TAKING CARE OF MARY JANE’S WORKERS

James Lieberman

Industrial Hygiene and Occupation Safety for Marijuana Facilities
Marijuana
Evil Spell or Healing Herb

A Look at the History of Mans Relationship With Cannabis
The Plant and Its Properties

Cannabis sativa

**Sativa**
- Mainly affects the mind
- Tall and skinny plant structure
- Uplifting and/or euphoric feelings

**Indica**
- Mainly affects the body
- Short and dense plant structure
- Heavy feeling and/or "body-melt"

Cannabis sativa L
The First Recorded Use

Imperial China 2727 BC
The Spread Of Cannabis

Most Ancient Empires knew about and used cannabis
From Rome To America

Known for its many uses, cannabis was a commodity spread world wide by 1545

- Toothaches
- Child Birth
- Rope
- Paper
- Clothing
- Fibers
The Stigma Starts

Federal Bureau of Narcotics
Established 1930

The Marijuana Tax Act
of 1937
Possession Becomes a Felony

1950's-Mandatory Sentencing for Possession

Cannabis schedule I drug under Controlled Substances Act
A New Task Force Forms

The Birth of the DEA in 1973

Up to 20 Years in Jail
States fight Back

44,816 people incarcerated for cannabis in 2004
- Not including 700,000+ locally incarcerated

Legal in
- Alaska
- Colorado
- Oregon
- Washington

27 States + D.C. have legal MMJ
Medically Beneficial

A Gateway Drug?

The Endocannabinoid System

- Inflammation
- Glaucoma
- Nausea
- Pain
Industrial hygiene is dedicated to anticipating, recognizing, evaluating and controlling occupational hazards. We are responsible for protecting and enhancing health and safety.
Process Safety Management Review

PSM: A basic tool for ID and controlling hazards from operations

Identifying:

1) Physical hazards

2) Chemical hazards
Anticipated Facility and Process Parameters

Query client to determine:

- Anticipated processes
- Equipment
- Throughput
- Chemicals
- Future expansion
Common Marijuana Operations

Cultivation

Marijuana Concentrate Production (MCP)

Manufactured Infused Products (MIP)
Hazards: Butane & Solvent Extraction

- Flammability/Explosivity
- Pressure
- Exposure
Physical Hazards

Flammability

LEL for common used solvents

- Butane: 1.8%
- Ethanol: 3.3%
- Heptane: 1.1%
- Hexane: 1.2%
- Propane: 2.1%
Chemicals Used

DOT Hazard Class

- Flammable Liquid - 3
- Flammable Gas - 2.1
- Non-Flammable Gas
Non-Flammable Gas – CO$_2$

IDLH - 40,000 ppm

PEL/TLV - 5,000 ppm

Action Limit – 2,500
OEL - Common Solvents

- Butane: N/A :1000
- Ethanol: 1,000
- Heptane: 500:400
- Hexane: 500:50
- Propane: 1,000:1,000
Toxicology

Basic principle of toxicology

The dose makes the poison!
Setting OEL for THC & Extract

Measurements of Exposure

No Observed Effect Level (NOEL)

Lowest Observed Effect Level (LOEL)

Lethal Dose 50% (LD\(_{50}\))

Dose Effective 50% (DE\(_{50}\))

Therapeutic Index (TI) – Margin of safety for a drug – LD\(_{50}\)/DE\(_{50}\)
Oral OEL

Studies of THC psychotropic oral dose threshold

- First study: 0.1 to 0.2 mg/kg
- Second study: 0.2 to 0.3 mg/kg
- Third study: ~0.07 mg/kg = 5 mg dose for average adult

Set target OEL to be NOEL/10
Therefore 0.5 to 2 mg/day
1 mg/day average
Dermal Exposure

Very Conservative Assumptions:
- 10% dermal absorption
- Avoidance dose 5 mg
- Extract containing 80% cannabinoids

- Dermal occupational exposure avoidance dose:
  - \((5 \text{ mg}/0.10)/0.80 = 62.5 \text{ mg of extract}\)

- Add Safety Factor of 10:
  - Dermal OEL = 6.25 mg/day
Inhalation OEL

\[ C \text{ (mg/m}^3\text{)} = \frac{D}{(V_R \times K \times t)} \]

\[ C = \frac{5}{(0.016 \times 0.50 \times 480)} \]

\[ C = 1.3 \text{ mg/m}^3 \]

Using safety factor of 10

\[ \text{OEL} = 0.13 \text{ mg/m}^3 \]
Average Dose from a “J”

Quantity: 0.5 - 1.0 g/Joint

THC concentration: 15%

Assumed: 50% inhaled vapor absorbed

Dose = 38 – 75 mg
Hazard Controls

Engineering & administrative controls determined through:

1) Hazard Assessment
2) Process Safety Management Review
3) Exposure Assessment
Controls: Butane & Solvent Extraction

Containment

Ventilation

Storage

Procedures

PPE

Training
# Controls for CO₂ Extraction

<table>
<thead>
<tr>
<th>Good process layout</th>
<th>Creation of operating procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dedicated room &amp; ventilation</td>
<td>Hazard, equipment, and operations training</td>
</tr>
<tr>
<td>Safely directing relief exhaust</td>
<td>Emergency action plans</td>
</tr>
<tr>
<td>Gas alarm for high levels</td>
<td>Appropriate PPE</td>
</tr>
</tbody>
</table>
Thank You For Your Time

Any questions?

THC-SAFETY.com