

Report for:

Mr. Jay McNeff OccuHealth, Inc. 44 Wood Avenue Mansfield, MA 02048

Regarding:

Project: Dartmouth Police Dept.; Legionella Screening

EML ID: 1175846

Approved by:

Dates of Analysis:

Legionella pnéumophila culture: 03-07-2014

Technical Manager Ariunaa Jalsrai

Service SOPs: Legionella pneumophila culture (1687) AlHA-LAP, LLC accredited service, Lab ID #103005

All samples were received in acceptable condition unless noted in the Report Comments portion in the body of the report. Due to the nature of the analyses performed, field blank correction of results is not applied. The results relate only to the items tested.

EMLab P&K ("the Company") shall have no liability to the client or the client's customer with respect to decisions or recommendations made, actions taken or courses of conduct implemented by either the client or the client's customer as a result of or based upon the Test Results. In no event shall the Company be liable to the client with respect to the Test Results except for the Company's own willful misconduct or gross negligence nor shall the Company be liable for incidental or consequential damages or lost profits or revenues to the fullest extent such liability may be disclaimed by law, even if the Company has been advised of the possibility of such damages, lost profits or lost revenues. In no event shall the Company's liability with respect to the Test Results exceed the amount paid to the Company by the client therefor.

3000 Lincoln Drive East, Suite A, Marlton, NJ 08053 (866) 871-1984 Fax (856) 489-4085 www.emlab.com

Client: OccuHealth, Inc. C/O: Mr. Jay McNeff

Re: Dartmouth Police Dept.; Legionella Screening

Date of Sampling: 02-26-2014 Date of Receipt: 02-27-2014 Date of Report: 03-07-2014

**OUANTITATIVE LEGIONELLA REPORT** 

Location:	D-1:	D-2:	D-3:	D-4:
	2nd Floor Mens Room Sink	2nd Floor Mens Room Sink Flush	Roll Call Sink	1st Floor Locker Room Sink
Comments (see below)	None	None	None	None
Lab ID-Version‡:	5324323-1	5324324-1	5324325-1	5324326-1
Analysis Date:	03/07/2014	03/07/2014	03/07/2014	03/07/2014
Sample type*	Water sample	Water sample	Water sample	Water sample
·	cfu/1,000 ml	cfu/1,000 ml	cfu/1,000 ml	cfu/1,000 ml
L. pneumophila	480	80	1,400	18,000
Other Legionella species***	< 40	< 40	< 40	< 40
TOTAL CFU/UNIT	480	80	1,400	18,000

Comments:

Information on Legionella control may be found in the OSHA Technical Manual Sec. III, Ch. 7 (ISBN: 0-86587-674-6 or online at www.osha.gov).

The limit of detection is a raw count of 1 at the lowest dilution plated. The analytical sensitivity is equal to 1 raw count/reporting unit x the dilution factor.

Interpretation is left to the company and/or persons who conducted the field work.

Based on samples delivered. Sampling techniques, contaminants infecting samples, unrepresentative samples and other similar or dissimilar factors may affect results. EMLab P&K hereby disclaims any liability for indirect, punitive, incidental, special or consequential damages arising out of the use or interpretation of the data contained in, or any actions taken in reliance upon, this report; and its actual direct damages arising out of the use or interpretation of the data contained in, or any actions or omitted taken in reliance upon, this report shall be limited to the cost of this report.

‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

<sup>\*</sup> The sample type affects the interpretation of the results. For example, swab samples provide only qualitative results but are not recommended for comparison to the OSHA guidelines for permissible levels of *Legionella* in water samples.

<sup>\*\*</sup> Legionella isolate identification using serological testing. The Legionella pneumophila organism is responsible for approximately 90% of the reported Legionellosis cases. Of the reported Legionellosis cases caused by Legionella pneumophila species, Legionella pneumophila serotype 1 organisms are implicated as the causative agent over 80% of the time, with serotypes 2-14 being implicated in the majority of the remaining cases.

<sup>\*\*\* &</sup>quot;Other Legionella species" include, but are not limited to, the following organisms: Legionella anisa, Legionella bozemanii, Legionella dumoffii, Legionella gormanii, Legionella jordanis, Legionella longbeachae 1 and 2, and Legionella micdadei.

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Re: Dartmouth Police Dept.; Legionella Screening

Date of Sampling: 02-26-2014 Date of Receipt: 02-27-2014 Date of Report: 03-07-2014

**QUANTITATIVE LEGIONELLA REPORT** 

Location:	D-5:	D-6:	D-7:	D-8:
	1st Floor Locker Room Sink Flush	1st Floor Locker Room Shower	Basement Mens Sink	Gym Sink
Comments (see below)	None	None	None	None
Lab ID-Version‡:	5324327-1	5324328-1	5324329-1	5324330-1
Analysis Date:	03/07/2014	03/07/2014	03/07/2014	03/07/2014
Sample type*	Water sample	Water sample	Water sample	Water sample
	cfu/1,000 ml	cfu/1,000 ml	cfu/1,000 ml	cfu/1,000 ml
L. pneumophila	9,000	4,600	< 40	19,000
Other Legionella species***	< 40	< 40	< 40	< 40
TOTAL CFU/UNIT	9,000	4,600	< 40	19,000

Comments:

Information on Legionella control may be found in the OSHA Technical Manual Sec. III, Ch. 7 (ISBN: 0-86587-674-6 or online at www.osha.gov).

The limit of detection is a raw count of 1 at the lowest dilution plated. The analytical sensitivity is equal to 1 raw count/reporting unit x the dilution factor.

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<sup>\*</sup> The sample type affects the interpretation of the results. For example, swab samples provide only qualitative results but are not recommended for comparison to the OSHA guidelines for permissible levels of Legionella in water samples.

<sup>\*\*</sup> Legionella isolate identification using serological testing. The Legionella pneumophila organism is responsible for approximately 90% of the reported Legionellosis cases. Of the reported Legionellosis cases caused by Legionella pneumophila species, Legionella pneumophila serotype 1 organisms are implicated as the causative agent over 80% of the time, with serotypes 2-14 being implicated in the majority of the remaining cases.

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	BC - BipCaesette TP	A15 – Andersen	SAS - Surisce Air Semple   P - Polable Water	CP — Contact Plate	

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# PathCon Laboratories

# TECHNICAL BULLETIN 1.5

# Legionella Bacteria in Environmental Samples: Hazard Analysis and Suggested Remedial Actions

GEORGE K. MORRIS, Ph.D., AND BRIAN G. SHELTON, M.P.H.
PathCon Laboratories, Norcross, Georgia 30092

#### THE DISEASE

The diseases caused by Legionella bacteria, or legionellosis, are currently recognized to occur in two distinct clinical forms: Legionnaires' disease and Pontiac Fever.

Of the two, Legionnaires' disease is the more serious condition, causing a multi-system disease including pneumonia with fatality rates of about 15%. When outbreaks occur, usually less than 5% of exposed individuals develop disease, commonly within 3 to 9 days after exposure.

Pontiac fever is a non-fatal flu-like disease of short duration which does not cause pneumonia. Approximately 95% of exposed individuals develop disease, usually within 2 to 3 days. The number of cases of Legionnaires' disease occurring in the United States each year has been estimated by the Centers for Disease Control and Prevention (CDC) at 10,000 to more than 100,000 per year.

#### THE BACTERIUM

Legionellosis is caused by Legionella bacteria which occur natually in surface waters including lakes, streams, and mud. There are more than 34 known species and more than 50 serogroups of Legionella. Many of them have not yet been implicated in human disease. Legionella pneumophila serogroup 1 is most frequently implicated in disease and is most frequently found in the environment. It is possible that some species have not yet been associated with human disease beause they occur so rarely in nature; therefore, all strains should be considered potentially pathogenic.

#### RISK OF INFECTION

To cause disease several factors must occur: the organism must be virulent, it must be in sufficient number to cause disease, the water source must be aerosolized and distributed to the human host, the legionellae must be inhaled by the potential host deeply into the lungs, and the human host's defenses must be unable to stop the infection.

The infectious dose has not been determined, but the larger the dose, the more likely an infection will occur. The risk of infection will be greater if the dose of Legionella-containing water is in direct, close contact with the target person (as is the case with humidifiers and foggers) than if the water is distant from the target person (as with cooling towers, (CT), and evaporative condensers, (EC)}. Portable water systems may represent an intermediate category.

The risk of infection is greater and a lower dose is required in those individuals who are older, smokers, heavy drinkers, immunocompromised with other diseases or on immunosuppressive therapy.

#### **BUILDING AND INDUSTRIAL SOURCES**

Water in many natural or man-made systems serves as an amplifier of Legionella bacteria by providing suitable conditions for growth. Potential sources include cooling towers, evaporative condensers, humidifiers, potable water heaters and holding tanks, pipes containing stagnant warm water, shower heads, faucet aerators, decorative fountains, nebulizers, mister reservoirs, and whirlpool baths. Legionella apparently survives in low numbers in routine water treatment used to treat potable water and can be carried in the treated drinking water into buildings, where the bacteria can colonize in the plumbing fixtures, especially in hot water systems.

Therefore, cooling towers and other systems may become contaminated through the make-up water. Well-maintained systems are less likely to be colonized with legionellae than systems that are poorly maintained. Continued vigilance in terms of excellent preventive maintenance and an excellent water treatment program are required to minimize the risk of Legionella.

# HEALTH HAZARD ANALYSIS

The mere presence of legionellae either in heat rejection systems or water services will not by itself cause disease. High numbers of legionellae have been noted in cooling towers and other sources with no associated disease. However, an epidemiologic link has been established between the legionellae in the environment and the occurrence of legionellosis. Best and coworkers (1983) found that the reduction of legionellae in the environment was linked to a reduction in the incidence of clinical Legionnaires' disease.

Most outbreaks from cooling towers and evaporative condensers have been associated with high numbers of legionellae, at least 1,000 colony-forming units per milliliter (CFU/ml) or more in the implicated source (Shelton and co-workers, 1994). At PathCon Laboratories, we have found numbers of Legionella averaging 160 CFU/ ml (range <1 to 1,500) in a potable water system associated with an outbreak; and as few as 10 CFU/ ml of fogger reservoir water that may have caused disease in people in immediate direct contact with the mist. Of utmost importance, most cases of legionellosis occur as sporadic cases, not epidemics, and it is not known how many organisms in a water source may represent an infectous risk for sporadic cases to occur.

Many people with responsibility for maintaining air quality in buildings and industrial settings require programs designed to detect potential problems with legionellae. For this reason, we have developed quantitative legionellae criteria and corresponding remedial actions. These quantitative Legionella data are based on numbers of viable legionellae because health risk from nonviable Legionella has not been documented. Although there is honest disagreement among informed scientists on the risks associated with legionellae in the environment, the degree of remedial action suggested in Table 1 is expected to err on the side of safety. Many health authorities discourage the notion of

completely eliminating Legionella bacteria from environmental waters. Other workers have recommended that immunocompromised patients be completely protected from waters containing Legionella (Helms, et al., 1983). It is our opinion that these data in Table 1 are not applicable in areas with immunocompromised individuals or for waters used for therapeutic purposes. In these situations, no level of Legionella organisms is acceptable.

Table 1: Suggested Legionella Remedial Action Criteria

Legionella (CFU/ml) Detectable	CT/EC *	Remedial Action if Detected in: Potable Water	Humidifler/Fogger	
But<1	1	2	3	
1 to 9	2	3	4	<del></del>
10-99	3	4	5	
100-999	4	5	5	<u>.</u>
≥ 1,000	5	5	5	

\* Cooling Tower / Evaporative Condenser

#### REMEDIAL ACTIONS

Action 1. Review routine maintenance program recommended by the manufacturer of the equipment to ensure that the manufacturer's recommended program is being followed. The presence of barely detectable numbers of legionellae represents a low level of concern.

Action 2. Implement Action 1 (see above). Conduct follow-up legionellae analysis after a few weeks for evidence of further amplification. This level of legionellae represent little concern, but the number of organisms detected indicates that the system is a potential amplifier for legionellae.

Action 3. Implement Action 2. Conduct review of premises for direct and indirect bioaerosol contact with occupants and health risk status of people that may come in contact with the bioaerosols. Depending on the results of the review of the premises, action related to cleaning and/or biocide treatment of the equipment may be indicated. This level of legionellae represents a low but increased level of concern.

Action 4. Implement Action 3. Cleaning and/or biocide treatment of the equipment is indicated. This level of legionellae represents a moderately high level of concern. The level is approaching levels that may cause outbreaks. It is uncommon for samples to contain numbers of legionellae which fall into this category.

Action 5. Immediate cleaning and/or biocide treatment of the equipment is definitely indicated. Conduct post-treatment legionellae analysis to ensure effectiveness of the corrective action. The level of legionellae represent a high level of concern. These numbers are at a level that has the potential for causing an outbreak. It is very uncommon for

samples to contain numbers of legionellae which fall in this category.

#### ANALYTICAL LIMITATIONS

The microbiological analysis may be influenced by many factors including the possibility that Legionella bacteria may be harbored and amplified inside the cells of aquatic protozoa or in slime or biofilm. Therefore, a negative test result does not necessarily indicate that the environmental source of a sample is free of Legionella. The only way to ensure that legionellosis does not occur is to eliminate Legionella bacteria from the environment, but research has shown that, because of the ubiquitous nature of the bacteria, it is unlikely that a water source will always remain free of legionellae. A negative result indicates only that if present, the number of Legionella in the sample, at the time the sample was taken, was less than the detection limits of the test. The finding of low numbers of Legionella, or even negative findings, does not ensure that an environment will not be the source of legionellosis.

#### REFERENCES

Best, M., V.L. Yu, J. Stout, et al. 1983. Legionellaceae in the hospital water supply. Epidemiologic link with disease and evaluation of a method for control of nosocomial Legionnaires' disease and Pittsburgh pneumonia. Lancet, ii: 307-310.

Helms, C.M., R.M. Massanari, R. Zeitler, et al. 1983. Legionnaires' disease associated with a hospital water system: a cluster of 24 nosocomial cases. Ann. Int. Med. 99: 172-178.

Shelton, B.G., W.D. Flanders and G.K. Morris. 1994. Legionnaires' disease outbreaks and cooling towers with amplified Legionella concentrations. Current Microbiol. 28:359-363.



Occupational Health & Safety, Environmental Consultants

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March 14, 2014

Chief Timothy Lee Dartmouth Police Department 249 Russells Mills Road Dartmouth, MA 02748

emailed to: CTLee@dartmouthpd.org

RE: Legionella Sterilization and PCR Sampling

Dear Chief:

OccuHealth, Inc. (OHI) is submitting this report on the Legionella sterilization and follow up sampling activities conducted in March, 2014 at your facility located at 249 Russells Mills Road, Dartmouth, MA. The activities were led by Mr. Jay McNeff, Senior Project Manager under the direction of Thomas E. Hamilton, Certified Industrial Hygienist, both of OHI. The work was requested and authorized by Mr. David Saulnier, who maintains the facility at the Dartmouth Police Department. This report documents sterilization activities conducted on March 8, 2014 with confirmation samples obtained on March 10, 2014.

# **Sterilization Process Description**

The objective of sterilization was to bring all hot water temperatures in the system to at least 160 deg F which in turn should ensure destruction of the Legionella bacteria. The plan was developed to bring the main hot water supply in the basement up to about 170 deg F. The plumber disabled the cold water supply to the tempered mixing valve so untempered hot water could be delivered to the fixtures in the building. Mr. Saulnier developed a list of all hot water fixtures in the facility. These fixtures were "red bagged" to signify that the hot water was unavailable for use by the employees during the sterilization process. The 'red bags" are actually black trash bags with yellow caution tape which indicate fixtures are out of service. The team chose to remove all sink aerators and shower heads during this process. These fixtures were replaced with new ones at the end of the process. The sterilization team of Jay McNeff and Dave Saulnier then proceeded to run the superheated hot water through all hot water fixtures in the facility. Actual temperatures

were recorded with digital thermometers at all locations to confirm sterilization was completed. The team then proceeded to re-set the system to normal hot water mode by returning the hot water supply in the basement back to mixed supply delivering to the building at 120 deg F. "Red Bags" were removed at all fixtures and temperatures were checked to confirm hot water was being delivered at 130 deg F or less and would be safe for use. The "master" recording sheets used for the sterilization effort are attached for reference. The hot water recirculation pump's controls were modified so it would run continuously instead of its normal mode of shutting down over 110 deg F.

The sterilization proceeded effectively in that all but one location was brought to at least 160 deg F. The exception was the basement Ladies Room shower which remains out of service. Some observations of note during the sterilization included the fact that cold water seemed to be cross connected into the hot water supply to the basement fixtures of the Mens and Ladies rooms as well as the Roll Call Sink and the Dark Room Sinks.

# Facility Water Sampling and Testing

Sampling and Analytical Methodology

OccuHealth collected 18 water samples on March 10, 2014 of various hot water sources within the facility. Sample collection was conducted by Jay McNeff of OHI with the assistance of Dave Saulnier of the Dartmouth Police Department. The laboratory used a PCR (Polymerase Chain Reaction) method for rapid turnaround results. This method is capable of obtaining faster results that the traditional viable method where any bacteria present is grown and analyzed over a 2 to 3 week period. These samples are being analyzed with both methods and the PCR method results are in this report.

### Analytical Results

The results are summarized on Table 1. Fifteen of the 18 samples indicated the presence of Legionella.

Sample Number	Location	Positive/Negative	Qualitative Description
D-1	Roll Call Sink	Positive	Low
D-2	Roll Call Sink Flush	Positive	Medium-high
D-3	Booking Sink	Positive	Medium
D-4	Cells J1/J2 Composite	Positive	High
D-5	Cells M3/M4 Composite	Positive	High

Table 1: Legionella Testing Results

Sample Number	Location	Positive/Negative	Qualitative Description
D-6	Deep Sink	Positive	Low
D-7	Lobby Sink	Positive	Low-medium
D-8	Dispatch Kitchen Sink	Positive	Low-medium
D-9	Dispatch Kitchen Sink Flush	Positive	Medium
D-10	Men's Locker Room Sink	Positive	Medium-high
D-11	Men's Locker Room Shower	Positive	Medium-high
D-12	Women's Locker Room Sink	Positive	High
D-13	Gym Sink	Positive	Medium
D-14	2 <sup>nd</sup> Floor Ladies Room Sinks Flush (Composite)	Negative	Not Detected
D-15	2 <sup>nd</sup> Floor Mens Room Sinks (Composite)	Negative	Not Detected
D-16	2 <sup>nd</sup> Floor Ladies Room Sinks (Composite)	Positive	Low-medium
D-17	Chief/ Maint Sinks (Composite)	Negative	Not Detected
D-18	Men's Locker Room Sink Flush	Positive	Medium

Positive = presence of L. Pneumophila

#### Conclusions and Recommendations

The results of the viable testing will be available in 1 to 2 weeks. OHI will follow up with additional recommendations at that time. In summary, OHI offers the following recommendations:

- 1. Communicate results with affected employees.
- 2. Begin consideration and investigation of other alternatives in the event that testing proves that sterilization was unsuccessful. Those alternatives may include short term end of pipe filtration which has been successfully validated for 30 days. Other options include replacement of hot water distribution piping or the implementation of a silver ionization treatment system.

#### Limitations

The contents of this report are based on OccuHealth, Inc.'s best professional judgement, comparison of collected data with established industry guidelines and information obtained from our client.

Thank you for the opportunity to be of service. Please call either of the undersigned at (508) 339-9119 with any questions regarding this report.

Regards,

OCCUHEALTH, INC.

Jay McNeff, Senior Project Manager

Thomas E. Hamilton, CIH

Thomas E Hamilton

OccuHealth, Inc. 44 Wood Ave Mansfield, MA 02048 508-339-9119

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Date MARCH	4 2014

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6	M.L.R SHOWER LEFT	164
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4	DISPATCH KITCHEN SINUS	164
1 9	DISPATEN P.R. SINA	165
	M.R. SWELLER	169
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