Methamphetamine Concerns and Exposures Associated with Use and Manufacture

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What is a Meth Lab?

[Images of a meth lab environment]
Red P Cook at a Home

The “Birch” or “Nazi” Method

ANHYDROUS AMMONIA

DURACELL DRILL
Hazards Present During the Cook

- Red Phosphorous Cooks
  - Phosphine, iodine, phosphorous, strong base

- Anhydrous Ammonia Cooks
  - Anhydrous ammonia, reactive metals

- All Cooks
  - Hydrogen chloride, solvents, methamphetamine, fire hazards

Airborne Methamphetamine using Red P Method

4200 ug/m³
To
5500 ug/m³

Methamphetamine

- Symptoms
  - Very little known regarding low level chronic exposures.
  - Irritation of the skin, eyes, mucous membranes, and upper respiratory tract.
  - High levels may cause dizziness, headache, metallic taste, insomnia, high or low blood pressure, etc.
  - Chronic exposures may cause irritability, personality changes, anxiety, hallucinations, psychotic behavior.
  - Smaller infants, altered behavior patterns, lower IQ scores, teratogenic affects, cerebral hemorrhage.
  - Skin absorption is possible.

- Current Standards
  - None
  - Therapeutic dose = 5 mg (2 to 3 x per day)
  - Surface contamination = 0.1 - 0.5 ug/100 cm²
What About After the Cook?

Study Design

- **Day One**
  - Two controlled methamphetamine cooks
  - Red P method – 3 g each
  - Sampling time = approximately 4 hours
- **Day Two**
  - No Activity
  - Medium Activity
  - Heavy Activity
  - Each sampling time = 2 hours

Medium Activity
Iodine and Hydrogen Chloride

<table>
<thead>
<tr>
<th></th>
<th>Iodine (ppm)</th>
<th>Hydrogen Chloride (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cook Area</td>
<td>0.07</td>
<td>0.34</td>
</tr>
<tr>
<td>Remote Area</td>
<td>0.005</td>
<td>0.09</td>
</tr>
<tr>
<td>No Activity</td>
<td>0.005</td>
<td>ND</td>
</tr>
<tr>
<td>Medium Activity</td>
<td>0.005</td>
<td>0.04</td>
</tr>
<tr>
<td>Heavy Activity</td>
<td>0.002</td>
<td>0.07</td>
</tr>
<tr>
<td>TLV</td>
<td>0.1 (c)</td>
<td>2 (c)</td>
</tr>
<tr>
<td>RFC (CDPHE/EPA)</td>
<td>0.0001</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Exposures 24 hours After a Cook

- **Airborne Methamphetamine**
  - During the Cook - 520 – 780 ug/m³
  - Walking Around - 70 – 117 ug/m³
  - Mild Activity - 106 – 170 ug/m³
  - Heavy Activity - 100 – 210 ug/m³
- **Meth in Carpet Dust**
  - 59 ug/m² – 270 ug/m²
- **Other Compounds**
  - Iodine and HCl becomes airborne next day

Surface Meth Concentrations
Carpet Contamination

Controlled “Smoke”

Study Process
- Standard motel room
- Did not inhale
- Total amount: 2.45 grams
Controlled Smoke Findings

- Airborne meth levels ranged from 330 ug/m³ to 1600 ug/m³. (Typical lab levels = 4000 - 5000 ug/m³)

- Surface areas throughout the room were contaminated with up to 35 ug/100 cm². (Typical lab levels range up to 2800 ug/100 cm²)

- These levels may be less due to inhalation.

Research Findings from the Utah Methamphetamine Project at National Jewish Health
Goals of the Project

- Determine sampling efficiencies.
  - False positive and negative rates
  - Inter-laboratory variation
  - Interferences
    - Laboratory
    - Homes
  - Solvent usage (methanol, isopropanol, water)
  - Recovery rates from different surfaces.

- Suggest a sampling protocol

- Determine potential personnel contamination at clandestine methamphetamine laboratories

Goals (cont)

- Determine decontamination effectiveness
  - Decontamination of clothes.
  - Decontamination of building materials

- Determine effectiveness of different cleaners
  - Simple Green
  - Oxidizer solutions
  - Compare different surfaces (porous, smooth)

- Explore methamphetamine penetration into painted drywall

- Explore encapsulation of methamphetamine-contaminated surfaces.

Goals (cont)

- Provide suggestions for decontamination of individuals and materials from clandestine methamphetamine laboratories

- Help to create a website for Utah’s methamphetamine project.
Sampling Specificity and Precision

Sampling Precision and Specificity

- Our Data
  - 53 blanks submitted = 53 ND (<0.05 ug)
  - 34 - 0.03 ug spikes = 31 ND and 3 at 0.37 - 0.38 ug.
  - 34 - 0.06 ug spikes
    - Range = ND - 0.10 (avg. = 0.08)
    - 2 samples at ND from 1 lab.
    - 23 samples within 10% of actual level
  - 25 - 0.3 ug spikes
    - Range = 0.3 - 0.37
    - Only 2 samples over 20% difference

Sampling Specificity and Precision

- Samples using LC/MS or GC/MS are extremely precise and specific.
- A non-detect at 0.05 ug/wipe is accurate and even a spike at 0.03 ug will not be reported.
- Most samples to the lab will be within +/- 30% of the actual amount present.
- The presence of dust and latex paint will not change the results.
- The use of isopropanol or methanol will not interfere with the results.
- No difference between glass and plastic, between gauze and filter, or between cooled and uncooled shipping.
Methamphetamine Recovery Protocol

• Purpose – Determine how easily meth can be recovered from different surfaces using different solvents.

• Surfaces – unpainted drywall, painted drywall, unpainted wood, painted wood, glass, metal, floor tile, carpeting, clothing.

• Solvents – water, isopropanol, methanol

Protocol

• Used "street meth" spiked to surfaces in a methanol solution using a micropipette.
  • Spiked level = 27 ug/100 cm²

• Dried overnight prior to sampling.

• Sampled using a 3" x 3" gauze wipe.
  • 18 samples/surface
  • 5 samples/surface/solvent
  • 27 control samples
  • 135 spiked samples

• Analyzed using LC/MS
<table>
<thead>
<tr>
<th>Surface Type</th>
<th>Mean Recovery</th>
<th>Median Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unpainted Drywall</td>
<td>0.9 %</td>
<td>0.4 %</td>
</tr>
<tr>
<td>Painted Drywall</td>
<td>73.8%</td>
<td>70.4 %</td>
</tr>
<tr>
<td>Unpainted Wood</td>
<td>5.8%</td>
<td>5.2 %</td>
</tr>
<tr>
<td>Painted Wood</td>
<td>74.3 %</td>
<td>77.8 %</td>
</tr>
<tr>
<td>Glass</td>
<td>53.3 %</td>
<td>53.3 %</td>
</tr>
<tr>
<td>Metal</td>
<td>90.1%</td>
<td>91.9 %</td>
</tr>
<tr>
<td>Tile</td>
<td>11.6%</td>
<td>8.9 %</td>
</tr>
<tr>
<td>Carpeting</td>
<td>1.3%</td>
<td>1.3 %</td>
</tr>
<tr>
<td>Clothing</td>
<td>0.4%</td>
<td>0.4%</td>
</tr>
</tbody>
</table>

**Contamination**

- A total of 227 total personnel contamination samples were taken during all of our projects.
- 154 were above 0.02 ug/sample
- Mean for positive samples = 11.2 ug/sample
- Median = 0.80 ug/sample
- Range = 0.04 ug/sample - 580 ug/sample
Personnel Contamination

- **Cook Personnel**
  - Sample # = 46 (96% tested positive)
  - Mean = 22.1 ug/sample
  - Median = 2.22 ug/sample
  - Range = 0.04 - 580 ug/sample
- **Investigation Only (Staged Cooks)**
  - Sample # = 72 (87% tested positive)
  - Mean = 8.7 ug/sample
  - Median = 0.97 ug/sample
  - Range = 0.06 - 230 ug/sample

Personnel Contamination (cont)

- **Suspect Contamination**
  - 18 samples taken (94% positive)
  - Mean = 5.5 ug/sample
  - Median = 3.22 ug/sample
  - Range = 0.2 - 17.4 ug/sample

Lab Bust Contamination

- **Suspects**
  - 0.9 ug/wipe to 17.4 ug/wipe
  - Hands, clothing, etc.
- **Children**
  - 0.2 ug/wipe to 1.18 ug/wipe
- **Pets**
  - 1.89 ug/wipe (fur)
- **Law Enforcement Officers**
  - 0.5 - 0.93 ug/wipe
Entry Only Contamination: 24 hours After Cook

- All individuals that entered the home came out with measurable contamination.
  - Foot Contamination
    - Mean = 0.78 - 49 ug/wipe
  - Hand Contamination
    - Mean = 29 - 56 ug/wipe
  - Neck
    - Mean = All positive but most below 1.0 ug

Activity Related Exposure 24 Hours After a Staged Cook

- Heavy Activity
  - Mean = 11.1 ug/sample
  - Median = 0.7 ug/sample
  - Range = 0.59 - 49 ug/sample
- Medium Activity
  - Mean = 9.4 ug/sample
  - Median = 1.0 ug/sample
  - Range = 0.3 - 56 ug/sample
- Low Activity
  - Mean = 0.6 ug/sample
  - Median = 0.6 ug/sample
  - Range = 0.08 - 1.7 ug/sample

What Does This Mean?

- Anyone entering or taken from the lab area will be contaminated with low levels of methamphetamine.
- In many cases, these levels may not be high.
- The potential for high contamination level does exist.
  - Accidents, fires, entry during the cook, etc.
- Contamination may involve more than meth.
- There is no adequate method for direct detection at this time.
Clothing Decontamination

- **Purpose**: To test the effectiveness of clothing decontamination by washing.
  - Normal washing machine
  - Warm water
  - Cold water Tide

- **Clothing tested**
  - Denim cloth
  - Cotton blanket material
  - Bunker Gear

- **Treatments**
  - 1 wash, 2 washes, 3 washes, no washes
  - "Street meth" in chamber
  - Random number grid for sampling
  - Dried overnight prior to sampling
## Denim Cloth Results

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Start (Ug/100 cm²)</th>
<th>Finish (Ug/100 cm²)</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Wash</td>
<td>112.9</td>
<td>122.9</td>
<td>+ 9.0%</td>
</tr>
<tr>
<td>1 Wash</td>
<td>150</td>
<td>0.9</td>
<td>99.4%</td>
</tr>
<tr>
<td>2 Washes</td>
<td>115.4</td>
<td>0.3</td>
<td>99.7%</td>
</tr>
<tr>
<td>3 Washes</td>
<td>101.1</td>
<td>0.2</td>
<td>99.8%</td>
</tr>
</tbody>
</table>

## Cotton Cloth Results

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Start (Ug/100 cm²)</th>
<th>Finish (Ug/100 cm²)</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Wash</td>
<td>255.7</td>
<td>156.4</td>
<td>39%</td>
</tr>
<tr>
<td>1 Wash</td>
<td>271.4</td>
<td>0.5</td>
<td>99.8%</td>
</tr>
<tr>
<td>2 Washes</td>
<td>218.6</td>
<td>0.2</td>
<td>99.9%</td>
</tr>
<tr>
<td>3 Washes</td>
<td>125.0</td>
<td>0.2</td>
<td>99.8%</td>
</tr>
</tbody>
</table>
### Bunker Gear Results

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Start (ug/100 cm²)</th>
<th>Finish (ug/100 cm²)</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Wash Outside</td>
<td>102</td>
<td>4</td>
<td>96.1%</td>
</tr>
<tr>
<td>1 Wash Inside</td>
<td>64</td>
<td>3.4</td>
<td>94.6%</td>
</tr>
<tr>
<td>3 Washes Outside</td>
<td>109</td>
<td>1.3</td>
<td>98.8%</td>
</tr>
<tr>
<td>3 Washes Inside</td>
<td>19.5</td>
<td>1.6</td>
<td>91.8%</td>
</tr>
</tbody>
</table>

### Conclusions
- The initial wash in a normal washing machine with no bleach resulted in a significant reduction in methamphetamine levels.
- Subsequent washes did not result in as drastic a reduction.
  - Residual meth was normally less than 0.2 ug/100 cm²
  - The last portion of meth may not be easy to remove and may not pose a significant threat.
  - Levels may dissipate over time for some clothing and not for others. We will look at this in the future.

### Painted Construction Materials Decontamination
- Purpose - To test the effectiveness of painted construction material decontamination by washing.
  - Simple Green using spray bottle
  - Light scrubbing
  - Warm water rinse
- Treatments
  - 1 wash, 2 washes, 3 washes, no washes
  - "Street meth" in chamber
  - Random number grid for sampling
  - Dried overnight prior to sampling
  - Dried between washes
  - New washcloth
### Painted Drywall Results

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Start (ug/100 cm²)</th>
<th>Finish (ug/100 cm²)</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Wash</td>
<td>12.9</td>
<td>14.3</td>
<td>-10.5%</td>
</tr>
<tr>
<td>1 Wash</td>
<td>36.1</td>
<td>8.5</td>
<td>76.5%</td>
</tr>
<tr>
<td>2 Washes</td>
<td>22.9</td>
<td>5.2</td>
<td>77.4%</td>
</tr>
<tr>
<td>3 Washes</td>
<td>17.0</td>
<td>3.2</td>
<td>80.9%</td>
</tr>
</tbody>
</table>

### Painted Plywood Results

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Start (ug/100 cm²)</th>
<th>Finish (ug/100 cm²)</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Wash</td>
<td>11.3</td>
<td>12.5</td>
<td>-10.5%</td>
</tr>
<tr>
<td>1 Wash</td>
<td>12.1</td>
<td>5.7</td>
<td>52.9%</td>
</tr>
<tr>
<td>2 Washes</td>
<td>11.4</td>
<td>4.2</td>
<td>62.9%</td>
</tr>
<tr>
<td>3 Washes</td>
<td>17.9</td>
<td>3.6</td>
<td>79.6%</td>
</tr>
</tbody>
</table>

### Sheet Metal Results

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Start (ug/100 cm²)</th>
<th>Finish (ug/100 cm²)</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Wash</td>
<td>3.6</td>
<td>3.2</td>
<td>12%</td>
</tr>
<tr>
<td>1 Wash</td>
<td>11.4</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>2 Washes</td>
<td>1</td>
<td>0</td>
<td>100%</td>
</tr>
</tbody>
</table>
## Glass Results

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Start (ug/100 cm²)</th>
<th>Finish (ug/100 cm²)</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Wash</td>
<td>0.1</td>
<td>0.2</td>
<td>-50%</td>
</tr>
<tr>
<td>1 Wash</td>
<td>0.2</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>2 Washes</td>
<td>12.5</td>
<td>0</td>
<td>100%</td>
</tr>
</tbody>
</table>

## Conclusions

- It is difficult to decontaminate painted surfaces.
- The initial decontamination cleaning will remove the majority of the methamphetamine that can easily be removed.
  - 50% - 70% of the methamphetamine present is removed from the first wash.
  - Up to 80% is removed through subsequent washes
- Smooth surfaces (metal and glass) can be cleaned with a single wash.

## Decontamination with Oxidizers
Decontamination with Oxidizers

• Utilized three cleaning agents:
  • Hypochlorite-based cleaning agent
  • Quaternary ammonia cleaning agent
  • Hydrogen Peroxide - based agent

• Cleaning Process
  • Sprayed on cleaning agent and let stand for 1.5 minutes
  • Wiped cleaning agent off with tap water and cloth.
  • Hydrogen peroxide agent was just let stand.
  • Minimized potential contamination by using different cloths at each rinsing.
### Results of Quaternary Ammonia Cleaner

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Starting Conc.</th>
<th>Finishing Conc.</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Treatment</td>
<td>21 ug/100 cm²</td>
<td>21 ug/100 cm²</td>
<td>0%</td>
</tr>
<tr>
<td>One Wash</td>
<td>26 ug/100 cm²</td>
<td>2.7 ug/100 cm²</td>
<td>90%</td>
</tr>
<tr>
<td>Three Washes</td>
<td>18 ug/100 cm²</td>
<td>96 ug/100 cm²</td>
<td>95%</td>
</tr>
</tbody>
</table>

### Results of Hypochlorite Cleaner

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Starting Conc.</th>
<th>Finishing Conc.</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Treatment</td>
<td>20 ug/100 cm²</td>
<td>21 ug/100 cm²</td>
<td>-6%</td>
</tr>
<tr>
<td>One Wash</td>
<td>20 ug/100 cm²</td>
<td>8.9 ug/100 cm²</td>
<td>56%</td>
</tr>
<tr>
<td>Three Washes</td>
<td>23.6 ug/100 cm²</td>
<td>8.4 ug/100 cm²</td>
<td>64%</td>
</tr>
</tbody>
</table>
Results of Hydrogen Peroxide Agent

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Starting Conc.</th>
<th>Finishing Conc.</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Treatment</td>
<td>15.3 ug/100 cm²</td>
<td>14.6 ug/100 cm²</td>
<td>4.3%</td>
</tr>
<tr>
<td>One Wash</td>
<td>14.8 ug/100 cm²</td>
<td>&lt;0.05 ug/100 cm²</td>
<td>100%</td>
</tr>
<tr>
<td>Three Washes</td>
<td>14 ug/100 cm²</td>
<td>&lt;0.05 ug/100 cm²</td>
<td>100%</td>
</tr>
</tbody>
</table>

Conclusions

- The hydrogen peroxide agent was the most effective with no detectable methamphetamine present after its use.
- The quaternary ammonia cleaner was more effective than the hypochlorite cleaner.
  - 1st wash = 90% vs. 50%
  - 3rd wash = 95% vs 64%
- All of these chemicals are very irritating and may be associated with pulmonary problems.
- Oxidation by-products are unknown at this time.

Methamphetamine Persistence in Paint

- Exposed drywall painted with latex paint to methamphetamine in a chamber
  - Sampled the drywall with methanol wipe.
  - Sampled the remaining paint by cutting out a 100 cm² section of paint and paper.
  - Sampled an un-sampled area by cutting out a 100 cm² section of paint and paper.
### Methamphetamine penetration into painted drywall

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Mean Meth Level</th>
<th>Median Meth Level</th>
<th>Mean % of Total Meth</th>
<th>Median % of Total Meth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wipe Only</td>
<td>5.5</td>
<td>4.8</td>
<td>36.9</td>
<td>34.3</td>
</tr>
<tr>
<td>Cut Out After Wipe</td>
<td>8.6</td>
<td>8.6</td>
<td>57.8</td>
<td>61.4</td>
</tr>
<tr>
<td>Cut Out</td>
<td>14.8</td>
<td>14.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cut Out After Wipe + Wipe</td>
<td>14.0</td>
<td>13.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Methamphetamine Reduction Over Time

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Date Sampled</th>
<th>Mean Meth Conc.</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Treatment</td>
<td>7/24/2008</td>
<td>14.3 ug/100 cm²</td>
<td></td>
</tr>
<tr>
<td>No Treatment</td>
<td>1/19/2008</td>
<td>3.2 ug/100 cm²</td>
<td>77.6%</td>
</tr>
<tr>
<td>Three Washes</td>
<td>7/24/2008</td>
<td>3.3 ug/100 cm²</td>
<td></td>
</tr>
<tr>
<td>Three Washes</td>
<td>1/19/2009</td>
<td>0.62 ug/100 cm²</td>
<td>81.3%</td>
</tr>
</tbody>
</table>
Conclusions

• Wipe samples only remove approximately 30% of the total meth on a painted drywall surface.

• 50% - 60% of the meth present is contained within the paint.
  - Used latex enamel paint
  - Surface was painted recently (2 days)

• Over a period of 6 months, the amount of meth present (via wipe only) on painted drywall was reduced by as much as 81%

Encapsulation of Methamphetamine on Drywall

• Contaminated drywall in a chamber using street methamphetamine
  - Painted with latex paint
  - Painted with Kilz paint
  - Painted with oil based paint

• Used a roller for the latex paint and sprayed on the other paints.
• Sampled using a methanol wetted wipe.
• Re-sampled 4 months later to determine break-through
<table>
<thead>
<tr>
<th>Treatment</th>
<th>Mean Conc.</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated Pretest</td>
<td>29.7</td>
<td></td>
</tr>
<tr>
<td>Untreated Post test</td>
<td>27.2</td>
<td>8.3</td>
</tr>
<tr>
<td>Latex Pretest</td>
<td>29.8</td>
<td></td>
</tr>
<tr>
<td>Latex Post test</td>
<td>5.0</td>
<td>83.4</td>
</tr>
<tr>
<td>Latex 4 month</td>
<td>2.4</td>
<td>91.8</td>
</tr>
<tr>
<td>Kills Pretest</td>
<td>28.4</td>
<td></td>
</tr>
<tr>
<td>Kills Post Test</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Kills 4 month</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Oil Pretest</td>
<td>34.6</td>
<td></td>
</tr>
<tr>
<td>Oil Post Test</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Oil 4 month</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

**Conclusions**

- Latex applied with a roller will only encapsulate approximately 83% of the meth present.
- Oil based paints will encapsulate 100% of the meth present.
  - No meth broke through for as long as 4 months.
Health Hazards Associated with Marijuana Grow Operations

Types of Marijuana Operations

• Small Home Operations
  • Few plants for recreational use.
  • Similar to any plant growing.

• Large Outdoor Operations
  • May have acres of plants.
  • Water pollution, criminal behavior.

• Large Indoor Operations
  • Called MGO's
Indoor MGO’s

- Numbers have increased dramatically.
  - Ontario believes they have 15,000 in Province.
  - Calgary raids 100 MGO’s per year
  - Increasing in the US.
- Who are they?
  - Growers hire family to grow.
  - Many have children.
Why Have Indoor MGO’s

- Better growing conditions
  - Plants grow and mature faster.
  - Growing conditions can be controlled.
  - THC content can be doubled.
- Security
  - May be harder to detect.
  - Law enforcement is using thermography and utility usage.
- Continuous crop rotations

Average THC Content of Marijuana

Environmental Conditions in MGO’s

- Hydroponic and “Natural” grow conditions.
- High humidity present in both types of operations.
- High carbon dioxide increases THC content.
- Electricity demands are high and often jury-rigged.
- Temperatures are normally high.
- Pesticides and fertilizers are utilized.
- Solvents may be utilized for extractions.
Dangers Associated with MGO's

- Environmental Conditions
  - Elevated CO2, Mold, Nitrogen Oxides, pesticides, fertilizers.
- Structural and electric Problems
  - Damage to foundations, cuts in floors, mold, fires.
- Utility Theft
  - Use of high intensity lights need high electricity flow.
  - Single utility in Ontario estimated loss at $1 million at 191 MGO's
- Criminal Activity
  - Booby traps, firearms, etc
- Hashish Production

Reports of Health Complaints

- Denver Area Law Enforcement
  - Reports of rashes, difficulty breathing, increased asthma symptoms.
- Other Law Enforcement Complaints
  - Upper respiratory irritation, runny nose, cough, rash, eye irritation.
Exposure Concerns

- High Humidity and warm temperatures.
  - Fungal growth
  - Endotoxin
- Elevated carbon dioxide
  - Carbon monoxide exposures
  - Oxides of nitrogen exposures
- Fertilizers and pesticides
- Solvents

Health Hazards Associated with Fungal Exposure
Exposures to Fungal Contamination

- Canada Mortgage and Housing Corp.
  - Looked at 32 MGO's
  - 7 had extensive mold contamination
  - 2 moderate mold contamination
  - Musty smell in most houses

- Jennifer Mustard et al. looked at 68 homes and found no significant difference in total spore counts
  - Asp/pen increased in unknown history homes.

- McLaren et al. found 13/14 samples contaminated with Aspergillus.
  - Majority of pot smokers have antibodies to Aspergillus sp.

Health Effects of Fungi

- Allergic Reactions
  - Hay fever, allergic rhinitis, hypersensitivity pneumonitis, asthma

- Infections
  - Aspergillosis

- Irritation and Toxic Reactions
  - Mycotoxins, endotoxins, MVOC's
  - Stachybotris
Health Concerns During Investigation
• Dust exposure for sensitive individuals.
• Allergic response from sensitized individuals.
  • Asthma
  • Atopic
  • Hypersensitivity Pneumonitis
• Aspergillus sp infections in individuals with a lowered immune system.
• Organic Dust Toxic Syndrome (ODTS)
  • Fever, flu-like symptoms, respiratory affects.

Hypersensitivity Pneumonitis
• Caused by repeated or continuous exposure to antigenic substances.
• Flu symptoms - chills, fever, malaise, cough, difficulty breathing.
• Granulomatous lesions within the lung.
• Easily misdiagnosed.
  • Sarcoidosis

Pesticide Exposures
Hazards of Concern

- Insecticides
  - Organophosphates
  - Carbamates
  - Biologicals
- Herbicides
  - Chlorophenoxy Herbicides
- Other Pesticides

Route of Entry

- Ingestion
  - Chlorophenoxy herbicides
- Skin Absorption
  - Organophosphates
- Respiratory
  - Pyrethrins

Organophosphates

- Causes phosphorylation of the acetylcholinesterase enzyme at the nerve endings.
Organophosphates (Cont)

• Symptoms
  • Headache, hypersecretion, muscle twitching, nausea, diarrhea, respiratory depression, seizures, loss of consciousness, miosis, depressed plasma and red cell cholinesterase.

• Cause of death
  • Pulmonary edema
  • Respiratory failure

• Treatment
  • Establish airway, atropine sulfate, pralidoxime (2-PAM), decontaminate

Organophosphates (cont)

• Route of Entry
  • Inhalation
  • Ingestion
  • Skin Absorption

• Toxicity
  • Parathion - LD50 = 3 – 8 mg/kg
  • Phosalone - LD50 = 1500 mg/kg

• OPIDN

Carbamates

• Cause carbamylation of the acetylcholinesterase enzyme.
• It dissociates more easily than does the organophosphate bond.
  • Limits duration of effect.
  • Larger difference between initial symptoms and lethality.
Carbamates (cont)

- Symptoms
  - Fatigue, muscle weakness, dizziness, sweating, headache, salivation, sweating. Cholinesterase levels may not be significantly depressed.
- Cause of Death
  - Pulmonary edema
  - Respiratory failure
- Treatment
  - Establish airway, atropine sulfate, pralidoxime (2-PAM), decontaminate

Carbamates (cont)

- Route of Exposure
  - Primarily by inhalation or ingestion.
  - Some skin absorption may occur.
- Toxicity
  - Most have LD50's between 50 mg/kg and 500 mg/kg.

Pyrethrums

- Oleoresin extract from dried chrysanthemum flowers.
- Penetrate insects and cause nervous system paralysis.
- Human toxicity is usually as a dermal and respiratory allergen.
- Pyrethroids may cause some neurotoxicity and skin effects.
Biological Agents

- Bacillus Thuringiensis
  - Pathogenic to some insects.
- No to low toxicity for humans.
  - Fever and GI symptoms have been reported.

Chlorophenoxy Herbicides

- Symptoms
  - Not highly toxic to humans but may cause irritation to skin and mucous membranes.
  - Has caused vomiting, diarrhea, headache, confusion, cardiac changes, renal failure, metabolic changes, etc. in high ingested doses.
- Dioxin and furan contamination may be linked to teratogenic and mutagenic properties.

Un-Vented Fossil Fuel Combustion
Hazards Associated with Unvented Combustion

- Carbon Dioxide
  - Toxic reactions are only at very high exposure levels.
  - Oxygen Displacement

- Carbon Monoxide
  - Binds to hemoglobin with stronger forces than will oxygen (210 - 250 x).
  - One of the most common causes of death in the U.S.
  - Can cause permanent nerve damage.
  - No odor or taste.

Carbon Monoxide Health Effects

- Carboxyhemoglobin
  - Non-Smokers - 1 - 2%
  - 1 - 10% may result in many symptoms or very few.
  - >50% may be fatal.

- Carbon Monoxide
  - NIOSH REL = 35 ppm
    - Ceiling = 200 ppm
    - IDLH = 1,200 ppm
  - ACGIH – TLV = 25 ppm
  - OSHA - PEL = 50 ppm
Carbon Monoxide (cont)

- Carboxyhemoglobin half-life
  - Normal ½ life in blood = 2 to 6.5 Hrs
  - With Oxygen = 40 min
  - With hyperbaric oxygen = 20 min

Hazards (cont)

- Oxides of nitrogen
  - Present even if CO is absent or low.
  - Very irritating (asthmatics)
  - Nitrogen dioxide
    - 0.1 ppm may result in increased lung irritation
    - Asthmatics may have symptoms.
    - >3 ppm may result in a drop in lung function

Contact Information

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- California Documents -