

Pathogenic Analysis based on *Cryptosporidium* Oocysts & *Legionella*



Pathogen Description

Diseases caused by aquatic pathogenic microorganisms such as *Escherichia Coli*, *Legionella Pneumophila*, *Pseudomonas Aeruginosa*, *Cryptosporidium Parvum* Oocyst and so on are always sources of health concerns. Legionnaires' disease, the worst form of Legionellosis, is characterized as a type of pneumonia. Legionellosis is caused when any *Legionella* species are contacted to a host as an aerosol. *Legionella* is a ubiquitous aquatic organism that thrives in warm environments (32°- 45°C) and causes over 90% of legionella diseases in the U.S.A. as a real threat to human health. Cooling towers, showers, spa pools, faucets, and potable water systems that circulate contaminated water are capable of producing a potentially lethal aerosol.

Another threat case, *Cryptosporidia*, the etiological agents of *Cryptosporidiosis* outbreaks worldwide that are known for their remarkable ability to withstand chlorination even at free chlorine levels far exceeding those normally employed in water treatment processes.

Technology Overview

The BACO solution is an ecologic solution benefiting of degradable components in the environment. BACO and MIOX on-site generated (OSG) mixed oxidants solution (MOS) using saturated brine (table salt and water) and electricity provides a valuable option which ultimately results in improved energy efficiency and eliminating biological hazards. At the first step, destruction of



biofilm as a host for any pathogenic microorganisms, removes the sessile bacteria and so eliminates the possibility of any microbial, virus and protozoa caused disease in addition to algae and fungi. This old knowledge based technology uses a solution of sodium chloride (salt) and fresh water as feedstock. When electricity is applied to the feedstock, a disinfecting oxidant solution is produced including different oxidants consisting of chlorine gas, sodium hypochlorite and other FACs, chlorine dioxide and other exogenous oxidant species.



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NOTIFICACIÓN

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ASUNTO NOTIFICACIÓN

BACO Environmental Engineering & Technology S.L.
A/A AMIR SAMANI MAJD
admin@baco.tech

NOTIFICACIÓN Nº M-E19-15720

En contestación a su solicitud de fecha de entrada en este Instituto Nacional de Toxicología y Ciencias Forenses, el día 30 de agosto de 2019, por el cual la empresa BACO Environmental Engineering & Technology (NIF Y4246460F), solicita que la baja del Sistema de Relación de Empresas con el Instituto Nacional de Toxicología y Ciencias Forenses, por "Errores en la solicitud de alta de la empresa", podemos informarle lo siguiente:

BACO solution against Legionella & Cryptosporidium Oocysts

Based on studies conducted at the University of New Mexico, Albuquerque, comparing equivalent chlorine concentrations of hypochlorite to MOS showed that after 10 minutes of exposure at a pH of 8.0, MOS achieved total kill against Legionella pneumophila while chlorine alone did not. Same studied carried on with BACO and proved the capability of MOS and presented below.

Microorganism	Dose (ppm)			Contact time			Inactivation log (log)
	MIOX	Bleach	BACO	MIOX	Bleach	BACO	
Escherichia Coli	2	2	2	3.8	5	3	4 log
Legionella pneumophila	2	2	2	10	10	10	>5 MIOX, 4.7 Beach > 5 BACO
Pseudomonas aeruginosa	2	2	2	10	10	10	>4.8 MIOX, 2.2 Bleach 5 BACO
Cryptosporidium Paravan Oocyst	5	5	5	240	1440	195	3 MIOX, No Bleach 3.5 BACO



Furthermore, according to the results for comparing relative biocidal effect of bleach and MOS (MIOX and BACO) on the Oocysts at same level of FAC (free available chlorine) concentration, the MOS showed a higher efficacy in *Cryptosporidium Paravan* Oocyst inactivation than sodium hypochlorite. MOS for *Legionella* water treatment and secondary disinfection can help eradicate biofilm that can harbor *Legionella* and other microorganisms without the use of chlorine dioxide. In addition to safety, the BACO solution improves eliminating the handling and storage of hazardous chemicals, by maintaining steady disinfection residuals. While MOS provides similar disinfection benefits in comparison to chlorine dioxide, chlorine gas and sodium hypochlorite, the chemical generation process is safe and easier to maintain because BACO systems use a salt/water brine solution to create a powerful, non-hazardous disinfectant.

The BACO on-site chemical generator can feed disinfectant directly into the distribution system, helping to maintain the dosing concentration in no distance and time of transportation. In order to provide continuous disinfection, maintain residual, reduce risk and optimal operation, MOS chemistry is recommended to be fed continuously while its concentration for the continuous feeding will be controlled under 15 ppm in order to avoid being corrosive.

