

The Wild West: Cannabis Industry - Safety Problems, Risk Factors, and Exposures



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Kristy Schultz, MS, CIE

Karen Gunderson MPH, CIH, CHMM

Monika Maier, CSP

Overview



- Basic Terminology
- Types of Products
- Common Jobs
- Cannabis Production
- Loss Prevention Focus
 - Industrial Hygiene
 - Safety
 - Ergonomics

Basic Terminology

- **Cannabis**
 - Tetrahydrocannabinol (THC)
 - Cannabidiol (CBD)
- **Some Plant Parts**
 - Cola, Trichomes, Flower, Leaves
- **Plant Types**
 - Indica, Sativa, Hybrids
- **Type of Grows**
 - Indoor or Outdoor



Types of Products

- Inhalation
 - Smoking by pipes, joints, water pipes, vapes, shatter
- Edibles
 - Cookies, coffee, chocolate, mineral water, gummies, soda, cannabutter
- Concentrated Liquid Extract
 - Tincture
- Oils and Creams



Shatter

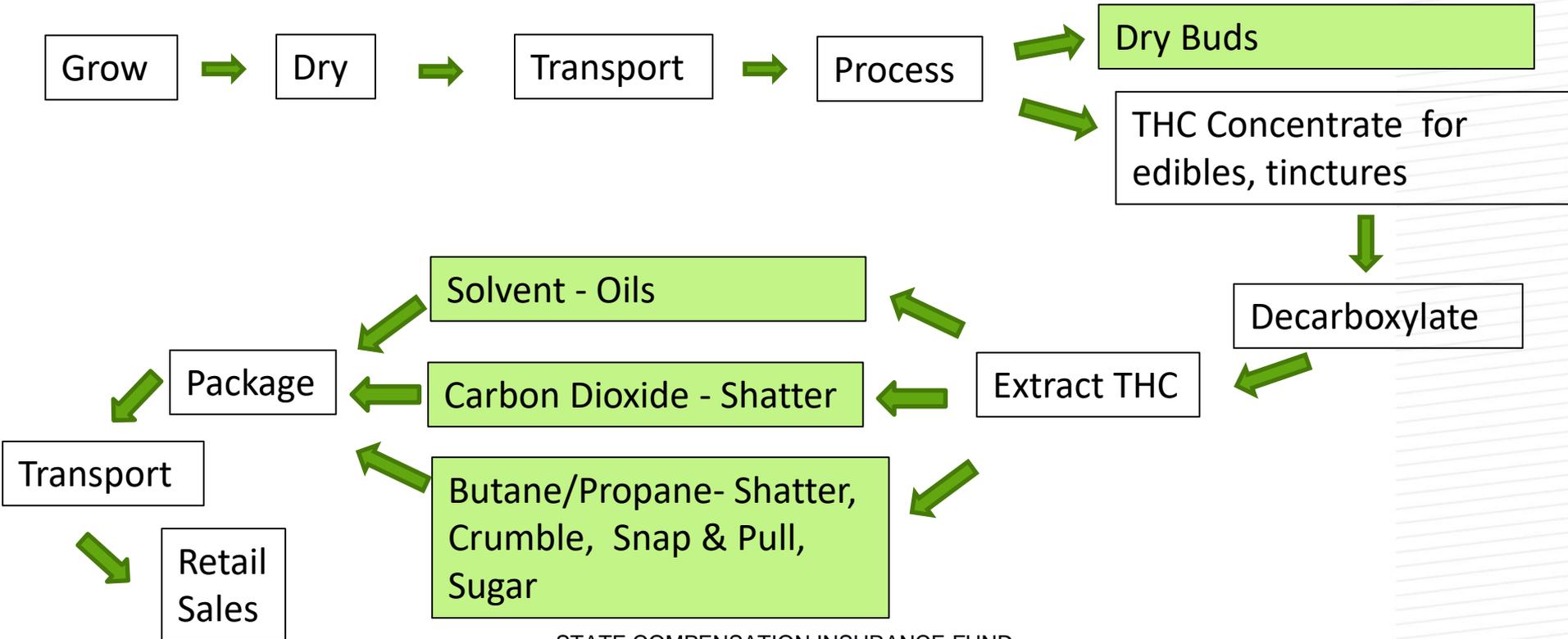


Common Jobs

- Cultivator
- Trimmer
- Extraction Technician
- Edible Producer
- Budtender
- Lab Technician
- Production
- Brand Ambassadors
- Drivers
- Security
- Maintenance/Office Staff



Cannabis Production - Overview



Exposures Covered:

- Grow Lights
- Dusts
- Extraction
- Distillation



Indoor Grow Lights - LED

- Light Emitting Diode Lights (LED)
 - Mimics Sunlight
 - Red Light (flowering)
 - Not hazardous
 - Blue Light (growth)
 - Interferes with sleep, melatonin
 - Cornea can't block, retinal damage
 - UVA
 - Retinal burns
 - UVB
 - Corneal damage
 - No Mercury in Bulbs



Indoor Grow Lights - HPS

- High Pressure Sodium Lights (HPS)
 - Visible light only
 - Intense (bright light)
 - Heavy in Red Light for Flowering
 - Produces a Lot of Heat
 - Broken Bulb Hazards
 - Mercury and UV light
 - Chronic Hazard for Retinal Burns



Indoor Grow Lights - Metal Halide

- Metal Halide Lights (MH)
 - Full Spectrum
 - Blue Light (growth)
 - Melatonin blocker
 - Retinal damage
 - UVA, UVB
 - Retinal burns
 - Corneal damage
 - Infrared Light
 - Contains Mercury Vapor and Metal Halides



Indoor Grow Lights - Others

- Fluorescent Light
 - Small scale
 - Not as intense
- Incandescent Bulbs
 - Never used for growing



Lighting Hazards Controls

- Limit exposure time
- Grow lights off for maintenance
- Skin coverage, clothing
- Special glasses
 - Dependent on type of grow light

LED Grow



HPS Grow



Dust Exposures

- Dried Leaf Dust
 - Grinding to fine powder prior to extraction
 - Hammer Mill grinder, smaller scale grinders
- Activated Carbon Dust
 - Removal of chlorophyll from extract solution
- Sugar/Citric Acid Dust
 - Addition to mixer that coats edible candies and gummies.
- *Respirators or dust masks present but no instruction, fit test, medical clearance*



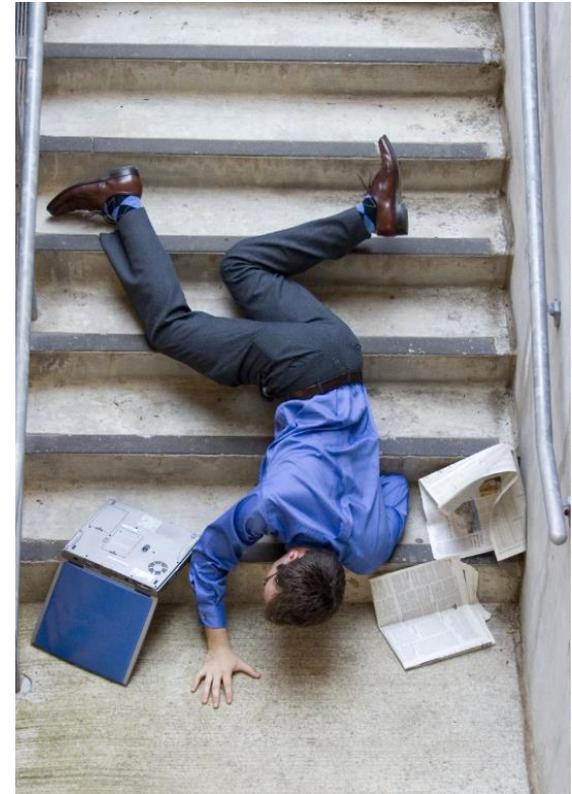
Extraction – Ethanol and Dry Ice

- Ground leaves added to ethanol bath in extraction vessel
- Temperature reduced with dry ice
- Solution recirculated
- Small unventilated room
- CO2 Sublimates
 - Solid CO₂ → Gaseous CO₂
- Odorless and colorless.



Carbon Dioxide (Dry Ice) Hazards

- Asphyxiant and Toxic
- Low levels – headaches and dizziness
- Higher levels - rapid breathing, confusion, increased heart rate and blood pressure, arrhythmias, and ***even death.***



Carbon Dioxide Hazards

Occupational Exposure Limits for Carbon Dioxide (CO₂)

Cal-OSHA PEL	Cal-OSHA Short Term Exposure Limit	ACGIH TLV	ACGIH Short Term Exposure Limit
5,000 ppm 0.5%	30,000 ppm 3%	5,000 ppm 0.5%	30,000 ppm 3%

Key to Table Abbreviations:

PEL – Permissible Exposure Limit (8 hour time weighted average)

ACGIH TLV- American Conference Governmental Industrial Hygienists Threshold Limit Value (8 hour time weighted average)

Ppm- parts CO₂ per million parts of air

Normal air contains 0.04% CO₂ (~400ppm)

Carbon Dioxide (Dry Ice) Hazards

- Dry ice is very cold
- Surface temperature of -109.3 degrees Fahrenheit
- Skin contact causes burns
 - Similar to frostbite
 - Happens quickly



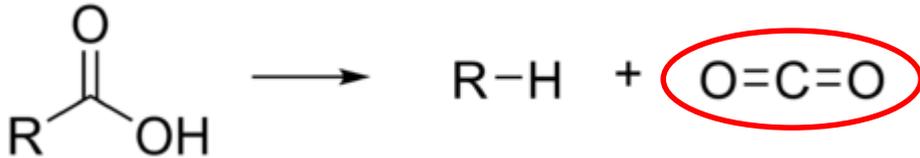
Dry Ice Storage



- Typical container
- When lid opened
- >3000 ppm CO₂

Other Carbon Dioxide Exposures

- Decarboxylation
 - Converts THC-A to THC
 - Removes Carbon Dioxide



- Elevated CO₂ Levels in Indoor Grows
 - Large tanks outside building plumbed in



Ethanol Extraction - State of Art



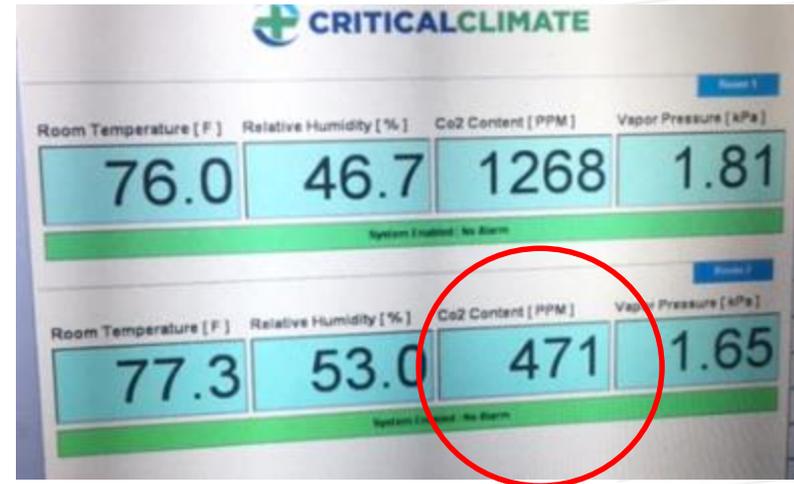
Carbon Dioxide Extraction System

- Automated CO₂ Extraction System
 - Forms Supercritical CO₂
 - Gas-liquid form of CO₂
 - Temperature
 - Pressure
 - No Solvent Residues
 - Fractionation of Terpenes (better flavor)
 - Carbon Dioxide is Recycled



Carbon Dioxide Controls

- Carbon dioxide emissions vented to outside
- Carbon dioxide personal monitor—direct reading
- Fixed carbon dioxide detector in room
- Proper PPE for handling dry ice
 - Cryo gloves, face shield, and apron



Propane/Butane Extractions

- Cool gases until they liquefy using low pressure and temperatures
 - Propane Boiling Point - 44°F
 - Butane Boiling Point - 30°F
- Run liquefied gas through sock filled with dried cannabis
- Capture liquid extract at bottom
- Modify temp and pressure to drive off the gases



Controls - Flammable Gas Extractions

- Ventilation
 - Fume hoods
 - Walk-in hoods
 - Booths
 - Exhausted rooms
- LEL Detectors
 - Fixed with warning alarm and/or light
 - Portable for detecting leaks in system
- Hearing Protection



Distillation Removes Extraction Solvents



- **Rotary Evaporation**
 - Under Vacuum
 - Heating of Ethanol
 - Drives off solvent at boiling point
 - Cannabis oil left behind

Fractional Distillation

- Further separates THC fractions with different amounts of terpenes
- Gives the oil a different flavor depending on terpene blend
- Involves heating the oil/solvent mixture further under vacuum



Controls for Distillation/Solvent Removal

- Staff Monitoring of Still
- Ventilated Rooms
 - Lab hood for filtering, small scale extracts
- Exhaust Systems
 - similar to standard lab type exhaust hood for still.
- PPE - gloves, lab coats, safety goggles

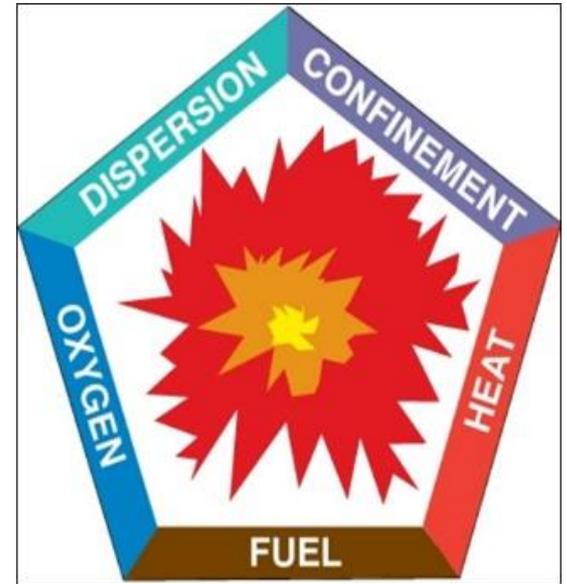


Safety Hazards

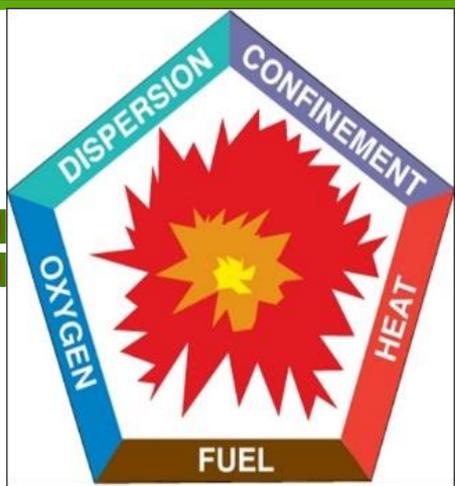
- Combustible Dust
- Electrical Hazards
- Trip Hazards
- Fire Suppression
- Security
- Heat Illness
- Tractor Safety
- Forklift Safety
- Licensing Safety Requirement
- Pesticide Safety
- Chemical Hazards

The combustible dust pentagon

- Combustible dust
- Dispersion of dust particles
- Source of ignition
- Confinement of dust cloud
- Oxygen in the air



Combustible Dust Explosion



Cannabis buds

Ground to powder
for extraction

BOOM!

Combustible Dust Solutions

- Improve housekeeping
- Use dust collection systems
- Eliminate fugitive dust from equipment
- Minimize horizontal surfaces that collect dust
- Use only explosion proof vacuum cleaners
- Bond/ground appropriate equipment
- Control static electricity
- Eliminate open flames, sparks, smoking and friction



Electrical Hazards

Extension Cords



Lighting Fixtures



Electrical Panels

Trip Hazards

- Extension Cords
- Watering Hoses
- Clutter
- Poor Housekeeping
- Water/Mud



Fire Suppression

- Fire alarms
- Smoke detectors
- Fire suppression
- Flammable cabinets
- Fire extinguishers
- Fire prevention plan



- Security Cameras
 - Recorded?
- Security Guard
 - Armed?
- Relationship with local Police



Heat Illness

- Outdoor Heat
 - Shade
 - Training
 - Emergency Procedures
 - Water
 - High Heat Procedures
- Primary areas of concern
 - Outdoor growing operations
 - Distribution areas/warehouses with outdoor work areas
- Indoor Heat
 - Humidity
 - Ventilation
 - Temperature
 - Water
- Primary areas of concern
 - Kitchen
 - Greenhouses
 - Distillation areas
- Cal OSHA proposed standard
 - Trigger temps of 82°F and 87° F



Tractor Safety

- ROPS
- Tractor training
- Tractor safety rules
- Daily Inspections



Forklift Safety

Located in distribution/warehouse

- Ventilated area
- Eyewash station
- Certifications
- Power Industrial Truck poster displayed
- Demarcation of pedestrian walkways



Licensing Safety Requirement

Cal Cannabis Cultivation Licensing

OSHA 30 General Industry Training
(CCR Title 3, Section 8102(bb))

- One supervisor
- One employee

CCR TITLE 3. Food and
Agriculture Division

DIVISION 8. Cannabis
Cultivation

Chapter 1. Cannabis
Cultivation Program

Pesticide Safety

- Required in Cultivation
- Pesticide Applicator
- Worker Protection Standard
- Proper Storage of Pesticides



Chemical Hazards

Compressed Gas Cylinders

- Storage
- Secured

Hazardous Liquids Storage

- Flammable cabinet
- Secondary containment

Hazardous Waste Storage

Sensitization to Cannabis

- Skin reaction to resin
- Breathing reaction from cannabis dust, mold, pesticides, solvents, soil components, ozone, other chemicals used in extraction...



Required Programs

- **Injury and Illness Prevention Program**
- **Emergency Action Plan**
- **Fire Prevention Plan**
- **Heat Illness Prevention Plan**
- **Indoor Heat Illness Prevention Plan**
- **Hazard Communication Program**
- **Respiratory Protection Program**
- **Hearing Conservation Program**
- **Confined Space**
- **Control of Energized Equipment (LOTO)**
- **Machine Guarding**
- **Ventilation Maintenance**
- **Violence in the Workplace / Active Shooter**



Ergonomics: Risk Factors for Musculoskeletal Injuries

- **High Hand Repetition, Awkward Postures, Pinch Grip Forces** – opening and closing childproof packaging, trimming
- **Lifting and Carrying** – boxes, plant containers, bags of soil, buckets
- **Awkward Postures** – bending, overreaching
- **Pinch Grips, Forceful Exertions** – hand tools (shovels, hulas, pruners)



Childproof bags

- Risk Factors
 - Pinch/pull forces from opening
 - Pinch forces from closing to seal bags
- Duration
 - Hundreds/day



Improvements Made



ROLLER



ZIPPER BAG CLOSING MACHINE
ASSOCIATEDBAG.COM



Eliminated
risk all
together by
automating
the bag
sealer



Opening Childproof Bag

Bags are now
delivered OPEN after concerns were expressed
to the bag manufacturer

Removing Cookie Dough

High forceful exertions using a scrap type of tool with awkward postures from trying to remove hard/cold cookie dough



Parchment paper used as a base -
easy to remove cookie dough

Cultivation - Transplanting

Risk Factors

- Static Posture
- Bending at the Waist (flexion)
- *Twisting*
- *Overreaching*



Raise the
work using
tables

Cultivation

Job Task: Lifting and carrying a 5-gallon bucket of “Worm Water”

- Distance is 75-feet
- Weight is ~40-pounds

Risk Factors

- Concentrated pressure to the fingers
- Asymmetric Load
- Awkward/Static Posture
- Forceful Exertion



Improvement Options



Use a bucket grip



Use a cart to carry the bucket

Improvement Options

Lifting Tool for Carrying Plant Containers

- Allows a full-hand power grip
- Decreases bending
- Reduces lifting strain
- Can improve productivity



NIOSH: Simple Solutions for Farm Workers

Improvement Options

- Keep hand tools sharp
- Keep trimmers clean from resin
 - Scrape resin off
 - Soak in rubbing alcohol
 - Use Teflon or Fluorine coating
- Consider better tool options
 - Rotating pruner handle
 - Spring loaded or ratchet
 - Easier
 - Comfortable



Trimmers for fine work



Sharpen Tools
Family Handyman©



Ratchet Pruners with Rotating Handle



THANKS!

