I THINK I MAY HAVE ANSWERED SOME OF MY QUESTIONS ABOUT ULTRAVIOLET LIGHTS IN BIOSAFETY CABINETS?

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INTRODUCTION

Researchers have used of ultraviolet (UV) lights in biological safety cabinets (BSC's) for a very long time. The use of UV light is one of several methods researchers use to disinfect the inside of their BSC's. However, the current version of the NSF International Standard 49 dismisses the use of UV in BSC's. The current standard states that the use of UV lights in BSC's is not recommended. The CDC and NIH, in their joint pamphlet "Primary Containment for Biohazards: Selection, Installation, and Use of Biological Safety Cabinets" (currently Appendix A in the 5th Edition of the Biosafety in Microbiological and Biomedical Laboratories) agrees stating "…are not recommended nor are they necessary." A disconnect between researchers, manufacturers, and health and safety professionals exist. A more scientific risk/benefit analysis needs to take place in order to prove or disprove the effectiveness and safety of UV lights in BSC's.

Fixed Sash

Integrated Sash

OBJECTIVES

This study seeks to find how prevalent UV lamps are in BSC's on Legacy UMDNJ campuses, whether the sash fixed or moveable, is the sash integrated with the ultraviolet bulb, and how many ultraviolet lights meet the minimum irradiance in a BSC of 40 microwatts per square centimeter as outlined in the above referenced CDC/NIH publication. This study also seeks to find out whether it is safe to be in a room when a UV light is on in a BSC. This will be determined by taking readings at 0, 20, 40, 60, 80, and 100 centimeters (cm) from the face of a BSC while the UV lamp is on.

MATERIAL AND METHODS

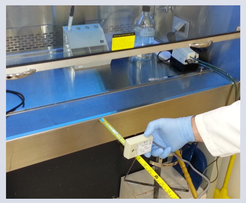
Ninety-six (96) readily available BSC's on the Stratford, Camden, New Brunswick, Piscataway, and Newark campuses of Legacy UMDNJ were used in this study. The following questions were answered for each of the BSC's:

1. Is a UV light present
2. Is the sash fixed or moveable
3. Is the sash integrated with the UV light
4. What is the location of the UV light
5. Was the UV light on at the time of the visit

A calibrated UV photometer [UVP UVX Radiometer, with a 254 nm probe [UVX-25] was used to capture UVC wavelengths [290 – 200 nm]. The optimal wavelength for disinfection purposes resides in the UVC range of 254.6 nm.

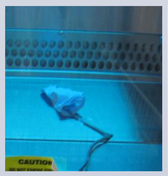
The specifications for UV lamp testing, outlined in NSF/ANSI 49-2007, Annex F, were used to test the radiation output of the UV light.

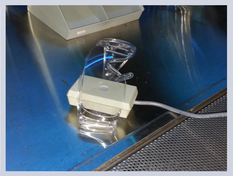
Measurements were taken inside of the BSC in the middle of the work area.

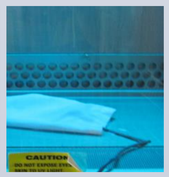


Measurements were also taken outside of the BSC are various distances from the sash. Measurements were taken at 0, 20, 40, 60, 80, and 100 cm away from an opened sash.

Since the use of personnel protective equipment is required when working at a biosafety cabinet, radiation output measurements were also taken behind ANSI approved safety glasses, inside a nitrile glove, and in the sleeve of a cotton laboratory coat.

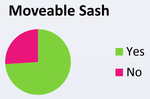






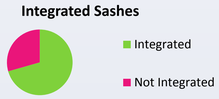
RESULTS

68 of the 93 (73%) BSC's involved in this study had UV lights present.



69 of the 93 (74%) BSC's had a moveable sashes.

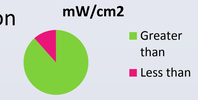
Of the 68 BSC's with UV lights present, 48 had integrated sashes (71%)



ALL of the UV lights were mounted on the back wall

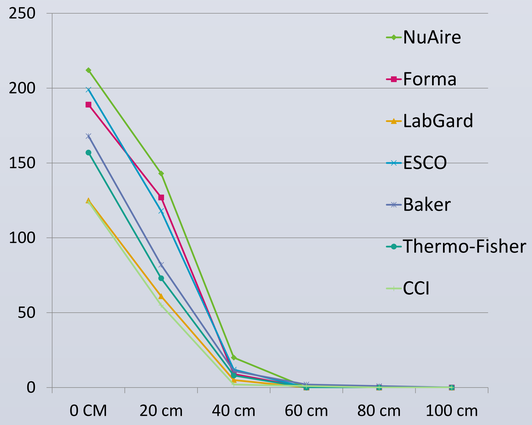
29 of the 68 (43%) BSC's UV light were on at the time of visit

61 of the 68 BSC's produced radiation output greater than 40 microwatts per square centimeters



Seven (7) different biosafety cabinets were measured for radiation out put at 0 cm, 20 cm, 40 cm, 60 cm, 80 cm, and 100 cm from the open sash.

Significant radiation output was noted at 20 cm for most BSC's, however a significant drop in radiation output was noted at 40 microwatts per square centimeter.



Measurements behind ANSI approved safety glasses, inside a nitrile/latex glove, and in the sleeve of a cotton l laboratory coat reduced the radiation output to background.

CONCLUSIONS

1. UV lights are prevalent in BSC's observed on the Legacy UMDNJ campuses.
2. A majority of the UV lights meet the minimum irradiance in a BSC of 40 microwatts per square centimeter.
3. Most individuals in the laboratory stated that they use various chemical disinfectants along with UV lights.
4. Most BSC's are only tested once a year during the certification process, since UV photometers are not readily available to researchers, BSO's, and facility managers.
5. Working in a laboratory with a BSC utilizing a UV light is not as dangerous as what is published. The irradiance of UV drastically diminishes as one moves away from the face of an open sash.
6. A large percentage of the BSC's had integrated (interlocked) sashes.
7. No BSC's tested had timers associated with the UV light. Requesting manufacturer's to install or retrofit BSC with timers associated with the UV light would not only allow adequate time for disinfection, but also, minimize the potential for overexposure to UV wavelengths.
8. The next edition of the Biosafety in Microbiological and Biomedical Laboratories needs to include updated information on the use of UV bulbs in BSC's to reflect current safety data.

We need to get away from the days of "UV lights are not recommended nor are they necessary"! UV lights, with the appropriate safety devices in place (interlocks and timers) are beneficial when used properly.

Note – a. there is still a risk and individuals have to be made aware of them, and b. no one should ever work inside of a BSC with the UV light on.

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