

# Laboratory chemical waste disposal guidelines

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## 1. Background

The University of Otago operates approximately 700 laboratories and these generate a wide range of different chemical wastes, some of which pose hazards to human health and safety or to the environment. In order to facilitate the removal of such wastes, and to discourage inappropriate disposal or accumulation of such wastes, the University currently funds the Health and Safety Office to dispose of such wastes through a free chemical waste collection service.

While the amount of waste you are generating may seem small and insignificant it is important to remember that you may not be the only person generating this waste and the combined effects of everyone disposing of waste inappropriately could be significant. As a consequence, it is important that everyone takes responsibility for disposing of hazardous chemical wastes in a manner that is safe, legal and responsible. The University of Otago typically disposes of approximately 7000 - 10,000 Kg of hazardous chemical waste annually through the Chemical Waste Collection Service.

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## 2. How do I arrange disposal of my chemical waste?

In the first instance contact your **Departmental Laboratory Manager (DLM)** for advice on disposal procedures in your department. In most departments the DLM coordinates the management of hazardous waste pick-ups from the department and will liaise with the Health and Safety Office to arrange this. In some areas, this task may be delegated to another person but the DLM should be able to direct you to the correct point of contact. If you are unsure who to contact in your area you can either contact the Laboratory Health and Safety Advisor or send an email to: [chemwaste@otago.ac.nz](mailto:chemwaste@otago.ac.nz).

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## 3. Information requirements

Information requirements vary depending on the processes in your department. However, in general you should expect to provide details about the identity and composition of any wastes, the number of quantity of items, as well as details about their HSNO Hazard Classifications and Dangerous Goods Classifications (if applicable). You may be asked to complete these details in the form a 'Hazardous waste form'. In some departments, the DLM may elect to complete some or all of this information on your behalf but please note that there should not be an expectation that this will be the case. Laboratory users have ultimate responsibility for any wastes they generate, including ensuring appropriate information about any wastes generated are provided. This information is necessary to ensure the University and waste contractors can meet their legal obligations in relation to transportation, storage and disposal of hazardous chemical wastes, to determine appropriate disposal methods and to ensure the health and safety of all personnel involved.

#### 4. What types of wastes are accepted?

The majority of waste chemicals are accepted, including; unwanted chemicals, waste organic solvents (e.g. HPLC waste), used X-ray film processor waste, mercury containing equipment (e.g. broken thermometers), as well as materials that may be contaminated with hazardous substances (e.g. tubes, assay plates, chemical spill kit materials).

Please note that we cannot accept the following -

- Gas cylinders
- Explosives or other Class 1 articles (e.g. ammunition, marine flares)

However, please contact the Laboratory Health and Safety Advisor for advice on disposal of such items.

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#### 5. Other hazardous wastes not collected as part of this service

Please note **infectious/biohazard** wastes are not collected as part of this service and need to be disposed in accordance with the *University of Otago Biohazard Waste Guidelines*.

**Radioactive** wastes should be disposed in accordance with the applicable radiation safety plan or contact the Radiation Safety Advisor for advice ([jeremy.nicoll@otago.ac.nz](mailto:jeremy.nicoll@otago.ac.nz))

To dispose of **expired human or veterinary medicines**, please box the medicines in a sturdy box of no more than 10 Kg and contact Interwaste (479 0045 to arrange disposal).

For disposal of **batteries, fluorescent light tubes and printer/photocopier cartridges** please contact the Recycling Hotline (x 3427).

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#### 6. What happens to my chemical waste?

The method of disposal will vary depending on the waste type. Some wastes may be purified, recycled and re-used for industrial purposes (e.g. many wastes solvents, oil). Other wastes may be chemically treated to neutralise hazardous components (e.g. formaldehyde). Finally, some wastes (e.g. chlorinated solvents) may be sent overseas for high-temperature incineration in approved facilities.

## 7. Disposal to drains

It is important to understand that laboratory drains are not designed or intended for use as a chemical disposal system and waste entering these drains does not undergo any special pre-treatment before entering the city waste water system. Inappropriate disposal to drains can create a number of issues, including;

- Some chemicals may damage drains directly (particularly corrosives) or affect the waste water treatment process.
- Disposal of some chemicals to drains may create a risk to health and safety, e.g. through the release of toxic vapours, or as a result of dangerous reactions between chemicals.
- Plumbers and other maintenance personnel may be exposed to chemicals disposed to drains when they need to carry out maintenance or repair work.
- Waste-water is subject to specific restrictions in relation to physical characteristics (e.g. pH) and chemical contaminants under local trade waste restrictions. The local council routinely monitors our waste-water discharges and breaches could result in fines or increased charges to the University.
- Some contaminants are subject to strict environmental exposure limits under HSNO and discharges resulting in breaches of these limits could result in prosecution under this legislation, with potential for significant financial penalties.

As a consequence, drains should only be used for disposal of low hazard substances, such as

- Water soluble non-hazardous substances such as sugars (e.g. D-glucose) or amino acids
- Dilute aqueous (water-based) reagents of low hazard, e.g. buffers, including those containing dilute ethidium bromide (<10µg/mL).
- Low volumes (as a guide, <100mL) of low toxicity organic solvents (e.g. ethanol, isopropanol) diluted to less than 10% in water (i.e. in >1L water).

The following should **NOT** be disposed via laboratory sinks –

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| <ul style="list-style-type: none"> <li>• Corrosive solutions (pH &lt;5.5 or &gt;11)</li> <li>• Substances that do not mix or dissolve readily in water (e.g. fats)</li> <li>• Cyanides and azides</li> <li>• Ecotoxic metals (and compounds of these) such as arsenic, chromium, copper, lead, mercury, silver, tin and zinc.</li> <li>• Antibiotics</li> <li>• Formaldehyde or paraformaldehyde solutions</li> <li>• Phenol, benzene or derivatives of these</li> </ul> | <ul style="list-style-type: none"> <li>• <i>Halogenated</i> organic solvents/ organochlorine compounds (e.g. chloroform, dichloromethane, epichlorohydrin, carbon tetrachloride).</li> <li>• Toxic organic solvents (e.g. methanol, acetonitrile, xylene)</li> <li>• Flammable liquids<sup>1</sup> (with the exception of small volumes as noted above).</li> <li>• Any reactive substances such as air or water reactive substances (Class 4.2 or 4.3) or strong oxidizers (Class 5).</li> </ul> |
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<sup>1</sup> Large volume disposal of flammable liquids to drains could result in dangerous accumulations of flammable vapours within the drain system. In addition, many flammable liquids are also toxic by the inhalation route.

## 8. Disposal to biohazard waste bags/bins

In general, this is not an appropriate method of disposal for chemical wastes with some exceptions specified elsewhere in these guidelines.

It is often incorrectly believed that these bags are incinerated but this is not in the case. Biohazard waste bags and bins are treated by steam sterilization and then shredded and disposed to landfill. This process will not destroy most chemical wastes and inclusion of some hazardous substances (particularly flammable and volatile toxic substances) may pose a health and safety hazard to waste treatment personnel as well contributing to contamination of landfill. In addition, indiscriminate dumping of chemicals into bags could result in dangerous accumulations of flammable substances, dangerous reactions between incompatible substances or result in lab personnel being exposed to toxic fumes.

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## 9. General chemical waste disposal requirements

Please observe the following;

- Never transfer waste chemicals from your laboratory to another location (e.g. store) until your DLM or other designated waste contact has advised you to do so. You will need to provide details about the wastes you wish to dispose of before they can be moved. Dumping unclassified chemical wastes in a central location (e.g. store) without prior notification and appropriate information may put the health and safety of personnel working in the area at risk.
- Note that the primary responsibility for hazardous wastes rests with the waste generator and it is their responsibility to supply any requested information regarding those chemicals. In some areas, the DLM may elect to complete information on behalf of the waste generator but there should not be an expectation that the DLM will do this.
- Ensure that waste chemicals are stored in leak-proof containers (with lids) that are made of materials compatible with the substance being stored and that these are in good condition. Please do not use old milk or soft-drink bottles as these are made from thin plastics that are prone to leaking or breakage. Please inform your DLM/waste contact if a container appears to be in a poor state of repair (e.g. leaking, damaged, or otherwise deteriorating).
- If using plastic jerry cans (i.e. square/rectangular style containers) to store waste chemicals, do not use container with taps – as these are prone to leakage during transport.
- Do not use containers of >25 L or Kg volume without prior consultation and approval of the laboratory health and safety advisor as these may pose manual handling issues.
- Do not mix wastes together (except where otherwise specified in these guidelines) as some combinations of chemicals may react dangerously.
- Keep wastes chemicals that are incompatible<sup>2</sup> (i.e. may react dangerously together) well segregated, i.e. do not store together in the same trolley or tray or in such a manner that if a container leaked it could come in contact with a container of an incompatible substance.

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<sup>2</sup> Refer to Section 11.

## 10. Guidance on common waste types

The following sections provide more detailed guidance on some of the most common chemical waste types. However, if unsure always seek advice from your DLM in the first instance.

### 10.1 Organic solvent wastes

Organic solvent wastes are a common waste stream generated from laboratory areas. Most organic solvents are flammable liquids and many are also toxic and environmentally hazardous.

Different organic solvent wastes can be collected together but please note the following -

- Wherever possible try to keep chlorinated solvents (solvents containing chlorine, e.g. dichloromethane, chloroform, epichlorohydrin, carbon tetrachloride) separate from non-chlorinated (e.g. acetone, acetonitrile, ethanol, isopropanol, methanol, xylene) and label accordingly. Wastes that contain chlorinated organic solvents are more expensive to dispose of as they need to be sent overseas for high temperature incineration.
- Record what solvents may be present in your waste and supply this information to your DLM (e.g. mixed solvent waste, contains acetonitrile and methanol).
- Never mix organic solvent wastes with other wastes, particularly reactive substances such as inorganic acids and oxidizers (e.g. sulfuric acid, nitric acid, hydrogen peroxide) as these may react dangerously.

### 10.2 X-ray film processor waste

Used X-ray developer/fixer/replenisher typically contains silver (this is released from the X-ray film as part of the photographic process), an environmental pollutant that is subject to strict trade-waste limits. As a consequence, it is recommended that X-ray processor waste is collected and disposed as chemical waste, particularly where large volumes are generated. Please do not use metal containers for storage of X-ray processor waste as this usually contains acetic acid which will corrode such containers.

### 10.3 Contaminated gloves, plastic, paper (e.g. tubes, assay plates, tips)

Low volume and occasional disposal of solid materials (e.g. gloves, plastic tips) contaminated with residue of hazardous substances into biohazard bags/pails is appropriate but where large volumes of such wastes are being generated (particularly on a routine basis) the use of this disposal pathway requires careful consideration.

Disposing of large volumes of such waste through biohazard bags/pails may result in exposure of lab personnel or waste contractor personnel to toxic fumes, may also pose a risk to the health of personnel working at the waste treatment facility and may contribute to contamination of landfill. Consult with your DLM if unsure of the appropriate disposal method.

Biohazard waste bags or pails must never be used for disposal of bottles or other containers of unwanted or waste chemicals.

#### 10.4 Formaldehyde and paraformaldehyde solutions

Solutions of formaldehyde and paraformaldehyde should not be disposed via drains as this a volatile toxic substance that is a known carcinogen and is subject to both stringent trade-waste restrictions as well as strict work-place exposure standards (including a ceiling exposure limit of only 1ppm). Please collect formaldehyde/paraformaldehyde wastes in airtight containers and dispose via the Chemical Waste Collection Service.

Non-human specimens preserved and suspended in solutions of formaldehyde may also be disposed by this pathway (it is not necessary to remove the specimens beforehand). However, carcasses of animals that have been perfused with formaldehyde/paraformaldehyde should be double-bagged and disposed of as animal carcasses – however, label the outermost bag clearly as “Contains FORMALDEHYDE, UN NO: 2209”.

#### 10.5 Agarose/polyacrylamide gel waste

In general, waste agarose and polyacrylamide gels, including those containing dilute (<10 µg/mL) ethidium bromide do not need to be disposed as hazardous chemical waste unless they contain other hazardous substances at concentrations likely to present a risk to health and safety or to the environment. Such gel wastes may be double-bagged and disposed via general waste skips but should not be placed in laboratory general waste bins.

#### 10.6 Empty containers

In general, empty containers may be triple-rinsed (filled with clean water and emptied) three times, any outside labels removed or completely defaced and the container disposed as either glass or plastic, as applicable.

However, empty containers may be disposed as hazardous waste if they contain residue of a substance that will not be readily removed by rinsing (e.g. a sticky resin) or which would be react dangerously with water (e.g. a chemical that heats dangerously or ignites in contact with water) or where it a container cannot be safely cleaned for some other reason.

#### 10.7 Unknown substances

Occasionally, containers may be discovered that have no or illegible labelling. In such cases, please try to provide as much information about the substance as you can, e.g. physical state (solid or liquid), colour, pH (check with litmus if possible) or likely contents (e.g. organic solvents, unknown). Please ensure you always label working solutions and reagents clearly to ensure that the contents can be identified by others who may have to deal with the container in the future.

#### 10.8 Potentially explosive substances

Containers of potentially explosive substances may occasionally be encountered, e.g. Picric acid (Trinitrophenol) or Nitrocellulose powder. Such substances are usually purchased in ‘desensitised’ form (i.e. mixed with a solvent to render them non-explosive) but if not stored properly they can become unstable over time. If you find such a substance and you are unsure if it has been stored correctly - **do not move or otherwise disturb the container** – contact your DLM or the Laboratory Health and Safety Advisor immediately for advice.

## 11. Incompatible wastes

Always check the Safety Data Sheet for detailed information on incompatibilities but the following are some of the most common incompatibilities that may be encountered.

- Keep substances with reactive hazard classifications (Class 4, 5.1.1, 5.2) segregated from each other and from flammable liquids (Class 3.1) and corrosives (Class 8)
- Treat Oxidizing acids (e.g. Perchloric, Nitric) as Oxidizers (Class 5.1.1), i.e. as above.
- Keep acids well segregated from cyanides, azides and hypochlorite solutions.
- Keep strong acids (e.g. sulfuric acid, hydrochloric acid) segregated from strong bases (e.g. sodium hydroxide, ammonia)