JOURNAL OF SCIENTIFIC RESEARCH IN ALLIED SCIENCES
ISSN NO. 2455-5800
DOI No. 10.26838/JUSRES.2021.7.4.508
Contents available at www.jusres.com

# DISINFECTION THROUGH AUTOMATIC SANITIZER DISPENSER AND STERILIZATION THROUGH UV-C LIGHT

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**ARTICLE INFO** | **ABSTRACT** | **ORIGINAL RESEARCH ARTICLE**

**Article History**
**Received: March 2021**
**Accepted: August 2021**
**Keywords:**
Disinfection, Healthcare-associated infections (HAIs), UV Sanitizer Box, UV-C Sterilization Torch, Macro and Micro Pollution, UV Purification.

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This research was conducted to estimate the potential for UV disinfection technology COVID 19 virus on daily used materials. This work carried out at the deactivate COVID 19 virus on any materials when it pass through UV sanitization box and system fouling may have on the efficiency of UV disinfection. A box type model successfully explained the results obtained with the collimated beam. No significant on materials quality changes that may affect system operation were identified.



## 1. INTRODUCTION

UVC radiation has been found to damage the outer protein covering of the SARS-Coronavirus, which is not the same as the current SARS-CoV-2 virus. UVC radiation may also be useful in inactivating the SARS-CoV-2 virus, which causes Coronavirus Disease 2019. (COVID-19) [1]. However, there is presently a scarcity of published data on the wavelength, dosage, and duration of UVC radiation necessary to inactivate the SARS-CoV-2 virus. Aside from determining if UVC radiation is efficient at inactivating a specific virus, there are restrictions to how effective UVC radiation can be at inactivating viruses in general. Because many UVC lamps available for household use have modest doses, it may require longer exposure to a given surface area to potentially deliver efficient bacterial or viral inactivation [2]. UVC radiation is widely used to cleanse the air within air ducts is shown in fig 1. This is the safest approach to use UVC radiation since direct UVC exposure to human skin or eyes can cause damage, and installing UVC within an air duct reduces the likelihood of skin and eye exposure.

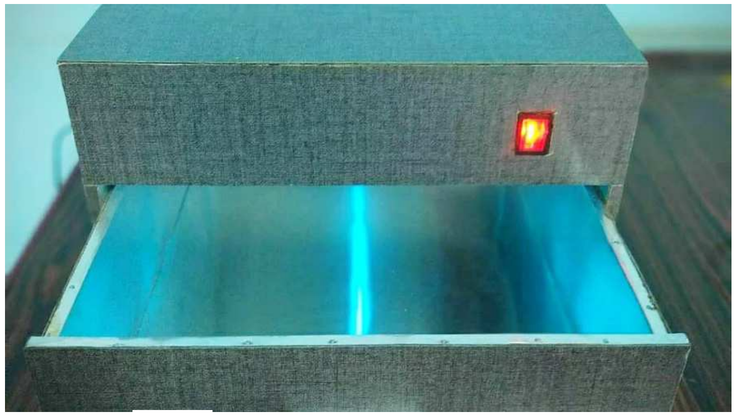

**Fig 1.** Sterilization through UV-C light

It is critical to understand that, in general, UVC cannot inactivate a virus or bacteria unless it is directly exposed to UVC. Because there is minimal published data on the wavelength, dosage, and duration of UVC radiation necessary to inactivate the SARS-CoV-2 virus, the efficiency of UVC lamps in inactivating the virus is uncertain [3]. In other words, if a virus or bacteria is covered by dust or soil, entrenched in a porous surface, or on the bottom of a surface, it will not be inactivated. Historically, the most popular kind of lamp used to generate UVC radiation was the low-pressure mercury lamp, which emits more than 90% of its light at 250 nm. This sort of bulb may also generate other wavelengths. Other lamps are available that emit a wide variety of UV wavelengths as well as visible and infrared light [4-6]. UV-emitting light-emitting diodes (LEDs) are also becoming more widely available. LEDs typically produce light with a relatively narrow wavelength range. UV LEDs with peak wavelengths of 265 nm, 273 nm, and 280 nm are now available. LEDs have one benefit over low-pressure mercury lamps in that they do not contain mercury. LEDs, on the other hand, may be less effective for germicidal applications due to their limited surface area and increased directionality. The data show that targeted and well-monitored UVA treatment is both safe and effective in lowering endotracheal viral load and improving clinical outcomes in COVID-19 patients [9]

## 2. MATERIALS AND METHODS

The data show that UVA radiation is both safe and effective in decreasing viral load and disease severity. This is the first human research of its type to assess the safety and effectiveness characteristics of UVA light administered internally to severely sick COVID-19 patients. Previously, the present study's researchers discovered that UVA treatment had antiviral effects on positive-sense, single-stranded RNA viruses such as coronavirus-229E. Based on the existing literature, they believe that the decreased respiratory virus load seen in the study participants is due to UVA light stimulation of MAVS protein signaling events. The impact of monochromatic UV-C (254 nm) on SARS-CoV-2 is reported here, demonstrating that viral inactivation is simple [11]. Experiments were carried out with a custom-designed low-pressure mercury lamp system that was spectrally calibrated to provide an average intensity of 1.082 mW/cm2 over the lighting region (see the details reported in the Method section). The first concentration corresponds to low-level contamination reported in controlled contexts (e.g., hospital rooms), the second to the average concentration discovered in the sputum of COVID-19 infected patients, and the third to a very high concentration recorded in terminally ill COVID-19 patients. Following UV-C treatment, viral replication was examined using a culture polymerase chain reaction (C-RTPCR) targeting two regions (N1 and N2) of the SARS-CoV-2 nucleocapsid gene, as well as an analysis of the SARS-CoV-2-induced cytopathic effect. This method allows researchers to track the kinetics of viral development and determine if the dose given is adequate to totally inactivate the virus over time. When UV-C devices are used to disinfect surfaces and the surroundings, this is beneficial from a practical standpoint. The effect of UV-C exposure on SARS-CoV-2 replication was very clear and independent of the MOI used; dose–response and time-dependent curves were seen.

An automatic hand sanitizer dispenser is a device dispensing a controlled amount of hand sanitizer (or a similar liquid such as soap solution). They are often used in conjunction with automatic faucets in public restrooms. They help conserve the amount of sanitizer used and stem infectious disease transmission. Our world has changed so much in 2020. The coronavirus has taught us many different things. It feels like yesterday when we were at the office shaking hands, talking freely, and roaming around at will. And now, we are locked down in our homes, keeping a safe distance from others and using hand sanitizers after every few minutes. Even as time passes and the 'new normal' becomes a way of life for everyone, these new habits and newly gained consciousness about health and hygiene will stay. Of these, hand sanitization at regular intervals has found universal acceptance, pandemic or not. Further awareness campaigns on sanitization are on their way, and governments are installing hand sanitizers at numerous public spaces. To avoid contact, many people are opting for touch less automatic hand sanitizer dispensers as they are believed to offer an extra layer of protection. An automatic hand sanitizer dispenser is an excellent alternative to the traditional ones as it requires zero to no contact. But with its so many advantages, there is still some skepticism regarding its usage and effectiveness.

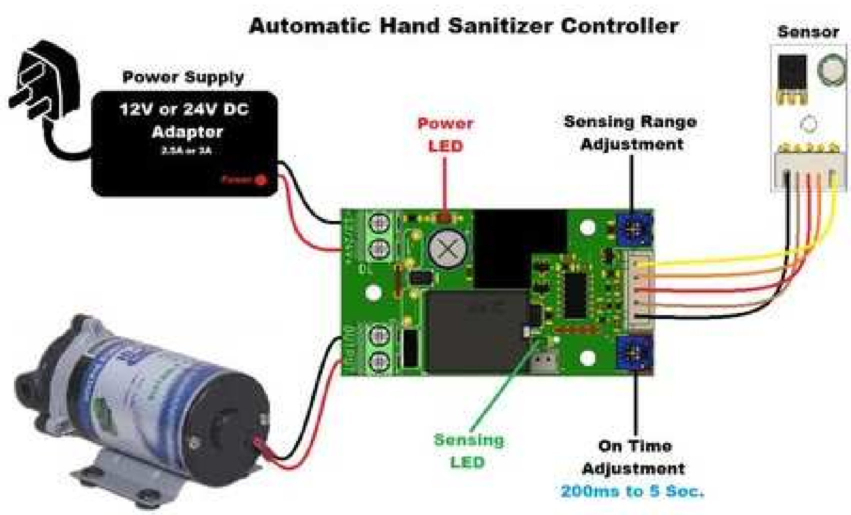


**Fig. 2** Circuit Diagram

With help of this method successfully removed the virus from the materials when it passes from UV rays. Schematic circuit diagram is shown in fig 2.

**Pros of an Automatic Hand Sanitizer Dispenser**

***1. Automatic***

The first and foremost advantage of an automatic sanitizer dispenser is that it provides a truly touchless experience. There is no hassle of pressing a button or a handle (as in the case of foot-operated ones). These dispensers have ultrasonic sensors that release the sanitizer once you keep your hands below the nozzle. It's fast, safe, and simply more efficient.

***2. Easy to use***

For every appliance, the ease of use is what determines its feasibility. While choosing a sanitizer dispenser, you will want something that will be easy to use, unlike the manual ones.

Automatic hand sanitizer dispensers are better than the traditional ones as they dispense the sanitizer automatically. You don't have to apply physical pressure on the dispenser; just place your hands under the nozzle, and it provides the right amount.

Here's how can easily install an automatic hand sanitizer dispenser:

***3. Delivers a standard dose***

One of the biggest advantages of an automatic hand sanitizer dispenser machine is that it offers a standard amount that is enough to clean both hands.

These standardized doses are usually sprayed on the hands, which causes minimum to no wastage, unlike manual ones, which releases extra sanitizer at times.

***4. Eliminates a contact point***

Manual hand sanitizers require pushing the pump to release sanitizer. Touching the pump can spread a lot of germs, as people with dirty hands also use it.

With touchless hand sanitizer dispensers, there is no common contact point, which means less or no germs will be transferred from one person to another.

***5. Modern appearance***

Contactless hand sanitizer dispensers usually have a sleek and stylish design. They also add a modern appeal to places they are installed in.

If it installs a contactless hand sanitizer dispenser at any workplace, then it are indeed giving a high-end vibe to work environment.

**Cons Of an Automatic Hand Sanitizer Dispenser**

1. ***Batteries wear down fast***

Most automatic dispensers rely on batteries to operate. So, they require regular and timely maintenance in terms of refilling the batteries. This is an added expense as well as a hassle for the consumers, who will have to change the batteries as soon as they wear down.

However, since the onset of this pandemic, many hand sanitizer dispenser brands in India have made innovations to make things easier for the buyers. Today's sanitizer dispensers run on electricity and thus, eliminate the hassle of refilling batteries.

2. ***Price factor***

These machines come with a fully automatic system, and quite understandably, these are more expensive than the manual ones.

But instead of simply focusing on the cost price, we should also consider the service and the long-term value of the purchased product. Being touchless, these are safer to operate and also last longer than usual. Moreover, many brands today offer affordable choices that everyone can buy.

3. ***Maintenance***

There is skepticism that an automatic dispenser is high maintenance. As the sanitizer dispenses automatically, it gets clogged in places, which requires timely cleaning. This also makes the place dirty and unhygienic. However, dispenser units that run on electricity and use a mist-based spray technique, require very little regular maintenance. These are consequently very hygienic as well. Even though the refilling of sanitizer dispenser is a manual job, it is pretty simple to refill these machines and only takes a few minutes to do so.

**3. RESULTS**

The viral solution was illuminated using a low-pressure mercury lamp set in a custom-designed holder consisting of a box with a circular aperture 50 mm in diameter located approximately 220 mm from the source. The aperture acts as a spatial filter, uniformizing the light of the region behind it. To begin the lighting process, a mechanical shutter is also present. The plate is positioned 30 mm below the circular aperture, and a single dwell (34.7 mm in diameter) has been irradiated from the top, centered in relation to the 50 mm aperture. To achieve a 1 mm thick liquid layer, the dwell was filled with 0.976 ml of the virus suspended in Dulbecco's Modified Eagle's Medium (DMEM). Following the irradiation, the sample was handled in the manner indicated in the preceding section. The cosine-corrected irradiance probe, model CC-3-UV-T, is attached to the tip of a 1 m long optical fibre and couples to the spectrometer. The fig. 1 clearly shows that when UV passes into the air will remove the virus. Same function is used to remove the virus in the box. When any materials placed in the box it will remove the virus.

Ozone production has been highlighted as one of the hazards connected with UV disinfection, particularly in the use of air disinfection. Deep UV irradiation catalyzes the conflicting processes of ozone production and dissociation from and to molecular oxygen, which are widely documented in the literature. It is generally understood that light in the far-UVC range may cause ozone formation by photolysis of atmospheric oxygen molecules. As a result, systems designed to employ far-UVC radiation for air disinfection may generate ozone while running; however, the risk posed by this production is dependent on the UV source power output and emission spectrum, as well as air movement or stagnation and operational duty cycle.


**Fig.3** Effect of UV-C pass in air

## 4. DISCUSSION AND CONCLUSION

UV susceptibility governs requirements that are not restricted to RNA or DNA structures. The virus also contains proteins, such as spike proteins from the COVID family, which are required for the virus to attach to receptors on the host cell and infect the cell. The kinetics of UV-induced viral inactivation is determined by all of the above-mentioned inherent properties of viruses. Kowalski developed a genomic model to predict the susceptibility of various viruses to 254 nm UV radiation and published kinetic data that is fairly consistent with experimental analysis, taking into account the intrinsic features and genomic structure of microorganisms.

## 5. CONCLUSION

Only time will tell how human activity has influenced the progression of the COVID-19 epidemic. It is possible that staying at home alone will not be enough to prevent the spread of COVID-19; hence, in addition to traditional preventative measures, novel disinfection technologies, such as UV radiation, have gotten a lot of attention. The increased usage of UVC sterilisation equipment for air and surface disinfection demonstrates the efficacy and convenience of disinfection technologies. In the absence of a well-established protocol and guidelines for validating commercial UV disinfection products, a large number of UV-based sterilisation devices with unknown efficacies against SARS-CoV-2 and a lack of safety data raised serious concerns about whether such products are yet ready for use by laypeople.

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