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Design to Purify Environments of Microorganisms: Prospects For The Emergence of Covid19

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Abstract

We present a simple device that takes advantage of the properties of ultraviolet light to sanitize the air in indoor spaces.

Key words: *UVC light, Covid19, bacteria, environment.*

1. Introduction

The emergence of Covid 19 has led societies to consider strategies to reduce the probability of contagion in closed environments or places with human traffic. One strategy usually considered in laboratories to avoid contamination is the use of ultraviolet radiation light. UV light acts on the structure of DNA/RNA introducing alterations that lead to non-functional cellular products (Herman et al. 2021; Valuntaitė and Girgždienė 2010; Dėdelienė and Juknys 2010; Prasad et al. 2011; Tan and Linskey 2011; Enwemeka et al. 2020). On this basis we decided to make the following conjecture: if an air stream within an environment is forced to circulate while being irradiated by UV light it is plausible that the treated air is found to be mitigated in the percentage of particles with functional genetic material e.g. bacteria, yeasts and, fungi.

The working hypothesis is as follows:

$$\text{Initial air (high cfu)} \longrightarrow \text{Final air (low cfu)}$$
$$\uparrow$$
$$\text{UV light}$$

The equipment should be placed in a space where the light does not radiate directly to people, such as corners, under furniture, etc.

2. Methodology

For this purpose, we replaced with two UVC light tubes (253.7 nm) of 6 volts the resistance of a Magiclick or Ken Brown type heater usually found in the market (Photo).

3. Tests

The equipment was used in a room of 4 m x 4 m and 3.5 m in height.
Plates with LB or Sabouraud medium were confronted with control air or air that had circulated for 20, 45 or, 60 minutes under UVC light irradiation.
After exposure, the plates were sealed and incubated at 37 °C for 72 hours. Then colony forming units (CFU) were determined.

4. Results

The results obtained show that after 40 minutes there is a decrease in the order of 80 % of the CFU for both the LB bacteria medium (Figures 1a and 1b) or the Sabouraud medium (data not shown). It should be considered that viral particles are more sensitive than micro-organisms, i.e. the efficiency percentage will be higher for viruses.

5. Conclusions - Prospects

The device presents simple perspectives to be used: a) it involves low costs b) it is a simple technology to apply c) its use can be extended to patients in places with low defenses patients (age, post-operative).

6. References

Dėdelienė K, Juknys R (2010) Response of Several Spring Barley Cultivars to UV-B Radiation and Ozone Treatment. Environmental Research, Engineering and Management, 4(54):13-19

Enwemeka CS , Vakunseh Bumah V, Santos Masson-Meyers D (2020) Light as a potential treatment for pandemic coronavirus infections: A Perspective. Journal of Photochemistry & Photobiology, B: Biology 207: 11189

Herman J, Biegel B, Huang L (2021) Inactivation times from 290 to 315 nm UVB in sunlight for SARS coronaviruses CoV and CoV-2 using OMI satellite data for the sunlit Earth. Air Quality, Atmosphere & Health 14:217–233 https://doi.org/10.1007/s11869-020-00927-2

Krishna Prasad NV, Niranjan K, Sarma MSSR K, Madhavi N (2011) Correlation of Biologically Effective UV-B Irradiance versus Ozone at Visakhapatnam (17.7 deg North, 83.3 deg East). Environmental Research, Engineering and Management, 3(57): 15 – 20

Tan SY, Linskey K (2011) Niels Finsen (1860-1904): Gift of light. Singapore Med J 52(11) : 777-778

Valuntaitė V, Girgždienė R (2010) Level and Formation Peculiarities of Chemical and Physical Pollution in the Workplaces. Environmental Research, Engineering and Management 3 (53): 30-35

Photo: Installation of lamps and operation

Open device *Installation of lamps* *Device operating*

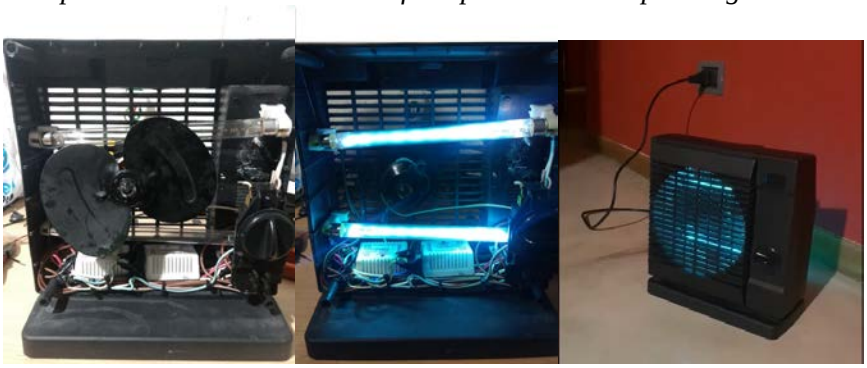
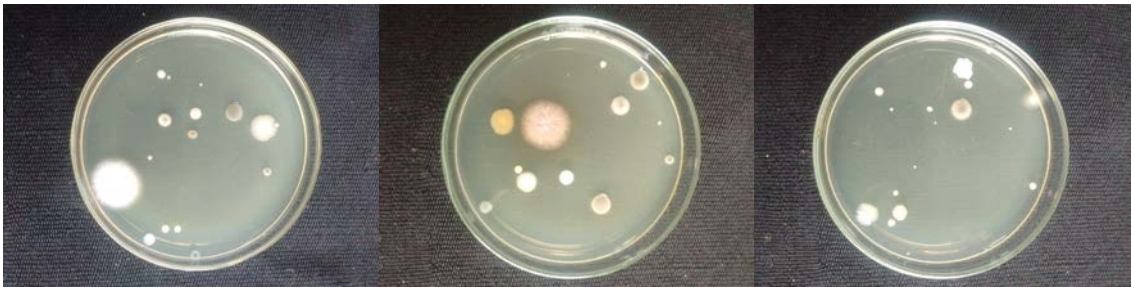


Figure 1: LB plates exposed without/without UVC light.



a b c

Figure 1a: air circulating in fan for 45 minutes.

Subsequently, the plates were left open for 20 minutes.

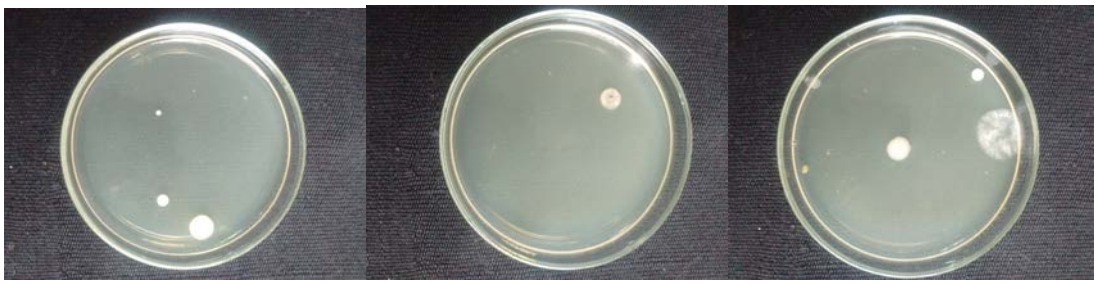


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Figure 1b: air circulating in fan + UVC light for 45 minutes.

Subsequently, the plates were left open for 20 minutes.