BARCLAY
WATER MANAGEMENT

Michael Castro, MPH, CWT
District Manager
Barclay Water Management

- 24 years of water safety experience
- Voting member of ANSI/ASHRAE Std. 188
- Committee member of ANSI/ASHRAE Std. 514
- Committee member of AAMI ST-108:2023
- Initiated Development of ASTM Std. D8422:
  - Intermittent Use Validation of POU Water Filters
- Certified Trainer for ASSE 12080 *Legionella* Water Safety & Management Specialist
- Co-authored a chapter entitled *Legionella: Causes, cases, and mitigation*

Michael Castro, District Manager
Barclay Water Management
480-636-0405, mcastro@barclaywater.com

BARCLAY
WATER MANAGEMENT

Opening Questions

- Have you already evaluated your options if your facility has significant **environmental *Legionella* colonization**/contamination?
- Does your facility want to be **proactive or reactive** with respect to waterborne pathogen challenges?
- Who is confident that you know which potable water **disinfectant** your hospital receives from the municipality?

Michael Castro, District Manager
Barclay Water Management
480-636-0405, mcastro@barclaywater.com

BARCLAY
WATER MANAGEMENT

150 1932 Bw Barclay Water Management
THE MOST IMPORTANT ELEMENT FOR YOUR WATER

90 years of Water Treatment and Consulting Experience

- *Legionella* remediation & prevention using our iChlor® Monochloramine System
- Customized Water Management Plans which are ASHRAE-188 and CMS compliant
- Boiler Chemical Treatment
- Cooling Tower Chemical Treatment
- Closed Loop Chemical Treatment
- Cooling Tower Cleanings
- Ice Machine Cleanings
- Coil Cleanings
- *Legionella* Sampling (CDC ELITE Lab)
- Consulting services for all water within facility (Potable and Utility)

COMBINING CHEMICALS, EQUIPMENT, AND SERVICE FOR A COMPLETE INTEGRATED SOLUTIONS WATER MANAGEMENT PROGRAM

617-926-3400 www.barclaywater.com

National Contracts: Premier, HCA-HealthTrust, Jones Lang LaSalle, Sodexo & Crothall

Michael Castro, District Manager
Barclay Water Management
480-636-0405, mcastro@barclaywater.com

BARCLAY
WATER MANAGEMENT

Potable Water Disinfection Methods

- Sodium Hypochlorite
- Chlorine Dioxide
- **Monochloramine (Barclay iChlor)**
- Copper/Silver Ionization
- **Microbiological Water Filtration (Nephros POU)**
- Ozone/UV

Michael Castro, District Manager
Barclay Water Management
480-636-0405, mcastro@barclaywater.com

BARCLAY
WATER MANAGEMENT

Secondary Disinfectants in California (Top 30)

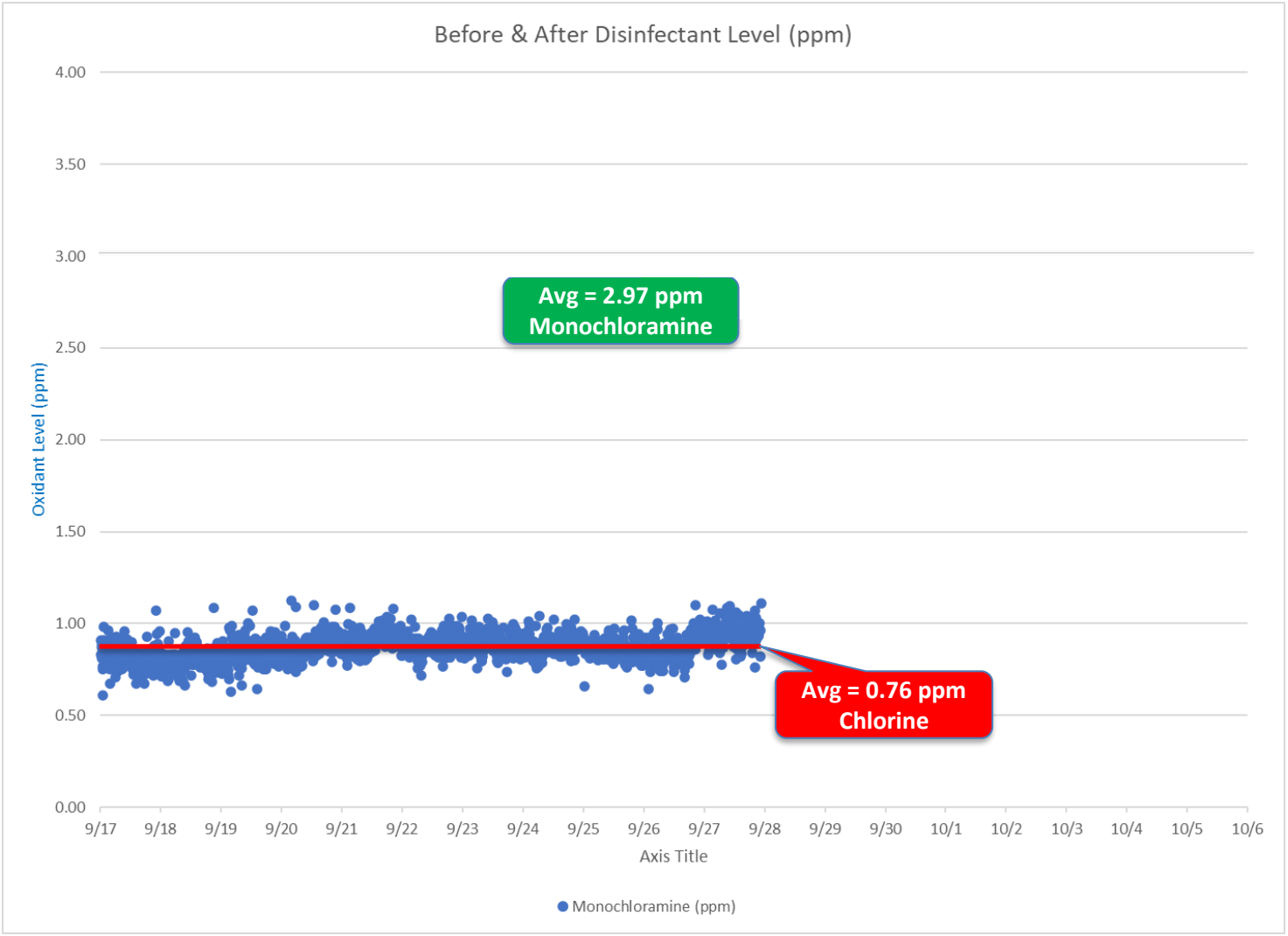
Approx. Population	Water Department	Secondary Disinfectant
3,973,278	LA DPW	Chloramine
1,414,545	City of San Diego Utilities	Chloramine
1,029,409	City of San Jose Env Svc. Dpt.	Chloramine
874,784	San Fran. Water Power Sewer	Chloramine
526,147	City of Fresno Water Division	Chlorine
503,482	**City of Sacramento H2O**	**Chlorine**
462,081	Long Beach Water	Chloramine
422,575	East Bay Muni Water	Chloramine
379,879	City of Bakersfield Domestic Water System	Chlorine
353,085	Anaheim Public Utilities	Chlorine
332,610	City of Santa Ana Water Resources Division	Chlorine
327,569	Riverside Public Utilities	Chlorine
311,103	City of Stockton	Chlorine
272,694	Irvine Ranch Water District	Chloramine

72% served by monochloramine

Approx. Population	Water Department	Secondary Disinfectant
268,779	Sweet Water Authority	Chloramine
234,829	Alameda County Water District	Chloramine
216,784	City of San Bernardino Water Department	Chlorine
214,485	City of Modesto - Modesto System CA5010010	Chlorine
212,704	Fontana Water Company	Chlorine
212,519	Santa Clarita Valley Water	Chloramine
208,751	Eastern Municipal Water District	Chloramine
207,722	City of Oxnard	Chloramine
199,778	City of Huntington Beach Utilities Division	Chloramine
199,357	City of Glendale Water & Power	Chloramine
178,391	City of Santa Rosa Water	Chlorine
178,194	Ontario Municipal Utilities	Chloramine
178,060	Cucamonga Valley Water District	Chlorine
175,694	City of Oceanside	Chloramine
173,370	Elk Grove Water District	Chlorine
172,800	City of Garden Grove Water Service Division	Chlorine

BARCLAY
WATER MANAGEMENT

Legionella Remediation & Control with Monochloramine



Michael Castro, District Manager
Barclay Water Management
480-636-0405, mcastro@barclaywater.com

BARCLAY
WATER MANAGEMENT

Onsite Generation of Monochloramine

iChlor® Unit

- Treats domestic cold and hot water with monochloramine
- Certified to NSF/ANSI 61 standards
- Continuously monitors water parameters
- Much higher-level automation than the municipal water plant

Michael Castro, District Manager
Barclay Water Management
480-636-0405, mcastro@barclaywater.com

BARCLAY
WATER MANAGEMENT

Supplemental Disinfection Methods

Pros specific to Monochloramine

- Most effective against *Legionella* bacteria (check the publications)
- Superior in dead legs and with low use fixtures
- Thermally stable and effective in hot water
- Significantly less corrosive than chlorine or chlorine dioxide
- Remediation can be performed without service interruption (<4.0 ppm)

Cons specific to Monochloramine

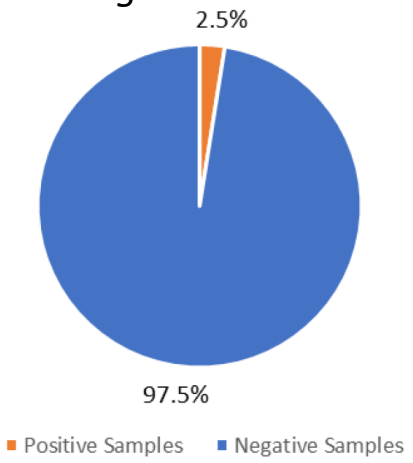
- No time to talk about them today!! ☺
- Always happy to discuss limitations with all of our interventions

Michael Castro, District Manager
Barclay Water Management
480-636-0405, mcastro@barclaywater.com

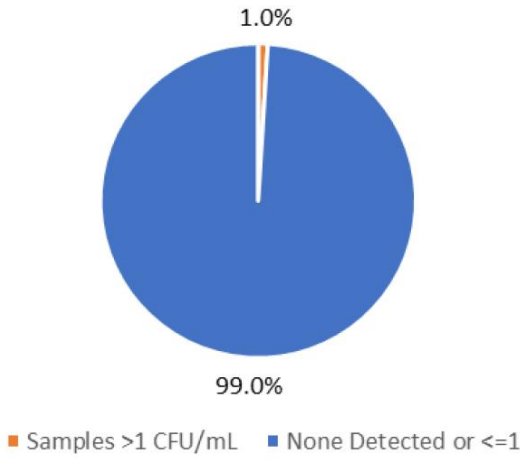
Retrospective Study of iChlor® Efficacy

Parameter	iChlor® Results
Date range (48 months)	June ‘18 – May ‘22
Number of iChlor® systems evaluated	85
Number of locations	54
Number of *Legionella* culture samples	10,432 culture
Percent positivity	**2.5%**

Overall *Legionella* % Positivity



Overall *Legionella* Positivity (CFU >1)



Michael Castro, District Manager
Barclay Water Management
480-636-0405, mcastro@barclaywater.com

BARCLAY
WATER MANAGEMENT

iChlor® Case Studies

BARCLAY
ENVIRONMENTAL GROUP
a division of Barclay Water Management, Inc.
Trust. Accountability. Peace of Mind.

CASE STUDY

iCHLOR® HPC Control

In Building Water Systems & Dental Water Lines

In June 2015, an iChlor® monochloramine supplemental disinfection system was installed on the incoming cold-water supply of a medical office building offering a dental clinic and additional outpatient services in the northeastern United States. The supplemental disinfection system was installed to help control the growth and spread of opportunistic waterborne pathogenic bacteria throughout the building's water distribution system. This iChlor® system has been operating as a permanent installation at the facility under normal conditions for over seven years.

With a focus first on *Legionella* bacteria control, the dental facility chose to monitor other water quality indicators, such as heterotrophic plate counts (HPC) on their faucet fixtures and dental lines. HPC is an analytic method used to measure the variety of bacteria that are common in the water. Generally speaking, the lower the concentration of bacteria in drinking water, the better maintained the water system is.[1] The American Dental Association recommends testing dental lines for HPC to validate their maintenance program.[2] The CDC recommends that dental unit water measures ≤500 CFU/mL HPC, the standard set for drinking water by the Environmental Protection Agency (EPA).[1,3] The following case study examines the levels of HPC in the facility's drinking and dental water. Data include samples taken between August 2015, after iChlor® was installed at the facility, to 2022. Samples were taken four times per year. Since the EPA and CDC recommend the HPC concentration ≤500 CFU/mL in both drinking and dental line water, this study uses 500 CFU/mL as a validation benchmark in this analysis. We compared the percentage of samples >500 CFU/mL in point of entry, faucet, and dental line samples.

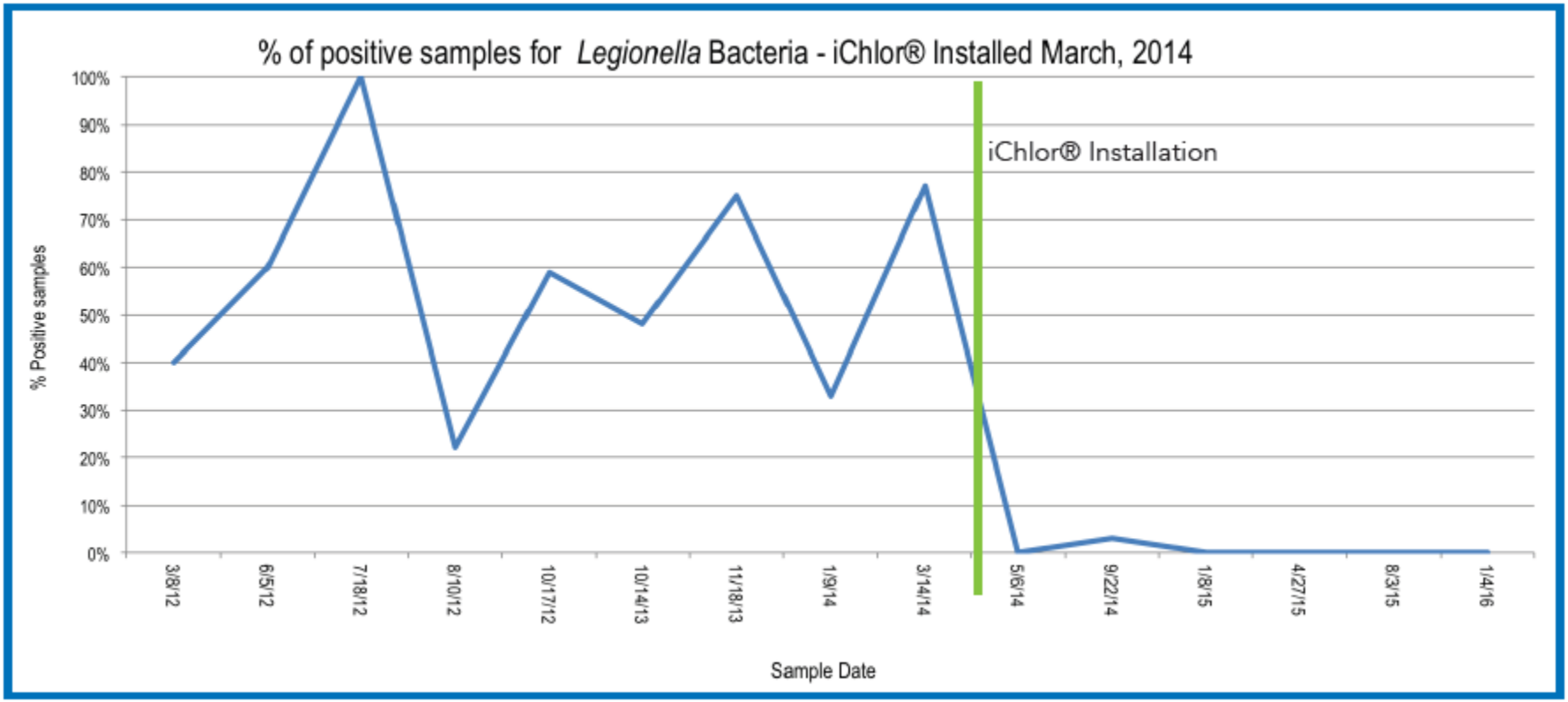
[1] ***United States Environmental Protection Agency. National Primary Drinking Water Regulations. EPA.*** *https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations. Updated January 26, 2022. Accessed June 20, 2022.*
[2] ***American Dental Association. Oral Health Topics: Dental Unit Waterlines. ADA.*** *https://www.ada.org/resources/research/science-and-research-institute/oral-health-topics/dental-unit-waterlines. Updated March 4, 2022. Accessed June 24, 2022.*
[3] ***Centers for Disease Control and Prevention. Oral Health: Dental Unit Water Quality. CDC.*** *https://www.cdc.gov/oralhealth/infectioncontrol/summary-infection-prevention-practices/dental-unit-water-quality.html. Updated June 18, 2018. Accessed June 24, 2022.*

BARCLAY WATER MANAGEMENT, INC.
55 Chapel Street
Newton, MA 02458
www.barclaywater.com
A 100% employee-owned company

Michael Castro, District Manager
Barclay Water Management
480-636-0405, mcastro@barclaywater.com

BARCLAY
WATER MANAGEMENT

iChlor® Case Studies



Michael Castro, District Manager
Barclay Water Management
480-636-0405, mcastro@barclaywater.com

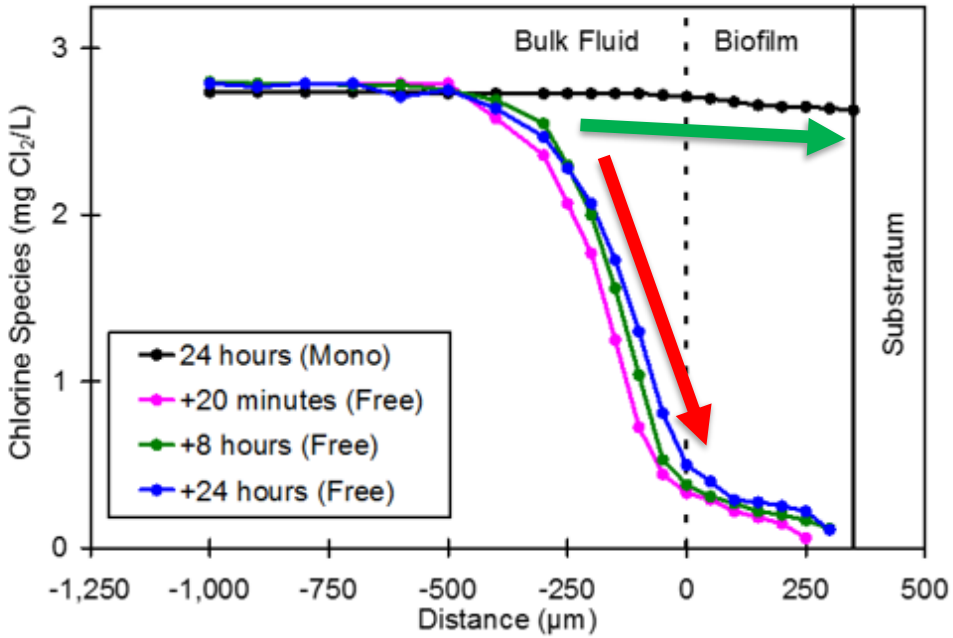
BARCLAY
WATER MANAGEMENT

Studies & Publications

Monochloramine vs Free Chlorine

Biofilm Penetration

- Monochloramine → complete penetration
- Free chlorine → penetration depth stabilizes
- Different reactivity with biofilm



Lee, W. H.; Wahman, D. G.; Bishop, P. L.; Pressman, J. G., Free chlorine and monochloramine application to nitrifying biofilm: comparison of biofilm penetration, activity, and viability. *Environ. Sci. Technol.* **2011,** *45*, (4), 1412–1419.

- For equivalent chlorine concentrations, monochloramine shown to penetrate biofilms 170 times faster than free chlorine
- Even after subsequent application to a monochloramine-penetrated biofilm, free chlorine penetration was limited

Michael Castro, District Manager
Barclay Water Management
480-636-0405, mcastro@barclaywater.com

BARCLAY
WATER MANAGEMENT

Nephros POU Water Filters

- **High risk patient** care units (long-term)
- **Ice machine filtration** (long-term)
- Stop-gaps for **remediation** (short-term)
- Looking to upgrade current intervention to **Class II FDA 510(k)** cleared product
- Looking to comply with **AAMI ST-108 or ASHRAE 514** recommendations

90-day

180-day

BARCLAY
WATER MANAGEMENT

When Indicated, Use the Available Interventions

BARCLAY
WATER MANAGEMENT

Thank You!!!

Questions?

Michael Castro
District Manager
Barclay Water Management
480-636-0405
mcastro@barclaywater.com