

Trinity College Dublin
Department Of Biochemistry
Health And Safety Action

Waste Disposal Outline Protocols (revised May 2006)

As a general principle, no scientific wastes should end up in a domestic waste-stream (Lab waste baskets, black plastic sacks, black or green standard wheelie bins, *etc.*). Scientific wastes are potentially hazardous and if they end up in landfills there is possible cause for involving the College in scandal and exposure to costly legal action in a situation where someone scavenging over the dump cuts himself on a discarded item and claims that they contracted HIV or CJD from handling the item. You may claim (on behalf of the College) that the item was rendered safe prior to disposal but it is unlikely that you have proof to substantiate your position in a court in relation to that specific item. Note, in addition, that you have a 'cradle-to-grave' responsibility for any wastes you produce. The College (and its insurers) expects that you will not involve it in exposure to scandal and onerous costs.

More detailed procedures are described, for each category of waste, in the Departmental Safety Statement. Note that 'labelling' means **indelibly marked** (to withstand weathering) with waste producer's name, Lab no., date, description of hazard(s) present and hazard warning decal along with any i.d. tag. National law for disposal of most categories of waste requires classification and certification [under European Communities (Classification, Packaging and Labelling of Dangerous Preparations) Regulations 2004 and ADR Regulations 2004 - The Carriage of Dangerous Goods by Road Regulations 2004 (S.I. No. 29 of 2004)] – this is to ensure that all wastes are defined/classified, the transport operator knows what he is carrying, the environment protected and your 'cradle-to-grave' responsibility underlined in law. [College internal and/or national 'Waste Management Regulations, 1998' certification procedures apply for most wastes – The Hazardous Materials Facility has a stock of C1 Forms and generally completes the form for your waste batch.]

The College has established a Hazardous Materials Facility (HMF) based in the penthouse of the East End 4/5 Building [Mr. Marcus Phelan assisted by Mr. Colm Deevey, Ext.: 3565; Email: marcus.phelan@tcd.ie & ctdeevey@tcd.ie]. The thrust of EU and national regulations (the 'polluter pays' principle) is to make waste disposal costly to encourage waste minimisation (per kg charge).

You need to keep in mind that the goal is the prevention of waste generation. For example the inclusion of a hazardous substance with a non-hazardous waste stream means it must be classified as hazardous waste, and subsequently the cost of disposal multiplies.

In the absence of the Departmental Safety Officer or Marcus Phelan or Colm Deevey, the only competent person authorised to sign certificates is the College Safety Officer (Tom Merriman or Elaine Lee) or someone nominated by him/her.

The appropriate legislation (Acts and Regulations) can be found at this URL:
www.irlgov.ie/ag

Classification of Wastes: General principles of classification and labelling.

All wastes can be classified as one or more of the following based on hazard type -

A) Chemical substance or preparations

- (a) explosive,
- (b) oxidising,
- (c) extremely flammable,
- (d) highly flammable,
- (e) flammable,
- (f) very toxic,
- (g) toxic,
- (h) harmful,
- (i) corrosive,
- (j) irritant,
- (k) sensitising,
- (l) carcinogenic,
- (m) mutagenic,
- (n) toxic for reproduction,
- (o) dangerous for the environment.

B) Biological Agent (including GMM/GMO)

C) Ionising Radiation (radioactive materials – RAMs)

D) Sharp

Each Lab or producer has to set up a waste management system to ensure separate waste streams for these major hazard types.

Hazard-Warning Labels

Some general advice:

- You must remove or deface all hazard-warning labels on any empty container that is to be consigned to a non-contaminated waste-stream for disposal via the ‘domestic’ route to landfill. The best way to do this is to use a spatula as a scraper.
- Radioactive trefoil signs must be removed from any radioactive waste consigned to yellow Sulo bins or yellow UN waste sacks destined for storage on the roof of Wellcome or Hamilton buildings.

1. Glassware

There are basically two types of glass in use in Labs – soda-glass and boro-silicate types (Pyrex) so collection and disposal follow two different routes. All glassware should be rendered non-contaminated at source in your Lab by appropriate treatment and labels defaced or removed. Do not deliberately break any glass container – it’s safer intact.

1.1. Soda-glass: Non-contaminated

Broken or unwanted soda-type glassware (not scientific glass such as Pyrex) such as brown Winchester and reagent bottles, disposable pipettes, *etc.* (provided that containers are well rinsed and caps removed to allow venting) or all parts otherwise appropriately de-contaminated) should be collected in your Lab in a labelled cardboard or plastic box (**designated 'soda-glass only'**). Remove the caps then **deface or tear off any material descriptive or hazard warning labels or i.d. on containers**. Members of the lab are required to bring the box to the recycling 'wheelie-bins' (for 'clear', 'brown' and 'green' glass), located outside the building (South end of building, at present), for disposal. The lids on these bins are not locked so all you have to do is discharge your box's contents into the bin. If the bin is full do not leave the box on the ground: return again the next day.

1.2. Boro-silicate (scientific-type – Pyrex, etc.): Non-contaminated

Pyrex-type (borosilicate) glassware cannot be recycled so it must go to landfill. This means it has to be separately collected in your Lab and not mixed with soda-glass for disposal. Set aside a cardboard box designated for **'Pyrex glass only'**. Containers should be well rinsed and caps removed (to permit venting) or all parts otherwise appropriately de-contaminated. Remove the caps then **deface or tear off any material descriptive or hazard warning labels or i.d. on containers**. When full the box should be brought by Lab personnel only to the waste-compactor located in the pen at the south end of the building and placed directly into the large compactor through its side door.

2. Plastic sharps such as micropipette tips, micro-centrifuge tubes, transfer pipettes and syringe barrels: Non-contaminated

These plastics (provided that they are not contaminated) should be collected/ stored in labelled screw cap plastic containers at each researcher's/student's working area (used plastic chemical containers or culture flasks are the most suitable). Once the containers are full, they are capped and put into black bags. Do not put micropipette tips, micro-centrifuge tubes, transfer pipettes and syringe barrels into domestic waste bins or place them >naked= into plastic bags (they can pierce the bag). For disposal of these black bags go to the large waste compactor located in the pen at the south end of the building and place the sealed bag directly in it yourself via the side door. If these sharps are contaminated (biohazard, radioactive, toxic chemical, *etc.*) then follow Protocols 4 or 6.

3. Gloves

All disposable gloves must be taken off by turning inside out and placed in yellow bags because they are considered as **always** contaminated. Do not put gloves into domestic waste bins or into black waste sacks. Contaminated gloves must be placed in an appropriately labelled yellow bag or Sulo bin designated for that hazard (biohazard, radioactive, *etc.*)

4. Contaminated sharps

Blades, syringe needles, *etc.* used in biohazard, radioactive, GMO or toxic chemical work are disposed of in a labelled and designated yellow rigid sharps' container kept within the lab. Once full, this container is removed by the Hazardous Materials Facility to order. [You will be charged for the cost of the container, i.d. tag and the disposal.]

5. Disposable glass or plastic pipettes

Glass or plastic disposable pipettes must not be placed in domestic waste bins or naked in plastic bags - they are >sharps=. Non-contaminated pipettes may be placed into a labelled

cardboard box (follow Protocol 1 for disposal). Contaminated pipettes must be placed in an appropriate waste stream providing that they are treated as 'sharps' as well (follow Protocols 4 or 6).

6. Solid radioactive waste

Ensure that all liquid waste is removed to a separate waste stream that can be certified as to activity level.

Remove or deface any radioactive hazard labelling on containers (use indelible black ink felt-pen) before putting materials (combustible materials only) into a suitable labelled container ('Yellow bags' for soft wastes only. 'Sulo' bins for hard wastes). [The waste must not be identifiable as radioactive. The waste can only be incinerated if it has an activity level below that designated by law. The activity threshold depends on the radionuclide present.

On no account use bins or bags to dispose of significant activities of any radionuclide – the law requires certification for all such disposals. If you know or believe that significant activities are present from say spillage, *etc.* then you are required to make an estimate of the activity and declare it to the DRPS.]

Yellow bags must be protected from inadvertent puncturing in labs – please make sure you have a suitable pedal-bin type bag holder fitted with a lid.

[You will be charged for the cost of any container, tag and disposal.]

Soft wastes: disposable gloves, paper tissue, BenchKote, cardboard packaging - provided that it is compressed and crumpled, *etc.*

Hard Wastes: micropipette tips, microcentrifuge tubes, disposable plastic pipettes, disposable dropper/transfer/Pasteur pipettes, Sterilin tubes, syringe barrels, empty plastic LSC vials, *etc.*

Handy Hint - Used contaminated micropipette tips, transfer pipettes and micro-centrifuge tubes may be collected at the work-station in labelled plastic screw cap containers (old reagent bottles, disposable culture flasks, *etc.*) before putting into the 'Sulo' bins.

Fill any 'yellow bag' or 'Sulo' bin only to about two-thirds full. Absolutely no glass, lead, or other non-combustible materials permitted in bags or bins. Once filled, place the lid on the bin and attach the numbered i.d. cable-tie. In the case of bags tie the bags off tightly with the appropriate numbered i.d. cable-tie.

Cable-Ties I.D. are available from Hazmat.

The producer then notifies the Safety Officer by Email that x No. of Sulo bins and y No. of Yellow bags are ready to go to the Roof Store. A list of the Sulo bins with their i.d. tag numbers must be provided and/or a list of the Yellow bag i.d. tag numbers. Please keep lists separate. A Charge-Code must also be provided. Please also provide your Tel. Ext. Number. You will be contacted to arrange a time for bringing the containers to the Roof Stores of the Wellcome or Hamilton Biotech buildings, as appropriate. The i.d. tag numbers will be entered in a Register maintained by the Safety Officer. This will be forwarded to the Technical Storesperson for invoicing purposes.

In the case of each container you **must** label indelibly (waterproof felt-pen or better) with the lab name, the PI in charge and the person(s) within the lab who produced the waste. Bins and bags must be subjected to monitoring for ionising radiation intensity at the surface of the

container by the College Hazardous Materials Facility technician or the CRPO and so for this reason they are to be taken by you to the roof storage area. Please do not bring the containers to the roof until you have made prior contact with Dr. Mike McKillen (Lab 2.1. Ext.1613. Email: mmckilln@tcd.ie).

7. Liquid radioactive waste

Do not dispose liquid wastes to the Lab sinks and drains. It is important to note that screw-cap mini-vials must be used for radioactivity counting not the snap-cap ones, as these caps are tricky to remove. All liquid wastes including spent scintillation fluid must be collected into labelled and numbered plastic containers (not glass) because of breakage risks. [It is important to ensure that the plastic container chosen is compatible with toluene (if toluene is in the scintillation fluid).] Fill the container at max. about two-thirds full (this is to allow for safe expansion). Before disposal take 100-500 Φ l sample from each numbered container and measure its activity in a scintillation counter using appropriate scintillation fluid in the case of LSC (do not forget a background control). A College certificate (triplicate books available from Stores) for the disposal of all liquid wastes, including scintillation fluid, must be filled out following the activity check and it must be signed and approved by Dr. Mike McKillen prior to disposal. If the activity meets the permitted level for the radionuclide and there is no water-immiscible solvent present in the waste, it may be disposed of into the storm sewer. There are two access routes to the storm sewer. One is a sluice, draining directly to the sewer located in the Hamilton Building (cross-corridor on ground floor) and the other is located in the bike park at the rear of the Wellcome Building. To obtain a key to both of these facilities you need to contact Liam McCarthy (Chief Technician). In addition, a tool is required for the Wellcome Building sluice to lift off the manhole-cover. Contact Noel or Liam in the workshop. [**Hazard Warning:** risk of foot crushing; keep feet well away from cover.]

In the case of both sluices please note:

- the sluices are only for certified liquid water-miscible wastes. No solids whatsoever. Certification is done through DRPS (Mike McKillen) as per usual procedures.
- Hamilton - the push-button on the cistern valve has to be pressed quite hard and held down to flush. The cistern fills quite rapidly so the waste can be subjected to repeated flushings. I would suggest that at least 4 flushes be done for each disposal. Some disposals (depending on activity and/or radionuclide) may require more extensive flushing. In the case of the Wellcome sluice, run the tap while you are using the facility.
- Take care not to cause splashing/spillage when decanting waste solutions into bowl (Hamilton) or gulley (Wellcome). Any spillages to be reported to me. I don't want to find that these areas become a 'hot' area from misuse.
- Please wear disposable plastic apron, gloves and goggles when using the sluices.
- The rim of your storage bottles (always plastic) should be wiped with tissue before you remove it from out of the sluice area - this is to minimise contamination drops.

- These facilities are designed for use by Biochemistry personnel only working in the Hamilton Biotech or Wellcome labs. Please do not facilitate any other groups. It has taken years of effort to get this far!

If the activity is too high, waste must be diluted prior to disposal and smaller portions disposed over a number of days. If the scintillation fluid used contains toluene, following the radioactivity check, this waste is brought to the College Chemical Waste Facility located at the rear of the Department (opening hours 10:00 – 11:00 hrs). It must be accompanied with a copy of the signed and approved certificate for the disposal of liquid wastes. [You will be charged for the cost of disposal.]

8. Radioactivity checks of equipment

It is a licence requirement of the RPII that you perform radioactivity checks on all equipment and communal surfaces on a routine basis (this would also include fridge/freezer handles, door handles, taps, switches, *etc.*). As none of the Mini-Monitors available in the department are suitable to detect ^{14}C or tritium, Kendall Webcoll alcohol preps are used as swabs on the above areas. Put swabs into large scintillation vials, add scintillation fluid and use a clean unused swab placed in a vial of scintillation fluid as a background count. Count the swab tests on the ^{14}C and tritium channels in the scintillation counter. Report any contamination exceeding background by in excess of three-fold to Dr. Mike McKillen.

9. Autoclaving

Material to be autoclaved must be collected in appropriate bags or bottles and each container **clearly labelled with principal producers name and lab number**. To permit steam entry and air displacement, leave bags open at the top and bottle caps slightly ajar. Put a piece of autoclave tape on the outside of each container as an indicator of autoclaving. Each Lab must have a specific metal container for holding and transporting all materials to the autoclave – bags, in particular, must not be carried unprotected to the facility. New users must register with Noel or Liam in the Workshop to organise first time use of the autoclave. The normal autoclave run is 121EC for 20 minutes. Bags, bottles, *etc.* must be placed in the designated metal boxes used in the autoclave. All sharps (pipettes, transfer pipettes, micropipette tips, micro-centrifuge tubes, *etc.*) must be protected. You have to sign ‘off’ your use of the autoclave and your disposal each time.

10. Non-radioactive chemical waste

Please note that unlabelled or unidentified chemical substances or preparations cannot be disposed. Some chemical substances or preparations may have to be stored on the premises in perpetuity because waste contractors will not accept them due to the nature of the hazard.

Solvents

Solvents must be divided into chlorinated (*e.g.* chloroform) and non-chlorinated (*e.g.* acetone) wastes: these are **not** to be mixed together. Keep the solvents in individual containers and when full contact the Hazardous Materials Facility about disposal. Transport glass containers in a suitable transport carrier. [You will be charged for the cost of disposal.]

Solids

If solids are to be disposed collect them in your Lab in a suitable labelled container (do not mix incompatible chemicals) and produce a typed inventory (compound or preparation, quantity, & hazard category) and then contact Ronnie in the Prep Room (Ext. 1607). Collect

spilt mercury in a suitable gas-tight screw-cap plastic bottle. Unknown chemicals are very expensive to dispose - take care to retain labels on original containers. Ronnie deals with disposal of waste chemicals during the long vacation period. He will make arrangements with the College Hazardous Materials Facility and contact you about details later. [You will be charged for the cost of disposal.]

Mutagenic, cytotoxic wastes

This category includes compounds such as ethidium bromide (EtBr), vincristine and other anti-cancer drugs, etc. Special segregation and handling procedures apply to these materials. For some time "ethidium bromide contaminated wipes and gloves" has been an established hazardous waste stream handled by HMF. This has involved disposers separating the material from other waste streams and placing it in black bags for disposal via HMF. The use of black bags is not particularly desirable as it signifies domestic waste. Also there has been an element of confusion with regard to what can be placed in these black bags and sharp material has on occasion been found in the bags. This is not satisfactory.

In order to address these issues there will be a change in the system to the following:

Yellow **cytotoxic clinical waste** 60L bins and/or smaller sharps' boxes topped with 'purple lids' should be used to contain EtBr contaminated waste.

The 60L bins are the same as the normal clinical waste bins but **must be sealed with a purple lid** rather than a yellow one. In addition a label indicating, "contains cytotoxic waste" will be added to the 60L bins. The purple lid denotes cytotoxic/ cytostatic waste. This waste stream will be sent abroad for incineration (same disposal method as before).

Segregation (as per best practice):

60L bins with purple lids may contain:

Contaminated wipes & gloves, gels, other soft waste. They may **/_not_/** contain sharp materials.

Purple lid sharps' boxes:

Sharp EtBr contaminated items e.g. pipette tips, glass, needles, empty tubes etc.

(Anyone with liquid EtBr they wish to dispose should contact HMF directly.)

/Note/: Other cytotoxic materials may be placed in these containers also. See page 39 of the DoHC guidelines: http://www.dohc.ie/publications/segregation_packaging.html

HMF now has cytotoxic waste containers in stock and disposers may obtain them from HMF by calling ext. 3565. Marcus Phelan will update the HMF site soon with the changes. Please call HMF if you have any questions or comments.

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Web (TCD access only): http://www.tcd.ie/Hazardous_Materials/

Please implement these changes from 8 MAY 2006 onwards.

11. Ethical aspects of waste disposal

Each Principal Investigator has >cradle-to-grave= legal responsibility for all waste or unwanted materials arising from their activities. Waste disposal is expensive and made deliberately so, as a result of National and E.U. policy to encourage waste-minimisation. Uninvolved third - parties (such as cleaning, maintenance and service staff, visitors, *etc.*) and the environment must not be damaged by your activities. The production of wastes has to be managed so that proper and appropriate waste-streaming procedures are in place in individual laboratories, the Department and the College.

It is the duty of Principal Investigators to ensure that students and research personnel, who are involved with them in their activities, are aware of the proper waste management procedures and that effective monitoring of compliance is in place.

The College disciplinary procedures can be invoked to ensure compliance. These procedures could include the imposition of fines, withdrawal of I.D. card, suspension from laboratory work for a period, *etc.*

12. Temporary research personnel and waste management

Some temporary research personnel (SS project work, summer job students, ERASMUS, *etc.*) may not be able to complete the handling of their wastes prior to departure. In such circumstances it is essential that the Principal Investigator makes appropriate local arrangements to have the waste assigned to him/her for custody. The previous producers name should be removed from the container (s) and the supervisors name indelibly affixed instead. The supervisor must know and record the provenance of the waste.

13. Hazardous Materials Facility (HMF)

The Hazardous Materials Facility staff should be contacted for advice about presentation of wastes for disposal by outside contractors. [http://www.tcd.ie/Hazardous_Materials/]

The services that are available at present include:

➤ Chemical

1. Non-chlorinated organic solvent
2. Chlorinated organic solvent
3. Hydrofluoric acid
4. Waste photographic developer/ fixer
5. Ferric chloride
6. Waste lab smalls, comprising all classes bar Class 1 (explosives), and certain Class 4 materials (these are self-reacting substances and those which ignite in water or spontaneously combust)

7. Pharmaceuticals
8. Waste silica (still at enquiry/ quotation stage)
9. Chemically contaminated sharps

➤ **Biological**

10. Clinical waste (Soft and sharp wastes)

➤ **Other services**

11. Range of Primary Packaging available for all types of clinical waste and other sharp waste- see website.

12. Packaging for Diagnostic Specimens will be introduced on a trial basis if sufficient interest merits it. (This disposable/ reusable packaging is UN approved, and once used correctly no other provisions of ADR apply i.e. totally legally compliant).

13. Advice on transport of dangerous goods including aspects relating hazardous waste.

14. Electronic Equipment, Fridges, Freezers, etc.

The College has policies and procedures for the disposal of all electrical, electronic, white-goods, batteries, fluorescent tubes, etc. wastes. Please refer to the Grounds & Gardens Supervisor, Mr David Hackett at Ext. 608 1630 or EMail: hackettd@tcd.ie

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