Occupational Safety and Health Hazards in the Cannabis Industry

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CANNABIS INDUSTRY

- Medical Cannabis: 29 states + D.C.
- Recreational Cannabis: 8 states + D.C.
- Initially focused on small operators
  - Increasing trend of acquisitions and industry consolidation
- Overall: $6B in annual sales in 2016
  - 150,000 workers nationwide
  - Job market could double or triple in near- and intermediate-terms
  - Almost $1.2B in annual sales in Colorado alone
  - Projected sales nationwide to more than $21B by 2021
CANNABIS INDUSTRY

- **U.S. Drug Enforcement Agency:**
  - Cannabis: Schedule I drug
    - drugs with no currently accepted medical use and a high potential for abuse.

- **Cannabis companies are required nonetheless to follow federal and state laws for worker health and safety**
  - OSHA regulations still enforceable
CANNABIS INDUSTRY

- Occupational health risks both similar to and unique from other agricultural/horticultural activities
- Very new industry that was once underground
  - Need for clear understanding of and guidance for worker safety and health issues
CANNABIS INDUSTRY—Grow/Cultivation: Occupational Safety and Health Hazards

- Indoor environmental quality
  - Humidity, temperature, volatile organic compounds
- High intensity grow lights – UV radiation
- Electrical safety in a wet environment
- Pesticide application/use
- Nutrient/corrosive chemical use
- Slips/trips/falls
- Microbials
  - Endotoxins, allergens, fungi
- Ergonomic issues

Photos courtesy of Center for Health, Work, & Environment, CSPH.
CANNABIS INDUSTRY—Processing/Manufacturing: Occupational Safety and Health Hazards

- Mechanical safety hazards
  - Lack of guards for moving equipment, pinch points, wiring
- Chemical use
  - Butane
  - CO₂
- Cuts/lacerations
- Noise
- Ergonomic hazards
- Microbials
  - Endotoxins, allergens, fungi
- Delta-9-Tetrahydrocannabinol (THC)

Photo courtesy of Center for Health, Work, & Environment, CSPH.
CANNABIS INDUSTRY—Retail Operations: Occupational Safety and Health Hazards

- Theft and workplace violence
  - Presence of large quantities of cash and product
  - Violence can be committed by strangers, customers or clients, coworkers, or personal relations

- Security concerns

- Fear of raid/arrest/business interruptions by federal authorities may be a source of job stress

- Job insecurity
NIOSH HEALTH HAZARD EVALUATIONS: Cannabis Industry
NIOSH Health Hazard Evaluations (HHEs)

- Mechanism for NIOSH to evaluate occupational hazards at a worksite
  - Workers
  - Unions
  - Management
  - Technical assist for government agencies

- HHE #1: Harvesting and Processing Cannabis at an Organic Farm
- HHE #2: Medicinal Cannabis Grow and Processing Facility
NIOSH HHE #1: Harvesting and Processing Cannabis at an Organic Farm

- Union request to NIOSH
- Conducted 2 site visits in 2015
- Farm:
  - Operated by the owner and three employees
  - Five acres
  - Grew pesticide-free cannabis, vegetables, and fruit outdoors
  - Grew Cannabis sativa, Cannabis indica, and Cannabis sativa/indica hybrid in hoop houses
  - 40 plants (over 8 feet tall; over 6 feet wide)
NIOSH HHE #1: Harvesting and Processing Cannabis at an Organic Farm

A worker harvesting cannabis.

Photo by NIOSH.
NIOSH HHE #1: Harvesting and Processing Cannabis at an Organic Farm

Employee performs “big leafing” from a stem as it hangs on a line.

Photo by NIOSH.
NIOSH HHE #1: Harvesting and Processing Cannabis at an Organic Farm

An employee removes the flower from the stem by pulling the stem through a small, drilled hole in a tin can.

Photo by NIOSH.
NIOSH HHE #1: Harvesting and Processing Cannabis at an Organic Farm

An employee using a trim station for the final stage of flower hand trimming.

Photo by NIOSH.
NIOSH HHE #1: Harvesting and Processing Cannabis at an Organic Farm

- **Site visit activities:**
  - Observed work practices
  - Observed demonstrations for machine trimming
  - Conducted confidential medical interviews
    - Work history
    - Use of personal protective equipment
    - Any symptoms when working with cannabis
    - Long-term health and safety concerns related to their job
NIOSH HHE #1: Harvesting and Processing Cannabis at an Organic Farm

- **Site visit activities:**
  - Performed ergonomic evaluations on specific tasks
    - Measured pinch force used to pull leaves off stems
    - Measured force to remove bud with trimming scissors
    - Evaluated repetitive motion of the hand and fingers during final hand trimming
    - Recorded trimming activities for video analysis
  - Collected air samples for microbial (n=26) and endotoxin (n=26) analysis
    - Bacterial and fungal diversity reported in terms of relative abundance
  - Collected surface wipe samples (n=33) for THC
CANNABIS INDUSTRY: Occupational Safety and Health Hazards:

*Airborne Endotoxins Exposures*\(^5\text{-}8\):  

- Endotoxin inhalation exposures in agricultural and industrial settings have been associated with:  
  - Mucous membrane irritation, chest tightness, cough, shortness of breath, fever, wheezing  

- Chronic health effects associated with endotoxin exposure include:  
  - Asthma, chronic bronchitis, bronchial hyper-reactivity, chronic airway obstruction, hypersensitivity pneumonitis, organic dust toxic syndrome
CANNABIS INDUSTRY: Occupational Safety and Health Hazards:

**Airborne Endotoxins Exposures**⁵⁻⁸:

- No accepted OELs have been developed in the U.S. for endotoxin exposures⁹⁻¹⁰
  - Variability of sampling and analytical methods
  - A lack of data showing a consistent dose-response relationship

- In 2010, the Dutch Expert Committee on Occupational Safety recommended a health-based OEL of 90 EU/m³ as an 8-hour time weighted average¹¹
CANNABIS INDUSTRY: Occupational Safety and Health Hazards:

Fungal Exposures:

- Fungi are eukaryotic organisms that can produce health effects by four mechanisms:\textsuperscript{12}
  - Allergic reactions (e.g., allergic rhinitis, conjunctivitis, asthma), and
  - Toxic reactions (e.g., gastrointestinal symptoms from ingesting mycotoxins)
  - Infections (e.g., respiratory)
  - Irritant reactions
CANNABIS INDUSTRY: Occupational Safety and Health Hazards:

Allergic Sensitization to Cannabis Allergens:

- Skin contact through personal handling of cannabis has been associated with: \(^{13-14}\)
  - Hives, itchy skin, swollen or puffy eyes
    - Case reports of hives in forensic specialists who directly contacted cannabis \(^{15-16}\)

- Studies shown hypersensitivity to proteins derived from \textit{C. sativa} \(^{17}\)

- Repeated exposures can lead to progressively stronger and more abnormal responses
CANNABIS INDUSTRY: 
Occupational Safety and Health Hazards:

**Exposure to THC:**

- Health effects from an effective dose of cannabis/THC may include mood changes, diminished memory, and disorientation\(^{18}\)
  - Effects from long-term occupational exposures: unknown

- Study of 7 cannabinoids to produce allergic contact dermatitis\(^{19}\)
  - THC and cannabinoil found to be extreme sensitizers

- Occupational surface levels of THC indicate potential for dermal and ingestion exposures\(^{20}\)
NIOSH HHE #1: Harvesting and Processing Cannabis at an Organic Farm

- **Findings:**
  - Employees did not report any work-related symptoms
  - Employees were concerned about repetitive hand motions from trimming cannabis
  - Some hand trimming activities required a lot of hand motions, but not a lot of force
Findings:

- *Botrytis cinerea* was the main fungal species in the air
  - Plant pathogen that can cause allergic reactions
  - Associated with Wine Grower’s Lung
- We found THC in every surface wipe sample
  - 0.17 to 210 micrograms per 100 cm² (µg/100cm²)
  - Martyny et al.: <0.1 µg to 2000 µg/100 cm² (GM: 0.37 µg/100 cm²)
    - “we do not believe THC levels observed on the surfaces...pose a significant health risk to those involved under normal conditions”
- Endotoxin concentrations were all below the Dutch Expert Committee on Occupational Safety occupational exposure limit of 90 EU/m³
  - 2.8 to 37 EU/m³
NIOSH HHE #1: Harvesting and Processing Cannabis at an Organic Farm

**Employer recommendations:**

- **Ergonomic improvements:**
  - Provide frequent breaks when hand trimming
  - Develop a job rotation plan to use different muscle groups
  - Change hook line hanging heights to correspond with employee working technique
  - Remove netting surrounding plants during harvesting
- **Provide high quality tools and training on tool cleaning, lubrication, sharpening, and maintenance**
- **Develop a surface cleaning schedule to remove THC from surfaces**
- **Provide non-latex gloves to employees to prevent latex allergy**
NIOSH HHE #1: Harvesting and Processing Cannabis at an Organic Farm

- **Employee recommendations:**
  - Wear non-latex gloves when handling cannabis, cannabis products, or equipment that comes into contact with cannabis
  - Wash your skin with soap and water after removing gloves
  - Clean surfaces after processing cannabis material
  - Report any symptoms believed to be work-related to the supervisor and health care provider
NIOSH HHE #2: Medicinal Cannabis Grow and Processing Facility

- Union request to NIOSH

- Facility:
  - Operated by multi-site owner
  - Grew pesticide-free cannabis indoor and outdoors
  - Processed cannabis products into capsules, oral solutions, bulk oils, and vaporizer cartridges at an in-house processing and laboratory facility

- Conducted 1 site visit in 2016
NIOSH HHE #2: Medicinal Cannabis Grow and Processing Facility

- **Site visit activities:**
  - Observed work practices and interviewed employees
  - Collected air samples for microbes, endotoxin, terpene and oxygenated compounds
  - Collected surface wipe sample for:
    - THC
    - Delta-9-tetrahydrocannabinol acid (THCA)
    - Cannabidiol and cannabinol
NIOSH HHE #2: Medicinal Cannabis Grow and Processing Facility

- NIOSH HHE: Harvesting and Processing Cannabis at an Organic Farm
  - Released April 2017

- NIOSH HHE: Medicinal Cannabis Grow and Processing Facility
  - Not yet released – ongoing evaluation

- Both will be available at:
  https://www2a.cdc.gov/hhe/search.asp
  - Search word: “cannabis”
CANNABIS AND PUBLIC HEALTH ORGANIZATIONS
CANNABIS AND PUBLIC HEALTH ORGANIZATIONS: CDC

- Identified a need to address increasing questions about marijuana and public health
- Formed CDC-wide working group
- [https://www.cdc.gov/marijuana/index.htm](https://www.cdc.gov/marijuana/index.htm)
CANNABIS AND PUBLIC HEALTH ORGANIZATIONS: Colorado Department of Public Health & Environment

Retail Marijuana Public Health Advisory Committee & Occupational Health and Safety Workgroup

Mike Van Dyke, Ph.D., CIH
Section Chief
Environmental Epidemiology, Occupational Health, and Toxicology

OHSW: Participation

- Multiple CDPHE divisions
- Colorado School of Public Health
- Center for Worker Health and Environment
- Colorado State University
- Local health departments
- Private consultants
- Industry representatives
- Federal agencies
CANNABIS AND PUBLIC HEALTH ORGANIZATIONS: Colorado Department of Public Health & Environment

- **Hazards:**
  - Biological, chemical, physical
  - Health and safety program plans
  - PPE
  - Respiratory protection
  - Hearing
  - Lock-out/tag-out

CANNABIS AND PUBLIC HEALTH ORGANIZATIONS: Colorado Department of Public Health & Environment & Colorado School of Public Health

- Provision of Health and Safety Training to Industry Workers
  - Two training sessions: June 28 and November 15, 2017
    - OSHA and the general duty clause
    - Establishing a safety and health program
    - Overview of hazards
    - Hierarchy of controls
    - Hazard communication
    - PPE
    - Lock-out/tag-out, energy control, machine guarding
    - Slips, trips, fall, and ergonomics
# Job Hazard Analysis

## Job: Bud Trimming (Dry)

**Department or location:** Trimming

<table>
<thead>
<tr>
<th>Task or Step</th>
<th>Hazards</th>
<th>Controls</th>
<th>Personal Protective Equipment (PPE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remove any unwanted leaves (hand trimming)</td>
<td>Ergonomics/ cuts repetitive motions Body position Eye strain Allergic reactions/ sensitivity Molds (exposure)</td>
<td>Proper posture Job rotation large grip tools Antifatigue mats Adjustable tables Adjustable chairs Sharpened tools clean tools stretching Move positions- exercise in place Supplies close to you Good ventilation Lighting</td>
<td>Gloves Eye protection Respirator (Dust mask- half face) (required/voluntary use) Long sleeves</td>
</tr>
<tr>
<td><strong>- Machine Trimming</strong></td>
<td>Spinning parts/ blades Pinch points Cuts Noise</td>
<td>Use machine guarding LOTO Use properly rated equipment for the job- no homemade equipment Proper interlocks- no bypassing Good ventilation</td>
<td>Gloves/ eye protection Hearing protection</td>
</tr>
<tr>
<td>Machine trimming-cleaning</td>
<td>exposure to solvents cuts Pinch points</td>
<td>LOTO</td>
<td>Gloves/ eye protection/ aprons</td>
</tr>
</tbody>
</table>

(Company name and address)
Post-Course Questions:

Based on what you learned in this training, what health and safety changes do you intend to make at your workplaces?

- Written procedures/documentation, ergonomics/work design, training, machine guarding/LOTO

What other health, safety, and wellness training topics do you need or want?

- Documentation, mental health and burnout, pesticide/fungicide, emergency management, ergonomics
CANNABIS AND PUBLIC HEALTH ORGANIZATIONS: AIHA

- Identified occupational safety and health in the cannabis industry as a priority area for government relations activities

- AIHA Government Relations Group organized an Cannabis Industry Health and Safety Task Force
  - Started in September 2017
  - Goals:
    • study the hazards, controls, and other health and safety issues
    • identify industry and regulatory standards/best practices
    • development of documents based on findings as warranted
CANNABIS AND PUBLIC HEALTH ORGANIZATIONS: AIHA

- Multi-presentation session on cannabis industry accepted for AIHce 2018 in Philadelphia, PA:
  - “The Emerging Cannabis Industry Part II: Health, Safety, and Laboratory Issues in the Cannabis Industry”
CANNABIS AND PUBLIC HEALTH ORGANIZATIONS: AIHA

- May 2017 article in The Synergist:

GROWING PAINS

Personal Protective Equipment for Workers in the Emerging Cannabis Industry

BY JAMES LIEBERMAN, ROB BROWN, AND ROBERT N. PHALEN
CANNABIS AND PUBLIC HEALTH ORGANIZATIONS: AIHA

- AIHA Laboratory Accreditation Programs (LAP):
  - demand for proper laboratory testing of cannabis will continue to grow
  - any cannabis testing should always be done by a testing laboratory that is accredited
  - AIHA-LAP supports and encourages policymakers to include in any cannabis proposals specific requirements that laboratory testing be conducted in accordance with the general requirements for the competence of testing and calibrations activities
  - AIHA-LAP can accredit cannabis testing laboratories under its Unique Scopes Program
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Thank you!

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For more information, contact CDC
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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention or the National Institute for Occupational Safety and Health.