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Lodz, 22-08-2016

Certificate of Analysis No K/313/01/2016

**Subject of analysis: Bactericidal lamp of direct action series NBV 2 x 36 IP 65 equipped with OSRAM light tubes**

**Customer: Ultra-Viol sp.j. Pietras, Purgał, Wójcik  
ul. Stępowizna 34  
95-100 Zgierz**

The sample for testing was delivered by the Customer: 12-07-2016  
The tests began: 13-07-2016  
The tests finished: 22-08-2016

Type of analysis	Method	Results
<b>Microbiological parameters</b>		
Research of bactericidal effectiveness against:	Own Methodology Instruction I-85	The reduction of microorganisms
- <i>Staphylococcus aureus</i> ATCC25923		R <sub>1 min</sub> = 99,3%
		R <sub>4 min</sub> = 100%
- <i>Escherichia coli</i> ATCC 25922		R <sub>1 min</sub> = 99,5%
		R <sub>4 min</sub> = 100%
- <i>Salmonella</i> Typhimurium ATCC14023		R <sub>1 min</sub> = 99,8%
		R <sub>4 min</sub> = 100%
- <i>Listeria monocytogenes</i> ATCC13932		R <sub>1 min</sub> = 93,4%
		R <sub>4 min</sub> = 100%
- <i>Saccharomyces cerevisiae</i> (yeast) ATCC 9763		R <sub>1 min</sub> = 98%
		R <sub>4 min</sub> = 100%
- <i>Aspergillus restrictus</i> (molds) ATCC 42693		R <sub>1 min</sub> = 58,7%
		R <sub>4 min</sub> = 98,3%
	R <sub>15 min</sub> = 100%	

Authorized:  
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Pracowni Mikrobiologii  
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Accepted:

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**Assessment of antibacterial efficacy of Bactericidal lamp of direct action series NBV 2 x 36 IP 65 equipped with OSRAM light tubes**

**The aim and scope of the research**

The aim of the study was to determine the antibacterial efficacy of bactericidal lamp of direct action series NBV 2 x 36 IP 65 equipped with OSRAM light tubes (Research report K/313/01/2016), against microorganisms: *Staphylococcus aureus* ATCC25923, *Escherichia coli* ATCC 25922, *Salmonella* Typhimurium ATCC14023, *Listeria monocytogenes* ATCC13932, *Saccharomyces cerevisiae* (yeast) ATCC 9763, *Aspergillus restrictus* (mold) ATCC 42693.

**Test procedure**

The research was conducted in accordance with its own methodology developed at the Laboratory No. I-86, point. 6.4 "Checking the effectiveness of the UV lamps".

A suspension of the test strain (density adjusted to that of a 1 McFarland standard) was prepared, followed up with a series of decimal dilutions. Aliquots of 1 ml were spread onto 2 Petri dishes of 140 mm diameter with a suitable agar (TSA or TSYEA) to obtain an increase from 900 to 1100 cfu (colony forming units). One control Petri dish (without UV exposure) was placed in an incubator at a suitable temperature for the microorganism (25°C, 30°C, 37°C) and incubated for a specified time, from 48 hours to 5 days. A second test Petri dish was placed open on the table and exposed to UV rays at a distance of 1 meter, respectively: 1 minute, 4 minutes, 15 minutes. The Petri dish was then sealed and incubated in the suitable for the microorganism temperature (25°C, 30°C, 37°C) for a specified time (from 48 hours to 5 days). After an incubation time the grown colonies on the control Petri dish and the test Petri dish (UV exposed) were counted. The study was performed in triplicate for each microorganism, and then calculated the percentage reduction in the number of microorganisms according to the formula 1.

$$(1) R = 100 - (b \times 100/k)$$

were:

R – reduction in the number of microorganisms

b – average number of colonies on the test plates after UV exposure

k – average number of colonies on the control plates (without UV exposure)





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**Table 1.** The effectiveness of antibacterial efficacy of **Bactericidal lamp of direct action series NBV 2 x 36 IP 65 equipped with OSRAM light tubes from** in 1 minute time

The results obtained for the test and control sample						
Microorganism	The number of colonies on the control plates without UV exposure [cfu]			The number of colonies on the test plates after 1 minute UV exposure [cfu]		
<i>Staphylococcus aureus</i> ATCC25923	1068	1004	1027	5	11	7
	k = 1033			b = 7,7		
				R [%] = 99,3%		
<i>Escherichia coli</i> ATCC 25922	1000	998	1052	4	7	3
	k = 1016			b = 4,7		
				R [%] = 99,5%		
<i>Salmonella</i> Typhimurium ATCC14023	1120	1100	1091	2	1	3
	k = 1103			b = 2		
				R [%] = 99,8%		
<i>Listeria monocytogenes</i> ATCC13932	1025	991	1005	67	62	71
	k = 1007			b = 66,7		
				R [%] = 93,4%		
<i>Saccharomyces cerevisiae</i> (yeast) ATCC 9763	1005	991	999	<sup>27</sup>	15	17
	k = 998			b = 19,7		
				R [%] = 98%		
<i>Aspergillus restrictus</i> (molds) ATCC 42693.	912	927	905	427	335	373
	k = 915			b = 378		
				R [%] = 58,7		



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**Table 2. The effectiveness of antibacterial efficacy of Bactericidal lamp of direct action series NBV 2 x 36 IP**

**65 equipped with OSRAM light tubes in 4 and 15 minutes time**

The results obtained for the test and control sample									
Microorganism	The number of colonies on the control plates without UV exposure [cfu]			The number of colonies on the test plates after 4 minutes UV exposure [cfu]			The number of colonies on the test plates after 15 minutes UV exposure [cfu]		
<i>Staphylococcus aureus</i> ATCC25923	990	1013	985	0	0	0	nt	nt	nt
	k = 996			b = 0			b = -		
				R [%] = 100%			R [%] = -		
<i>Escherichia coli</i> ATCC 25922	1025	1050	960	0	0	0	nt	nt	nt
	k = 1011			b = 0			b = -		
				R [%] = 100%			R [%] = -		
<i>Salmonella</i> <i>Typhimurium</i> ATCC14023	1098	1012	989	0	0	0	nt	nt	nt
	k = 1033			b = 0			b = -		
				R [%] = 100%			R [%] = -		
<i>Listeria monocytogenes</i> ATCC13932	1100	1054	930	0	0	0	nt	nt	nt
	k = 1028			b = 0			b = -		
				R [%] = 100%			R [%] = -		
<i>Saccharomyces cerevisiae</i> (yeast) ATCC 9763	988	902	923	0	0	0	nt	nt	nt
	k = 938			b = 0			b = -		
				R [%] = 100%			R [%] = -		
<i>Aspergillus restrictus</i> (molds) ATCC 42693.	970	952	903	17	15	21	0	0	0
	k = 942			b = 17			b = 0		
				R [%] = 98,25			R [%] = 100%		

nt – not tested





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**Final result**

**Bactericidal lamp of direct action series NBV 2 x 36 IP 65 equipped with OSRAM light tubes** operating from a distance of 1m causes after 1 minute UV exposure reduction in the number of test bacteria from 93.4% to 99.8%, the number of yeast *Saccharomyces cerevisiae* (yeast) ATCC 9763 by 98% and the mold *Aspergillus restrictus* ATCC 42693 by 58.7%. After 4 minutes of UV exposure it was a 100% reduction of 5 microorganisms: *Staphylococcus aureus* ATCC25923, *Escherichia coli* ATCC 25922, *Salmonella* Typhimurium ATCC14023, *Listeria monocytogenes* ATCC13932, *Saccharomyces cerevisiae* (yeast) ATCC 9763 and 98% *Aspergillus restrictus* ATCC 42693 decline. After 15 minutes of UV exposure the reduction in the number of *Aspergillus restrictus* ATCC 42693 was 100%.

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