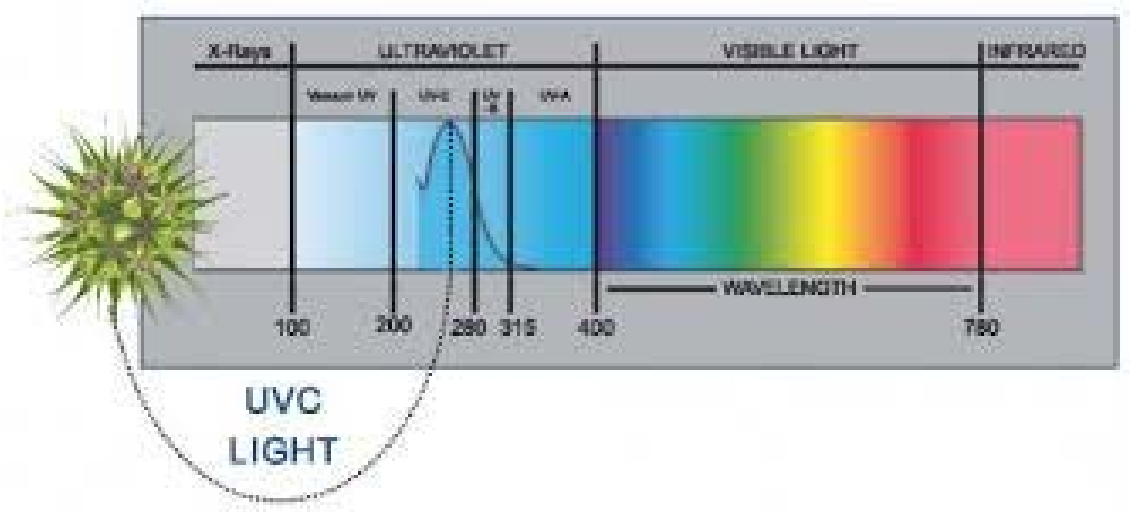
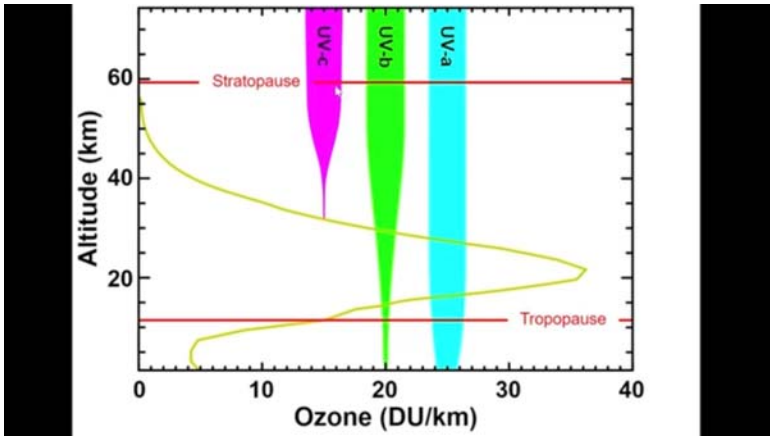
COVID-19 or Influenza Susceptibility To UV Light …..The UV-C Issue



Laboratory scientists use UV light (UV-C, vs UV-A and UV-B) to sterilize the interior of hoods (covered lab work sites) by continuous UV-C (wavelengths 200 -280 nm) lamps which turn off with operator use. When not in use the UV light is operational. Hospitals may use overhead UV-C lamps, as well, but these lamps are also not "on" during foot traffic. The UV-C lamp output is the critical measure and typically hand held UV-C lamps people are buying to pass over their tables and what not are not powerful enough, nor held over an area long enough (several minutes at the appropriate power). Those do not have the output energy nor the time duration via hand waving over surfaces to actually do significant viral reduction. The UV-C is also humidity dependent where lower humidity is greater in reducing viable virus.

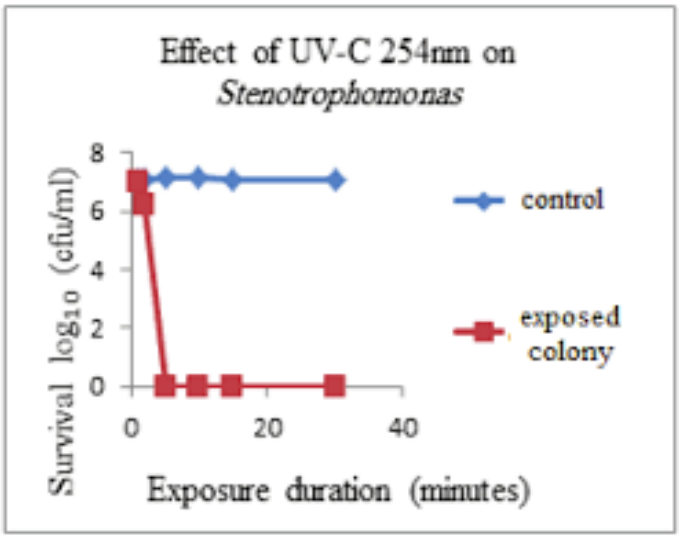
The penetration of the atmosphere by the three categories of UV light showing UV-C does not get through the ozone layer at all. But, use of a UV-C lamp at 220 nm will experience light scatter (loss of energy ➔ higher wavelength) and produce UB-B and UV-A and the visible blue light at the edge of our vision sensitivity. It is the scatter to UV-B where the danger lurks.



It is clear that UV-C does not make it to the Earth's surface due to ozone absorption.

Protection from UV-light is done by sunscreen chemistry. The table below describes the wavelengths and suggested protections.

UV category	Wavelength range	Effects	Protection
UV-A	320–400 nm	Tanning Premature skin aging Skin cancer	Avobenzone (Parsol 1789) Ecamsul (Mexoryl) Zinc oxide
UV-B	290–320 nm	Vitamin D production Sunburn Cataracts Genetic damage Skin cancer	Oxybenzone Homosalate Octinoxate Octisalate Titanium dioxide
UV-C	100–290 nm	Cellular decomposition	Ozone in lower stratosphere



Effect of UV-C exposure on this bacterial colony growth From: https://aip.scitation.org/doi/abs/10.1063/1.5048178

Evidence is clear that UV-C can serve as a sterilant but the safety is a concern, especially UV-C to UV-B scatter. In a home environment with furniture and rugs and shadows from the lamps, is not a practical solution for viral reduction in the environment. The UV-C wavelengths will destroy the fabrics and other surfaces (not stainless steel like in a hood) over time.

https://www.bbc.com/future/article/20200327-can-you-kill-coronavirus-with-uv-light

Also, an article by McDevitt, et al., is a technical report UV light (UV-C specifically) is fine on the facemasks - on the side exposed to the light but will destroy them over time. It is not to sterilize but to reduce viral copies as the light does not shine on every corner/crevice and deep into the fabric. The more prudent option is disposable PPE ....shortages in PPE seen in the news lately, however, causes significant risk taking and we are seeing medical personnel infected with COVID-19, unfortunately.

A 2012 article of interest can be obtained at:
https://www.researchgate.net/publication/221730864_Aerosol_Susceptibility_of_Influenza_Virus_to_UV-C_Light

Aerosol Susceptibility of Influenza Virus to UV-C Light

James J. McDevitt, Stephen N. Rudnick, and Lewis J. Radonovich

February 2012; Applied and Environmental Microbiology 78(6):1666-9

ABSTRACT: The person-to-person transmission of influenza virus, especially in the event of a pandemic caused by a highly virulent strain of influenza, such as H5N1 avian influenza, is of great concern due to widespread mortality and morbidity. The consequences of seasonal influenza are also substantial. Because airborne transmission appears to play a role in the spread of influenza, public health interventions should focus on preventing or interrupting this process. Air disinfection via upper-room 254-nm germicidal UV (UV-C) light in public buildings may be able to reduce influenza transmission via the airborne route. We characterized the susceptibility of influenza A virus (H1N1, PR-8) aerosols to UV-C light using a benchtop chamber equipped with a UVC exposure window. We evaluated virus susceptibility to UV-C doses ranging from 4 to 12 J/m2 at three relative humidity levels (25, 50, and 75%). Our data show that the Z values (susceptibility factors) were higher (more susceptible) to UV-C than what has been reported previously. Furthermore, dose-response plots showed that influenza virus susceptibility increases with decreasing relative humidity. This work provides an essential scientific basis for designing and utilizing effective upper-room UV-C light installations for the prevention of the airborne transmission of influenza by characterizing its susceptibility to UV-C.

“UVC is really nasty stuff – you shouldn't be exposed to it,” says Arnold. “It can take hours to get sunburn from UVB, but with UVC it takes seconds. If your eyes are exposed… you know that gritty feeling you get if you look at the sun? It’s like that times 10, just after a few seconds.”

To use UVC safely, you need specialist equipment and training. The World Health Organization (WHO) has issued a stern warning against people using UV light to sterilize their hands or any other part of their skin.