Occupational UV Exposure in Cannabis Farms

Christopher Simpson, PhD
simpson1@uw.edu
Health effects and hazard function

• Erythema
  – reddening of skin, sunburn
• Premature aging of skin
• Skin cancer
• Photokeratitis
  – aka snow blindness, welders flash
• Cataracts
Exposure limits and guidance values

- **ACGIH TLV (Broadband UV, \(\lambda=180-400\)nm):**
  Daily exposure based on \(E_{\text{eff}}\) limited to 0.003 J/cm\(^2\) (\(\lambda=180-400\)nm)
  
  - Equivalent to 0.0001 mW/cm\(^2\) per 8-hr day

- **DOSH PEL (Broadband UV, \(\lambda=200-400\)nm):**
  WAC 296-62-09005, applies to UV radiation from arcs, gas, and vapor discharges, and incandescent sources, but not to UV lasers or solar radiation

  \(\lambda=320-400\)nm (UV-A):
  
  - 1 mW/cm\(^2\) (exposure <1000 sec)
  - 1 J/cm\(^2\) (exposure >1000 sec)

  \(\lambda=200-315\)nm (UV-B, UV-C):
  
  \(E_{\text{eff}}\) 0.0001 mW/cm\(^2\) per 8-hr day
Stage 1: Breeding/Cloning

Germinate from seed/propagate from clippings of another plant under low light
Stage 2: Growing

Transfer plants into progressively larger vessels
Water and prune regularly
Change rooms to alter light (indoor), or transfer outside
Stage 3: Harvest
Remove buds from plants
Cure, hang dry plants
“Buck” (or remove) buds off of stems
to prepare for processing
Lighting for indoor grows

**FIGURE 2.** Hazard function (relative spectral effectiveness, $S(\lambda)$) for UV.
Lighting technologies in cannabis farms

• Solar
• LED (including UV-LED)
• Fluorescent
• High intensity discharge (HID)  
  – High pressure sodium (HPS); metal halide (CMH)
• Germicidal bulbs
UV measurement tools

- UV Dosimeter
- Eff. Irradiance Sensor
- UV Dose Watch
- Spectrometer
Lighting technologies

8hr Mean Dose
by Bulb Type @ 3 ft

Dose (mJ/cm²)

Germicidal  Metal Halide  High Pressure Sodium  Fluorescent  LED

DOSH PEL
Pilot Study of UV Exposure Potential

![Graph showing the mean dose per workshift for different lighting conditions. The graph compares HPS/Fluorescent, LED, HPS/LED, Shadehouse, and Outdoor conditions. The horizontal line at 3 mJ/cm² represents the DOSH PEL limit.](image)
Germicidal bulb, sold for control of powdery mildew
UVB emitting LED
Fluorescent grow lamp, with UVB output
PROTECTING WORKERS FROM HARMFUL UV EXPOSURES
A Guide for Indoor Cannabis Grow Operations: Employers

Grow lamps used in indoor cannabis grow operations produce varying levels of ultraviolet (UV) light. Recent research from the University of Washington Department of Environmental and Occupational Health Sciences shows that some light bulbs may exceed health protective guidelines for UV exposure. Over-exposure to UV light is known to cause skin cancer, premature aging, cataracts and other eye damage, and immune system suppression.

WHEN DOES UV BECOME DANGEROUS?

The radiant exposure, a measure of an employee’s dose, is the amount of energy received per unit area of surface, expressed as millijoules per square centimeter (mJ/cm²).

The Washington State Division of Occupational Safety (DOSH) specifies a UV skin and eye permissible exposure limit (PEL) of 3 effective mJ/cm² per 8hr work shift.

WHAT CAN I DO TO PROTECT MY EMPLOYEES?

Use grow lamps with lower UV intensities.

Position all light bulbs higher than 8ft off the ground.

Train all employers on how to take proper safety precautions with all bulbs.

Display warning signs in areas where UV-emitting bulbs are used.

Never use germicidal bulbs when workers are present. Rooms containing germicidal bulbs should be interlocked to prevent access while lamps are on.

Provide UV-protective eye wear to employees.
UV exposure controls

- Wear PPE: sunglasses, hats, scarves, sunscreen, SPF t-shirts
- Use lower UV-emitting bulbs where appropriate; maximize distance between bulb and worker
- To minimize exposure to solar UV:
  - provide shade,
  - Avoid scheduling outdoor work during midday and rotate workers to minimize sun exposure
Conclusions

• In the facilities that we surveyed, none of the workers received UV exposures from bulbs that exceeded the DOSH PEL.
  – Newer technology bulbs that are being developed and marketed to this industry do have the potential to cause hazardous exposures

• Solar radiation was the primary sources of UV exposure in this industry, with workers at outdoor facilities most at risk.
  – Use PPE, provide shade to workers, and schedule work practices to minimize exposure, especially near midday
Producers are businesses that grow marijuana plants for the purpose of harvesting and curing the flowers (aka buds). Growing can be done indoors or outdoors.

Typical agricultural hazards such as outdoor heat exposure and pesticide handling are found during this stage and possibly some less frequently encountered ones associated with the following:

- Air enrichment with carbon dioxide in an indoor environment using tanks of compressed carbon dioxide, burners, or dry ice, and other methods.
- Planting, growing, and cultivating indoors where there may be improperly wired equipment, damaged electrical plug cords, or outlets.
- Using equipment with exposed rotating, cutting or pinching hazards, to process and destroy waste plant products.

Marijuana producers must take steps to protect workers from these and all other hazards during production.

More help from L&I:

- Getting Started with Safety.
- Consultation Services.
- Workplace Safety Complaints.
- Worker Rights to a Safe Workplace.

For general information, call 1-800-423-7233.
Guide to Worker Safety and Health in the Marijuana Industry

Marijuana Occupational Health and Safety Work Group
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