



**2023 IUVA**  
WORLD CONGRESS

**September 10-13, 2023**

InterContinental Dubai - Festival City  
Dubai, U.A.E.



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# EVALUATION OF UV-C AIR PURIFICATION SYSTEM IN REDUCING MICROBIAL CONTAMINATION IN OCCUPATIONAL ENVIRONMENTS

**PRESENTED BY**

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# UV-C DISINFECTION: A DISINFECTION APPROACH IN HEALTHCARE ENVIRONMENTS

UV-C devices operate in:

- Surface (direct-acting devices)
- Air (flow devices)

## University of Siena researchers demonstrate rapid UV disinfection of ORs between surgeries

April 15, 2021



Journal of Hospital Infection

Volume 128, October 2022, Pages 19-25



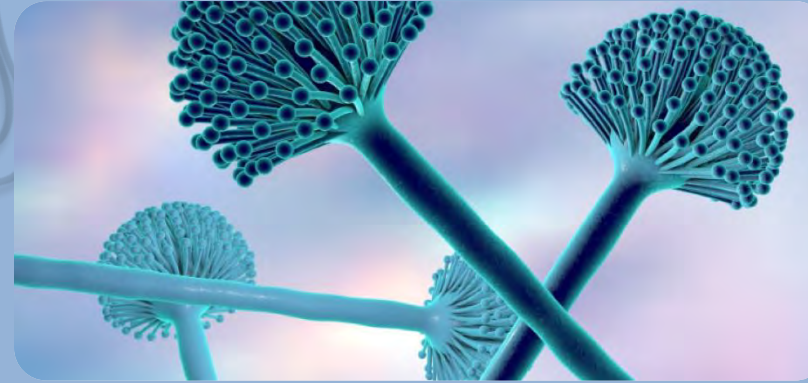
## Improvement and standardization of disinfection in hospital theatre with ultraviolet-C technology

R. Bosco<sup>a</sup>, G. Cevenini<sup>b</sup>, S. Gambelli<sup>c</sup>, N. Nante<sup>d</sup>, G. Messina<sup>d</sup>  



# AIR QUALITY IN INDOOR ENVIRONMENTS

## Indoor Air Quality



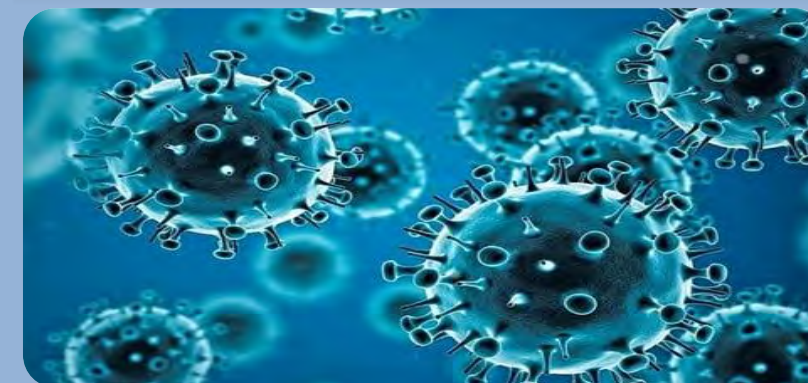
### Fungi

- *Aspergillus spp.*
- *Penicillium spp.*



### Bacteria

- *Staphylococci spp.*
- *Bacillus spp.*
- *Clostridium spp.*



### Viruses

- Respiratory (Influenza Virus, SARS-CoV, Adenovirus)
- Gastrointestinal (Enterovirus, Rotavirus, Norwalk-Like Virus)





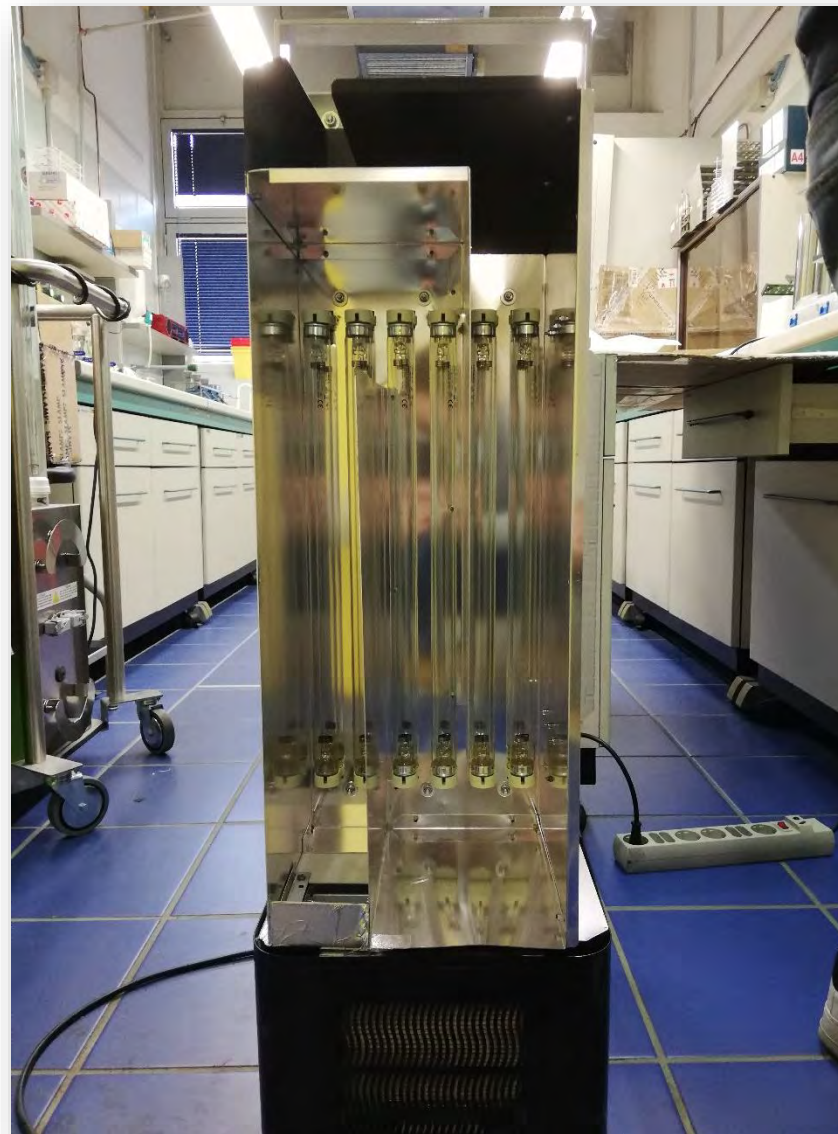
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# AIM OF THE STUDY

- to evaluate the effectiveness of a UV-C air purifier system in a real working environment
- to assess the system's ability to reduce microbial air contamination in an office setting.

## Cleaning Air T12

- 12 UV-C lamps
- 6 lamps per side (separate sections)
- 210 m<sup>3</sup> / h



Dec 2020 – Feb 2021

Environmental Hygiene Laboratory  
(preliminary stage) and Office  
(experimental stage) of the  
Department of Molecular Medicine  
and Development of the University of  
Siena.



# SCHEMATIC PROCEDURE

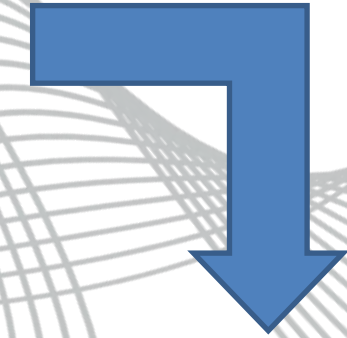
Samplings during  
Preliminary and  
Experimental stage



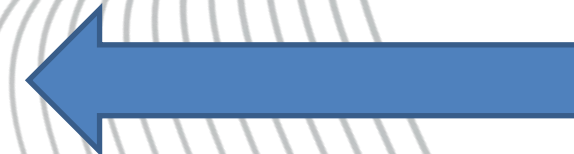
**Plates Count Agar  
inserted in the  
device**



**Set different parameters  
and started air sampler**

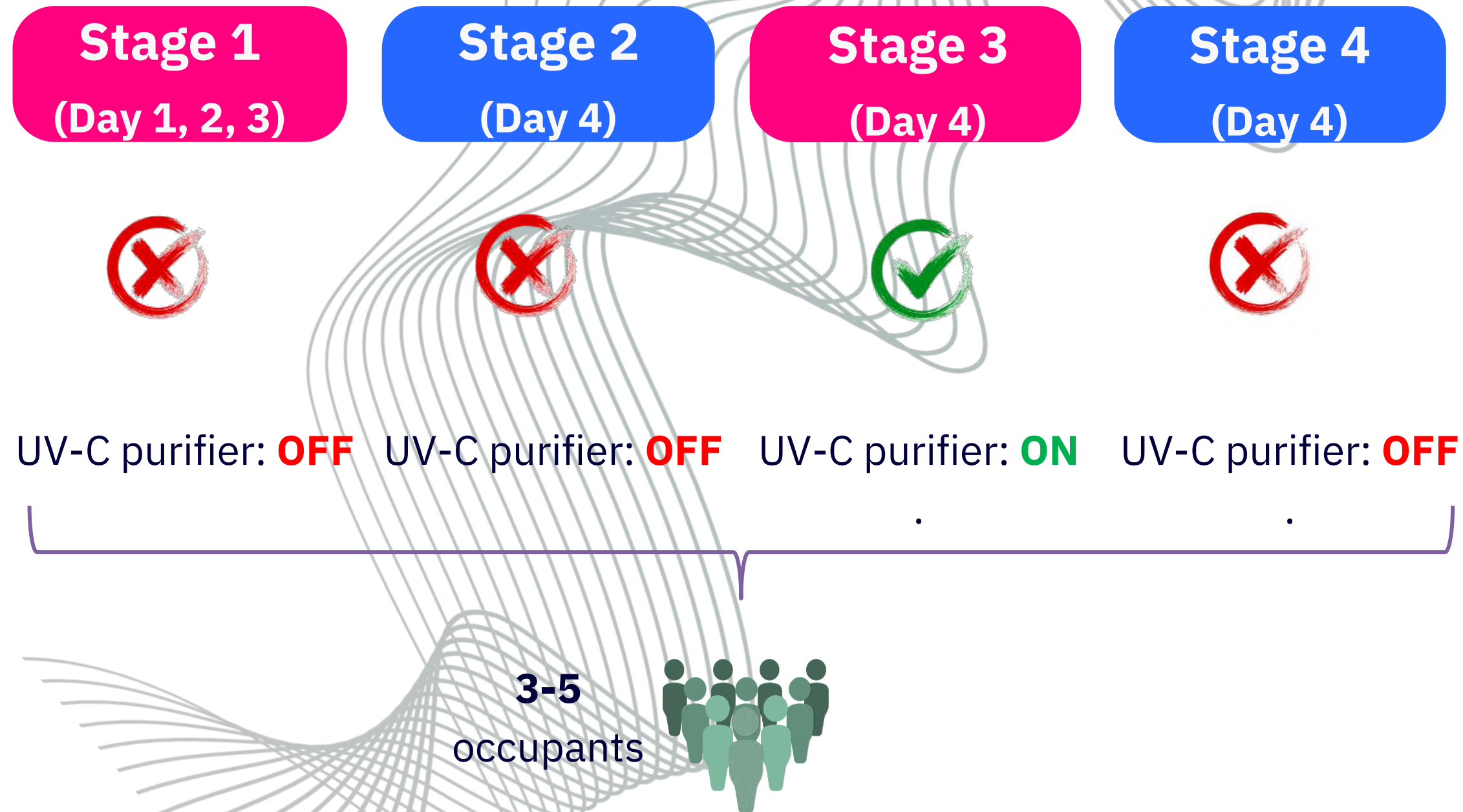


**Incubate the plates at  
36°C and 22°C for 72h**



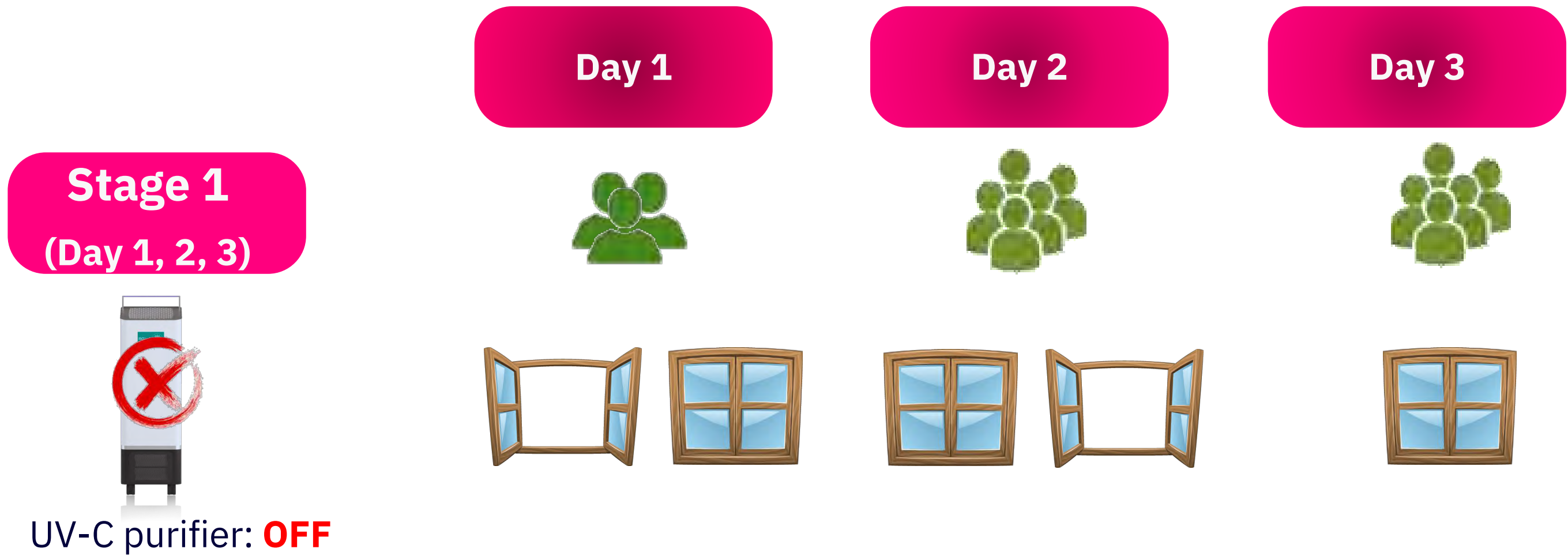
**The air in the room is  
aspirated before and  
after the exposure to the  
Cleaning Air T12**

# OPERATIVE SPHERE





# STAGE 1 (Day 1, 2 and 3)



# Results: STAGE 1 (Day 1, 2 and 3)

## Average Microbial Load 22°C:

186.8 CFU/m<sup>3</sup> (95% CI 154-219) (Day 1);  
93.6 CFU/m<sup>3</sup> (95% CI 69.6-117.6) (Day 2)  
152 CFU/m<sup>3</sup> (95% CI 124-180) (Day 3)

## Average Microbial Load 36°C:

161.1 CFU/m<sup>3</sup> (95% CI 131-191) (Day 1);  
107.8 CFU/m<sup>3</sup> (95% CI 78.7-137) (Day 2)  
181 CFU/m<sup>3</sup> (95% CI 151.7-212) (Day 3)

**Stage 1**  
(Day 1, 2, 3)



UV-C purifier: **OFF**

**Does the number of subjects change air quality?**



**Median Microbial Load 22°C**  
(CFU/m<sup>3</sup>):

<b>66</b>	<b>153</b>
95% CI	95% CI
(59.18-139.81)	(108.79-179.75)

**Median Microbial Load 36°C**  
(CFU/m<sup>3</sup>):

<b>88</b>	<b>173</b>
95% CI	95% CI
(80-101)	(141.55-228.61)



# Results: STAGE 1 (Day 1, 2 and 3)

## Average Microbial Load 22°C:

186.8 CFU/m<sup>3</sup> (95% CI 154-219) (Day 1);  
93.6 CFU/m<sup>3</sup> (95% CI 69.6-117.6) (Day 2)  
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## Average Microbial Load 36°C:

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181 CFU/m<sup>3</sup> (95% CI 151.7-212) (Day 3)

Is there a difference in the microbial load in the air if the window is open or closed?



## Median Microbial Load 22°C

(CFU/m<sup>3</sup>):

**136**

**241**

95% CI  
(113.71-  
215.73)

95% CI  
(199-257)

## Median Microbial Load 36°C

(CFU/m<sup>3</sup>):

**141**

**173**

95% CI  
(123.14)

95% CI  
(116-272)



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# RESULTS: Stage 2,3 and 4 – 4<sup>th</sup> day

Stage 2

Stage 3

Stage 4

✗

✓

✗

UV-C

UV-C

UV-C

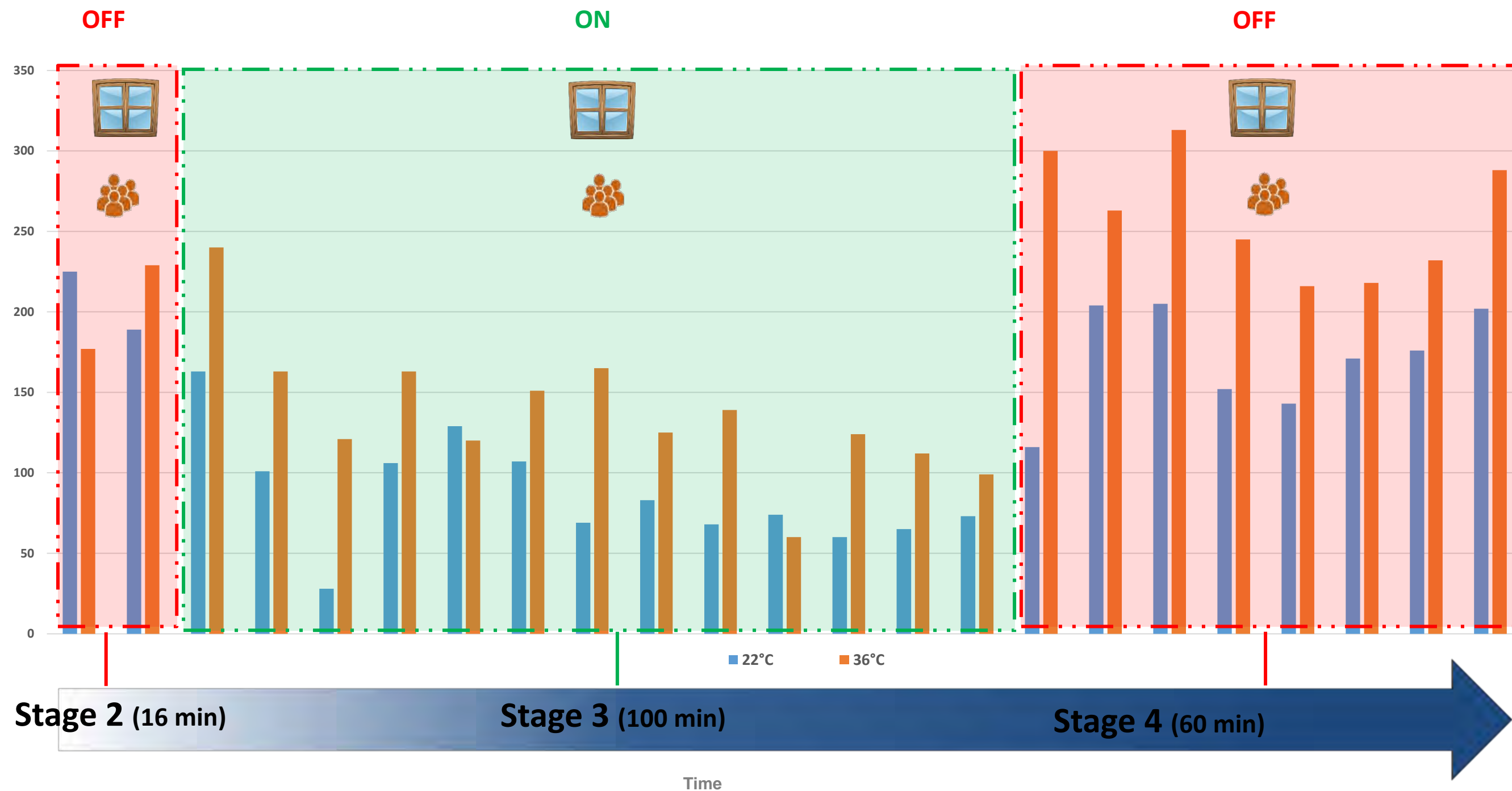
purifier: OFF

purifier: ON

purifier: OFF

5

occupants

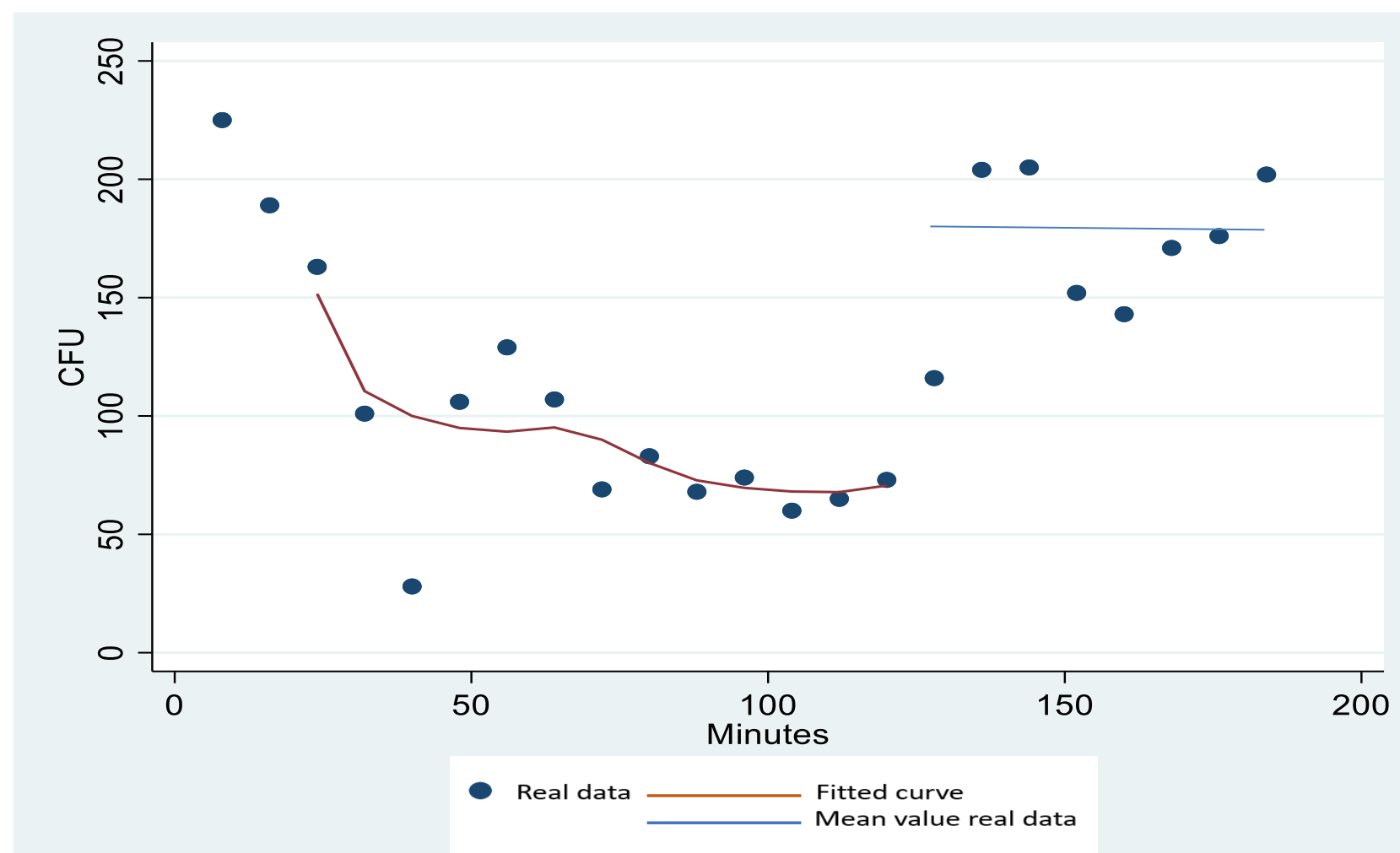




# RESULTS: EXPERIMENTAL STAGE (Phase 3 and 4 – 4<sup>th</sup> day)

ON

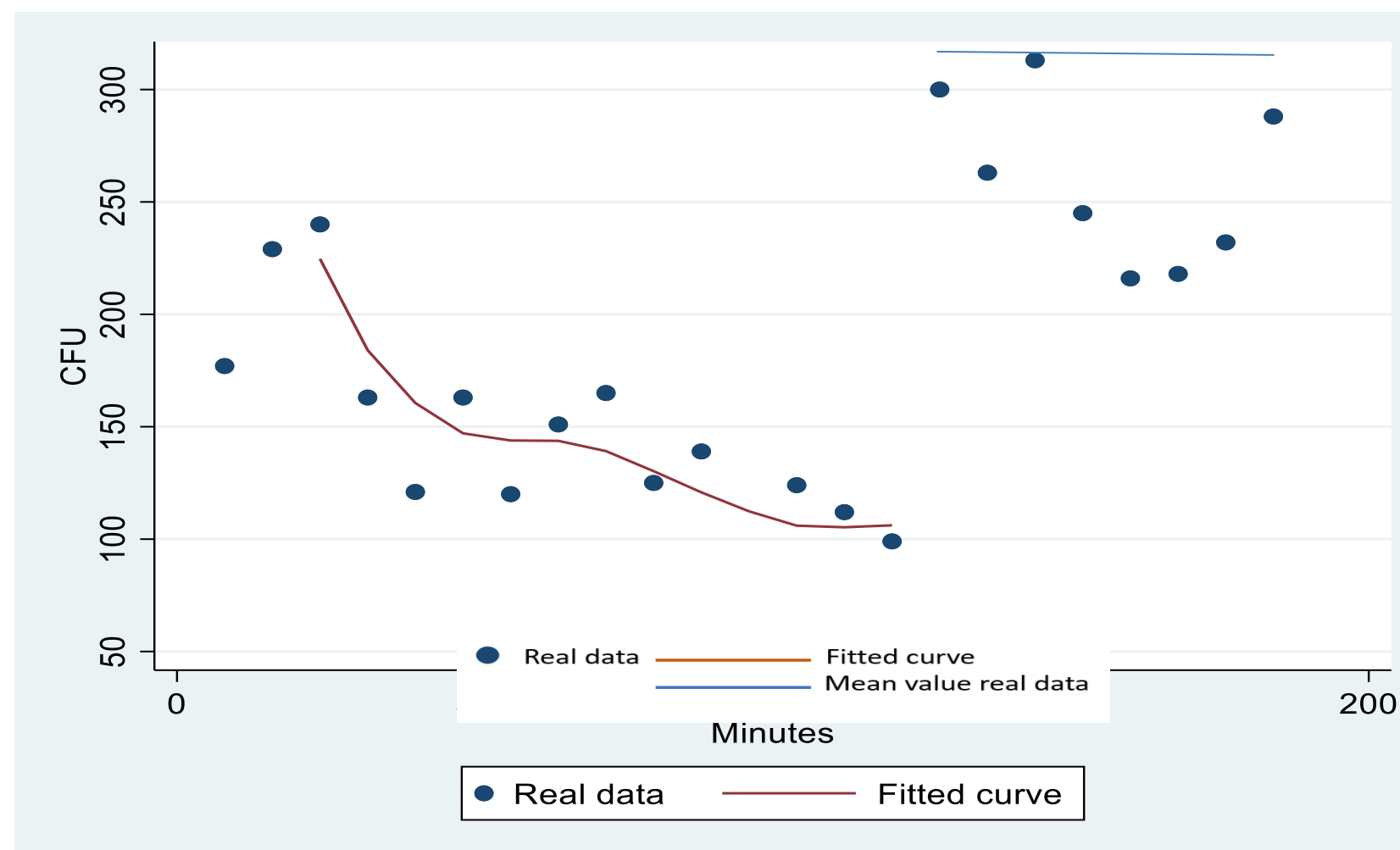
OFF



22°C

ON

OFF



36°C



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**Cleaning Air T12 was able to significantly reduce and control microbial contamination of the air**



# CONCLUSIONS

1

Comparison of CFU data, between the device-on phase and the subsequent device-off phase, showed statistically significant increase of environmental contamination (from a mean of **86.6 to 171.1 CFU/m<sup>3</sup>**) **about 100%**.

2

In an office with no air exchange with the outside, **reductions values** have reached levels of **over 60%** compared to the initial contamination values, despite **the presence of 3-5 people**.

3

The effectiveness of the device is even more evident when it's switched off: a rapid increase in the microbial load of the air is observed (**up to 150%**) compared to start time.





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# SOME LIMITATIONS...

**Cleaning Air T12 was able to significantly reduce and control air microbial contamination**

- We tested a single scenario
- The subjects wore a disposable 3-layer surgical mask
- The fourth day of the experiment was repeated only once





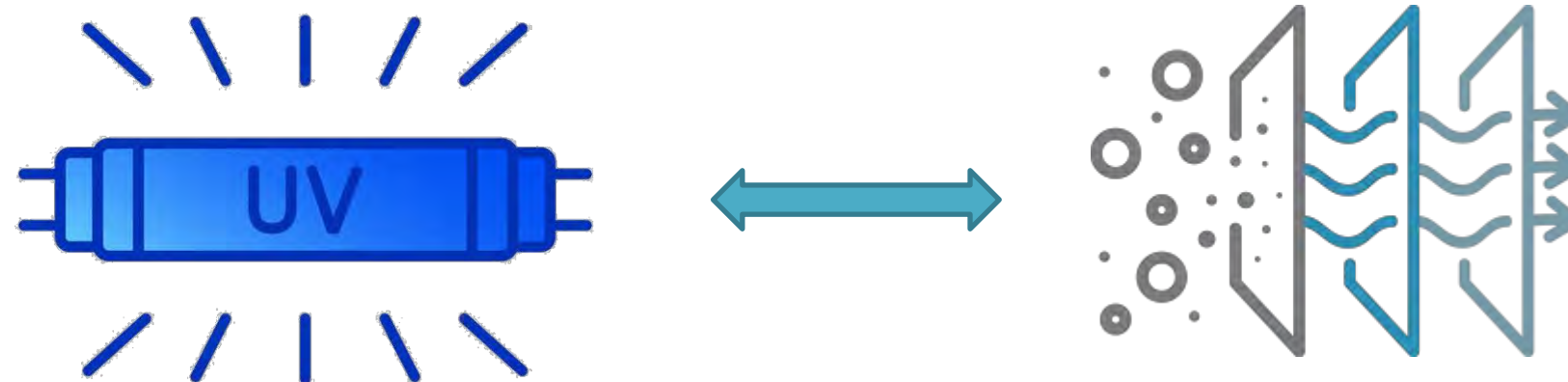
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# FUTURE PERSPECTIVE

**Cleaning Air T12** was able to  
**significantly reduce and control**  
**air microbial contamination**



In order to increase the UV-C device  
performance in disinfection the solution could  
be a **combined system with the addition of**  
**filters with intermediate filtering power**





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# Thank you for your attention...

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Case Report

### Wind of change: Better air for microbial environmental control

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