The virus inactivation efficiency of current UVC air disinfection systems is tremendously low for mass and safe air disinfection in manned public spaces

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CHIA C. WANG et al. wrote a paper entitled "Airborne transmission of respiratory viruses (1). Airborne infection control in public spaces requires not only ventilation but also airflow control to prevent viruses from infecting people and to incorporate virus degradation processes (1,2,3). CHIA C. WANG et al. introduced UV radiation and CDC has also recommended ultraviolet germicidal irradiation (UVGI) of the upper part of the room in public spaces (4). However, several challenges remain with their UVGI systems.

- Natural convection problems (4):

If left to natural convection, the upper layer of air warmed by UVC energy will remain at the top of the space. It is necessary to circulate the air in some way.

- UVC effective distances (5):

Naturally, the irradiance of UVC light decreases inversely with distance from the source. Even if the distance can be increased by controlling the luminous flux, the reflection on the opposing wall and the effect on the human body must be considered. It is advisable to affix a UVC absorber or similar material to adjacent walls.

- The problem of impact on infants and sensitive skin (5,6):

The aforementioned reflected light and irradiation at a wavelength limited to 222nm, which was considered to have little effect on the human body, does not mention the effect on infants and people with sensitive skin. No such clinical trial data exists, and the manufacturer's accountability remains.

- Virus developing resistance against UVC:

With half-hearted UVC irradiation, there is a possibility that viruses may develop resistance or produce mutants.

In addition, the closed-system UVC irradiators currently on the market such as air purifiers do not allow for a high air volume in order to achieve both UVC irradiation and virus degradation efficiency. Therefore, if a high definition filter such as HEPA is used, the air volume is limited by the pressure drop (7). In order to solve these problems and to decompose airborne viruses with high efficiency by UVC irradiation, the following conditions must be satisfied:

- materials must be selected that do not cause any turbulence in the device,

- controllable luminous flux of the UVC ray in order to increase the effective distance of the UVC in the device,

- to increase the reflectivity of the UVC or to minimize the transmission and absorption of the UVC into the surrounding material in the device,

- to make the airflow in the device as laminar rather than turbulent as possible,

- to create a laminar flow in order to process large volumes of air by using multiple layers in an enclosed space in the device,

- to be able to irradiate the virus with UVC from 360 degrees instead of one direction in the device:

When 360-degree irradiation becomes possible, the typical model of disinfection power is expressed as disinfection power irradiance (W/m^2) x irradiation time (s), which needs to be updated to (W/m^3), and

- to be able to replace the reflector of the device due to deterioration caused by UVC irradiation.

As the result of the recent pandemic, there are fraudulent products on the world market. Few experts are able to determine the authenticity of these products, a challenge that cuts across disciplines such as chemical

engineering, virology, biology and fluid analysis. From the lessons of this pandemic, experts in chemical engineering, virology and fluid analysis must educate consumers and we should not turn a blind eye to this situation.

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