

# Ultraviolet (UV) Sterilization Wands

## Overview

The COVID-19 pandemic has brought forth an incredible amount of challenges to reduce the spread of the virus. UV light has been one of the solutions as it has been used for decades to deactivate viruses by destroying their protein covering. However, there are severe limitations to this process that must be taken into account to assure complete deactivation of the virus and human health and safety.

## Classifications

UV is a type of non-ionizing radiation which is broken into three bands: UV-A, UV-B, and UV-C. UV-C has proven to be effective in deactivating viruses, however research into UV-C and COVID-19 has been limited. There has been evidence UV-B can be effective against SARS viruses (the family COVID is part of) but no direct study on COVID-19. UV-B is historically much less effective than UV-C. UV-A is 1000 times less effective than UV-C for sterilization and should not be used for this purpose.

## Health Hazards

All UV bands have hazards associated with them to eye and skin. UV-A and UV-B can harm the lens of the eye and create cataracts. UV-B and UV-C can cause corneal injuries and photokeratitis (snow blindness). Exposure over time can lead to erythema of the skin (burns) and chronic exposure can lead to skin cancer. With these health effects in mind UV light should not be exposed to eyes or skin.



## Limitations

UV-C can easily be blocked by uneven surfaces, dust, dirt, or trace fluids. Any UV disinfection can only succeed on hard/non-porous material which is free from contaminants and debris

UV lights/wands sold for homes are low power and would take a substantially longer time to completely inactivate viruses than an FDA approved medical grade device.

UV lights can create secondary hazards such as ozone which is a criteria air pollutant defined by the EPA and can irritate the respiratory system. It can also lead to faster degradation of materials such as plastics and fabric. UV lights also contain small amounts of mercury which if broken can escape into the environment.

Overall effectiveness of home use wands is unknown. Studies have not shown any effectiveness of these products. Most have not gone through any verification process by the FDA and can not prove they produce any results. FDA approved medical grade UV sterilization equipment is rigorously tested and verified as Class II devices under 21 CFR 880.6600. These devices still require surfaces to be thoroughly cleaned before UV sterilization.

Different lamps can produce distinct wavelengths in the UV spectrum (eg. 222nm v. 254nm) and these small differences can vastly change their abilities. LED's are becoming more common which have the advantage of not containing mercury but the LED's cover a smaller area and have a greater directionality which hinders effectiveness.

It is **STRONGLY** advised unless the UV device has an FDA approval, with full spec sheet, not to use it for purposes of destroying the COVID-19 (or any) virus as no studies show these to be effective while taking into account their well-documented human and environmental health hazards.

## For more information or questions:

UMass-Lowell Radiation Safety Office  
Room: Pinanski 103  
Phone: 978-934-3372  
Email: [Radiation\\_safety@uml.edu](mailto:Radiation_safety@uml.edu)