Proactive Minimization of Legionella and Water Bourne Pathogens
Legionnaires Disease?

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

- We know what causes legionella and the conditions that cause it to 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.
Currently there are Ministry and OS&H Guidelines for Legionella ...

- MOL Information Bulletin Workplace Health and Safety

- OH&S Act Section 25(2)(h)
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
Susceptible Systems Include:

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

©2012 Chem-Aqua, Inc.
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
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:

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

6.8.2
If hyperchlorination is used, staff and management shall be alerted and measures shall be taken to prevent the use of the plumbing system during the hyperchlorinated period. The entire treatment system may need to be flushed to remove the chlorine concentrations to background and the treated water shall be removed for use of the system. Appropriate records shall be documented.

Note: Hyperchlorinating the entire system can be an effective treatment for Legionella bacteria or other water-borne pathogens if chlorine can cause accelerated corrosion.

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 (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
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
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
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
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
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.
## Copper Silver Ionization Approvals

<table>
<thead>
<tr>
<th>Organization</th>
<th>Approval Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSA Group</td>
<td>Copper-silver ionization system may be installed on hot water recirculating lines to discourage growth of Legionella. CSA Z317.13.12</td>
</tr>
<tr>
<td>ASRAE Guideline 12-2000</td>
<td>Copper Silver Ionization to control Legionella in hot water distribution systems has been used successfully in a number of hospitals.</td>
</tr>
<tr>
<td>OSHA</td>
<td>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:</td>
</tr>
</tbody>
</table>
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
Excellent Choice for High Risk Areas:

- Wash Stations
- Showering
- Ice Preparation
- Rinsing Medical Devices
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
AQ IN-LINE FILTER

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

---

Nosocomial and Occupational Infections

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

Table 4. Critical Steps for Reprocessing Flexible Endoscopes

<table>
<thead>
<tr>
<th>STEP OR PROCEDURE</th>
<th>RATIONALE</th>
<th>BARRIERS TO ADEQUATE REPROCESSING</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>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.</td>
<td>Bacterial overgrowth within flexible endoscope channels may result from tap water microorganisms in moist channels. This has led to infection transmission between patients.</td>
</tr>
</tbody>
</table>
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

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

Scientific Validation and Peer Review

Performance verified in multicenter field trials
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
Questions?