>L. pneumophila</i> indeterminate	<i>Legionella</i> species not isolated	<1 absent <sup>1</sup>
YMCA Mens Plus locker room shower	Swab	<i>Legionella</i> species detected	<i>Legionella pneumophila</i> serogroup 1	not applicable
YMCA Mens Plus locker room shower	Water	<i>Legionella</i> species detected	<i>Legionella anisa</i>	<1 absent
YMCA Womens	Water	<i>L. pneumophila</i> detected, <i>L. pneumophila</i> sg1 indeterminate	<i>Legionella anisa</i>	<1 absent
YMCA Womens	Swab	<i>Legionella</i> species detected	<i>Legionella pneumophila</i> serogroup 1 (Isolate 1), <i>Legionella anisa</i>	not applicable
YMCA Hot water heater	Water	<i>L. pneumophila</i> detected, <i>L. pneumophila</i> sg1 indeterminate	<i>Legionella</i> species not isolated	<1 absent
YMCA Incoming water	Swab	<i>Legionella</i> species detected	<i>Legionella</i> species not isolated	not applicable

YMCA Incoming water	Water	<i>Legionella</i> species detected	<i>Legionella</i> species not isolated	<1 absent
Jail Sample #1	Swab	<i>Legionella</i> species detected	<i>Legionella pneumophila</i> serogroup 1	not applicable
Jail Sample #2	Water	<i>Legionella</i> species detected	<i>Legionella pneumophila</i> serogroup 1	<1 absent
Jail Sample #3	Water	<i>Legionella</i> species detected, <i>L. pneumophila</i> indeterminate	<i>Legionella pneumophila</i> serogroup 1	<1 absent
Jail Sample #4	Swab	<i>Legionella</i> species detected	<i>Legionella pneumophila</i> serogroup 1	not applicable
Jail Sample #5	Water	<i>L. pneumophila</i> detected, <i>L. pneumophila</i> sg1 indeterminate	<i>Legionella pneumophila</i> serogroup 1	<1 absent
<b>Distribution system</b>	<b>Specimen Type</b>	<b><i>Legionella</i> PCR</b>	<b><i>Legionella</i> Culture</b>	<b>Legiolert (MPN/100 ml)</b>
GRPU Booster Station	Water	<i>Legionella</i> species detected	<i>Legionella</i> species not isolated	<1 absent
GRPU Booster Station	Swab	<i>Legionella</i> species detected	<i>Legionella</i> species not isolated	not applicable
GRPU North Tower Hydrant	Water	<i>Legionella</i> species detected	<i>Legionella</i> species not isolated	<1 absent
GRPU Treatment plant	Swab	Indeterminate	<i>Legionella</i> species not isolated	not applicable
GRPU Treatment Plant	Water	<i>Legionella</i> species detected	<i>Legionella</i> species not isolated	<1 absent
GRPU South Tower	Water	<i>Legionella</i> species detected	<i>Legionella</i> species not isolated	<1 absent
GRPU Service Center	Swab	<i>Legionella</i> species detected	<i>Legionella</i> species not isolated	not applicable
GRPU Service Center	Water	<i>Legionella</i> species detected	<i>Legionella</i> species not isolated	<1 absent

<sup>1</sup>Results are lower than the detection limit of the assay.

### University of Minnesota (February 2024)

Water in the distribution system network and inside of buildings was tested by researchers at the University of Minnesota. They collected 7 samples at 7 locations in the distribution system (i.e., minimized or no premise plumbing) and 4 samples at 2 locations in buildings:

- Distribution system: 1 positive out of 7 locations (concentration: 1 MPN / 100 mL). The U of M team collected from or very close to the water meter in all cases with several minutes of flushing of the cold water, to constant temperature, to minimize the impact of premise plumbing.
- Building samples: 2 positives out of 4 samples from 2 locations inside buildings (range: 538 – 572 MPN / 100 mL).

**Table 5. Legiolert results from U of M sampling**

	Sample location	Legiolert Result (MPN/100 mL)
Distribution system	GRPU Treatment Plant - effluent sample tap	<1 absent
Distribution system	GRPU South Water Tower - fire hydrant	<1 absent
Distribution system	GRPU PRV - sample tap in building	<1 absent
Distribution system	Yanmar Arena - mop sink (near water meter)	1
Distribution system	YMCA- hose bib (near the water meter, but after the softener)	<1 absent
Inside building	YMCA- men’s locker room shower head – hot water	<1 absent
Inside building	YMCA- men’s locker room shower head – cold water	<1 absent
Distribution system	Itasca County Jail - hose bib/entry point	<1 absent
Inside building	Itasca County Jail - mop sink hot	538
Inside building	Itasca County Jail - mop sink cold	572
Distribution system	City of LaPrairie: City Garage - water meter	<1 absent

## Next Steps

GRPU is implementing a 2-pronged approach to promote safe drinking water and to protect public health.

- 1) Investigation and sampling of GRPU water distribution system locations and volunteered building locations
- 2) Investigation and implementation of GRPU water system disinfection

In the coming months, GRPU is planning to implement additional *Legionella* testing in the distribution system drinking water, as well as collecting water samples from buildings in the community. In addition, GRPU is currently working with engineers and drinking water experts to figure out how to best move forward with implementing a disinfection protocol of the city’s drinking water.

Up to date information will be added to the GRPU website:

<https://cityofgrandrapidsmn.com/utilities/page/legionella-and-drinking-water-information>



