Syracuse University

Laboratory Guidance Document

Ultraviolet Radiation Sources

This Laboratory Guidance Document was created by Syracuse University Environmental Health & Safety Services (EHSS) to assist researchers in developing laboratory specific standard operating procedures for the use of ultraviolet radiation sources.

Properties:

Ultraviolet (UV) is electromagnetic radiation that falls within the 100-400nm wavelength region of the electromagnetic spectrum. High-energy UV radiation (wavelengths <125nm) is a form of ionizing radiation.

The following table lists the different UV regions and associated hazards:

Region	Wavelength (nm)	Primary Hazard
UV-A	315-400	Retinal degeneration
UV-B	280-315	Severe burns to skin and eyes
UV-C	100-280	Severe burns to skin and eyes, germicidal

Sources of UV radiation in the laboratory include transilluminators, crosslinkers, lasers, fluorescence microscopes, and germicidal lamps. The UV radiation levels produced by this equipment greatly exceed the levels found in nature.

Potential Hazards:

Ultraviolet radiation presents health hazards through the damaging effects on the skin and eyes.

- Symptoms of overexposure include severe erythema (sunburn), photokeratitis ("welder's flash") and potential blindness.
- Overexposure to UV radiation often has no immediate warning signs and symptoms may not manifest for several hours after exposure. Medical attention must be sought in cases of suspected overexposure.

General Precautions:

1. **Training**
   The Principal Investigator is responsible for ensuring all personnel under their supervision are aware of associated hazards of UV radiation, have received appropriate hands-on training, adhere to the laboratory standard operating procedures, and are provided with the appropriate personal protective equipment.
2. **Awareness**
   The manufacturer's technical manual should be consulted for information regarding the spectral output and potential exposure level.
3. **Substitution**
   Alternative systems of visualization such as blue light fluorescence should be considered.
4. **Guarding**
   Ultraviolet radiation sources should be shielded (i.e., blocked with an absorbent polymer). Some devices are also equipped with interlocks that prevent operation while the shield is open.

Personal Protective Equipment (PPE):

In addition to the standard laboratory attire (i.e., long pants and closed toe shoes), the following PPE is recommended for all protocol involving UV radiation sources:

- ANSI compliant (Z87U) UV-filtering safety glasses
- Long sleeve lab coat. Care should be taken to avoid gaps where skin is exposed, particularly around the wrists and forearms.
- Nitrile gloves

Best Practices for the Safe Operation of Ultraviolet Radiation:

1. Review the manufacturer's technical manual, laboratory standard operating procedure (SOP), and emergency response procedures before starting any protocols requiring UV radiation sources.
2. Post an in-lab primary hazard posting and emergency response procedure in use areas.
3. Eliminate surface reflections; cover or paint reflective surfaces whenever practical.
4. Shield UV radiation sources with a material that is impenetrable at the operating wavelength. Care should be taken to ensure seams and entry/exit ports are sealed.
5. UV light can easily enter the eyes when examining gels on a transilluminator. A Perspex safety shield should be used as a protective guard.
6. Handheld/portable UV radiation sources should be used with care to avoid skin and eye exposure.
7. Germicidal lamps installed inside biosafety cabinets should not be used during times when the room is occupied.

Disposal:

Ultraviolet lamps contain mercury vapor and are subject to certain regulatory requirements for disposal. Contact the EHSS Hazardous Waste Group at 315-443-9132 to arrange for disposal of devices containing UV lamps.

Incident Response:

All laboratory emergencies must be reported to the Department of Public Safety at 315-443-2224.