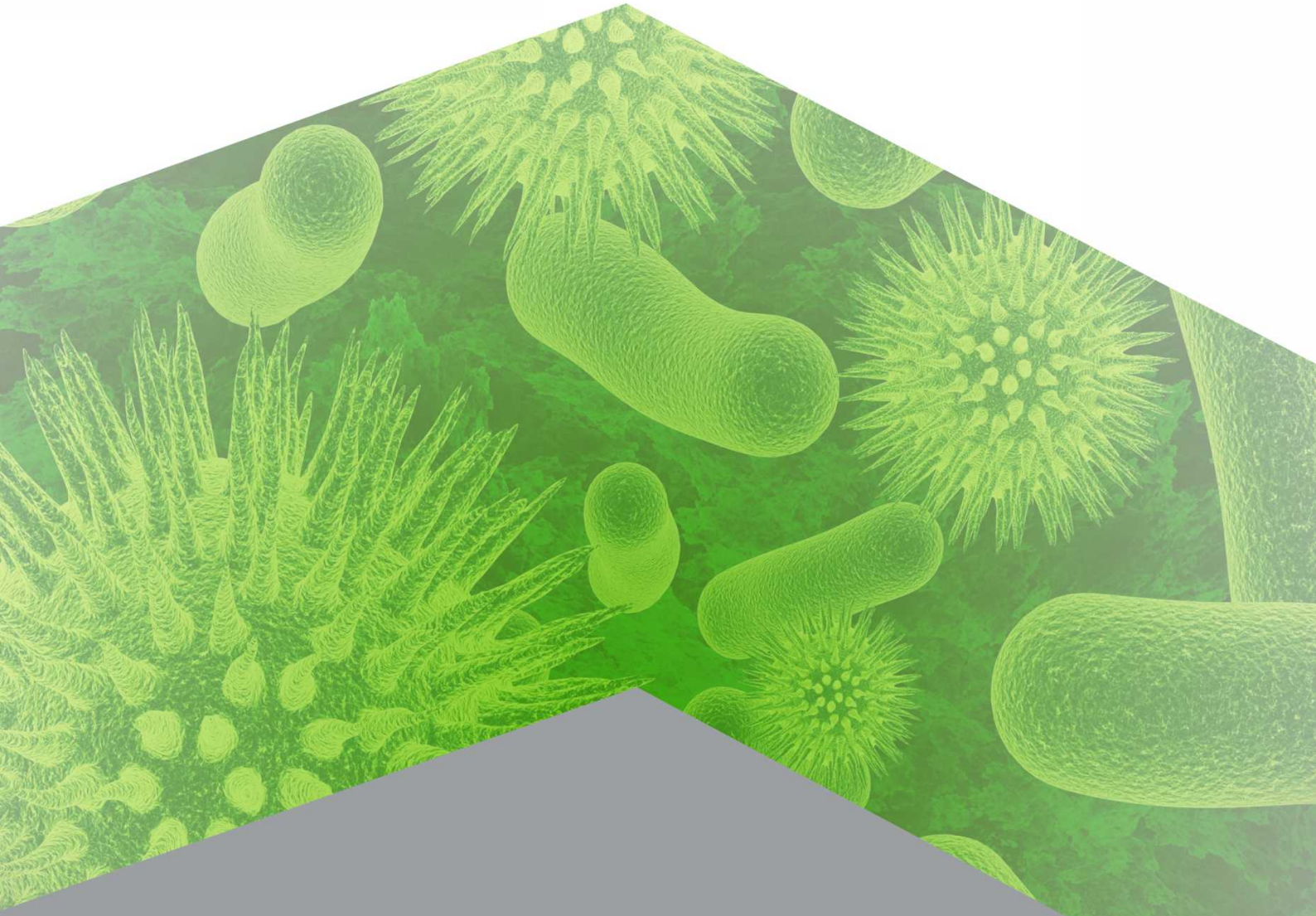
decon logic



# Biological Efficacy List

## Chlorine dioxide gas

# Biological Efficacy of Chlorine Dioxide

***Spaulding Classification:***

Bacterial Endospores
(*Clostridium, Bacillus*)
↓
Mycobacteria
(*Mycobacterium*)
↓
Non-enveloped, non-lipid viruses
(Parvoviruses)
↓
Fungi
(*Aspergillus, Stachybotrys*)
↓
Gram negative vegetative bacteria
(*Escherichia, Pseudomonas*)
↓
Gram positive bacteria
(*Enterococcus, Staphylococcus*)
↓
Enveloped, lipid viruses
(Influenza)

Chlorine dioxide gas is highly effective against fungi, viruses, bacteria, and spores both in the laboratory and in real-world settings. Extensive testing has been done using chlorine dioxide on a multitude of specific organisms, and that information can be found in each of the listed tables below. It is not a complete list of organisms in which chlorine dioxide gas is effective against, only a sample of organisms in which chlorine dioxide has been successfully tested against. To date, no organism tested against chlorine dioxide gas has proved resistant. The Spaulding classification listed on the left lists organisms in order of decreasing resistance to sterilizing agents.

As testing is continually being performed on other organisms, updated data will be added to this list as the results come in. If an organism is not listed here, it does not necessarily mean that chlorine dioxide gas is ineffective against it. Please contact us to see if there is any data or information regarding your specific organism, or to arrange for specific organism testing.

| Bacteria | Ref. |
|---|---|
| *Blakeslea trispora* | 28 |
| *Bordetella bronchiseptica* | 8 |
| *Brucella suis* | 30 |
| *Burkholderia mallei* | 36 |
| *Burkholderia pseudomallei* | 36 |
| *Campylobacter jejuni* | 39 |
| *Clostridium botulinum* | 32 |
| *Corynebacterium bovis* | 8 |
| *Coxiella burneti (Q-fever)* | 35 |
| *E. coli ATCC 11229* | 3 |
| *E. coli ATCC 51739* | 1 |
| *E. coli K12* | 1 |
| *E. coli O157:H7 13B88* | 1 |
| *E. coli O157:H7 204P* | 1 |
| *E. coli O157:H7 ATCC 43895* | 1 |
| *E. coli O157:H7 EDL933* | 13 |

| Bacteria | Ref. |
|---|---|
| *E. coli O157:H7 G5303* | 1 |
| *E. coli O157:H7 C7927* | 1 |
| *Erwinia carotovora (soft rot)* | 21 |
| *Franscicella tularensis* | 30 |
| *Fusarium sambucinum (dry rot)* | 21 |
| *Fusarium solani var. coeruleum (dry rot)* | 21 |
| *Helicobacter pylori* | 8 |
| *Helminthosporium solani (silver scurf)* | 21 |
| *Klebsiella pneumonia* | 3 |
| *Lactobacillus acidophilus NRRL B1910* | 1 |
| *Lactobacillus brevis* | 1 |
| *Lactobacillus buchneri* | 1 |
| *Lactobacillus plantarum* | 5 |
| *Legionella* | 38 |
| *Legionella pneumophila* | 42 |
| *Leuconostoc citreum TPB85* | 1 |

| Bacteria | Ref. |
|---|---|
| *Leuconostoc mesenteroides* | 5 |
| *Listeria innocua ATCC 33090* | 1 |
| *Listeria monocytogenes F4248* | 1 |
| *Listeria monocytogenes F5069* | 19 |
| *Listeria monocytogenes LCDC-81-861* | 1 |
| *Listeria monocytogenes LCDC-81-886* | 19 |
| *Listeria monocytogenes Scott A* | 1 |
| *Methicillin-resistant Staphylococcus aureus (MRSA)* | 3 |
| *Multiple Drug Resistant Salmonella typhimurium (MDRS)* | 3 |
| *Mycobacterium bovis* | 8 |
| *Mycobacterium fortuitum* | 42 |
| *Pediococcus acidilactici PH3* | 1 |
| *Pseudomonas aeruginosa* | 3 |
| *Pseudomonas aeruginosa* | 8 |
| *Salmonella* | 1 |
| *Salmonella spp.* | 2 |
| *Salmonella Agona* | 1 |
| *Salmonella Anatum Group E* | 1 |
| *Salmonella Choleraesins ATCC 13076* | 1 |
| *Salmonella choleraesuis* | 8 |
| *Salmonella Enterica (PT30) BAA-1045* | 1 |
| *Salmonella Enterica S. Enteritidis* | 13 |
| *Salmonella Enterica S. Javiana* | 13 |
| *Salmonella Enterica S. Montevideo* | 13 |
| *Salmonella Enteritidis E190-88* | 1 |
| *Salmonella Javiana* | 1 |
| *Salmonella newport* | 4 |
| *Salmonella Typhimurium C133117* | 1 |
| *Salmonella Anatum Group E* | 1 |
| *Shigella* | 38 |
| *Staphylococcus aureus* | 23 |
| *Staphylococcus aureus ATCC 25923* | 1 |
| *Staphylococcus faecalis ATCC 344* | 1 |
| *Tuberculosis* | 3 |
| *Vancomycin-resistant Enterococcus faecalis (VRE)* | 3 |
| *Vibrio strain Da-2* | 37 |
| *Vibrio strain Sr-3* | 37 |
| *Yersinia enterocolitica* | 40 |
| *Yersinia pestis* | 30 |
| *Yersinia ruckerii ATCC 29473* | 31 |

| Viruses | Ref. |
|---|---|
| *Adenovirus Type 40* | 6 |
| *Calicivirus* | 42 |
| *Canine Parvovirus* | 8 |
| *Coronavirus* | 3 |
| *Feline Calici Virus* | 3 |
| *Foot and Mouth disease* | 8 |
| *Hantavirus* | 8 |
| *Hepatitis A Virus* | 3 |
| *Hepatitis B Virus* | 8 |
| *Hepatitis C Virus* | 8 |
| *Human coronavirus* | 8 |
| *Human Immunodeficiency Virus* | 3 |
| *Human Rotavirus type 2 (HRV)* | 15 |
| *Influenza A* | 22 |
| *Minute Virus of Mouse (Parovirus)(MVM-i)* | 8 |
| *Minute Virus of Mouse (Parovirus)(MVM-p)* | 8 |
| Mouse Hepatitis Virus (MHV-A59) | 8 |
| Mouse Hepatitis Virus (MHV-JHM) | 8 |
| Mouse Parvovirus type 1 (MPV-1) | 8 |
| Murine Parainfluenza Virus Type 1 (Sendai) | 8 |
| Newcastle Disease Virus | 8 |
| Norwalk Virus | 8 |
| Poliovirus | 20 |
| Rotavirus | 3 |
| Severe Acute Respiratory Syndrome (SARS) Coronavirus | 43 |
| Sialodscryoadenitis Virus (Coronavirus)(SDAV) | 8 |
| Simian rotavirus SA-11 | 15 |
| Theiler's Mouse Encephalomyelitis Virus (TMEV) | 8 |
| Vaccinia Virus | 10 |

| Algae/Fungi/Mold/Yeast | Ref. |
|---|---|
| *Alternaria alternata* | 26 |
| *Aspergillus aeneus* | 28 |
| *Aspergillus aurolatus* | 28 |
| *Aspergillus brunneo-uniseriatus* | 28 |
| *Aspergillus caespitosus* | 28 |
| *Aspergillus cervinus* | 28 |
| *Aspergillus clavatonanicus* | 28 |
| *Aspergillus clavatus* | 28 |

| Algae/Fungi/Mold/Yeast | Ref. |
|---|---|
| *Aspergillus egyptiacus* | 28 |
| *Aspergillus elongatus* | 28 |
| *Aspergillus fischeri* | 28 |
| *Aspergillus fumigatus* | 28 |
| *Aspergillus giganteus* | 28 |
| *Aspergillus longivesica* | 28 |
| *Aspergillus niger* | 12 |
| *Aspergillus ochraceus* | 28 |
| *Aspergillus parvathecius* | 28 |
| *Aspergillus sydowii* | 28 |
| *Aspergillus unguis* | 28 |
| *Aspergillus ustus* | 28 |
| *Aspergillus versicolor* | 28 |
| *Botrytis species* | 3 |
| *Candida spp.* | 5 |
| *Candida albicans* | 28 |
| *Candida dubliniensis* | 28 |
| *Candida maltosa* | 28 |
| *Candida parapsilosis* | 28 |
| *Candida sake* | 28 |
| *Candida sojae* | 28 |
| *Candida spp.* | 5 |
| *Candida tropicalis* | 28 |
| *Candida viswanathil* | 28 |
| *Chaetomium globosum* | 7 |
| *Cladosporium cladosporioides* | 7 |
| *Debaryomyces etchellsii* | 28 |
| *Eurotium spp.* | 5 |
| *Fusarium solani* | 3 |
| *Lodderomyces elongisporus* | 28 |
| *Mucor circinelloides* | 28 |
| *Mucor flavus* | 28 |
| *Mucor indicus* | 28 |
| *Mucor mucedo* | 28 |
| *Mucor rademosus* | 28 |
| *Mucor ramosissimus* | 28 |
| *Mucor saturnus* | 28 |
| *Penicillium chrysogenum* | 7 |
| *Penicillium digitatum* | 3 |
| *Penicillium herquei* | 28 |
| *Penicillium spp.* | 5 |

| Algae/Fungi/Mold/Yeast | Ref. |
|---|---|
| *Phormidium boneri* | 3 |
| *Pichia pastoris* | 3 |
| *Poitrasia circinans* | 28 |
| *Rhizopus oryzae* | 28 |
| *Roridin A* | 33 |
| *Saccharomyces cerevisiae* | 3 |
| *Stachybotrys chartarum* | 7 |
| *T-mentag (athlete's foot fungus)* | 3 |
| *Verrucarin A* | 33 |

| Bacterial Spores | Ref. |
|---|---|
| *Alicyclobacillus acidoterrestris* | 17 |
| *Bacillus coagulans* | 12 |
| *Bacillus anthracis* | 10 |
| *Bacillus anthracis Ames* | 30 |
| *Bacillus atrophaeus* | 14 |
| *Bacillus atrophaeus ATCC 49337* | 31 |
| *Bacillus megaterium* | 12 |
| *Bacillus polymyxa* | 12 |
| *Bacillus pumilus ATCC 27142* | 12 |
| *Bacillus pumilus ATCC 27147* | 11 |
| *Bacillus subtillis (globigii) ATCC 9372* | 11 |
| *Bacillus subtillis ATCC 19659* | 31 |
| *Bacillus subtillis 5230* | 12 |
| *Clostridium. sporogenes ATCC 19404* | 12 |
| *Geobacillus stearothermophilus ATCC 12980* | 11 |
| *Geobacillus stearothermophilus ATCC 7953* | 31 |
| *Geobacillus stearothermophilus VHP* | 11 |
| *Bacillus thuringiensis* | 18 |

| Chemical Decontamination | Ref. |
|---|---|
| Mustard Gas | |
| Ricin Toxin | 10 |
| dihydronicotinamide adenine dinucleotide | 24 |
| microcystin-LR (MC-LR) | 25 |
| cylindrospermopsin (CYN) | 25 |

| Beta Lactams | Ref. |
|---|---|
| Amoxicillin | 29 |
| Amplicillin | 29 |
| Cefadroxil | 29 |
| Cefazolin | 29 |

| Beta Lactams | Ref. |
|---|---|
| Cephalexin | 29 |
| Imipenem | 29 |
| Penicillin G | 29 |
| Penicillin V | 29 |

| Protozoa | Ref. |
|---|---|
| *Chironomid larvae* | 27 |
| *Cryptosporidium* | 34 |

| Protozoa | Ref. |
|---|---|
| *Cryptosporidium parvum Oocysts* | 9 |
| *Cyclospora cayetanensis oocysts* | 41 |
| *Giardia* | 34 |

| Microsporidia | Ref. |
|---|---|
| *Encephalitozoon intestinalis* | 27 |

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