Proactive Minimization of Legionella and Water Bourne Pathogens

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ENVIRONMENTAL SERVICES

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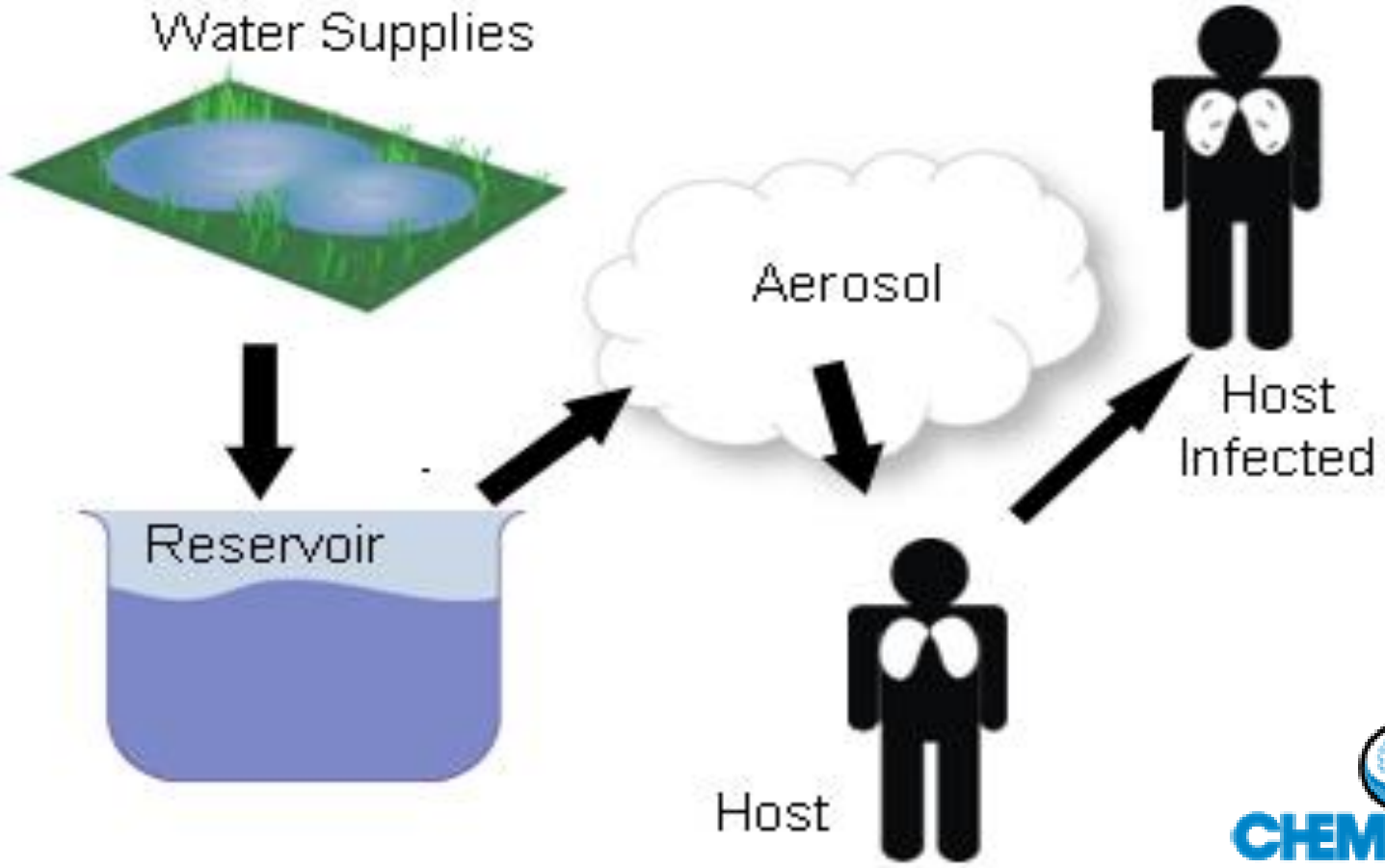
Legionnaires Disease?

Caused by inhaling aerosolized water droplets that are contaminated by Legionella bacteria deeply into the lungs.



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Legionnaires Disease?

- Fatal if not diagnosed and treated correctly
- Not contagious
- 34 known species and 50 serotypes
- Greatest risk with Legionella pneumophila, Serotype 1
- Immunocompromised people are more likely to contract disease

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Nosocomial Legionnaires' Disease

OS&H estimates more than 25,000 cases and 4,000 deaths in North America in 2011 from Legionella.

- 25% to 45% of cases healthcare acquired
- *Canadian provinces spend just over $3-billion on patients who become infected annually while being treated in hospitals*
- *Patients remain in hospitals longer, increasing financial strain*
- *Effects benchmarking and funding*

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Current Regulatory Environment

- We know what causes legionella and the conditions that cause it grow
- We have state of the art technology to detect Legionella
- We know how to minimize legionella bacteria

But unlike many other countries, North America has no regulations or laws on the books.

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Currently there are Ministry and OS&H Guidelines for Legionella …

- MOL Information Bulletin Workplace Health and Safety
- OH&S Act Section 25(2)(h)

Information Bulletin: Workplace Health and Safety Guideline--Legionella

Page 1 of 3

Ontario

Ministry of Labour

About the Ministry | News Releases | Employment Standards | Health and Safety | Labour Relations

Location: Ministry of Labour > Health and Safety > Publications >

Information Bulletin
Workplace Health and Safety Guideline--Legionella

The public health system has primary responsibility for the health of members of the public, including residents of long-term care facilities, patients of hospitals, and occupants of public buildings such as offices serving the public. For further details contact your local municipal public health unit.

The Ministry of Labour enforces the Occupational Health and Safety Act and its regulations, which set legal requirements for employers to ensure protection of workers.

Legal Requirements:

Employers have a duty under the Occupational Health and Safety Act, section 25(1)(a) & (b), to ensure that equipment, materials and protective devices that they provide are maintained in good condition. Section 25(2)(h), requires the employer to take every precaution reasonable in the circumstances for the protection of a worker. This includes the maintenance of water systems and ventilation systems in buildings to protect workers from the hazard of Legionella exposure.

Regulations also have provisions for protection of workers from hazards such as Legionella. The Regulation for Health Care and Residential Facilities, section 8, requires that the employer implement measures and procedures for worker health and safety. Pursuant to section 9, this may include the proper use, maintenance and operation of equipment. Section 19 of the Health Care and Residential Facilities Regulation requires that indoor ventilation be adequate to protect the health and safety of workers and a mechanical ventilation system be inspected by a qualified person every six months to ensure it is in good condition. It also requires the ventilation system to be serviced and maintained as prescribed. The Regulation for Industrial Establishments, section 127, requires industrial establishments to be adequately ventilated such that the atmosphere does not endanger the health and safety of workers.

Workplace parties such as employers, supervisors and workers share the responsibility for occupational health and safety under the internal responsibility system. If the internal responsibility system fails to address adequately the health and safety issues in a workplace, or if the Occupational Health and Safety Act and regulations are not being followed, the Ministry of Labour has the authority to enforce the law.

http://www.labour.gov.on.ca/english/hs/ib_legionella.html

3/3/2008

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The Attitude is Changing…

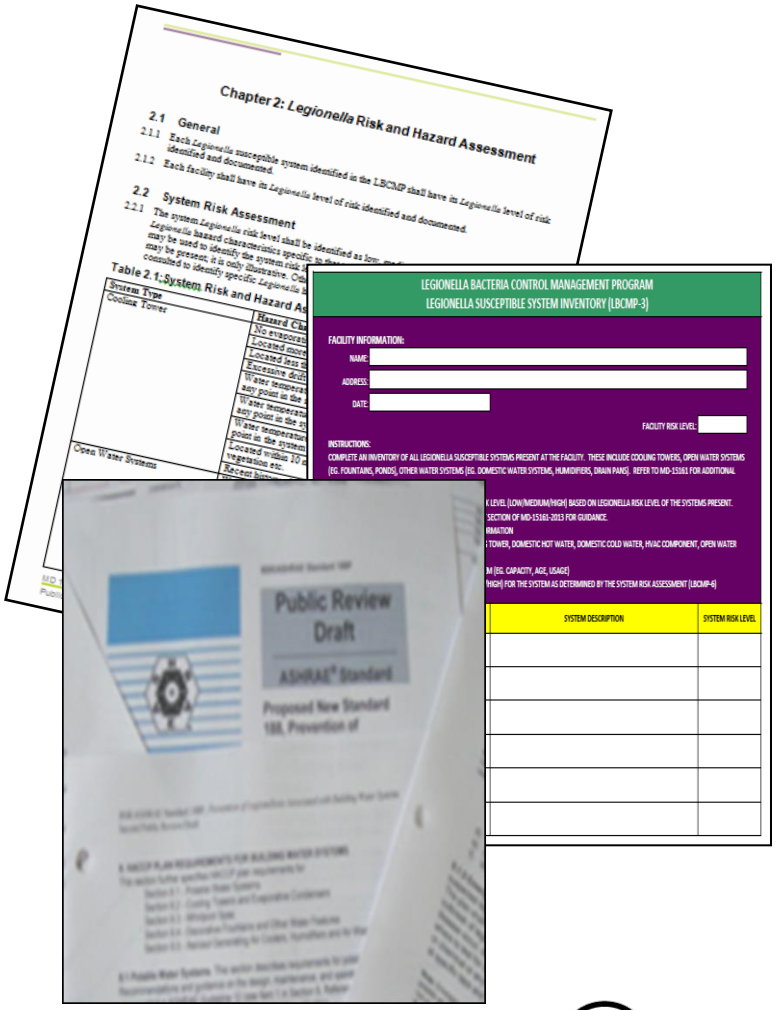
- PWGSC has updated MD 15161-2013 – Control of Legionella
- ASHRAE* will soon release the new Standard 188P
- CSA has released Z317 and is updating 317.1 Healthcare Standards

As standards, these carry far more legal weight than guidelines.

* American Society of Heating Refrigeration and Air Conditioning Engineers

What Are Your Responsibilities?

- Define Critical Control Points and define the risk at these points
- Prepare a Written Plan with Validated Controls and Limits
- Verify the plan is being followed



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Susceptible Systems Include:

- **Cooling Towers**
- **Open Water Systems (decorative fountains)**
- **Domestic Hot Water**

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Biofilm Formation is a Critical Factor

Free-floating microbes anchor themselves to internal pipe surfaces, faucets, and shower heads.

Once they irreversibly attach to an internal plumbing surface, they multiply and produce a biofilm.

Legionella and other bacteria will grow inside of and then slough off the biofilm and enter the bulk water.

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Biofilm Formation is a Critical Factor

- Biofilms are prone to form on the internal of plumbing systems and hide in system **“dead legs”**

- Biofilm can form in the system within a few days in new construction or renovations.

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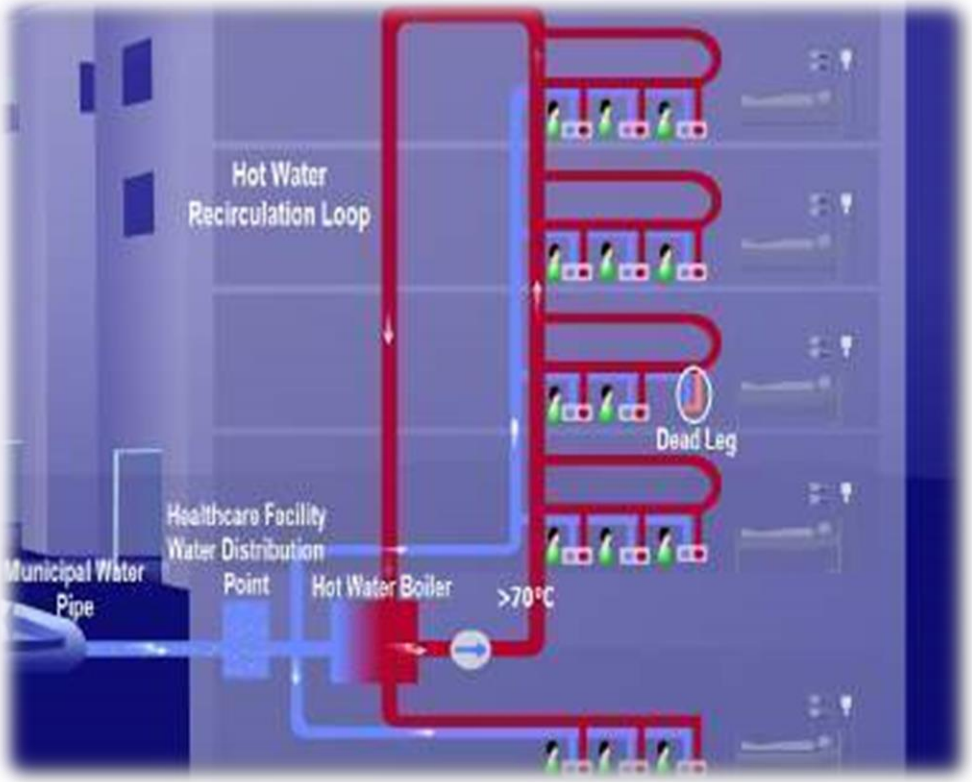
Critical Control Point:
Hot Water Recirculating Loops

Literature indicates that most Nosocomial outbreaks are actually related to domestic recirculating hot water systems.



- Hot Water Storage Tanks and Systems
- Showers
- Faucets
- Dead Legs

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Establish Control Options and Limits

Standards will not tell you what controls or limits to use …

… but does require them to be validated by scientific evidence.

Control Options
Hot Water Recirculating Loops:

6.8.2

If hyperchlorination is used, staff an… alerted and measures shall be taken to prevent the use of the plumbing system du… plumbing system has been hyperchlorinated, the entire treat… bring the chlorine concentrations to background an… precautions removed for use of the system… shall be documented.

Note: *Hyperchlorinating the ent… can be an effective treatment … Legionella bacteria or other w… chlorine can cause accelerat…*

CSA Group

CSA Z317.13-12

Infection control during construction, renovation, and maintenance of health care facilities

6.8.4

If facility systems and conditions warrant it, a copper-silver ionization system may be installed on hot water recirculating lines to discourage growth of *Legionella* or other water-borne pathogens.

Notes:

1) *Such treatment systems are especially valuable for health care facilities with significant risk factors including very large buildings with complex piping systems, older facilities that have undergone multiple renovations or have a considerable number of existing dead leg pipes, or health care facilities that are responsible to deliver their own water supply (well systems).*

- **Heat and Flush**
- **Chlorination**
- **Ultraviolet Radiation**
- **Point Of Use Filters**
- **Chlorine Dioxide**
- **Copper-Silver Ionization**

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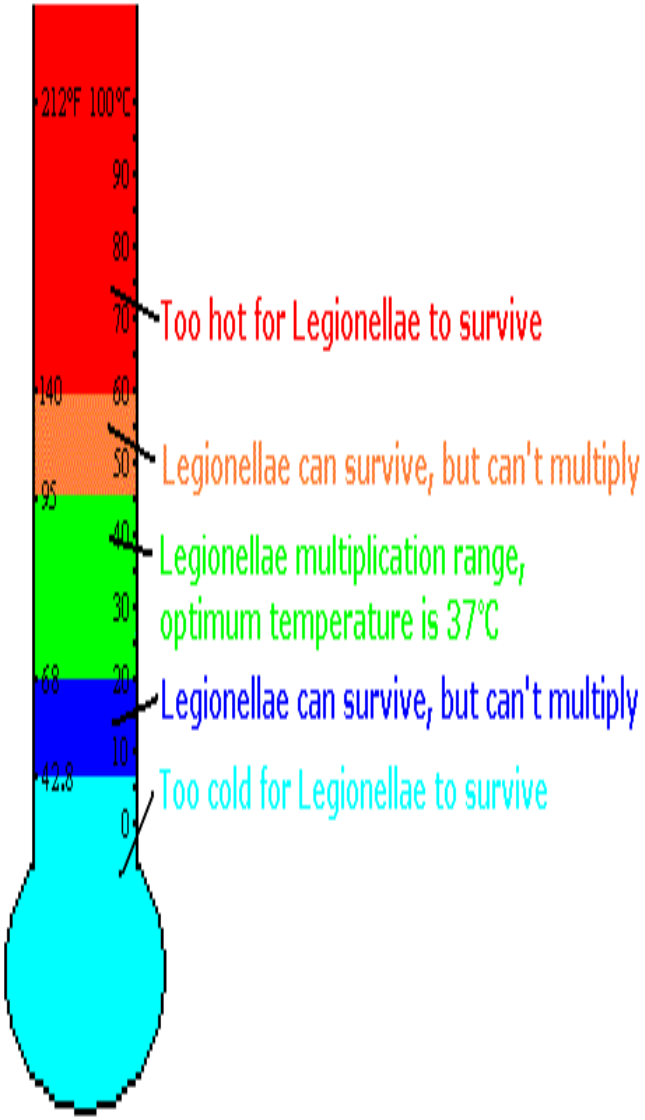
Heat and Flush (Hyperthermal Disinfection):

- Elevate and maintain hot water tank temperature to greater than 65-70° C, while flushing every fixture for up to 10 minutes.

- No residual effect and incomplete removal of biofilms.

- High labor costs to properly flush each outlet



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Disinfection With Halogenation

- Hyperchlorination

  Add chlorine to increase free chlorine to 50 ppm. Maintain residuals and circulate for 2 to 6 hours. Open all outlets and flush so halogen can contact all areas.

- Highly corrosive
- Rapid re-colonization
- Does not penetrate biofilm

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Ultraviolet Radiation

- UV light has proven effective in killing Legionella
- Use limited to small sub-systems, not entire buildings
- No residual effect
- Scaling of UV interferes with light intensity
- Suspended solids may reduce efficiency

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Chlorine Dioxide Disinfection

➢The Efficacy of ClO2 against Legionella is well documented, however it is better fed to the cold water supply.

- Less corrosive than hypochlorite and produces less hazardous byproducts (THM)
- It penetrates and removes biofilms and is more effective in dead legs because the dissolved gas rises through the system
- Must be generated on site and generators so capital investment can be higher than other solutions

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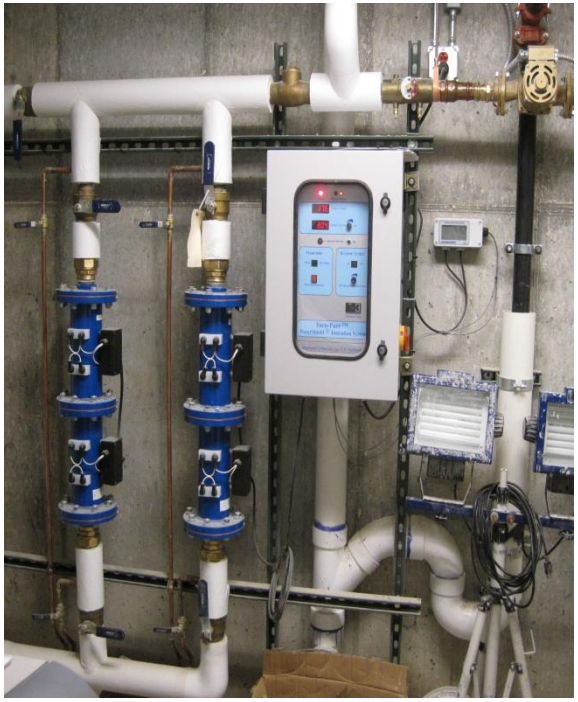
Copper Silver Ionization

Copper -silver has proven to be the best and most effective technology in the market for Legionella minimization and control.



- Eliminates waterborne pathogens and provides residual protection for up to 6-12 weeks
- Cost effective- it eliminates labour intensive hyperchlorination or thermal shock
- Widely used in healthcare facilities in North America since 1990

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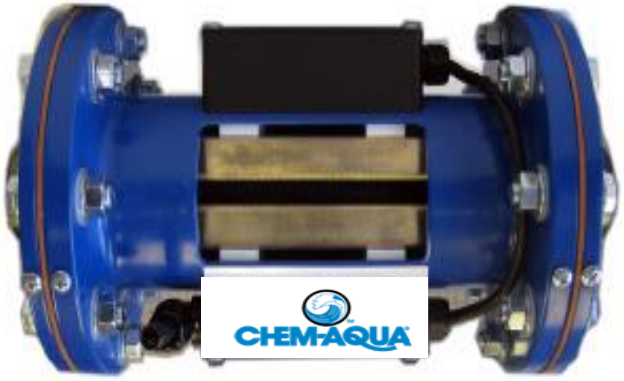
How Does Copper Silver Ionization Work?:

- Electrodes made of copper and silver, are placed in a flow cell
- The system is plumbed on a bypass into the return line of the hot water recirculating pump.
- A controller sends small DC charge to flow cell, causing copper and silver ions to be dispensed into the water as it passes through the flow cell.



- Copper destroys the bacteria by piercing the outer membrane and Silver gets absorbed and kills by disrupting cell DNA.

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Copper Silver Ionization Approvals

CSA Group	**Copper-silver ionization system may be installed on hot water recirculating lines to discourage growth of Legionella** **CSA Z317.13.12**
	Copper Silver Ionization to control Legionella in hot water distribution systems has been used successfully in a number of hospitals." **ASRAE Guideline 12-2000**
OSHA®	**A means to control Legionella growth includes "the use of metal ions such as copper or silver (which have a biocidal effect)"** **OSHA technical manual on Legionnaires' Disease, section iii:**
World Health Organization	***Recognizes "metal ionization (copper and silver)" as an accepted technology "for the eradication of Legionella".*** ***Legionella: Guidelines for Drinking-water Quality, WHO (2004*).**

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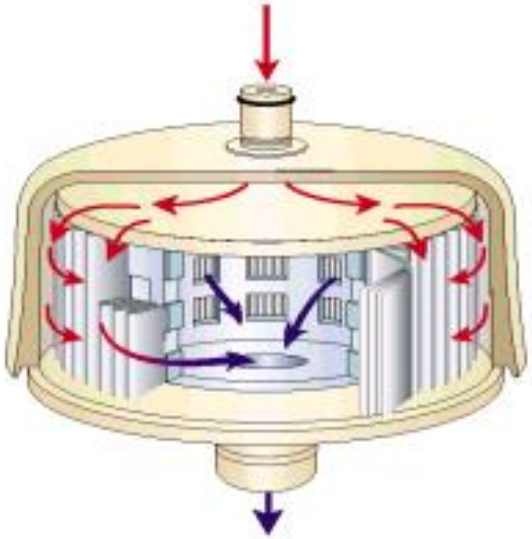

Point Of Use Filtration

- Point-of-use filters complement systemic disinfection technologies
- 0.2 micron bacterial retention membrane
- *Effective against Legionella, Pseudomonas,* Mycobacterium and more

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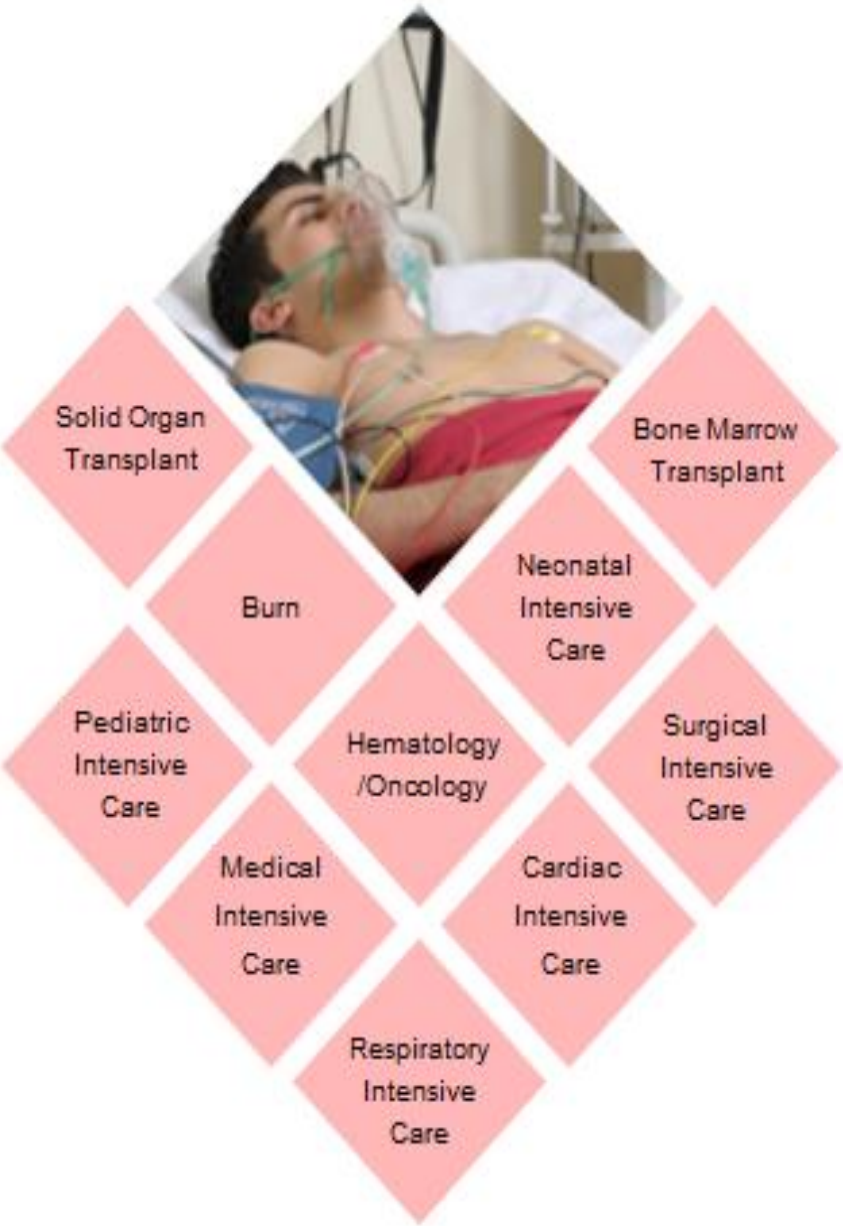
Excellent Choice for High Risk Areas:



- Wash Stations

- Showering
- Ice Preparation

- Rinsing Medical Devices

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QPoint Tap Water Filter

Reusable Docking Station and Exchangeable Filter Capsule for up to 2 months use

- Sterilizing-grade filtered water at the Point-of-Use
- Bacteriostatic additive in the housing minimizes touch contamination
- Quick and easy installation and recyclable after use

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AQ IN-LINE FILTER

- Used for Endoscope Rinsing, Ice Machines and Sorin Heater/Coolers

Public Health Agency of Canada | Agence de la santé publique du Canada

Canada

Home > Infectious Diseases > Nosocomial and Occupational Infections > Infection Prevention and Control Guideline for Flexible Gastrointestinal Endoscopy and Flexible Bronchoscopy

Nosocomial and Occupational Infections

Infection Prevention and Control Guideline for Flexible Gastrointestinal Endoscopy and Flexible Bronchoscopy

Table 4. Critical Steps for Reprocessing Flexible Endoscopes

STEP OR PROCEDURE	RATIONALE	BARRIERS TO ADEQUATE REPROCESSING
16. Final rinse water should be sterile or bacteria-free. **Tap water can be used, but if it is, a subsequent 70-90% alcohol rinse is CRITICAL between each patient use and prior to storage.**	Tap water can contain *Mycobacteria*, *Pseudomonas* and other microorganisms. Therefore, the final rinse water should be bacteria-free (i.e., filtered through a 0.2 µm filters). Filtration can produce bacteria-free water provided there are no viruses in the water being filtered and the filters are patent.	Bacterial overgrowth within flexible endoscope channels may result from tap water microorganisms in moist channels. This has led to infection transmission between patients.

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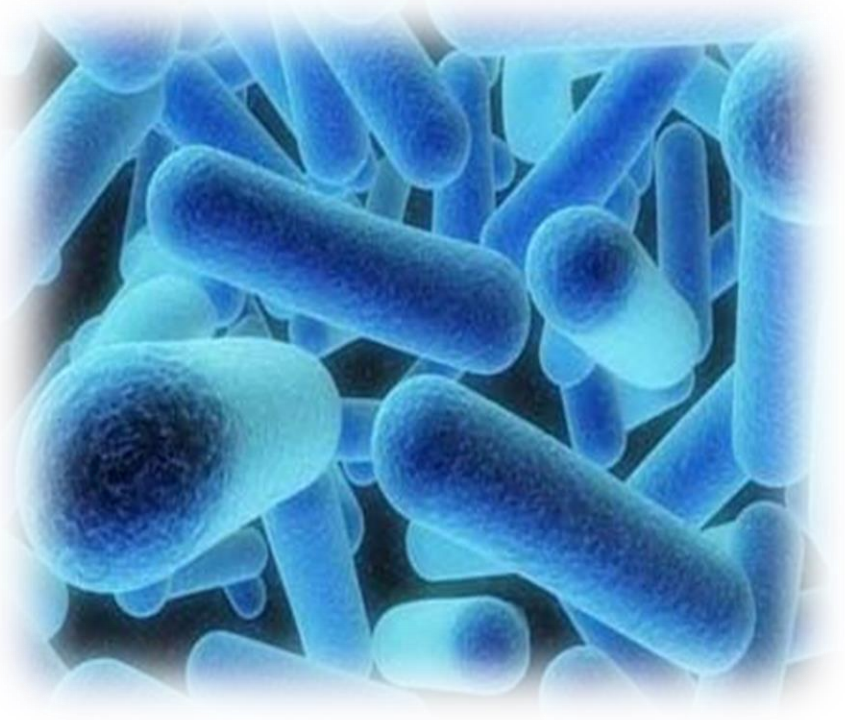
Legionella

Legionella presents one of the most pressing and high-profile problems with respect to waterborne healthcare-associated infections. [1]

Sheffer et al. evaluated the Pall-Aquasafe filter in a hospital building with chronic Legionella contamination and determined that **point-of-use filters completely eliminated Legionella pneumophila**. [2]



1. **Stout, J.E. and V.L. Yu. 2003. Hospital-acquired Legionnaires' disease: new developments. Curr. Opin. Infect. Dis. 16(4): 337-341.**
2. **Sheffer, P., J. Stout, R. Muder, and M. Wagener. 2004. New point-of-use water filters to prevent exposure to Legionella and waterborne bacteria. Annual Meeting – Association for Professionals in Infection Control and Epidemiology (APIC), Phoenix, AZ. Abstract #21793.**

Pseudomonas Aeruginosa

Several studies revealed that up to 40% of healthcare acquired Pseudomonas Aeruginosa infections are derived from contaminated water distribution systems. [1]

Point Of Use filtration is a simple, successful, and highly cost effective strategy to lower P. Aeruginosa infections in a Surgical ICU [2]

1. **Wunderink R.G., Mendoza D.L., "Epidemology of *Pseudomonas aeruginosa* in the Intensive Care Unit", *Infectious Diseases in Critical Care.* 2007 218-25.**
2. **Trautmann, M. et al. 2008. Point-of-use water filtration reduces endemic Pseudomonas aeruginosa infections on a surgical intensive care unit. AJIC 36(6):421-429.**

Scientific Validation and Peer Review

Performance verified in multicenter field trials

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If you don’t look for it, you won’t find it …

If you don’t find it, you don’t think you have a problem…

If you don’t think you have a problem, you don’t do anything about it !

Dr. Bruce Dixon,
Director of the Allegheny County Health Department

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Questions?

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