

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 consolidation¹
- **Overall: \$6B in annual sales in 2016²**
 - 150,000 workers nationwide²
 - Job market could double or triple in near- and intermediate-terms²
 - Almost \$1.2B in annual sales in Colorado alone³
 - Projected sales nationwide to more than \$21B by 2021⁴

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 Exposures⁵⁻⁸:

- **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 Exposures⁵⁻⁸:

- **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: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 cannabis¹⁵⁻¹⁶
- Studies shown hypersensitivity to proteins derived from *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 disorientation¹⁸**
 - Effects from long-term occupational exposures: unknown
- **Study of 7 cannabinoids to produce allergic contact dermatitis¹⁹**
 - THC and cannabidiol found to be extreme sensitizers
- **Occupational surface levels of THC indicate potential for dermal and ingestion exposures²⁰**

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

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

■ 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”²⁰
- 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>

The screenshot shows the CDC website page for 'Marijuana and Public Health'. At the top is the CDC logo and the text 'Centers for Disease Control and Prevention' and 'CDC 24/7: Saving Lives, Protecting People™'. Below this is a navigation bar with 'MENU', 'CDC A-Z', and a search bar. The main heading is 'Marijuana and Public Health'. There are social media icons for Facebook, Twitter, and a plus sign. The main content area has a background image of a pregnant woman. The text on the page includes: 'Marijuana is the most commonly used illegal drug in the United States, with 22.2 million users. Other common names for marijuana are weed, pot, or cannabis.®', 'We know that marijuana use may have a wide range of health effects on the body and brain.', and 'We have **strong** evidence that marijuana use may lead to:'. A list of health effects follows: 'Addiction.⁹', 'Breathing problems, including inflammation of the airways and symptoms of chronic bronchitis, such as daily cough and phlegm.', 'Short-term declines in memory, attention, and learning.', 'Impaired ability to drive 📄 [PDF 272KB].', 'Increased risk of poisoning among children.', 'Increased risk for low birth weight in babies when a mother uses during her pregnancy 📄 [PDF 229KB].', and 'Increased risk for psychosis or schizophrenia.' Below the list is a link: 'Learn about the health effects of marijuana.' On the right side, there is a section titled 'Using marijuana during pregnancy may increase your baby's risk of developmental problems.' Below this are three menu items: 'HEALTH EFFECTS' (Information on diseases and public health problems related to marijuana use.), 'FREQUENTLY ASKED QUESTIONS' (Answers to some commonly asked questions about marijuana use in the United States.), and 'AT A GLANCE FACT SHEETS' (Fact sheets about marijuana's possible effects for pregnant women, teens, and drivers.)

CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

MENU CDC A-Z SEARCH

Marijuana and Public Health

f t +

Marijuana is the most commonly used illegal drug in the United States, with 22.2 million users. Other common names for marijuana are weed, pot, or cannabis.®

We know that marijuana use may have a wide range of health effects on the body and brain.

We have **strong** evidence that marijuana use may lead to:

- [Addiction.⁹](#)
- [Breathing problems, including inflammation of the airways and symptoms of chronic bronchitis, such as daily cough and phlegm.](#)
- [Short-term declines in memory, attention, and learning.](#)
- [Impaired ability to drive 📄 \[PDF 272KB\].](#)
- [Increased risk of poisoning among children.](#)
- [Increased risk for low birth weight in babies when a mother uses during her pregnancy 📄 \[PDF 229KB\].](#)
- [Increased risk for psychosis or schizophrenia.](#)

[Learn about the health effects of marijuana.](#)

Using marijuana during pregnancy may increase your baby's risk of developmental problems.

HEALTH EFFECTS
Information on diseases and public health problems related to marijuana use.

? FREQUENTLY ASKED QUESTIONS
Answers to some commonly asked questions about marijuana use in the United States.

🌐 AT A GLANCE FACT SHEETS
Fact sheets about marijuana's possible effects for pregnant women, teens, and drivers.

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



COLORADO
Department of Public
Health & Environment

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



COLORADO
Department of Public
Health & Environment

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



Guide to Worker Safety and Health in the Marijuana Industry

Marijuana Occupational Health and
Safety Work Group
January 2017



[colorado.gov/cdphe/marijuana-occupational-safety-health](https://www.colorado.gov/cdphe/marijuana-occupational-safety-health)

- Hazards:
 - Biological, chemical, physical
 - Health and safety program plans
 - PPE
 - Respiratory protection
 - Hearing
 - Lock-out/tag-out
- <https://www.colorado.gov/pacific/cdphe/marijuana-occupational-safety-and-health>

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

CANNABIS AND PUBLIC HEALTH ORGANIZATIONS:

Colorado Department of Public Health & Environment & Colorado School of Public Health

Job Hazard Analysis

Job: Bud Trimming (Dry)	(Company name and address)
Department or location: Trimming	

Task or Step	Hazards	Controls	Personal Protective Equipment (PPE)
Remove any unwanted leaves (hand trimming)	Ergonomics/ cuts repetitive motions Body position Eye strain Allergic reactions/ sensitivity Molds (exposure)	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	Gloves Eye protection Respirator (Dust mask- half face) (required/voluntary use) Long sleeves
-Machine Trimming	Spinning parts/ blades Pinch points Cuts Noise	Use machine guarding LOTO Use properly rated equipment for the job- no homemade equipment Proper interlocks- no bypassing Good ventilation	Gloves/ eye protection Hearing protection
Machine trimming-cleaning	exposure to solvents cuts Pinch points	LOTO	Gloves/ eye protection/ aprons

CANNABIS AND PUBLIC HEALTH ORGANIZATIONS:

Colorado Department of Public Health & Environment & Colorado School of Public Health

■ 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 I: Worker Safety and Health, and Impact of Cannabis Use History on Workplace Impairment and Workplace Drug Testing”
 - “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:



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
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

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.

