

Basic Principles for the Safe Use of Chemicals

This is a synopsis of the main safety principles for working with chemical agents. Refer to Unit publications or specialist data for further information.

* Follow all basic safety precautions to minimize risks when working with hazardous chemicals.
* Pay attention to the health and physical hazards of the materials you use.
* Never work alone when hazardous chemicals are involved.

The critical issue in handling chemicals is the risk assessment and management of the chemical reactions risks. This is the purpose of the [Chemical Agent Risk Assessments](http://www.nuigalway.ie/heathsaf/?menu=7&page=143) (banded and specific assessments) and the [Activity/Project Risk Assessment](http://www.nuigalway.ie/heathsaf/fdownload.php?fid=544)s. These risk assessment assess the risks related to the combination of chemicals and products along with the physical conditions to ensure that all risks are comprehensively assessed and managed.

**Chemical Safety – First Principles**

* Read the safety data sheet (SDS) and Chemical Agent Risk Assessment for all the chemicals/bands you are handling before you start work. Check the information on the label of the container and the current SDS. Ensure that the SDS is the current version and has been updated with the REACH and GHS requirement to include such revisions as the correct Hazard and Precautionary Statements. For more detail on these revised labelling and information requirements see the HSA website at <http://www.hsa.ie/eng/Topics/Chemicals/>
* [Maintain an organized and orderly facility at all times.](http://blink.ucsd.edu/safety/research-lab/chemical/general/index.html)
* Keep the work area clean and uncluttered including adjacent areas such as corridors.
* Never play practical jokes or engage in horseplay. Always use adequate safety measures and never leave exposed [sharps](http://blink.ucsd.edu/safety/research-lab/hazardous-waste/sharps/index.html) (needles, razor blades, etc. unattended:
* Ensure that the risks of any unattended experiments are eliminated as far as possible first and otherwise minimised in advance. Also ensure that there are adequate “Unattended Experiment” controls in the event of a failure or emergency. This applies to:
  + - Ongoing chemical reactions in laboratories
    - Energized electrical, mechanical, or heating equipment
* Ensure that others are advised of the potential hazards of the substance(s) by ensuring that the appropriate warning signs are posted in the area.
* Post warning signs near any dangerous equipment, reactions, or conditions
* Post personal protective equipment requirements for users before entering the facility, if applicable (ideally on entrance door).

**Risk Reduction**

* If the material you are using is hazardous, reduce the risk(s) in the following way:
* Substitute it with a less hazardous material
* Minimise exposure by using engineering controls e.g. fume cupboard, use of an isolated work area;
* Restrict the use of the substance;
* Restrict the number of personnel who use the substance;
* Ensure you are properly informed and/or trained in the use of the substance;
* Monitor exposure levels;
* Use appropriate Personal Protective Equipment (PPE) as a supplementary protective measure where needed. The project/activity risk assessment should detail the PPE requirements. If you are unfamiliar with its use check with your supervisor beforehand. If the equipment is inappropriate or ill-fitting it will not provide the required protection. PPE on its own is regarded as a “last resort” protective/ preventive measure because of its various limitations and must be used in conjunction with the preferred measures above. In addition  
  - Keep loose hair tied back.  
  - Do not wear open-toed sandals in the laboratory.
* Minimise the volume of substances you keep at your workbench to what is immediately required. Within the Unit an accurate inventory needs to be maintained to ensure overall chemical safety in individual labs and in the Unit overall see [Chemical Inventory Policy](http://www.nuigalway.ie/heathsaf/fdownload.php?fid=546) and [Template](http://www.nuigalway.ie/heathsaf/fdownload.php?fid=539)
* Ensure that the containers for all substances are properly labelled as to the name and details of the material and hazard statements. Also label any intermediate containers you may be using as to the material it contains, its hazards and appropriate hazard statements. Ensure that substances are stored appropriately in terms of their chemical compatibility, storage requirements, physical characteristics and manual handling factors. Keep containers closed except when in use, including hazardous waste containers.
* In all cases, when working with hazardous substances ensure the work area is appropriately ventilated. Specifically where vapours or dusts are generated, a fume cupboard, glove box, safety screen as appropriate should be used.
* Minimise the risk of ingesting hazardous substances or personal contamination by taking the following precautions:
* No food, drink (including water) to be stored, prepared or consumed in the laboratory
* Mouth pipetting is prohibited, use a pipette filler;
* Never smell chemicals to identify them;
* No smoking at any time in University buildings;
* Wash your hands regularly especially after leaving the laboratory and before eating/drinking, smoking or applying cosmetics;
* Remove your laboratory coat/other specialised protective clothing before leaving laboratory.

**Special Risks**

* Follow your Unit’s hazard control plans for hazardous materials.
* Pay particular attention to control measures for chemicals that are known to be particularly [hazard](http://blink.ucsd.edu/safety/research-lab/chemical/specific/index.html)ous or Carcinogens, Mutagens and Reproductive Toxicants (CMRs).
* If working with CMRs, an individual risk assessment is required.
* Working with CMRs requires supervision by a competent person.
* Assume that:
* Any mixture should be considered to be more hazardous than its most toxic component
* All substances of unknown toxicity should be considered to be highly toxic
* Be aware of electrical hazards and safely manage the electrical equipment you use as part of your work with chemicals
* Where using a trap ensure that you are trained to safely set up, use and maintain the trap. This should be addressed in the Project/Activity Risk Assessment.

**Be** [**prepared for accidents and emergencies.**](http://blink.ucsd.edu/safety/research-lab/chemical/general/index.html)

Follow basic emergency preparedness best practices:

* Prepare for spills. Clean up only very small quantities and only if you have been properly trained and report them directly. All other spills should be cleaned up by specially trained personnel. Units should have used the [Emergency Action Plan – Chemical Spills](http://www.nuigalway.ie/heathsaf/fdownload.php?fid=473) template
* Know the locations of emergency equipment and how to use it. This should be addressed in your Laboratory Safety Induction which your Unit will have arranged when you started.

**Disposal**Dispose of all waste chemical materials in the approved manner – see Unit Disposal Procedure. Ensure that all waste is correctly labelled. In deciding how often a collection is required the hazards associated with waste storage should be considered (i.e. flammability, storage location etc.) in determining how much material should be held prior to disposal. The waste containers should be appropriately segregated (advice from Disposal Company) and should be of a size appropriate to the rate of production. This prevents waste buildup and consequent increased risks and costs.

**Pre-purchase safety considerations:**

The purchase of chemicals is a process that should not be undertaken lightly. All purchases of chemicals should contain an element of lifecycle planning for that chemical.

Factors which should be considered include but are not limited to:-

1. Appropriateness of sample size. This should take account of the rate of use of the chemical thus giving an expected shelf life for the sample. The shelf life in this context is not simply how long the sample will remain in good condition but also how long the user is prepared to store it. For hazardous material the sample shelf life should be kept short and for less hazardous samples a longer shelf life can be planned for. In many cases larger samples are cheaper but represent a false economy as excess sample represents a storage risk and ultimately additional disposal costs.
2. Chemical risk assessment for use and storage. For any chemical before it is purchased the risk associated with it throughout its life should be considered. How will it be stored safely? Is access to the required equipment available to use it safely in the intended application bearing in mind that hazards associated with a chemical can change with physical conditions and application? Once used what if any products will be formed which will require disposal? Will they be hazardous and does a facility exist in house to store these prior to disposal?
3. Where a Unit has a continuous need for particular chemicals (most typically solvents but also relevant to sharps and other items) a central mechanism for disposal may be most convenient rather than every user arranging individual disposal. In that event central ordering of the item can allow the addition of a levy to the cost price to fund disposal thus allowing funding in advance for the disposal and easily applying the “user pays principle”.
4. Inventory control. Maintain lean, well managed chemical inventories to avoid fire risks, unnecessary chemicals and their management in the interim pending disposal. A clear inventory of holdings within a Unit allows for substantial risk reduction and is required by other agencies such as the Fire Authority. An inventory also facilitates the once off provision of chemicals “on loan” from neighboring groups. The same principle can be applied to occasional use on a small scale allowing researchers to assess a chemicals usefulness prior to purchase. All labs should regularly review their holdings and remove for disposal any chemicals not in regular use. No chemical should be left with a damaged label as a label-less chemical (even an innocuous one) will cost many multiples of the normal disposal cost and other significant hidden costs.
5. In considering disposal costs prior to purchase the following should be accounted for.   
   - Disposal of the material itself which remains unused.   
   - Disposal of byproducts of the reactions to which it is applied.

In all cases the purchase of chemicals should take into consideration the realistic disposal cost. The purchaser of the chemical is responsible for arranging its safe disposal (and of byproducts) including funding this process. All projects and positions should have in place a process by which all chemicals are disposed of prior to completion.