

ORGANISMS KILLED BY OZONE

BACTERIA

Achromobacter butyri NCI-9404
Aeromonas harveyi NC-2
Aeromonas salmonicida NC-1102
Bacillus anthracis
Bacillus cereus
B. coagulans
Bacillus globigii
Bacillus licheniformis
Bacillus megatherium sp.
Bacillus paratyphosus
B. prodigiosus
Bacillus subtilis
B. stearothermophilus
Clostridium botulinum
C. sporogenes
Clostridium tetoni
Cryptosporidium
Coliphage
Corynebacterium diphthiriae
Eberthella typhosa
Endamoeba histolicea
Escherichia coli
Escherichia coli
Flavobacterium SP A-3
Leptospira canicola
Listeria
Micrococcus candidus
Micrococcus caseolyticus KM-15
Micrococcus sphaeroides
Mycobacterium leprae
Mycobacterium tuberculosis
Neisseria catarrhalis
Phytomonas tumefaciens
Proteus vulgaris
Pseudomonas aeruginosa
Pseudomonas
fluorescens (biofilms)
Pseudomonas putida
Salmonella choleraesuis
Salmonella enteritidis
Salmonella typhimurium
Salmonella typhosa
Salmonella paratyphi
Sarcina lutea
Seratia marcescens
Shigella dysenteriae
Shigella flexneria
Shigella paradysenteriae
Spirillum rubrum
Staphylococcus albus
Staphylococcus aureus
Streptococcus 'C'
Streptococcus faecalis

FUNGUS & MOLD SPORES

Aspergillus candidus
Aspergillus flavus (yellowish-green)
Aspergillus glaucus (bluish-green)
Aspergillus niger (black)
Aspergillus terreus,saitoi & oryzae
Botrytis allii
Colletotrichum lagenarium
Fusarium oxysporum
Grotrichum
Mucor recomosus A & B (white-gray)
Mucor piriformis
Oospora lactis (white)
Penicillium cyclopium
P. chrysogenum & citrinum
Penicillium digitatum (olive)
Penicillium glaucum
Penicillium expansum (olive)
Penicillium egyptiacum
Penicillium roqueforti (green)
Rhizopus nigricans (black)
Rhizopus stolonifer

PROTOZOA

Paramecium
Nematode eggs
Chlorella vulgaris (Algae)
All Pathogenic and Non-pathogenic forms of Protozoa

FUNGAL PATHOGENS

Alternaria solani
Botrytis cinerea
Fusarium oxysporum
Monilinia fruticola
Monilinia laxa
Pythium ultimum
Phytophthora erythroseptica
Phytophthora parasitica
Rhizoctonia solani
Rhizopus stolonifera
Sclerotium rolfsii
Sclerotinia sclerotiorum

YEAST

Baker's yeast
Candida albicans-all forms
Common yeast cake
Saccharomyces cerevisiae
Saccharomyces ellipsoideus

Streptococcus hemolyticus
 Streptococcus lactis
 Streptococcus salivarius
 Streptococcus viridans
 Torula rubra
 Vibrio alginolyticus & anguillarum
 Vibrio cholerae
 Vibrio comma
 Virrio ichthyodermis NC-407
 V. parahaemolyticus

saccharomyces sp.

CYSTS

Cryptosporidium parvum
 Giardia lamblia
 Giardia muris

ALGAE

Chlorella vulgaris
 Thamnidium
 Trichoderma viride
 Verticillium albo-atrum
 Verticillium dahliae

VIRUS

Adenovirus (type 7a)
 Bacteriophage (E.coli)
 Coxackie A9, B3, & B5
 Cryptosporidium
 Echovirus 1, 5, 12, & 29
 Encephalomyocarditis
 Hepatitis A
 HIV
 GD V11 Virus
 Infectious hepatitis
 Influenza
 Legionella pneumophila
 Polio virus (Poliomyelitus) 1, 2 & 3
 Rotavirus
 Tobacco mosaic
 Vesicular Stomatitis

1-mg/l = 1-PPM

<u>Pathogen</u>	<u>Dosage</u>
Aspergillus Niger (Black Mould)	Destroyed by 1.5 to 2 mg/l
Bacillus Bacteria	Destroyed by 0.2 m/l within 30 seconds
Bacillus Anthracis (causes anthrax in sheep, cattle and pigs. Also a human pathogen)	Ozone susceptible
Bacillus cereus	99% destruction after 5-min at 0.12 mg/l in water
B. cereus (spores)	99% destruction after 5-min at 2.3 mg/l in water
Bacillus subtilis	90% reduction at 0.10-PPM for 33 minutes
Bacteriophage f2	99.99% destruction at 0.41 mg/l for 10-seconds in water
Botrytis cinerea	3.8 mg/l for 2 minutes
Candida Bacteria	Ozone susceptible

Clavibacter michiganense	99.99% destruction at 1.1 mg/l for 5 minutes
Cladosporium	90% reduction at 0.10-PPM for 12.1 minutes
Clostridium Bacteria	Ozone susceptible
Clostridium Botulinum Spores. Its toxin paralyses the central nerve system, being a poison multiplying in food and meals.	0.4 to 0.5 mg/l threshold value
Coxsackie Virus A9	95% destruction at 0.035 mg/l for 10-seconds in water
Coxsackie Virus B5	99.99% destruction at 0.4 mg/l for 2.5-minutes in sludge effluent
Diphtheria Pathogen	Destroyed by 1.5 to 2 mg/l
Eberth Bacillus (Typhus abdominalis). Spreads typically by aqueous infection and causes typhoid.	Destroyed by 1.5 to 2 mg/l
Echo Virus 29: The virus most sensitive to ozone.	After a contact time of 1 minute at 1 mg/l of ozone, 99.999% killed.
Enteric virus	95% destruction at 4.1 mg/l for 29 minutes in raw wastewater
<u>Escherichia Coli Bacteria</u> (from feces)	Destroyed by 0.2 mg/l within 30 seconds in air
E-coli (in clean water)	99.99% destruction at 0.25 mg/l for 1.6 minutes
E-coli (in wastewater)	99.9% destruction at 2.2 mg/l for 19 minutes
Encephalomyocarditis Virus	Destroyed to zero level in less than 30 seconds with 0.1 to 0.8 mg/l.
Endamoebic Cysts Bacteria	Ozone susceptible
Enterovirus Virus	Destroyed to zero level in less than 30 seconds with 0.1 to 0.8 mg/l.
Fusarium oxysporum f.sp. lycopersici	1.1 mg/l for 10 minutes
Fusarium oxysporum f.sp. melonogea	99.99 % destruction at 1.1 mg/l for 20 minutes
GDVII Virus	Destroyed to zero level in less than 30 seconds with 0.1 to 0.8 mg/l.
Hepatitis A virus	99.5% reduction at 0.25 mg/l for 2-seconds in a phosphate buffer
Herpes Virus	Destroyed to zero level in less than 30 seconds with 0.1 to 0.8 mg/l.

Influenza Virus	0.4 to 0.5 mg/l threshold value
Klebs-Loffler Bacillus	Destroyed by 1.5 to 2 mg/l
Legionella pneumophila	99.99% destruction at 0.32 mg/l for 20 minutes in distilled water
Luminescent Basidiomycetes (species having no melanin pigment).	Destroyed in 10 minutes at 100-PPM
Mucor piriformis	3.8 mg/l for 2 minutes
Mycobacterium avium	99.9% with a CT value of 0.17 in water (scientifically reviewed document)
Mycobacterium foruitum	90% destruction at 0.25 mg/l for 1.6 minutes in water
Penicillium Bacteria	Ozone susceptible
Phytophthora parasitica	3.8 mg/l for 2 minutes
Poliomyelitis Virus	99.99% kill with 0.3 to 0.4 mg/l in 3-4 minutes
Poliovirus type 1	99.5% destruction at 0.25 mg/l for 1.6 minutes in water
Proteus Bacteria	Very susceptible
Pseudomonas Bacteria	Very susceptible
Rhabdovirus virus	Destroyed to zero level in less than 30 seconds with 0.1 to 0.8 mg/l
Salmonella Bacteria	Very susceptible
Salmonella typhimurium	99.99% destruction at 0.25 mg/l for 1.67 minutes in water
Schistosoma Bacteria	Very susceptible
Staph epidermidis	90% reduction at 0.1-ppm for 1.7 min
Staphylococci	Destroyed by 1.5 to 2.0 mg/l
Stomatitis Virus	Destroyed to zero level in less than 30 seconds with 0.1 to 0.8 mg/l
Streptococcus Bacteria	Destroyed by 0.2 mg/l within 30 seconds
Verticillium dahliae	99.99 % destruction at 1.1 mg/l for 20 minutes
Vesicular Virus	Destroyed to zero level in less than 30 seconds with 0.1 to 0.8 mg/l
Virbrio Cholera Bacteria	Very susceptible
Vicia Faba progeny	Ozone causes chromosome aberration and its effect is twice that observed by the action of X-rays

