

UVR-M and UVR-Mi, *UV Air Recirculators Test Report*



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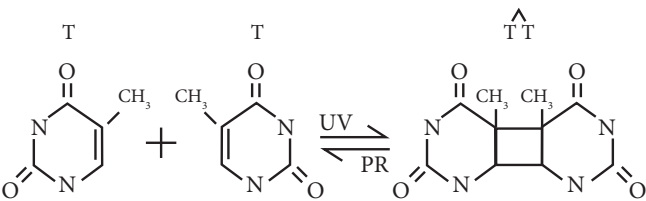
UV air recirculators UVR-M and UVR-Mi, produced by BioSan, are equipped with bactericidal UV lamps (Philips) and are used for air disinfection in research laboratories, hospitals and veterinary clinics. To show the efficiency of UV air recirculators UVR-M and UVR-Mi, we examined UV intensity in Philips 25W bactericidal UV lamps and an impact of UV radiation on various types of microorganisms.

GENERAL INFORMATION

Photochemical reaction

UV radiation affects the viability of microorganisms by causing photochemical reactions in the structure of DNA and RNA. Adjacent pyrimidine molecules form dimers and block the reproduction of bacteria, as a result, causing their death.

The diagram below shows the process of formation of pyrimidine dimers using thymine as an example (source: <http://www.photobiology.info>).



Destruction of microorganisms using UV radiation

The UV intensity needed for the elimination of microorganisms, such as yeasts, bacteria and viruses was previously investigated and reported by UVP Inc. A table below shows an amount of germicidal, shortwave (254 nm) UV energy needed for complete destruction of certain microorganisms.

Table 1, Destruction chart of bacteria and various organisms (source: <http://www.uvp.com/pdf/ab-115.pdf>)

Bacteria organisms	Energy: mW seconds per cm ²	Other microorganisms	Energy: mW seconds per cm ²
Bacillus anthracis	8.7	YEAST	
S. enteritidis	7.6	Saccharomyces ellipsoideus	13.2
B. Megatherium sp. (veg.)	2.5	Saccharomyces sp.	17.6
B. Megatherium sp. (spores)	5.2	Saccharomyces cerevisiae	13.2
B. paratyphosus	6.1	Brewer's yeast	6.6
B. subtilis	11.0	Baker's yeast	8.8
B. subtilis spores	22.0	Common yeast cake	13.2
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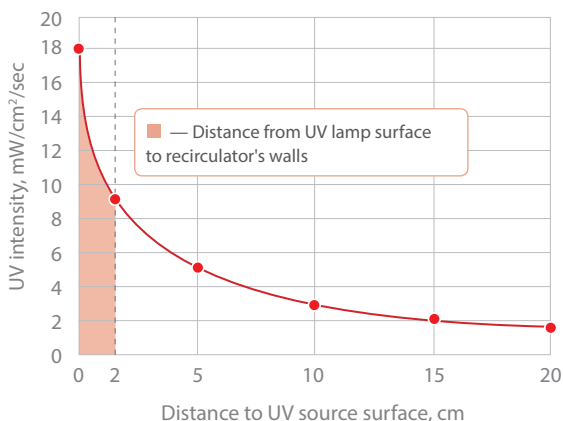
Bacteria organisms	Energy: mW seconds per cm ²	Other microorganisms	Energy: mW seconds per cm ²
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Clostridium tetani	22.0	MOLD SPORES	
Corynebacterium diphtheriae	6.5	Penicillium roqueforti	26.4
Eberthella typosa	4.1	Penicillium expansum	22.0
Escherichia coli	6.6	Penicillium digitatum	88.0
Micrococcus cadidus	12.3	Aspergillus glaucus	88.0
Micrococcus sphaeroides	15.4	Aspergillus flavus	99.0
Mycobacterium tuberculosis	1.0	Aspergillus niger	330.0
Neisseria catarrhalis	8.5	Rhisopus nigricans	220.0
Phytomonas tumefaciens	8.5	Mucor racemosus A	35.2
Proteus vulgaris	6.6	Mucor racemosus B	35.2
Pseudomonas aeruginosa	10.5	Oospora lactis	11.0
Pseudomonas fluorescens	6.6		
S. typhimysium	15.2	VIRUS	
Salmonella	10.0	Bacteriophage (E. coli)	6.6
Sarcina lutea	26.4	Tobacco mosaic	44.0
Sarratia marcescens	6.1	Influenza	6.6
Dysentery bacilli	4.2		
Shigella paradysenteriae	3.2	PROTOZOA	
Spirillum rubrum	6.1	Paramecium	200.0
Staphylococcus albus	5.7	Nematode eggs	92.0
Staphylococcus aureus	6.6	Chlorella vulgaris (algae)	22.0
Streptococcus hemolyticus	5.5		
Streptococcus lactis	8.8		
Streptococcus viridans	3.8		

Results

UV Intensity measurements of Philips 25W bactericidal UV lamp

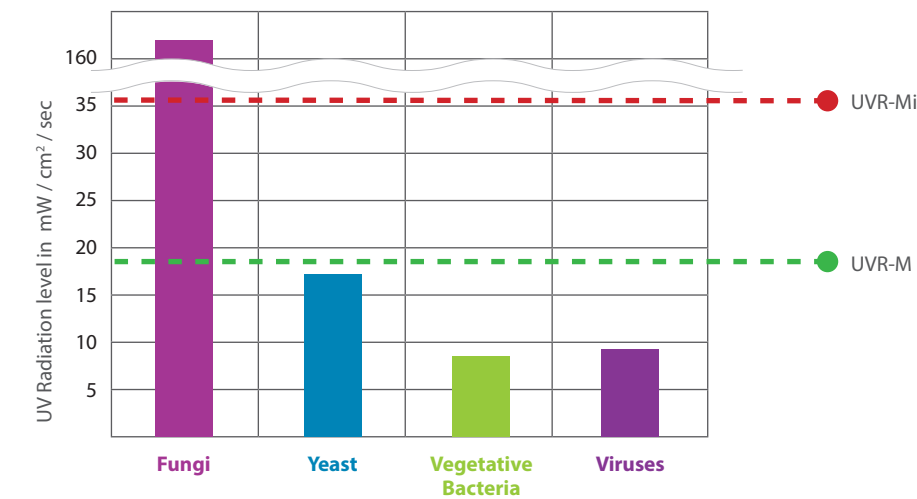
UV intensity depends on the distance from the UV source. The graph below shows that UV intensity drops dramatically as the distance increases.

Dependence of UV intensity over distance to the UV source, one lamp 25 W



UV intensity, mW/cm ²	Distance, cm
18.0	0
9.3	2
5.0	5
2.8	10
2.2	15
1.7	20

Sensitivity of microorganisms to UV radiation intensity in UV air recirculators UVR-M and UVR-Mi



Microorganism examples

Yeast

Saccharomyces cerevisiae
Brewer's yeast

Viruses

Bacteriophage (*E. coli*)
Influenza

Vegetative Bacteria

Clostridium tetani
Mycobacterium tuberculosis
Salmonella
Dysentery bacilli
Staphylococcus aureus
Streptococcus hemolyticus

BEFORE



AFTER

