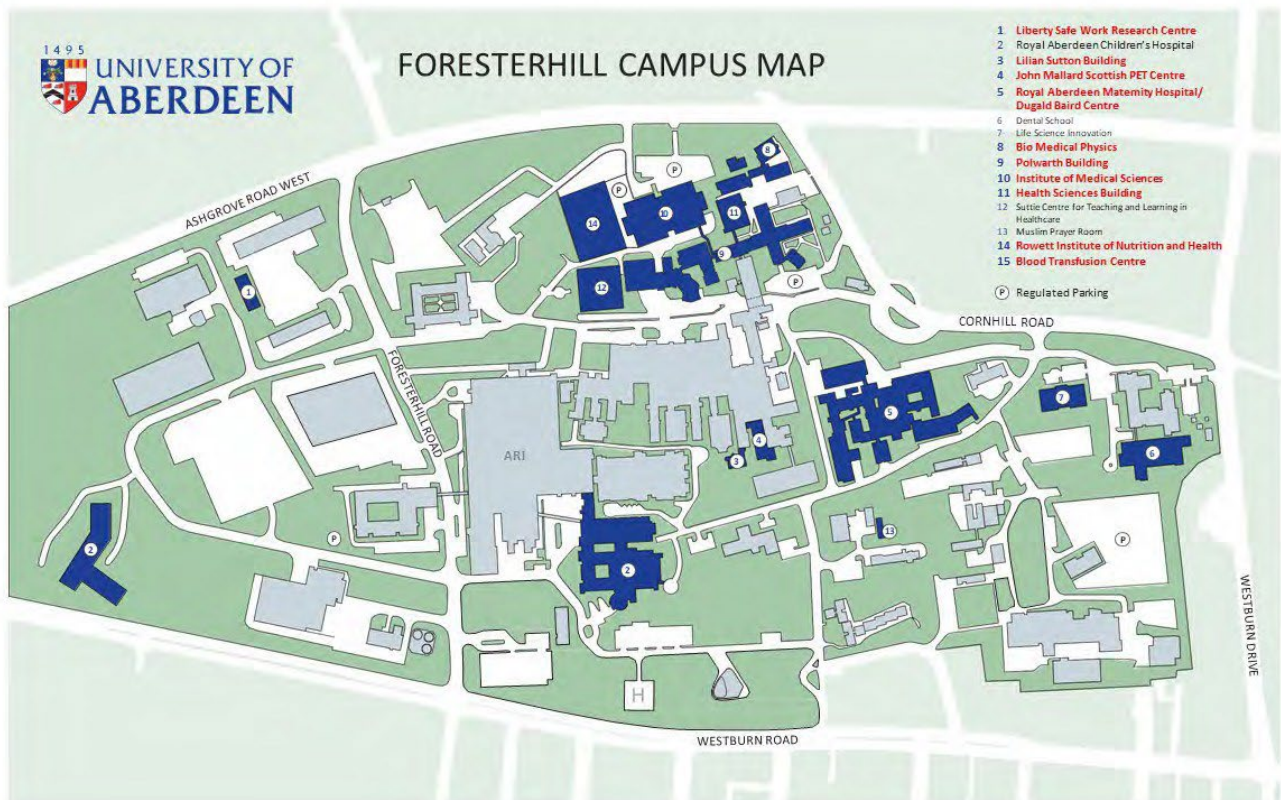


# INSTITUTE OF MEDICAL SCIENCES



## *The IMS Safety Handbook*

*January 2024*

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# KEY CONTACTS

Alphabetical Listing	Function/Role	Ext. No.
<b>INSTITUTE OF MEDICAL SCIENCES CONTACTS</b>		
Dr Guy Bewick	IMS Lead Safety Coordinator	7398
Professor David Blackburn	Convenor, IMS Health & Safety Committee, Director of Institute of Medical Sciences	7480
George Cameron	Biomedical Physics and PET Centre Safety Coordinator	7829
Dr Isabel Crane	IMS Lead Radiation Protection Supervisor	7529
Dr Sergio Dall'Angelo	Research Fellow Representative on IMS Health & Safety Committee	7563
Dr Charlie Harrington	IMS Deputy Lead Safety Coordinator, Liberty and SNBTS	8563
Elizabeth Logan	Clerk to IMS Health & Safety Committee	7505
Dr Alexander Lorenz	Chair, Foresterhill Biological Safety Committee (FBSC)	7323
Lynne Lumsden	Phlebotomy, HSB & IMS Safety Coordinator	7503
Dr Stephen McCallum	University Radiation Protection Adviser and Laser Protection Adviser	76-53109
Dr Chris McNeil	Lilian Sutton Safety Coordinator	8353
Dr Sam Miller	IMS Deputy Lead Safety Coordinator	7484
Dr Wendy Pickford	IMS, LSB, LSI and Liberty Buildings Technical Resource Officer and Safety Coordinator	7460
Denise Tosh	Polwarth, HSB and IMS Technical Resource Officer and Safety Coordinator	7457
Dr Debbie Wilkinson	IMS Laser Protection Supervisor, IMS Safety Committee	7422
Dana Wilson	Rowett and Maternity Unit Safety Coordinator, Solvent and chemical waste removal	8610
Dr Claire Walker	IMS Interim Technical Resource Officer and Safety Coordinator	7467
<b>UNIVERSITY, SECURITY AND EMERGENCY SERVICE CONTACTS</b>		
<b>ACCIDENT &amp; EMERGENCY</b>	<b>HOSPITAL A &amp; E</b>	<b>76-50539</b>
Estates: fault reporting	normal hours	3333
	out-of-hours (emergencies only)	3939
<b>FIRE BRIGADE, POLICE &amp; AMBULANCE</b>	<b>EMERGENCY SERVICES</b>	<b>9-999</b>
Willie Tocher	University Fire Safety Adviser	2515
OCCUPATIONAL HEALTH	OH Works <a href="http://www.ohworks.co.uk">www.ohworks.co.uk</a>	To arrange an appointment please contact your Line Manager or HR Adviser/Partner
Dr Allan Petrie	Central Senior Health and Safety Adviser	3896
Vivienne Amakiri	Central Health and Safety Adviser	2514
Garry Fisher	Head of Health, Safety and Resilience	2783
UNIVERSITY SECURITY	Security	3939

## Summary of revisions to the Handbook in this version

No.	Item	Change
1	Key contacts	Updated in Handbook and Summary
2	Section 1 - Statement from the IMS Director & 1h – Responsibilities of the IMS Health and Safety Committee	An updated statement from the IMS Director on Health and Safety. Chair, IMS Director and Head of School. Subsection links added, including responsibilities of IMS H&S Committee
3	Section 4 – Risk assessment	RA form modified to include physical hazards
4	Section 5 - Wellbeing	Section 4a has been amended to add specific contacts and information for staff and students.
5	Section 6 - Inspections	
6	Section 8 - Accidents	
7	Section 9 - Fire safety	
8	Section 10 - Spillages	
9	Section 13 – Good laboratory practice (mobile phones)	
10	Section 14 - Waste disposal	Updated in August 2022
11	P5 - Biological safety	
12	P11 – Chemical safety	
13	P12 – Compressed gases/cylinders	
14	P13 - Computer workstation assessments	
15	P22 – Lasers	
16	P23 – Lone working	
17	P26 – Microwave Ovens	
18	Entire handbook	Minor and grammatical changes corrected throughout and cross-referencing changes made.
19	Section 34	Update to Pregnancy and Expectant Mothers (December 2022)

# Statement from the Head of School and IMS Director

The Institute of Medical Sciences (IMS) accommodates clinical and basic scientists from the School of Medicine, Medical Sciences and Nutrition who are based on the Foresterhill Campus. As well as the IMS building itself, this also includes the Polwarth Building, Biomedical Physics Building, Liberty Building, Lilian Sutton Building, plus University sections of the Health Sciences Building, Maternity Hospital and Children's Hospital. Responsibility for Health and Safety issues within the IMS rests with the Head of School, who has delegated the management of Health and Safety to the Director of the IMS, the Convenor of the Health and Safety Committee and Lead Safety Coordinator Health and Safety, to ensure a consistent approach across the whole of the IMS. Further details on the responsibilities of individual personnel and the IMS Safety Committee for Health and Safety can be found in the **IMS Safety Handbook** or via links on the [IMS Safety Website](#). Please read through this handbook and have all the members of your team become familiar with its contents.

We recognize that Health and Safety is a core and integral aspect of good business management, and we want to ensure that the IMS provides a safe and healthy working environment.

A summary of the major principles of IMS safety is provided in the **IMS Safety Summary**. This booklet summarizes some important issues to allow safe working in the laboratory. However, it must not be used in isolation; links are provided to more detailed information that is available in the full safety manual on the web. For the benefit of everyone, we urge all staff and students to commit themselves to maintaining high standards of Health and Safety within the IMS. We encourage anyone with suggestions to improve our procedures to discuss them with us or with one of the IMS Safety Coordinators.

Prof David Blackburn  
Chair H&S Committee &  
Director IMS



A handwritten signature in black ink, appearing to read 'D. Blackburn'.

Prof Silidatya Bhattacharya  
Head of School



A handwritten signature in black ink, appearing to read 'Silidatya Bhattacharya'.

Dr Guy Bewick  
IMS Lead Safety Coordinator



A handwritten signature in blue ink, appearing to read 'G. Bewick'.

*IMS Safety Handbook: January 2024*

***Institute of Medical Sciences  
January 2024***



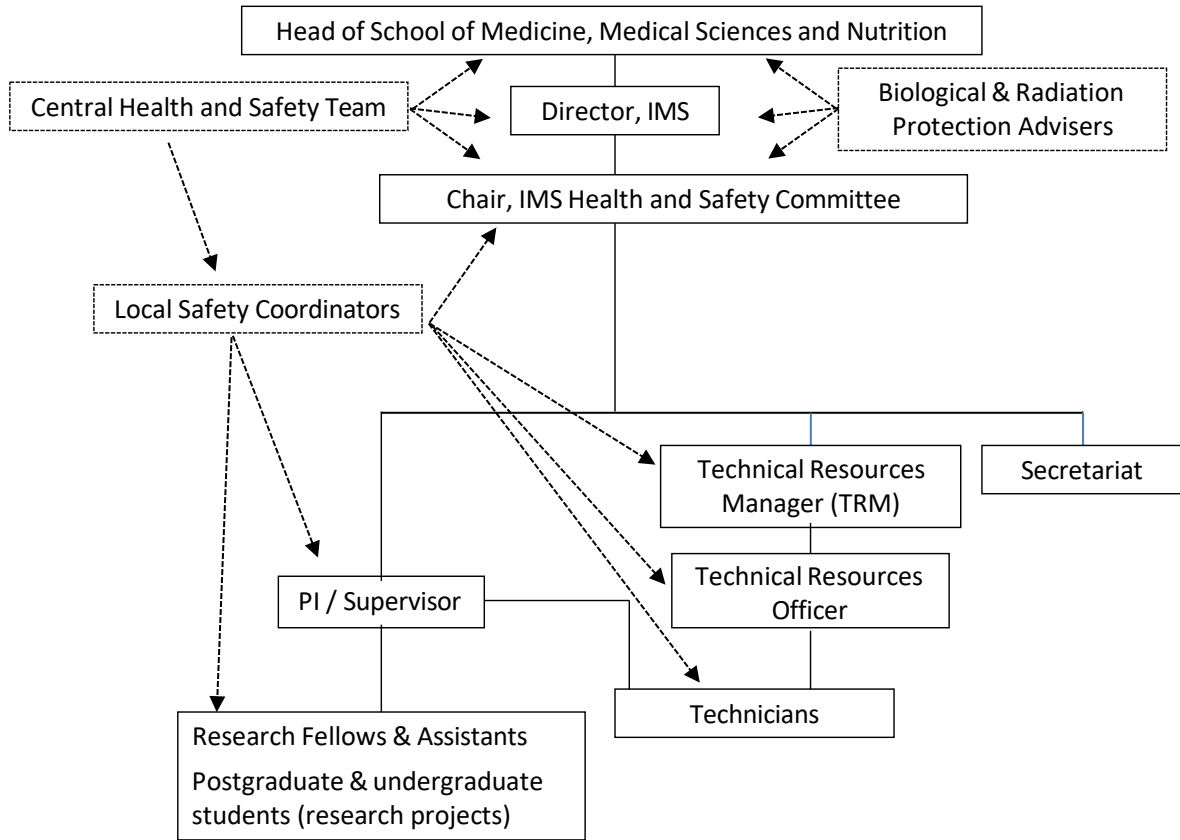
# 1. Organization and responsibilities for health and safety

## a) Overview

The University Court has ultimate responsibility for overseeing health and safety matters at the University and the Principal has overall responsibility for the implementation of the University Policy on this.

The Head of the School of Medicine, Medical Sciences and Nutrition has overall responsibility for Health and Safety matters in their School and individual Institutes within the School. However, for activities undertaken within the Institute of Medical Sciences, the management of Health and Safety is delegated to the Director of the Institute of Medical Sciences, the Convenor of the IMS Health and Safety Committee and Lead Safety Coordinator. Although the task of managing Health and Safety matters is delegated to others, the Head of School will retain overall responsibility for Health and Safety matters as required by the University Health and Safety Policy.

Chain of responsibilities for safety management in the IMS



Dashed arrows indicate lines of advice. The IMS Health & Safety Committee and Safety Coordinators provide **advice** on all safety matters. Safety **provision** runs along management (solid) lines.

Note: Technicians are shown as having dual lines of reporting. Responsibility for Health and Safety rests with the:

- PI/Supervisor when they are working in the laboratory, but
- Team Leader when undertaking IMS duties such as providing a service for the IMS.

Authority is also delegated to the Director of the Institute of Medical Sciences and the Chair of the Health and Safety Committee for those activities undertaken in the laboratories and associated offices in the following areas:

- IMS Building
- Biomedical Physics Building
- Children's Hospital
- Health Sciences Building
- Liberty Building
- Lilian Sutton Building
- Maternity Hospital
- Polwarth Building

**Note:** Health and Safety provision is the responsibility of line managers, not those who have "Health" and/or "Safety" in their job title. The Safety Coordinators provide advice and assistance. **Enacting that advice** and any other safety provision appropriately **is the responsibility of line managers** and supervisors, who play the primary direct role in Health and Safety matters.

## **b) Responsibilities of the Director of the IMS**

The IMS Director will:

- develop, implement and maintain an effective Health and Safety management system which is appropriate for the Institute and which meets the requirements of the University Health and Safety Policy;
- provide a Health and Safety Policy for the Institute and, in consultation with the Head of School, ensure provision of resources necessary to implement the Policy;
- in consultation with the Head of School, appoint local Safety Coordinators to provide advice and assistance with Health and Safety matters;
- set up a Health and Safety Committee and act as chair, or appoint a Convenor, to keep under review the Health and Safety arrangements in the Institute, to make recommendations for improvements and to provide a forum for discussion of Health and Safety issues; and
- bring to the notice of the Head of School any Health and Safety problem which is not resolved in a timescale commensurate with the level of risk.

### **c) Responsibilities of Group Leaders/Principal Investigators**

Group Leaders/Principal Investigators are responsible for implementing the IMS Health and Safety Policy in their areas of control. In implementing the Policy, they will (either directly or via a named delegated person):

- ensure that all hazards creating significant risks are identified and that necessary steps are taken to reduce the risks to acceptable levels, including maintaining up to date Risk Assessments or SOP alternatives, which are reviewed annually or before work re-starts after a 12 month pause;
- ensure that necessary Health and Safety training is provided for all staff and students in their control to ensure their competence in safety critical activities;
- ensure that necessary supervision is provided for all staff and students in their control;
- ensure that all premises and equipment in their area of control are maintained in an acceptable condition; and
- make arrangements to monitor whether staff and students in their areas of control are complying with the IMS Health and Safety arrangements.

### **d) Responsibilities of all Supervisors**

All PIs, postdoctoral and technical staff, or postgraduate students undertaking supervisory roles will:

- ensure that all staff and students (PG and UG) under their control work in accordance with IMS procedures.

### **e) Responsibilities of all staff and students**

All staff and students must:

- co-operate and comply with the Health and Safety arrangements put in place by the IMS Director;
- do all they can to ensure that their activities do not pose a risk to others;
- if they are aware of something which they believe is unsafe, either take immediate steps to make it safe or bring it to the attention of a person who can do something about it;
- if they become aware of deficiencies in the IMS Health and Safety arrangements, bring these deficiencies to the attention of their immediate supervisor; and
- not interfere with, or misuse, anything provided for reasons of Health and Safety.

## f) Responsibilities of IMS Local Safety Coordinators

Local Safety Coordinators in the IMS will:

- maintain an up-to date understanding of the type of work and safety risks of the work in their charge and visit each lab on a regular basis to speak with staff;
- introduce themselves to new staff and students and instill approachability;
- provide advice to the Convenor of the Health and Safety Committee and any members of the School on Health and Safety matters;
- undertake inspections of the IMS activities as commissioned by the Director of the IMS;
- liaise with the Central Health and Safety Team, on all matters relating to Health and Safety within the IMS and to communicate these to the Convenor of the IMS Health and Safety Committee as appropriate.

## g) Arrangements for dealing with Health and Safety concerns

It is expected that Health and Safety concerns will be resolved by discussions within the IMS, either by raising them at the IMS Health and Safety Committee meetings, or less formally between such meetings. An individual member of staff or a student wishing to raise a concern should discuss it initially with their line manager/supervisor or with an IMS Safety Coordinator. If the matter is not resolved in either of these avenues, it should be brought to the attention of their Head of School.

## h) Responsibilities of the IMS Health and Safety Committee

Regular meetings of the [IMS Health and Safety Committee](#), chaired by the appointed Chair or their Deputy, will address Health and Safety matters. The remit of this [committee](#) is to:

- advise the IMS Director on Health and Safety matters and to recommend actions required to improve Health and Safety within the IMS;
- produce a Safety Handbook for the IMS and to monitor compliance with the procedures in the Handbook; and
- provide a forum for discussion of Health and Safety issues and to provide uniformity in advice throughout the IMS.
- Particular matters that the Committee will consider include:
  - reports on Health and Safety inspections of the facilities;
  - reports of all accidents and near misses;

- the Health and Safety content of training for staff and students; and
- Health and Safety information provided for staff and students and its communication.

If any student or member of staff has a matter they wish the committee to discuss they should contact their immediate supervisor, an IMS Safety Coordinator or one of the members of the [IMS Health and Safety Committee](#).

## 2. Review of the IMS Safety Handbook

This IMS Safety Handbook will be reviewed and updated every 2 years, although important and urgent changes may be made more immediately, if appropriate.

The most recent, complete [IMS Safety Handbook](#) can be found online on the IMS safety website, along with other Health and Safety information. To ensure only the latest advice is consulted, it is not intended for the full manual to be downloaded. Relevant sections of the handbook will be incorporated into undergraduate or postgraduate course documentation. Each group or shared laboratory should, however, download and place a printed copy of the [IMS Safety Summary](#) in the laboratory. This will then be always available for all laboratory members, including undergraduate students, to consult.

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### 3. Risk assessment

Risk assessment is the process of:

- identifying where there is a significant risk (*i.e.* danger) in an activity and
- determining how that risk can be decreased to an acceptable level (*i.e.* working out how the activity can be done safely).

Risk assessment is fundamental to the effective management of Health and Safety. The University is obliged by law to ensure that risk assessments are done and there is also a legal requirement to record the 'significant findings' of risk assessments in writing. The 'significant findings' are precautions that need to be taken when doing particular activities.

A good risk assessment is one which concentrates on the main dangers, ignores the trivial ones and records the 'significant findings' in such a way that will help those undertaking the work to do it safely.

Risk assessments must be reviewed, and be signed and dated as having been reviewed, at least every two years or when there are significant changes to the work.

#### **Purpose of risk assessment**

The purpose of risk assessment is not to produce a form that is forgotten about. It is to decrease the likelihood of danger in the laboratory. The work should be discussed and committed to writing in sufficient detail to achieve this purpose.

A suitable risk assessment form that may be used is provided on the [IMS safety website](#) and in the following section. An assessment should be completed that is suited for the particular procedure and approved by the supervisor/lab manager/senior technician. There are separate specific forms that **must** be completed for certain procedures (*e.g.* application for work with genetically modified micro-organisms). Although working alone may not introduce any new hazards, the risks may differ significantly when a task is carried out unaccompanied. Task-specific risk assessments need to be carried out for lone working and out of hours working (see Procedure [P23](#)).

#### **Postgraduate work and undergraduate 'Honours' projects.**

For research work involving postgraduate students, the University Court has said that supervisors must ensure

***"Postgraduate projects are assessed for Health, Safety and Wellbeing risks" and "Necessary precautions are agreed with the postgraduate (and in all but the most elementary circumstances are committed to writing)".***

The University Court has said that undergraduate honours projects should be treated in the same way as postgraduate projects. Risk assessments for both postgraduate projects and undergraduate honours projects follow the same method described below.

Risk assessments for research work in the laboratories involving postgraduate or undergraduate 'honours' students must follow this method for risk assessment.

Supervisors are responsible for ensuring that it is followed. The purpose is to ensure that students appreciate where dangers lie in the work they are about to undertake and understand the precautions they will need to take to ensure the work is done safely.

Supervisors are responsible for deciding to what extent necessary precautions should be committed to writing.

- 1) Student and supervisor should examine the dangers associated with the work before it begins. They should discuss the techniques available to enable the work to be done safely. The supervisor should ascertain whether the student is aware of the sections in this handbook that are relevant to the work.
- 2) The student should then be asked to write a summary of the dangers and precautions that will be necessary to do the work safely. This will constitute the 'significant findings' of the risk assessment. The supervisor should give guidance as to the level of detail required. More experienced students, in whom the supervisor has confidence, will require less detail than less experienced students.

The student should be asked to:

- complete a written [risk assessment](#), or
  - record the risk assessment in their laboratory notebook.
- 3) If the student will be following existing laboratory protocols which already contain full details of the Health and Safety precautions required, the supervisor may permit the student to make reference to these protocols in the risk assessment instead of having to write out the precautions again.
  - 4) The supervisor should then review the written record of the assessment and sign it before the work can begin.
  - 5) The student must retain the assessment record as long as the work continues and must be produced, if required, during Health and Safety inspections.
  - 6) The student must understand that significant alterations in the agreed procedure must not be introduced without the supervisor's knowledge. Regular discussions between the student and supervisor should be held to ensure that all risk assessments remain valid. Any significant changes will require revision of the record of assessment and signature of the supervisor.

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### 3a. Risk assessment form

**Institute of Medical Sciences  
Risk Assessment**

<i>Description of work</i>

<i>Name of Research Group</i>

<i>Building and Lab</i>		<i>Start date of work</i>	
-------------------------	--	---------------------------	--

<p><b>List potentially harmful physical, chemical and biological/organismal risks together with their main hazards. Are radioactive materials or genetic manipulation involved? Are cuts/stick injuries, postural issues, temperatures issues likely? If yes, specify.</b></p>          
--

<p><b>Do any of these chemicals/organisms pose a risk to a pregnant woman or foetus in the early stage of pregnancy? If yes, specify</b></p>          
--

<p><b>Which parts of the planned operations might create significant risk?</b></p>          
--

<p><b>Describe waste disposal procedure to be used</b></p>          
--

**Describe the precautions that will be taken to minimise the risk**

**Describe planned actions in the event of an accident**

Prepared by:.....Signature: ..... Date:

Approved by:.....Signature: .....Date:

List others using this procedure with whom this assessment has been discussed:

Name: Signature: Date:

Name: Signature: Date:

Name: Signature: Date:

Name: Signature: Date:

**Record of reviews.** All risk assessments must be reviewed every two years or if the protocol has changed significantly such that safety aspects are changed.

Date	Approved by	Comments

## **Risk Assessment Prompt**

The objective of risk assessment is to predict circumstances which could lead to danger, devise measures which will minimise that danger and write it down. You must carry out a risk assessment for every procedure even if you conclude there is no risk. When assessing risk, note that you have a duty of care to yourself, to others in the building, to visitors and to the public at large.

**“List potentially harmful chemicals and organisms to be used together with their main hazards”. Are radioactive materials or genetic manipulation involved? If yes, specify.**

Here you are asked to identify potentially hazardous compounds that you plan to use, *e.g.* acetone (flammable), cyanide (poison). Remember micro-organisms, plants and animals can also be harmful so include these. Look up the properties of the compounds/organisms in data sheets to determine their hazards, any LD<sub>50</sub> and occupational exposure limits and ACDP hazard groups. Use your intelligence - the information in data sheets is often written on the assumption that you have a large quantity of the chemical for industrial use. If the chemical has not been assessed for toxicity, look up related chemicals and extrapolate. Your general knowledge will also help. While it does not pay to be over-cautious, err on the safe side for unknown materials. Find out the likely route for the materials to enter the body, *e.g.* vapour or dust which may be inhaled. If radioactive materials are to be used remember you **must** be registered with the University of Aberdeen as a radioactive isotope user and your work must meet the appropriate requirements and be approved by the Radiation Protection Coordinator (see [Ionising Radiation Safety Arrangements](#) and IMS Local Rules for ionising Radiation. If your work involves genetic manipulation or wild-type microorganisms at containment level 2 or 3, it must be approved by the [Foresterhill Biological Safety Committee](#)

**"Do any of these chemicals/organisms pose a risk to a pregnant woman/foetus/breast-fed infant? If yes, specify"**

Here you are asked specifically to highlight any chemicals or organisms that affect the reproductive system and that may be harmful to an unborn child. You should also consider whether any of these chemicals might pass into breast milk and therefore pose a hazard to a breast-fed infant. This section will allow women to assess the risks of any procedures **prior** to conception as many teratogenic effects occur at the very earliest stages of pregnancy often before a woman discovers she is pregnant.

**“Which parts of the planned operations might create significant risks?”**

This question asks you to think of the operation as a whole, *e.g.* will there be naked lights or sources of sparks when you are using acetone? Are you going to be using incompatible chemicals or generating ones which are unstable or otherwise hazardous. Having regard to the hazard data, ask yourself if the quantities to be used

provide a significant risk but remember that the largest quantity to be handled is often in the stock bottle. How do you plan to pipette safely? Is any equipment going to be left running unattended at night? Think how you are going to store the materials involved safely. Do not forget to include the more mechanical hazards, pressure, vacuum, UV and other radiation, rotating machines, lifting and electrical.

**“Describe waste disposal procedure to be used”**

Here you must think about how you are to get rid of the waste from your experiment. It is your responsibility to dispose of all waste safely. This will include everything from paper tissues to syringes and solutions. Your main problem may well be the stock solutions and any unwanted chemicals in their original container. Remember also that the washing-up service and even the workshop may come into contact with your dirty apparatus. Since you also have a duty to them you may need to consider if it is necessary to rinse all items used before sending them away for cleaning/repair.

**“Describe the precautions that will be taken to minimise the risks”**

It is at this stage that you must decide how you are to minimise the problems you have identified, *e.g.* if you are using acetone you must not use naked lights, if the compound has a toxic or carcinogenic vapour you must use a fume hood, if the compound is harmful to the skin or eyes, gloves and/or eye protection are required. What level of biological or other containment is needed? Guards may be required for rotating equipment and a lifting procedure might be necessary. Will supervision/training or even vaccination of the operative be required? Whatever you decide, this should be incorporated into your working protocol, not left on the risk assessment form and ignored.

**“Describe planned actions in the event of an accident”**

This is for you to devise emergency procedures, *e.g.* what would you do if you drop the stock bottle, get some in your eye or on your skin? Think about it and be prepared.

**Finally**, sign (and if you are a student get your supervisor to sign the form, too). If other workers in the laboratory are to use the same procedures, they must also see the form and have the procedures explained to them before they too sign.

**Risk assessments are not forever.** At least every two years, or if there has been a change in the working protocol, the assessments must be reviewed to ensure they are up to date. This review must be signed by all users and dated.

## 4. Health and Safety training and Wellbeing

Health and Safety training will be provided for staff and students as follows:

- 1) All new staff and students (UG, PGT and PGR) will receive induction training during the first month of arrival. An individual's immediate supervisor is responsible for ensuring that training is provided. A training and competency form is available on the A-Z page of IMS Safety site (<http://www.abdn.ac.uk/ims/safety/az.php>). It is expected that supervisors and group leaders will maintain this record of what training each new member of staff or student receives. For ECRs and students, this record must be kept accessible at all times, usually in a folder in the lab.
- 2) All postgraduate students (PGR, PGT) carrying out laboratory-based research work will receive specific training in laboratory safety. A general safety training course, including laboratory safety, is arranged by the Graduate School and usually run in October/November each year. Students are required to attend this. In addition, an IMS H&S induction session will take place in October for all PhD students and new staff working in labs within the IMS Health and Safety Committee remit. **Students who miss induction training must be given training by supervisors before being permitted to work in laboratories.** The project supervisor will provide this directly or delegate this task to a senior member of the lab. Good laboratory practice and risk assessment training will be given at the start of the project and will form part of the induction training procedure. Training in more specific procedures to be used in the laboratory will be given as deemed appropriate by the supervisor. Records will be recorded on the training and competency form which should be maintained within the labs.
- 3) Other, more specific courses on safety matters are organised by the Central Health and Safety Team. These are held throughout the year, and staff are encouraged to attend courses that are appropriate. Staff must attend those courses if it is necessary for the safe undertaking their work.
- 4) The most recent copy of the **IMS Safety Summary (not the full manual)** MUST be available as a printed version in each laboratory. This Summary document, like the full IMS Safety Handbook, is also available at <https://www.abdn.ac.uk/ims/safety/index.php> and will be updated periodically. Notification of important amendments will be emailed to all staff/students within the IMS. **It is the responsibility of the laboratory PI to ensure the printed summary in the lab is the most recent available.** Staff and students must acknowledge on their training & competency record that they are aware of how to access the handbook and have read and understood the implications of its content.
- 5) Training courses for topics that are not mandatory are nevertheless of great value. No person can receive too much Health and Safety training and more staff with up-to-date knowledge from experts will benefit the management of the IMS Health and Safety policy. Training records will be reviewed, at least annually, and the needs for further training identified and arranged by the IMS Director.

## 4a. Wellbeing

The major focus of this Handbook has been to provide clear guidance on how we handle and manage Health and Safety within the IMS. However, we recognize that the University has also set the important goal of improving the wellbeing of its staff, because it sees this as an integral component toward the University becoming a successful and healthy environment in which to work. Mental health and other wellbeing-related issues require specific specialist care. For information and support on Wellbeing-specific issues, the occupational health CRO International SOS provides support and guidance to University management and a health surveillance service to staff (see [P.28 Occupational health](#)). For staff, the University also provides a range of other support services, including Counselling service. For further details contact your HR adviser or the [HR website](#). In addition, the Central Health and Safety Team arranges open days throughout the University to encourage healthy lifestyles, promote healthy activities provided within the University and offer medical and nutritional information to help staff understand and, perhaps, avoid problems. There are many staff in the IMS with mental health first aid (MHFA) training. Please contact [Claire Walker](#), [Denise Tosh](#) or one of the wider University's [MHFAs](#). For PGR, PGT and UG students, please contact the [Student Advice & Support Office](#).

## 4b. SafeZone app

There is a SafeZone app to connect staff and students to the University security team if you ever need urgent help, first aid or if you have an emergency while on campus. This allows security to identify your location and deal with first aid or emergency calls. Staff and students are urged to add this app to their phone. The details, for staff (<http://www.abdn.ac.uk/staffnet/working-here/safezone.php>) and students (<http://www.abdn.ac.uk/infohub/safezone.php>) are available on the University web pages.



## 5. Health and Safety inspections

- 1) The Director of the IMS will commission Health and Safety inspection of the facilities' activities at least two times per year. The purpose of the inspections is to ascertain the extent of compliance with the Health and Safety arrangements described in this handbook.
- 2) A joint inspection of all laboratory areas under the remit of the IMS H&S committee will be undertaken.
- 3) A checklist based on the Health and Safety arrangements described in this handbook will guide the inspection team. A checklist is included that may be used ([5a – Inspection checklist, also available on the IMS safety website](#)) Matters to be examined during the inspection will include:
  - compliance with procedures for specific hazards;
  - adequacy and review of documented risk assessments;
  - adequacy of understanding of the Health and Safety arrangements and the assessment of risk by staff and students (particularly students under supervision);
  - completeness of Health and Safety training and competency records;
  - emergency response arrangements; and
  - arrangements for inspection and maintenance of premises, equipment and completeness of records of inspection and maintenance.
- 4) The inspection team will produce a report for the Director of the IMS, and this will include:
  - (a) positive findings, as well as details of location and significance of any failings discovered;
  - (b) recommendations for remedial action, including timescale and priorities; and
  - (c) suggestions as to who should undertake particular remedial actions.

The reporting process should not delay remedial measures or prevent immediate action if there is a risk of serious injury or ill health. The Director of the IMS will confirm the suggested remedial action and ensure that the appropriate person responsible for taking the action is informed.

- 5) A follow-up inspection may be arranged specifically to ensure that necessary remedial action has been taken and is effective. If remedial action is not completed, then the Lead Safety Coordinator and Committee Convenor should discuss with the PI involved and report to the IMS Director on the discussions.
- 6) It is the responsibility of supervisors and group leaders to perform checks at regular intervals in between Safety Committee inspections to confirm that the requirements of the IMS Safety Handbook are being satisfied and that adequate

records are being kept. An example of the areas which supervisors/group leaders could address are:

### **Staff**

- Have all staff read the current IMS Safety Handbook?
- Do all staff understand who is responsible for Health and Safety?
- Do all staff know what to do in the event of accidents/fire/spillages?
- Do all staff know who can provide safety advice?
- Have all staff undertaken appropriate training for the work they are doing, including equipment usage, radioactive work, etc?
- Can training and competency records be produced?
- Are staff informed by supervisors of the need to be vaccinated against hepatitis B if handling unscreened samples?
- Are protocols and written assessment of risk (either as part of protocols, or as formal risk assessment forms) available for all hazardous procedures?
- Is everyone working in the laboratory wearing a Howie lab coat, safety glasses and other appropriate protective clothing?
- Are lab coats stored appropriately?
- Do all staff know about streaming for waste disposal?
- Are staff aware of rules about lone working and out-of-hours working?
- Are staff aware of the rules for containment level 2 where appropriate?

### **Laboratory**

- Are floors clear, no trailing wires, no excess papers on benches, no outdoor coats, bags, etc?
- Are appropriate warning notices displayed – containment level 2, flammable liquids in fridges/freezers, UV, radioactive areas, etc?
- Are unscreened blood samples used? If so, are Containment level 2 rules in operation?
- Are acids/alkalis/solvents stored correctly? Are staff aware of how to dispose of them?
- Are gas cylinders secured? Are procedures for transport of cylinders understood and users trained?
- Are the regulators on cylinders compliant and clearly labelled as within date?
- Are drugs/carcinogens stored correctly?
- Are kick stools or steps available for access to heights?



- Is waste removed promptly?
- Are the procedures for transport of liquid nitrogen and dry ice understood?

## 5a. IMS Safety Inspection Checklist

Lab Room No:		Supervisor(s):	
Autoclaves and pressure cookers - general state & regular inspections			
Balance area cleanliness			
Biohazards and biological waste – CL2 local rules, etc.			
Centrifuges and rotors - cleanliness and maintenance			
Chemicals and solvents - storage, compatible materials, ability to deal with spills - waste properly labelled, level of accumulation			
Computer workstations assessed			
Containment level and knowledge of associated rules			
Cryogenics			
Electrical equipment - general state & PAT testing, no trailing cables/overloading			
Electrophoresis equipment - general state			
Fire - extinguishers in place and uncluttered, exits clear and signposted			
Fume hoods – tidiness			
Gas cylinders - properly secured, age of regulators, protective shoes			
General housekeeping - state of lab, tidiness, <i>etc.</i> no eating, drinking, smoking, limited papers and books on bench no outdoor clothes in lab wearing of lab coats, eye protection			
Glassware general state, chipped or cracked items			
Heating/ventilation and lighting, lab fabric <i>i.e.</i> state of flooring and benches			
Knowledge of safety policy			
Labelling of reagents, equipment, centrifuges, <i>etc.</i>			
Ladders labelled and inspected annually			
Radiation area – tidiness and adherence to local rules			
Risk assessment forms – regularly reviewed, awareness of main issues			
Sharps bins, broken glass bucket – not overfilled, no accumulation			
Storage general and high level			
Training and competency records			
Tubing for gas, water and cell incubators, security of connections			
Waste accumulation			
Comments:			
Inspectors:		Date:	

## 6. Postgraduate and honours students

The University Health and Safety Policy states:

- (a) Each School must make arrangements to provide postgraduate students with such supervision as is necessary to ensure their Health, Safety and Wellbeing.***
- (b) The duty to supervise postgraduates is delegated by the University to the Director(s) of the IMS and thence to the member of staff directly responsible for the postgraduate.***
- (c) New postgraduates should be trained in IMS Health and Safety policies and procedures, and provided with their own safety training record document.***
- (d) Supervisors must not discharge their duty to supervise by relying solely upon a postgraduate's status or apparent competence. They must be able to demonstrate that they have exercised an active supervisory role.***
- (e) Active supervision does not usually mean constant attendance. However, Supervisors must ensure:***
  - Postgraduate projects are assessed for Health and Safety risks***
  - Necessary precautions are agreed with the postgraduate (and in all but the most elementary circumstances are committed to writing)***
  - Regular checks are carried out to ensure that the postgraduate is working to the agreed procedures***
  - Postgraduates understand that significant alterations in agreed procedures must not be introduced without the supervisor's knowledge.***
- (f) Arrangements must be made to cover for the temporary absence of a postgraduate's normal supervisor.***

The relationship between supervisor and student is a critical factor in ensuring safety in postgraduate research. Supervisors must ensure that students are competent to carry out practical work safely and students must work in accordance with procedures agreed with their supervisors.

Some postgraduate students will have completed a first degree at Aberdeen and may already have demonstrated competence in Health and Safety matters to staff in the IMS. However, staff will have very little knowledge of the abilities of students coming to Aberdeen from other institutions. These students will need to receive training in IMS Health and Safety procedures and be under close

supervision during the early stages of postgraduate study. (See also section 4, "[Health and Safety training](#)").

The supervisor will be responsible for Health & Safety induction and training. An initial induction should be carried out within the first month of a student arriving, and recorded on the **Training, Awareness and Competence** record. The aim of this training is to ensure that students have a general introduction to Health and Safety procedures of the IMS. An H&S induction lecture will be organised by the Graduate School in October of each year for new graduate students. After this generic training, the supervisor will continue to provide the necessary training in more specific procedures that are required for the particular project, updating the **Training, Awareness and Competence** record as appropriate. This record must be kept in the laboratory/office to allow for their inspection as required.

- 1) Supervisors must ensure that postgraduate students appreciate the dangers in the work they are to carry out and understand the precautions to be taken. **It is mandatory that supervisors require postgraduate students to produce written Risk Assessments for any laboratory work.** The supervisor must approve the assessment before work may begin (see Section 3 in this handbook – "[Risk Assessment](#)").
- 2) Students must be made aware that unauthorised initiatives are not permitted. Students must work within the scope of the agreed risk assessment and discuss with their supervisor before making significant changes.
- 3) Supervisors must tell their students where help and advice can be obtained when the supervisor is not available.
- 4) Whenever a supervisor is absent for more than three working days, their students must be informed. It must be made clear to the student what they should do in relation to Health and Safety matters that may arise during their absence. At such times, another supervisor must first approve any significant changes to procedures. Appropriate arrangements should be made when longer spells of absence are likely to occur.

### **Shared project supervisors**

In certain circumstances, two members of staff may propose a project entailing laboratory work in two areas. Health and Safety management cannot be managed efficiently on a shared basis. To overcome this, the following steps must be taken when two members of staff are jointly involved in an undergraduate or postgraduate project.

For the purpose of Health and Safety management, the student must have one supervisor, who must ensure that the procedure described above for postgraduate students (items 1-4) is followed. At their initial meeting, supervisor, co-supervisor and student must clarify who is responsible for the Health and Safety management of the student and all risk assessments must be discussed and signed by that supervisor.

### ***Independent work by honours undergraduates***

Undergraduate students do practical work as part of their honours year. This work must be supervised to at least the same extent as new postgraduates. In some cases, much higher levels of supervision may be required. The preparation and agreement with the supervisor of an adequate risk assessment before any independent work begins is critical (see section 3 – [“Risk assessment”](#)). Undergraduates are not allowed to work unsupervised in the laboratory outside normal working hours.

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## 7. Accident investigation and reporting

Staff and students must report all accidents and near misses, as soon as possible, to their immediate supervisor. The following must be reported:

- any incident in which anyone is hurt (regardless of how minor the injury might appear at the time and regardless of whether medical attention was required);
- any incident in which someone could have been hurt (a “near miss”). These are unplanned incidents which did not result in injury or ill health but which might have done so if the circumstances had been slightly different.

Accident or Near miss reporting should be completed online. Forms for both are available on the Central Health & Safety Pages. [www.abdn.ac.uk/safety/general/accidents/](http://www.abdn.ac.uk/safety/general/accidents/).

The most important reason for reporting accidents is to enable us to take action to prevent a similar accident occurring in the future. The University may also need to report the incident to the *Health and Safety Executive* (HSE) or to our insurers.

### Procedure

- 1) Accident or Near miss report forms should be filled in on-line at <http://www.abdn.ac.uk/safety/general/accidents/>.
- 2) The form must be completed within 48 hours of the accident **by the immediate supervisor** of the injured person or the person in charge of the area where the incident happened (and **not by the injured person**). In the event of the supervisor’s absence, an IMS Safety Coordinator will complete the form.
- 3) Completed forms are automatically sent to the Central Health and Safety Team, but **also forward copies to the Clerk of the IMS Health and Safety Committee and IMS Lead Safety Coordinator**. The Clerk will maintain a log of incidents with details of any follow-up actions taken or to be taken. These records will be reviewed at each Committee meeting. **The IMS Lead Safety Coordinator will inform the Director of serious accidents or near misses.**
- 4) **Serious accidents** (those requiring attendance to Accident & Emergency), after providing the necessary medical response, must then be reported **immediately** to the Central Health and Safety Team by telephone (Working hours: ext. 2783 (Head), 3896 (Senior Adviser), 2514 (Adviser), or Out of hours: Security (3939)). They will ensure that the Health and Safety Executive and our insurers are notified where necessary.
- 5) **Incidents involving ionising radiation** must be reported by telephone to the University Radiation Protection Coordinator (Dr Stephen McCallum; 76-53109) and to an IMS Radiation Protection Supervisor. All incidents should be formally reported using the on-line reporting form as above.
- 6) The member of staff responsible for the injured person must initiate an investigation into the accident to discover the cause. They should contact a local IMS Safety Coordinator if they need assistance. Investigation findings and

remedial actions should be reported to the Lead IMS Safety Co-ordinator for all minor injuries.

- 7) If the accident is reportable to the Health and Safety Executive (Central Health and Safety Team will indicate whether it is), the Head of School must receive a copy of the accident report and the results of the investigation into the accident.
- 8) A report should include the following details:
  - the incident location;
  - the identity of the injured person;
  - the injury;
  - what happened (including the cause of accident and precautions which could have been taken to avoid the accident);
  - the identity/contact details of any witnesses;
  - the contact details for the supervisor signing the report.

### ***Checklist for accident investigation***

The following checklist is included as a guide to structure investigations and written reports. For further assistance, contact a local IMS Safety Coordinator.

#### **1) Obtain basic facts**

- Names of injured/witnesses/people early on scene
- Condition of any equipment/relevant local environmental elements
- Any chemicals/substances in use or present
- Layout of area
- Place, time, conditions
- Extent of injury/damage/disruption
- Photograph/sketches/measurements of undisturbed scene.

#### **2) Establish circumstances**

- What was being done at the time and what happened?
- Immediate causes
- Events leading up to the incident
- Any evidence linking pre-existing ill health status to work
- Competence (extent of training before event, experience in the job; were they aware of the dangers of the activity?)
- What was established method; was it adequate; was it followed?
- Behaviour and actions of individuals
- Supervisor's role: did they request the task to be done or did those involved in the accident act on their own initiative?

- What was the worst that could have happened?
- Has it happened before?
- Could it happen again?



### **3) Identify preventative measures**

Review the risk assessment for the activity. What precautions should have been in force? What training should those involved have received?

What precautions were actually taken and what training was actually given? Compare these with what should have been the case.

### **4) Was first response to the accident adequate?**

Was prompt and appropriate action taken? (*e.g.* making safe any continuing risk; electrical isolation; suitable fire-fighting; effective first aid; correct spillage procedures).

### **5) Identify underlying causes - *e.g.***

- Management or supervision failure
- Lack of competence
- Inadequate training
- Shortcomings in original design of equipment
- Absence of maintenance system.

### **6) Determine action needed to prevent a recurrence**

Actions to prevent a recurrence might include:

- improve physical safeguards
- introduce better test and maintenance arrangements
- improve work methods
- provide and use personal protective equipment
- change supervision and training arrangements
- review similar dangers elsewhere in the IMS
- review procedures involving external contractors
- improve inspection systems.

In determining the course of action, the information in the IMS Safety Handbook must be considered. Is it adequate? Is it being ignored? What might be changed to make it effective at preventing accidents and maintaining health at work?

The above is a checklist; not everything may be applicable for a given accident. The more serious the incident, the greater the depth of investigation will probably be required. The main purpose of the investigation is to find all that can be learned to enable such accidents to be prevented in the future. The information gathered from this investigation will be used to improve the management of Health and Safety in the IMS.

## 8. Fire safety precautions

Fire is probably the greatest single safety-related threat to the IMS and its members. Even if everyone escapes safely from a building, important facilities and documents may be destroyed. We must therefore do all we can to prevent a fire starting and, should a fire start, be prepared to respond quickly and effectively to save life and property.

### ***Fire prevention***

Precautions that decrease the likelihood of fires starting include:

- In accordance with University policy, IMS offices and laboratories are 'No Smoking' areas. No smoking is permitted at any time within University buildings, or outside their entrances or doorways. By law (Scottish Government Directive 31<sup>st</sup> March 2015) no smoking is permitted anywhere on NHS grounds. This includes either tobacco products or their electronic alternatives.
- Comply with:
  - systems for inspection of electrical equipment;
  - procedures for storage/use of highly flammable liquids;
  - procedures for out-of-hours running of experiments; and
  - procedures for use of gas Bunsen burners.
- Avoid accumulations of unnecessary materials that can easily burn (*e.g.* cardboard, paper)
- Do not obstruct the ventilation of electrical equipment or place material immediately above or close to electric heaters
- Do not overload electrical sockets or use multiple extension leads/adapters. Seek to get extra power sockets installed
- Do not trail electric leads over benches/floors in such a way that they might be caught, snagged or be a trip hazard.

### ***On discovering a fire***

If you discover a fire, take the following steps in the order given:

- 1) Sound the alarm;
- 2) Get someone to telephone Estates (x3939) or the fire brigade (9-999);
- 3) Warn others (shout "**FIRE**" and bang on doors);
- 4) If you can do so without putting your own safety at risk and only if suitably trained attempt to fight the fire with a suitable extinguisher (**NB - if one extinguisher is insufficient, the fire is too big for you to fight**);
- 5) Otherwise, close the door to contain the fire, leave the building by the nearest designated safe/fire exit and wait to give details to the fire brigade;
- 6) Do not use lifts; and
- 7) At the assembly point (given on fire notices), report to the person taking charge.

## Extinguishers

Signs are posted throughout the University to indicate the applications for which the different types of extinguisher are suited and a sign above each extinguisher lists its use.

The applications are summarised below:



<i>Colour of lettering:</i>	<i>cream</i>	<i>black</i>	<i>blue</i>
<b>Application</b>	<b>Foam</b>	<b>Carbon dioxide</b>	<b>Dry Powder</b>
Wood, paper, textiles, etc.	✓		✓
Organic solvents, petrol, oil, fats, paints, etc.	✓	✓	✓
Fire associated with electrical hazards		✓	✓

### ***Use of extinguishers:***

- (1) Before starting to fight a fire (however small), ensure that the alarm is activated.
- (2) Extinguishers are only for dealing with small fires – if in any doubt, then withdraw, closing all windows and doors behind you.
- (3) Know which extinguishers can be used on the different types of fire.
- (4) Away from the fire, pull out the pin and do a brief test jet of the extinguisher.
- (5) Always position yourself on the side of the fire closest to a safe exit.

- (6) Only ever use one fire extinguisher, if you need to use two, then the fire is too big for you to fight
- (7) Do not use carbon dioxide extinguishers in small, closed cupboards and avoid holding the horn as it will get very cold.
- (8) Do not use an extinguisher on a fire involving burning gas – turn off gas supply if it is safe to do so or leave for the fire brigade.
- (9) Do not use water on burning liquids or live electrical apparatus.
- (10) With electrical appliances, turn off the power supply before using extinguisher.
- (11) Normal foam is not effective on fires involving alcohols.
- (12) Special extinguishers are required for fires involving burning metal. The type of extinguisher depends on the metal involved.
- (13) Fire blankets in laboratory areas can often be useful for fires to personal clothing. Lay the victim horizontally, to avoid the flames spreading up to the face. Wrap the blanket firmly around the affected area to completely smother the flames. Avoid setting fire to yourself by keeping behind the blanket.

All extinguishers are checked every 12 months (by a company contracted to the Estates Section). The date of last inspection is shown on the extinguisher.

***If you hear the fire alarm:***

- 1) check the rooms and laboratories near to yours, if you can, to ensure the occupants have heard the alarm and have left;
- 2) leave the building by the nearest designated fire exit and go to the assembly point shown on the fire notices;
- 3) anyone teaching or supervising groups of students should ensure that all students leave the building by the nearest exit and go to the assembly point;
- 4) if you are aware that someone might be still in the building, report this to the person taking charge (yellow jacket wearer);
- 5) do not re-enter the building until the fire alarm has been silenced. If necessary, call security (ext. 3939) to request attendance by an electrician to silence and reset the alarm.

***Escape routes***

- Corridors and escape routes must be kept clear. Combustible materials must not be stored in corridors or on escape routes.
- Furniture and other items must not be placed obstructing escape routes.

- Fire doors inhibit the spread of fire and smoke. So, they must be kept closed and never wedged open. Any door fitted with a door-closing device should be treated as a fire door.

### ***Floor checkers***

Several people on each level of our buildings have been designated as ‘floor checkers’ and received appropriate training. This simply means checking that labs and offices are empty as you leave the building. **On no account should floor checkers jeopardise their own safety.**

- Don an orange jacket.
- Ensure (as far as reasonably possible) that persons have been evacuated from the office/laboratory area in which you are working
- Exit and assemble at designated point (see relevant yellow University “In the event of fire” notices)
- As soon as possible, report to the ‘yellow jacket wearer’ (attendant on duty at the Fire Assembly Point) the extent of evacuation in your area of responsibility, and especially location of any individuals that have refused to leave or not responded to the fire alarm.
- If directed, take control of entrances or assembly points to prevent re-entry until informed it is safe to do so by the Fire Brigade. **The cessation of the fire alarm should not be assumed as a signal for safe re-entry.**
- Floor checkers should only enact this role in the part of the building in which they are present when the alarm sounds. **Do not attempt to go to other laboratory/office areas further away from your exit.** Simply immediately leave the building by the nearest exit route, encouraging others to leave *en route*.

### ***Liaison with the fire brigade***

When the fire brigade arrive at a building containing laboratories, they need to be provided with information about the dangers they will face and their location. The person in charge wearing a yellow jacket will give this information.

### ***Fire drills and alarm tests***

Fire drills are held in all University buildings at least once each year to test the efficiency of fire evacuation arrangements.

The fire alarms are tested each week as follows (N.B. alarms sound twice in close succession):

Polwarth building	Wednesday 11.00 a.m.
IMS building	Wednesday 11.25 a.m.

Staff in other University buildings should familiarise themselves with the times for fire alarm testing.

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## 9. First aid arrangements

A list of qualified first aiders within the IMS is posted throughout the IMS and Polwarth buildings and on the IMS Health and Safety web site <https://www.abdn.ac.uk/ims/safety/index.php>

Local IMS Safety Coordinators will ensure that:

- adequate numbers of qualified first aiders are present for staff and students in the IMS and that notices are posted stating who they are and keep them up to date
- qualified first aiders receive a refresher course within three years of their previous training
- adequate first aid materials are available throughout the IMS and Polwarth and maintained in a satisfactory condition
- for eye-washing, a clean irrigation tube should be kept near the sink; when required, it can be attached to a tap and the eye irrigated with water for 10-15 minutes. Eye-wash bottles are not sufficient on their own because the contents cannot flush the eye for long enough and, if supplied, their expiry date should be monitored.

### ***Minor injuries***

First aid boxes/cabinets are located in the corridors of each floor of the IMS and Polwarth buildings, plus strategic locations throughout other areas. Staff and students must be aware of the nearest first aid supplies and how to contact a trained first aider. A first aider should be contacted (details displayed on/near first aid box) and asked to assist with any injury except the most minor of cuts or scratches. Even minor scratches should be washed thoroughly in cold running water before applying a plaster. The assistance of a first aider is important if you are injured while working with substances that could cause harm if they enter the body through breaks in the skin. Then, complete an online [Accident Report form](#).

### ***First aid rooms***

A first aid room with a bed and sink is located in the IMS (room 1:56) and Ground Floor, Polwarth Building (room 4.016). This may be used for recovery after minor injuries. IMS room 1:56 is the only room designated for taking blood from patients/volunteers. It may also be used for mothers breast-feeding and a fridge for their use only is provided.

### ***Major injuries***

An ambulance should be called immediately, by dialing 9-999. Indicate clearly which building you are in. Do not call for an ambulance via the University switchboard. Send someone to the front door of the building to direct the ambulance. A first aider can then be contacted to administer first aid to the casualty while waiting for the ambulance to arrive. Report major injuries as soon as practicable by telephone to the [Central Health and Safety Team](#) x2783 (Head), x3896 (Senior Adviser), x2514 (Adviser) or 07974 892303.



## 10. Spillages

Despite precautions taken to avoid exposure to hazardous materials during normal use, unforeseen accidents may occur in which release of biological agents or chemicals occurs unexpectedly. An immediate response is required to:

- remove workers from the affected area;
- identify the nature and extent of the risks created by the spillage; and
- clean up the spillage.

In order to achieve this, staff from each laboratory need to ensure that:

- risk assessments are available in which appropriate clean up procedures for spillages of hazardous compounds is incorporated;
- materials and protective clothing are available to clean up the spillage;
- suitable persons are involved in the cleaning up of spillages; and
- resultant waste is disposed of suitably.

Any students (PG or undergraduate) involved with a potentially dangerous spillage must evacuate the area immediately and contact their supervisor. The supervisor should assess the extent of the risk. Small spillages of bacteria can be cleaned up and disinfected without causing too much disruption. Spillage of small quantities of chemicals that give off toxic vapours, however, is likely to require a greater extent of evacuation and notification to the Security (x3939).

### ***Response to spillages***

In the event of a [serious spillage emergency](#), especially with a hazard to breathing:

- Evacuate the area (affected room, corridor or building, as necessary), seal off access to the area, attach 'no entry' signs to doors accessing the area, if possible.
- Contact Security (ext. 3939 or 01224 273939) – within or out-with office hours. (Please note [the IMS Spillage Response Team is no longer in operation](#)). Identify the location and the substances involved in the spillage. They will attend and decide whether the Scottish Fire and Rescue Service (SFRS) need to be called.
- Inform your supervisor, lab PI and/or IMS Safety Co-ordinator.
- Complete an online accident investigation report for the incident (see [Section 7](#))

If the spillage is [less serious](#) (small volumes and no hazard to breathing),

- 1) Consult the risk assessments from the laboratory for hazard information on released materials. NB. Ability to mount an appropriate spillage response should be planned at time of ordering any material, especially when hazardous.
- 2) Contact your supervisor/Principal Investigator or an IMS Safety Coordinator

for advice. **For more serious incidents, contact Security (x3939), who will determine whether to contact the Scottish Fire and Rescue Service (SFRS).** Only the SFRS are regularly trained in the use of respiratory protective equipment for these serious incidents.

- 3) If the spillage can be cleaned up without any hazard to breathing, clear the immediate area. Wear suitable protective clothing (safety goggles, gloves, laboratory coats, aprons, overshoes; see [procedure P.31](#)) from spillage kits in the lab. Work in pairs where necessary.
- 4) Dispose of hazardous waste in a suitable fashion (see [section 13](#)).
  - Waste contaminated by hazardous chemicals must be securely contained in bags or bins and collected for incineration.
  - Microbiologically contaminated waste must be fully disinfected/sterilised by autoclaving before disposal.
- 5) Emergency procedures following the release of living organisms are dealt with in [procedure P.19](#).
- 6) Complete an accident investigation report on the incident (see [section7](#)).

# 11. Inspection and maintenance of premises and equipment

## *Maintenance of equipment*

Equipment in the IMS requires periodic inspection and maintenance if it is not to become a source of danger to staff, students and members of the public.

Each School or laboratory must keep a list of major equipment in a folder kept for the purpose. This should list the following:

- Item, model number and serial number;
- Person responsible for ensuring maintenance of equipment;
- Details on frequency of inspection and/or service and who will do it;
- Inspection dates;
- Service dates; and
- Service reports (to be incorporated as they arise). A responsible, named person, will:
  - Determine the frequency of inspection and test for the different types of equipment in the Group's area;
  - Ensure that inspection and test is carried out at the specified intervals;
  - Ensure that electrical equipment is marked to indicate that it has been inspected or tested; and
  - Maintain records of inspection and tests in a folder kept for this purpose.

Equipment will be examined at each safety inspection to ensure that inspections and services are kept up to date and that the person responsible for ensuring these checks are done is still in charge.

Equipment requiring periodic maintenance/replacement include:

- centrifuges,
- copiers,
- electrical equipment,
- fume cupboards,
- microbiological safety cabinets,
- gas cylinder regulators, *etc.*

Some of these may be tested/serviced by external contractors. Nevertheless, it is necessary to maintain all test certificates since the IMS retains responsibility for ensuring that maintenance is undertaken on all of its equipment.

### ***Maintenance of premises***

The maintenance of University premises is the function of Estates. Any member of staff noticing any part of the premises that give concern, with respect to Health and Safety, should place a warning sign, if necessary, and contact Estates through the fault desk (ext. 3333). All work that affects the fabric of the buildings MUST be undertaken by Estates. The purpose of this prohibition is to prevent asbestos containing materials being disturbed.

## 12. Good laboratory practice

The following practices should be instinctive to all who work in laboratory areas. Everyone should be encouraged to ensure that they follow the practices to make the laboratory a safer place for everyone. Several of these practices are dealt with in more detail elsewhere in the Handbook.

- Do not use unfamiliar equipment without reading the instructions and safety procedures. If possible, ask an experienced operator to demonstrate its use.
- Turn off all gas, water and electric supplies when no longer required.
- Keep benches, shelves and floors clean and tidy at all times.
- Keep corridors, fire exits and entrances clear of obstruction.
- Any spillages and breakages must be cleaned up immediately.
- All containers must be clearly labelled with their contents and, where possible, marked with the appropriate hazard-warning symbol.
- Wash bottles containing any liquid must be clearly labelled.
- Do not set up apparatus in front of service controls, fume cupboards, fridge doors or exits.
- Sinks are intended for washing up and disposing of suitable liquid waste to the drainage system, not hand washing. Keep the area clean when not in use. Do not leave glassware sitting in sink. Hand washing must use a separate designated sink.
- Contaminated glassware should be soaked and/or rinsed thoroughly with water or solvent to remove chemical contaminants before thorough washing. Biologically contaminated glassware must be adequately disinfected before washing, ensuring that all areas of glassware are submersed in disinfectant.
- Labs using biohazardous material must have effective disinfectants available for immediate use in the event of spillage.
- Balances weighing chemicals should be kept clean at all times. Spillages must be cleaned up immediately; other workers will not know the nature and safety precautions needed to clean up your spillage.
- Take care if you have to access elevated areas/storage. Do not climb over apparatus and always use kickstool or steps. Avoid storing items on high shelves above people's workbench.
- Do not place volatile toxic materials in lifts or cold rooms.
- When heating liquids, beware of bumping: add boiling beads before heating is started.
- Lone working (see procedure [P.23 Lone working and out of hours working](#)): avoid working alone with hazardous apparatus and chemicals, and always if a procedure is new and un-practiced.

- Fire (for details see section 8, [Fire safety precautions](#)). You must know:
  - the fire escape routes from your place(s) of work
  - the sound of the alarm
  - the types, location and method of use for the different types of extinguisher.
  - the location of the break glass fire alarm call points
  - the location of the first aid boxes
  - how to call for emergency help (9-999).
- Accidents. Report all accidents and near misses to your supervisor, who is the person who must complete the online accident report form (see section 7: [Accident Prevention and Reporting](#))
- Visitors should be kept away from laboratories whenever possible.
- Children in the IMS must be accompanied and adequately supervised at all times. Entry to laboratory areas should be restricted to those over 14 years and they should use the same protective clothing required of adults in laboratories.
- Mouth pipetting (even of harmless substances) is prohibited.
- All procedures must minimise the production of aerosols.
- Eating, drinking and food/drink storage in laboratory areas is prohibited., unless specifically authorised for human physiology/exercise experiments, and then only in clearly designated areas.
- Applying cosmetics and putting pens/pencils in mouth is not permitted.
- Laboratory coats, closed-toe shoes **and safety glasses\*** must be worn **at all times** in laboratory areas. Open-toed shoes do not protect the feet of the wearer from drips or impacts. Laboratory coats should always be fastened when worn. These should be removed when **leaving** laboratory areas, unless in transit to another laboratory area. (\*Safety glasses may be omitted if risk assessment approved).
- Laboratory coats are **never allowed** in the IMS atrium, including the cross-bridge walkways. Nor are gels or laboratory materials. The outer corridor must be used.
- To minimise the risk of accidents, goods must not be transported across IMS atrium or central walkways.
- Laboratory coats should be cleaned at regular intervals. Dirty lab coats, labelled with name, building and room number should be put into the black bin in IMS wash- up for cleaning. Ensure that all pockets are emptied. **Syringe needles or razor blades must never be put in pockets at any time. Coats contaminated with biological agents must be autoclaved before washing.**
- Wash your hands thoroughly after handling hazardous substances and when you leave the laboratory, in a designated hand-washing sink and **not the laboratory sink**.

- The laboratory door should be closed while work is in progress.
- When wearing protective gloves, do not touch anything that someone else might touch without gloves (e.g. telephone, computer keyboard, door handles).

Remove glove(s) before touching these items.

- Mobile phones are discouraged from laboratories to avoid handling them with contaminated protective gloves. Should hand-held devices be used for laboratory work (such as photography) and where the use of protective gloves is required, then phones should be enclosed in a plastic bag or cellophane and the covering left in the laboratory on leaving. The use of mobile phones in the lab for personal calls/texts is prohibited and they must not be carried in lab coat pockets.
- The wearing of personal headphones/in-ear audio devices in laboratory areas and corridors is banned. Their use is permitted in offices/write-up areas, provided they can still allow alarms to be heard.



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## 13. Waste and its disposal

We have a duty to ensure that hazardous waste **does not harm anyone likely to handle it**. This includes those who:

- handle it between the point where it is generated and the point of ultimate disposal (*e.g.* cleaners, porters, waste disposal contractors);
- come into contact with the waste at its point of ultimate disposal (*e.g.* chemicals mistakenly sent to a landfill site for domestic waste. This could harm workers at the site, or children/families who might play or live near the site).

We separate waste into different streams at the point of generation. Each **waste stream** is stored separately and follows separate routes. Everyone in the IMS must:

- Be aware of the specific waste streams in the IMS;
- Ensure they know which waste goes into which stream (see below); and
- Know where to place waste for each of the waste streams.

IMS users must ensure that waste is removed promptly and not allowed to accumulate.

### WASTE STREAMS

#### **A. Solid waste**

**General non-toxic domestic waste**, *e.g.* paper, dry mixed recyclables, foods

- Are collected in **recycling bins**
- Must not be contaminated (*e.g.* no plastic with food)
- Only mixed non-hazardous waste goes into **black bags**
- it is disposed of in landfill sites
- cleaners will take this waste away
- Cardboard, flattened for recycling, is taken to cages at rear door of IMS

**Confidential waste**

- confidential paper waste goes into **white** bags or locked confidential waste consoles. **Only paper should be put in white bags or consoles**
- Estates should be contacted for the collection of white bags; it will be shredded and recycled to comply with the University Data protection responsibilities
- Consoles will be emptied by external contractors and will be shredded

**Equipment, metals and strip light bulbs**

- Metal should **not** be disposed of in autoclave bags or yellow bags
- For large pieces of metal & old equipment, removal needs to be arranged by Estates (contact IMS Technical Resources Officer, Claire Walker /Dana Wilson)

- Estates will arrange for removal and safe disposal of spent bulbs.

### **Clinical and biohazardous waste**

- waste goes into **yellow** bags - these should be tagged/clearly labelled with building, lab number and PI of the group.
- it will get heat sterilised and disposed of in land fill sites
- infected material or tissue culture waste must not be disposed of in yellow bags (see below)
- waste should be placed in the containers outside IMS.

### **Infected /tissue culture waste**

- waste goes into **clear** 'autoclave' bags;
- labelled with building and lab number;
- it is autoclaved; and
- it will then be treated as yellow bag waste

### **GMM waste**

- Genetically modified microorganisms (GMMs) must first be inactivated according to **approved** procedures before disposing in appropriate waste stream (see procedure [P.19 Genetic modification work](#)).

### **Human tissue waste**

- Place human tissue and waste from 'highly infectious' cases **in 170 gauge yellow bags**. Place this into a 300 gauge yellow bag in deep freeze. When outer bag is 50% full, seal with ratchet seal and await uplift.
- Contact Chris Osbeck, Waste and Environmental Manager [ext.2053] if you have any problems.

### **Solid radioactive waste**

- Radioactive waste goes into **white plastic** bags. Disposal **must** be recorded on the **IsoStock system** and the bag will require a specific label from the RPS before it can be disposed of (see Ionising Radiation Safety Arrangements and IMS Local Rules for Ionising Radiation; both at <https://www.abdn.ac.uk/staffnet/working-here/resources-5988.php#faq49>).

### **Sharps with or without minor human blood contamination**

- sharps *e.g.* needles, small amounts of broken glass, blood tubes, slides, etc. should go in sharps bins (yellow with blue lids)
- sharps bin lids should be secured correctly on container before use. Never attempt to remove secured lids
- once full to the level indicated, the sharps bin should be sealed, tagged and labelled with lab number (*e.g.* IMS 4:23 or Polwarth 3.025)
- full sharps bins should be put into the "sharps" yellow wheelie bin in the bunker between IMS and Polwarth. The key is held in IMS stores.
- sharps bins will then be sent for incineration

- larger quantities of blood should be double-bagged and placed in clear bags for autoclaving. Double bagging ensures blood cannot leak out.

#### **Ethidium bromide waste**

- should go in '**Cytotoxic Bins**' (**yellow bins with purple lids**)
- cytotoxic bins should be sealed, tagged and labelled with lab number (e.g. IMS 4:23 or Polwarth 3.025)
- full cytotoxic bins should be placed in the yellow wheelie bin in the bunker outside the IMS. The key is held in IMS stores.
- use of alternative, less toxic dyes should be considered instead of ethidium bromide.

#### **Broken glass**

- uncontaminated broken glass too big for sharps bins should be placed in puncture-proof container (e.g. a securely taped, robust cardboard box). Full containers should be sealed and labelled as 'Broken Glass' and contact Technical Resources Officer (Wendy Pickford) for uplift.
- contaminated broken glass should be placed in a suitable container (e.g. a plastic box) which can be autoclaved, then placed in a clear bag and taken for autoclaving.

### ***B. Liquid waste***

Many chemicals can be safely disposed of down drains flushed with plenty of water – check the MSDS. Forbidden materials include:

- Water-immiscible solvents – see solvent waste below
- Chemicals which can produce inflammable/explosive vapours in drains
- Chemicals which can produce explosive deposits in drains (e.g. azides, acetylides, silver salts)
- Substances that might block drains, or cause injury to drainage workers (e.g. cyanide, large quantities of antibiotics).
- Formaldehyde-containing solutions (glutaraldehyde, paraformaldehyde, etc.).

#### ***Disposal of waste not suitable for discharge into drains***

- Disposal of chemicals must be planned before purchase.
- Significant quantities of unwanted chemicals should not be allowed to accumulate.
- If you have unwanted chemicals that cannot be discharged to the drains, contact an IMS Safety Coordinator for advice.
- Where possible, dangerous wastes should be rendered innocuous by

suitable chemical treatment.

### **Solvent waste**

- Each laboratory using water immiscible solvents should have two waste bottles, both clearly labelled, (a) non-halogenated solvents; (b) halogenated solvents.
- These must be stored in a solvent cabinet and should be labelled to indicate the proportions of individual solvents and whether any hazardous chemicals are dissolved in the solvent.
- For disposal, contact Wendy Pickford (7460), who will place them in the solvent store outside IMS and arrange for removal.

### **Biological and radioactive liquid waste**

- All liquid microbiological cultures must be treated with disinfectant for suitable periods to kill the organism concerned.
- Disposal of radioactive waste to drain must be down designated sinks only and **must be recorded on the IsoStock system** (see Ionising Radiation Safety Arrangements and IMS Local Rules for Ionising Radiation; both at <https://www.abdn.ac.uk/staffnet/working-here/resources-5988.php#faq49>).

### **Chemical Waste Disposal**

- Waste should be separated into 3 categories:
  - Organic solvent waste – non-halogenated
  - Halogenated solvent waste
  - Other chemical waste, including formaldehyde-containing liquids
- Contact [Dana Wilson](#) who will send you a chemical waste disposal form, which should be completed and returned, after which, she will make arrangements to meet you at the Solvent Store located just outside the Stores exit door.
- If you have a large amount of chemicals, email [Dana Wilson](#) to obtain crates to put the chemicals in – then prepare a list, using chemical waste disposal form for each crate detailing what you have put in each. Email this list to Dana Wilson and proceed as above.
- **What not to put into Solvent Store:**
  - Yellow cytotoxic or sharps bins (use bins in a cage outside the IMS for depositing these)
  - Anything suspected to contain radioactive substances (these are disposed of with radioactive waste but please inform the RPS if they also contain hazardous chemicals).

- Any leaking containers (these must be made safe by placing inside a container which contains absorbent granules to absorb the leaks. This containment should have a lid and should be clearly labelled with the contents). Contact your lab [Safety Co-ordinator](#) for advice.

## Miscellaneous waste

Used batteries, empty aerosol cans and used deuterium, tungsten, xenon & mercury arc lamps can be disposed of in the same way as chemicals. IT equipment, waste electrical and electronic equipment (WEEE) should be returned to IT or stored for disposal at bi-annual WEEE collections.

### 13a WASTE STREAM FOR IMS AT FORESTERHILL SITE

The disposal system for waste at Foresterhill is summarised in a flow chart on the following page. A copy can be found on the final page of the IMS Safety Summary that should be printed out and located in each laboratory. Always ensure that waste enters the correct stream to protect people from hazardous waste. Conversely, general non-hazardous rubbish should not be put in with hazardous waste. This encourages others to disregard proper waste disposal procedures and adds unnecessary cost to the disposal of hazardous waste. Specialist Chemical waste uplift should be used for certain waste chemicals (e.g. those that are toxic, harmful to the environment) and should be arranged via the IMS Technical Resources Team (see Key Contacts list). Do not allow waste to accumulate.

#### SUMMARY OF COLOUR CODE FOR WASTE:

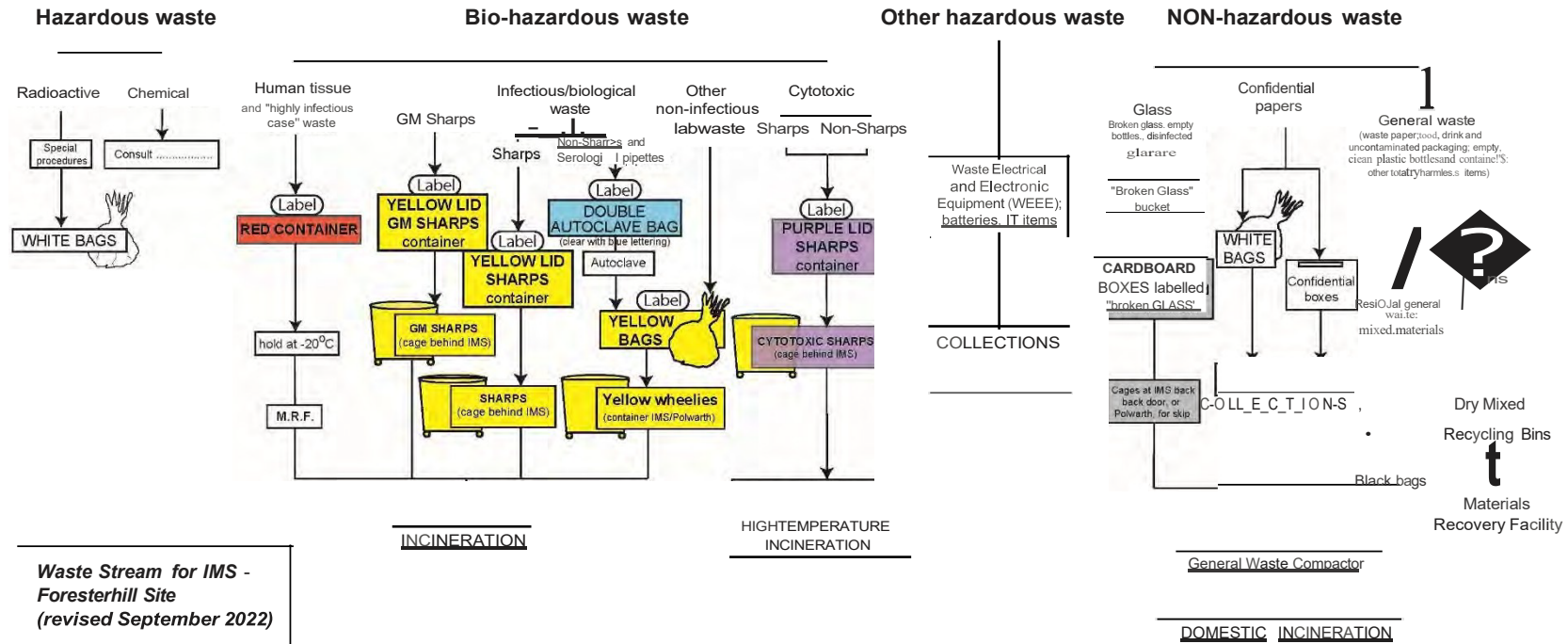
##### **Non-Laboratory**

RECYCLING bins	Separate bins: Dry mixed recyclables and Food
BLACK bags	Residual general waste (mixed materials)
WHITE bags	Confidential waste

##### **Laboratory waste**

CLEAR bags	Autoclavable waste
WHITE bags	Radioactive waste
YELLOW bags	Infectious /potentially infectious clinical waste contaminated with chemicals /medicines
YELLOW bins	Cytotoxic waste (PURPLE LIDS)
YELLOW bins	Sharps (YELLOW LIDS)

# TYPE OF WASTE





## 14. Procedures for specific hazards

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## P.1 Access to the IMS

Unaccompanied access to the various IMS buildings is restricted to University staff and students with University ID cards, and in some they must be specifically activated for a particular building. Cards must be carried at all times.

When entering out of hours (weekends, bank holidays, 6pm-6am weekdays) you should complete the sign-in sheet on entry and departure. You are also advised to use the [SafeZone app](#) on your smartphone.

Staff should check the access procedures for other buildings within the University.

Working out with hours poses the additional risks associated with working alone (see procedure [P.23 – ‘Lone working’](#)). Wherever possible this should be avoided. When unavoidable, you are advised to use the SafeZone app on your smartphone.

All electrical equipment being run out with normal hours should be accompanied with a form (see procedure [P.30 – ‘Out of hours running of unattended experiments’](#)).

Valuables should never be left unattended in unlocked places throughout the University.

### Visitors, children and pets

- Visitors should be kept away from laboratories whenever possible.
- Research subjects should not be left unattended where there is any likelihood that they can walk into laboratories or other prohibited areas.
- If entering laboratory areas, visitors should be made aware of potential risks. They should not be left unaccompanied.
- Children brought onto University premises must be accompanied and adequately supervised by a responsible adult at all times. Safety rules for laboratories apply to both adults and children (*e.g.* rules on the wearing of personal protective equipment) and they should only be allowed into laboratories after a full risk assessment. Children should never be left in circumstances where they could wander away from adults and find themselves in a hazardous area. Adults who are accompanying children should not engage in activities which would interfere with their ability to provide adequate supervision.
- Pets are not allowed in any IMS areas.

### Authorised Visitors to the IMS

It is recognised that public engagement activities are important, but equally it is necessary to acknowledge that laboratories are working environments and that most, if not all, are shared spaces between two or more groups. The following guidelines are to ensure that the normal working activities of the laboratory are not disrupted, while at the same time allowing for the showcasing of research taking place in the IMS.

Ideally, photos, videos and interviews should be done in non-laboratory spaces within the IMS. However, where it is considered essential that a laboratory visit takes place the

following guidelines must be followed:

- The PI, hosting the visit, should give reasonable advanced notification to all co-occupants of the laboratory of any forthcoming visit and any hazardous activities either be suspended during visits or identified in advance and risks assessed.
- Visits to laboratories should not normally exceed five visitors and they must always remain accompanied.
- Laboratory visits should be restricted to less than 30 minutes, unless there are good reasons for longer visits and prior agreement has been sought from all the PIs sharing the space.

The PI hosting the visit is responsible for the safety of visitors and must ensure that they are made aware of potential hazards and provide white coats and safety glasses to be worn in the laboratory.

## P.2 Access to heights

### Storage above head height

It is particularly important in a laboratory, where the consequences of a fall can be severe, that a suitable means of access is used to reach storage above head height. Access to storage above head height should only be by stepladder or a kick stool. “Unsuitable access” includes chairs or tables. A ladder is available in IMS stores and in various labs within IMS. Ladders must be inspected every 6-12 months, depending on frequency of use, to ensure they are safe, and a record of inspections kept next to the step ladder. Chairs, and particularly swivel chairs, must never be used. Every attempt should be made to minimise the extent of storage above head height. See separate procedure (procedure P.11 “[Chemical safety](#)”) for guidelines on storage of hazardous chemicals.

### Work at heights

It is not normally deemed suitable for anyone in the IMS to work in a place where they could fall more than 2 metres. Should anyone be required to do so, they must discuss the matter first with their Supervisor or Local Safety Coordinator.

## P.3 Driving on University business

Guidance on Driving on University Business has been prepared at the request of the University Health and Safety Committee. A copy of the guidance can be found [here](#).

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## P.4 Autoclaves and pressure cookers

Autoclaves are used in the IMS for sterilisation of infected material and for the sterilisation of materials for use in the laboratory. The autoclaves are maintained and operated by staff in the IMS building. Only authorised people trained in their use may operate autoclaves.

Bags of infected material for autoclaving should be sealed with a blue ratchet clasp and labelled with name and room number. They should be left in the basket in IMS room 1:21. Medium and glassware for sterilisation, labelled with name and room number on autoclave tape, should be left on the trolley next to the autoclave. The caps must be loosened on any bottles; remember that they will tend to tighten under pressure during autoclaving. They should be collected from the bench opposite the autoclave.

The major hazards associated with autoclaves are:

- explosive breakage of vessels placed in the autoclave while they are being unloaded from the autoclave or are subsequently being opened;
- scalds resulting from careless handling of vessels containing boiling liquids;
- scalds from steam issuing from autoclave;
- burns from physical contact with the autoclave; and
- failure of component parts of the autoclave while under pressure.

Pressure cookers (bench-top autoclaves) may be used in laboratory areas. These must be suitable for laboratory use and operated according to manufacturer's instructions. Most of the hazards that apply to autoclaves will apply to the use of such pressure cookers. (When operating microwave ovens, it is also important to note that bottles must have their caps loosened – see procedure [P.26 Microwave ovens](#)). Heat-resistant gloves must be used when handling hot items. Allow adequate time for cooling before opening pressure cookers. Likewise allow bottles to cool before they are opened.

### Inspection and maintenance of autoclaves

1. Regular bench-top autoclave maintenance and servicing is organised by Wendy Pickford/TRM (7460) and notified by email to lab PIs.
2. Each Supervisor is responsible for ensuring the regular inspection and maintenance of all autoclaves. A register of all autoclaves in the IMS is retained to ensure that they are regularly inspected and maintained in accordance with manufacturers' recommendations.
3. There are specific statutory requirements covering the inspection of pressure systems. A written scheme of examination must be prepared for all such systems stating what must be inspected, the nature of the inspection and the frequency of inspection. An insurance company contracted by Estates Section will prepare the written scheme of examination and carry out the periodic inspection.

Each Supervisor should ensure that, where required,

- a written scheme of examination has been prepared for each autoclave
- the required inspections are carried out at the specified intervals
- copies of the written schemes are kept on file along with inspection certificates from each inspection.
- each autoclave requiring inspection is marked with the date of last inspection and the date when the next inspection is due.


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## P.5 Biological safety

This section applies to any work with a “biological agent” and to *unscreened human blood and tissues that may contain biological agents*. A “biological agent” is defined as *any microorganism, cell culture or human endoparasite which may cause infection, allergy, toxicity or otherwise create may create a hazard to human health*.

Those in control of work with biological agents must:

- determine the hazard group for the biological agent (there are four hazard groups 1-4 – see below and “***The approved list of biological agents***” links);
- determine the containment level required (there are four containment levels 1-4 – see links below); and
- implement the requirements of the appropriate containment level and, for work at containment level 2 or above, produce “local rules” to be followed by those who will be involved in the work.
- notify the Foresterhill Biological Safety Committee (FBSC) about projects involving work with wild-type microorganisms requiring Containment Level 2 or above (i.e. GM1 work approved by the FBSC. Further information is at <http://www.abdn.ac.uk/ims/safety/biological-and-gm-safety.php> .

Those in control of work with biological agents must have ready access to the book entitled, “***The Management, Design and Operation of Microbiological Containment Laboratories***” (2019) HSE Books, ISBN 0-7176-2034-4, [free to download]. They should also have, “***Safe working and the prevention of infection in clinical laboratories and similar facilities***”.  Dangerous Pathogens, the official body that oversees work with infectious material throughout the UK, produces a book called, “***The approved list of biological agents***”. This gives information of the classification of various biological agents.

The HSE have published guidance on working in clinical laboratories. As well as being relevant to work in hospital laboratories, it provides guidance on safe working practices, which will be of use in all University laboratories where biological material with a risk of human infection is handled. Each Group should have a copy – it is, “***Safe working and the Prevention of infection in clinical laboratories and similar facilities***”; [Health and Safety Executive, 2003, ISBN 0717625133](#).

### Biological Agent Hazard Groups

Biological agents are categorised into four hazard groups based on the risk of infection: Group 1 agents create the least risk of infection; Group 4, the highest risk.

**Group 1** Unlikely to cause human disease; e.g. *Aspergillus niger*, *Cyanobacter spp.*

**Group 2** Can cause human disease and may be a hazard to laboratory workers; it is unlikely to spread to the community and there is usually effective prophylaxis or treatment available; e.g. *Vibrio cholerae*, *Listeria monocytogenes*.

**Group 3** Can cause severe human disease and may be a serious hazard to laboratory workers; it may spread to the community, but there is usually effective prophylaxis or

treatment available; e.g. *Yersinia pestis*, *Histoplasma spp*, *Hepatitis B virus*, *Human retrovirus*, *polio virus* and *verotoxigenic Escherichia coli strains*.

**Group 4** Causes severe human disease and is a serious hazard to laboratory workers; it is likely to spread to the community and there is usually no effective prophylaxis or treatment available, e.g. *Lassa*, *Marburg* and *Ebola viruses*.

The Health and Safety Executive have produced a list of the common biological agents assigned to Hazard Groups 2, 3, and 4. The list is called the “**Approved List**” (which places micro-organisms in their respective Hazard Groups from which the level of containment is then determined). The current list (2004) is available as a PDF document at <http://www.hse.gov.uk/pubns/misc208.pdf>.

It should not be assumed that an unlisted agent is automatically in Group 1 if it is not listed in the higher groups. Those working with the agent are responsible for placing it in the correct group on the basis of the criteria specified for each group.

Having determined the hazard group for a biological agent, the next step is to determine the level of laboratory containment that must be adopted when working with the agent. **Unscreened blood/tissue (i.e. where a hazard group classification cannot be made) should be treated as for hazard group 2.**

## Laboratory containment level

The term “containment” is used in describing safe methods for managing biological agents in the laboratory where they are being handled or stored. The purpose of containment is to control the exposure of laboratory workers and others to potentially infectious material.

Containment involves:

- configuring the laboratory in a suitable manner
- providing suitable equipment
- ensuring appropriate working practices.

The greater the risk of infection from the biological agent, the stricter the standards of containment need to be. [Biological and GM Safety | The Institute of Medical Sciences | The University of Aberdeen \(abdn.ac.uk\)](#) Health and Safety legislation defines four levels of containment (levels 1 - 4) . It is a legal requirement that work with a biological agent be carried out at the containment level corresponding to the hazard group

(i.e. CONTAINMENT LEVEL 1: for hazard group 1 biological agents

CONTAINMENT LEVEL 2: for hazard group 2 biological agents

CONTAINMENT LEVEL 3: for hazard group 3 biological agents

CONTAINMENT LEVEL 4: for hazard group 4 biological agents).

Note: **There are no facilities for containment level 4 in the University.** In the IMS only very restricted areas are certified for containment level 3 work. All users in these facilities must be authorized and familiar with procedures before working. Anyone requiring to use these facilities in IMS should first consult Wendy Pickford, Denise Tosh or Lynne Lumsden.

## Requirements of CONTAINMENT LEVEL 1

Containment level 1 is required for work with Group 1 biological agents. Group 1 agents are defined as being those “unlikely to cause human disease”.

Containment level 1 represents the basic level of containment and represents what many refer to as “Good Microbiological Practice”. All of the precautions at containment level 1 should be second nature to anyone working with any material of biological origin.

### Building/physical measures

- 1) Good hygiene should be maintained and this is aided if the laboratory is easy to clean, particularly the bench surfaces. These should be impervious to water and resistant to acids, alkalis, solvents and disinfectants that may be expected in normal use.
- 2) The laboratory should contain a basin or sink that can be used for hand washing.

### Work practices

- 3) Laboratory coats should be worn in the laboratory and removed when leaving the laboratory suite. They may be side-fastening lab coats.
- 4) Effective disinfectants should be available for immediate use in the event of spillage.
- 5) Eating, chewing, drinking, taking medication, smoking, storing food and applying cosmetics in the laboratory are forbidden.
- 6) Mouth pipetting is forbidden.
- 7) All procedures should be performed so as to minimise the production of aerosols.
- 8) Hands should be washed as soon as contamination is suspected and before leaving the laboratory.
- 9) Bench tops and laboratory equipment should be disinfected after use.
- 10) Used laboratory glassware and other materials awaiting disinfection should be stored in a safe manner. Pipettes should be totally immersed in disinfectant.
- 11) Contaminated materials whether for recycling or disposal, should be stored and transported in robust leak-proof containers without spillage.
- 12) All waste material, if not to be incinerated, should be disposed of safely by other appropriate means (see section 13 – ‘Waste and its disposal’).
- 13) Accidents and incidents should be immediately reported to and recorded by the person controlling the work.



## Requirements of CONTAINMENT LEVEL 2

Containment level 2 must be used for work with Group 2 biological agents and unscreened human blood/tissue. Containment level 2 differs from containment level 1 in the following ways:

- those working in the laboratory must receive specific training in the hazards associated with the agents used and the precautions required
- a high standard of supervision of the work must be maintained
- local rules should be prepared detailing the procedures to be followed in the laboratory
- there must be specified procedures for disinfection
- access to the laboratory must be restricted while work is in progress
- the door to the laboratory should be kept closed while work is in progress
- there must be designated safe storage facilities for biological agents
- there are restrictions on the types of ventilation permitted in the laboratory
- a microbiological safety cabinet must be used for procedures which give rise to infectious aerosols
- side or back fastening gowns (rather than front-fastening lab coats) must be worn
- wash basins must have taps of the type that can be operated without being touched by hand
- an autoclave for sterilisation of waste must be available in the same building.

### Containment level 2 - generic local laboratory rules

These are generic local rules (also available as a separate document and available to download on the IMS H&S webpage) which can be used as a starting point for producing local rules specific to a particular laboratory. These are minimal generic rules, and it is essential they are supplemented with additional laboratory-specific local rules.

Personnel working in a containment level 2 laboratory must receive specific training in the hazards associated with the agents used and the precautions required. A high standard of supervision of the work must be maintained.

- The biohazard symbol and the level of containment should be displayed at the entrance to the laboratory.
- ONLY authorised personnel should have access to the laboratory. The laboratory door should be kept closed whenever work is in progress. Casual visitors to the laboratory are not permitted.
- There must be NO eating, chewing, drinking or storing of food in the laboratory.

- All personnel in the laboratory MUST wear a lab coat at all times. Side fastening Howie-style laboratory coats are compulsory in containment level 2 laboratories. Coats MUST always be fastened. Even visitors not handling blood should wear a white coat.
- NO bags, outdoor clothing, *etc.* should be in the laboratory.
- Gloves MUST be worn when handling blood or tissue. Gloves should be removed before handling items likely to be touched by those not wearing gloves (such as telephones, paperwork, door handles, light switches). If samples are taken to another laboratory, at least one glove must be removed. The ungloved hand is then used to open doors *en route*.
- Cuts, scrapes, *etc.* on exposed skin should be covered with waterproof dressings.
- All work using human blood and tissue MUST be carried out on sealed benches or in spillage trays.
- Benches should be kept clear of paperwork, *etc.*, and underbench areas should be clear of boxes, *etc.*
- A microbiological safety cabinet or similar must be used when carrying out procedures that could result in infectious aerosols.
- The use of sharps and glassware should be avoided as much as possible. To avoid needlestick injury, do not re-sheath needles or replace needles on a syringe.
- In the event of a needlestick injury, if the needle is clean and unused, no further action is necessary. If the needle is contaminated with potentially infective material, bleeding should be encouraged and medical attention should be sought from the Accident and Emergency Department at the Hospital). Where possible the blood sample contaminating the needle should be kept for analysis. An online accident report form must be completed by the supervisor.
- Samples carried to other laboratories must be placed in un-breakable, leak-proof containers that will contain any spillage if dropped. Consult appropriate regulations/local Safety Coordinator if transport of samples is required.
- Blood, tissue and derived products must be stored safely when work is not in progress.
- Bench surfaces and any equipment used should be disinfected immediately when work is finished with a chlorine-based disinfectant such as Presept, Haz Tabs or ChemGene. At the end of the working day there should be no biological material left out on benches, *etc.* which could pose a hazard to cleaning and security staff.
- Waste segregation procedures must be followed. Blood and tissue samples should be re-capped and disposed of by placing into autoclave bags and then autoclaved. Large quantities of blood and products (*e.g.* washing medium from cell isolation procedures), can be treated overnight with at least a half volume of disinfectant such as Presept or ChemGene, and then disposed of down the sink.

Used needles should never be re-sheathed. They should be disposed of intact in Cin-bins immediately.

- Spillages of blood, *etc.* should be treated with the Biological Hazard spillage kit provided in the laboratory. Make sure you know where this kit is, and how to use it. The recommended procedure is to blot spillage with absorbent material and flood with a freshly made solution of disinfectant.
- Individuals should inform their PI if they are undergoing any treatment that affects their normal resistance to infection (e.g., HIV infection, prescription of antibacterial antibiotics or steroids). Alternatively, they should consult with Occupational Health (tel: 76-53663).

Containment level 2 allows work with unscreened blood and tissue only. You cannot work with samples KNOWN to be, for example, Hepatitis B or HIV positive. HIV has been detected in blood and blood products, in serum, plasma, breast milk, semen, vaginal and cervical secretions, urine, tears, peritoneal fluid, pleural fluid, pericardial fluid, synovial fluid, amniotic fluid, saliva and both CSF and brain tissue. Possible HIV contamination should therefore be considered when handling materials of these types in the laboratory.

### Containment level 3

If work requires containment level 3 facilities, this must be first discussed with the Director of the IMS and procedures put in place before any work is undertaken.

### Handling of human tissues, blood and other secretions

***No worker should EVER use their own blood, or that from anyone else associated with the work, for culture or transforming cells. The use of another person's cells is vital so that, in case of accidental penetrating injury to the worker, they can raise a defensive immune response. The use of a worker's own blood prevents this immune reaction, so potentially transformed cells will not be cleared from the body. For similar reasons, the donor of the blood should not be allowed to enter the room where culture of their blood is taking place.***

### Work with blood and tissue must be carried out as follows:

Work with unscreened human blood/tissue must use Containment level 2, the requirements of which have been described above. Unscreened human blood may be infected with blood borne biological agents such as HBV (hepatitis B virus) and HIV (human immunodeficiency virus). All human tissue or body fluids could potentially be contaminated with blood or contain viral agents and therefore will present similar risks to unscreened blood. The following additional precautions should also be adopted:

- use a microbiological safety cabinet or other form of primary containment when infected material may be dispersed, for example by tissue homogenisation, or vigorous mixing;
- keep the designated working area clear of any unnecessary equipment;
- wear gloves and other personal protective equipment appropriate to the task, for example eye protection;
- cover cuts, grazes and broken skin on exposed skin with waterproof dressings;
- avoid using sharps and glassware; and
- clean and disinfect bench surfaces and any equipment immediately on completing a work session.

It is strongly recommended that personnel working with unscreened blood or tissue are vaccinated against Hepatitis B (see below).

Any work with material known or strongly suspected to be infected with HBV or HIV must be carried out at containment level 3, since these viruses are both Hazard Group 3 biological agents.

If blood or tissue is known to be positive for a biological agent other than HBV or HIV, precautions appropriate for that agent must also be taken.

Precautions for work with human and animal transmissible spongiform encephalopathies (the prion diseases, including BSE and CJD) are given in [BSE - Occupational guidance: Advisory Committee on Dangerous Pathogens](#)".

### **Taking blood specimens (phlebotomy)**

- 1) Only those who have been properly trained in phlebotomy and who have received written authorisation from the Director of the IMS should take blood from veins. A register of authorised phlebotomists is maintained by the Clerk to the IMS Health and Safety Committee.
- 2) Prospective donors of blood should be recruited on the basis of informed consent and good ethical principles and should:
  - not be pressured into volunteering;
  - be made aware that they do not have to disclose why they do not wish to participate; and
  - be aware that, if they have any doubts about the advisability of giving blood, they may discuss their concerns, in complete confidence, with their doctor or a nurse in the University's Occupational Health Service.

One reason for this approach is to enable people in groups with a high risk of infection from blood borne viruses to withdraw/refuse without drawing attention to themselves, as there are other valid reasons for declining to participate. Ethical committee approval may be required in some circumstances.

If there any doubts about the advisability of giving blood, prospective volunteers may discuss their concerns, in complete confidence, with a doctor or a nurse in the University's Occupational Health Service.

- 3) The authorised person taking it must maintain a record of the volumes of blood taken in a blood sample collection record book. This will be maintained centrally in the IMS office. No more than 600ml of blood should be donated by any individual in any 6-month period, **including blood donated directly to the Blood Transfusion Service (BTS)**. Thus, additional voluntary donations for research purposes might not be possible from BTS donors. **It is essential to make this clear to donors.**
- 4) Blood should not be taken in places where there are microbiological, chemical or radiation hazards or where the preparation or consumption of food/drink is taking place. Laboratories are unsuitable places for taking blood. In the IMS building, the first aid room (1:56) must be used for this purpose.
- 5) Ideally a second person should be available in case help is required, *e.g.* in the case of a volunteer fainting.
- 6) Impervious worktops and hand washing facilities should be available. The room should be easy to decontaminate after a spillage. Material to clear up a spillage and to decontaminate the parts of the room affected should be readily available.
- 7) The authorised person taking blood should wear a clean coat (which should have been laundered if previously used as a laboratory coat) and gloves.
- 8) Human blood, even if from apparently healthy individuals, should be treated as potentially infectious and should be handled with at least Laboratory Containment Level 2 – *i.e.* use higher containment if risk assessment indicates it is required.
- 9) Those taking blood or handling unscreened blood should, where feasible, have been vaccinated for hepatitis B.

## **Needlestick injury**

Needlestick injuries are a common problem in laboratories and the most likely route of transmission of infection. Should a needlestick injury occur, the following guidelines should be followed:

- 1) If the needle is clean and unused, all that is necessary is to encourage bleeding of the wound. If the needle has been used and has come into contact with potentially infectious or radioactive material, bleeding should be encouraged and medical attention sought from the accident and Emergency Department at the Hospital. Where possible the blood sample contaminating the needle should be kept for analysis. An online accident report form must be completed by the supervisor.

- 2) The incident should be reported immediately by the supervisor using the online accident report form available on the IMS safety web site (<http://www.abdn.ac.uk/ims/safety/az.php>) and copies sent to the Clerk for the IMS Health Safety and Wellbeing Committee and the IMS Lead Safety Coordinator for IMS records.

To reduce risk of needle stick injuries, never attempt to re-sheath or remove a needle from a syringe.

## **Immunisation/vaccination**

Vaccination for hepatitis B is strongly recommended for those working with unscreened blood and tissue samples. Vaccination for hepatitis A, polio, typhoid and tetanus is recommended for those who will be coming into contact with human waste products and/or untreated water.

Vaccination should be arranged through the University's Occupational Health Service provider [OHWorks](#).

Where graduate/honours projects require students to be vaccinated, sufficient time should be allowed for vaccination to be effective (a minimum of 6 weeks should be allowed for hepatitis B). Not all people respond to vaccination and so work should not commence before antibody responses have been confirmed. Where possible, supervisors should consider alternative projects to avoid the need for vaccination

## **Immunocompromised staff and students**

Staff and students who are known to have a suppressed immune system should consider this in their risk assessment. There are microorganisms that are more pathogenic in immunocompromised persons. Supervisors should inform students of such risks in project so that the student can either discuss with supervisor or consult the University's Occupational Health Service provider [OHWorks](#).

## **Packaging and shipment of infectious materials**

For the shipment of any infectious materials, the packaging must be done by or checked by a person trained for these Safe-T-Pak procedures. By "infectious materials" we mean not only microorganisms in [Hazard Group 2](#) but also materials such as [unscreened blood](#) where there is uncertainty about the infection risk. A list of [trained persons](#) can be found on the website, or by contacting IMS Reception, which coordinates parcel uplift. No such package should be shipped without prior approval of a Safe-T-Pak trained person.

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## P.6 Building works and fault reporting

The fabric of the University buildings and the installed services (electricity, water, gas, etc.) are the responsibility of the Estates Section.

- 1) Anyone who notices any parts of the building, which are unsafe and need to be repaired, should contact Estates. Any urgent matters should be notified directly to Estates on their 24-hour emergency telephone number ext. 3939. Routine faults should be reported to the fault desk online or on ext. 3333.
- 2) Anyone planning to bring contractors into the IMS MUST contact Wendy Pickford, Denise Tosh or Lynne Lumsden in advance to agree any precautions that might be required.

## P.7 Bunsen burners

Bunsen burners represent a serious fire risk and should be operated with care. Several precautions should be taken to avoid the risk of fire.

- 1) Regularly inspect the tubing for deterioration and replace if necessary. Ensure that the tubing is not likely to be caught by anything.
- 2) Tubing should be firmly clipped using a jubilee clip to the gas outlet tap and to the Bunsen burner.
- 3) Place burners in a clear space on the bench and away from any solvents or combustible material/papers.
- 4) Do not place burners in a place where people are likely to stretch over them.
- 5) Many gloves burn readily. It is preferable not to wear them near naked flames. If they must be worn, great care is needed to keep them clear of the flame.
- 6) Use gas igniters to light burner and do not use matches.
- 7) Always turn off the Bunsen completely if you have to leave the laboratory. Turn the flame down to the pilot light if not using the bunsen temporarily.
- 8) Be aware **beforehand** what procedures to follow should a surrounding object catch fire (see section 8 – [‘Fire safety precautions’](#)).

## P.8 Carcinogens

The procedures in this section are mandatory for work with Category 1 and Category 2 carcinogens.

Carcinogens are divided into three categories.

- Category 1: These are substances *known to be carcinogenic to man*. There is sufficient evidence to establish a causal association between human exposure to a substance and the development of cancer. If purchased from a supplier they will be marked:
    - T; R45 MAY CAUSE CANCER or
    - T; R49 MAY CAUSE CANCER BY INHALATION
  - Category 2: These are substances that *should be regarded as if they are carcinogenic to man*. There is sufficient evidence to provide a strong presumption that human exposure to a substance may result in the development of cancer, generally on the basis of appropriate long-term animal studies and other relevant information. If purchased from a supplier they will be marked:
    - T; R45 MAY CAUSE CANCER or
    - T; R49 MAY CAUSE CANCER BY INHALATION
  - Category 3: These are substances that cause concern for man owing to *possible carcinogenic effects* but in respect of which the available information is not adequate for making a satisfactory assessment. There is some evidence from appropriate animal studies, but this is insufficient to place the substance in Category 2. If purchased from a supplier they will be marked:
    - Xn; R40 POSSIBLE RISK OF IRREVERSIBLE EFFECTS
- 1) Carcinogenic chemicals should not be used for purposes for which a satisfactory non-carcinogenic substitute is available.
  - 2) Work with carcinogens must be conducted in accordance with WRITTEN procedures that are derived from the risk assessment for the work. Risk assessments for work with carcinogens should always consider:
    - processes which can produce aerosols or vapour containing a carcinogen
    - manipulation of carcinogens likely to result in dust formation
    - storage and manipulation of carcinogenic gases, volatile carcinogens and compounds which decompose spontaneously evolving carcinogens
    - weighing of carcinogens and the preparation of solutions containing them
    - the possible effects of static electricity during handling of powders
    - changing traps and exhaust filters
    - response to a spillage or other uncontrolled release of a carcinogen



- decontamination of work areas and equipment
  - disposal of waste
- 3) Carcinogens should be handled only in suitable designated areas with adequate equipment for their containment.
- Designated areas should be marked clearly.
  - Access to designated areas should be restricted to those carrying out the work.
  - The numbers of those involved in the work and entering the designated areas should be kept as low as possible.
  - Effective methods must be devised to ensure people not involved in the work do not enter designated areas
- 4) If small samples of carcinogenic materials need to be taken to non-designated areas (*e.g.* for specialised analysis), samples should be clearly marked as carcinogens and be carried in robust sealed containers. The same stringent precautions as are required in designated areas should be observed in non-designated areas.
- 5) Carcinogens should be kept segregated from all other chemicals in a locked cupboard clearly labelled “Chemical carcinogens”. Only people authorised by an IMS Safety Coordinator, or a nominated senior member of each research group may hold keys.
- 6) Protective clothing required should be specified and be worn at all times.
- Protective clothing must be disposable and must be disposed of in the same manner as the carcinogen itself.
  - Contaminated clothing must be disposed of, not sent for laundering, ANY PROCEDURE, WHICH ROUTINELY CAUSES CONTAMINATION OF PROTECTIVE CLOTHING, IS UNSATISFACTORY AND MUST BE IMPROVED.
  - Protective clothing, which has been worn in a designated area, is potentially contaminated and must not leave the designated area except for disposal.
- 7) Standards of personal hygiene in any laboratory should always be high. When working with carcinogens it is particularly important to ensure that the highest standards are maintained.
- No eating, drinking, or applying of cosmetics is permitted in the laboratory
  - There should be no mouth pipetting
  - Any exposed cut or abrasion of the skin must be covered with an appropriate surgical dressing before commencing work or putting on protective clothing. Gloves should then be worn over dressed areas on hands.
  - Hands should be washed and dried with disposable towels before leaving the laboratory

- 8) Decontamination methods for experimental residues and laboratory equipment should ensure complete chemical conversion into non-carcinogenic substances. Written instructions for cleaning and decontamination of equipment must be prepared. Decontamination and cleaning of equipment should be carried out in the designated area.
- 9) Written procedures for disposal of waste must be prepared. Contaminated material that cannot be decontaminated should be double bagged in sealed plastic bags, clearly labelled with contents and carcinogenic nature of hazardous substances and then inform Wendy Pickford (ext. 7460), who will arrange appropriate disposal.
- 10) Any sharps (e.g. needles, broken glass) must be placed in sharps containers (yellow bins with blue lids) and passed to IMS stores for disposal by incineration. To avoid needlestick injuries, do not re-sheath needles or remove them from syringes before disposal.



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## P.9 Cell culture facilities

**The use of tissue culture facilities is dependent upon local codes of practice that must be adhered to.**

- 1) A Supervisor must be appointed to be responsible for the cell culture facility and ensure that all users adhere to local rules.
- 2) The Supervisor must be informed of any new biological materials or hazardous chemicals brought into the unit. They must also be kept fully informed of the nature of all work in progress in the unit. All work with genetically modified organisms must be approved before work is started (see [P.19 Genetic modification work](#)).
- 3) All activities must be assessed for the necessary level of containment (see [P.5 Biological Safety](#)). Laboratory personnel must receive suitable and sufficient information, instruction and training in working safely with agents in Group 2 if required. A high standard of supervision of the work should be maintained.
  - a) The laboratory door must be closed when work is in progress.
  - b) Access to the laboratory is restricted to authorised persons
  - c) There must be specified disinfection procedures
  - d) Personal protective equipment, including protective clothing, must be stored in a well-defined place, checked and cleaned at suitable intervals. Labcoats must be of the 'Howie' style

Adequate assessment based on an awareness of the hazards, good organisation of work and **adherence to principles** of good laboratory practice is critical to **the safe use of cell cultures**. It is important that basic quarantine and segregation procedures are adopted to prevent the inadvertent transmission of infectious agents from one culture to another. To guard against this, the following points should be noted.

- 1) Only one cell line should be handled at a time with appropriate decontamination methods used between operations on different cell types. It is also desirable that cell cultures that are known to be infected are handled at the end of the work period or preferably in a different laboratory from those that are known to be infection free.
- 2) Wear a **clean** Howie-style labcoat while working with cells – and **not** the same coat that you wear in the general lab.
- 3) Wash your hands before and after dealing with cells.
- 4) While working with cells, **do not eat, drink, bite fingernails or otherwise risk ingesting** what might be hazardous material.
- 5) Swab down the working surface of the cabinet and also under the perforated surface with ethanol or other appropriate disinfectant **before and after** use.
- 6) **Never** mouth pipette.
- 7) Always use pipetting aids in accordance with Training and Competence instruction to prevent breakages and possible injury.

- 8) Always wipe up spillages of cells/contaminated material after treating with appropriate disinfectant. Dispose of paper tissues in correct waste bag/stream (see section 13 – "[WASTE AND ITS DISPOSAL](#)").
- 9) Put all disposable plastics, after use, into an autoclave bag. In the case of plates, media should be removed into the waste container that has appropriate disinfectant. All autoclave bags have to be closed with specific tags and labelled with room number, then taken to the wash-up room. Any non-autoclaved material should be disposed of in orange safety bags. When these are  $\frac{3}{4}$  full they should be closed with blue tags, labelled with room number and taken to the yellow wheelie bins contained in the yellow containers outside the IMS building.
- 10) Always have regard for sterility. Do not move hands or arms over an open culture dish or medium bottle; put the lids of culture dishes or medium bottles the right way up, on the cleaned surface of the hood, not inverted; remove sterile pipettes without contaminating the pipette.
- 11) Never put a pipette that is non-sterile, or has come into contact with cells, into a bottle of sterile medium.
- 12) If bottles of medium or serum have been warming in the water bath, wipe with an ethanol-soaked swab before transferring them to the hood. Water baths tend to harbour bacteria.
- 13) Look at cells frequently under the microscope to monitor their general well-being and ascertain any contamination problems as early as possible.

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## P.10 Centrifuges

The major hazards associated with centrifuges are:

- physical contact between the operator and the rotating head;
- mechanical breakage of rotors caused by corrosion or use in excess of manufacturer's recommended limits; and
- severe vibration caused by an unbalanced rotor.

A rotor can suffer stresses similar to those occurring in high-speed aircraft engine components. The periphery of a 10-cm rotor travelling at 50,000 rpm is travelling at over 1,100 miles per hour. The rotor is stressed by every acceleration/deceleration cycle and undergoes measurable stretching each time it accelerates. Mechanical breakage of unbalanced rotors and the vibration resulting from an unbalanced rotor can cause extensive and expensive damage as well as having potential to cause severe injury to anyone in the same room as the centrifuge.

To prevent injury centrifuges should be:

- used in the correct manner; and
- regularly inspected and maintained.

Note: The formation of aerosols when samples of infectious material are centrifuged may also be a hazard and may require the use of sealed centrifuge buckets.

### Correct use of centrifuges

- 1) Centrifuges may be operated only by staff in supervisory positions or students under the direct instruction of their supervisor.
- 2) If you are unfamiliar with the operation of any machine, seek assistance before you use it.
- 3) The centrifuge lid must be closed whenever the rotor is in motion and must be interlocked so it cannot be opened when the rotor is in motion.
- 4) Do not stop the rotor by hand or indirectly by the application of an implement to the rotor. Stop the centrifuge by returning the control to zero, not by switching off the power supply.
- 5) If there is any indication of malfunction, stop the machine immediately and contact your immediate supervisor or an IMS Safety Coordinator.
- 6) Follow the manufacturer's instructions, particularly regarding balancing tolerances and operating speeds for different rotors. Note that balancing by volume is not suitable for dense solutions (e.g. sucrose solutions must not be balanced with the same volume of water). Balance accurately by weight.
- 7) Before starting a run, inspect the rotor and tube caps for signs of corrosion or cracks. Never use faulty parts.

- 8) Ensure that the outsides of containers are clear and free of drops of liquid before placing them into the rotors (drops of liquid could be a cause of corrosion or contamination). If any liquid is spilt into a centrifuge or onto a rotor it is crucial that it is removed immediately and the equipment cleaned using an appropriate method.
- 9) Never leave a centrifuge while it is accelerating. Many faults occur during the acceleration phase of a run. If you are present, you can immediately turn the machine off.
- 10) All free-standing centrifuges should have a logbook. Always fill in the logbook, giving all the details required. The replacement times for rotors and drive mechanisms are calculated from the data in the logbook.
- 11) Always clean and dry the rotor and the centrifuge carefully after use. It is important to remove all traces of materials that could promote corrosion, stress cracking or contamination. Mild detergent (*e.g.* Teepol), possibly with gentle brushing, is all that is required for cleaning. Do NOT use agents that will corrode the rotor (*e.g.* NOT bleach/oxidising agents such as chlorox). Cidex can be used. Avoid scratching a rotor.
- 12) If rotors require biological disinfection, do NOT use agents that will corrode the rotor (*e.g.* NOT chlorox). Cidex can be used.
- 13) Always leave the lid “ajar” when the centrifuge is not in use. This minimises corrosion/rusting and buildup of biological contaminants.

### **Inspection and maintenance of centrifuges**

All centrifuges should be covered by maintenance contracts and inspections are undertaken every 6 months. Check inspection sticker and contact Wendy Pickford or Denise Tosh if this is out of date. Records of maintenance should be retained and date of last inspection noted on each centrifuge. Record of inspection should be monitored during safety inspections.

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## P.11 Chemical safety

Before the work commences, anyone working with chemicals of any sort must ensure that they:

- understand the hazards associated with the chemicals
- know what precautions should be taken.

The main hazards of chemicals are:

- toxicity of chemicals if they enter the body;
- corrosive nature of some chemicals in contact with human tissue;
- flammability of some chemicals; and
- reactivity of some chemicals - including incompatible chemicals coming together.

These hazards need to be considered during:

- storage of chemicals;
- use of chemicals; and
- disposal of chemical waste.

Consider also what will be done if there is a spillage (or other uncontrolled release) of a chemical.

### Safety data sheets

It is a legal requirement that the supplier of a chemical must provide a Safety Data Sheet to the purchaser of the chemical. If you have purchased a chemical and do not have the hazard data sheet and cannot find it on the supplier's website, contact the supplier and request one. Safety data sheets (SDS) are available on websites from various chemical companies of bodies, e.g. [VWR](#); [Sigma-Aldrich](#) (now Merck); [Fisher](#); [Interactive Learning Paradigms](#).

Unless the chemical is one whose properties are well known to the user, it is essential to consult a Safety Data Sheet. Supervisors should get their students into the habit of consulting Safety Data Sheets as part of the process of carrying out risk assessments. Details on the handling, storage and disposal of hazardous chemicals should be incorporated into risk assessments as should procedures for dealing with accidental spillages.

### Risk assessment

By law, those controlling the work should determine how it is to be carried out safely. Risk assessments must always take account of the risks

created by any chemicals which are used (see section 3 - "[Risk assessment](#)" for details of how risk assessments should be done)

Risk assessments must always address:

- storage of chemicals
- use of chemicals
- disposal of waste
- actions to be taken in event of a spillage or accident.

The wide range of chemicals that are used in the IMS means that it is only possible in this handbook to provide very general guidance on precautions to be taken. Supervisors of those using chemicals are responsible for ensuring that specific hazards are identified and the necessary precautions are taken.

## Storage of chemicals

- 1) All chemicals (either in the stores or in the laboratory) must be correctly labelled. Materials purchased from suppliers should already be correctly labelled. When solutions are prepared in the laboratory or when chemicals are dispensed or repacked, they must be clearly labelled and any hazards indicated with appropriate hazard symbol labels. This includes ethanol dispensed by IMS stores.
  - Correct chemical names are required. Labelling a bottle only as "solution A" is NOT acceptable. Consider what happens if the bottle leaked or was knocked over when the person making the solution is away from the lab.
  - Durable labels are required (*e.g.* marker pen on glass is not acceptable).
- 1) Chemicals must be stored so that they cannot accidentally come into contact with incompatible chemicals (see [Appendix 1](#) for a list).
  - When making arrangements for storing chemicals consider the effects of two chemicals coming into contact if there was a spillage or a leak. With some incompatible chemicals violent reactions can occur if the chemicals combine under uncontrolled conditions. With other chemicals, uncontrolled mixing can result in the production of highly toxic gases or fumes.
- 3) Bottles of >1 litre containing liquids must be placed in bottle carriers for transport to/from storage areas outside the laboratory. Always check the integrity of wire carriers before using. When carriers need replaced, purchase totally enclosed ones with sealed lids. These help contain possible spillages and prevent point impacts on bottles.
- 4) Highly flammable liquids must be transported and stored in sealed carriers. For storage of highly flammable liquids, see [P.21 – 'Highly flammable liquids'](#).
- 5) For the transport of dangerous chemicals in University vehicles consult an IMS Safety Coordinator, and check the guidance notes (<https://www.abdn.ac.uk/staffnet/working-here/resources-5988.php#faq46>).



## Chloroform

Chloroform is a class 2 carcinogenic (see [P.8 Carcinogens](#)) and should, like phenol, be used in a fume hood with full protective clothing. Phenol/chloroform and TRIzol mixtures are used in the process of DNA extraction, but many alternatives exist and the IMS very strongly recommends that such alternative techniques are used, where possible.

## Dimethylsulphoxide (DMSO)

Dimethylsulphoxide (DMSO) is rapidly absorbed through the skin. Great care should be taken when it is used as a solvent for other toxic or carcinogenic substances as DMSO facilitates their absorption. On its own it is relatively non-toxic.

## Drugs – legal restrictions and Misuse of Drugs Act

Attention is drawn to the Misuse of Drugs Act. The Act gives three lists of drugs.

- Class A: opiates, narcotics and hallucinogens and N, N-dimethyl- and N, H-diethyl-tryptamine and certain chemicals such as 4-phenyl-piperidine-4 carboxylic acid ethyl ester,
- Class B: amphetamines, cannabis, *etc.*
- Class C: compounds which have effects on the central nervous system; examples are pemoline and methaqualone.
- It is an offence to make or possess any of the compounds listed in these classes except for specific purposes and conditions.
- If you have permission to use these drugs, they must be kept in a locked cabinet.

Those planning to make or use compounds of this kind for research purposes must consult the list in the Act, consult with an IMS Safety Coordinator and enquire from the Home Office the exact regulations governing their use.

## Drug precursor chemicals

Legislation on the regulation of drugs precursor chemicals in the United Kingdom and Export of these compounds outside the EU came into force on 18th August 2005 (EC regulation No 273/2004). This legislation affects Universities in the following ways:

- you must obtain a licence for your university to enable you to purchase category 1 chemicals
- you must complete returns for the Home Office on all category 1 chemicals and some category 2 chemicals
- you must have a compliance officer to deal with these matters. They will act on the university's behalf in regulating this new legislation. This will include

advising the competent authority on any potential illicit usage of the compounds included in all three categories,

These are all mandatory requirements.

Chemicals and categories include:

**Category 1**

- Benzyl methyl ketone (BMK)
- Acetylanthranilic acid
- Isosafrole
- Piperonyl methyl ketone
- Piperonal
- Safrole
- Ephedrine
- Pseudoephedrine
- Norephedrine
- Ergometrine
- Ergotamine
- Lysergic acid

**Category 2**

- Potassium permanganate
- Acetic anhydride
- Phenylacetic acid
- Anthranilic acid
- Piperidine

## Ethers and formation of organic peroxides

- 1) Dialkyl ethers and cyclic ethers (*e.g.* tetrahydrofuran, dioxan) form explosive peroxides when allowed restricted access to air and exposure to light. They should therefore be stored in dark bottles with the air space above the liquid kept to a minimum. Bottles containing ethers should not be topped up as this can lead to the formation of peroxides in the bottle.
- 2) Do not attempt to distil the low boiling point aliphatic ethers nearly to dryness because this concentrates the peroxides and can cause dangerous detonation.
- 3) Test strips to enable testing for peroxides must be purchased by those planning to hold stocks of ethers. Opened bottles should be tested for peroxides before use and at least annually.
  - Date and result of annual test must be recorded on a label on the bottle along with the name of the person carrying out the test.
  - Date of opening of a new bottle should be recorded on a label on the bottle.

- 4) Peroxide can be removed from ether by washing with sodium metabisulphate, or acidified ferrous sulphate, or by passing the ether over alumina. It should be noted that on prolonged storage of ethers the peroxides, mainly hydroperoxides, which are initially formed might be converted into secondary products, such as dialkyl peroxides. These products (also explosive) are difficult to detect.
- 5) Di-isopropyl ether presents an extremely severe peroxide hazard. Its structure is such that peroxidation is very rapid and the hydroperoxide settles out as a readily detonated crystalline solid. The maximum permissible storage time is one month unopened and one week opened. A crystalline deposit near the stopper is a danger sign. If this is seen do not attempt to open the bottle, but consult an IMS Safety Coordinator about disposal.

## Ethidium bromide gels and solutions

Ethidium bromide is used in gel electrophoresis for visualisation of nucleic acids. Several alternatives exist (<http://bitesizebio.com/417/ethidium-bromide-the-alternatives/>) and these are preferred. If ethidium bromide has to be used, the following should be considered: It is a potent mutagen and should therefore be handled and disposed of with care.

**Nitrile** (blue) gloves - **NOT latex** - are recommended with ethidium bromide because they are more robust and less likely to develop pin holes. Nitrile gloves are supplied in stores, at a very similar cost to latex gloves, so are the glove of choice when handling ethidium bromide gels. They also reduce allergenicity.

### Handling of ethidium bromide

- 1) The IMS Safety Committee strongly advocates that ethidium bromide is confined as far as possible to a specific designated bench area clearly delineated by cytotoxic tape. It also advocates using pre-prepared stock solutions wherever possible. Solid ethidium bromide **MUST** be weighed out in a fume cupboard. Stock solutions should be kept in clearly labelled, darkened bottles and stored at 4°C. It should only be opened in a fume cupboard. Tips used **MUST** be discarded into "cytotoxic waste" bins (yellow bins with purple lids). Ethidium bromide should only be added to heated agarose solutions when they are cooled below 50°C. This prevents the possible release of ethidium bromide vapour.
- 2) All treated gels must be transported in robust leak-proof containers. The following precautions must be taken to avoid contamination of non-laboratory areas and door handles.

- a) Anyone carrying gels must have one hand ungloved, to open doors without contamination. The other hand should be gloved to carry the container with the gel.



- b) An additional clean glove should be taken for the ungloved hand, to enable handling the gel in a room for viewing gels. The room must have adequate ventilation for working with ultraviolet radiation (and use appropriate safety visor - see [P.37 Ultra-violet radiation](#)).
- c) Remove a glove to then handle items to be touched by those not wearing gloves (e.g. door handles, light switches, computer keyboards).

### **Ethidium bromide disposal**

- a) All gels containing ethidium bromide, or which have been in contact with buffers containing ethidium bromide, must be disposed of by incineration. Disposal by other methods is not acceptable. Waste gels should be placed in yellow "cytotoxic waste" bins (yellow bins with purple lids). When full, the lid should be put on and sealed, labelled with name, room number and contents, then taken to the large yellow bin in cages outside IMS (key from IMS stores). Arrangements will be made by IMS stores to send it *via* a licensed waste contractor for incineration.
- b) Extremely dilute buffers (typically <0.5 micrograms per ml) can be poured down the drain IF they are then followed by large amounts of water.
- c) More concentrated solutions (*e.g.* 10 mg/ml stock solutions) must either be incinerated or treated to make safe before disposal to drain. Small bottles of stock solutions can be placed with gels in "cytotoxic waste" bins and sent for incineration. Treating solutions involves passing through commercially available treatment columns (*e.g.* Merck 43721 2Y) or mixing with activated charcoal and filtering off the charcoal.

### **Formaldehyde disposal**

All solutions containing formaldehyde or glutaraldehyde should be disposed of as chemical waste and not disposed to drain.

### **Hydroquinone in photographic developers**

There is a maximum exposure limit to hydroquinone that must be observed (see manufacturer's instructions), and ventilation must be adequate for photographic dark rooms.

### **Mercury**

Any remaining mercury-containing thermometers must be replaced with either digital thermometers or ones filled with non-toxic coloured spirit. Mercury containing bulbs (*e.g.* from fluorescent light sources) should be disposed of via the chemical waste store (email/phone Wendy Pickford (7460) for details). Mercury vapour is a cumulative poison: mercury should never stand exposed in the laboratory. Do not allow mercury to run down a drain. Any spillage should be cleaned up immediately using mercury collectors, obtained from either an IMS Safety Coordinator or Jencons PLS. Any mercury not able to be cleaned up in this way should be sprinkled with zinc dust, available in the balance room in the Polwarth Building, to form an amalgam, and then swept up.

### **Perchloric Acid**

There is a long history of accidents involving perchloric acid. Most involve either its exceptional oxidising power or the inherent instability of its covalent compounds, which can form readily. Although commercial 70-72% acid is a very strong but non-oxidising acid, it becomes an extreme oxidant and powerful dehydrator at elevated temperatures (160°C) or when anhydrous/crystallised. Wooden benches, which have

been subject to occasional perchloric acid spills, have been known to explode on percussion. Consult with your Lab Safety Co-ordinator for safe storage instructions.

### **Phenol (burn treatment)**

For a small phenol splash on the skin the initial treatment should be rapid and copious irrigation with cold water for at least 10 minutes. Safety data sheets often suggest a special treatment for phenol contamination of the skin, such as polyethylene glycol in methylated spirits. For small splashes, very little extra is gained by subsequent treatment with polyethylene glycols. Since this corresponds to the most likely scenario in our laboratories it is not necessary to stock any specific treatment for phenol burns. The recommended initial treatment, as for all chemical contamination of the body, is rapid and copious irrigation with cold water. For nearly all chemicals this should continue for at least 10 minutes. For larger skin exposures, treat as above but seek medical advice immediately.

### **Silica gel**

Use silica gel without cobalt chloride.  $\text{CoCl}_2$  is now classified as a Category 2 carcinogen (see [P.8 Carcinogens](#)). Until recently, most self-indicating silica gels contained small amounts of cobalt chloride. Silica gel is now available with much less toxic indicators.

### **Strong acids**

Always add acid to water when diluting strong mineral acids. Mineral acids will burn skin. If splashed, immediately irrigate with cold water for 10 minutes. 'Do what you oughta, add the acid to the water'!

### **Strong alkalis**

Sodium, potassium or calcium hydroxide and ammonia cause burns and rapid damage, particularly to eyes. It is recommended those opening bottle should wear eye protection (goggles/face mask). Always open bottles of concentrated ammonia in a fume cupboard.

### **Violent reactions**

Some materials can react suddenly and violently with little or no warning. Some of these are listed below. A further list of incompatible reagents is given in [Appendix 2](#).

- Strong acids with strong bases
- Oxidising agents and metals/reducing agents/sulphuric acid/wood/paper
- Metal hydrides, *e.g.* sodium borohydride with water
- Nitric acid (concentrated) with alcohol
- Ammoniacal silver nitrate solution residues

## P.12 Compressed gases/gas cylinders

The main hazards associated with cylinders of compressed gas are:

- the explosive release of energy stored in a cylinder in event of an uncontrolled discharge (i.e., cylinders can become jet propelled);
- the mass of the cylinder (cylinders are tall, thin and heavy; they can inflict damage and injury if they fall on any part of the body); and
- the properties of the gas stored in the cylinder (e.g. flammable, asphyxiating, toxic, corrosive, oxidant/fire-enhancing).

To prevent harm, cylinders should be:

- stored correctly;
- moved correctly; and
- used correctly.

The handling, storage and transport of compressed gas cylinders should **only be undertaken by those with appropriate training**. Should you need to handle cylinders, then you should arrange to receive training from one of the trained staff or arrange to undertake training by contacting Lynne Lumsden (see Key Contacts list). A list of trained users can be found on the IMS safety website (<http://www.abdn.ac.uk/ims/safety/az.php>).

### Storage of cylinders

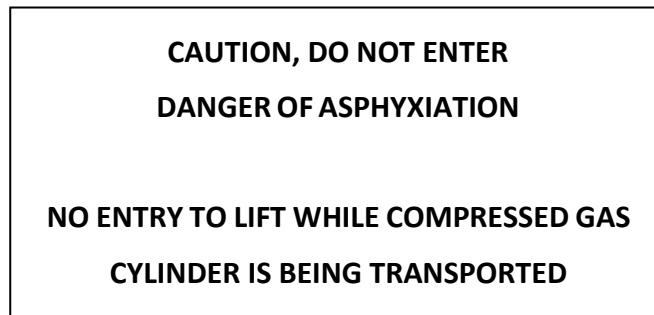
- All cylinders not in use (*i.e.* not connected to equipment) must be stored outside the building in the cylinder store cage behind the IMS building. Access to the store is controlled and it is kept locked. Keys are available from IMS stores.
- Only people who have been trained in cylinder handling should work with or move cylinders.
- Cylinders in the store must be correctly secured in a vertical position.
- Cylinders in the store are segregated according to industry guidelines (to limit the consequences of a leak of gas or fire)
- Stock is rotated so that oldest stock gets used first
- Nothing else is kept in the store except cylinders.

### Movement of cylinders

- Cylinders must be transported secured vertically in a cylinder trolley.
- Within the cylinder store/laboratory, cylinders should be “milk churned” (tilted slightly on base and rotated) into position. Cylinders must never be

rolled along the ground.

- The pressure regulator should be removed during transport, unless using a trolley specifically designed for the purpose.
- While moving cylinders from the store or within the laboratory, keep unsecured vertical cylinders under direct control. Never turn your back on a free-standing cylinder. The consequences of falling cylinders can be severe.
- Wear protective footwear and industrial gloves when handling gas cylinders
- In lifts, all cylinders must be secured but unaccompanied - full or empty.
  - A leak from a full/partially full cylinder can quickly make air in a liftcar unbreathable. If the lift stops between floors (quite common in the IMS), the consequences may quickly be fatal.
  - This also avoids injury from cylinders falling in transit, or confusion/misconceptions over procedures.
  - Use a goods lift wherever possible.
  - There is a system in place that prevents passengers entering during transit. A free-standing labelled sign (positioned outside the IMS goods lifts) or labelled wide tape must be placed *inside* the lift entrance to prevent anyone using the lift. The sign must be visible to people attempting to enter the lift. It should have the following content:



- In the IMS building, boards to indicate transport of cylinders are located near GOODS lifts and MUST be used.

### Use of cylinders

- All cylinders in a laboratory must be securely supported. Either, mount vertically on a stand or secured to the bench, or directly to the wall.
- Cylinders should be fitted with a regulator valve of the correct type (*e.g.* it is unsafe to fit a nitrogen regulator to an oxygen cylinder) and that is labelled to show it is within date. The cylinder key should be secured to the gauge/cylinder so it is always available for emergency cut off.
- Regulators must be replaced every five years (from date of manufacture) regardless of the amount of use received. Check any connected tubing at the same time and replace if damage/imperfections/stressed areas found.
- Do not use excessive force on valves and gauges. If a cylinder valve cannot be opened readily, it should be returned to the supplier.

- Never use oil or grease on any part of a valve or regulator. They can explode under pressure. Do not use PTFE tape on any part of a compressed gas system. If a gas tight seal cannot be obtained, change the fittings.
- Always open valves slowly; rapid opening may result in an explosion.
- Check your equipment regularly for leaks. Always use the proprietary liquids that are intended for detecting leaks. (Do not use soap and water. Some soaps contain fats that react violently with oxygen.)
- Always use a needle valve to control gas flow from the low-pressure side. Regulator valves are not intended for use with low flow rates and low back pressures. Needle valves can be obtained from "BOC" as FINE CONTROL VALVES, the thread depending on the gas to be controlled.
- All connections should be secure; a "jubilee" clip is ideal. A safety valve of some form is advisable to prevent high pressure being applied to your apparatus.
- After use, always shut off the gas at the cylinder valve, and release the pressure in the gauges before finally shutting all valves. Do not rely on the regulator to stop the gas flow for more than brief periods.
- Understand the hazardous properties of the compressed gases you are using (e.g. flammability, toxicity).



#### BRIEF SUMMARY

##### - SAFE GAS CYLINDER STORAGE & HANDLING

- Secure cylinders properly.
- Inspect for leaks and check brackets.
- Make sure it is safe to change regulators.
- Transport gas cylinders securely - they travel alone in lifts.
- Be sure you are trained in the safety rules for gas cylinder use, handling and storage.

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## P.13 Computer workstations

Using computer display screens and keyboards for prolonged periods can be a health hazard. Some workers may experience fatigue, eye strain, upper limb problems and backache from overuse or improper use of DSE.

The risks are controlled by applying ergonomic principles to the design, selection and installation of computer equipment, the design of the workplace and the organisation of the task. Consult IMS Safety Coordinators and the list of trained computer workstation assessors for advice.

### Computer workstation assessments

In the first instance, users should assess their own computer workstation at least every 2 years using [the online guide](#) provided by the University. Each assessment takes 10-20 min and is for your specific workstation. The DSE training and self-assessment are available online [BeOnline Health and Safety Training](#). If a user changes their workstation, a new assessment should be undertaken. If you find any issues with your workstation on completion of your online assessment a trained workstation adviser will be allocated by the Central team to complete a further assessment.

If there are any queries, please contact a trained School computer workstation assessor (contact Clerk to IMS Safety Committee in [Key Contacts list](#)).



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## P.14 Cryogenic fluids (liquid nitrogen) & dry ice/cardice (solid carbon dioxide)

The hazards arising from low temperature liquefied gases (cryogenic fluids) are:

- asphyxiation from oxygen deficient atmosphere (*e.g.* in poorly ventilated/confined spaces)
- fire – the surface of liquid nitrogen can be enriched for oxygen
- cold burns - brief contact with metals/surfaces at cryogenic temperatures can produce severe burns.
- over-pressurisation
- very low temperature effects on materials (*e.g.* becoming brittle).

To prevent cryogenic fluids becoming harmful, they must be stored, moved and used correctly. When dry ice is used for shipping samples, it is regarded as 'Miscellaneous Dangerous Goods' (UN1845, Class 9) and parcels should be packed and labelled accordingly. Contact IMS Reception, which co-ordinates parcel uplift, for packaging instructions.

### Storage of bulk stocks of cryogenic fluids

- 1) Bulk stocks of liquid nitrogen are contained in pressurised 2000L tank stored outside IMS room 1:39.
- 2) In this area Wendy Pickford (IMS technical Resources Officer) is responsible for ensuring that:
  - The storage area is satisfactorily maintained
  - Necessary personal protective equipment (PPE) is available
  - Appropriate warning notices are posted
  - Equipment used for storage is suitable for the purpose and is maintained in a good condition.
- 3) IMS room 1:39 has an oxygen-depletion monitoring system, with alarms both inside and outside the room. If you are in the room when the alarm sounds, leave immediately. If you are outside, do not enter the room. Do not silence the alarm. Look through the window for anyone in the room. If there is someone inside, do not enter – get help by either:
  - During office hours - contact staff trained with breathing apparatus who may be able to make a rescue (see section 10 Spillages).
  - Outside normal hours, contact security (ext. 3939) to call someone on the list for the 'IMS freezer room'. (NB: electricians and security staff are NOT trained to respond to the oxygen alarm).

(As a guide to how much nitrogen might cause serious oxygen depletion, 145 mL of

liquid nitrogen/m<sup>3</sup> will decrease oxygen content by 2% (air normally contains 20.9% oxygen). 18% oxygen is potentially dangerous, while 10% can produce permanent brain damage and death.)

## Transport of cryogenic fluids within lifts

Cryogenic fluids must never be in lifts with people. They must always travel unaccompanied. A lift cage is a confined space. If the lift became trapped between floors evaporation of even a small amount of the fluid can cause the air to become unbreathable. In a lift, a 1-litre flask of nitrogen can displace enough air to cause asphyxia.

In the IMS building, boards to indicate transport of liquid nitrogen are located near the goods lift and these must be used. Otherwise, place wide tape across the *inside* of the entrance to the lift to prevent anyone entering the lift. A labelled sign (available from an IMS Safety Coordinator) must be placed on the tape and visible to

<b>CAUTION, DO NOT ENTER:</b> DANGER OF ASPHYXIATION	
NO ENTRY TO LIFT WHILE CRYOGENIC FLUIDS ARE BEING TRANSPORTED	
Cylinder being moved from:	LEVEL.....<enter>...
	to: LEVEL.....<enter>...
DATE:.....<enter>.....	
TIME:.....<enter>.....	
Person moving cylinder:.....<enter>...	
Contact telephone number:.....<enter>.....	

people attempting to enter the lift. It should have the following content, and details concerning each journey should be written on the surface of the laminated card:

Even small Dewar flasks of nitrogen can be dangerous when carried, so they should be carried carefully and slowly especially when moving up or down stairs.

## Use of cryogenic fluids

- 1) No one should work with cryogenic fluids until they have been instructed and trained in the nature of the hazards and the precautions to be taken. The hazards associated with cryogenic fluids will not be readily apparent to someone who has not received appropriate training.
- 2) Eye protection (a full-face visor when dispensing cryogenic liquids) must be worn. Laboratory coats must be fastened properly. Watches and jewellery that could trap cryogenic fluid close to the skin should not be worn.

Gloves must be worn. When dispensing liquids, they should ideally be “Cryo-gloves” (gloves specially designed for low temperature work). Alternatively, use non- absorbent leather gloves with close-fitting cuffs but a fit that means they can easily be removed if fluid should splash into them. Gauntlet gloves with wide cuffs should not be used. The wide cuffs can funnel any spillage into the glove.

Those working with cryogenic fluids must be aware of the first aid treatment for

cold burns (copious irrigation with water at room temperature for at least 10 minutes, then seek medical/first aider attention).

- 4) Materials used in experiments involving cryogenic fluids must be chosen with care. The most significant considerations are brittle fracture and ensuring that material junctions are suitable for the temperatures that will be encountered.
- 5) Small, screw-capped vials stored in liquid nitrogen can explode or release nitrogen jets. Always wear gloves and eye protection when handling, and open the vial with lid pointing away from your body (see also [Removing cryovials from liquid nitrogen storage](#) below).
- 6) Cryogenic fluids should be dispensed only into vessels specially designed for use with that particular fluids. The vessels must have vented lids or, safety relief valves. The lid should be secured only by a securing method integral to the manufacturer's lid design and permits venting with the lid secured in place. Vessels should be clearly labelled showing the cryogenic fluid they contain. Eye protection must be worn, as Dewar vessels containing liquid nitrogen can suddenly shatter; this is most likely to happen when they are being filled or carried.
- 7) Excess, unrequired liquid nitrogen in a small flask should not be returned to bulk storage flasks. The flask should be placed in a fume cupboard overnight and the nitrogen allowed to evaporate.

### ***Removing cryovials from liquid nitrogen storage***

Wherever possible, cryovials should be stored in the vapour phase of a liquid nitrogen storage tank. Liquid nitrogen can enter the cryovial and, therefore, the vial can explode when removed from storage. Shards of shattered plastic can cause serious injury to the hand or face, as well as blood contamination with the contents.

If stored in liquid phase, consider sealing the individual vials in cryoflex tubing or equivalent which is designed to prevent penetration by liquid nitrogen.

Regardless, the following procedures should be adopted for removing vials from storage;

- Treat every vial as if it could explode. Always wear cryoprotective gloves, full face-shield and a fastened laboratory coat.
- Use forceps to handle the vials.
- Place the vial immediately inside a secondary containment (*e.g.* sandwich box + lid) to allow it to thaw. If the vial is going to explode, this usually occurs just after removal.

### **Use of dry ice (cardice, solid CO<sub>2</sub>)**

- 1) Solid carbon dioxide (CO<sub>2</sub>) presents two safety hazards – burns due to low temperature and danger from asphyxiation as the CO<sub>2</sub> escapes into the atmosphere. CO<sub>2</sub> release can be rapid when pellets are in contact with water. So, keep dry ice away from sinks and places where pellets may warm up rapidly.
- 2) Handle dry ice with cryogloves and store in polystyrene boxes with a lid.
- 3) For disposal, do not discard dry ice in sinks. Small quantities (e.g. in boxes ~30x30 cm) can be left to slowly evaporate through the polystyrene/lid. For disposal of larger quantities, contact IMS stores for advice, or offer to others in the IMS for use.
- 4) Packages transported in dry ice must be appropriately labelled. For air travel, DHL accepts only dry ice UN1845 packed according to packing instruction 904 of the IATA Dangerous Goods Regulations. They restrict carriage to various European states. For USA and other countries TNT are used as carriers.
  - The packaging must permit release of carbon dioxide gas and prevent build-up of pressure.
  - The packaging must be marked with:
    - shipper and consignee's name and address
    - UN 1845 Carbon Dioxide, solid
    - Net Quantity ..... Kg



- A class 9 label:
  - The airwaybill, in addition to the above details, must include the statement: “Dangerous Goods – Shippers Declaration not required”.
  - For the shipment of any infectious materials, an extra label (UN3373). Every package shipped must have prior approval of a trained person ([Saf-T-Pak trained staff](#)). The packaging must be of the required standard and checked, by a person trained for these procedures. “Infectious materials” include not only microorganisms in Hazard Group 2, but also materials such as unscreened blood (where infection risk is uncertain). A list of trained Saf-T-Pak persons can be found on the [website \(https://www.abdn.ac.uk/ims/safety/index.php\)](https://www.abdn.ac.uk/ims/safety/index.php).
- 5) Larger quantities of dry ice (e.g. bags from BOC) must be stored in appropriate containers, not left open on floors.

## Use of ultra-low temperature freezers

- 1) Skin burns can occur from touching metal surfaces within  $-70/80^{\circ}\text{C}$  freezers. Gloves should be worn when using such freezers.
- 2) Compressed  $\text{CO}_2$  cylinders are attached as back-up measures for  $-70/80^{\circ}\text{C}$  freezers in the IMS. Procedures for handling compressed gases must be followed when installing or replacing such cylinders (see [P.12 Compressed gases/gas cylinders](#)).
- 3) Contact names and telephone numbers must be attached to the door of  $-70/80^{\circ}\text{C}$  in case the alarm triggers. If the alarm triggers during routine use, leave a note for others, indicating you are aware the alarm is ringing and it should reach temperature soon. Write the freezer temperature, time and date. Return to the freezer later to ensure the preset temperature is reached and the alarm is off, and then remove the warning notice.

**CAUTION**

**DO NOT USE THIS LIFT FOR PERSONNEL WHILE TRANSPORTING COMPRESSED GAS or LIQUID NITROGEN**

For additional assistance  
Contact any IMS Safety Advisor

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## P.15 Dangerous pathogens and toxins

As part of the Anti-Terrorism, Crime and Security Bill, 2002, the University is under a legal obligation to inform the Home Office of any holdings of a number dangerous pathogens (primarily Category 3 or 4) and toxins.

### **Dangerous viruses, *Rickettsiae* and bacteria:**

These are primarily Category 3 or 4 organisms and the full list is available from an IMS Safety Coordinator.

### **Dangerous toxins**

<i>Abrin</i>	<i>Saxitoxin</i>
<i>Botulinum toxins</i>	<i>Shiga and shiga-like toxins</i>
<i>Clostridium perfringens epsilon toxin</i>	<i>Staphylococcal enterotoxins</i>
<i>Clostridium perfringens enterotoxin</i>	<i>Tetrodotoxin</i>
<i>Conotoxin</i>	<i>Viscum Album Lectin 1 (Viscumin)</i>
<i>Modeccin toxin</i>	<i>Volkensin toxin</i>
<i>Ricin</i>	

Note that any reference to micro-organism or toxin also includes:

- genetic material containing any nucleic acid sequence associated with the pathogenicity of the micro-organism; and
- genetically modified organism containing any such sequence.
- subunits of the toxin

Se There are some exemptions to the requirement to notify the Home Office - the full list can be obtained from an IMS Safety Coordinator. An important exemption is that quantities of toxins not exceeding 5 milligrams within any single secure area of the premises need not be reported to the Home Office. Quantities of these toxins of less than 5 mg should be locked in the designated IMS fridge/freezer (see below) and/or locked room. Please note:

- A locked box within an unlocked fridge is NOT sufficient.
- *Botulinum* or *Clostridium perfringens* toxins are not subject to this exemption. **Any** quantities of these toxins must be reported to the Home Office *via* an IMS Safety Coordinator.

**Facilities for storing these toxins are available in the IMS. Any group who plans to use or store any of these listed toxins or pathogens must notify Lynne Lumsden,**

**Wendy Pickford or Denise Tosh, who will issue further advice.**



## P.16 Electrical equipment

The main hazards arising from the use of electrical equipment are:

- electric shock
- fire (from overheated conductors)
- explosion (from sparks in a flammable atmosphere).

To prevent electricity becoming a source of harm, electrical equipment should be:

- 1) installed correctly and be suitable for the application
- 2) used correctly
- 3) maintained in good condition.

### Selection and installation of electrical equipment

- 1) The electrical installation in the building up to and including the electrical sockets or other point of supply is the responsibility of the University's Estates Section. ONLY Estates electricians or their contractors can work on the electrical installation or attempt to carry out repairs.

Anyone who needs changes made to the installation or believes part of it may be faulty should contact Wendy Pickford, Denise Tosh or Lynne Lumsden who will arrange for Estates to carry out any necessary work.

- 2) Electrical equipment must be suitable for the area in which it will be used. Particular care is needed when selecting equipment for use in the following places:

- outdoors
- areas where there is water
- places where electrolytes or saline solutions are used
- cold rooms
- places of high humidity
- where flammable atmospheres might develop.

It is unlikely that "normal" electrical equipment will be suitable for any of these conditions. Anyone wanting to use electrical equipment in one of the above environments or any other hazardous environment should contact an IMS Safety Coordinator for advice on the selection and installation of suitable equipment.

- 3) Any new electrical equipment bought within the IMS should be marked with date of purchase but need not be PAT tested. Any equipment brought in that is not new should be PAT tested for electrical safety before being put into use. This includes equipment brought from home, or equipment received from other University locations. Contact Denise Tosh (7457) to obtain a PAT tester. All PAT testing must be reviewed every 2-3 years.
- 4) Only competent persons should fit three-pin plugs and other electrical connections. (If you are in any doubt as to whether you are a competent person, then you are not!). At the Foresterhill site, phone the fault desk (3333) for electrical repairs and plug fitting.

## Correct use of electrical equipment

- 1) Carry out a visual inspection of any electrical equipment before connecting it to the electrical supply. (Look for any obvious damage, frayed cables, exposed wires and damaged plugs)
- 2) If equipment is faulty, disconnect it from the mains supply and take steps to prevent use. Place a notice on the equipment AND the plug. Arrange to have the equipment repaired.
- 3) Always replace a blown fuse by a fuse of the correct rating. A 13 amp fuse will be too large for most IMS equipment. Fuses must be fitted in the live lead only. If the replacement fuse blows, the equipment should be regarded as faulty and not reconnected to the power supply until the fault has been repaired by a trained electrician.
- 4) Do not use multiway plug-in adapters with electrical equipment. They can lead to overloading of sockets. Power only one piece of equipment from each socket, or use a fused distribution board. If there are not enough sockets available, contact Wendy Pickford, Claire Walker, Lynne Lumsden or Denise Tosh to arrange to get some more installed.
- 5) Where water may be present, always provide additional protection by the use of an earth leakage circuit breaker (ELCB). They may already be installed as part of the electrical installation for the building - check. If they are not already fitted to the installation, portable ELCBs should be obtained from Estates.
- 6) If solutions or chemicals are spilled on or near equipment, switch off and disconnect the apparatus by removing the plug. Clean the apparatus immediately before attempting to use again.
- 7) High voltage power packs used in electrophoresis are potentially lethal and must have safety connectors. Older electrophoresis equipment must be protected by a cage/box designed to shut off power when the box is opened. Electrophoresis apparatus must be marked: "DANGER HIGH VOLTAGE - DO NOT TOUCH". Ensure all leads are tidy and not in a position where they might be caught.
- 8) Only attempt to repair electrical equipment if you are competent to do so. When carrying out repairs always disconnect the equipment from the supply by pulling out the plug. Take steps to prevent anyone plugging it in again while you are carrying out the repair.

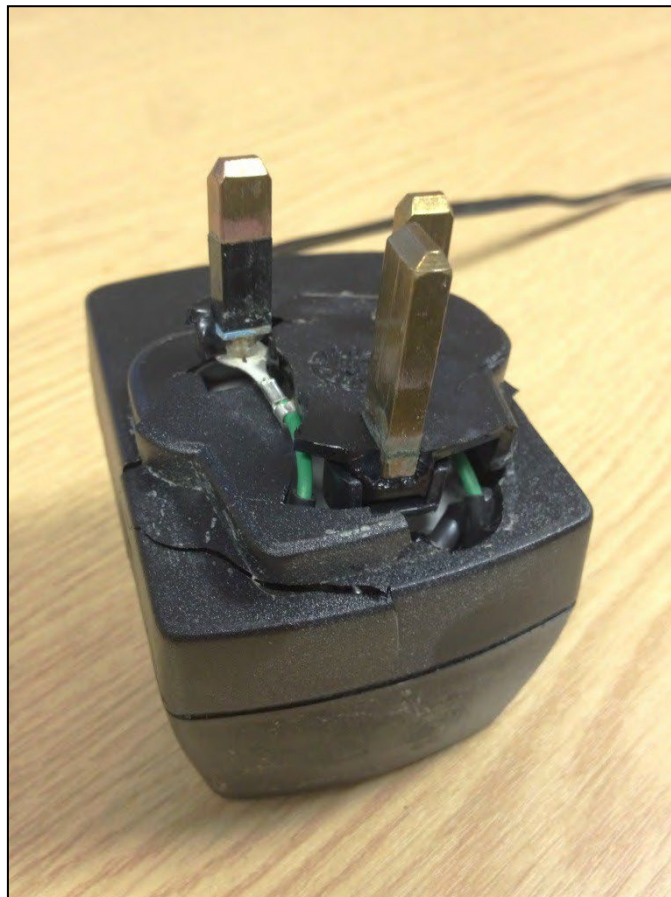
## Maintenance of electrical equipment

- 1) A co-ordinated programme for inspection and testing of major and common electrical equipment is arranged by (Wendy Pickford (7460), Denise Tosh (7457) or Lynne Lumsden (7503). Service of specialised equipment should be arranged by the PI.

2) Those responsible for inspections will:

- determine the frequency of inspections and tests for the different types of electrical equipment in the IMS.
- ensure that inspection and test is carried out at the specified intervals.
- ensure that equipment is marked to indicate that it has been inspected or tested; and
- maintain records of inspections and tests.

3) All small, potentially portable, equipment must be PAT tested regularly. The IMS has contracted this to the NHS, who will inspect all such equipment annually. Pls are responsible for reporting if any equipment is missed and ensuring PAT testing is done on small pieces of used/secondhand equipment entering labs and offices between inspections. Testing new equipment, direct from the supplier, is not essential and left to the Pls discretion. The IMS Safety Coordinators will provide advice on operating electrical PAT testing equipment and on the visual inspection of electrical equipment. PAT testers are available from Denise Tosh (7457) or Wendy Pickford (7460)



Testing includes visual inspection for damage to plugs and cables, as here.

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## P.17 First aid - emergencies

[Lists of first aiders](#) with contact details are posted in labs and corridors throughout the IMS and also on the safety web pages. A first aider may take several minutes to reach the scene of an accident or may not be available at the time of an accident. Therefore, the actions taken by others on the scene in the time immediately following an incident may significantly limit the extent of the injuries suffered by a casualty.

### Chemical contamination of the body

- 1) First, stop the chemical causing further damage to the body. Move the victim away from the spillage. Do not wait for medical help to arrive. Any delay could exacerbate the damage. Medical help is more important at a later stage, to repair any damage that has been caused.
- 2) Immediately apply large amounts of running water to the affected area for 10-15 minutes. This is what a first aider would do – so why wait? It is the standard initial treatment for all chemical contamination. It must be commenced immediately. Even a few minutes delay can greatly increase damage to the body's tissues.
- 3) Anyone assisting a casualty should protect themselves with rubber gloves *etc.* Then, quickly and carefully brush off any dry chemical. Remove contaminated clothing and jewellery.
- 4) After water irrigation for 10-15min, seek medical attention. Take the safety data sheet for the substance if the casualty is taken to hospital.
- 5) If chemical contamination of the eyes occurs, apply running water for 10-15 minutes. Use either eye wash fountains or flexible tubing fitted to a laboratory tap. Then, the casualty should always then be taken to hospital. (NB - Chemical contamination of the eyes should not occur if wearing appropriate eye protection, which is mandatory in all IMS labs).

Note: Running water is essential for treating chemical contamination of the eyes. Bottles of sterile water are inadequate, as they only have sufficient water for a few seconds of treatment. However, they are useful while the casualty is proceeding to a source of running water to continue the treatment when the bottle is empty.

- 6) Certain chemicals particularly require LARGE amounts of water.
  - Contamination with phenol – apply even **LARGER** amounts of water, as insufficient water may increase absorption of the chemical. Thus, bottled sterile water will be insufficient – although it can be used while moving to a larger source.
  - Contamination with chemicals that ignite with water - still apply LARGE amounts of water as rapid dilution will overcome this combustion risk. But be aware the casualty may panic.

## Burns

To minimise the effect of burns, speed is essential. Immediately apply cold running water for at least 10 minutes. This **dramatically** limits tissue damage. Only seek medical attention after running water has been applied for this period or send others to summon help during the 10 minute application. The same treatment applies to cold burns (e.g. liquid nitrogen).

## Electrocution

If a colleague is electrocuted, do not approach/touch the victim until the power is shut off. If this is not possible, pull the victim away using thick (not thin disposable) rubber gloves, a coat, a rope or some other non-conducting material to avoid becoming a victim yourself. Once the victim is isolated, if required, artificial respiration should be started at once. Send for an ambulance (9-999), stating it is electric shock with possible cardiac arrest.

## Fire

If a colleague's clothing is alight:

1. Get the victim to lay horizontal, so flames do not spread up the face.
2. Use a fire blanket to smother the flames.
3. Keep behind the blanket to avoid setting fire to yourself.
4. Wrap the blanket firmly around the affected area to completely smother the flames.
5. If required, send for an ambulance (9-999).

## First aid room

A first aid room, with a bed and sink, is located in the IMS (room 1:56) and Polwarth (0.004). This may be used for recovery after minor injuries.

## First aid boxes

First aid boxes are located in the corridors on laboratory floors of the IMS (levels 1, 2, 4 and 6) and Polwarth, and at strategic locations in other buildings.



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## P.18 Fume cupboards

Fume cupboards are intended to keep harmful substances away from the person operating the fume cupboard and other laboratory users. But the cupboard will only do this effectively if:

- it is used correctly; and
- it is maintained regularly.

### Use of a fume cupboard

- 1) Fume cupboards are for experimental work and not storage areas. Storage interferes with the airflow within the cupboard, increasing the likelihood harmful substances escape from the cupboard into the laboratory. Also, if there were to be an accident, chemicals stored in the cupboard would increase the risks.

*Do not undertake an experiment in a fume cupboard being used as a store.*

- 2) Set up equipment away from the front edge of the fume cupboard, to avoid turbulent air flow at the front of the cupboard. Generally, equipment should be at least 150mm behind the sash. "Eddies" in the air stream greatly increases the risk of harmful substances escaping into the laboratory.

*Of course, take care equipment is not too far back. It must not obstruct the extract slot at the back of the cupboard or require the operator to put their head in the fume cupboard to operate the equipment!*

- 3) Avoid unnecessary clutter. Large objects (safety screens, ovens, trays, etc) cause turbulence in the air being drawn into the cupboard. Turbulence can be minimised by raising large objects ~50 mm above the base of the cupboard with blocks.
- 4) Avoid rapid movements in near or within the fume cupboard. Sudden movement can disturb the airflow and allow harmful substances to escape.
- 5) Fume cupboards are NOT for work with micro-organisms. Use microbiological safety cabinets to work with hazardous micro-organisms.

### Maintenance of fume cupboards

The best designed and engineered installation cease to perform effectively if not maintained on a regular basis. It is a legal requirement that all fume cupboards are maintained and that their performance is measured at least every 14 months. Certificates of testing are attached to each fume cupboard.

- 1) Maintenance of the fume cupboards used in the IMS is undertaken by Estates. The Facilities Manager (Wendy Pickford, Lynne Lumsden, Denise Tosh) are responsible for ensuring that:
  - fume cupboards in the IMS are inspected and maintained
  - records are kept of inspection and maintenance. Certificates provided by maintenance contractors are recorded on each fume cupboard
  - face velocities are marked on the cupboards. (Face velocity is the speed at which air is drawn in through the front of the fume cupboard.)
  - any fume cupboard which is not inspected on schedule, or which fails its inspection is taken out of use and maintenance sought.
  
- 2) Regular inspections:
  - users will keep fume cupboards clear from clutter and, where necessary, carry out a thorough wash-down of the interior of the fume cupboard (including, if necessary, the area behind the baffle). This will be monitored during regular safety inspections.
  
- 3) Every 12 months contractors arranged by Estates will:
  - check the condition of services to the fume cupboard and the functioning of any alarms and controls;
  - carry out a face velocity test and record the face velocity and the date of measurement on a label on the outside of the fume cupboard;
  - carry out a detailed check on the condition of the fan;
  - check the stability and condition of the discharge stack;
  - check and clean duct work as necessary;
  - check that the make-up air into the laboratory is satisfactory; and
  - provide a certificate of inspection.

### **“Do not use” signs**

Where a fume cupboard is marked, “Do not use”, under no circumstances should the fume cupboard be turned on or anything placed in the fume cupboard. Maintenance of the fume extraction system is probably being undertaken and use of the cupboard will expose the maintenance worker to hazardous gases or fumes.

## P.19 Genetic modification work

Safe handling of GM organisms in the IMS **requires approval** for the use of all:

- genetically modified microorganisms;
- genetically modified animals;
- all wild-type microorganisms requiring work at containment level 2 or 3 (unless approval is already held for work using the genetically modified strain of the same microorganism).

Work involving genetic modification in the IMS must not commence until each project has been approved by the **Foresterhill Biological Safety Committee** (FBSC). The remit of the FBSC includes work with wild-type microorganisms that require containment level or above, in addition to GM microorganisms (GMMs).

For further information is at <http://www.abdn.ac.uk/ims/safety/biological-and-gm-safety.php>

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## P.20 Glassware

### Accidents.

Accidents with glassware are a common source of injury in the University.

Accidents with glassware can be very serious, therefore avoid using glassware if possible.

- 1) Check glassware is sound before use. Cracked or chipped glassware is dangerous and must be repaired or thrown away. If it is possible that it could be salvaged from the bin, carefully break the object into the bin to prevent reuse. Even scratches and star cracks can cause failure of glass in vacuum systems.
- 2) All glass must be properly supported. It is bad practice to clamp vessels of more than 500 ml by the neck alone.
- 3) NEVER pick up Winchesters by the neck, as the weight of the contents can be enough to shatter the bottle.
- 4) When carrying glass objects, take care not to harm yourself or any other person. Always carry glass tubes vertically. Never carry glass objects in your pockets.
- 5) Always protect your hands with a cloth when cutting glass tube, or when inserting glass objects through bungs. A cork borer is a valuable aid to inserting glass through a bung. A lubricant such as glycerol or industrial alcohol will also help.
- 6) Take care when fitting pipettes into pipetting devices. The pipette should be grasped near the top and pressed gently but firmly into the device with a twisting motion and avoid leverage. Pipettes should be removed in a similar way.
- 7) Take care when putting flexible tubes, *e.g.* rubber or PVC tube on to glass objects. When removing flexible tubes from glass do not struggle with the stuck one, cut it off, flexible tube is not expensive.
- 8) Fire polish the ends of glass tubes to remove dangerous sharp edges.
- 9) Never store glass on the floor, to avoid kick-damage.
- 10) For glass used for vacuum and low positive pressures, to prevent bursting or collapse provide a protective screen or cage, or tape the apparatus with self-adhesive tape. 'Clingfilm' is very useful in this respect. Never apply vacuum or pressure suddenly, as damage may result. Never use scratched, stained or damaged glassware. Always use the smallest suitable container, it is less likely to come to harm and with vacuum systems is easier to exhaust.
- 11) If heating glassware, apply the heat slowly and ensure that the glassware is vented to avoid a pressure developing. Even glass coming from a cold room to the laboratory can develop pressure sufficient to cause damage.
- 12) Broken glass must be cleaned up at once. Where eye protection (lab goggles/safety spectacles). Avoid walking on areas of broken glass. Take care not to cut yourself – never collect glass with bare hands/fingers. Handle larger fragments with forceps. Use a dustpan and brush for smaller glass fragments (every lab should have one). Use a piece of plasticine for collecting

the smallest slivers of glass – and dispose of carefully. Take particular care with broken glass in sinks: wet, broken glass is often invisible. If a liquid spill is involved in the accident, take care that the cleaning cloths do not collect broken glass. It is safest to dispose of all cloths used for clean-up.

- 13) Each laboratory must have access to a clearly labelled broken glass bin, clearly separated from any general waste bins. Biologically contaminated glassware must be thoroughly disinfected before disposal in the bin.
- 14) Disposal. Place glassware in cardboard boxes marked “broken glass”. Tape the box well and sufficiently strong to support the weight of broken glass. For the Polwarth building, place in the blue compacting skip behind the building. IMS staff should leave broken glass boxes in the cages within the rear entrance.

### IMS washing facility for glass and plasticware.

- 1) A dishwashing facility is available in room 1:21.
- 2) Glassware should be transported to/from washing up (level 1) using a trolley, via the goods lift.
- 3) Ensure that all glassware and plastics are clearly marked with lab number.
- 4) Items must have been disinfected, soaked in detergent and rinsed thoroughly before being taken to room 1:21. No corrosive or toxic residues must be left.
- 5) For information, the dishwasher powder is Neodisher GK and is alkaline. The neutraliser is Neodisher 2 and is acid.
- 6) The staff who operate the wash-up facility, must be told if there are any special instructions (such as no soap wash).
- 7) Ensure that no glassware taken for washup is broken. Check for cracks and chips and discard glassware unlikely to survive the washing process
- 8) Leave rinsed glassware and plastics in bins on sink area in 1:21. The washing can be collected from the tables in the centre of the room later that day. A piece of blue towel on top indicates that the glassware is clean.
- 9) Glass pipette washing, drying and sterilising services also operate. Pipettes must be disinfected and rinsed before taking to room 1:21 in an empty bucket.

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## P.21 Highly flammable liquids (HFLs)

Highly flammable liquids (HFLs) should be treated carefully so:

- They do not become a source of fire
- They do not fuel an existing fire.

A HFL is a liquid with a **flash point** below 32°C. The flash point is the lowest temperature at which the liquid emits vapour at a concentration to form a combustible mixture with air. The flash points of some laboratory solvents used in the IMS are:

ethanol	+12°C
methanol	+11°C
acetone	- 19°C
diethyl ether	- 45°C

As the flash points of all these liquids are below room temperature, they always constitute a major fire and explosion hazard. Acetone & diethylether have flash points below the temperatures of a refrigerator or freezer and therefore constitute explosion hazards even when in cold storage.

### Bulk stocks

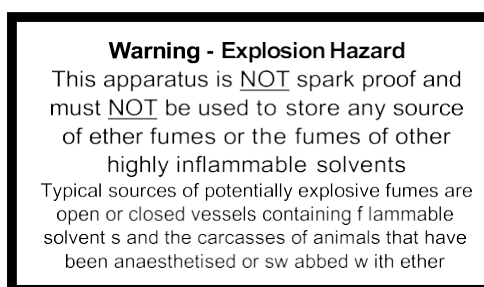
- 1) Bulk stocks (>50 litres) of HFLs must be kept in the solvent store maintained by IMS stores and located outside the back entrance to the IMS building (see also, 'Laboratory Stocks', below).
- 2) Entry to any such store is restricted to keyholders.
- 4) Bottles of HFLs will only be issued at IMS stores to people with sealed bottle carriers capable of containing the contents of the bottle in event of spillage. The bottle carriers must be used to transport the HFLs to the laboratory.
- 5) Bottles to be filled at IMS Stores must have previous labels completely removed, a clear new label and the appropriate hazard warning symbol.

### Laboratory stocks

- 1) The total volume of HFLs in any laboratory or room in the IMS must be kept as low as possible and under no circumstances must it exceed 50 litres. 50-litres is set by legislation.
- 2) All HFLs in a laboratory must be stored in specially designed and approved fire-resisting cabinets. Ordinary metal storage cabinets are not acceptable. Cabinets should be located away from exits from the laboratory. Cabinets must be conspicuously marked with approved labels indicating they contain HFLs. Cabinets should be used only for solvents, never oxidants, acids, alkalis or other materials that could react with the solvents or corrode the cabinets. HFLs should not be stored on the open bench or in fume cupboards.
- 3) Bottles of HFLs temporarily removed from their storage cabinets should not be left on the open bench in direct sunlight.

## Refrigerator storage

- 1) HFLs stored at below room temperature must use a special refrigerator / freezer. It must be spark proofed and protected against an explosion. Even a very small amount of HFL in an ordinary refrigerator or freezer can create an explosive atmosphere that can then be ignited by a very low energy spark (e.g. from a thermostat). The consequences can be devastating. It is very likely that the resulting explosion will, at the very least, completely destroy the laboratory containing the refrigerator or freezer. Even in a protected refrigerator, the HFLs must be kept in closed containers impervious to the solvent concerned. Many plastics are not suitable.
- 2) All refrigerators, freezers and cold rooms which are not spark-proof must be labelled with a sign indicating that they are not suitable for storage of any HFL (in either open or closed containers). Signs are available from IMS Stores. Even if the flash point of the liquid is above that of the working temperature inside the refrigerator, storage is still not permitted. If the cooling system were to fail, the temperature could rise above the flash point and an explosive atmosphere could result.



## Empty bottles

Empty bottles that once contained HFLs should be handled and stored as carefully as full bottles as they may contain explosive vapours.

## Working with Highly Flammable Liquids

- 1) Those working with HFLs must be aware of the flash points of the liquids and must take care to exclude ignition sources from the work area. The risk assessment for the work must address how this will be done.
- 2) In deciding what might be a possible source of ignition, note must be taken of the **autoignition temperature** of the HFL. The autoignition temperature is the minimum temperature to initiate combustion. It is not only sparks and naked flames that can be a source of ignition. If the vapour of the HFL comes into contact with a surface at a temperature in excess of the autoignition temperature, the vapour can ignite (e.g. the autoignition temperatures of diethyl ether is 160 °C).

## P.22 Lasers

There is serious risk of retinal damage from laser light, even from reflected beams. Lasers are classified according to their power output. Class I lasers are not powerful enough to harm the eye. Wherever possible the beam should be enclosed. In the IMS, they are used as pointers and in flow cytometry and confocal microscopy. The full list of equipment containing lasers in the IMS is outlined in the Laser Safety Local Rules (an up-to-date copy can be found in each room that contains laser equipment). For any other use of lasers, you should first consult with the IMS Laser Protection Supervisor Dr Debbie Wilkinson (ext. 7422) or the University Laser Protection Adviser, Dr Stephen McCallum (Tel: 76-53109).

### 1) Laser pointers

The University guidance on the purchase of laser pointers can be found at <https://www.abdn.ac.uk/staffnet/working-here/resources-5988.php#radiation>. Any laser pointer purchased should be either Class I or Class II. The human aversion response of the eye should ensure that such lasers do not damage the eye unless viewed through a focusing system. Some people, however, may not respond as rapidly as anticipated or may choose to over-ride their natural blink response.

- Pointers must never be aimed directly at anyone
- Never look directly at a pointer to see if it is working
- If it fails to switch off, place pointer in a light-tight enclosure and the incident brought to the attention of an IMS Safety Coordinator
- Anyone with queries should contact Dr Steve McCallum, Tel: 76-53109.

### 2) Equipment with lasers (Microscopy/Flow Cytometry)

Purchase of equipment containing lasers must be notified to the IMS Laser Protection Supervisor (Dr Debbie Wilkinson ext. 7422). The equipment with lasers in the IMS do not pose a risk to users when operated normally. There must be adequate ventilation for cooling of the laser head. Users should check that fans are operating. The systems have been configured by the suppliers to comply with safety regulations. Most of the lasers within the machines are class 3B (3mW to 200mW) but the machines have a number of safety interlocks which will protect the user from accidental exposure to the beam. Potentially lethal voltages can occur in the laser head and control box. Thus, no attempts should be made to open any of these. All users are expected to read the Laser Safety Local Rules which can be found in each room that contains laser equipment.

Any questions or concerns about the safety of equipment should be communicated to the Facility Managers (Dr Debbie Wilkinson ext. 7422 or Dr Andrea Holme ext. 7162) or the IMS Laser Protection Supervisor (Dr Debbie Wilkinson ext. 7422).

Although lasers have the potential to cause damage, most accidents involving lasers are caused by more conventional hazards. High voltage electricity can give rise to fire or explosion hazards and, under certain circumstances, can generate X-rays.

If you have, or believe you have, received an exposure to laser radiation in excess of permitted levels, then you must immediately follow the Emergency Plan that is outlined in the Laser Safety Local Rules in the laboratory. If an accident or incident has occurred, the laser or laser system should be switched off, isolated and remain undisturbed until the University Laser Protection Adviser (Dr Steve McCallum, Tel: 76-53109 ) undertakes a full investigation.



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## P.23 Lone working and out of hours working

**Lone working** is working without anyone else within calling distance that would be able to provide assistance. Lone working can occur during the day – *e.g.* during lunch hours, during holiday periods, *etc.* as well as at evenings and weekends. Only low risk laboratory work should be undertaken by lone workers and it is the responsibility of PIs to make sure that all members of their group are aware of this. Exactly what types of lab work that can and cannot be done by a lone worker must be established by the PI. The person within calling distance of a lab worker needs to be capable of providing assistance in an emergency. It is the risk of the laboratory task alone that must be assessed and not the competence or the experience of the lone worker. Risk assessments for the task to be undertaken should be carried out and reviewed regularly. Further guidance is provided in the University Lone working policy and guidance (issued 04 October 2016; [https://www.abdn.ac.uk/staffnet/documents/UA004\\_Lone\\_Working\\_Policy\\_2016.pdf](https://www.abdn.ac.uk/staffnet/documents/UA004_Lone_Working_Policy_2016.pdf)).

**Out of hours working** refers to work outside the normal working hours, times at which supervisory staff may not be available for advice or assistance. For the purpose of this procedure, we will use the following as normal hours: 8am to 6pm, Monday to Friday, except bank holidays. Less experienced workers may encounter difficulties when working out of hours and, without supervisory advice, they may push on with work and create a situation with unacceptable safety risks. PIs must review the training and competence of those undertaking particular tasks to decide whether they can be allowed to carry out such tasks out of hours. The procedure for lone working will also need to be applied if there is nobody within calling distance.

This procedure is designed to:

- Raise the awareness of the dangers of lone working
- Distinguish between lone working and out of hours working
- Inform staff of permissions required for lone working and out of hours working
- Provide guidance for out-of-hours working.

### **Lone working**

- 1) All laboratory workers must be informed of the additional hazards associated with lone working and of its distinction from out-of-hours working. Lone working can take place out of hours and also during the working day. Someone working in the evening might be a lone worker but, equally, might not be.
- 2) Only low risk laboratory work may be undertaken by lone workers and PIs should define what tasks may be undertaken by lone workers. It is the task that needs to be assessed and not the competence or experience of the lone worker. Experienced workers can have accidents too. Consider what could go wrong and whether the presence of someone else within calling distance could make a difference to the outcome; *e.g.* if there were a spillage of a chemical onto the lab worker, would someone else be able to help with the emergency response – likewise if there were a fire?
- 3) In most laboratories lone working should be the exception rather than usual practice.

- 4) Postgraduate and Honours students must be alerted by their supervisors to the situations in which lone working might arise during normal hours and out with normal hours.
- 5) Lone working by students should only be allowed only for low-risk tasks that have been authorised by supervisor/PI.
- 6) Laboratory workers should identify that other people are working within calling distance. They should continue to check on this situation throughout the day or night. If this is not the case, then they need to be aware that they are a lone worker. If not permitted to do the tasks as a lone worker, then they must find another person or cease their work until they are no longer a lone worker.
- 7) A person in calling distance needs to be able to assist in an emergency. A friend who is unfamiliar with laboratory work is unlikely to be suitable leaving you effectively as a lone worker.
- 8) Use of the [SafeZone app](#), enabling rapid contact to University Security, is strongly encouraged during Lone Working.

### **Out of hours working**

- 1) You must have explicit permission from your supervisor for out-of-hours working. The experience and competence of those undertaking the work is the key factor in deciding if they can carry out a particular task out of hours.
- 2) At the same time as giving permission for out of hours working, supervisors should indicate whether there must be someone else present within calling distance to avoid lone working.
- 3) If working out of hours, let your supervisor or someone else know when and where you are working; exchange your name and telephone contact number; phone or text to indicate when you leave. The use of the [SafeZone app](#) is recommended for both lone working and out-of-hours working.
- 4) Undergraduate students are not allowed to work out of hours unless supervised.

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## P.24 Manual handling

Injury resulting from manual handling is a common cause of lost time at work. Injury to the lower back, caused by a momentary lapse of good practice, may never recover fully and can be prone to relapse. It is not only injuries to the back which can result from manual handling operations. Cuts, bruising of hands and feet are injuries which can occur when manual handling is not done correctly.

- 1) Members of the IMS with supervisory responsibilities must ensure that people under their control are not expected to carry out manual handling operations which are likely to cause injuries.
- 2) Before attempting to lift anything, size up the job. Do not hesitate to seek help with heavy or awkwardly shaped loads. Always look at the possibility of moving the load in an easier way (*e.g.* by using a trolley or some other form of mechanical assistance).
- 3) In particular, care should be taken when office/laboratory moves are undertaken: hiring external contractors can avoid unnecessary injury.
- 4) Anyone with any doubts about their ability to lift or carry a particular item, should discuss it with their immediate supervisor. It will usually be possible to work out a different way to move the load.
- 5) The University has manual handling training courses for those whose jobs involve lifting and carrying. Those who may benefit should attend such courses.

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## P.25 Microbiological safety cabinets

### Types of microbiological safety cabinets

Health and Safety legislation requires a microbiological safety cabinet to be used of work at laboratory containment levels 2, 3 or 4 is likely to give rise to infectious aerosols. (Note: There are no facilities for containment level 4 in the University.)

There is a British Standard that defines three different types of safety cabinet. These are called Class I, Class II, and Class III. Note: **The class numbers do not have any relationship to containment level numbers** or to biological agent hazard group numbers. Take care not to confuse the two systems.

**Class I** microbiological safety cabinets are designed to provide operator protection by maintaining an inward flow of air past the operator and over the work surface inside the cabinet. As the incoming air is unfiltered, this type of cabinet does not provide product protection. There is a risk that airborne organisms in the working environment, for example, will contaminate cell cultures. Class 1 cabinets are generally suitable for work at laboratory containment levels 2 or 3.

**Class II** cabinets, on the other hand, offer protection to both the operator and the product. The inflow of air at the front of the cabinet, which is filtered before circulation within it, discourages emission of airborne particles generated by the work while the downflow of filtered air over the working surface protects the work. A Class II cabinet is potentially more susceptible to disruption of its airflow pattern than a Class I cabinet. If, however it can be shown that it achieves an operator protection factor equivalent to a Class I cabinet, it can be used at laboratory containment level 2, and under exceptional circumstances, at containment level 3.

**Class III** cabinets are totally enclosed units and can provide the maximum protection for the operator, the environment and the work. In this model, both incoming and outgoing air is filtered. Access to the interior of a Class III cabinet is gained by use of arm-length gloves attached to ports in the front panel of the unit. Use of Class III cabinets is generally confined to work with pathogens in Hazard Group 4 but this model may also be appropriate for other work where the equipment or procedures used may present a risk of vigorous aerosol generation.

**Important Note:** "Laminar flow" cabinets are designed only to provide product or sample protection and [provide no protection at all to the operator](#).

### Maintenance of microbiological safety cabinets

After installation, a microbiological safety cabinet will continue to meet the requirements of the relevant British Standard only if it is maintained in accordance with the standard. Maintenance tests should be carried out at least annually.

- 1) Wendy Pickford is responsible for ensuring that microbiological safety cabinets are inspected and maintained and that records are kept to show this. They will arrange for the microbiological safety cabinets to be inspected by a third-party contractor at least every 6 months. An IMS Safety Coordinator will ensure that any cabinet which is not inspected on schedule, or which fails inspection is taken out of use.
- 2) If the cabinet is used for work at laboratory containment levels 2 or 3, the inspection must include the measurement of operator protection factor at least every 12 months.
- 3) A certificate of inspection will be obtained from the contractor and held on file. The date of inspection and confirmation that the cabinet has passed inspection will be recorded on a label on the outside of the microbiological safety cabinet.

### **Fumigation of microbiological safety cabinets**

Microbiological safety cabinets used for work at containment level 2 or above must be fumigated before any servicing or maintenance work that requires access to the filters is carried out.

Contractors usually carry out Service and maintenance. The current servicing contractor, Clean Air Containment Services, must receive from the IMS a written declaration for each safety cabinet before beginning servicing or maintenance work. The declaration must state:

- **either** that the safety cabinet has been fumigated **or**
- that the cabinet has been used only for sample protection and not for the protection of the operator from potentially harmful biological agents **or**
- that the cabinet has been used for potentially harmful biological agents and any work that involves access to the filter must not be carried out until the cabinet has been fumigated.

The British Standard provides guidance on fumigation. A responsible person who has adequate knowledge of the procedure and the precautions to be followed should carry out fumigation of cabinets. A warning notice that the cabinet is being fumigated should be displayed.

Decontamination of the whole cabinet, including filters, fan unit and work surfaces can be achieved by fumigation with formaldehyde vapour. For cabinets that recirculate air to the room, the system of fumigation used must ensure that personnel are not exposed to levels of gases above the relevant occupational exposure limits. In the IMS, please consult Denise Tosh /Wendy Pickford or an IMS Safety Coordinator for advice on the fumigation of Category 2 Safety cabinets.

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## P.26 Microwave ovens

No food/drinks should be heated in laboratory ovens and no laboratory use should be made of ovens in kitchen areas. For accurate timing, only microwaves with digital timers are recommended. Rotational/twist timers have a high level of inaccuracy, leading to inadvertent over-heating and accidents

The main dangers of using microwave ovens are:

- Burns from superheated liquids
- Fire arising from thin pieces of metal (e.g. aluminium foil)
- Explosions from screw-capped bottles and eggs.

### Superheated liquids

Water does not always boil when heated above its normal boiling temperature (100 °C). Something must trigger the formation of steam bubbles, a process known as "nucleation." If there is no nucleation, there will be no boiling and therefore no effective limit to how hot the water can become. In a microwave oven, nucleation usually occurs at defects in the surfaces of cooking vessels. Since glass containers and laboratory vessels often have few or no such defects there is the possibility that the water will superheat, then boil over when touched. If superheated water escapes the vessel it can cause serious eye injuries or third-degree burns.

The risks can be minimised: by not overcooking liquids in the microwave oven; by allowing the liquid to cool before removing it from the oven; and by being cautious when you first disturb liquids/vessels that have been heated in a microwave oven.

To avoid burns from superheated liquids: keep the vessel away from your face and body until you are sure it is safe and never look over the top of the container. You can ensure that it is safe by deliberately nucleating the liquid. Holding the flask in a heat-resistant glove, and keeping it away from your face, gently swirl the liquid in the container. With large quantities of potentially superheated water (more than 1 cup, or 100 ml) do not try to nucleate boiling until you have waited for it to cool down.

Microwave ovens can heat material so quickly that, even though the container cap may be loosened to accommodate expansion, the cap can seat upwards against the threads and the container can explode. Screwcaps should always be REMOVED from containers which are being microwaved. If there are concerns about preserving the sterility of the contents, the screwcaps may be replaced with soft foam plugs or similar which will work their way out gently under pressure.

### Metals in microwave ovens

Microwaves cause currents to flow in metals. With thin pieces (e.g. aluminium foil), the currents may heat the metal enough to cause a fire. Metallic decorations on fine porcelain can become hot enough to damage the porcelain. The currents flowing in the metal can also produce sparks, particularly at sharp points, and these sparks can cause fires. In general, smooth and thick metallic objects such as spoons are not a problem, but sharp or thin metallic objects such as pins, metal foils or metal twist-ties are.

## P.27 Needle-stick injuries (& other 'stick' injuries)

- 'Stick' injury refers to any penetrating injury. Although this commonly involves syringe needles, sharp glass and even biological tissues (insect stings) can cause 'stick injuries'.
- If the needle/object is clean and unused all that is necessary is to encourage bleeding of the wound.
- If the needle/object has been used and come into contact with potentially infectious or radioactive material, bleeding should be encouraged and medical attention sought at [Occupational Health](#) provided by Occupational Health & Wellbeing (OHWorks) ([www.ohworks.co.uk](http://www.ohworks.co.uk)– see [Key Contacts](#) list) or, outside normal working hours, at the Accident and Emergency Department at the Hospital.
- If the injury involves blood from another person, you should go to [Occupational Health](#) (provided by OHWorks, [www.ohworks.co.uk](http://www.ohworks.co.uk) - see [Key Contacts](#) list) immediately to have a blood sample tested and, where possible, a sample of blood from the source person should also be tested.
- If the injury involves toxic chemicals then, after immediate treatment, you should seek attention at Accident and Emergency. Take with you information regarding the toxic agents.
- A University [accident report form](#) should be completed within 48 hours by the line manager or a witness, and copies sent to the local safety coordinator.

### Precautions

The likelihood of needle-stick injury should be minimised by:

- prohibiting the re-sheathing of needles
- discarding needle and syringe as a complete unit (do not disassemble)
- discarding used sharps immediately into sharps container
- Immediate treatment following stick injury

involving exposure to blood:

- Gently squeeze wound to encourage blood flow out of the wound (do not suck area)
- Wash affected area with soap and water (do not scrub)
- Rinse mucous membranes (eyes/nose/mouth) with warm water (do not swallow water)

All laboratory workers working with human body fluids should receive appropriate immunisations. Supervisors should ensure that staff or students are aware of the risk and encourage vaccination. Vaccination for hepatitis B is strongly recommended for those working with unscreened blood and tissue. A minimum of 6 weeks should be

allowed prior to commencement of work and particular attention of this should be given to undergraduate honours projects. Vaccination for hepatitis A, polio, typhoid and tetanus is strongly recommended for those who will be coming into contact with human waste products and/or untreated water. Vaccination should be arranged through Occupational Health provided by OHWorks, [www.ohworks.co.uk](http://www.ohworks.co.uk).

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## P.28 Occupational Health

Occupational Health services are provided by Occupational Health & Wellbeing (OHWorks) [www.ohworks.co.uk](http://www.ohworks.co.uk) which is the designated provider of specialist advice and assistance to University staff regarding the effect of the working environment on their health and consequent ability to carry out their duties at work.

Appointments must be made through your HR partner and line manager for non-urgent issues. PG and UG students should contact Student Health Services (<https://www.know-who-to-turn-to.com/>)

Further details can be found at: [www.ohworks.co.uk](http://www.ohworks.co.uk)

Contact details: [aberdeenstaff@ohworks.co.uk](mailto:aberdeenstaff@ohworks.co.uk)  
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Location in Aberdeen will be notified on contact with  
OHWorks HQ. Tel: 01227 286 288 / [info@ohworks.co.uk](mailto:info@ohworks.co.uk)

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## P.29 Offices, libraries and corridors

The following practices should be instinctive to all staff and students in the IMS. It is important that everyone ensures that they follow these guidelines to make buildings a safer place to work in.

- 1) Machines:
  - only operate these according to the manufacturer's instructions
  - ask an experienced operator to show you how to use them
  - avoid getting long-hair/clothing caught in machines
  - do not remove panels or adjust electrical fittings
  - follow handling instructions provided by the manufacturer when handling photocopier and printer chemicals.
- 2) Lighting facilities and ventilation should be adequate to maintain a comfortable working environment.
- 3) Seating arrangements, keyboard positions and VDU location should be adapted to meet the needs of an individual office worker (see [P.13 Computer Workstations](#))
- 4) Electric leads should not trail over benches or floors such that they can cause an accident. Multiple adaptors should not be used: arrange for extra power sockets to be fitted through Estates.
- 5) All appliances should be switched off at night, except for items such as fridges and freezers. The control switch on the latter should be labelled with: 'NAME OF ITEM' and 'DO NOT SWITCH OFF'.
- 6) When carrying files/packages ensure that your vision is not obstructed. If so, use a trolley. This is especially important when carrying buckets with glassware.
- 7) Filing cabinets should allow only one drawer to open at a time. Also:
  - Ensure sufficient weight at the base so that the opening the top drawer does not cause the cabinet to fall over.
  - Do not leave drawers open as the corners can cause injury.
- 8) Do not stand on chairs or stools. Use a kick stool or a ladder. Try not to store things at great heights (*i.e.* over 2 metres).
- 9) Keep doorways clear of all items.
- 10) Do not obstruct corridors, doorways and staircases (either with people or objects).
- 11) Do not use fire appliances as doorstops.
- 12) Do not leave fire doors open.
- 13) Do not run in any area of the IMS.
- 14) Office and non-laboratory staff should be aware that laboratories are hazardous areas. Never touch bench surfaces, apparatus or chemicals in laboratory areas unless permitted by senior staff of the laboratory.



- 15) Lock doors and switch off lights at night, unless occupied.
- 16) Strip light bulbs that fail must be replaced by qualified electricians and the spent bulbs disposed of by Estates.
- 17) If chemical or other spills occur in corridors or stairways, ensure that others entering these areas are aware of increased danger and evacuate the area if necessary (see [section 11 - 'Spillages'](#)).
- 18) Kettles should be operated in "kitchen" areas with attention given to the condition of the cable, boiling the kettle dry and steam burns.
- 19) Mail: On receipt of any suspicious package or of a telephone bomb threat, the Estates section must be informed immediately, and they will assist in the implementation of an appropriate course of action (ext. 3939).



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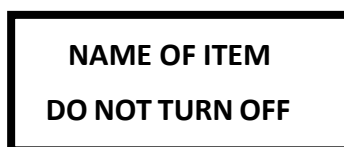
## P.30 Out of hours running of unattended experiments and equipment

### Equipment left running overnight and at weekends

For safe operation and to keep Security staff fully informed, the following procedure must be used for equipment running overnight (see also procedure [P.23 – Lone Working](#)).

#### a) Permanent equipment

The power and water supplies of fridges, freezers, ice makers and water stills should be clearly labelled with permanent labels next to the control switch saying:



#### b) Equipment not normally used out of hours

For example, centrifuges, fraction collectors, electrophoresis equipment. Before setting up an out of hours experiment, check any equipment that is to be left unattended for signs of damage. Cooling water systems need effective jubilee clips and sound tubing. Ensure that any waste lines for water are secured into the drain in case the pressure increases overnight.

The equipment must be labelled with a completed yellow running permit, available from an IMS Stores.

Persons responsible for the equipment must ensure that they are available to answer any emergency call during the period of the experiment.

Students must get permission from their supervisor before running any equipment unattended outside normal working hours. The supervisor should discuss with the student the following considerations before granting permission.

- Has the experiment been run attended for at least one hour under the exact conditions in which it will be run unattended?
- Are water connections secure so as to prevent flooding?
- What will happen if services such as cooling water, electricity or compressed air fail? Has the experiment been set up in a way that will prevent dangerous conditions developing following such a failure?
- Will the experiment present a danger to those who might come into the laboratory outside normal working hours (e.g. cleaning and security staff)?

## P.31 Personal protective equipment

### Eye Protection

- 1) **Eye protection should be worn for all laboratory procedures unless specifically exempted by risk assessment.** These offer protection from material (e.g. droplets, cryogenic fluids or solid fragments) entering the eyes. Eye protection could be safety specs, goggles or full-face visors, depending upon the level of risk and severity of the consequences. It is the Principal Investigator's responsibility to ensure there is appropriate eye protection for any procedure undertaken by their lab members. Safety glasses can be obtained from IMS stores.



- 2) Normal spectacles are not an effective or acceptable form of eye protection.
- 3) Where the risk of injury to the eyes or face skin is high, standard safety will be insufficient. Goggles or full-face visors will be required. Full face visors are essential when dispensing or handling cryogenic fluids. Droplets of caustic/heated solutions will easily and quickly cause facial scars. It is too late to reach for face protection when you have already been splashed.
- 4) UV-resistant visors must be used when viewing DNA gels with ultraviolet light (see [P.37](#) Ultraviolet Radiation)

### Ear Protection

- 1) Ear protection should be worn whenever using prolonged periods of ultrasonication. For most uses, containment within a fume cupboard usually provides sufficient protection.
- 2) When assessing the risk from sonication the protection of others in the laboratory area must also be considered.
- 3) Where extended periods of sonication are required, sonication equipment must be contained in an isolation box.

### Respiratory Protection

No procedures in the IMS require the use of respiratory protective equipment. Laboratory procedures and experimental work should normally be designed to keep airborne contaminants such as dust, toxic gases and fumes away from people. If someone needs to wear a facemask, they must ask themselves if it is also unsafe for everyone else in the same room.

Respiratory protective equipment may be required in an emergency (e.g. [Section 10 - 'Spillages'](#) or failure of normal controls).

### Lab coats/Protective coats

- 1) Laboratory coats are intended to collect small spillages and to protect the person

and their clothing. All lab coats used in the IMS must be Howie style (side-fastening) and always be worn fastened up in laboratory areas.

- 2) The contamination that accumulates on a lab coat should remain in the laboratory and not be transported around the building. **The lab coat should not be taken into libraries, write up areas or places for eating and drinking.** Staff should not cross the IMS atrium in lab coats or when carrying gels/biological samples. A failure to follow this very basic precaution can result in others in the building (as well as the wearer) being exposed to the contamination.

Note: Anyone who does not wear a lab coat in the laboratory will carry contaminants out of the laboratory on their clothing.

- 3) Laboratory coats fastened by press studs are much better than those fastened by buttons as the former can be removed much more quickly in event of a spillage on the coat.
- 4) If there is a likelihood of splashing liquids, a thick rubber or plastic apron should be worn over the normal lab coat.
- 5) Should those working with biological agents find their lab coat becomes contaminated with biological agents, the coat should be put in an autoclave bag and autoclaved.
- 6) When laboratory coats are to be laundered, all pockets must be checked, and their contents emptied before being sent to the laundry.

## Hand protection

Gloves are essential in laboratories and should be worn whenever there is a likelihood of the hand coming into contact with substances that could damage the skin or with toxic substances that could be absorbed through the skin (or through cuts and abrasions on the skin). Cuts and abrasions on hands should be sealed with plasters before donning gloves, in case the gloves split, or skin contamination occurs when removing gloves. As a general rule, nitrile or neoprene gloves are recommended, but check the list below and manufacturer guidance if uncertain.

Catalogues of gloves suitable for laboratory use contain a very large range of different gloves made of different materials. A large range is essential as materials used have differing resistances to the different types of chemicals used in the laboratory. Some chemicals will go through the material of some gloves almost immediately. It is vital to pick the correct glove to provide the right level of protection against the substances with which you are working.

A broad classification of the barrier effectiveness of the different materials from which chemically resistant gloves are made is given below. This is a guide only. Before using a glove to protect against a particular chemical it is essential to refer to the specification produced by the manufacturer of that glove. Many gloves will burn readily. It is preferable not to wear them near naked flames. If they must be worn, great care is needed to keep them clear of the flame.

When wearing gloves do not touch anything that someone else without gloves might touch (*e.g.* telephone, computer keyboard, door handle).

Know how to remove disposable gloves without touching their contaminated outer surfaces with your hands by turning the gloves inside out.

## **Do not use latex gloves (allergic reactions)**

Use hypoallergenic gloves, e.g. those issued by IMS stores. In the past, powdered latex gloves were commonly used in laboratories. Studies have now established that the use of cheap powdered latex gloves substantially increases the risk of the wearer developing an allergy to the latex proteins in the gloves. Once such an allergy develops, there is usually no cure. Symptoms can include inflammation of the skin and asthma. Therefore, IMS stores no longer issues latex gloves. Hypoallergenic alternatives (usually nitrile) are available instead.

Anyone who develops symptoms of glove allergy (or any skin problem which they feel might be work related) should be referred to the Occupational Health Service (provided by [OHWorks](#) 01227 286 288).

## **Hand protection handling ethidium bromide**

Blue **nitrile** gloves (not latex) must be used with ethidium bromide because they are more robust and less likely to develop pin holes.

Remember to follow proper procedures when using gel documentation rooms and ethidium bromide gels. Gloved hands that have handled ethidium bromide should not then be used to touch any instrumentation, computer mouse, light switch, door handle *etc.* When inside a gel doc room adopt either a "one handed approach" where one gloved hand manipulates the gel while the other, also gloved but **clean**, hand is used to touch the mouse, instrument, *etc.*, or use a "double gloved approach" where the gloves used to handle the gel are removed leaving clean gloves with which you can handle other things in the room. If using the double gloved approach, make sure you remove the second glove on leaving the room to ensure no possibility of contaminating doors in the corridor.

## P.32 Personal safety entering/leaving buildings

Staff and students should take precautions for their security and the security of University buildings that they work in, including:

- Parking your car in open well-lighted locations.
- Phone security (ext. 3939) if you have any suspicion about persons around buildings.
- Wear your identification badge and do not let anyone into a building if they do not have identification.

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## **P33 Power Failure – Action to be taken by building occupants**

Following a power failure in a University building, emergency lighting powered from batteries will switch on automatically. This should last for at least one hour. Its purpose is to illuminate exit routes from the building. It is not there to enable building occupants to remain in the building and continue working.

### **If there is a power failure during hours of darkness:**

Building occupants should immediately vacate the building;

### **If there is a power failure during daylight hours:**

- 1) Building occupants should immediately vacate any parts of the building which are not illuminated either by emergency lighting or by natural daylight;
- 2) If power is not restored within five minutes, building occupants should vacate
  - any parts of the building which are illuminated by emergency lighting only (*i.e.* where there is no illumination from natural daylight) and
  - any parts of the building where the exit routes are illuminated only with emergency lighting (*i.e.* corridors and stairwells without windows);
- 3) If they wish to do so, building occupants may remain in the parts of buildings which are illuminated by natural light and which are served by exit routes which are also illuminated by natural light.

Before leaving, building occupants should disconnect from the electricity supply any equipment which was in use prior to the power failure.

**Note:** Fire alarm systems are fitted with back up batteries which will enable the fire detection and alarm systems to continue to operate until at least the end of the working day.

## P34 Pregnancy & Expectant Mothers

### New and expectant mothers

Note that **all existing** risk assessments **should already record hazards** associated with substances or procedures that can cause harm to reproductive organs, or to the unborn child in the period immediately following conception, or that could be hazardous during pregnancy or breastfeeding.

Due to the hazardous nature of many of the chemicals in use in our labs it is prudent to assess the risks associated with all procedures at the earliest stage of pregnancy or ideally even before conception. While you do not have to inform the University that you are pregnant or breastfeeding, you are encouraged to let your supervisor or line manager and your co-workers know as early as possible so that steps can be taken to protect you and your child's health. Your supervisor or line manager will carry out a risk assessment with you so that any necessary changes can be made to your own, or your co-workers', work practice. If you prefer, you can meet your Human Resources Advisor (for students, a Student Support Officer) or a local Safety Coordinator. There is guidance available and a checklist of matters to be considered in HSE documents which you can find at the [University H&S web-site](https://www.abdn.ac.uk/staffnet/working-here/resources-5988.php#faq13) <https://www.abdn.ac.uk/staffnet/working-here/resources-5988.php#faq13> where a risk assessment form for new and expectant mothers can be found.

***'Please note, this is a generic form for staff and students across the whole University. In the PPE requirement section, for research laboratories, there is no expectation that labwork will stop simply because it requires PPE. PPE is a requirement for all work in research laboratories. Cessation of work by an expectant individual should only be expected if the new Risk Assessment indicates such work now poses an unacceptable risk (as perceived by either the supervisor/line manager or the expectant individual), even with enhanced provision of PPE or adapting procedures.'***

Due to the dynamic nature of pregnancy, the assessment should be reviewed on a regular basis.

### ***Facilities for resting, or expressing and storing milk when breastfeeding***

Facilities are available in the first aid rooms in the IMS (room 1:56) or Polwarth building (4.016). A lockable refrigerator can be placed in the first aid room for milk storage: please ask an IMS Technical Resource team member (see [Key Contacts](#) list).



## P35 Radioisotope use

The use of radioisotopes is strictly controlled. The rules governing this use and the procedures to be used are laid out in the Ionising Radiation Safety Arrangements and IMS Local Rules for Ionising Radiation (both at <https://www.abdn.ac.uk/safety/resources/radiation/ionising/>) and must be adhered to. They are overseen by the Radiation Protection Advisor, **Dr Stephen McCallum**, and the Radiation Protection Supervisors (Lead RPS for IMS is **Dr Isabel Crane**; other RPSs are Fiona Murray and Ian Fleming).

### Please be aware:

- Experiments involving radioactive materials must only be carried out by suitably trained staff/students that are approved and registered as radioisotope users. A member of staff or student wishing to undertake work with unsealed radioactive substances **must** first have completed the basic radiation safety course, available online at <https://www.abdn.ac.uk/ims/safety/radiation-protection.php>. Once the prospective user has confirmed that they have passed the online course and has had local lab training in the radioisotope procedures, they can apply for registration on the IsoStock system. Previous experience or training elsewhere is **not** sufficient. Once the prospective user has confirmation that they have passed the online course and has had local lab training in the radioisotope procedures, they can apply for registration – please contact the IMS Lead RPS.
- The principal investigator must ensure that all staff or students working on the experiment are proficient in basic laboratory techniques, and in the protocols required for the experiments with isotope, before they start manipulation of radioactive substances unsupervised. It is important that all staff involved in this work are suitably trained in carrying out contamination monitoring.
- Work with radioactive materials should only be carried out in designated areas. Room 6.38 (restricted access) is for storage and dispensing of radioisotope stocks.
- Access to radiation areas should be restricted to those who have been trained and are directly involved in the experiment. Only trained, registered workers may handle radioactive isotope.
- Principal Investigators are responsible for ensuring that all University and local rules regarding use of radioisotopes within their laboratories are adhered to.
- Experiments should be carefully planned and should only take place if no other equivalent experiment which does not involve radioactive substances exists. We are obliged by SEPA to ensure that any experiments that require the use of an isotope utilises the minimum quantity of radioactivity that will ensure a viable result. Consequently, ALL isotope users must have **written** evidence that they are complying with this requirement.

- The amount of a radioisotope that can be held in the IMS is limited. To place an order for an unsealed radioisotope, you must first register your request in IsoStock system. Users should limit the amounts of radioactive stock solutions kept within the IMS to that required in the immediate future. Stocks stored for several years, even those containing isotopes with long half-lives, are unlikely to retain any biological activity.
- Consideration should always be given to using the least hazardous radionuclide for example  $^{33}\text{P}$  should be used in preference to  $^{32}\text{P}$ .
- Contamination monitoring should take place **before** starting work and **after** the work is completed and for the wider lab area on a 2-weekly basis. Procedures for carrying out and recording contamination monitoring are explained in the IMS local rules for ionising radiation section 11, appendix 1. If significant contamination is found, then decontaminate following the advised procedure.
- All radioisotope users must ensure that storage, usage and disposal of radioisotopes is recorded promptly on the IsoStock system. In the case of disposal of radioisotopes to drain, this disposal should be entered on IsoStock system immediately **before** the disposal is made. This is to ensure that we do not exceed the monthly discharge limits as determined by SEPA.
- From time to time, it may be necessary to decommission labs or areas in labs no longer required for isotope work. When this is done it is vital that comprehensive monitoring is performed to ensure that all working surfaces, floors, equipment, drains and flow hood are free of radioactive contamination. A form must be completed to document these checks and is available from the lead RPS. You are advised to speak to Stephen McCallum and the lead RPS before commencing decommissioning of any lab in the IMS.

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## P.36 Refrigerators, freezers and cold rooms

- 1) Standard refrigerators and freezers are not equipped with spark-proofed equipment and must never be used to store highly flammable liquids. This applies even when these liquids are in small quantities and/or in sealed containers.
- 2) Warning signs must be posted on the door indicating whether a fridge/freezer or cold room is suitable for storage of highly flammable liquids. Signs are available from IMS Stores.

**Warning – Explosion hazard**

This apparatus is NOT spark proof and must NOT be used to store any source of either fumes or the fumes of other highly inflammable solvents

Typical sources of potentially explosive fumes are open or closed vessels containing flammable solvents and the carcasses of animals that have been anaesthetised or swabbed with ether

- 3) Before storing any material in a refrigerator, it must be clearly labelled with the owner's name, the contents, hazard information and the date on which it was stored. Labels must be firmly fixed so that they are not lost or obscured during storage. In the case of items that can become reactive at room temperature, precautions must be taken against interruption of the electricity supply.
- 4) Electrical equipment used in a cold room must be designed for that purpose. Equipment should be labelled clearly with the operator's name, lab number and telephone number.
- 5) Cardboard boxes for storage should be avoided- they get wet and harbour mould growth. Culture media should be stored in designated cold rooms.
- 6) Close the door of the cold room whenever you enter and exit; to avoid temperature fluctuations and condensation build up.

## P.37 Ultra-violet radiation

Ultra-violet (UV) radiation lies between the wavelengths 100-400 nm. The action of UV light on the eye is acute and the human eye cannot detect wavelengths below 380 nm. Conjunctivitis results 3-12 hours post exposure and lasts for several days. Skin damage and even burns can be caused by exposure. Suitable eye protection must always be worn whenever there is a possibility of direct exposure to UV radiation. Sunglasses and ordinary prescription glasses do not provide adequate protection for eyes. Protective clothing (*i.e.* laboratory coat) and gloves, which should be worn at all times, will protect from skin exposure.

In the IMS, UV lights are used in:

- visualisation of DNA gels. UV light boxes should be used in dark rooms in which the door can be locked to prevent others entering while UV radiation is being emitted. UV radiation can cause the production of ozone. Adequate ventilation of the dark room is necessary to ensure that exposure to toxic ozone is kept below the statutory exposure limit for the gas.
- microbiological safety cabinets. The UV light must always be turned off before starting work in these cabinets. If the UV light fails, do not try to replace it. Let a qualified service engineer or electrician replace the bulb. Release of mercury vapour upon stress destruction of high-pressure mercury vapour lamps poses an additional safety hazard. Spent light bulbs must be disposed of by contacting Wendy Pickford (ext. 7460; w.j.pickford@abdn.ac.uk ).
- spectrophotometers and fluorescent microscopes (HBO mercury bulbs). In most microscopes and spectrophotometers, the deuterium UV light source is shielded from emitting radiation from the equipment. The only real danger is if the power is turned on with the cover removed. In no cases must this be done. If a deuterium or any other bulb is to be replaced, the power must first be turned off and unplugged.

Warning signs must be used at every UV installation, including stickers on doors of laboratories housing the equipment.

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## **P.38 Vacuum systems**

- 1) The danger of implosion in a vacuum system depends on the absolute pressure difference between the inside and the outside of the system. This means that a water-pump vacuum is as dangerous as a high vacuum of similar dimensions and the same precautions must be taken.
- 2) Enhanced eye protection (goggles or safety visor) is mandatory when operating glass vacuum apparatus. Standard lab safety spectacles provided by IMS stores do not provide sufficient protection.
- 3) When assembling vacuum equipment, examine it for stresses and strains, both before and after filling. Use metal or plastic tubing wherever possible and include flexible couplings
- 4) Wide bore tubing, bulbs and items up to 1 litre capacity should be strapped with tape and sprayed with PVC. Larger items should be encased in solid, metal mesh cages.
- 5) Vacuum pumps must be serviced regularly.
- 6) Ensure that rubber bungs are large enough to avoid being sucked into an evacuated vessel.
- 7) Ensure that stopcocks are lubricated. Always operate stopcocks slowly, while supporting the barrel at the same time, and never try to force them open.

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## Appendix 1

### Incompatible chemicals with reactive hazards

A wide variety of chemicals react dangerously when mixed with certain other materials. Some of the more widely used incompatible chemicals likely to be used in the IMS are listed below, but the absence of a chemical from this list should not be taken to indicate that it is safe to mix or store it with any other chemical. Incompatible chemicals must be stored separately.

Substance	Incompatible substances
Alkali and alkaline earth metals together with magnesium, and powdered aluminium.	Carbon dioxide, carbon tetrachloride and other chlorinated hydrocarbons, waste.
Acetic acid	Chromic acid, nitric acid, ethylene, glycol, perchloric acid, peroxides and permanganates.
Acetone	Concentrated nitric and sulphuric acid mixtures. Chloroform + base.
Acetylene	Chlorine, bromine, fluorine, copper, silver and mercury.
Ammonia (anhydrous)	Mercury, chlorine, calcium hypochlorite, iodine, bromine, hydrogen fluoride.
Ammonium nitrate	Acetic acid, metal powders, flammable liquids, chlorates, nitrites, sulphur, finely divided organics or combustibles.
Azides	Acids.
Bromine	Ammonia, acetylene, butadiene, butane and other petroleum gases, sodium carbide, turpentine, benzene, and finely divided metals.
Calcium oxide	Water.
Carbon, activated	Calcium hypochlorite.
Chlorates	Ammonium salts, acids, metal powders, sulphur, finely divided organics or combustibles.
Chlorine	Ammonia, acetylene, butadiene, butane and other petroleum gases, hydrogen, sodium carbide, turpentine, benzene and finely divided metals.
Chlorine dioxide	Ammonia, methane, phosphine and hydrogen sulphide.
Chromic acid and chromium	Acetic acid, naphthalene, glycerol, trioxide turpentine, alcohol and other flammable liquids.

Copper	Acetylene, hydrogen peroxide.
Flammable liquids	Ammonium nitrate, chromic acid, sodium or hydrogen peroxide, nitric acid, halogens
Fluorine	Isolate from everything.
Hydrazine	Hydrogen peroxide, nitric acid, any other oxidant
Hydrocarbons	Fluorine, chlorine, bromine, chromic acid, peroxides, nitric acid.
Hydrocyanic acid	Nitric acid, alkalis
Hydrogen peroxide	Copper, chromium, iron, metals or their salts, any flammable liquid, combustible materials, aniline, nitromethane
Hydrofluoric acid, anhydrous	Ammonia (aqueous or anhydrous).
Hydrogen	Fluoride.
Hydrogen sulphide	Fuming nitric acid, oxidising gases.
Iodine	Ammonia (aqueous or anhydrous), acetylene
Mercury	Acetylene, fulminic acid (produced in nitric acid-ethanol mixtures), ammonia.
Nitric acid (concentrated)	Acetic acid, acetone, alcohol, aniline, chromic acid, hydrocyanic acid, hydrogen sulphide, nitratable substances.
Nitroparaffins (nitroalkanes)	Inorganic bases.
Oxygen	Oils, grease, hydrogen, flammable liquids, solids, or gases.
Oxalic acid	Silver, mercury.
Perchloric acid	Acetic anhydride, bismuth and its alloys, alcohol, paper, wood, grease, oils and many other organic materials.
Peroxides, organic	Acids (organic or mineral), many organic substances.
Potassium chlorate and potassium perchlorate	Acids
Potassium permanganate	Glycerol, ethylene glycol, benzaldehyde, sulphuric acid.
Silver	Acetylene, oxalic acid, tartaric acid, fulminic acid (produced in nitric acid-ethanol mixtures) and ammonium compounds.
Sodium	Carbon dioxide, carbon tetrachloride and other chlorinated hydrocarbons.

Sodium nitrite	Ammonium nitrate and other ammonium salts
Sodium peroxide	Any oxidisable substance ( <i>e.g.</i> ethanol, methanol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulphide, glycerol, ethylene glycol, ethyl acetate, methyl acetate and furfural).
Sulphuric acid	Chlorates, perchlorates and permanganates

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## Appendix 2

### Incompatible chemicals with toxic hazards

Substances in the left-hand column should be stored and handled so that they cannot accidentally contact corresponding substances in the centre column, because toxic materials (right hand column) would be produced.

<b>Substance</b>	<b>Incompatible substances</b>	<b>Toxic hazard</b>
Antimony	Reducing agent	Stibine
Arsenical materials	Any reducing agent	Arsine
Azides	Acids	Hydrazoic acid
Cyanides	Acids	Hydrogen cyanide
Hypochlorites	Acids	Chlorine or hypochlorous acid
Nitric acid	Copper, brass, any heavy metals	Nitrogen dioxide (nitrous fumes)
Nitrites	Acids	Nitrogen dioxide
Nitrates	Sulphuric acid	Nitrogen dioxide
Phosphorus	Caustic alkalis or reducing agents	Phosphine
Selenides	Reducing agents	Hydrogen selenide
Sulphides	Acids	Hydrogen sulphide
Tellurides	Reducing agents	Hydrogen telluride

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