

# UV Inactivation Chart\* (in mJ/cm<sup>2</sup>)

Organism	Type	Affiliated Disease, Contamination, Toxin	Dose log 2	Dose log 3	Dose log 4	Reference
Adenoviridae	Virus	Upper respiratory infections (most UV-resitant virus known)		90	121	Meng and Gerba, 1996 / Gerba et al., 2003
Acanthamoeba spp. (cysts)	Protist	Amoebic keratitis and encephalitis		140		Maya et al, 2003
Aeromonas hydrophila	Bacterium	Tissue damage in humans (opportunistic pathogen)		3.9		Wilson et al, 1992
Agrobacterium tumefaciens	Bacterium	Crown Gall disease in Dicotyledons (Grapes, Berries, Fruits, Nuts)		8.5		
Aspergillus flavus (yellow green)	Fungus (Mold Spore)	Aspergillosis of the lungs, corneal infections		99		
A. glaucus (blue green)	Fungus (Mold Spore)	Allergenic		88		
A. niger (black)	Fungus (Mold Spore)	Otomycosis, Black mold on fruits and vegetables		330		
Bacillus anthracis	Bacterium	Anthrax		8.7	110	Coohill and Sagripanti, 2008
B. anthracis (spores)	Bacterium	Anthrax		46.2	620	Pasteur Institute / Coohill and Sagripanti, 2008
B. megatherium (vegetable)	Bacterium	Infections, food poisoning		2.5		
B. megatherium (spores)	Bacterium	Infections, food poisoning		52	600	Coohill and Sagripanti, 2008
B. paratyphosus	Bacterium	non pathogenic		6.1		
B. subtilis (vegetable)	Bacterium	Ropiness in bread dough, food contamination		11		
B. subtilis (spores)	Bacterium	Ropiness in bread dough, food contamination		61	600	Chang et al, 1985 / Sommer et al, 1998 / Coohill and Sagripanti, 2008
Campylobacter jejuni	Bacterium	Food poisoning, gastroenteritis		4.6	21	Wilson et al, 1992 / Coohill and Sagripanti, 2008
Chlorella vulgaris	Protist (algae)	Plant pathogen		22		
Clostridium tetani	Bacterium	Tetanus		23.1		Pasteur Institute, Paris
C. botulinum	Bacterium	Produces Botulin toxin		11.2		
C. perfringens	Bacterium	Food poisoning (ex C. welchii)		75		Jacangelo et al, 2003
Coliphage	Virus	Bacteriophage that infects E. coli		6.6		
Corynebacterium diphtheriae	Bacterium	Diphtheria		6.5		
Coxsackie A	Virus	Hand, foot & mouth disease, conjunctivitis, herpangina		6.9		
Coxsackie B	Virus	Pericarditis, myocarditis, gastrointestinal distress	20.6	27		Battigelli et al, 1993 / Gerba et al., 2003
Cryptosporidium parvum	Protist	Cryptosporidiosis, gastrointestinal illness	2.5	12	25	Craig et al, 2001 / EPA, 2006
Cyanobacteria	Bacterium	(blue green algae)		700		Masschelein et al, 1989
Desulfovibrio spp	Bacterium	(sulfate-reduction bacteria) Contamination of oilfield process water		10		Hagan et al, 2011
Eberthella typhosa	Bacterium	Typhoid fever		4.1		
Entamoeba histolytica	Protist	Amoebiasis		84		
Enterococcus spp.	Bacterium	Indicator species for (recreational) water quality		30		Beltran and Jimenez, 2008
Escherichia coli	Bacterium	Food poisoning, gastroenteritis, meningitis		8.6		Sommer et al, 1998; Wilson et al, 1992
Fusarium oxysporum	Fungus	Plant pathogen (Fusarium wilt)		100		
Giardia lamblia (cysts)	Protist	Giardiasis (Beaver Fever, Traveller's Diarrhea)	2.1	11	22	Linden et al, 2002 / EPA, 2006
Hepatitis virus	Virus	Hepatitis, jaundice		15		US.EPA, 1999
Influenza virus	Virus	Influenza, respiratory infections		6.6		
Klebsiella pneumoniae	Bacterium			15	20	Giese & Darby, 2000
Legionella bozemanii	Bacterium	Pneumonia		3.5		
L. dumoffii	Bacterium	Pneumonia		5.5		
L. gormanii	Bacterium	Pneumonia		4.9		
L. longbeachae	Bacterium	Legionnaire's disease, pontiac fever		2.9		
L. micdadei	Bacterium	Influenza, Pittsburgh pneumonia		3.1		
L. pneumophila	Bacterium	Legionnaire's disease		3.8	9	Wilson et al, 1992
Leptospira interrogans	Bacterium	Leptospirosis (Weill's disease, canicola-, canefield-, 7-day fever )		6		
Listeria monocytogenes	Bacterium	Foodborne Listeriosis		40		
Micrococcus candidus	Bacterium			12.3		
M. sphaeroides	Bacterium			15.4		
Mycobacterium tuberculosis	Bacterium	Tuberculosis	10			Bohrerova et Linden, 2006
Mucor racemosus A	Fungus (Mold Spore)	Fungal plant pathogen, zygomycosis and fungal sinusitis in humans		35.2		
Naegleria fowleri (cyst)	Protist	Warm water pathogen		105		
Neisseria (Moraxella) catarrhalis	Bacterium	Otitis media, sinusitis, laryngitis		8.5		
Nematode eggs (Roundworm)	Parasite	Ascariasis, Appendicitis, Loeffler's Syndrome		92		
Oospora lactis	Fungus (Mold Spore)	Fruit rot (rapid decay of ripe fruits, potatoes), mold in dairy products				
Paramecium spp.	Protist			200		
Penicillium digitatum (olive)	Fungus (Mold Spore)	Fungal spoilage in fruits and vegetables		88		
P. expansum (olive)	Fungus (Mold Spore)	Postharvest decay of stored apples		22		
P. roqueforti (green)	Fungus (Mold Spore)	Producing harmful secondary metabolites (alkaloids + mycotoxins)		26.4		
Phytophthora infestans	Bacterium	Crown Gall disease in Dicotyledons (Grapes, Berries, Fruits, Nuts)		8.5		
Polio virus	Virus	Poliomyelitis (Polio)		27		Snicer et al, 1998, Wilson et al, 1992
Proteus vulgaris	Bacterium	Infections (esp. sinus and respiratory, urinary tract)		6.6		
Pseudomonas aeruginosa (lab)	Bacterium	Hospital acquired infections, ear infection, dermatitis in pools & tubs		3.9		
Pseudomonas aeruginosa (env.)	Bacterium	Hospital acquired infections, ear infection, dermatitis in pools & tubs		10.5		
Pythium spp	Fungus	Plant pathogen (root rot)		100		
Rhizopus nigricans (black)	Fungus (Mold Spore)	Infections, allergic reactions (known as breadmold)		220		
Rhodospirillum rubrum	Bacterium			6.2		
Rotavirus	Virus	Infections, severe diarrhoea, gastroenteritis		26	36	Battigelli et al., 1993; Wilson et al., 1992
Saccharomyces spp	Yeast			13.2		
Salmonella enteritidis	Bacterium	Egg-associated Salmonellosis (fever, abdominal cramps, diarrhea)		7.6	10	Tosa and Hirata, 1998
S. paratyphi	Bacterium	Enteric fever		6.1		
S. typhi	Bacterium	Typhoid fever		30	50	Beltran and Jimenez, 2008 / Maya et al. 2003
Sarcina lutea	Bacterium			26.4		
Serratia marcescens	Bacterium	Nosocomial (Hospital acquired) infections		6.2		
Shigella dysenteriae	Bacterium	Epidemic dysentery		4.2		Wilson et al., 1992
S. flexneri	Bacterium	Shigellosis, dysentery		3.4		
S. sonnei	Bacterium	Shigellosis		7		Chang et al., 1985
Staphylococcus aureus	Bacterium	Staph and nosocomial infections, toxic shock syndrome		7	10	Chang et al., 1986
S. epidermidis	Bacterium	Infections in catheters and prostheses		5.8		
Streptococcus hemolyticus	Bacterium	Strep throat		5.5		
S. faecalis	Bacterium	Endocarditis, bladder and prostate infection		8	11.2	Harris et al., 1987 / Chang et al., 1985
S. lactis	Bacterium			8.8		
S. pyogenes	Bacterium	Scarlet fever, toxic shock syndrome, flesh eating disease		8.8		
S. viridans	Bacterium	Mouth or gingival infections, endocarditis		3.8		
Tobacco mosaic virus	Virus	Mottling and discoloration in plants		440		
Toxoplasma gondii	Protist	Toxoplasmosis		10		Ware, Swinburn et al., 2010
Vibrio cholerae	Bacterium	Cholera		2.2	2.9	Wilson et al., 1992
Yersinia enterocolitica	Bacterium	Yersiniosis (fever, abdominal pain, diarrhea)		3.7	5	Wilson et al., 1992

Typical Wyckomar UV systems produce UV doses of 38 – 60 mJ/cm<sup>2</sup>

\*UV energy levels required at 254 nanometer wavelength for 99.9% (log 3) destruction of organisms