Clandestine Amphetamine-Derived Drug Laboratory Cleanup Guidelines

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National Collaborating Centre for Environmental Health
Centre de collaboration nationale en santé environnementale
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Introduction

The purpose of these guidelines is to provide information on the remediation of clandestine drug labs. They may be used by public health officials, municipal agencies, law enforcement agencies, and property owners to address decontamination of former drug labs. The goal in producing these guidelines is that cleanup of amphetamine-derived drug labs will be carried out in such a way that will protect the health of re-occupants.

These guidelines are derived from instructions for methamphetamine lab cleanup in the United States, specifically from those produced in Colorado, North Carolina, and Minnesota. The American guidelines are based on known chemical characteristics of the chemicals associated with drug production. Further field research is needed to validate the effectiveness of these recommended procedures. Historically, the majority of ecstasy used in North America was produced in Europe, and data on residual ecstasy levels in labs is very scarce. Due to the chemical similarity between ecstasy and methamphetamine, this document recommends similar cleanup methods be followed for both compounds.

These guidelines are intended to protect human health from residual chemicals resulting from drug manufacturing. They do not address other health hazards that may be encountered during cleanup.

Very little research has been done on the evaluation of the effectiveness of clandestine lab cleanup. The development of a protocol for cleanup requires the collection of data documenting the effectiveness of cleaning procedures. Scientific data is needed to ensure that remediation results in effective reduction or removal of residual materials. Until research validating the cleanup procedures is completed, the effectiveness of the suggested cleanup procedures is unknown. Further research may allow for more specific recommendations for cleaning protocols.

These guidelines were designed to minimize the exposure of re-occupants to chemical residues resulting from the manufacturing of amphetamine-derived substances. Further research is needed to determine the levels of residue which remain following suggested cleanup procedures.

Background

The illegal manufacturing of methamphetamine (meth), methylenedioxymethamphetamine (MDMA, commonly called ecstasy) and methylenedioxyamphetamine (MDA) is an increasing problem in British Columbia. The number of clandestine labs discovered in this province increased from 13 to 42 over the last five years (Figure 1).

![Synthetic Labs in British Columbia](image)

*Figure 1. The number of clandestine methamphetamine, MDMA, and MDA labs seized between 2003 and October 18, 2007 (RCMP, unpublished data)*
Clandestine labs may be found in a variety of structures, including private dwellings, townhomes, apartments, motels, and vehicles. The sophistication of these labs varies widely, from individuals at home following online instruction to large elaborate set-ups.

These operations may present a danger to the health of the communities in which they operate. The most obvious dangers posed are fire and explosion risks to neighbours and law enforcement personnel. Less obvious are the health risks that residual chemicals from drug manufacturing processes present to re-occupants of the structure. Bad disposal practices may also pose a human health risk to surrounding neighbours and re-occupants.

**Exposure and toxicity**

Exposure of building occupants to residual chemicals is dependent on several factors including: the location of contamination within the structure; whether it is present in air only or on surfaces; and the behavioural patterns of re-occupants. In turn, the risk of re-occupants suffering health consequences upon exposure to residual chemicals depends on many factors including the inherent toxicity of the residue, the intensity and frequency of exposure, and the duration of exposure to toxic substances.

**Exposure**

**Inhalation**

Potential exposure to residual chemicals for re-occupants may be via oral, dermal, or inhalation pathways. While inhalation exposure of volatile organic carbons (VOCs) and gases may present a health risk to first responders, proper venting of houses following lab seizure should allow for the dissipation of airborne chemicals. In the case of large spills or residual pools of volatile chemicals trapped in the sewer lines, it is possible that re-occupants could experience inhalation exposure to chemicals if the structure is not cleaned thoroughly. Although removal of volatile chemicals and ventilation will eliminate most of this source of exposure, cleaning of surfaces may yield further reductions in concentrations of these substances in air.

**Oral and dermal**

Oral and dermal contact with residual chemicals on contaminated surfaces may also occur. A recent study by Martyny et al (2004) examined chemical exposures associated with clandestine methamphetamine laboratories. The study reported that methamphetamine became aerosolized during the filtering and crystallization stages of manufacturing. These aerosols can then settle throughout the house, leading to widespread contamination in the building containing the illegal lab. Residue that is on accessible surfaces such as walls, floors, kitchen appliances, and furniture in frequently used rooms may provide a source of exposure. Within a building used as a clandestine lab, the distribution of chemical residues will depend upon the manufacturing process and the proximity to the room used for manufacturing, as well as the design of the ventilation system. Contaminated surfaces may result in skin absorption of residual chemicals or ingestion of residues through direct contact mouthing or hand to mouth behaviour.

**Levels and patterns of exposure**

Preliminary data from samples collected in a house used for MDA manufacturing suggests that MDA residue may have spread throughout the structure, even though the lab was located in the basement of the house. MDA was detected on a child’s training toilet (2418 µg/sample) located three stories above the lab, in the master bathroom. MDA residue was also detected on bedroom blinds, on a child’s crib, and on counters in the master bathroom (BCCDC, unpublished data). Martyny et al (2004) reported levels of meth residue in former labs ranging from non-detectable to 16000 µg/sample. Further sampling is needed to determine the mechanism by which chemical residues are spread, as well as to detect patterns of chemical residue contamination in structures.
Along with the location of contaminants, behavioural patterns will influence the frequency of exposure. Behaviours that influence the extent of exposure to residual materials from clandestine labs are dependent upon the age. Toddlers are at greatest risk of exposure to residue from oral exposure due to constant placing of objects and fingers in their mouths. Toddlers are likely to be the most highly exposed to residue that is on floors, carpets, and furniture through oral and dermal exposure. Toddlers crawling on contaminated floors could be exposed to residues through skin contact. However, an increase in the discovery of clandestine labs has not resulted in any reported poisonings in BC. The BC Drug and Poison Information Center has had no reported cases of poisoning associated with clandestine labs in the past four years (personal communication, December 21, 2007).

Toxicity

The probability that residual chemicals will lead to adverse health effects is dependent on the amount of exposure and the toxicity of the residues. Clandestine labs contain a variety of contaminants and by-products that do not have predictable drug effects\(^1\). The composition of the residue will also differ between labs. Many of the chemicals used in amphetamine manufacturing are also found in common household products (tables 1 and 2). Toxicity information and occupational exposure levels for some of these chemicals are listed in Table 3.

The goal in cleaning clandestine labs is that re-occupants will experience no adverse health effects from exposure to residual chemicals from drug manufacturing processes.

Due to the variation in contaminants and their distribution in clandestine labs, there is not sufficient data to recommend concentration or mass-based cleanup levels for meth, ecstasy, and MDA labs. Even if more data were available, it is not clear that this represents a practicable approach to ensuring the protection of building re-occupants. Concentration-based standards that currently exist in the US are based on analytical detection limits and feasibility rather than health endpoints\(^5,6\). Furthermore, exposure to many of the substances listed in tables 1 and 2 occurs on a daily basis from other “illicit” sources.

A more workable approach emphasizes cleanup measures to remove residual chemicals in order to prevent re-occupants from exposure to these residues.

Preliminary assessment

Prior to the commencement of cleanup, a preliminary assessment of the extent of contamination should be conducted. Since all clandestine labs may differ in set-up and location, it is necessary that each lab be assessed individually while employing a consistent framework for this assessment. In some cases, factors other than the presence of residual chemicals may result in a determination that the building is not fit for re-occupancy.

The following information should be collected and forwarded to the party responsible for the cleanup. This individual must ensure that the contractors performing remediation receive a copy of the documented information to assist them in determining necessary cleanup procedures.

The information that needs to be recorded includes:
1) drugs manufactured;
2) list of chemicals and equipment found at site;
3) method of drug manufacture, if known;
4) set up of equipment and forced ventilation systems;
5) location of cooking, processing, and storage areas;
6) visible signs of drug manufacturing (e.g., extensive yellow staining from iodine use).
The person or agency responsible for the cleanup should:

- Determine whether the heating, air-conditioning, or ventilation (HVAC) systems serve more than one unit or structure. Examples of multi-unit buildings are motels, apartments, and townhouses. If the ventilation system is shared by more than one unit, the responsible official should determine whether neighbouring units may have been contaminated.

- Examine the structure and surrounding property for contamination by chemical spills and/or waste deposits present after bulk chemical removal by HazMat personnel. The responsible party should arrange removal and disposal of any drums, containers, or other bulk quantities of hazardous materials by qualified personnel.

- Inspect the property for visible signs of soil, groundwater, or septic bed contamination. If evidence of contamination or potential for contamination is found in soil, groundwater, or septic systems, officials must notify the agency responsible for regulation of these contaminants and ensure cleanup to any applicable standards.

**Cleanup recommendations**

Prior to cleaning interior surfaces and ventilation systems, all equipment used for manufacturing should be dismantled, and bulk chemicals removed. In certain cases, the property owner may need to consult with law enforcement officials to ensure all required information has been collected from the crime scene before cleanup commences.

**Ventilation/airing out**

Solvents and other volatile chemicals used in the manufacturing process may be present in the air and absorbed into walls and furnishings of clandestine labs. While labs are generally vented throughout the criminal investigation and removal of bulk chemicals, they may be sealed for security reasons after law enforcement officials have left the scene. This short-term venting may not allow sufficient time for absorbed chemicals to volatilize and airborne chemicals to be dispersed. Proper ventilation should be continued throughout the cleanup process.

**Chemical spills and residues**

Cleanup of chemical spills and residues should be completed by personnel trained to deal with chemical hazards. If the spills or residues are found to contain acids or bases, chemicals should be neutralized before cleaning and disposal. Acids may be neutralized with solutions of sodium bicarbonate (baking soda), and bases may be neutralized by using weak acidic solutions of vinegar or acetic acid in water. Solid spills and residues can be scooped up and packaged for proper waste disposal. Liquids can be absorbed with clay or other non-reactive material and packaged for disposal.

**Heating/ventilating/air-conditioning systems (HVAC)**

In multi-unit buildings, the ventilation systems, as well as the heating and air-conditioning systems, should be checked to determine whether contamination may have spread, through common ducts beyond the unit used as a lab. Heating and air-conditioning systems can collect dust and other debris. Airborne chemicals from the lab that enter ventilation systems may be redistributed throughout the structure, resulting in widespread contamination. For this reason, it is important to ensure that the ventilation system is thoroughly cleaned as part of the remediation.

The number of units potentially contaminated should also be determined. In multi-unit buildings, the same ventilation system may serve more than one unit or structure. For this reason, property owners of motels, apartments, row houses, or other multiple-family dwellings may wish to take wipe samples from adjacent...
or connected areas/rooms/units, working outward from the lab site until samples show low levels or no contamination. In areas that show contamination, the following procedures should be followed:

- Any ventilation system suspected of being contaminated and that is constructed of non-porous material such as sheet metal should be vacuumed using a high efficiency particulate air filter (HEPA).
- Ductwork may also need to be washed to arm's length using water and detergent until all contaminants are removed.
- All air filters in the system should be replaced.
- Air diffusers and vents should be removed and cleaned.
- Air diffusers and vents may be replaced rather than being cleaned.
- All surfaces near system inlets and outlets should also be cleaned with detergent and water.

**Sewer, septic, and plumbing systems**

As dumping of liquid and sludge waste products may be the primary disposal methods used by drug manufacturers, it is possible that sewer or septic systems may contain hazardous materials. If staining or presence of volatile organic compounds indicate dumping into municipal sewer systems, household plumbing should be aggressively flushed. Generous flushing should reduce the concentration of contaminants and resulting odours.

Liquid wastes and sludge produced during manufacturing are frequently dumped into sinks, bathtubs, and toilets. These by-products may also contaminate drains, traps, and septic tanks. Sewered wastes may give off chemical vapors if household plumbing is not flushed extensively. All drains should be checked for visible signs of staining. Plumbing fixtures that are visibly contaminated beyond normal household wear may be difficult to clean, and need to be replaced. Some materials such as stainless steel can be successfully cleaned.

If the unit is hooked up to a municipal sewer system, it is not likely that the disposal of meth-related waste will pose a health risk, due to high dilution that takes place. Even so, the local authorities should be informed that chemicals associated with manufacturing might have been disposed of down the sanitary sewer.

Dumping of chemicals in units that use a septic system may result in contamination of the septic system and surrounding soil. If the property is on a septic tank system and tank liquid is suspected to be contaminated, sampling of tank liquid should be conducted to determine the extent of contamination. The appropriate authorities should be notified that testing needs to be conducted. Depending on the results of the analysis, the contents of the tank may need to be disposed of as hazardous waste.

**Porous materials and furnishings**

Absorbent materials may collect residual dust and powder from chemicals used in drug manufacturing. Porous materials may also accumulate vapors that are created and dispersed during the cooking process. Items in this class may be split into two groups: those that are machine washable including some drapes, clothing, and bedding and those that are not machine-washable such as carpeting, upholstered furniture, and mattresses. For all porous items, remediation will include either cleaning or disposal. If the property owner does not wish to dispose of contaminated items such as furniture, he/she must prove, through testing, that items are not contaminated. Since all clandestine labs will be set up differently and located in varying types of structures, professional judgment will be required in making decisions regarding the cleaning or disposal of items. The most important consideration in making this decision is the potential for human exposure.
Items found throughout the structure that are heavily stained or contain odors from the manufacturing process should be discarded.

In areas of mild to moderate contamination, cleaning may be an acceptable course of action. If the owner does not wish to dispose of machine washable goods, these items should be thoroughly laundered using detergent. All personal items that are not discarded must be laundered.

Porous items that are not discarded and cannot be machine-washed should be HEPA vacuumed, followed by at least one hot water detergent scrubbing or steam cleaning. It is possible that even after thorough cleaning of carpets and other porous materials, residue will remain and porous fabrics will need to be discarded. Residual contaminants on carpets could provide a source of exposure for toddlers and young children. Floors must be HEPA vacuumed following the removal of carpets.

Non-porous surfaces

Hard interior surfaces such as walls, tile and wood flooring, ceilings and paneling, and hard furniture or appliances may contain chemical residues from the cooking process, especially in those areas in and adjacent to where the cooking and preparation took place. It is important that floors, walls, tiles, and doors are thoroughly cleaned, as humans may have frequent contact with these surfaces. Surfaces such as countertops and tables used for food preparation may cause exposure through food if these surfaces are not thoroughly cleaned.

If a surface has visible contamination or staining, complete removal and replacement of that surface section is recommended. This could include removal and replacement of wallboard, floor coverings, and counters. For non-porous surfaces that are not discarded, intensive cleaning with a detergent-water solution is recommended. Floors should be HEPA vacuumed before being washed. The ceiling should be cleaned first, followed by walls, and finally floors and other surfaces. This procedure should be repeated using a fresh detergent solution and fresh rinse water.

Special care should be taken throughout the assessment process to note and clean high-traffic areas and pathways such as hallways to and from the cooking areas, and between chemical storage and cooking areas.

Household appliances

Appliances that show visible contamination in areas that are difficult to clean should be discarded. All other appliances can be evaluated on a case-by-case basis, with attention to: use during drug manufacturing; proximity to lab activity; use in the home; ability to be cleaned; and cost benefit of disposal vs cleaning.

Encapsulation

In certain situations, it may be necessary to repaint or seal hard surfaces as part of the remediation process. This will create a physical barrier between any residual contaminants that were not removed by cleaning and human contact. This will also prevent any residual chemicals from further volatilization. In areas of high contamination, such as those rooms in which cooking took place, the ceilings and walls should be repainted with a non-water-based paint or sealed with a non-water-based coating. Floors that are highly contaminated and of a porous nature should be removed and replaced if they cannot be effectively cleaned. Floors constructed of materials such as laminate or vinyl can either be removed and replaced or recovered with new flooring after cleaning. Ceramic or stone-tiled surfaces, floors, countertops, walls, or other ceramic or stone-tiled surfaces in the rooms used for the manufacturing can be removed, reglazed, or grout stained using an epoxy-based stain. Wooden materials (floors, walls, ceilings, cabinets, or other wooden materials in the rooms used for the manufacturing can be removed or cleaned and then sealed with a non-water-based coating.
Thorough cleaning of hard surfaces should effectively remove all traces of contaminants. If, however, any signs of visible contamination or odors are detected in rooms other than those used for manufacturing, these surfaces should also be cleaned and repainted or resealed.

**Exterior contamination**

The property surrounding the structure should be inspected for evidence of contamination. Liquid and solid waste materials may have been dumped, buried, or burned outside of the structure. Where waste materials are dumped, soil and groundwater contamination threats exist. If soil or groundwater contamination is suspected, the appropriate agency should be contacted regarding proper cleanup.

**Roles and responsibilities**

The roles and responsibilities of the involved agencies will vary across Canada. It is outside the mandate of the National Collaborating Centre for Environmental Health to designate responsibilities to the various agencies.
References


Appendix A: Sampling Procedure for Methamphetamine

This procedure describes a technique for sampling both flat and irregular surfaces for the detection and quantification of amphetamine-derived substances. For flat surfaces, a 100 sq cm surface is sampled by placing a 10 x 10 cm template on the area of interest and using alcohol-soaked absorbent cotton gauze to wipe the surface.

For porous surfaces, wipe sampling can only be used to verify the presence or absence of contamination rather than quantitative identification.

The following procedure can be used for collecting wipe samples:

1) Place the template in the desired position and mark the four corners with a dark marker. Remove the template and carefully place the masking tape so the defined area is within the four corners. This is defined as the sampling area.

2) To avoid cross contamination between samples, wear nitrile gloves. A new set of gloves should be used for every sample.

3) Transfer two to four mL of isopropyl alcohol to a 7.62 x 7.62 cm absorbent cotton gauze.

4) Wipe the surface according to the following procedure:
   a) Wipe the defined sampling area from left to right horizontally, top to bottom. Fold the gauze to expose a new surface.
   b) Wipe the area vertically from top to bottom and fold the gauze once again to expose a new surface.
   c) Repeat step a).

5) Place the gauze into a 20 mL scintillation container and cap.

6) Document all observations pertaining to the sample and submit documents and samples to the lab.
### Appendix B: Chemicals used in clandestine laboratories

Table 1. *Chemicals that may be used in methamphetamine laboratories*

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Chemical</th>
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</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>Methyl amine</td>
</tr>
<tr>
<td>Ammonia</td>
<td>Methyl ethyl ketone</td>
</tr>
<tr>
<td>Acetic acid</td>
<td>Methylene chloride</td>
</tr>
<tr>
<td>Alcohol, isopropyl</td>
<td>Naptha</td>
</tr>
<tr>
<td>Ammonia</td>
<td>Nitroethane</td>
</tr>
<tr>
<td>Ammonium hydroxide</td>
<td>Petroleum spirits</td>
</tr>
<tr>
<td>Benzene</td>
<td>Phosphoric acid</td>
</tr>
<tr>
<td>Chloroform</td>
<td>Potassium chromate</td>
</tr>
<tr>
<td>Ether</td>
<td>Potassium dichromate</td>
</tr>
<tr>
<td>Ethyl ether</td>
<td>Potassium permanganate</td>
</tr>
<tr>
<td>Ethanol</td>
<td>Red phosphorus</td>
</tr>
<tr>
<td>Formic acid</td>
<td>Sodium chromate</td>
</tr>
<tr>
<td>Freon</td>
<td>Sodium dichromate</td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>Sodium hydroxide</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>Sodium metal</td>
</tr>
<tr>
<td>Iodine</td>
<td>Sulfuric acid</td>
</tr>
<tr>
<td>Lithium metal</td>
<td>Toluene</td>
</tr>
<tr>
<td>Methanol</td>
<td>Trichloroethane</td>
</tr>
</tbody>
</table>

Table 2. *Chemicals that may be used in methylenedioxyamphetamine and methylenedioxyamphetamine laboratories*

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Chemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>Methylamine</td>
</tr>
<tr>
<td>Dichloromethane</td>
<td>3,4-methylenedioxyphenyl-2-propanone</td>
</tr>
<tr>
<td>Ethanol</td>
<td>Methylformamide</td>
</tr>
<tr>
<td>Formamide</td>
<td>Sodium borohydride</td>
</tr>
<tr>
<td>Formic acid</td>
<td>Sodium hydroxide</td>
</tr>
<tr>
<td>Hydrochloric acid</td>
<td>Sassafras oil</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>Toluene</td>
</tr>
<tr>
<td>Mercuric chloride</td>
<td></td>
</tr>
<tr>
<td>Methanol</td>
<td></td>
</tr>
</tbody>
</table>
Table 3. Toxicity summary for chemicals used in the manufacturing of methamphetamine and/or ecstasy, and chemicals produced during the manufacturing process

<table>
<thead>
<tr>
<th>Substance (including Chemical Abstracts Service [CAS] number)</th>
<th>LD$_{50}$ (g/kg bw)$^a$</th>
<th>LC$_{50}$</th>
<th>Critical effect dose$^b$</th>
<th>IARC$^c$ classification</th>
<th>ACGIH$^d$ exposure limit (TWA)$^e$ mg/m$^3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic acid 64-19-7</td>
<td>3.31-3.53</td>
<td>11.4 mg/L/4 hr</td>
<td>Exposure: oral</td>
<td>25</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Endpoint: nephropathy</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>NOAEL: 900 mg/kg/d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acetone 67-64-1</td>
<td>5.8-9.9</td>
<td>76 mg/L/4 hr</td>
<td>50.1 mg/L/8 hr</td>
<td>590</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>76 mg/L/4 hr</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ammonia 7664-41-7</td>
<td>0.35</td>
<td>7.6 g/m$^3$/2 hr</td>
<td>Exposure: inhalation</td>
<td>18</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Endpoint: pulmonary function and subjective symptoms</td>
<td></td>
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<td></td>
<td></td>
<td>NOAEL: 6.4 mg/m$^3$</td>
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<tr>
<td>Benzene 71-43-2</td>
<td>3.31</td>
<td>10000 ppm/7 hr</td>
<td>Exposure: oral</td>
<td>1.6</td>
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<td></td>
<td></td>
<td></td>
<td>Endpoint: decreased lymphocyte count</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>*BMDL$^f$: 1.2 mg/kg/d</td>
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<td></td>
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<td></td>
<td>Exposure: inhalation</td>
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<td></td>
<td></td>
<td></td>
<td>Endpoint: decreased lymphocyte count</td>
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<td></td>
<td>*BMCL$^g$: 8.2 mg/m$^3$</td>
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<tr>
<td>Chloroform 67-66-3</td>
<td>0.91-2.81</td>
<td>47.70 g/m$^3$/4 hr</td>
<td>Exposure: oral</td>
<td>2B</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Endpoint: fatty cyst formation in liver and elevated SGPT$^h$</td>
<td>9.78</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>NOAEL: 15 mg/kg/d</td>
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<tr>
<td>Dichloromethane 75-09-02</td>
<td>1.6-3.0</td>
<td></td>
<td>Exposure: oral</td>
<td>87</td>
<td></td>
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<td></td>
<td></td>
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<td>Endpoint: liver toxicity</td>
<td></td>
<td></td>
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<td></td>
<td>NOAEL: 5.85 mg/kg/day (males)</td>
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<td></td>
<td>6.47 mg/kg/day (females)</td>
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<tr>
<td>Diethylether 60-29-7</td>
<td>3.56</td>
<td>32000 ppm/4 hr</td>
<td>Exposure: oral</td>
<td>1200</td>
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<td></td>
<td></td>
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<td>Endpoint: depressed body weight</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>NOAEL: 500 mg/kg/day</td>
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<tr>
<td>Ethanol 64-17-5</td>
<td>6.2-17.8</td>
<td>20000 ppm/4 hr</td>
<td></td>
<td>1900</td>
<td></td>
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<tr>
<td>Substance</td>
<td>LD&lt;sub&gt;50&lt;/sub&gt; (g/kg bw)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>LC&lt;sub&gt;50&lt;/sub&gt;</td>
<td>Critical effect dose&lt;sup&gt;b&lt;/sup&gt;</td>
<td>IARC&lt;sup&gt;c&lt;/sup&gt; classification</td>
<td>ACGIH&lt;sup&gt;d&lt;/sup&gt; exposure limit (TWA)&lt;sup&gt;e&lt;/sup&gt; mg/m&lt;sup&gt;3&lt;/sup&gt;</td>
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<tr>
<td>Formic acid 64-18-6</td>
<td>0.73</td>
<td>15 g/m&lt;sup&gt;3&lt;/sup&gt;/15 min</td>
<td>7.4 mg/L/4 hr</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Hydrochloric acid 7647-01-0</td>
<td>0.9</td>
<td>3124 ppm/1 hr</td>
<td>Exposure: inhalation Endpoint: hyperplasia of nasal mucosa larynx and trachea LOAEL: 15 mg/m&lt;sup&gt;3&lt;/sup&gt;</td>
<td>3</td>
<td>C 2.8 (STEL)&lt;sup&gt;i&lt;/sup&gt;</td>
</tr>
<tr>
<td>Methanol 67-56-1</td>
<td>5.63</td>
<td>64000 ppm/4 hr</td>
<td>87.5 mg/L/6 hr</td>
<td>Exposure: oral Endpoint: increased SAP&lt;sup&gt;j&lt;/sup&gt; and SGPT&lt;sup&gt;h&lt;/sup&gt; and decreased brain weight NOAEL: 500 mg/kg/day</td>
<td>260</td>
</tr>
<tr>
<td>Methylamine 74-89-5</td>
<td>0.08-0.69</td>
<td>2.9 mg/L/4 hr</td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Methyl ethyl ketone 78-93-3</td>
<td>2.9-5.5</td>
<td>34.5 g/m&lt;sup&gt;3&lt;/sup&gt;/4 hr</td>
<td>Exposure: oral Endpoint: decreased body weight LED: 594 mg/kg/day Exposure: inhalation Endpoint: developmental toxicity LEC: 5202 mg/m&lt;sup&gt;3&lt;/sup&gt;</td>
<td></td>
<td>147.5</td>
</tr>
<tr>
<td>Phosphoric acid 7664-38-2</td>
<td>1.53</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Safrole 94-59-7</td>
<td>1.95</td>
<td></td>
<td></td>
<td></td>
<td>2B</td>
</tr>
<tr>
<td>Sodium chromate 7775-11-3</td>
<td>0.01-0.05</td>
<td>0.03-0.12 g/m&lt;sup&gt;3&lt;/sup&gt;/4 hr</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium dichromate 10588-01-9</td>
<td>0.05</td>
<td>0.12 g/m&lt;sup&gt;3&lt;/sup&gt;/4 hr</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sulfuric acid 7664-93-9</td>
<td>347 ppm/1 hr</td>
<td></td>
<td></td>
<td></td>
<td>0.2</td>
</tr>
<tr>
<td>Substance</td>
<td>LD$_{50}$ (g/kg bw)$^a$</td>
<td>LC$_{50}$</td>
<td>Critical effect dose$^b$</td>
<td>IARC$^c$ classification</td>
<td>ACGIH$^d$ exposure limit (TWA)$^e$</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------------------</td>
<td>-----------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>--------------------------</td>
<td>-----------------------------------</td>
</tr>
</tbody>
</table>
| Toluene           | 2.6-7.5                 | 26700 ppm/1 hr, 8000 ppm/7 hr | Exposure: oral  
Endpoint: increased kidney weight  
*BMDL$^f$: 238 mg/kg/day  
Exposure: inhalation  
Endpoint: neurological effects  
NOAEL: 46 mg/m$^3$ | 3                                      | 75                                 |
|                   |                         |           |                                                                                       |                          |                                   |          |
| Trichloroethane   | 71-55-6                 | 24000 ppm/1 hr, 14000 ppm/7 hr | Exposure: oral  
Endpoint: reduced body weight  
BMDL$^f$: 2155 mg/kg/day  
Exposure: inhalation  
Endpoint: liver histopathologic changes  
NOAEL: 1553 mg/m$^3$ | 3                                      |                                   |          |

$^a$LD$_{50}$ and LC$_{50}$ values are taken from toxnet.nlm.nih.gov/  
$^b$Critical effect doses are taken from www.epa.gov/iris/  
$^c$International Agency for Research on Cancer  
$^d$American Conference of Governmental Industrial Hygienists  
$^e$Time weighted average  
$^f$Benchmark dose (lower confidence limit)  
$^g$Benchmark concentration (lower confidence limit)  
$^h$Serum glutamic pyruvic transaminase  
$^i$Serum alkaline phosphatase  

*dose corresponding to a one standard deviation from the mean
Appendix C: Cleanup Summary

1. Obtain all essential information from law authorities
2. Ensure the removal of bulk chemicals/hazards is complete
3. Determine level of personal protective equipment required
4. Perform preliminary assessment while ventilating structure; continue ventilation throughout cleanup
5. Clean up any major chemical spills

HVAC systems

- Cost effective to clean?
  - Yes: HEPA vacuum ductwork and other non-porous surfaces
  - No: Wash ductwork 3x to arm's length
  - Cost effective to clean?
    - Yes: Replace air filters
    - No: Replace items

Sewage/septic/plumbing systems

- Plumbing system visibly used for disposal?
  - Yes: Contact local authority, if applicable
  - No: Conduct testing of septic tank, if applicable
  - Flush plumbing system
  - Replace sections of plumbing, if required
  - Replace all fixtures and traps
  - Flush plumbing system
  - Replace all fixtures and traps

Non-porous items/surfaces

- Cost effective to clean?
  - Yes: Wash 3x with water and detergent
  - No: Discard

Porous items/surfaces

- Cost effective to clean?
  - Yes: HEPA vacuum and steam clean large items
  - No: Discard

Encapsulation

- Repaint, reseal, restain, reglaze, regrout, or cover
- Ventilate thoroughly
Feedback Form

Please provide your comments below.

Document Name:

Clandestine Amphetamine-Derived Drug Laboratory Cleanup Guidelines

Is this document useful for your work? Why or why not?

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

How could this document be improved?

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

What is your occupation? ______________________________________________________________

Your name: ________________________________________________________________________

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