



Laboratory Standard Operating Procedure for:

Ultraviolet (UV) Radiation

Principal Investigator (PI) Approval is Required Prior to Performing this Procedure

Description

This standard operating procedure outlines the use of UV radiation. Review this document and supply the information required in order to make it specific to your laboratory. In accordance with this document, laboratories should use appropriate controls and personal protective equipment when working with UV radiation.

Useful UV Links:

- <http://www.cdc.gov/niosh/topics/uvradiation/>
- <http://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/Tanning/ucm116425.htm>
- <http://www.who.int/uv/en/>
- <http://hps.org/hpspublications/articles/uv.html>
- http://www.ccohs.ca/oshanswers/phys_agents/ultravioletradiation.html
- www.icnirp.de/documents/UVWorkers.pdf

Potential Hazards

An unfortunate property of UV radiation is that there are no immediate warning symptoms to indicate overexposure. Symptoms of overexposure including varying degrees of erythema (sunburn) or photokeratitis (aka “welder’s flash” or “snow blindness”) that typically appear hours after exposure has occurred.

Skin Injury — UV radiation can initiate a photochemical reaction called erythema within exposed skin. This “sunburn” can be quite severe and can occur as a result of only a few seconds exposure. Effects are exaggerated for skin photosensitized by agents such as coal tar products, certain foods, e.g., celery root, certain medications and photoallergens. Chronic skin exposure to UV radiation has been linked to premature skin aging, wrinkles and skin cancer.

Eye Injury — UV radiation exposure can injure the cornea, the outer protective coating of the eye. Photokeratitis is a painful inflammation of the eye caused by UV radiation-induced lesions on the cornea. Symptoms include a sensation of sand in the eye that may last up to two days. Chronic exposures to acute high-energy UV radiation can lead to the formation of cataracts.

UV radiation is just outside the visible range, or under 400 nanometers (nm). There are three ranges of UV:

Region	Also Known As	Range in nm	Hazard Potential	Damage Mechanism (High Exposures)
UV-A	near UV (Black Light)	320-400	lowest	cataracts
UV-B	mid UV (Erythema)	290-320	mid to high	skin or eye burns
UV-C	far UV (Germicidal)	190-290	highest	skin or eye burns

Occupational Exposure Limits (OELs):

1. For the UV-A or near ultraviolet spectral region (315 to 400 nm), exposure to the eye should not exceed 1 milliwatt per square centimeter (1.0 mW/cm^2) for periods greater than 1,000 seconds (approximately 17 minutes).
2. For exposure times less than 1,000 seconds, the dose (total energy) should not exceed 1.0 joules per square centimeter (J/cm^2). Additional exposure limits apply to the amount of UV light exposure to the skin and the eyes.
3. The amount of UV exposure a person can receive on their skin or eyes during an 8-hour period varies with the wavelength of the UV radiation. For specifics review the Ultraviolet Radiation section of the current edition of the ACGIH publication [Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices®](#).
4. For the actinic ultraviolet spectral region (200-315 nm; about half of the UV-C and most of the UV-B range), the exposure of unprotected skin or eye should not exceed the values given in Table 1 of the ACGIH booklet, within an 8-hour period. For detailed TLVs refer to the current TLV booklet published by [ACGIH](#).

Engineering Controls

Potential engineering controls (preferred to other controls or PPE) include:

- Light-tight cabinets,
- Enclosures (including dedicated rooms) enclosed with opaque materials or UV radiation absorbing glass and plastic shielding and fail-safe interlocks are the key engineering control measures used to prevent human exposure to UV radiation,
- Utilize shields, curtains, and barriers.
- If no engineering controls are needed please cite this fact. If engineering controls are not practical, note what administrative or work practice controls are recommended, as well as applicable PPE.

Work Practice Controls

Never allow the skin or eyes to be exposed to UV radiation sources. The UV radiation generated by laboratory equipment can exceed recommended exposure limits and cause injury with exposures as brief as three seconds in duration. Utilize suitable separation distances to protect individuals against the UV radiation emitted by open sources. Many overexposures to UV radiation have occurred as a result of individuals not knowing the hazards associated with UV-emitting equipment. To help prevent eye and skin injuries, any equipment that emits UV radiation must be conspicuously labeled with a caution label. The label should contain language similar to:

WARNING
THIS DEVICE PRODUCES POTENTIALLY HARMFUL UV LIGHT
PROTECT EYES AND SKIN FROM EXPOSURE TO UV LIGHT



Labels and signs may be available from UM's M-Marketsite website or may be available from the manufacturer of the UV light product.

Personal Protective Equipment (PPE)

In order to select the appropriate PPE for the workplace, a Hazard Assessment is conducted. The hazard assessment determines the hazards and potential hazards associated with a task, machinery, or process. The appropriate PPE for the situation may be subsequently determined.

The Hazard Assessment Form can be found as Appendix A in the [Personal Protective Equipment \(PPE\) guideline](#). It may be completed either by the workplace supervisor or the lab manager/director.

Protective Clothing: Wear standard laboratory apparel including a fully buttoned lab coat, long pants and closed toe shoes. While working with UV radiation sources, lab workers must be particularly vigilant to prevent gaps in protective clothing that commonly occur around the neck and wrist areas.

Eye/Face Protection: If there is any potential for the eyes and face to be exposed to UV radiation, a polycarbonate face shield stamped with the ANSI Z87.1 "UV certification" must be worn to protect the eyes and face. Ordinary prescription eyeglasses may not block UV radiation. UV-certified goggles and safety glasses will protect the eyes, but it is common for lab workers to suffer facial burns in the areas not covered by the goggles or glasses.

Gloves: To protect hands and wrists, wear disposable thick nitrile, double latex gloves or something similar to protect exposed skin on the hands. Ensure wrists and forearms are covered between the tops of gloves and the bottom of the lab coat sleeves.

Transportation and Storage

Not applicable.

Waste Disposal

Not applicable.

Exposures/Unintended Contact



If the employee is in need of emergency medical attention, call 911 immediately.



- For UV radiation over exposure of the eye, place a sterile dressing over the eye and get medical attention.
- For UV radiation over exposure of the skin, apply cold water or ice to the skin burns and get medical attention.

Report all work related accidents, injuries, illnesses or exposures to WorkConnections within 24 hours by completing and submitting the [Illness and Injury Report Form](#). Follow the directions on the WorkConnections website [Forms Instructions](#) to obtain proper medical treatment and follow-up.

Complete the [EHS Laboratory Incident and Near-Miss Report](#) form.

TREATMENT FACILITIES:

Midwest Medical Center -- *Campus Employees (including student employees)*

Mon-Fri 7:30 am - 4:30 pm

9301 Middlebelt Road

Romulus, MI 48174

Phone: 734-941-1000

After hours - go to:

Midwest Medical Center

Open 24/7

4700 Schaefer

Dearborn, MI 48126

Phone: 313-581-2600

Henry Ford Medical Center-Fairlane -- *University students (non-life threatening conditions)*

19401 Hubbard Drive

Dearborn, MI 48126

Phone: 313-928-8278

Click [here](#) for more information.

Report all emergencies, suspicious activity, injuries, spills, and fires to Public Safety by calling at (313) 593-5333 or 911 from a campus phone. Register with the University of Michigan-Dearborn [Emergency Alert System](#).

Training of Personnel

All person are required to attend initial (first-time) training in class (go to <http://www.umd.umich.edu/training/> to register). Refresher training can be completed via [MyLINC](#), the **Comprehensive Laboratory Safety** session (**BLS009** or *equivalent*). Furthermore, all personnel shall read and fully adhere to this SOP when working with UV radiation.

Certification

I have read and understand the above SOP. I agree to contact my Supervisor or Lab manager if I plan to modify this procedure.

Name	Signature	UM ID #	Date

Principal Investigator _____

Revision Date _____