

Ultraviolet Radiation

Introduction

Ultraviolet (UV) radiation can be hazardous to laboratory personnel. This Safety Short gives information about this hazard, and how to protect you from UV radiation.

Properties

UV Region	UV Region Name	Wavelength in nm	Possibility of Hazard
UV-A	Near UV (Black Light)	315-400	Least
UV-B	Mid UV (Erythema)	285-315	Intermediate
UV-C	Far UV (Germicidal)	185-285	Greatest

Exposure to ultraviolet radiation is usually limited to the UV-A region of the electromagnetic spectrum resulting from exposure to sunlight. The earth's atmosphere shields us from the more harmful UV-C radiation and more than 99% of the UV-B portion of the electromagnetic spectrum. However, some laboratory equipment can produce concentrated UV radiation in all of the above three spectral regions that can cause injury with only a few seconds of exposure without appropriate personal protective equipment and shielding.

Typical Sources of Ultraviolet Radiation in Research Laboratories

There are many devices that produce ultraviolet radiation in the laboratory, such as germicidal lamps used in biological safety cabinets, nucleic acid transillumination boxes, nucleic acid crosslinkers and UV lasers. Germicidal lamps and nucleic acid crosslinkers typically operate in the far UV range at 254 nm.

Health Effects Related to Exposure to Ultraviolet Radiation

Ultraviolet exposure is not immediately felt, so there are no immediate warning symptoms to indicate overexposure.

Skin Damage – Ultraviolet radiation can cause erythema (redness or ulceration) on exposed skin. This skin reaction can be very severe and can occur with only a few seconds of exposure to UV radiation. Risk factors of long-term exposure to UV radiation include premature skin aging and even skin cancer.

Eye Damage – Ultraviolet radiation exposure can damage the cornea, which is also epithelial tissue. Photokeratitis is a painful swelling of the eye caused by UV radiation exposure of the cornea. Symptoms of photokeratitis include a feeling of sand in the eyes that may last as long as two days. Long-term exposure to acute high-energy UV radiation can result in formation of cataracts in the eyes.

Work Safety Practices for Ultraviolet Radiation

Do not permit the skin or eyes to be exposed to sources of ultraviolet radiation. The ultraviolet radiation produced by standard laboratory equipment can exceed recommended exposure limits and cause damage with exposures as short as three seconds in duration.

Biosafety Cabinets – Do not work in a biosafety cabinet while the germicidal lamp is turned on. If possible, it is best to close the sash while the lamp is turned on.

Transilluminators and Crosslinkers – Do not use a transilluminator without the protective shield in its proper location. Ultraviolet radiation shields must be kept clean and replaced if they are damaged. Crosslinkers must not be used by laboratory personnel if the door safety interlock is not functioning correctly.

Labeling of Equipment Emitting UV Radiation – To help prevent eye and skin damage, any equipment that emits ultraviolet radiation must be prominently labeled. The label should indicate that the equipment must be used with caution because it emits ultraviolet radiation, the equipment must be used only with proper shielding in place, and that skin and eyes must not be exposed to UV radiation.

Personal Protective Equipment for Ultraviolet Radiation

Clothing in the Laboratory – While working with UV radiation wear standard laboratory clothing including a lab coat that is fully buttoned, long pants, and shoes with closed toes. Laboratory workers must strive to prevent gaps in protective apparel that typically occur around the neck and wrist.

Laboratory Protection for the Eyes and Face – Ordinary eyeglasses or contacts offer very limited protection against ultraviolet radiation! If there is any possibility of the eyes and face being exposed to UV radiation, a polycarbonate face shield bearing the ANSI Z87.1-1989 UV certification must be worn by the laboratory worker to protect the eyes and face. Be sure that the exposed parts of the face are covered when using UV certified goggles or safety glasses, since it is typical for laboratory workers to suffer facial burns in the areas not protected by the goggles or glasses when exposed to ultraviolet radiation.

Gloves in the Laboratory – When working with ultraviolet radiation wear disposable nitrile gloves to protect skin on the hands and wrists. Be sure that the skin is covered up to the lab coat so that there are no gaps between the gloves and the lab coat.

Overexposure to Ultraviolet Radiation

If overexposure to ultraviolet radiation occurs, contact the UAB Radiation Safety Program at 934-4751 during normal business hours. After normal business hours, call 934-3411 and ask to have the Health Physicist on-call paged.

References – Office of Environmental Health and Radiation Safety, University of Pennsylvania, and Environmental Health & Safety office, University of Washington.