Alcohol and Drug Foundation: Position Paper

Methamphetamine exposure and remediation in dwellings.

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What is it?

Methamphetamine is a stimulant drug that is among the most used illicit drugs in Australia and around the world.

Methamphetamine contamination can occur in a building where the drug has been produced and residue from manufacturing chemicals and the drug remain.[1]

It has been postulated that contamination can also happen in a dwelling where only smoking has occurred, but according to the New Zealand Chief Scientist: "there is no published (or robust, unpublished) data relating to health risks of residing in a dwelling formerly used only for smoking methamphetamine."[2]

Methamphetamine is often manufactured in clandestine laboratories (otherwise known as clan labs or meth labs). These labs may be constructed in commercial buildings, factories, sheds and residential dwellings.

During the manufacturing process, a range of by-products and drug products may be present in the air (as vapours) or as chemical deposits on surfaces. By-products may also be present in liquid, which is dumped down drains, stored in containers or dumped outdoors in soil. By-products can persist on indoor surfaces for several months past production.[3]

Methamphetamine remediation is undertaken in dwellings and buildings where methamphetamine exposure is considered to present health risks.

Remediation depends on the surfaces of the building and whether adherence, adsorption or absorption may have occurred including under flooring and in drains.

Detection of methamphetamine residue is easier on hard, non-porous surfaces, such as plastics or metal, and more difficult as surfaces become more porous, such as wood or soft furnishings. Guidelines have been developed specifically for cleaning of contaminated dwellings where contamination at harmful levels has been discovered.

The manufacturing of methamphetamine requires the use of many different, often highly toxic chemicals. The cooking process of methamphetamine may happen once or repeatedly, use a variety of different techniques, be done by beginners or professional chemists and vary from small scale temporary production through to large scale and highly technical sophisticated 'super labs'. As a result, the nature and type of potential health hazards vary immensely.

In Australia, the main compounds of concern are methamphetamine, phosphine, ammonia and hydrogen chloride. In New Zealand, following restrictions on the sale of solvents and certain precursor chemicals, production methods changed

resulting in the primary contaminate being methamphetamine itself.[2]

Assessment of potential health risks usually commences with a toxicological assessment to determine which chemicals are present and at what levels. From this data, a risk characterisation can be determined which can inform whether remediation is warranted.[2]

New Zealand analysis found that most houses in which methamphetamine was detected had only low levels that were not widespread and less than 1% of the sample tested above 30µg/100cm^2 – the level that is considered to indicate a property was likely to have been used for manufacturing.[2]

It is important to note that concerns around methamphetamine contamination should be kept in context of where manufacturing has occurred. There is little evidence that supports the need for remediation in any other circumstances. Incorrect action can result in substantial hardship, displacement from homes and destruction of property based on no evidence of significant harm.

Why?

High levels of methamphetamine exposure can be hazardous to health, particularly for children who live in a house where methamphetamine is manufactured, as they are more susceptible due to different metabolic processes.

In a study undertaken to examine the effects of exposure to methamphetamine labs, the most frequently reported symptoms were headache (17%), nausea/vomiting (14%), respiratory (8%), and eye irritation (7%).[4, 5]Children (46%) were more likely to be affected than adults (29%) when exposed to methamphetamine residue.[5]

Exposure to chemicals included in manufacturing methamphetamine has been associated with cancer and adverse effects on the respiratory, renal, hepatic, neurological, developmental and reproductive systems.[6] However, no data is available to identify chronic effects from exposure specifically to methamphetamine contamination.[7]

Health risks posed by the manufacturing chemicals and methamphetamine contamination are dependent on the level of contamination, and the method and chemicals used in the manufacturing process.[7]

Where a building has been used for manufacture of methamphetamine, levels of methamphetamine residue are used as a marker for levels of other potential contaminants (heavy metals or other chemicals used in the manufacturing process) which may be associated with additional health risks.[7]

Evidence relating to dose-response associations and safe levels of exposure is limited.

Few studies have investigated the health effects of exposure to methamphetamine residue, or the levels at which exposure may prove harmful, and thus little evidence of dose-response associations exists.

Larger amounts of residue typically remain from the manufacturing process than from smoking and there is additional potential residue of other hazardous chemicals used in the production process.[8]

There is some evidence that a dwelling may become contaminated with methamphetamine residue if the drug is heavily smoked even if manufacturing does not occur. Typically, however, smoking methamphetamine results in much lower potential residues than manufacturing in general, even accounting for different types of manufacturing processes.[3]

Experiments involving simulated smoking of methamphetamine found that residue levels decline rapidly over a few days.[3, 9]

Most international investigations (and subsequent contamination guidelines) focus mainly on identifying methamphetamine labs and remediating them when found. Contamination by smoking only generally does not lead to particular consideration or action.[2]

There is currently no evidence that residue on household surfaces from smoking methamphetamine poses significant adverse chronic health risks.[2]

*30µg/100 cm2 relates to a total amount of methamphetamine, measured in micrograms (30 µg), collected from a specific sample size (100cm^2).

Remediation after discovery of clandestine laboratory

Testing for contamination is only recommended where it is suspected that manufacturing occurred.[2]

How testing is carried out is also important in ensuring accurate information about the level of contamination.

For initial screening, the practice of combining multiple samples taken throughout a dwelling into a single composite sample has limited value in accurately reflecing level of risk. Depending on how this data is integrated, the results can be misleading and give a false indication of high exposure.[2]

From establishment of a clandestine lab through to remediation (and re-occupancy) the potential for environmental exposure goes through a number of phases:

The operational phase	When the drug is being manufactured. There is a high potential for individuals in the dwelling to be exposed to a large number of chemicals in potentially high amounts.
The discovery phase	When a lab is 'seized' by police and chemicals and equipment are removed from the premises. In some cases, residents may return to the property immediately after the removal which may still expose residents to a wide range of chemicals that remain.
The remediation phase/ post operation phase	Where either exposure may be associated with a known laboratory that has not been remediated, or a lab that was undetected and remains un-remediated, or a known laboratory that has not been adequately remediated.

The process of discovery of a potential clandestine laboratory through to successful remediation is shown in Appendix One.

The greatest hazard associated with methamphetamine production, both in relation to likelihood of exposure and concentrations that may be present, occurs during the operational phase of the cooking.[10]

In Australia the number of clandestine laboratories detected nationally decreased for the fifth consecutive reporting period in 2016-17, with about half of all detections small to medium scale (referred to as 'addict-based').[11]

Most clandestine laboratories detected in Australia are in, or adjacent to, domestic dwellings (68.4%). Other sites include in vehicles (often caravan type vehicles, 9.9%), public places (6.8%), rural areas (6.0%), commercial/industrial buildings (4.2%) and other (4.7%).[12]

Evidence

There is little to no research pertaining to occupational safety and health exposure and management of clandestine drug laboratories.

Most research in Australia has focused on the health outcomes of illicit drug use and law enforcement aspects of methamphetamine use.

Despite the scarcity of evidence, some guidelines have been developed to attempt to address concerns about, and possible risks from, methamphetamine contamination.

Most relate to dwellings where contamination is due to the manufacturing of methamphetamine only and not from smoking. Additional consideration may be necessary for the presence of other toxic chemicals which occur when residue results from manufacturing.

Guidelines

Guidelines have been developed for the cleaning of contaminated properties after a clandestine laboratory has been found.[5, 7]

These guidelines use the detection of methamphetamine below a specified level after remediation/cleaning has taken place. This reference level is used as a point that contaminants have been sufficiently cleaned away to ensure safety.[2]

It is important to note the difference between levels of contamination that may signal remediation is necessary and the level of contamination that is considered no or minimal health risk.

New Zealand guidelines note that remediation is required when a property shows contamination at 15µg/100cm^2. These same guidelines note that: "exposure to methamphetamine levels below 15µg/100cm^2 would be unlikely to give rise to any adverse effects". If a property tests at this level or above, remediation may be required to clean the property if there is a reason to suspect a lab has been present. A property that tests at 1.5µg/100cm^2 or below does not pose significant health risk and does not require remediation.

Australia, New Zealand and two states in the USA have developed recommendations for safe levels of methamphetamine contamination. Guidelines developed by Colorado and Australia have used a reference value of 0.5 µg/100 cm^2 as indicating safe levels or a clean-up guideline, respectively.[2] California adopted a reference value of 1.5 µg/100 cm^2 as the highest level of safe exposure acceptable.[13-15]

Following recommendations from the Chief Science Advisors report, New Zealand increased its threshold for remediation being required to 15 µg/100cm^2.[16]

The variation in the reference values is in part due to different mathematical equations and different dose responses. (Reference values are also expressed both as µg/cm surface area and as µg/kg body weight/day. Both of which are different equations that are important to note when comparing).

California developed a threshold 'reference dose' from a study which estimates the amount of substance a human (including children and other sensitive groups) can be exposed to daily, over their lifetime, without any harmful effects.2 The lowest dose that showed any effect in this study was equivalent to 80 µg/kg body weight/day. A large safety factor was then applied to this dose to take into consideration sensitive individuals and the reference dose was set at 0.3 µg/kg body weight/day (1.5µg/100cm^2).[2]

The Colorado reference value is a health-based reference which indicates the lowest dose that humans (including children and sensitive groups) can be exposed to at which the first onset of any adverse health effect may occur.[2] The reference value, calculated based on animal toxicology studies, was set at 5 – 70 µg/kg body weight/day (surface concentration 0.5µg/100cm^2).[2]

Both above US assessments are notably very conservative in their reference levels incorporating a large (~300 fold) safety factor.

Australian guidelines (0.5µg/100 cm^2) were developed based on California's reference dose. New Zealand guidelines were originally as per Australia, however in 2017 Standards New Zealand published new decontamination guidelines informed by a 2016 Institute of Environmental Science and Research (ESR) report, setting remediation levels of 1.5 µg/100cm^2.[2]

Some important considerations should be noted. Current guidelines are based on a worst case scenario and there is currently no evidence to suggest that exceeding these guidelines, particularly by only a small margin, will always result in harmful outcomes.[2] There is a paucity of evidence of dose-response associations and this is crucial for establishing appropriate guidelines for future use.

The NZ guidelines also recognise that in addition to risk due to methamphetamine toxicity, there is a risk of heavy metal toxicity, particularly mercury and lead, which may be present depending on the type of manufacturing method. They recommend that a survey of heavy metals be carried out to ensure that there are no elevated levels still present and that the clean-up required for heavy metals may require different procedures.[6]

Remediation approaches to dwellings contaminated with methamphetamine vary between jurisdictions.

For instance, New South Wales outlines approaches for high and low risk sites. These include recommendations for removal of items from the site, waste material disposal, and development and implementation of a remediation plan.

The Australian guidelines recommend four phases for remediation: trigger for assessment; preliminary assessment and action; site assessment and remediation; and validation (see Appendix One).

It is important that remediation guidelines always be according to scientific best practice weighing up a range of factors alongside an assessment of actual health risks. For example, if furniture has been moved into a dwelling after the methamphetamine exposure it may need to be assessed differently to furniture that was present during exposure.

Testing

Given the scarcity of evidence of contamination in dwellings where methamphetamine lab activity is not suspected, the NZ Guidelines recommend testing is only done where laboratory activity is suspected or confirmed.[2]

In dwellings where contamination is suspected, recommendations may be made for the dwelling to be cleaned/remediated until contamination is at, or below, the guidelines recommended.

Reasons to caution testing dwellings

In the absence of clear scientific and health information, assumptions can be made among the general public that even trace levels of methamphetamine residue pose a health risk to individuals who may be exposed.

As a result, commercial interests can drive public concern about methamphetamine contamination, resulting in remediation of properties that may not pose health risks.

There is a risk of displacing families from homes that are incorrectly labelled as methamphetamine contaminated.

In New Zealand in 2017/18 hundreds of public housing tenants were evicted from their houses due to being wrongly penalised for methamphetamine contamination in their homes.[16]

The Board of Housing New Zealand admitted that significant harm was done to hundreds of Housing New Zealand residents as a result of policies and procedures associated with methamphetamine exposure guidelines incorrectly applied.[16] The harms associated with displacement and destruction of possessions cannot be understated.

There is a risk of stigmatising tenants/home occupiers. It is important that testing does not become driven by public misinformation fuelled by industry and negative media reporting relating to methamphetamine use.

In New Zealand, many people lost their homes and belongings, and huge sums of money were spent unnecessarily by vulnerable tenants, real estate agents, lawyers and landlords.

ADF position

1. The Australian limit should be set in line with best available evidence which is currently 15µg/100cm^2 for initial screening.
2. The Australian process should consider that recommended in NZ and **only** conduct testing in homes where laboratory activity is suspected or confirmed.
3. The ADF advises of the need to be mindful of vested interests pursuing outcomes based on negligible evidence and appeals to prejudice.
4. Develop accreditation/recognised training courses for screening samplers or decontamination operators to ensure only those with the necessary skills and experience undertake the work.

APPENDIX ONE

General process for site investigation and reporting under the Australian Government Clandestine Drug Laboratory Remediation Guideline. The below shows the four phases in the notification and remediation process that are recommended to be followed by the various agencies involved in clandestine drug laboratory remediation.

Phase 1

Trigger for Assessment

Police seize clan lab, process, render safe and provide appropriate authority with notification letter and 'site assessment report.

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Phase 2

Responsible authority orders preliminary assessment to determine extent of risk.

↓ **Risk Identified**

Investigation and Assessment checklist indicates contamination is present/potentially present.

↓ **No Risk**

No further action required

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Phase 3

Appropriate authority issues pollution control/prohibition or other environmental order against property as may be deemed necessary. Authority issues order to provide contamination order in accordance with guideline.

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Completion of site assessment checklist and investigation, including laboratory analysis, in accordance with guideline.

↓ **Contamination Identified**

Assessment confirms contamination. Remediation Action Plan (RAP) is devised. Responsible authority initiates remediation.

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On completion of remediation activity, a site validation report is prepared.

↓ **No Contamination Identified**

Responsible authority reviews investigation report.

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Phase 4

Appropriate authority reviews report and audits checklist, issues site clearance on acceptance of final validation report.

Table from: Al-Obaidi TA, Fletcher SM. Management of clandestine drug laboratories: need for evidence-based environmental health policies. Environ Health Prev Med. 2014;19(1):1-11.

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