

DISINFECTION IN A FLASH

The Power of UV Disinfection in Restaurants and Food Service



TABLE OF CONTENTS

Introduction	3
Impact of Foodborne Illnesses	4
Strategies for Preventing Outbreaks	5
Benefits of UV Disinfection	7
Conclusion	8
References	9
About PURO Lighting and Violet Defense Technology	10

Introduction

Each year, millions of people acquire foodborne illnesses from bacteria and viruses, including in restaurants, catering or banquet facilities, private residences, schools and daycare, health care facilities, and other locations.

These illnesses come at a great cost from both the impact on people's lives, but also the detrimental effect they can have on the businesses themselves. Preventing these unnecessary illnesses will require a comprehensive approach to better food safety, including improved practices for environmental disinfection.

This white paper, written by PURO Lighting's technology partner Violet Defense, lays out the challenges that restaurants and other food service establishments face in keeping their facilities safe from harmful germs, including pathogens associated with the COVID-19 outbreak, and how advancements in UV disinfection technology will change the way they think about protecting these environments.

Impact of Foodborne Illnesses

It's estimated that 1 in 10 people fall ill to foodborne diseases each year. Globally, there are an estimated 600 million foodborne illnesses each year, with 420,000 deaths attributed to these illnesses.¹

These estimates probably don't even fully account for all of the illnesses caused, as many people may not seek treatment. According to CDC estimates, only 1 out of 29 people who get sick from a typical salmonella outbreak will be diagnosed.²

"Foodborne illnesses for Salmonella cases are estimated to cost \$3.3 billion, including medical costs, time lost from work and cost of premature death."

USDA Economic Research Service

As more and better tools to track outbreaks are developed, the prevalence of outbreaks has risen. FDA-regulated food recalls have more than doubled in the past decade.

The pathogens of concern in these types of outbreaks and recalls include bacterial pathogens, such as *Campylobacter*, *Escherichia coli* (*E. coli*), and *Salmonella*, and viral pathogens, such as Norovirus.

Each of these pathogens may cause acute diarrhea along with other types of illnesses. They have high infectivity with infections associated with consumption of contaminated food.

According to the World Health Organization, diarrheal diseases are the most common type that result from unsafe food — making up $\frac{1}{2}$ of the global cases of foodborne illnesses. These illnesses can be especially dangerous for children under age 5, who account for almost $\frac{1}{3}$ of deaths from foodborne illnesses.¹

While the sheer number of illnesses are cause for alarm, there is also a large economic impact to these cases. Accounting for medical costs, time lost from work, and the cost of premature death, the USDA has estimated that *Salmonella* cases cost \$3.3 billion, Norovirus cases cost \$2.2 billion, and *E. coli* O157 cases cost \$271 million.³

However, the impact of foodborne illnesses does not stop at the number of people infected or those subsequent costs. Outbreaks of foodborne illnesses can have a devastating effect on businesses themselves.

Issues caused by bacteria and viruses have resulted in numerous impacts on the food industry, ranging from recalls, lost sales, damage to reputation, and closings.

A study conducted by the Grocery Manufacturers Association of three dozen international companies revealed that more than half had a recall issue

and 23% suffered financial impact greater than \$30 million.⁴

Another issue faced by restaurants and other food service industries is the risk of long-term reputational damage due to recalls or illness outbreaks. Between social media and dedicated websites for reporting foodborne illnesses, it is critical to minimize your risk of outbreaks and the potential negative consequences to your brand.

Some brands that have suffered numerous outbreaks have never fully recovered from the damage that was done to their reputation and the negative media coverage. Chipotle, a restaurant chain that has been plagued by numerous foodborne outbreaks, took around a 30% hit to their sales and a major hit to their stock prices.⁵ Outbreaks can also result in expensive lawsuits and legal fees and higher insurance premiums. Jack in the Box, the source of a massive *E. coli* outbreak in the early 1990s, which caused over 600 people to become ill, paid out over \$50 million in settlements.⁶

While it is alone a tremendous responsibility to keep customers safe from the potential harmful effects of germs, it is also a critical step to identify tools and strategies that will help minimize the risk of spreading these bacteria and viruses to protect your business.

Restaurants and other food service industries face the risk of long-term reputational damage due to recalls or illness outbreaks.



Strategies for Preventing Outbreaks

There are multiple causes of outbreaks for foodborne illnesses, ranging from improper preparation or storage of food, contaminated meat or produce, or lack of effective environmental or personal hygiene practices that can lead to cross-contamination. Therefore, to prevent these types of outbreaks requires a multi-pronged approach to address the various potential causes.

PROPER HANDWASHING

According to the CDC, a large percentage of foodborne disease outbreaks are spread by contaminated hands. Microorganisms are carried on hands, cloths, utensils, and cutting boards — making it easy to transfer them to food. Staff should wash hands before handling food and often during food preparation. Do not touch food with bare hands.⁷

RINSE FRUITS & VEGETABLES

From 2004-2008, 127 foodborne illness outbreaks were associated with leafy greens. Fruits and vegetables may become contaminated with bacterial or viral pathogens prior arriving at restaurants or due to improper handling by workers during preparation.⁸ Carefully rinse fruits and vegetables before preparing and serving them.

COOKING & STORAGE SAFETY⁹

Proper cooking can take care of most dangerous pathogens. Pay special attention to foods, such as meat, poultry, eggs, and seafood. Foods such as soups and stews should be brought to boiling to make sure they have reached 70°C.

According to the CDC, a large percentage of foodborne disease outbreaks are spread by contaminated hands.



Keep cooked food hot (more than 60°C/140°F) prior to serving. Once cooked, do not leave the food at room temperature for more than 2 hours.

WASH & SANITIZE SURFACES AND EQUIPMENT

While many illnesses may be caused by sick workers contaminating food they are preparing, many also come from improper food preparation and lack of environmental hygiene. In the state of Florida alone, there were over 65,000 food safety violations in 2016-2017 due to food-contact surfaces not being properly cleaned and sanitized in restaurants.¹⁰



Frequently touched objects and kitchen surfaces should be regularly cleaned and sanitized.

Frequently touched objects and kitchen surfaces should be regularly cleaned and sanitized. Hot, soapy water is recommended for most surfaces and tools, but commercial disinfectant may be needed depending on the situation.

It is also recommended that commonly touched items, such as refrigerator handles or cabinet knobs or pulls, are also regularly sanitized. In 2016-2017, there were over 44,000 violations in Florida food service establishments alone related to non-food contact surfaces being cleaned.¹⁰

Studies have found that staff often end up spreading germs around instead of actually removing them from surfaces. Health Protection Agency researchers conducted a study, which reported that 56% of cleaning cloths contained unacceptable levels of bacteria, including *E. coli* and *Listeria*.¹¹ It's important that cloths, sponges, and mops be changed frequently enough to avoid spreading germs from one location to the next.

Given the difficulty in ensuring all surfaces have been cleaned properly or that specific areas may not be regularly sanitized, adding an additional layer of protection with enhanced disinfection systems, including ultraviolet light, can help minimize the risk of foodborne illnesses.

Benefits of UV Disinfection



Advancements in the technology have made it more viable and cost-effective to deploy UV in everyday spaces.

Enhanced disinfection methods, particularly automated decontamination devices, such as UV disinfection systems can help overcome the potential health risks associated with toxic chemicals, as well as the inability to consistently achieve the necessary disinfection levels.

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, coronaviruses 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.

UV light, particularly UV-C, has also been shown to have great benefits when combined with other cleaning methods for optimal results. Researchers at Duke University and the UNC Schools of Medicine found an additional 94% reduction in epidemiological-important pathogens when UV was added to the standard use of quaternary compound disinfectants.¹⁵

In spaces where one must be careful about the use of chemicals, UV provides a great alternative to ensure the level of disinfection needed is achieved, without risking chemicals making their way into food products.

Conclusion

Ultraviolet light has an extensive history of effectively killing up to 99.9% of bacteria and viruses, including *E. coli*, Salmonella, Noroviruses, and other harmful pathogens that cause foodborne illnesses.

As a result of the miniaturization of this technology deployment, it is now possible to incorporate UV disinfection into 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.

Given the increased risk that food service establishments face for foodborne illnesses, ultraviolet light should be incorporated into the standard cleaning protocols of restaurants, catering or banquet facilities, and other settings with commercial kitchens as an added insurance against these harmful pathogens.

References

1. World Health Organization. (2015). WHO estimates of the global burden of foodborne diseases. Foodborne Disease Burden Epidemiology Reference Group (2007-2015).
2. Information for Healthcare Professionals. Centers for Disease Control and Prevention. <https://www.cdc.gov/foodsafety/groups/healthcare-professionals.html>.
3. United States Department of Agriculture, Economic Research Service. (2014). USDA ERS - Cost Estimates of Foodborne Illnesses. (2014). Retrieved from <https://www.ers.usda.gov/data-products/cost-estimates-of-foodborne-illnesses/>
4. Kowitt, B. (2016). Why Our Food Keeps Making Us Sick. Retrieved from <http://fortune.com/food-contamination/>
5. Wang, C. (2016). Chipotle shares slide after first ever loss on surprisingly steep sales decline. Retrieved from <https://www.cnbc.com/2016/04/27/shares-of-chipotle-slide-on-loss-sharp-sales-decline.html>
6. Jack in the Box E. coli Outbreak | E. coli Food Poisoning. Retrieved from https://about-ecoli.com/ecoli_outbreaks/jack-in-the-box-e-coli-outbreak
7. CDC VitalSigns - Preventing Norovirus Outbreaks. (2014). Retrieved from <https://www.cdc.gov/vitalsigns/norovirus/index.html>
8. Coleman, E., Delea, K., Everstine, K., Reimann, D., & Ripley, D. (2013). Handling Practices of Fresh Leafy Greens in Restaurants: Receiving and Training. Journal Of Food Protection, 76(12), 2126-2131. doi:10.4315/0362-028x.jfp-13-127
9. Five keys to safer food manual. (2006). Retrieved from <https://www.who.int/foodsafety/publications/5keysmanual/en/>
10. Florida Department of Business & Professional Regulation. (2017). Division of Hotels and Restaurants Annual Report: 2016-2017 [Ebook]. Retrieved from http://www.myfloridalicense.com/dbpr/hr/reports/annualreports/documents/ar2016_17.pdf
11. Boseley, S. (2010). Restaurant cleaning cloths pose health risk, says study. Retrieved from <https://www.theguardian.com/society/2010/sep/15/restaurant-cleaning-cloths-health-risk>
12. Rutala, William, et al. "Microbial Load on Environmental Surfaces: The Relationship Between Reduced Environmental Contamination and Reduction of Healthcare-Associated Infections." Open Forum Infectious Diseases, vol. 3, no. suppl_1, 2016, doi:10.1093/ofid/ofw172.128.

ABOUT PURO UV DISINFECTION LIGHTING

Launched in 2019 in Lakewood, Colorado, PURO™ Lighting products, powered by Violet Defense™ technology, have set out to take proven UV light disinfection technology to the next level by making it more powerful, more affordable and most importantly, smaller and easier to utilize. PURO Lighting products can rapidly disinfect any room of any size and at any time using the proprietary miniaturized, pulsed Xenon Light Engine System. Our high intensity broad-spectrum UV disinfection units rapidly kill up to 99.9% of viruses and bacteria and can significantly reduce the growth of fungi such as yeasts and molds. All in remarkably small, yet powerful fixed or mobile units designed for any sized space. For more information, visit www.purolighting.com.

ABOUT VIOLET DEFENSE

Founded in 2012, Violet Defense is on a journey to find new ways to protect people from harmful germs that have grown resistant to traditional forms of cleaning and disinfecting. Its patented technology is the only known Pulsed Xenon UV solution that can be installed into a room full-time, creating continuous way to address disinfection needs of all types of settings, including healthcare and non-healthcare alike. Designed to bring hospital-grade disinfection to everyday spaces, Violet Defense has cost-effective solutions to kill up to 99.9% of bacteria and viruses, including *E. coli*, Salmonella, MRSA, Norovirus and *C. diff*. For more information, visit www.violetdefense.com.



Contact Information for PURO Lighting
sales@purolighting.com
12340 W Cedar Dr, Lakewood CO 80228
(877) 452-8785