

Title of HWBGM Guidance Note:

Guidance on handling Hazardous Chemicals

Cross Ref. to University of Oxford Policy Statement: S6/05

Introduction

This Guidance note details the local rules that should be applied by all users of chemicals within the Centre. Most chemicals have the potential to cause harm, however there is a broad range of chemicals used within the Centre & hence a vast array of risks.

Hazard	Symbol	Definition
Toxic		A substance which if it is inhaled or ingested or it penetrates the skin may involve serious, acute or chronic health risks or even death.
Harmful	 	A substance which if it is inhaled or ingested or if it penetrates the skin may involve limited health risks.
Irritant		A non-corrosive substance which, through immediate, prolonged or repeated contact with the skin or mucus membranes, causes inflammation.
Corrosive		A substance which may on contact with living tissue destroy it.
Extremely Flammable		A substance whose flash point is below 0°C. The flash point being the lowest temperature at which a flammable concentration of vapour will be formed by evaporation in air.
Highly Flammable		A substance whose flash point is below 21°C. The flash point being the lowest temperature at which a flammable concentration of vapour will be formed by evaporation in air.
Flammable		A substance whose flash point is below 55°C. The flash point being the lowest temperature at which a flammable concentration of vapour will be formed by evaporation in air.
Explosive		A material that is liable to explode under the effects of flame or due to impact or friction.
Oxidising		An oxidising material assists the combustion of a flammable material although it may not itself burn. Powerful oxidising agents may give rise to spontaneous ignition at normal temperatures.
Cryogenic		Very low temperatures at which the effect on the skin can lead to severe burns.

It is therefore important that in addition to reading this document you make yourself fully aware of any/all of the information available relating to the chemical in question e.g:

- COSHH Assessments – See below
- Material Safety Data Sheets – Copies should be held within each Group, or with Safety Officer or contact supplier.
- Information on the Sides of Containers.
- Oxford Physical Chemistry WebSite.

It is your responsibility to ensure you know what controls are needed to ensure the health of you and your colleagues around you. You **must not begin** any work until you are absolutely sure of the appropriate precautions to take. If you are unsure, consult:

- Supervisor
- Group Head

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- Health & Safety Officer (or lab-support@well.ox.ac.uk)
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COSHH Assessments

Introduction

As indicated most chemicals have the potential to cause harm – Therefore in UK law, there is a specific and absolute requirement to carry out ‘Risk Assessments’ on their use. This comes under the

“Control of Substances Hazardous to Health Regulations”

Hence the term COSHH Assessments.

The purpose of the COSHH Assessment is to define the steps that must be taken before an experiment is started to ensure that a potentially harmful chemical can be used safely. It is accepted that many chemicals pose limited risk if handled according to “Good Laboratory Practise”. However if you work within the laboratory, at some point you will almost certainly come into contact with a particularly hazardous chemical (e.g. Ethidium Bromide, Acrylamide, Phenol, Formamide, 2-Mercaptoethanol). How these specific chemicals need to be handled is detailed in COSHH assessments, and although the assessment may already be completed, you must understand the reasoning behind the assessment to ensure the appropriate control measures are followed. The next section therefore takes you through the requirements of ‘COSHH’ and gives you an indication on completing the assessments.

Definition

The full definition of a substance hazardous to health is defined within University Policy Statement S6/05.

A written assessment will always be required, but certainly not limited to the following instances:

- all microorganisms, classified under the ACDP or DEFRA guidelines as Hazard Group 2 or above.
- where substances in use have been assigned any of the following risk phrases: R23, R24, R25, R26, R27, R28, R34, R35, R40, R41, R42, R43, R45, R46, R48, R49, R60, R61, R63 or R64
- where extreme toxicity is indicated (e.g.. LD50 oral, rat < 1 mg/Kg)
- where special first aid provision is required (e.g. cyanide, hydrofluoric acid, phenol)
- where significant amounts of substances with a Workplace exposure Limit (WEL) are used in unenclosed or partially enclosed circumstances (e.g. use of volatile chemicals on the open bench with no fume cupboard or other local exhaust ventilation)
- where procedures involve explosive, oxidising, or pyrophoric substances (risk phrases R1, R2, R3, R4, R5, R6, R7, R8, R9) Although not strictly covered by COSHH regulations – the form would provide a convenient format to start the assessment.

It should be noted however that a formal COSHH assessment is not always required; if the substance is of low hazard and exposure controlled by Good Laboratory Practice, then a written assessment is not necessary.

Documentation & Training

To meet the requirement of the regulations, Group Heads must ensure that individuals within their Group carry out appropriate COSHH assessments **before** they begin work with a new substance. All documented COSHH assessments (and relevant information) must be kept in such a place that all members have access to it.

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All new staff and visitors to the Group should be made aware of the whereabouts of these assessments. They should also be specifically guided to any action they need to take as and when they commence work with the assessed substances. A record of this should be kept on the individuals training record log. A copy of the Assessments should also be forwarded to the H&S Officer, who must ensure that all other visitors, contractors and support staff are made aware of these assessments if they too are to be affected.

As many of the processes carried out within the Centre are the same, there are Generic Assessments available on the Web Site. It is therefore not necessary for all groups to duplicate these assessments, but they must ensure that the assessment is relevant to the work they are carrying out. If for instance a different substance is used or the volumes are significantly different, then a new assessment will be required.

Individuals Affected

It is also worth noting that when completing the assessment, certain individuals, dependant on the material in question, may also be at higher risk. Anyone who knowingly fits into one of these categories should be made aware of the risk and should be advised to consult the H&S Officer/Occupational Health for further guidance. These people are:

- Anyone who has a compromised or suppressed immunity through existing disease or medication,
- Anyone who is pregnant (when the foetus may also be at risk) or breast feeding,
- Anyone who may have a history of asthma (and therefore may be at increased risk from respiratory sensitisers)
- Anyone who has a skin condition such as eczema.

Completing the Assessment

Where a formal COSHH assessment is required, it is recommended that the University COSHH Assessment form be used – Available from the Centre's H&S Website or H&S Officer. The following information details how to complete this Assessment, but it should be read in conjunction with the University Policy Statement S6/05.

Guidance Notes on how to complete University COSHH Assessment Form

1. Complete the first Sections, detailing the procedure under assessment, who is likely to be affected and therefore the scope of the assessment.
2. In the next Section list all the substances to be used in the procedure.
3. For all the substances listed above identify the Hazards associated, by stating their risk phrases. Information regarding hazards can be found in the following sources:
 - Substance container label
 - [Material Safety Data Sheets](#) (Contact Suppliers directly or search their websites).
 - Previous COSHH Assessments
 - Physical and Theoretical Chemistry safety website: <http://msds.chem.ox.ac.uk/>
 - Technical Reference Manuals i.e. Merck Index
 - Suppliers catalogues
 - HWBGM H&S Officer
4. By using the following Table, score each of the remaining categories and calculate the associated RISK by multiplying the scores together.

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Table 1. Risk Calculation

SCORE	HAZARD CATEGORY	QUANTITY	PHYSICAL CHARACTERISTIC
4	Substances classified as Very Toxic, EEC Class 1&2 carcinogens, Respiratory sensitisers, 'Unknowns' suspected of very high toxicity, WEL <0.1ppm, Risk Phrases R26, R2, R28, R39, R42, R45, R46 ACDP Hazard Group 3 & 4 Pathogens	> 1 Kg > 1 Litre	Substances likely to promote absorption though lung, skin or mucous tissue.
3	Substances classified as Toxic or Corrosive Skin sensitisers, 'Unknowns' not in the very high category, WEL 0.1 to 10 ppm, Risk Phrases R23, R24, R25, R34, R35, R39, R41, R43, R48 ACDP Hazard Group 2 Pathogens	100 g – 1 Kg 100ml – 1 Litre	Gases, Highly volatile liquids, Aerosols, Solutions that promote skin absorption. Infection by inhalation.
2	Substances classified as Harmful or Irritant, EEC Class 3 Carcinogens & Mutagens, WEL 10 to 500 ppm, Risk Phrases R20, R21, R22, R36, R37, R37, R40, R48, ACDP Hazard Group 1 Pathogens	1 – 100 g 1 – 100 ml	Dusty Solids, Lyophilised (easily dispersed) Solids, Volatile Liquids Concentrated Solutions, Low skin absorption. Percutaneous Infection.
1	Substances not identified as Hazardous, WEL > 500 ppm	< 1 g < 1 ml	Dense Solids, Non-volatile liquids, Dilute solutions, No skin absorption Infection by Ingestion

5. From Table 2 below, note the Risk Rating, and then decide on the appropriate control measures required to control the risk. **Note:** this is **only guidance** and all the factors specified in the table above should be considered before deciding on the appropriate actions. Note also that the first way of limiting risk is to decide if a less hazardous substance can be used. If it can, but you do not use it, then you must record the reasons why this is so.

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Table 2. Risk Rating & Control Measures

CALCULATED RISK	RISK RATING	Recommended actions for Substances hazardous by Inhalation	Recommended actions for Substances hazardous to Skin
1 - 10	Low	No special Precautions Required. General Laboratory Rules Apply.	
11-20	Medium	Must handle in Fume Cupboard or MSC (as appropriate) or if risk is such, Wear Appropriate Face Mask	Must Wear Appropriate Gloves and unless risk is such, Safety Glasses should be worn.
21-30	High	Must be handled in a Fume Cupboard/MS (as appropriate) or special containment Facility	Must Wear Appropriate Gloves & Consider the need for Full Face visor. In some circumstances a special isolation facility may be necessary.
>31	Very High	Contact the H&S Officer before commencing any work.	

6. For those chemicals that have been assessed as Medium or above then record the appropriate control measures in the relevant part of the next Section. Consider the following points when recording the control measures:

- Engineering controls. Some Examples are
 - Must be handled in a Fume Cupboard,
 - Must be handled in a Microbiological Safety Cabinet (Class I/II/III),
 - Handle in a well-ventilated area etc.
- Personal Protective Equipment. Some Examples are
 - Wear Safety Glasses,
 - Wear Chemically Resistant Gloves (Note: You should always specify what type of gloves are recommended e.g. 'Wear Nitrile Gloves', as some chemicals will react with certain rubbers)
 - Wear a Face Mask (again you may need to specify the type of mask – see H&S Officer for advice)
- Management Controls. Some Examples are
 - [Good Microbiological Practise](#)
 - Keep separate from Oxidising materials.
 - Store at room temperature & avoid direct sunlight.
 - Never use Sharps
 - Avoid the creation of Aerosols
 - Do not handle out of Normal Working Hours
 - Inexperienced workers will require supervision

7. In the final parts of the form, note any Emergency Procedures that apply. For most substances, this can be recorded as 'Normal Emergency Response applies – Contact a First Aider'. However some substances require specific actions above and beyond the normal response and these must be fully documented eg. Phenol. For your information the 'Normal Emergency Response' when handling **hazardous Chemicals** is:

- Contact First Aider & if **severe, obtain medical attention.**
- If contact with **Eye**, irrigate using one of the Eye Wash taps provided for at least 10mins.
- If contact with **Skin**, drench the area affected thoroughly with water. If necessary use one of the Eye Wash taps or the Emergency Shower to direct the water to the affected area. Remove all contaminated clothing and wash before re-use.
- If **Inhaled**, remove from exposure, rest & keep warm.
- If **Ingested**, wash out mouth thoroughly with water. Do not give anything to drink & do not induce Vomiting, instead obtain Medical Attention immediately.

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8. Finally complete the sections on waste disposal. Again 'normal waste procedures apply' could be satisfactory, unless there are some specific requirements.
9. One important aspect of the last sections is the 'Checks on Control measures'. This refers to checks required for any equipment used to limit exposure. Some Examples are:
 - Fume Cupboards must be checked annually.
 - Microbiologically Safety Cabinets must be checked annually.
 - Respiratory Protective Equipment (Non-Disposable) i.e. Mechanical Respirators must be checked monthly.
10. Next sign the form as complete and arrange for the Group Head to countersign it. Once completed pass a copy to the H&S Officer and inform all those that will be affected of the assessed requirements.
11. Unfortunately the responsibility does not finish there – ***IN FACT IT ONLY JUST BEGINS***. According to the COSHH regulations, the control measures need to be monitored & reviewed to ensure that all actions are adequate. At the very minimum, the assessment must be reviewed every year, to ensure that all information is relevant. This will include checking that individuals are following the appropriate control measure and that it is working.

GOOD CHEMICAL PRACTISE

As stated above, the majority of chemicals used within the Centre do not pose any significant hazard provided they are handled with appropriate caution. The following details the very minimum that everyone within the Centre **must** be following to ensure the Health of themselves & fellow colleagues.

General Rules

- Side fastening or Back Fastening 'Howie' type Laboratory coats must be worn when working at the bench.
- Eating, drinking, chewing, smoking, mouth pipetting and applying of make-up is forbidden.
- Use the minimum amount of chemicals required to avoid excess quantities on the bench.
- All work should be carried out in a tidy & organised manner. Plan and lay out your work so that everything needed is ready to hand.
- Work must be performed with the minimum of spilling and splashing in order to limit contamination. Suitable dispensing aids must be used and substances handled over spill trays if appropriate.
- Remove all protective clothing before leaving the laboratory completely.
- Wash hands before leaving the laboratory and as often as is necessary. Only use the 'elbow' style taps provided for this purpose.
- Bottles, especially Winchester size, should be transported in appropriate carriers.
- Flames and compressed gas supplies should be shut off when not in use and at the end of the working day.
- The Centre's policy for late or lone working must be adhered to - The Centre therefore **recommends** in general, that staff should not work alone. In particular, working with quick acting, highly toxic or asphyxiating materials is **prohibited for persons working alone**. Examples: large amounts (>0.5 litre) of: concentrated acids, phenol, ammonia and cryogenic liquids.

Inhalation Controls

- Inhalation of vapours and powders is to be avoided. In general terms, Fume Hoods must be used for substances that are toxic by the inhalation, flammable, fuming, carcinogenic, have a low vapour pressure or have nuisance odours.
- Fume Hoods must be left as clear as possible both for the proper functioning of the hood and for the safe handling of materials. All waste must be removed at the end of a period of work.

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- Fume Hoods are tested annually but, should also be inspected prior to use to ensure they are functioning correctly. If the Fume Hood is not functioning (e.g Indicator light is not within safe limits), report the fact to lab-support@well.ox.ac.uk immediately. Do not use it until it has been passed safe to do so.
- When working in the Hood, always keep the Sash to the absolute minimum height and generally never above 30cm.
- Recirculating Fume Hoods provide only limited protection and are not suitable for many operations. The purchase and use of recirculating fume hoods must be approved by the H&S Officer, to ensure they are suitable and will offer the required protection. A list of approved substances must be drafted in consultation with the H&S Officer and attached to the Hood. You must contact the H&S Officer before handling ANY substance not listed in such hoods.
- When not in use, **always** close the sash to enable the hood to vent correctly.
- Appropriate respirators(see H&S Officer for guidance) can be used for handling small quantities of non-hazardous fine powder. However it must be remembered that this only offers user protection and that others working in the same area could be affected. Fume Hoods should always be used for handling large quantities of fine powder.
- Never handle hazardous substances in poorly ventilated conditions.
- Exposure to gases and vapours should be limited by covering vessels and replacing caps or stoppers promptly.

Skin Contact Controls

- Wear appropriate disposable gloves at all times when handling chemicals (or longer sleeved type if the arms are also at risk of contact with the substance).
- Appropriate gloves must always be worn when working with acids, alkalis, and other corrosive liquids and liquefied gases.
- Information as to appropriate gloves is provided within the Material Safety Data Sheet – Further guidance can be given by the H&S Officer or by reference to Oxford Physical Chemistry WebSite.
- Gloves should be checked for holes or other signs of damage before use.
- If gloves become heavily contaminated – remove immediately & replace with a fresh pair.
- Never re-use Disposable Gloves as this is likely to lead to imperfections & limits their protective nature.
- Remove gloves as much as possible, before leaving the laboratory area you are working in. If it is necessary to keep gloves on when travelling between laboratory areas, always take one glove off to open doors and carry items in the other. If it is absolutely necessary to keep both gloves on, ensure you use the handles on doors designated for ‘Gloves Only’.
- Routinely check hands for cuts and abrasions and cover with a waterproof dressing before commencing any work.
- Avoid the use of sharp objects. Dispose of broken glass or ‘Sharps’ via the appropriate route. Never leave sharp objects such as disposable scalpels lying around.
- One very significant risk is in the use of Phenol. Phenol not only causes burns on contact with skin but will also permeate the skin and is Toxic. Great care must therefore be taken in handling this substance to prevent contact with skin & operators must be suitably trained in the appropriate Emergency Procedures:
 - Contact First Aider & if **severe, obtain medical attention.**
 - If contact with **Eye**, irrigate using one of the Eye Wash taps provided for at least 10mins. **DO NOT** use PEG 300 on the eyes. Obtain Medical Attention.
 - If contact with **Skin**, remove contaminated clothing avoiding contamination of unaffected areas. Wash the affected area with copious amounts of water to remove any excess Phenol that has not been absorbed. Swab the contaminated skin with Phenol Antidote (Polyethylene Glycol 300), but do not scrub as this may lead to spreading the contamination. Obtain Medical Attention for all Phenol burns.
 - If **Inhaled**, remove from exposure, rest & keep warm.
 - If **Ingested**, wash out mouth thoroughly with water. Do not give anything to drink & do not induce Vomiting, instead obtain Medical Attention immediately.

Eye Protection

- Safety glasses or prescription glasses must be worn at all times in the laboratory.

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- Greater protection in the form of goggles or face shield should be worn if the work may generate fumes, mists, dust clouds or heavy splashing.
- Examine all personal protective clothing and equipment before use and replace any that are damaged or likely to be ineffective.

Flammable Materials

- Highly flammable liquids should be stored in sealed containers in fire resisting enclosures.
- Quantities should be kept to a minimum and the total quantity stored should not exceed 50 litres in any one side of a laboratory.
- Never store or hold volumes >500ml on the open bench.
- They must not be stored in refrigerators and freezers which are not deemed ‘Spark-proof’ (units with internal lights, in general, are not). Unsuitable refrigerators and freezers carry standard warning labels – however you should check before use.
- Flammable substances must be kept well away from sources of ignition including naked flames, electric hot plates and non-flameproof electrical equipment.
- Do not overheat substances with low auto-ignition temperatures, or allow their vapours to come into contact with hot surfaces.
- Highly flammable liquids must not be poured down the sink.

Spillage

- Individuals must be aware of the nearest ‘Emergency Response Spill Kits’.
- Contaminated surfaces and equipment must be cleaned without delay.
- Information relating to hazards of the materials in use & specific spillage procedures should be clearly detailed and accessible in COSHH assessments.
- Any personal contact with a substance should be dealt with immediately by safe and effective first aid – refer to COSHH assessments.
- All spills/accidents must be reported using the Accident Report book.

Containers & Storage

- Substances must be placed in approved storage enclosures when not in use e.g. Flammable material in Flammable cupboards; acids/alkalis etc. in Corrosive cupboards.
- All Containers must be properly labelled, including any appropriate Hazard Warning label.
- Chemicals not in use should be returned promptly to their correct storage enclosures.
- Light sensitive substances (e.g. chlorinated solvents) should be stored in amber-coloured bottles away from the light. It is prudent to keep all chemicals out of direct sunlight
- Surplus materials must not be allowed to accumulate in laboratories. Periodically check storage areas and remove duplicated or unused substances.
- Never store hazardous chemicals above the lower shelf on the central shelving.
- Always keep Oxidising substances separated from flammable substances and sources of ignition.
- Always check compatibility of chemicals and ensure incompatible substances are stored separately.

Waste Disposal – For full details consult Centre policy on Handling waste. In general:

- Waste receptacles should be sealed, labelled, and never overfilled.
- A hazardous waste chemical form should be completed and sent to the Safety Office and chemical@well.ox.ac.uk
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- Incompatible wastes (e.g. halogenated and non-halogenated solvents) should be kept apart.