

*CODE OF PRACTICE FOR  
CONTROL & PREVENTION OF  
LEGIONELLA BACTERIA  
IN WATER DISTRIBUTION SYSTEMS*

*Issue No: 07, Issue Date : January 2020*



*Prepared By*

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## ***MicroChem***

We have taken this opportunity to provide a practical guide to assist you in controlling and preventing Legionella bacteria colonization in water distribution system in your premises. The information in this leaflet provides guidelines to reduce the risk.

We are committed to help industries, Hotels, Organizations to upgrade and maintain the Health & Safety of the employees, their clients and general public in various ways. Few of our services are listed below

- Provide Laboratory services in following disciplines
  - Microbiological analysis of water for indicator micro organisms and pathogens including *Legionella*
  - Chemical analysis of water & waste water
  - Microbiological & chemical analysis of food products
  - Swab tests to evaluate environment & food handlers
  - Air quality measurements
- Conduct educational and training programs in prevention and control of Legionella bacteria in domestic water systems
- Carry out inspection on water management systems to assess the possibility of colonization and prevalence of Legionella bacteria and other health hazards
- Food hygiene management programs for hotels, food manufacturing factories, canteens etc.
- HACCP system development for hotels, food manufacturing factories, canteens etc.
- Food and environmental hygiene audits.
- Training of food handlers for good hygiene practices
- ISO 22000, 9000 ,14000 and Product standard consultancy services
- Training of staff for quality management systems.
- Writing quality manuals and procedure manuals and work instructions

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# *Legionella*

## ***Legionella is a pathogenic Gram negative bacterium***

*Legionella* acquired its name after a July, 1976 outbreak of a then-unknown "mystery disease" sickened 221 persons, causing 34 deaths. The outbreak was first noticed among people attending a convention of the American Legion - an association of U.S. military veterans. The convention in question occurred in Philadelphia during the U.S. Bicentennial year. This epidemic among U.S. war veterans, occurring in the same city as – and within days of the 200th anniversary of – the signing of the Declaration of Independence, was widely publicized and caused great concern in the United States. On January 18, 1977 the causative agent was identified as a previously unknown bacterium, subsequently named *Legionella*

## ***What is Legionnaire's disease?***

This is a serious form of infection caused by a type of bacteria known as *Legionella*. The infection can occur without any symptoms or alternatively can manifest with fever, headache, abdominal pain, diarrhoea and a non-productive cough. At its worst it can cause a severe infection of the lung which carries a 15% fatality rate.

## ***What causes infection?***

The *Legionella* bacteria are commonly found in low, harmless numbers in water, including tap water. They can however multiply to high levels in static or stagnant water; infection is transmitted by breathing water sprays or aerosols that contains the *Legionella* microbes. Infected people are usually sick five or six days after exposure.

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### ***Where are Legionella bacteria most likely to be found?***

High risk areas which support growth of these microbes include:

- I. Shower-heads and taps of bathrooms.
- II. Spas, whirlpools, Turkish baths and saunas
- III. Ornamental fountains.
- IV. Air-conditioning systems using wet cooling towers
- V. Hot and cold water tanks particularly if a deposit is present ,especially if they incorporate warm and medium hot water (between 20°C and 45°C).
- VI. Pipes with little or no water flow.
- VII. Slime (biofilm) and dirt in pipes and tanks.
- VIII. Rubber and natural fibers in washers and seals.
- IX. Scale in showers and taps.

### ***How can the risk be reduced?***

It is vital that hotels and other establishments recognize the risk of this infection in their premises. Any clients exhibiting ill health, particularly symptoms normally associated with Legionnaires disease, should be referred immediately to a medical practitioner. In addition it is the responsibility of the administration to follow a suitable Code of Practice and thus ensure that all necessary preventative measures are in place. The hotelier becomes responsible for the safety aspects of water from its delivery point at the hotel onwards i.e. within its “domestic distribution system”.

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# ***CODE OF PRACTICE***

## **1. Management**

**1.1** Each establishment should have one named person responsible for Legionella control on the premises. The individual in question should possess knowledge of situations which constitute a risk to Legionella transmission and would normally be a member of the Engineering Department of a grade sufficiently senior to implement any necessary corrective measures.

## **2. Hot and cold water systems**

**2.1** Water within calorifiers should be maintained at 60°C and not less than 50°C at the outlets. Blending or mixing valves at or near taps may be used to reduce the water temperature to Less than 45°C.

**2.1.1** It should be noted, however, that Legionella bacteria can multiply even in short segments of pipe containing water at this temperature. Increasing the flow rate from the hot-water-circulation system may help lessen the likelihood of water stagnation and cooling. "Dead legs" within the plumbing system provide areas of stagnation and cooling to <50°C regardless of the circulating-water temperature; these segments may need to be removed to prevent colonization. Rubber fittings within plumbing systems have been associated with persistent colonization, and replacement of these fittings may be required for Legionella eradication.

**2.2** Cold water should be maintained at temperatures below 25°C. This may involve insulating any segments that are exposed to external heat sources. Alternatively free chlorine level can be maintained between 0.5 -1.0 ppm level.

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**2.3** All taps and showers in guest rooms should be run to waste for a few minutes daily, even if the room is unoccupied.

**2.3.1** Showers, shower heads and taps should be kept clean and free from scale. The shower heads of hotel rooms should be dismantled and brushed down regularly, preferably between occupancies.

**2.4** Heat exchangers (calorifiers) should be regularly maintained, at least once a year.

**2.5** All water filters should be regularly checked and cleaned every three months.

**2.6** The hot water system should be disinfected with high level (50 ppm) chlorine for 2-4 hours after work on heat exchangers and before the beginning of every season.

**2.7** Water storage tanks, cooling towers and visible pipe work should be inspected on a monthly basis, ensuring that all coverings are intact and firmly in place.

**2.8** Any system modifications or new installations must not create pipe work with intermittent or no water flow.

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### **3.0** Evaporative cooling towers

**3.1** The design and construction of any evaporative cooling tower should be in such a way as to minimize the risk of Legionella proliferation and dissemination.

**3.2** Treatment of the water to prevent bacterial build-up is mandatory and should be performed by proprietary approval chemical disinfectants or using ultra-violet irradiation.

**3.3** An itemized schedule of maintenance must be kept by the person responsible and should include intervals at which the necessary inspection, checks and cleaning should be carried out as well as full details of the corrective action.

**3.4** It is important that the tower water is regularly monitored to detect any conditions which would be conducive to the proliferation of Legionella.

**3.4.1** It is highly recommendable that the tower water is tested for Legionella bacteria. This should preferably be performed at a minimum six-monthly frequency.

### **4.0** Drains

**4.1** Drains from air-cooling coils should be trapped and with an airbrake as with all drains.

**4.2** Collecting trays should be sloped to encourage rapid run off of water.

**4.3** Drains' connections should not protrude above the base of the tray since this will result in stagnant pools of water.

### **5.0** Humidifiers

**5.1** Humidifiers where necessary are recommended to be of the direct steam injection type.

**5.2** Spinning disc type and similar water based type of humidifiers should be avoided as far as possible.

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## 6.0 Whirlpools, spas, fountains or water cascades

6.1 Any source of aerosol formation should be subject to the same standards of maintenance and care to minimize the risk of Legionella proliferation and dissemination. If recirculating water is present, it should be chlorinated to ensure a constant free chlorine concentration of not less than 3.0 ppm.

7.0 Regular monitoring should be undertaken to include the following parameters:

Structure	Test parameter	MicroChem Recommended Limits	Frequency
Cooling towers	pH	7.0 – 8.5	Once a month
	Turbidity	<20 NTU	Once a month
	Total Hardness	150-500 mg/l	Once a month
	Total Iron	<1.0 mg/l	Once a month
	Biocides	as recommended by the supplier	
	Total bacterial count	Less than 10 <sup>4</sup> per ml	Once a month
	Legionella Count	0 CFU /L	Once in 6 months
Hot water	pH	7.0 – 8.5	Once a month
	Total Hardness	<100 mg/l	Once a month
	Total Iron	<0.3 mg/l	Once a month
	Total bacteria count	Less than 10 <sup>4</sup> per ml	Once a month
	Temperature at taps	>50 °C	Daily
	Temperature at tank	>60 °C	Daily
	Legionella Count	0 CFU /L	Once in 6 months
General purpose water (Temperature 25-35 °C)	pH	7.0 – 8.5	Once a month
	Turbidity	<8 NTU	Once a month
	Total Iron	<0.3 mg/l	Once a month
	Total bacteria count	Less than 10 <sup>4</sup> per ml	Once a month
	Free Chlorine at taps	0.5 – 1.0 ppm	Daily
	Legionella Count	0 CFU /L	Once in 6 months

**Table 01** : Control limits for Chemical Characteristics of water ( Recommended by *Microchem Laboratories Pvt Ltd* )

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## 8.0 Effect of temperature on survival of *Legionella*:

Above 70 °C	<i>Legionella</i> dies almost instantly
At 60 °C	90% die in 2 minute
At 50 °C	90% die in 80-124 minutes
48 to 50 °C	Can survive but do not multiply
32 to 42 °C	Ideal growth range
25 to 45 °C	Growth range
Below 20 °C	Can survive but are dormant, even below freezing

(Reference : "Legionella and the prevention of legionellosis," - World Health Organization)

**Table 02** : Effect of temperature on survival of *Legionella*

**9.0.** "European Guidelines for Control and Prevention of Travel Associated Legionnaires' Disease " emphasize the action level needed with respect to Legionella count in hot and cold water systems and cooling towers .

<b><i>Legionella</i> bacteria CFU/litre</b>	<b>Action required</b>
Not Detected	Acceptable
1000 or less	Ensure all real time monitoring parameters (pH, Chlorine, Biocide, etc) levels are within target limits
more than 1000 & up to 10,000	<b>Review risk assessment, programme operation &amp; monitoring results</b> The count should be confirmed by immediate re-sampling. If a similar count is found again, a review of the control measures and risk assessment should be carried out to identify any remedial actions.
more than 10,000	<b>Implement corrective action</b> The system should immediately be re-sampled. It should then be "shot dosed" with an appropriate <a href="#">biocide</a> , as a precaution. The risk assessment and control measures should be reviewed to identify remedial actions.

**Table 03:** Action levels following Legionella sampling in hot and cold water systems (3)

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**10.0** These guidelines are not intended to be a comprehensive engineering text and are advised to consult the following references

1. OSHA Technical manual, Section III, chapter 7
2. European Guidelines for Control and Prevention of Travel Associated Legionnaires' Disease. (The European Working Group for Legionella Infections -EWGLI)
3. European Technical guideline for the prevention, control and the investigation of infections caused by Legionella spp',

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## Annexure

# *The 15 point checklist*

An active programme to control the growth of *Legionella* bacteria should include the following:

- 1) Have one named person responsible for *Legionella* control.
- 2) Ensure the named person is trained in the control of *Legionella* and other staff are trained to be aware of the importance of their role in controlling *Legionella*.
- 3) Keep hot water hot and circulating at all times: 50°C - 60°C (too hot to put hands into or under for more than a few seconds).
- 4) Keep cold water cold at all times throughout the system. It should be maintained at temperatures below 25°C.
- 5) Run all taps and showers: in guest rooms run for several minutes at least once a week if they are unoccupied and always prior to occupation.
- 6) Keep shower heads, hoses and taps clean and free from scale.
- 7) Clean and disinfect cooling towers and associated pipes used in air conditioning systems regularly – at least twice a year.
- 8) Clean and disinfect water heaters (calorifiers) and hot water storage tanks at least once a year.
- 9) Disinfect the hot water system with a high level (50mg/l) of chlorine for 2-4 hours after work on water heaters and before the beginning of every season.
- 10) Clean and disinfect all water filters regularly - every one to three months.

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- 11)** Inspect water storage tanks, cooling towers and visible pipe work monthly. Ensure that all lids and insulation are intact and firmly in place.
- 12)** Inspect the inside of cold water tanks at least once a year and clean. If they contain a deposit or are otherwise dirty, disinfect with 50mg/l chlorine for a minimum of 1 hour.
- 13)** Ensure that system modifications or new installations do not create pipe-work with intermittent or no water flow or insufficient capacity to cope with surges in requirement.
- 14)** If there is a spa pool (synonyms - whirlpool spa, "Jacuzzi", spa bath; hot tub ) ensure that:
  - It is continuously treated with a minimum of 2-3mg/l chlorine or bromine and the pH is maintained at 7.0-7.6 and the levels are monitored at least three times a day
  - At least half of the water is replaced each day
  - Sand or diatomaceous earth filters are back washed daily
  - The whole system including the balance tank is cleaned and disinfected once a week
- 15)** Daily records are kept of all water treatment readings, such as temperature, pH and chlorine concentrations and ensure that any measurements that are outside of those specified have been acted upon and are checked regularly by the manager.

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