

# What is bioPURE CLEAN?

A chlorine dioxide (ClO<sub>2</sub>) based disinfectant which we apply utilizing an electrostatically charged delivery system. ClO<sub>2</sub> acts as a potent oxidizing agent with *antiviral* activity against viral nucleic acids/proteins and *antibacterial* activity against the cell wall and sulfhydryl groups required for ATP synthesis<sup>1-3</sup>.

### What is it effective against?

### MRSA:

-Use of  $ClO_2$  in a 486-bed hospital in Northern Ireland led to 48 less MRSA cases over 1 year with associated savings to the hospital of £276 000<sup>4</sup>.

-ClO<sub>2</sub> has been shown to be effective at killing MRSA on football shoulder pads, both on the surface and in the inner foam layers<sup>5</sup>.

-MRSA has no documented resistance to ClO<sub>2</sub>.

#### Influenza-A<sup>1-2,9</sup>

| Parvovirus <sup>1</sup><br>Acinetobacter baumannii <sup>6</sup> | E. Coli <sup>10</sup><br>Salmonella <sup>11</sup> | Psuedomonas Aeruginosa <sup>6</sup> |
|---|---|-------------------------------------|
|   |   |                                     |

EPA registered with effectiveness against numerous other bacteria, viruses, mold, and mildew<sup>\*</sup>

## Why should you use it?

**EFFECTIVE:** At equal 100 ppm concentrations, ClO<sub>2</sub> reduces MRSA and Multi-Drug Resistant Acinetobacter to undetectable levels while sodium hypochlorite (bleach) has minimal effect<sup>6,7</sup>. *Bleach at 10x concentration of ClO<sub>2</sub> remains <u>LESS</u> effective than ClO<sub>2</sub>.* 

**SAFE:** ClO<sub>2</sub> has been shown to be safe and used to decontaminate drinking water and foods in the past. It has less toxicity, less by-products, and will not cause damage to surfaces it disinfects in comparison to other common cleaners<sup>2-3,8</sup>.

#### **References:**

1. Sanekata T, Fukuda T, Miura T, Morino H, Lee C, Maeda K, Araki K et al. Evaluation of the antiviral activity of chlorine dioxide and sodium hypochlorite against feline calcivirus, human influenza virus, measles virus, canine distemper virus, human herpesvirus, human adenovirus, canine adenovirus, and canine parvovirus. Biocontrol Sci. 2010; 15(2): 45-49.

2. Ma JW, Huang BS, Hsu CW, Peng CW, Cheng ML, Kao JY, Way TD, Yin HC, Wang SS. Efficacy and safety evaluation of a chlorine dioxide solution. Int J Environ Res Public Health. 2017; 14(3):e329.

3. Noszticzius Z, Wittmann M, Kaly-Kullai K, Beregvari Z, Kiss I, Rosivall L, Szegedi J. Chlorine dioxide is a size-selective antimicrobial agent. PLoS One. 2013; 8(11):e79157.

4. Conlon-Bingham G, Aldeyab M, Kearney MP, Scott MG, Baldwin N, McElnay JC. Reduction in the incidence of hospital-acquired MRSA following the introduction of a chlorine dioxide 275 ppm based disinfecting agent in a district general hospital. Eur J Hosp Pharm. 2016; 23(1):28-32.

5. Newsome AL, DuBois JD, Tenney JD. Disinfection of football protective equipment using chlorine dioxide produced by the ICA TriNova system. BMC Public Health. 2009; 9:326

6. Hinenoya A, Awasthi SP, Yasuda N, Shima A, Morino H, Koizumi T et al. Chlorine dioxide is a better disinfectant than sodium hypochlorite against multi-drug resistant staphylococcus aureus, pseudomonas aeruginosa, and Acinetobacter baumannii. Jpn J Infect Dis. 2015; 68: 276-279.

7. Thorn RMS, Robinson GM, Reynolds DM. Comparative Antimicrobial Activities of aerosolized sodium hypochlorite, chlorine dioxide, and electrochemically activated solutions evaluated using a novel standardized assay. Antimicrob Agents Chemother. 2013; 57(5): 2216-2225.

8. Akamatsu A, Lee C, Morino H, Miura T, Ogata N, Shibata T. Six-month low level chlorine dioxide gas inhalation toxicity study with two-week recovery period in rats. J Occup Med Toxicol. 2012; 7:2.

9. Ogata N, Shibata T. Protective Effect of low-concentration chlorine dioxide gas against influenza A virus infection. J Gen Virol. 2008; 89: 60-67.

10. Bang J, Hong A, Beuchat LR, Rhee MS, Kim Y, Ryu JH. Inactivation of Escherichia coli O157:H7 in biofilm on food-contact surfaces by sequential treatments of aqueous chlorine dioxide and drying. Int J Food Microbiol. 2014; 191: 129-134.

11. Park S, Beuchat LR, Kim H, Ryu JH. Inactivation of Salmonella enterica in chicken feces on the surface of eggshells by simultaneous treatments with gaseous chlorine dioxide and mild wet heat. Food Microbiol. 2017; 62: 202-206.

\*EPA approved effectiveness against influenza-A virus, canine parvovirus, feline calcivirus, avian influenza-A, methicillin-resistant Staphylococcus aureus (MRSA), staphyloccus aureus, E. coli, listeria monocytogenes, hepatitis A, salmonella enteric, salmonella typhimurium (MDRS), trichophyton mentagrophytes, mycobacterium bovis (TB), candida albicans, herpes simplex-2, rhinovirus type 37, norovirus, coronavirus, poliovirus-1, rotavirus, adenovirus type 5, vaccinia virus, human immunodeficiency virus type 1 (HIV-1), algae, klebsiella pneumonia, vancomycin-resistant enterococcus faecalis (VRE), pseudomonas aeruginosa, fusarium solani, botrytis sp., penicillium digitatum, odor-causing bacteria, mold, and mildew