Exposure limits for ultraviolet (UV) radiation have been recommended by the American Conference of Governmental Industrial Hygienist (ACGIH) for the 180-400 nanometer wavelength region of the electromagnetic spectrum. Depending upon the exposure factors (wavelength, radiation intensity, exposure duration), exposure to UV radiation can be hazardous to the skin and eyes. UV radiation is commonly broken down into the following three main spectral regions:

<table>
<thead>
<tr>
<th>Region</th>
<th>Wavelength (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultraviolet A (UVA)</td>
<td>315-400</td>
</tr>
<tr>
<td>Ultraviolet B (UVB)</td>
<td>280-315</td>
</tr>
<tr>
<td>Ultraviolet C (UVC)</td>
<td>180-280</td>
</tr>
</tbody>
</table>

**COMMON UV RADIATION SOURCES**

**UV Crosslinker** – Used to attach nucleic acids to a surface or membrane following blotting procedures. Crosslinkers should be equipped with door safety interlocks, which prevent operation of the machine when the door is open. Ensure the interlock system is functioning correctly before using the device.

**Germicidal Lamps** – Used for disinfecting the interior surfaces of a biosafety cabinet before and after use. Avoid working in or around the biosafety cabinet while germicidal lamp is on. If possible, close sash for extra protection.
Examples of Other UV Radiation Generating Equipment:

- Absorbance Detector
- Finnigan Surveyor PDA Detector
- Fluorescence Detector
- Fluorometer
- HPLC Machines
- Image Station
- Laminar Flow Hoods
- Spectrophotometer
- UV Gel Dock
- UV Microscopes
- UV Stratalinker
- UV Transilluminator
- UV-VIS Detector
- Waters 486 Tunable

HEALTH RISKS

Overexposure to UV radiation may not be immediately apparent. Symptoms of overexposure, including different stages of erythema (sunburn) or photokeratitis (welder’s flash) typically appear 4-24 hours after an exposure has occurred.

Skin – UV radiation can initiate erythema within exposed skin. This “sunburn” consisting of “redness” ulceration varies in severity and can occur from only a few seconds of exposure. Symptoms can vary due to one’s genetic makeup. Pale to fair skin individuals are more susceptible to burns. Chronic exposure to UV radiation has been linked to premature skin aging, wrinkles, and skin cancer. Note: the neck and wrist areas are commonly left unprotected.

Eye – UV radiation exposure can damage the cornea, which is 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 may include pain in the eyes, headache, blurry vision, temporary vision loss, and a “sand like” feeling in the eye that can last several days. Chronic exposures to short term UV radiation can lead to the formation of cataracts.

EXPOSURE CONTROL MEASURES

It is the Principal Investigator’s and/or Lab supervisor’s responsibility to ensure the UV radiation hazards are properly controlled in their work areas. Examples of exposure control methods are listed below. The EH&S Office (x3347) can assist with exposure control measures.

Containment/Location – To avoid accidental exposure of other employees, avoid placing UV generating equipment in high traffic or common areas. Having equipment located in a separate room, alcove or low traffic area of a lab is ideal. The use of shields, curtains, or other UV blocking barriers is recommended.
**Interlocks** – Some equipment comes with interlock systems that prevent operation of the UV radiation sources without safety controls (e.g., containment system) in place. Interlocks should not be tampered with. They should also be replaced or repaired when defective.

**Eliminating Reflection** – Highly polished surface or shiny surfaces can reflect UVR. To reduce the intensity of reflections, consider non-reflective surfaces (e.g., matte black).

**Training** - As with any potentially hazardous activity, personnel should be trained and familiarized with the correct/safe way of using UV radiation sources. The manufacturer (user’s guide) can assist employees on safe operating procedures. At a minimum, lab personnel should be familiar with the following before working with or around UV radiation: UV radiation exposure locations, hazards, exposure controls, and symptoms of exposure. It is the Principal Investigator’s and/or Lab Supervisor’s responsibility to ensure the personnel working with UV radiation are adequately trained.

**Access Control** – Access to UV radiation sources should be limited to trained and authorized employees. Increasing the distance from the source and reducing the exposure duration will reduce the exposure potential.

**Warning Signs and Labels** - Many incidents of overexposure to UV radiation are the result of people not being aware of the hazards associated with UV producing equipment. To help prevent accidental overexposes, the UV radiation work area should have adequate warning signs.

**Personal Protective Equipment (PPE):**

**Safety Eyewear** - Should be ANSI Z87.1-rated polycarbonate and provide protection from side exposure via side lenses or wrap-around lenses. Regular prescription glasses may not provide adequate protection. To determine if eye protection is rated for UV protection, contact the manufacturer or look for the ANSI Z 87.1 label on the eyewear.

**Face Shield** - Should be ANSI-Z87.1 rated polycarbonate worn in addition to eyeglasses or goggles.

**Gloves** - At a minimum nitrile gloves are recommended. Certain gloves (e.g., vinyl) may transmit UV radiation.

**Lab Coat** - Employees should cover exposed skin. Lab coats, along with proper lab attire should be worn.