NuAire is a manufacturer of everyday use Laboratory Equipment with over 100,000 Biological Safety Cabinets located worldwide.

Ultraviolet lights are not always necessary but can be found in over 80% of NuAire Biosafety Cabinets sold. UV lights can be useful as an added defense against contamination and to maintain work-zone sterility in addition to your routine cleaning sequence.

If you do know what your facilities’ standard operating procedure (SOP) in regards to UV usage please check with your Environmental Health and Safety Department or Biosafety Officer to confirm your SOP about operating a Biological Safety Cabinet.

**HISTORY**

Soon after the discovery of microorganisms, biologists began to observe that many varieties of these creatures were able to be incapacitated by exposure to sunlight. Following the discovery of the ultraviolet bandwidth in 1801, scientists attributed the sun’s lethal effect to this invisible energy. Facilitated by the findings of a large body of experimental evidence collected in the decades following these initial hypotheses, contemporary scientists have determined that nearly all bacterial activity can be eradicated or at least attenuated by some wavelength of ultraviolet energy. Due to the overwhelming diversity of microorganisms present in the environment, the resistively and rate of lyses of each species varies greatly. Generally bacteria sterilization when compared to those species whose domain is general exposure was discontinued around the early 1900’s due to the development of sterilization technology utilizing chlorination and ozonation. However, there has been a general trend in industry during the last few decades towards the use of UV for germicidal purification due to its lack of toxic chemical by products.

**PHOTOCHEMICAL BACKGROUND**

The ultraviolet bandwidth occupies wavelengths roughly between 200 and 400 nanometers. To put into relative terms UV radiation is sandwiched between the higher energy, soft X-rays and lower energy visible light. Purification via exposure to ultraviolet radiation is unique from other types of sterilization modalities due to the fact that it does not necessarily cause death of the target organism. In those pathogens it does not directly kill, the UV radiation effectively alters the creature’s genetic structure. By causing damage to the target bacteria’s Deoxyribonucleic Acid (DNA), the bacteria is sterilized at the genetic level. Thus the organism is no longer able to reproduce and cause disease.

**ULTRAVIOLET GERMICIDAL LAMPS**

Based on experiments which compared the effectiveness of various light sources on the survival ratio of different species of bacteria, scientists were able to determine the wavelength of ultraviolet light which produced the maxi-
mal germicidal effectiveness. This wavelength was determined to be 253.7 nm. This finding explained why sunlight is only marginally effective in the treatment of pathogens. This wavelength is far beyond the short-wave limit of solar light.

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**APPLYING UV STERILIZATION TO INDUSTRY**

Sterilization through the utilization of ultraviolet radiation has experienced an upsurge of popularity in the last decade. Industry has embraced this technology due to its convenience, safety, and relative cost effectiveness. The following specific application areas are:

- Sterilization within the Food Industry
- UV Water Purification Systems
- Sterilization of Air

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**THE USE OF ULTRAVIOLET LIGHTS IN BIOLOGICAL SAFETY CABINETS**

The use of ultraviolet (UV) lights in biological safety cabinets (BSCs) has enjoyed a long history. The current version of the NSF International Standard 49 dismisses the use of UV in a BSC. The CDC and NIH, in their joint pamphlet “Primary Containment for Biohazards: Selection, Installation and Use of Biological Safety Cabinets, 2nd Ed.” have taken a similar stand.

ABSA [American Biological Safety Association] has, to date, made no official pronouncement. Researchers continue to request their cabinets be outfitted with the lights and all manufacturers offer them as an option. Currently 80% - 90% of all United States Class II Type A2 Biological Safety Cabinets manufactured within the last 15 years are being shipped with Ultraviolet Germicidal Lights installed.

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**OBSJECTIONS**

Several issues arise with the use of ultraviolet radiation in a biological safety cabinet. It has been argued that UV radiation puts researchers at risk from ocular damage and cancer. The UV radiation generates ozone that can damage materials within the cabinet, the radiation is ineffective at high humidity levels, the blue lamp remains the same constant blue even though the effective radiation has ceased to exist, UV radiation only kills surface bacteria, UV radiation gives the researcher a false sense of security, and the UV bulb must be cleaned weekly to prevent a drop in output.
Even though the vast majority of our UV-equipped cabinets were using the effects of the radiation to assist with disinfecting their cabinets, users of these BSC’s are also using chemical disinfectants [Isopropanol being the most common disinfectant in tissue culture areas]. Therefore, it has been argued that UV radiation is not necessary if the BSC is being properly disinfected using good aseptic techniques.

PRECAUTIONS

- An individual should not expose themselves to UV radiation. Be sure the BSC is not being used with the UV light on. Most BSC’s have the fluorescent light interlocked with the UV light switch with the window in the closed position for the UV light to be on.
- Wipe clean the UV lamp at least once every week or two.
- Check periodically with a UV meter to ensure the effectiveness of the radiation.
- When disposing of a spent UV lamp, dispose of it as hazardous waste.
- Beware the ozone emitted from the radiation can cause plastics/rubber to deteriorate.
- UV radiation should not take the place of wiping down the cabinet interior with a disinfectant.

REFERENCES


University of Minnesota, Environmental Health and Safety, “UV Lights” June 14, 2010


For more information on NuAire products and/or technical papers please visit www.nuaire.com

NuAire is working with the IFBA (International Federation of Biosafety Associations) to help promote biosafety and biosecurity throughout the world. Learn more by visiting: www.nuaire.com/ifba