UV Disinfection: No Magic Bullet, Just Smart, Layered Protection
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Introduction

When the global pandemic hit all of us in Spring 2020, school districts had to go into crisis mode, pivoting to digital instruction in a matter of weeks, many closing their doors while they sorted through mountains of information, often contradictory, on how best to protect against COVID-19.

As districts are faced with the challenge of identifying the best evidence-based strategies for re-opening safely, ensuring healthy equity for all students within their district, and determining the most effective use of the Elementary and Secondary School Emergency Relief Fund (ESSER) dollars, it can be an incredibly overwhelming task, but it is also a tremendous opportunity.

Outside of the percentages of ESSER III funding set aside for specific purposes as part of the American Rescue Plan Act, such as evidence-based interventions to address learning loss or summer enrichment programs, billions of dollars are available to districts to use for a wide variety of activities. To the greatest extent possible, districts are encouraged to adopt policies in line with CDC’s recommendations on “reopening and operating schools to effectively maintain the health and safety of students, educators, and other staff.”

Allowable expenses include purchasing supplies to sanitize and clean facilities, as well as “school facility repairs and improvements that would enable them to reduce the risk of transmission.”¹

With the right kinds of investment, these funds will not only help see us through this pandemic, but also well into the future. We can protect ourselves against SARS-CoV-2 and other pathogens, such as influenza that typically causes excessive student absences every year, or MRSA that frequently threatens our student athletes and others using locker rooms and athletic equipment.

Much of the guidance that is out there focuses solely on the use of chemical disinfectants, which comes with high associated costs in terms of ongoing expenses of chemicals, extensive labor requirements, and potential health risks to students and staff that can come from long-term exposure to chemicals. These practices may not be sustainable in the long-run economically and risk reduced compliance over time.

However, there are automated disinfection technologies that have been proven effective against SARS-CoV-2 as well as other pathogens, particularly UV disinfection. Used by hospitals for decades to combat healthcare-associated infections, advancements in UV technologies have made it possible (and affordable) to bring the power of ultraviolet light into schools. This white paper will specifically cover how UV disinfection can fit into the multi-layered prevention strategies outlined by the CDC.
Multi-Layered Prevention Strategies

Over the past year, schools have faced challenges like never before on how to balance the educational needs of their students with protecting their health and safety. Evidence has suggested that K-12 schools can safely re-open for in-person instruction with the proper set of prevention strategies.

There is no single solution that will prevent all transmissions. Therefore, the operational guidance from the CDC recommends the implementation of layered prevention strategies to reduce SARS-CoV-2 transmission in schools, which includes 5 key prevention strategies: universal and correct use of masks, physical distancing, handwashing and respiratory etiquette, cleaning and maintaining healthy facilities, and contact tracing in combination with isolation and quarantine.2

With the American Rescue Plan Elementary and Secondary School Emergency Relief (ARP ESSER) funds, schools will have the opportunity to invest in the infrastructure and solutions that will help them maintain the health and safety of both students and staff. These funds may be used for expenses associated with adopting policies consistent with the multi-layered prevention strategies laid out in the CDC guidance for re-opening.
While many of these strategies such as wearing masks and hand hygiene are relatively straightforward in their implementation, deciding on which strategies to use to address cleaning and maintaining healthy facilities can be confusing. Not only has guidance changed on how to best prevent the transmission of COVID-19, the marketplace has been filled with misinformation, new technologies that have not been fully tested, or conflicting advice.

Furthermore, many schools were already faced with challenges to have the resources needed to properly maintain their facilities. In June 2020, the GAO released a study that indicated that over 50% of public school districts need to “update or replace multiple building systems or features in their schools.” This included nearly 41% of districts needed to update or replace heating, ventilation, and air conditioning systems in over half of their schools. These older systems can negatively impact indoor air quality and cause problems with mold.3

The National Council on School Facilities (NCSF) has recommended that districts should allocate at least 15% of their federal relief and ARP funding toward implementing policies and strategies related to healthy facilities.

This would translate to $20 billion to “reduce the deferred maintenance that inhibits the effective layering of facilities-related mitigation strategies advised by the Centers for Disease Control.”4 According to NCSF, this approach would also help address “disparate impacts of the pandemic, since school districts with high levels of deferred maintenance and repairs are often also districts with high numbers and % of students from low income and minority communities.”4

As part of their efforts to support schools, the NCSF created a re-opening checklist to support districts as they plan and budget for implementing best practices, including strategies for increased levels of cleaning & disinfecting surfaces as well as improved air quality.

This mirrors the recommendations of the CDC to clean and disinfect high-touch surfaces, as well as tools to improve ventilation, including the use of ultraviolet germicidal irradiation (UVGI).
Continuous UV Air Disinfection

As scientists continued to learn about the transmission pathways of SARS-CoV-2, it became evident that inhalation of fine droplets and aerosol particles that contain infectious virus is one of the primary pathways. Joining other airborne pathogens such as influenza, measles, and the common cold that threaten the health and wellness of students and staff regularly, SARS-CoV-2 has highlighted the need for better solutions to prevent transmission of viruses via the air in schools.

Schools have been bombarded with information about technologies supposedly there to help them address indoor air quality. The Education Department is working on additional guidance on indoor air safety as unfortunately, experts indicate hundreds of schools have bought “devices, including ionizers and ozone-generating mechanisms, which lack peer-reviewed scientific data, are unregulated and could even be bad for students’ health, especially children with asthma or allergies.”

As part of the layered prevention strategies, the CDC has recommended that schools implement a variety of tools to improve ventilation, including increasing the introduction of outdoor air, using fans to increase effectiveness of open windows, improving central air filtration, and the use of ultraviolet germicidal irradiation (UVGI). “Upper-room UVGI systems can be used to provide air cleaning within occupied spaces, and in-duct UVGI systems can help enhance air cleaning inside central ventilation systems.”

UVGI systems have a long track record of disinfecting both air and surfaces. In 1937, a UVGI system installed in a school ventilation system significantly reduced the incidence of measles. Since 1950 much research has focused on the use of UVGI to address tuberculosis. In fact, the CDC has studied this use of UVGI for over two decades.

During COVID-19, we have seen an increase in the use of UVGI systems in HVAC systems, as well as in-room air disinfection products as they offer a way to continuously reduce the prevalence of SARS-CoV-2 and other bacteria or viruses. Furthermore, the incorporation of UV-C into HVAC systems has been shown to have energy-efficiency benefits, particularly for cooling coils.

UV solutions have been used for air disinfection safely for over a hundred years and are designed to protect students and staff from any adverse effects while effectively reducing pathogens, including SARS-CoV-2. As ESSER III funds can be used for upgrade projects to improve air quality, schools can invest in UVGI systems for in-room, upper-air, and/or in-duct disinfection to help combat airborne transmission of pathogens.
UV Disinfection for Surfaces

While much of the recent attention has been given to the air transmission of SARS-CoV-2, surface disinfection is still a critical component of a multi-layered prevention strategy as the virus may be spread by contaminated surfaces. One of the most confusing points of guidance is when and how often to disinfect your spaces. According to the CDC, “in situations when there has been a suspected or confirmed case of COVID-19 indoors within the last 24 hours, the presence of infectious virus on surfaces is more likely and therefore high-touch surfaces should be disinfected.”

Given that we may or may not know if someone infected with SARS-CoV-2 has been in the space, would it not be more prudent to plan for daily disinfection? However, chemical disinfection poses great risks to staff for ongoing exposure to toxic chemicals, as well as expenses from both ongoing chemical costs and labor. The National Council on School Facilities suggests in their reopening plans that schools budget $6500 per each incidence of needing to deep clean a site.

According to the CDC, “in most cases, fogging, fumigation, and wide-area or electrostatic spraying is not recommended as a primary method of surface disinfection and has several safety risks to consider.”

However, the CDC has published numerous studies supporting the effectiveness of UV disinfection devices to combat pathogens, such as C. diff and VRE, both of which are causes of health-care associated infections in hospitals.

UV disinfection products, like those from Violet Defense, have been independently validated by both third-party labs and university lab to be effective at killing up to 99.9% of SARS-CoV-2 on a variety of surfaces, as well as in the air.

Furthermore, these products can be installed for fully autonomous disinfection, making it both easy and affordable (i.e. no ongoing labor expenses or maintenance costs) to disinfect classrooms, locker rooms, nurse’s clinics, and more every day. With the opportunity to utilize ESSER III funds for such products, this is an opportunity to install products that will be able to protect spaces against SARS-CoV-2, as well as prepare schools for the next threat, whether it be annual flu season or the next pandemic.
Sanitizing Critical Equipment

Another aspect of cleaning and maintaining healthy facilities is addressing disinfection of specific types of equipment, including electronics such as tablets, touch screens, and keyboards. These objects may be difficult to disinfect without risking damage to these expensive items that cannot be sprayed down with most chemical disinfectants.

The CDC guidance includes “It may be necessary to use more than one wipe to keep the surface wet for the stated length of contact time. Make sure that the electronics can withstand the use of liquids for cleaning and disinfecting.” This translates to significant operational challenges. The alternative may be that these high-touch surfaces are not being disinfected.

Ultraviolet light offers a safe alternative for electronics as the UV light, specifically, pulsed Xenon UV disinfection lighting can effectively disinfect the objects without damaging them. Long-term exposure to certain types of ultraviolet lighting systems (i.e. continuous mercury-based bulbs) may cause degradation to certain types of materials. However, pulsed Xenon UV (PX-UV) disinfection systems deploy light differently as they flash intermittently instead of continuous operation.

Multiple studies have shown that degradation did not occur to materials exposed to pulsed Xenon UV disinfection systems. “Five-year materials damage testing has not indicated that PX-UV causes any kind of damage to materials in hospital settings.”

The UV Decon lockers and cases by Violet Defense leverage pulsed Xenon UV lighting to offer powerful disinfection without the risk of degradation in as little as 5 minutes.

UV Sports Decon system from Violet Defense that sanitizes balls, electronics, and other equipment in 5 minutes.
Frontline Protocols

Custodial and janitorial staff were already essential to the daily operations of schools across the country, but with COVID-19, their importance became that much greater. They became frontline workers helping to protect students and staff and were the first line of defense to disinfect areas where any persons infected with COVID-19 had been on campus.

However, this also meant the risks for janitors and custodians in contracting COVID-19 themselves were also greater. “For janitors in hospitals and schools, and office buildings, these are often the invisible front-line workforce in the fight against COVID-19 transmission, but they also happen to be the lowest paid and often represent people with racial minority groups that are underrepresented in the country, and so they are particularly vulnerable to having challenges for how many days of leave they can take for being sick,” said Kelly Baker, faculty member in the University of Iowa College of Public Health department of occupational and environmental health.

To provide these staff with additional peace of mind, UV disinfection can provide a touchless way to disinfect a space that is known to have had an infected student or staff member. Whether utilizing installed UV solutions that could be remotely activated or mobile solutions that could be quickly and easily rolled into a space and simply powered on, schools can ensure their spaces are being disinfected to protect against SARS-CoV-2, and can do it in a way that lessens the risk for their staff.

Nurses are another great example in schools where they are consistently exposed to bacteria and viruses that risk their health and wellness. In several clinics across the country, schools have installed pulsed Xenon UV disinfection systems from Violet Defense to provide an extra layer of protection in nurse’s clinics. These units automatically disinfect each evening, but can also be controlled by the nurses via remote control to activate additional disinfection cycles on demand.

Conclusion

UV disinfection can be an effective tool for both surface and air disinfection, particularly when used as an enhancement to traditional cleaning methods. These units can provide a long-term strategy to maintain the high levels of disinfection desired during the COVID-19 pandemic, without setting them up for having to contract out deep cleans with very expensive price tags or dramatically increased ongoing labor or chemical expenses. The ESSER III funds provide an opportunity to invest in an infrastructure to support cleaning and maintaining healthy facilities as we re-open fully to face-to-face instruction and beyond.
References


About Violet Defense

Violet Defense uses UV disinfection to protect everyday spaces from harmful pathogens by killing up to 99.9% of SARS-CoV-2, E. coli, Salmonella, MRSA, C. diff., Norovirus, and coronavirus. Violet Defense’s technology is the only known Pulsed Xenon solution that can be installed into a room full-time, creating a continuous way to address disinfection needs of all types of settings.

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