



Ultraviolet (UV) Radiation

Standard Operating Procedure

Revision Date: 01/28/25

Laboratory Director (LD) and/or Principal Investigator (PI) Approval is Required Prior to Performing this Procedure

This standard operating procedure (SOP) 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. All laboratory workers must read and understand the Laboratory Emergencies SOP found on the [UM-Flint EHS Laboratory Safety](#) web page prior to commencing any work in a laboratory.

Description [Provide additional information as it pertains to your research protocol]

UV radiation is a type of electromagnetic radiation with a wavelength of 180-400nm. UV radiation is present in sunlight and in artificial sources such as germicidal lamps, welding, black lights, UV LEDs, UV lasers, halogen lamps, and gas-discharge lamps.

UV radiation is invisible and has the ability to cause erythema and photokeratitis. It can also impact connective tissues and increase a person's risk of developing skin cancer.

Useful UV Links:

- <https://www.cdc.gov/nceh/features/uv-radiation-safety/>
- <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

Process [Write the steps for using UV radiation in your research protocol]

Potential Hazards [Provide additional information as it pertains to your research protocol]

An unfortunate property of UV radiation is that there are no immediate warning symptoms to indicate overexposure. Symptoms of overexposure include 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 of 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 exposure 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 (OEL):

- 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/cm²) for periods greater than 1,000 seconds (approximately 17 minutes).
- For exposure times less than 1,000 seconds, the dose (total energy) should not exceed 1.0 joules per square centimeter (J/cm²). Additional exposure limits apply to the amount of UV light exposure to the skin and the eyes.
- 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, contact Environment, Health & Safety (EHS) at (810) 766-6763 or 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®.
- 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 [Provide additional information as it pertains to your research protocol]

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 [Provide additional information as it pertains to your research protocol]

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 U-M's M-Marketsite website or may be available from the manufacturer of the UV light product.

Personal Protective Equipment [Provide additional information as it pertains to your research protocol]

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.

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The Hazard Assessment Form may be found as Appendix 1 of the [UM-Flint Chemical Hygiene Plan](#). It may be completed either by the workplace supervisor or the department's EHS representative.

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 [Provide additional information as it pertains to your research protocol]

Not applicable

Waste Disposal [Provide additional information as it pertains to your research protocol]

There is no waste associated with the normal use of UV radiation equipment. If the equipment is broken or no longer functioning, contact EHS- EHS at (810) 766-6763 for any questions regarding proper waste disposal. Also, refer to the UM-Flint EHS [Hazcom & Regulated Waste](#) web page and the UM EHS [Hazardous Waste Spill Response](#) web page for more information.

Exposures/Unintended Contact [Provide additional information as it pertains to your research protocol]



If the employee is in need of emergency medical attention, call (810) 762-3333 immediately.



For a chemical exposure/injury:

injury type	action	notes
Exposure-Eyes	1. Place a sterile dressing over the eye. 2. Seek medical attention.	
Exposure-Skin	1. Apply cold water or ice to the skin. 2. Seek medical attention.	
NOTE: If an ambulance is needed, call the University of Michigan-Flint Department of Public Safety (DPS) at (810) 762-3333 to request assistance.		

Contact EHS for advice on symptoms of chemical exposure, or assistance in performing an exposure assessment.

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

Complete the [UM-Flint Laboratory Incident & Near-Miss Report](#) form.

Treatment Facilities

MAJOR INJURIES	MAJOR INJURIES	MAJOR INJURIES
Henry Ford - Genesys Hospital 1 Genesys Parkway Grand Blanc, MI 48439 (810) 606-5000 or (810) 606-5933 (ER)	McLaren Hospital Flint 401 South Ballenger Hwy Flint, MI 48532 (810) 342-2000	Hurley Medical Center One Hurley Plaza Flint, MI 48503 (810) 262-9000
MINOR INJURIES	MINOR INJURIES	MINOR INJURIES
Henry Ford Employer Solutions 1 Genesys Parkway, Suite 1620 Grand Blanc, MI 48439 (810) 606-5957 <i>University's Designated Medical Provider For Work Related Injuries</i>		Hurley Medical Center Urgent Care One Hurley Plaza Flint, MI 48503 (810) 262-6744

Training of Personnel

All personnel are required to complete the **General Laboratory Safety Training** session (**BLS025w** or *equivalent*) via the [EHS My LINC](#) Web page. 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 have received approval from my Lab Director (LD)/Principal Investigator (PI) to perform this procedure. I agree to contact my LD/PI if I plan to modify this procedure.

Name	Signature	UMID #	Date

Laboratory Director/Principal Investigator

Revision Date

Major Revisions (Tracking purposes only -- Do not print as part of SOP)

Date	Revision
03-26-18	Put into EHS format, changed department name, and fixed links. Revised Spill Procedure section (AKJ).
04-09-18	Revised formatting (AKJ).
10-08-18	EHS name and logo were added, updated the formatting, and revised the content under exposure/unintended content (dab).
03-08-19	Updated links, certification and format (DML).
08-10-23	Updated links, OHS hours, Lab Emergency SOP, and waste information (RSH).
02-20-24	Adapted for UM-Flint
01-28-25	Updated treatment facility names