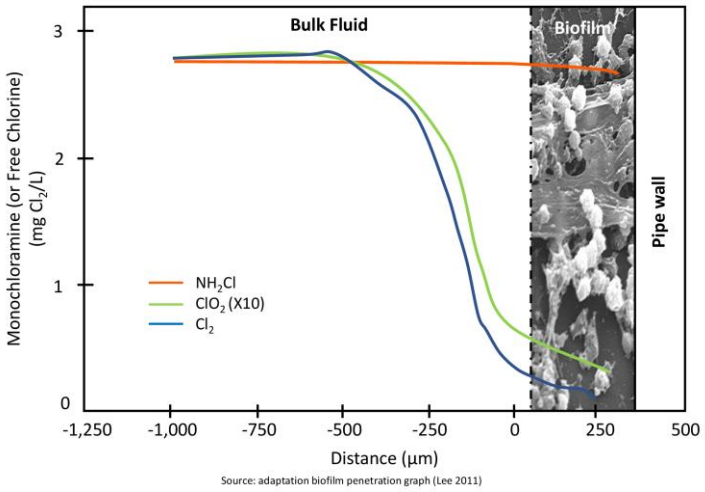
ENVIRONMENTAL WATER, LTD.
WATER TREATMENT SPECIALISTS

Monochloramine: The Best Defense Against *Legionella*

Monochloramine is a chlorine-based disinfectant that has shown to have significant impact on *Legionella* and biofilms.

Biofilm Penetration

Biofilm houses *Legionella* and allows the bacteria to sustain in the plumbing system. Monochloramine, chlorine, and chlorine dioxide have consistently been evaluated for how well each disinfectant can penetrate biofilm. Monochloramine can penetrate the biofilm effectively when chlorine and chlorine dioxide cannot due to chlorine and chlorine dioxide reacting more easily with other substances in the biofilm.



Source: adaptation biofilm penetration graph (Lee 2011)

Left: Monochloramine (red), chlorine dioxide (green), and chlorine (blue) evaluated in penetrating biofilm. Monochloramine can penetrate the biofilm while maintaining its concentration when chlorine dioxide and chlorine concentration significantly decreased when penetrating the biofilm.

The Safety is in the Details

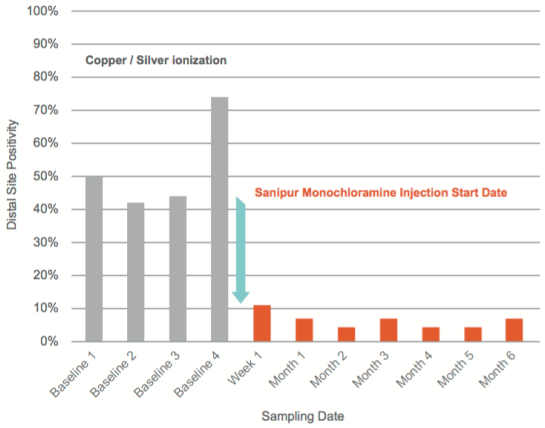
The monochloramine system created by Sanipur has been certified by ANSI/NSF Standard 61 and 372 certified, meaning the system is approved as a drinking water additive. There are also several safety features built into the system, including flow sensors, level switches, backpressure valves, and much more. Monochloramine is more stable than other disinfectants, does not produce disinfectant by-products (DBPs), and isn't an issue when it comes to corrosion.

Above: The SANIKILL-Lite system provides a cost-friendly monochloramine option for smaller hospitals.

Secondary Disinfection: Monochloramine

The Results Speak for Themselves

In its research, scientists have concluded the efficacy of monochloramine by seeing significant improvements in *Legionella* test results as soon as just one month. In these experiments, it was seen in facilities with greater than 50% positivity, monochloramine treatment vastly decreased positivity to below 10%.

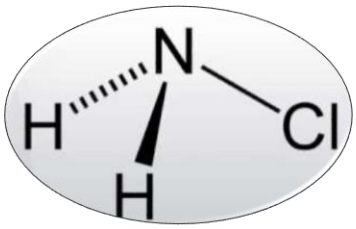


Borella P. et al., AJIC, 2012	Monochloramine	2-3 mg/l	From 60% to 8% positive sites in 1 month
Kandiah S, AJIC, 2012	Monochloramine	2-3 mg/l	From 33% to 0% positive sites in 3 weeks
Marchesi I et al., J. Wat.Health. 2013	Monochloramine	2-3 mg/l	From 100% to 9.5% positive in 1 month
Kandiah S.. et al., Infectous disorders, 2013	Monochloramine	2-4mg/l	From 53% to 0.35% in 1 year
Marchesi I. et al., J. Wat. Health, 2013	Monochloramine Chlorine dioxide	2-3 mg/l 0.5-0.7 mg/l	From 100% to 9.5% in 36 months From 96% to 46% in 36 months
Casini B.et al. ICHE, 2014	Monochloramine	2 mg/L	From 100% to 0% positive within 1 month
Duda S. et al., ICHE, 2014	Monochloramine	1-4 mg/l	From 53% to an average of 9% in 30 months (sensor faucets risk evaluated)
Coniglio M.A. et al., J. Health. Sci. 2015	Monochloramine	2-3 mg/l	From 100% to 0% in 1 month

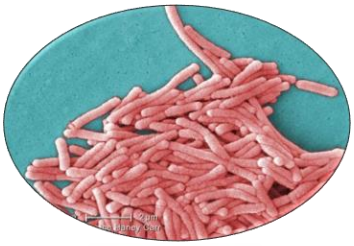
Left: *Legionella* positivity before and after Sanipur monochloramine treatment.
Right: Research articles highlighting the impact monochloramine treatment had on *Legionella.*

Treating the Hot Side

In the debate on whether monochloramine treatment should be applied to the cold or the hot side, there are three key reasons why hot is the way to go:



Chemistry- DBPs can be produced depending on water quality; adding monochloramines on the hot side prevents increasing these in the drinking water



Microbiology- *Legionella* is a risk in the hot water, which is support to focus the treatment where the risk is; monochloramines on the cold side also increase the risk for nitrifying bacterial growth

Economics- hot water often makes up about 10% of water consumption in facilities; less chemical is used when just treating the hot side, which is a plausible way to save money since the risk for *Legionella* is in the hot water