Smart, Healthy Buildings

A New Approach to Sustainability & Green Cleaning

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Introduction

Sustainability has varying meanings to people depending on the lens through which they view it, whether it be social, economic, or environmental. In terms of the environment, sustainability is "a state in which the demands placed on the environment can be met without reducing its capacity to allow all people to live well, now and in the future."[1]

However, to keep our everyday spaces clean, we are often risking both harm to the environment, as well as the people in them. Cleaning chemicals are often toxic and pose a threat to custodial workers and building occupants, indoor air quality, and the environment.

This white paper lays out the challenges of traditional chemical disinfectants and how advancements in UV disinfection technology will change the way we think about protecting our environment.

The Health Impacts of Chemicals

"The effects of 10-20 years of cleaning can be as damaging as smoking a pack of cigarettes a day for the same amount of time."

Hallie Detrick, Fortune Magazine on the findings from the European Community Respiratory Health Survey

Several studies have shown that chemical disinfectants pose significant health risks to those using them and can even potentially contribute to microbial resistance. In 2016, the U.S. Food and Drug Administration issued its final ruling related to over-the-counter consumer antiseptic wash products containing certain active ingredients.[2]

The ruling stated that manufacturers were unable to demonstrate that their ingredients were safe for long-term daily use, nor that they were more effective than plain soap and water in preventing illness and the spread of certain infections.[2]

The agency issued the ban after reviewing data that suggested that exposure to certain ingredients, including triclosan and triclocarban could pose health risks in humans, such as bacterial resistance and hormonal effects. The ban required these products to be pulled from the market.[2]

Additional studies have also shown that common cleaning products, such as bleach, glass cleaner, and detergents can trigger asthma or other respiratory symptoms. The associated reduction in lung function can last into the next day.[3]

More recent studies have investigated the impact of long-term exposure to cleaning chemicals. In a study by the European Community Respiratory Health Survey, 6,230 participants across 22 locations around the world were followed to determine the long-term effects of using cleaning products. The study found that women who used sprays or other cleaning agents at least once a week experienced significant decline in measures of lung function.[4] In comparison, the decrease in lung function over 10-20 years of exposure to cleaning products was equivalent to smoking a pack of cigarettes a day for that same period of time.[5]

The Environmental Threat

In addition to the danger cleaning products present to humans, they also have potential to harm the environment in a number of ways. Cleaning products frequently contain volatile organic compounds (VOC) that can threaten the quality of air indoors, and increase outdoor pollution, such as contributing to smog formation.[6]

Furthermore, when chemicals are released into the environment, either through evaporation of harmful compounds or rinsing residual product down the drain, the waste water may or may not be treated adequately to prevent adverse effects on water quality and/or aquatic species in waters receiving the waste.[6]

Even the packaging of certain products may be dangerous to the environment. Aerosol cans contain propellant gas, frequently chlorofluorocarbons, which have been proven hazardous to the ozone layer.[7] One-time use materials, such as wipes or paper towels are conducive to overuse and generating excess waste.

Numerous agencies have taken on the task of helping consumers, custodial workers, and facility managers find products that can help reduce the impact on the environment and lower risk to users or building occupants. However, there are limitations to the ability to "go green" and still achieve the disinfection standards needed in certain environments.

Green Seal, a non-profit that has developed a set of standards for a more sustainable world, aims to reduce the environmental, health, and social impacts "to the extent technologically and economically feasible."[8] Antimicrobial products endorsed by Design for the Environment, the US EPA program, means they are in the "least hazardous classes of EPA's acute toxicity category hierarchy."[9] While these guidelines help make more informed choices, they raise concerns that the available options may be limited due to technology constraints or being only the "least hazardous" solution available.

Given the challenges with traditional chemicals and difficulty in finding effective, yet sustainable products to disinfect spaces, a new strategy is warranted.

Benefits of UV Disinfection

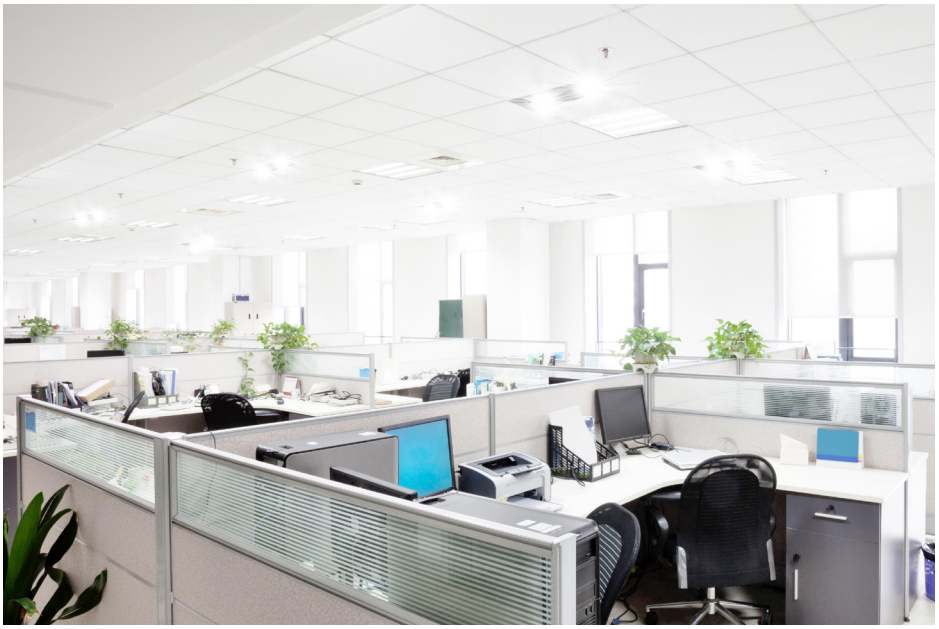
While not a "new" disinfecting technology, UV light has rapidly been growing in use in hospital settings as it is a proven disinfectant for surfaces, instruments, and air. With over 140 years of research behind it, UV light has been proven effective at killing bacteria, viruses, mold, and fungi.

Ultraviolet light attacks microorganisms at the DNA and RNA level. Microbes are not able to develop resistance to ultraviolet light, compared to their ability to form resistance to certain types of chemical disinfectants.

Ultraviolet light has been repeatedly proven effective against pathogens, including C. *diff*, MRSA, E. *coli*, Salmonella, Norovirus, and many more. The ability of UV light to kill microorganisms is directly related to the energy dosage produced by the UV source as a function of spectrum, time and distance to the target.

Another potential benefit is the ability to reduce the labor and/or cost of chemical cleaning. A study using pulsed UV for routine once-daily disinfection of hospital surfaces cut the number of housekeeping hours required in half, compared to using alcohol wipes in manual cleaning.[10]

In certain settings, such as hospitals, the combination of UV light with chemical disinfectants may still be warranted. For example, researchers at Duke University and the UNC Schools of Medicine found an additional 94% reduction in



epidemiological-important pathogens, and a subsequent 35% reduction in healthcare-associated infections, when UV was added to the standard use of quaternary compound disinfectants.[11]

However, most of our everyday spaces, such as offices, schools, athletic facilities, and hotels, could use reusable cleaning cloths or microfiber technology in combination with good old-fashioned soap and water to remove dirt, grime, and residue from spaces and leave the disinfection to UV light. This would create a sustainable method for sanitizing and disinfection spaces to protect people from harmful germs without exposing them to toxic chemicals.

Furthermore, UV disinfection systems like those from Violet Defense are also energy-efficient. Compared to bulky and expensive UV disinfection "robots" that have been used in hospitals which require large amounts of electricity to operate, Violet Defense's units all run off of a standard 110V outlet and draw at most 7 amps.

Conclusion

Ultraviolet light has an extensive history of effectively killing microbes in the air and on surfaces, which has been proven to reduce the infection rates of MRSA, C. *diff*, VRE and other harmful pathogens.

As a result of the miniaturization of this technology, it is now possible to deploy UV disinfectant technology in dramatically more settings than ever before, thereby creating cost-effective deployments to fight off harmful germs, particularly when used in combination with existing cleaning protocols.

With its proven results and chemical-free method of disinfection, ultraviolet light provides a sustainable, effective way to keep our spaces safe from harmful germs, while still protecting our environment.

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