COMPARISON OF ANOLYTE AND CHLORINE DIOXIDE FOR A CONTINUOUS HOT WATER DISINFECTION IN A NURSING HOME

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BACKGROUND

Drinking water is a recognized source for infections and Legionella control is a critical issue in healthcare settings. (1) Continuous disinfection is a control measure needs to be fine-tuned to obtain satisfactory results in individual hospitals over prolonged time periods.

PURPOSE AND HYPOTHESIS

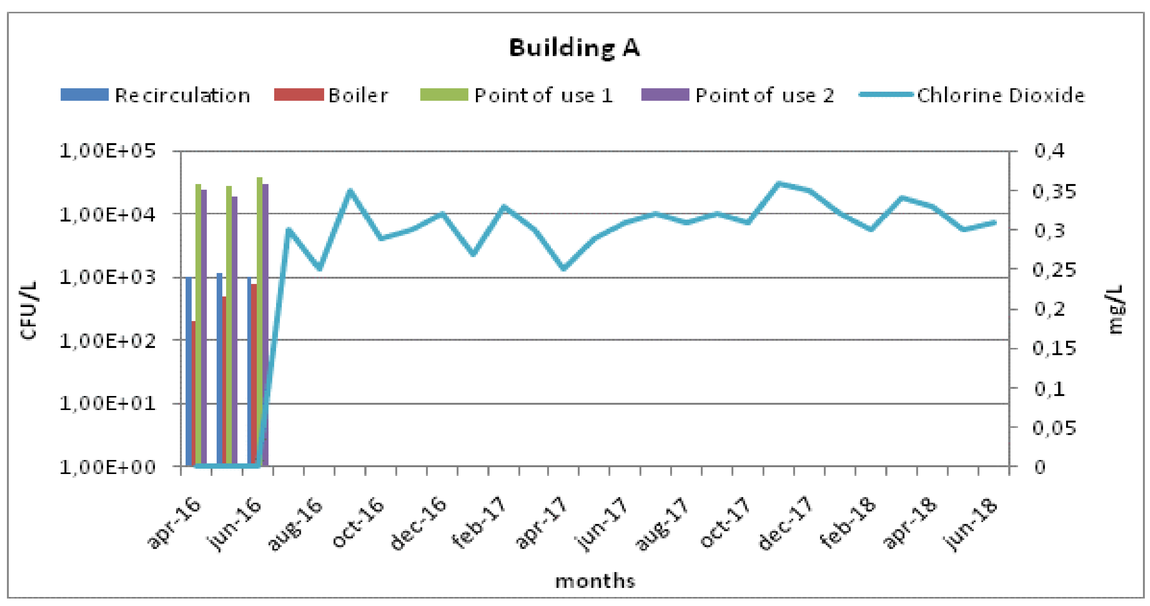
We compared the effect of anolyte and chlorine dioxide, applied in two different hot water networks of a nursing home to manage Legionella risk.

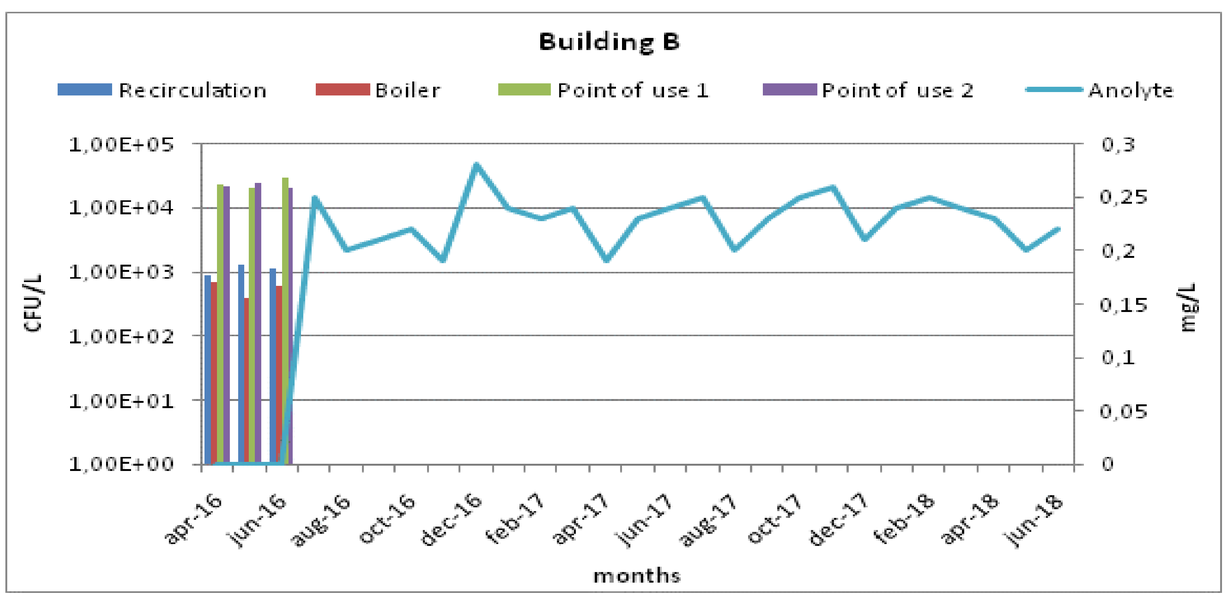
MATERIALS AND METHODS

Nursing home has two buildings (A with 39 beds; B with 42 beds), with the same point of aqueduct water entrance. Following a shock chlorination (50mg/L; 1h), aimed to remove Legionella colonization, from June 2016 the continuous disinfections with chlorine dioxide (0.33±0.04mg/L) and anolyte (0.23±0.04mg/L) were applied in hot networks of building A and B, respectively. From each building hot water was sampled at central heating system (recirculation; boiler) and at two points of use as suggested by Water Safety Plan. Legionella research (ISO11731) (2) was performed with a monthly basis while chemical tests of iron ions (Fe), manganese ions (Mn), zinc ions (Zn) and trihalomethanes (THM) were fulfilled with a half-yearly basis.

RESULTS

Before shock chlorination *Legionella pneumophila* sg1 was recovered in all buildings from $2x10^2$ to $3.8x10^4$CFU/L, while chemical compounds concentrations were within the limits provided by Directive 98/83/EC (3). After the application of the continuous disinfections, Legionella was not recovered in water samples and physical-chemical data were comparable between both buildings (Figures 1-2).





Figures 1-2: Trend of *Legionella pneumophila* sg1 concentration in building A and B during the period of study.

From water samples collected from the aqueduct and treated with chlorine dioxide and anolyte we obtained chemical values showed in Table 1.

Months	Fe (µg/L)			Mn (µg/L)			Zn (µg/L)			THM (µg/L)		
	Aqueduct	A	B	Aqueduct	A	B	Aqueduct	A	B	Aqueduct	A	B
Apr'16	45.7	22.8±1.2	55.8±3.1	1.4	13.8±4.2	1.7±0.4	39	106±9.8	85.4±12	1.6	13±0.5	1.9±0.3
Oct'16	43.8	26.9±2.1	49.9±3.5	1.8	12.4±3.7	1.9±0.6	41	104.4±8.9	88.6±8.7	1.2	10.2±0.4	1.6±0.6
Apr'17	44.7	32.9±1.5	41.8±2.6	1.1	11.1±3.1	1.2±0.4	40	99.5±11.3	75.2±9.1	0.9	9.4±0.7	1.3±0.4
Oct'17	43.8	35.4±1.8	43.1±2.5	1.2	12.6±2.4	1.3±0.2	41	98.7±13.8	73.4±8.3	1.1	10.6±1.2	1.1±0.1
Apr'18	44.1	38.3±1.4	42.5±2.7	1.3	12.8±3.2	1.1±0.4	41	100.2±14.5	71.2±6.9	0.9	11.9±1.7	1.1±0.1

Table 1: Chemical values of Fe, Mn, Zn and THM detected from aqueduct, buildings A and B with a half-yearly basis.

CONCLUSIONS

Both disinfectant appears effective against Legionella growth in water network, but anolyte ensure a lower disinfection byproducts (THM) release.

BIBLIOGRAPHY

(1) Casini B., Baggiani A., Totaro M., et al. Detection of viable but non-culturable legionella in hospital water network following monochloramine disinfection. J Hosp Infect. 2018, 98:46-52.

(2) International Organization for Standardization ISO 11731 Water quality -- Detection and enumeration of Legionella, Switzerland 2017.

(3) Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption.