UVR-M and UVR-Mi,

UV Air Recirculators Test Report

UVR-M and UVR-Mi, UV air recirculators Test Report

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

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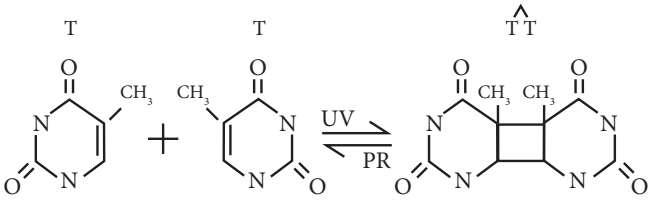
Photochemical reaction

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 cm²	Other microorganisms	Energy: mW seconds per cm²
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. parathyphosus	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
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Clostridium tetani	22.0
Corynebacterium diphtheriae	6.5
Eberthella typosa	4.1
Escherichia coli	6.6
Micrococcus cadidus	12.3
Micrococcus sphaeroides	15.4
Mycobacterium tuberculosis	1.0
Neisseria catarrhalis	8.5
Phytomonas tumefaciens	8.5
Proteus vulgaris	6.6
Pseudomonas aeruginosa	10.5
Pseudomonas fluorescens	6.6
S. typhimusium	15.2
Salmonella	10.0
Sarcina lutea	26.4
Sarratia marcescens	6.1
Dysentery bacilli	4.2
Shigella paradysenteriae	3.2
Spirillum rubrum	6.1
Staphylococcus albus	5.7
Staphylococcus aureus	6.6
Streptococcus hemolyticus	5.5
Streptococcus lactis	8.8
Streptococcus viridans	3.8

Other microorganisms	Energy: mW seconds per cm^2
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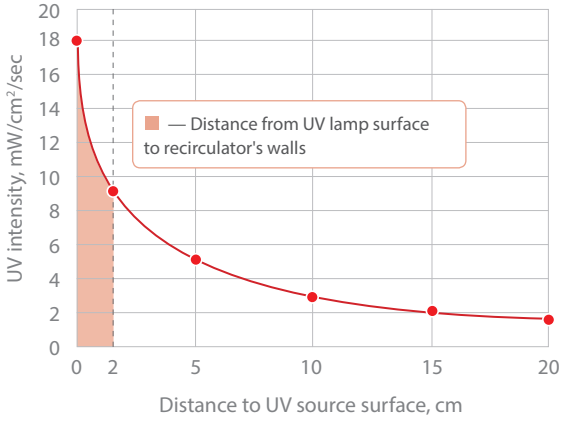
MOLD SPORES	
Penicillium roqueforti	26.4
Penicillium expansum	22.0
Penicillium digitatum	88.0
Aspergillus glaucus	88.0
Aspergillus flavus	99.0
Aspergillus niger	330.0
Rhisopus nigricans	220.0
Mucor racemosus A	35.2
Mucor racemosus B	35.2
Oospora lactis	11.0
VIRUS	
Bacteriophage (E. coli)	6.6
Tobacco mosaic	44.0
Influenza	6.6
PROTOZOA	
Paramecium	200.0
Nematode eggs	92.0
Chlorella vulgaris (algae)	22.0

Results

UV Intensity measurements of Philips 25W bactericidal UV lamp

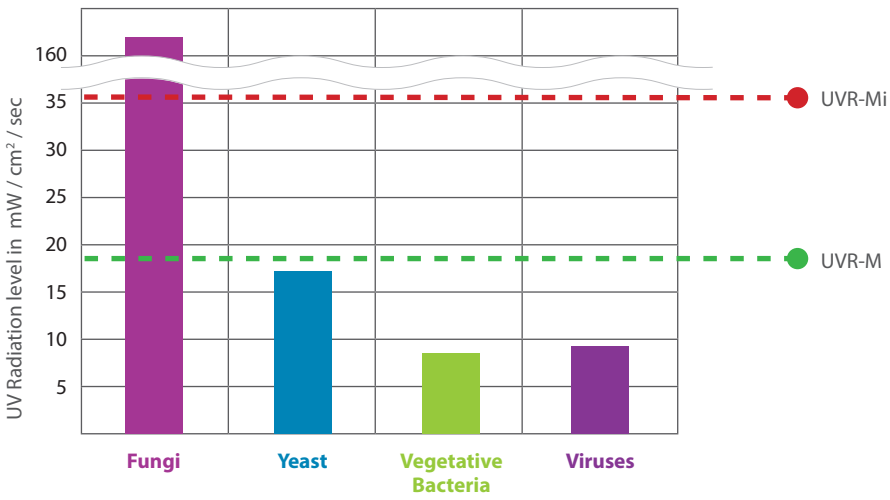
UV intensity depends on the distance from the UV source. The graph below shows that UV intensity drops dramatically as the distance increases.

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

Creation: **September 2011**
Revision 1: **December 2018**