

**UNIVERSITY  
of  
BIRMINGHAM**

**School  
of  
Biosciences**

**SAFETY  
HANDBOOK  
October 2012**

**For advice in an emergency**

**see page 12 for Fire,**

**page 13 for First Aid**

**page 16 for Security.**

**UNIVERSITY OF BIRMINGHAM**  
**School of Biosciences**  
**Safety Handbook**

It is the policy of the School of Biosciences to provide a safe working environment for its staff, students and visitors, in line with the University's Health and Safety Policy statement (UHSP/0/10). This safety handbook is issued annually to all members of the School who must read and understand its contents. It should be kept available for reference at all times and backed up by reference to the School Safety website ([www.biosciences-labs.bham.ac.uk/safety/](http://www.biosciences-labs.bham.ac.uk/safety/)) and the Health and Safety Unit's site ([www.hsu.bham.ac.uk](http://www.hsu.bham.ac.uk)).

Primary responsibility for safety at the laboratory bench or other workstation rests with the Safety Supervisor, who is the academic staff 'Principal Investigator' supervising research activities, or the manager in charge of teaching, support or administrative staff. If in need of information or in any doubt about safety issues, staff and students should initially consult their Safety Supervisor.

This handbook is set out in sections as follows:

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In addition, useful reference material is indicated in the body of the text and in various appendices attached or available on request from the College Safety Office. It is the responsibility of the Safety Supervisor to ensure that printed copies of all appropriate WWW references are made available to members of staff who do not have internet access.

Professor SJW Busby  
Head of School of Biosciences

## SECTION A INTRODUCTION AND POLICY

The School of Biosciences is part of the College of Life and Environmental Sciences. As such, changes at College level in health and safety management may at any time impact on the School and the contents of this handbook may thus require alteration. Any major amendments to the contents of this document will be notified by email and an updated electronic copy will be made available on the School safety web site ([www.biosciences-labs.bham.ac.uk/safety/](http://www.biosciences-labs.bham.ac.uk/safety/)).

The Head of School is responsible for ensuring that all safety procedures and regulations are observed and comply with University Policy.

The School Safety Coordinator and other safety coordinators with specialist expertise assist the Head of School in this task. .

Members of staff acting in a supervisory capacity have responsibilities which are outlined in the University policy document for work done under their supervision. Guidance is available here:

(<https://intranet.birmingham.ac.uk/hr/wellbeing/worksafe/management/hsmanagment.aspx>)

Responsibility for safety also rests with individuals, who at all times have a duty to keep themselves informed on safety procedures, conform to regulations, and carry out their work in a safe manner. **This responsibility of individuals for their actions is defined in law and places a legal duty of care on all in the workplace.**

### *Safety Policy*

1. **Rationale for a Safety Policy and its institutional context.** The School has an obligation to all who work within it, and to the wider public, to conduct its work in a safe manner and with regard to the environment. The School will fulfil these obligations by working within the regulations laid down by legislation and complying with University Health and Safety Policy. In fulfilment of these obligations the School aims to achieve a safety standard at least as high as that required by law and is committed to the following principles:
  - a) Recognition that management of health and safety is a management responsibility on an equal footing with other responsibilities - teaching and research.
  - b) Acknowledgement of the Head of School as holder of prime responsibility for Health and Safety, with day-to-day management being delegated to the Safety Coordinator, College Technical Services and Facility Manager and committee.
  - c) Recognition that the School will comply with its common law and statutory obligations in relation to Health and Safety.

- d) A commitment to avoid, as far as reasonably practicable, accidents or personal injury to employees, students and visitors and to maintain a safe place of work.
- e) To remind all employees that they have obligations under the law to act responsibly and to cooperate with management in all matters of Health and Safety.
- f) A commitment to continuously monitor Health and Safety and to review policy in the light of significant changes.

## 2. Safety Organisation

Key personnel and their responsibilities are identified as follows

- a) The School Health and Safety coordinator is responsible to the Head of School for development of policy by liaison with Head of School and with the University Health and Safety Unit, and by chairing School Safety Committee to develop a consensus
- b) The College Technical Services and Facility Manager is also the College Safety Co-ordinator. This role is responsible for execution of Safety Policy by liaising with School management and liaising with staff at all levels as well as having responsibility for supervising the College Health and Safety Manager
- c) The College Health and Safety Manager is responsible for record keeping of safety matters, management of safety documentation including web facilities, and liaison with School staff and postgraduate students regarding safety documentation and policy implementation.
- d) The Buildings and facilities Co-ordinator is responsible for liaison with Estates on any safety issues arising with the fabric of the School and the Estates plant associated with the School. This includes the maintenance of safe access/egress to all working areas within the School and ensuring that cleanliness is maintained throughout via liaison with Estates and porters/cleaners. Note that PIs and managers are responsible for cleanliness of labs other than routine floor cleaning.
- e) PIs, managers and others in supervisory positions (referred to below as ‘Safety Supervisors’) are responsible for safety management of those physical areas of the School and staff and students under their supervision, as detailed below in point 3.

3. **Safety supervision.** University policy acknowledges that primary responsibility for safe working must lie with those responsible for the work which creates or entails risk. In line with this policy every location and every activity in the School is the primary responsibility at local level of an identified individual, the Safety Supervisor. Broadly these are:

- a) *Research:* Principle Investigators (PIs), i.e. members of staff responsible for direction of research activity. They are responsible for those laboratories and ancillary areas under their control as well as the activities of those in their groups, i.e. research staff, research students, project students and technical and support staff. Where facilities or space are shared with others there must be

agreement on division of responsibility so that the named supervisor is clearly designated.

- b) *Teaching*: Due to the multiplicity of academic staff involved in practical classes, managerial responsibility for safety in teaching laboratories must rest with the teaching laboratory technicians. They must however be informed by, and work in concert with, the teaching staff concerned. Teaching staff are therefore required to take, jointly with the teaching laboratory technical staff, the responsibility for safety of classes. Academic staff must provide adequate details of laboratory schedules, in advance of classes, for discussion of safety issues with the laboratory staff who will carry out risk assessments.
- c) *Support functions*: Safety in central services prep rooms, horticulture and animal facilities, workshops, stores, offices etc. and computer clusters is the responsibility of their respective supervisors working with their managers where necessary. The College Technical Services Manager is responsible for communal space (stairs, corridors, lifts etc), buildings, and associated matters such as security.

4. **Role of the individual.** Legislation requires that every individual in the workplace must exercise care for the safety of himself or herself as well as others. Individuals must therefore be properly informed of safe working practices and the management of safety, and if necessary given appropriate training, before they are permitted to work in the School. It is the responsibility of supervisors to ensure that instruction in safe working is given to all newcomers under their supervision. However the individual must also in law accept personal responsibility to comply with health and safety regulations and requirements, and must cooperate with staff that have specific health and safety responsibilities.
5. **Provision of expert support for management.** The School is fortunate in this regard, having members of staff competent to act as its own safety consultants. Such specialist advisors on the Safety Committee cover issues of biological, chemical, radiation, environmental and mechanical/electrical relevance. Specialist advice is also available from HSU.

#### 6. **Specific responsibilities of individuals**

Listed below are the **specific responsibilities** of individuals at each level in the implementation of safety policy.

- a) Submission of risk assessments: Safety Supervisors (PIs, managers) with advice from and submission via the College Safety Office. Preparation of risk assessments may be delegated to others including research staff, support staff and postgraduate students but Safety Supervisors remain responsible for their provision and suitability for purpose.
- b) Control of contractors: College Technical Services Manager, service managers who deal with maintenance contractors.
- c) Monitoring/review of H&S performance. This is primarily the responsibility of the Safety Coordinator via the work of the committee. Some monitoring is also carried out in specialist instances by the University Health and Safety Unit. Increasingly, monitoring of finance/safety management is also conducted by audit from the Finance Office.

- d) Arrangements for dealing with emergencies, fire, flood etc. are the responsibility of the College Technical Services Manager with the support of other management staff and Safety Supervisors.
- e) The College Health and Safety Manager is responsible for support in the preparation and secure keeping of documentation for efficient H&S management. Central records for COSHH, PAT testing etc. are key items in this regard. Management of the web site for access to and dissemination of information is another function of this role.

## 7. Committee structure

**Safety Committee.** The School Safety Committee is responsible for formulation of health and safety policy and its implementation in the School and reports to the College Health, Safety and Environment Committee, Head of School and School Committee. It is chaired by the Health and Safety Coordinator (M Wheatley) who acts in this respect on behalf of the Head of School. Its membership is: College Teaching Manager (Kay Wroe), College Health and Safety Manager (Simon Ward), Specialist Safety Coordinators for radiation (Eva Hyde), chemical safety (Helen Cooper), micro-biological safety (Charles Penn), GMO safety (Robin May), electrical and mechanical (Derek Green) and environmental matters (vacant). The Unite Trade Union representative on the Committee is RE Godfrey. The committee meets monthly.

## Systems and procedures for safety at work

Systems and procedures are legally required to put safety policy, as outlined in the policy statements above, into effect. Information on systems and procedures follows below:

1. Procedure for producing relevant risk assessments in accordance with The Management of Health and Safety at Work Regulations (1999) (R3), through appropriate risk assessments.
2. Procedure for maintenance of;
  - a) cleanliness
  - b) safe access/egress
  - c) safe place of work - monitoring and inspection arrangements including Internal/HSU/Finance Office audit.
  - d) equipment in safe condition - maintenance, statutory inspections, PAT testing etc.
3. Provision of;
  - a) Health and safety training including specific training for first-aiders and fire wardens.
  - b) Written instructions on safe systems of work: signed checklists and suitable supervision as necessary.
  - c) Suitable personal protective equipment (PPE)

- d) Written instructions for fire safety & fire prevention. This includes evacuation procedures etc. including for those with disabilities.
  - e) Written instructions on use of machinery, including guarding & emergency procedures (workshop – includes specific legislation)
  - f) Written instructions for the control of contractors & supervision of visitors.
  - g) Instructions concerning the handling of hazardous materials/substances
  - h) Health surveillance (e.g. on exposure to sensitizers)
4. Procedures for dealing with accidents - prevention, investigation, reporting.
  5. Procedures involving the use of display screen equipment
  6. Procedures for consultation with the workforce on H&S matters, including committees & safety reps.

#### **Detailed arrangements for provision of safety at work**

**Safety information.** A comprehensive but concise Safety Book applicable to the whole of the School is made available to all staff. It provides essential information about staff involved in safety management and procedures to be followed. This is also available on the School Safety web site ([www.biosciences-labs.bham.ac.uk/safety/](http://www.biosciences-labs.bham.ac.uk/safety/)). In addition all staff are encouraged wherever possible to make full use of web-based information sources maintained by the Health and Safety Unit, and arrangements are made for those without web access to receive updates by other means.

**Safety instruction.** Safety supervisors are responsible for ensuring that no-one (staff, students or visitors) is permitted to work in research laboratories or other hazardous environments until they have read the relevant safety literature, been instructed in safe practices in the procedures they will use, including awareness of fire prevention and procedures, and a completed proforma or check list to that effect has been signed.

**Accident and incident reporting.** Safety supervisors are responsible for ensuring that all accidents, incidents and relevant illnesses are reported (this is a legal requirement) **as soon as possible** to the College Safety Office. Reports will be considered by the Safety Coordinator and committee as appropriate and for onward reporting to the Health and Safety Unit and if necessary the HSE.

- All accidents, dangerous occurrences and near misses will be investigated within 24 hours by the area Safety Supervisor.
- The College Safety Office Manager will regularly analyse the accident statistics and issue a report to Safety Supervisors identifying trends and common causations.

**Planning and review; consultation.** A programme of annual health and safety review and formulation of an annual Safety Management Action Plan, adopting SMART principles, will be followed. Staff may raise safety issues under a regular agenda item at School Committee meetings and are encouraged to contribute to development of safety policy, either locally with their supervisor or at School level. Trade union representatives are invited to participate in inspection teams.



**Safety Inspections: monitoring arrangements.** In line with the objectives of the annual Safety Management Action Plan, safety inspections will be held at regular intervals, when practicable every 6 months, to monitor health and safety performance. Inspection teams will consist of an independent peer group (normally an independent PI, technical staff and/or union representation, and appropriate expert advice from a member of the SC) for each area of the School. The inspections will be used as a basis for review of implementation of safety policy (see Planning and Review above) and identification of corrective measures where necessary.

### **Risk Assessments**

Safety supervisors will ensure that;

- All premises and activities subject to risk assessments are assessed in accordance with the relevant legislation.
- Such assessments will be repeated whenever any of the following factors occur:
  - Change in legislation
  - Change in control measures
  - Significant change in work carried out
  - Transfer to new technology
  - Change in level of risk due to personal factors e.g. pregnancy, nursing mothers.
- Assessments will be recorded and records maintained by the College H&S Manager.
- The results of all such assessments will be communicated to and be available for inspection by all employees.
- All assessments will identify necessary protective and preventative measures.

**Visitors** to any location may not be aware of the risks associated with the site. Therefore all visitors must be accompanied where necessary, i.e. in laboratories or other potentially hazardous locations, by the person(s) they are visiting, which in turn will be responsible for their safety. The safety of visitors must be included in risk assessments. See also page 16.

### **Training**

To comply with the general duty to provide such information, instruction, training and supervision as is necessary to ensure, so far as is reasonably practicable, the health, safety and welfare of employees (including students), health and safety training will be provided as follows;

- At induction
- Repeat training as appropriate
- On transfer to new duties

- On introduction of new technology
- On changes in systems of work
- When specific training needs are identified during risk assessments

Staff and Supervisors are expected to review safety training needs annually, as part of the review process, in light of information and courses available from the Health and Safety Unit.

All Safety supervisors will be involved in the implementation of health and safety training of staff for which they are responsible.

Records of all health and safety training will be maintained by the College H&S Manager.

**First Aiders** will be appointed by the School in accordance with the Health and Safety (First Aid) Regulations 1981. First aiders will be responsible:

- For the taking of prompt and appropriate action following any accident, whether to an employee or not.
- For the maintenance of the contents of their First Aid kits, ensuring that only specified items will be retained in the kits.

See page 13 for list of first aiders

## **SECTION B**

### **BASICS OF STAFF, STUDENT AND VISITOR SAFETY**

This section sets out some basic rules and information to ensure that the School of Biosciences can provide a safe working environment for everyone, both on these premises and on University business elsewhere. This guidance applies equally to Staff, Students and Visitors except where any special cases are indicated.

#### **Emergency procedure**

**Emergencies may arise for a variety of reasons. Accidents, building or equipment failure, fire or security problems are the most likely reasons. In all these situations you should alert the University Security's emergency control on 44444. They will then contact the appropriate services and personnel. Make sure you give clear information on the location, nature and severity of the incident.**

#### *Security*

**The School uses and maintains stocks of hazardous substances. It is therefore vital that all personnel are conscious of security and proactive in alerting School management or Security staff of any suspicious incidents. See also page 16.**

#### Access and egress

The building is open from 08:00 am to 18:30 pm Monday to Friday. Outside of these times, you will need your ID card programmed to enable access to the areas that you require. Inquire in the Finance Office (SG07) if you require your ID card to be programmed. **Out of hours, you must enter and leave the building only by the entrance into the Undercroft.** You SHOULD NOT under any circumstances allow others to enter the building with you after you have swiped open the door if they are not known to you or they do not have a valid ID card. It is VERY IMPORTANT that you sign in the book by the entrance to indicate that you and any accompanying visitors are in the building outside of normal working hours (06.00-18.30) and to sign out on leaving. If you are working in the building out of hours, you are asked to be particularly vigilant, especially before you leave, for any potentially unsafe operations or conditions such as unattended equipment left running, overheating of equipment etc. and to report any perceived problems to Security.

#### Accidents

All accidents (and 'incidents' e.g. illnesses that may be associated with the workplace or occurrences that might have lead to injury) must be reported **as soon as possible** to the College Health and Safety Manager (Tel: 46557). The University Health and Safety Unit (HSU) has to be notified and in certain cases accidents and incidents have by law to be reported by the University to the Health and Safety Executive. An accident report needs to be completed and the form is available from the School's website ([www.biosciences-labs.bham.ac.uk/safety/](http://www.biosciences-labs.bham.ac.uk/safety/)), the College Safety office or the

School's Finance Office. Manual handling and slips and falls are the most frequent causes of reportable accidents and the advice contained in Appendix 6 must be carefully considered.

### Allergies and other chronic conditions

Sufferers from allergies or chronic medical conditions that may be exacerbated by exposure to laboratory animals, chemicals or other materials used in the School must make these facts known to their supervisors. They should follow guidelines issued by the HSU and if necessary seek appropriate advice from the Occupational Health physician at the University Health Centre. The School issues a questionnaire from the Occupational Health Unit to all Staff and postgraduate students on known allergies and exposure to asthmagens in the workplace. Please complete and return this if applicable since it allows for appropriate monitoring to occur. All health information supplied is treated in confidence.

### Field work

The safety aspects of any fieldwork must be considered before any fieldwork commences and a risk assessment completed and lodged with the College Safety Office. Advice must be sought from the College H&S manager regarding the risk assessment as legal liabilities may be involved. Fieldwork in this context is defined as any practical work that is carried out by staff or students of the University for the purpose of teaching and/or research in places which are not under University control but where the University is responsible for the safety of its staff and students and those exposed to their activities. See further references at the end of this section.

### *Fire safety*

*You should familiarize yourself with your nearest fire alarm and fire exits.  
The action you should take if you encounter a fire is as follows:*

- *If the fire is a small one, tackle it with a fire extinguisher of the correct type*
- *If you have difficulty in extinguishing the fire – or if it is a large one – then SOUND THE FIRE ALARM. If fire is suspected in a closed room – do NOT open the door.*
- *Phone Security on 44444 and give details of the incident. The location of the nearest phone is shown on the card adjacent to the alarm.*
- *Leave the building – DO NOT USE THE LIFT – and proceed to the assembly point which is the pavement bordering University Road West nearest to the Haworth Chemistry building. Fire wardens will be on hand to guide you from the building.*

*From time to time it is necessary to test the fire alarms in the Biosciences Buildings. Only short intermittent ringing of the bells is required for testing. A long continuous ring must be treated as an alarm.*

*A list of current fire wardens is in Appendix 1 and will be updated regularly - consult the School website.*

## First Aid

If an accident results in injury to a member of staff or student, you should contact one of the trained first aid personnel who are listed below:

NAME	LOCATION	TELEPHONE NUMBER
Jared Smith	Tower 805	47877
Scott Hayward	Tower 402	47147
Carl Lloyd	2 <sup>nd</sup> floor Teaching	45428/45462
Mala Patel	Quad E204C	43301
Fay Hughes	Quad W104/Quad W204	45723/45585
Jackie Chappell	Quad W122	43257
Holly Etchell	Quad SG5	45891
Kate Studdard	Quad SG5	45924
Jason Gibson	Quad SG7	44900
<b>OUT OF HOURS FIRST AID DUTY SECURITY OFFICERS</b>	Control Office, Aston Webb	44444
<b>EMERGENCY AT ALL TIMES SECURITY CONTROL</b>	Control Office, Aston Webb	44444

*If the injury is severe then you should telephone 999 immediately and request an ambulance and then contact one of the first aid personnel. Outside of normal working hours when the first aid personnel are not available, telephone 44444.*

If medical treatment is required but an ambulance is not considered necessary the patient should be taken by taxi to either:

- (a) Queen Elizabeth Hospital, Mindelsohn Way, Edgbaston (627 2000)
- Or
- (b) For eye injuries – The City Hospital, Dudley Road (554 3801)

You are advised not to use your own vehicle for such purposes on insurance grounds.

## Laboratory safety for students

Before any set practical or project work can take place, a risk assessment must be performed by supervisors in order to identify hazards associated with work done under their supervision. In addition, supervisors must assess the level of supervision required for students undertaking practical work or projects particularly in the case of out-of-hours activities. Risk assessments for laboratory classes are kept by the Teaching Manager. For project students they are the responsibility of the Safety Supervisor of the lab concerned.

A COSHH assessment must be written for any procedure involving hazardous chemicals or micro-organisms that will be used in practicals or projects. It is the

responsibility of the supervisor to ensure that all users of the laboratory are aware of the requirements of these assessments and to ensure that they are available. COSHH assessments must be available for consultation in the laboratory at all times, with copies also being kept on file in the College Safety Office.

For project work, check lists of all hazards associated with the work must be produced before students (or new staff) commence work in research laboratories. The 'check list' itemises the procedures used in the laboratory or work area that the supervisor considers capable of causing harm to the user or other laboratory personnel if not performed correctly. The procedure will require either advice or practical guidance (by the supervisor or authorised colleague) before being carried out by a user new to the laboratory.

In practice, the supervisor lists all such activities that are performed in the laboratory and gives a copy to each new student. Appropriate instruction must be given for each procedure and checklists must be initialled and signed by all students before any of the procedures are carried out. Students must also sign to indicate that they have read and understood the risk assessments and the relevant sections of the School safety manual.

The updated list provides evidence to Safety Officers, University Safety Unit staff and HSE inspectors that the supervisor has carefully reviewed all hazardous activities that take place under his/ her supervision. At the same time the list clearly identifies for students and new staff those activities that must not be undertaken without prior advice or training.

One such list is shown below:

- Animal handling and post-mortem
- Autoclave
- Chemical hazards
- Compressed gases
- Egg-incubator
- Homogeniser
- Infectious organism handling
- Micro-organism handling
- Radioisotope work
- Shakers
- Animal house procedures
- Centrifuges
- UV source
- Disposal of waste materials
- Electrophoresis
- Human blood handling
- Liquid nitrogen storage
- Safety cabinets
- Ultrasonicator

Supplementary documentation on some of these activities is available on request from the College Safety Office.

### Out of hours activities

New procedures and/ or new equipment that are potentially dangerous must not be used alone outside normal working hours. When any hazardous activity has to be undertaken outside normal working hours, another person must be present in the same room or sufficiently near to be alerted in the case of an accident. Any equipment or laboratory procedure whose use involves a substantial risk of an accident which could result in personal injury should be regarded as being in this category. If in doubt, consult your supervisor or a School Safety Coordinator.

Equipment left running outside normal working hours **must be clearly identified with the name and the contact telephone number of the person responsible and with any associated hazard indicated** so that in the event of flood, fire or other emergency, security personnel or fire personnel can obtain essential information.

**Undergraduate students** must be supervised and may only work in laboratories during normal hours. Swipe-card access for undergraduate students out of hours will only be permitted in exceptional circumstances. If it is necessary for third-year undergraduates to work outside normal hours, the following must be observed:

- a) An application form, obtainable from the College Safety Office, must be completed in advance of the planned out of hours work and then taken, with a current identity card, to the School Manager for validation;
- b) When working in laboratories out of hours, students must be accompanied by their supervisor or other designated member of the **salaried** academic or research staff.

### Pregnancy

Women who are pregnant – or who have given birth within the last 6 months and are breastfeeding their babies – are owed a special duty of care. Some hazards in the workplace may present additional risks and it is the responsibility of the employer to address these issues. Pregnancy can be a very sensitive issue and some women may choose not to inform anyone of their pregnancy during the early stages. This has to be respected but once the appropriate manager or supervisor has been informed then action may need to be taken. For confidential advice on issues relating to pregnancy in the workplace please contact either Simon Ward (46557; [s.ward@bham.ac.uk](mailto:s.ward@bham.ac.uk)), Ken Jakeman (45538; [k.j.jakeman@bham.ac.uk](mailto:k.j.jakeman@bham.ac.uk)) or Occupational Health (48841; [occupationalhealth@contacts.bham.ac.uk](mailto:occupationalhealth@contacts.bham.ac.uk)).

### Protective clothing

Standard laboratory coats should be worn for all general laboratory or similar work. Standard laboratory coats must be worn for work with chemicals. High-necked coats with elasticated cuffs (“Howie” style) must be worn for all work with micro-organisms pathogenic for man or animals and level 2 GM work.

Requirements for other protective shields or clothing are indicated in sections dealing with particular hazards. Where a risk assessment indicates that personal protective clothing or protective equipment should be used, it is the responsibility of the supervisor to ensure that they are available and that they are used.

### Security

All staff must carry their ID card with them at all times and make it available for inspection by security and School staff if required.

If you encounter a “stranger” on the premises, you should ask them for ID. If your suspicions are aroused then you should contact Security immediately (Tel: 44444) and inform School management personnel e.g. Antony Jones. Security have sophisticated surveillance equipment available to track individuals on leaving a building and to help intercept if necessary. For your own safety never attempt to apprehend an intruder. Prompt reporting of any incident is the correct procedure.

### Smoking, eating and drinking

Smoking is not permitted anywhere in the building. Eating and drinking are not permitted in any laboratory or equipment room. The preparation and consumption of food and drink must be confined to common rooms or personal offices.

### Stress management

It is University and School policy that work should be managed in a manner that does not impose avoidable or unacceptable stress on individuals. Anyone who feels that they are subject to unnecessary stress should discuss this with their supervisors in the first instance. If problems cannot be resolved, they may raise them with senior management, the University Occupational Health Unit or the Staff Counselling Service (0121 878 2790)

### Training and instruction

No one may use machinery, apparatus or equipment or undertake any operations involving dangerous chemicals, carcinogenic substances, pathogenic micro-organisms or radio-isotopes unless they have received relevant training and instruction and a risk assessment of the activity has been made. It is the responsibility of supervisors and individuals to arrange or seek appropriate training where it is clear that it is required.

### Visitors

The School is responsible for the safety of casual visitors. Lay members of the public should not normally enter laboratories and risk areas, and children **must not** enter these areas. For insurance purposes, details of visitors who intend to work during their stay must be notified to the Head of School’s Secretary. A guidance document on dealing with visitors is available from the College Safety Office (email: s.ward@bham.ac.uk).



## Work Experience Placements

The School welcomes applications for work experience placements (normally of one week's duration) from school-age young persons. However, before a placement is offered the health, safety and welfare of such visitors must be considered carefully.

Young persons on work experience placements are deemed to be employees of the University and as such we have to ensure their health, safety and welfare. These arrangements may have to differ from those made for other employees due to their inexperience and lack of maturity. A special duty of care applies.

A young person is defined as a person **less than 18 years of age**. Additional and stringent requirements apply in respect of young persons **under 16** years of age, involving full individual risk assessments for every element of work to be undertaken and acceptance of those risks by parents/guardians. It is recommended that no one under the age of 16 is accepted for a placement in the School unless in exceptional circumstances. The College H&S manager should be consulted and informed of risk assessments made for work experience placements.

The University's Health & Safety guidance on Work Experience Placements can be found at:

<https://intranet.birmingham.ac.uk/hr/wellbeing/worksafe/topics/youngpersons.aspx>

The key to a safe and successful placement is advanced planning and good supervision. You should consider carefully if the environment in which you might consider placing a young person is safe for someone who is inexperienced and lacks maturity.

All requests for work experience placements should in the first instance be referred to Annette Evans, PA to the Head of School, who co-ordinates work experience placements in the School. In all cases, the young person will be invited for an informal interview with the member(s) of staff supervising the placement before any offer is made.

## Work Place design

Poor work station design can lead to significant musculature and joint problems. Guidance on work station design including a self assessment checklist to determine the suitability of your work station can be found at:

<https://intranet.birmingham.ac.uk/hr/wellbeing/worksafe/topics/workstations.aspx>

For all Policy and guidance documents visit the Health and Safety Units web site:

<https://intranet.birmingham.ac.uk/hr/wellbeing/worksafe/index.aspx>

## SECTION C BIOLOGICAL SAFETY

The School has two Biological Safety Coordinators, one for general biological safety (Professor Charles Penn, Tel. 46562, Email: [C.W.Penn@bham.ac.uk](mailto:C.W.Penn@bham.ac.uk)) and one for all genetic manipulation work (Robin May, tel. 45418, email: [r.c.may@bham.ac.uk](mailto:r.c.may@bham.ac.uk)), who should be consulted if necessary on relevant aspects of biological safety.

### Training

All users of biological materials should have attended appropriate courses run by the University Health and Safety Unit or, in the case of experienced personnel, if entering the School from elsewhere, provide evidence that they have attended relevant training elsewhere to carry out the work.

### **Use of ethanol when performing microbiological plate spreading – recommendations and safety controls to be implemented**

The use of ethanol for sterilizing purposes when spreading micro-organisms on agar plates is a well established technique. Unfortunately, the technique involves a high degree of risk since the ethanol is being used in the proximity of an ignition source (Bunsen burner).

Two incidents have occurred in the School recently where the ethanol has been ignited then spilt on the laboratory bench causing items nearby to catch fire. Ethanol burns with a clear flame and therefore it is not always immediately apparent that ignition has taken place. Fortunately, in both cases the fire was small enough to be extinguished quickly, but the potential for significant injury is high.

The School of Biosciences Health and Safety Committee has therefore issued the following advice and recommendations for people spreading agar plates:

**Avoid the use of ethanol by using disposable plastic spreaders or plastic spreaders that can be autoclaved and reused. This is the preferred option!** More information regarding purchasing and using plastic spreaders is available from Robin May or Kay Wroe.

If you do use ethanol then proceed as follows:

- Before starting to spread plates, check the work area and remove any combustible materials.
- If you are using a glass spreader, make sure it has been made from a solid glass rod and NOT a hollow rod or Pasteur pipette (which can explode when flamed)
- Check under the bench and remove any combustible materials that are stored immediately under the work area. In particular, make sure to relocate any waste bins that are close to the area, since these may contain large quantities of combustible material that is not immediately visible.

- Check that all other sources of ignition, apart from the Bunsen burner are removed from the work area.
- Dispense the minimum amount of ethanol for use in the procedure.
- Use a container for the ethanol that is not easily knocked-over. Some form of secondary containment should be used where practicable.
- Have a non-combustible 'lid' for the container handy such that if the solvent is ignited the 'lid' can be placed easily over the container to extinguish the flames.
- NEVER wear disposable gloves whilst spreading plates.
- Wherever possible, spread plates whilst standing, not seated. This will allow you to move away rapidly in the event of burning ethanol being knocked over.
- Position the Bunsen burner as far away from the ethanol container as possible and as far as possible away from shelves.
- Use as small a flame as is necessary for the procedure and **ALWAYS** reduce the air flow to the Bunsen (to give a visible yellow flame) when you have finished spreading a batch of plates.
- Extinguish the Bunsen burner as soon as possible after you have finished spreading plates completely. **NEVER LEAVE A LIT BUNSEN UNATTENDED!**
- Think about what you are doing and the risks involved and avoid being distracted.

### Use of animals

No experimental work with animals may be carried out without appropriate authorisation. Such work should be discussed with the Director of BMSU before work commences.

If the work involves vertebrates or some other named species then **it may not take place** without the authority of a Project Licence granted by the Home Office. In addition, all individuals wishing to carry out work under the authority of a project licence must attend the authorised course given by the staff of BMSU or an equivalent course and must have obtained a Personal Licence issued by the Home Office.

### COSHH regulations for biological agents

All work with potentially hazardous biological materials must be assessed with regard to the nature of the hazard they present and the risk that this might occur. Depending upon the nature of the material, approval must be obtained from one or more authorities **before** work can commence.

### Work with human cells and tissues (including blood)

Before work begins with human tissue or blood, permission must be sought from the School Safety Committee as such tissues are now covered by the Human Tissues Act. In practice, proposals should be submitted to Professor Penn, who would give approval after consultation with relevant colleagues. Recently derived cells should be regarded as a group 2 hazard and approval must be sought from the School Safety Committee and the relevant University Committee prior to commencing work with

such material. Appropriate arrangements must be made for obtaining blood from volunteers and advice must be sought from Professor Penn. Human and non-human primate cell lines may also contain pathogens or potentially oncogenic viruses but, in general, well established cell lines with no known infectious risk may be regarded as hazard group 1 (see below) and used under containment level 1 without prior approval.

#### Work with micro-organisms (MOs)

All micro-organisms are grouped into hazard groups 1 – 4 (Advisory Committee on Dangerous Pathogens, for further information consult the College H&S Manager) according to the hazard they might present to human health. Procedures of Good Microbiological Practice must be used for handling all micro-organisms, including those that have been genetically manipulated, and appropriate experience or training in these procedures must have been completed by those taking on such work. See Appendix 5 (page 46) for Good Microbiological Practice, waste disposal, use of disinfectants and dealing with spillages.

Work with hazard group 1 MOs may proceed without prior approval. Nevertheless, a hazard risk assessment must be performed on the appropriate University form (downloadable from the University Health and Safety website) and a record kept. Work with MOs in hazard groups 2 or above must be assessed as above and then approved by the School Safety Committee and by the relevant University Committee **prior** to work commencing.

Use of some Hazard Group 2 pathogens and all Hazard Group 3 agents must be notified to the HSE, while some animal and plant pathogens require a licence from DEFRA (see Annex III Part 1 of the University Health and safety Policy- Biological Safety)

#### Work with genetically modified organisms (GMOs)

This includes genetically modified micro-organisms (GMMs) as well as GMOs. As with MOs, all GMOs have to be assessed with regard to hazard and risk and assigned to 1 of 4 hazard groups, ACDP 1-4. This then determines the level of containment required to pursue the work. All work with GMOs must be approved in **advance** of work beginning. Following assessment on the appropriate University form (downloadable from the University Health and Safety website), the proposal must be submitted via the relevant School GMO Safety Coordinator (Robin May, [r.c.may@bham.ac.uk](mailto:r.c.may@bham.ac.uk)) to the School Genetic Modification Safety Committee for approval. National regulations on genetic modification are currently undergoing substantial revision and it is therefore advisable to liaise with the School GMO Safety Coordinator at an early stage when proposing work involving GMOs. Note that, under current legislation, work that is categorised as requiring containment level 2 or above must then be approved by the Health and Safety Executive (HSE) and will incur a cost.

#### Anti-terrorism, Crime and Security Act

A number of pathogens and toxins are currently notifiable to the Home Office prior to their acquisition and/or use in the laboratory. Storage arrangements are subject to

inspection by inspectors from the counter-terrorism unit. The list of pathogens and toxins currently notifiable to the Home Office can be found in Part 2 of Annex III of the University Health and Safety Policy- Biological Safety (see attached Schedule Five list).

#### Notifiable Diseases and Import of Non-Native Species

A number of diseases caused by bacteria, viruses and other pathogens are compulsorily notifiable to the Department for Environment Food and Rural affairs (Defra) by the Specified Diseases (Notification and Slaughter) Order 1992 (as amended) and the Specified Diseases (Notification) Order 1996 (as amended) to enact European Union Legislation. Work with such agents requires approval by, and the issue of a licence from, Defra. For a list of such pathogens see the Defra website (<http://www.defra.gov.uk/animal-diseases/notifiable/>). The import of non-native species including plant pests may also require a Defra licence. Proposal to work with such organisms should be discussed initially with Professor Penn.

For all Policy and guidance documents visit the Health and Safety Units web site:

<https://intranet.birmingham.ac.uk/hr/wellbeing/worksafe/index.aspx>

## SECTION D CHEMICAL SAFETY

The School's Chemical Safety Coordinator is Dr Helen J. Cooper (Tel. 47527, email [h.j.cooper@bham.ac.uk](mailto:h.j.cooper@bham.ac.uk)).

All staff, including postgraduate research students will be expected to attend the appropriate chemical safety training courses (details are given in the Graduate School Resource File) and will have access to safety information on the University Health and Safety web page. All undergraduate and taught MSc students must attend a course on Safety and Laboratory practice (details provided in introductory packs and included in timetables).

### Good chemical practice

All work should be to the standard of Good Chemical Practice (GChP). GChP sets the minimum standard for ensuring the protection of people against the adverse effects of chemical substances encountered at work. Details of where to find details of GChP are in the further references at the end of this section.

- Food, drink, cosmetics and cigarettes must not be taken into or used in the laboratory.
- Pipetting by mouth is prohibited.
- Laboratories and communal areas are designated as **NO SMOKING**.
- Benches should be cleaned and tidied regularly and surplus apparatus and chemicals returned to the stores or cupboards.
- Laboratory coats **MUST** be worn when working in the laboratory.
- Laboratory coats should be removed on leaving the laboratory area and **MUST NOT** be worn in coffee rooms, common rooms etc.
- As a minimum, safety spectacles or face visors must be worn to protect the eyes from splashes when handling hazardous liquids. When the risk from splashing is high, especially from toxic or corrosive liquids, a visor or goggles must be worn.
- Work must be carried out cleanly with the minimum of spilling and splashing to minimize contamination. Contaminated areas should be cleaned as soon as possible. The work area must be kept tidy and chemicals returned to the approved storage areas when not in use.
- Where it is necessary to avoid the inhalation of fumes and vapours or the build up of an explosive atmosphere (from highly flammable liquids or gases), a fume cupboard must be used. Fume cupboards should not be used for storage of chemicals.
- Flammable substances must be kept well away from sources of ignition - naked flames, hot plates etc. and infrequently used substances and containers larger than 0.5 litres stored in appropriate solvent bins.
- Minimise exposure to fumes and vapours by covering vessels and by prompt replacement of caps and stoppers to bottles when handling volatile or dusty chemicals.
- Winchester bottles must be carried in the special Winchester carriers available from Stores.

- Hands must be washed before leaving the laboratory area.
- Highly toxic chemicals must be stored in a locked container and a record of this store maintained.
- All work with carcinogens must be in accord with the guidelines provided in University Policy
- Containers must be adequately labelled to identify contents and to identify risk phrases.
- Chemicals must be stored according to hazard category.

### Hazard symbols

There are nine specific hazards associated with chemicals, each having its own warning symbol. These symbols are given on bottles and in catalogues. Chemicals within these categories must be labelled appropriately, e.g. small amounts of solvents shelved for current use must be labelled as flammable, etc.

### Protective equipment

The following protective equipment etc. is available from Stores:

Laboratory coats  
 Gloves, of various types, and barrier creams  
 Goggles and spectacles  
 Dust masks  
 Winchester carriers

### Accidents

All accidents involving chemicals must be reported immediately to the College H&S manager and an Accident/ Incident form completed.

### Risk assessment

Supervisors have a responsibility for assessing the risk to health and safety from any chemical hazard and for ensuring that working procedures are assessed and designed to minimise risk. They are responsible for ensuring that all activities involving chemicals have been assessed as required by the University Hazardous Substances Policy and that these assessments are documented and filed as completed COSHH forms. A number of laws and regulations impose legal requirements on work involving hazardous substances. The law requires:

- Assessment of the **hazard** (potential to cause harm) and **risk** (likelihood of harm under conditions of use) to the health and safety of people at work (and visitors) of the substances with which they are working.
- Prevention or adequate control of exposure to or risks from such substances.
- Adequate maintenance of plant and personal protective equipment needed for prevention or control.
- Monitoring exposure at the workplace if prevention cannot be achieved.
- Health surveillance where necessary.

- The provision of information, instruction and training for staff.

The overriding requirement of the law is that work involving hazardous substances is prohibited unless a suitable and sufficient risk assessment has been made.

**University Health and Safety Policy, including Hazardous Substances Policy, is based on the legal requirements. Compliance with University Policy should ensure compliance with the law.**

Forms for Chemical Hazard and Risk assessments and associated guidelines are available to download from the School server ([www.biosciences-labs.bham.ac.uk/safety/](http://www.biosciences-labs.bham.ac.uk/safety/)). These documents are also available from the College Safety Office (Earth Sciences Room 116, tel.46557; [s.ward@bham.ac.uk](mailto:s.ward@bham.ac.uk)). All COSHH assessments should be initially submitted to the College Safety Office in electronic form as an e-mail attachment to [bio.safety@contacts.bham.ac.uk](mailto:bio.safety@contacts.bham.ac.uk). COSHH assessments will be given an accession number. The accession numbers should be noted on all order forms for chemical purchase. A database of School COSHH assessments has been initiated and will be accessible via [s.ward@bham.ac.uk](mailto:s.ward@bham.ac.uk). All assessments will be kept in the College Safety Office and should also be available as a hard copy in the relevant laboratory.

**When ordering chemicals please be mindful of the fact that disposal costs are now a significant burden on School resources. Please only buy what you need and resist the temptation to order larger amounts because they are cheaper per unit weight or volume than smaller ones. When you add the cost of disposing of unused stocks this price advantage disappears and turns into a significant cost.**

#### Hazardous Waste Disposal

Procedures for the disposal of the following hazardous wastes are available on the School Safety web page ([www.biosciences-labs.bham.ac.uk/safety/](http://www.biosciences-labs.bham.ac.uk/safety/)).

- a. Carcinogens
- b. Phenol
- c. Mercury
- d. Cyanogen bromide
- e. Acrylamide

#### Waste solvents

At the point of production, waste solvents must be collected in securely closed screw-capped 2 litre Winchester bottles (maximum 2/3 full) in two categories:  
Halogenated (i.e. those that contain chlorine, bromine, fluorine or iodine)  
Non-Halogenated (not containing halogens in any form)

These should be labelled (remove or cover the original label) with a waste solvent label available from Stores. Waste solvents should be taken to Stores.



### Transport and use of liquid nitrogen

All transport of liquid nitrogen should be with the use of special containers (Dewar's) designed for this purpose. A barrier system must be used when transporting by lift to ensure that no personnel travel with it. The barrier system is available from the Stores and should be positioned inside the lift doors with the Dewar during transport. The barrier includes a sign indicating DANGER/DO NOT ENTER.

Materials must not be inserted or removed from liquid nitrogen freezers without adequate personal protection i.e. eye protection and gloves. Special care must be taken with screw-capped vials that may explode due to rapid boiling of liquid nitrogen that has entered the vial, upon exposure to ambient temperature.

For all Policy and guidance documents visit the Health and Safety Units web site:

<https://intranet.birmingham.ac.uk/hr/wellbeing/worksafe/index.aspx>

## **SECTION E**

### **ELECTRICAL AND MECHANICAL SAFETY**

This advice is of a general nature and is relevant to what might be regarded as the ordinary use of electrical equipment. For special situations, such as testing of live equipment and use of equipment under adverse conditions, additional precautions are required and further specialist advice must be sought via Mr Derek Green (ext 45441, [d.d.green@bham.ac.uk](mailto:d.d.green@bham.ac.uk))

#### Electrical safety

- When equipment is purchased or hired, written confirmation should be obtained from the suppliers that it complies with relevant standards, and that safety information is provided in accordance with Section 6 of the Health and Safety at Work Act. 13 amp plug tops will be fitted by members of the technical staff who have received instruction. All items of portable electrical equipment will be checked by a competent person at appropriate intervals and records kept of the checks.
- All equipment must have a means of isolation (switch) that is easily accessible and easily identifiable with the specific items of equipment.
- All terminals including low voltage lines must be electrically and mechanically sound and no undue strain put on them (e.g. plugs and sockets hanging unsupported).
- All terminals must be securely covered to prevent persons touching them.
- All lead acid and alkaline batteries should have protective insulated covers over the terminals and be used in well-ventilated areas.
- All flexes must be kept clear of the floor or protected to prevent heavy objects being placed or dropped on them or people walking or tripping on them.
- All flexes must have extra protection where they pass over or round sharp objects or corners or pass through metalwork (i.e. points of entry of equipment, etc.). Take care not to trap flexes in doors. Flex lengths should not normally exceed 2 metres.
- All flexes must be kept clear of radiators or other sources of heat and must not be wrapped round or fastened to pipe work.
- Keep all electrical equipment clear of taps. Containers of water or other liquids must not be placed on electrical equipment other than those items of equipment specifically designed for the purpose.
- Plugs and sockets used for 220/ 240 volts must not be of the same type as plugs and sockets used for lower voltages. Plugs and sockets should conform to

appropriate British Standard specifications, e.g. BS 1363: 1984 for 13 amp supplies. Advice is available from Workshop Supervisors.

- Where parts are replaced, it is essential that the correct type of replacement part is used (e.g. double insulated parts for double insulated equipment, cartridge fuses not fuse wire in plugs. etc.).
- Ensure that any items of equipment that are interconnected are fed from the same phase of the mains supply and have a single isolation point.
- Ensure that all equipment has a clear air space round it for cooling purposes.
- All equipment, not on standby, should be switched off when not in use. Equipment on standby, e.g. pH meters, should be marked with a numbered yellow tab. A list of all such equipment should be displayed in each laboratory on the appropriate yellow form 'Proprietary Equipment Normally Left On'
- Electrophoresis equipment. All equipment must be provided with safety covers or switches that prevent access to tanks and electrically live parts during operation. **It is expressly forbidden to bypass safety covers or switches.**

#### Mechanical safety

This advice is of a general nature and draws attention to mechanical safety implications in the use of moving machinery and equipment. Specialist advice and information is available both from manufacturers and from the Safety Unit.

- All moving parts of machinery and equipment must be adequately guarded. Do not use if guards are missing or defective. Report defects to the School Manager's office. Isolate defective equipment and post notices to prevent others from using it.
- No machinery, apparatus or equipment must be used or serviced unless the operator/user has received training or read instructions for use and has indicated this by signing a checklist.
- Instructions regarding the use of eye protectors, ear defenders and protective clothing must be adhered to.
- Prototype and modified equipment should not be commissioned or used without reference to the School Safety Coordinator.
- Centrifuges. All heads and rotors must be properly secured and tubes balanced before operation. High-speed heads and rotors will be checked by the manufacturer once per annum.
- Autoclaves, compressed gases and pressure vessels must only be used by trained personnel and operating instructions adhered to. Equipment is subject to periodic

checks by the University's insurers/engineers in accordance with regulations. (See Appendix 2).

- Power tools. Eye protection must be worn when using power tools.
- Vacuum systems. All components in or attached to vacuum systems must be designed or manufactured to withstand the pressures involved. Eye protection is required when glassware is used. Safety netting must always be used on evacuated vessels as a guard in case of implosion.
- Microwave ovens. In the event of failure the School Manager must be informed; he will arrange for servicing by the manufacturer. Such ovens must never be used to heat sealed or metal-containing containers or to melt large volumes of agar where pressure may build up due to local boiling of parts of the melting gel. Follow instructions displayed on each oven.
- Ultrasonic equipment. Ear defenders must be provided for use with ultrasonic probes and sonic emission limited by insulation if hazardous to others.
- High/low temperature equipment. Gloves must be provided and precautions taken to protect operators and others from burns, or in the case of very low temperature freezers, freezing of hands or sticking to cold surfaces. Warning notices must be displayed where hot surfaces are exposed.
- Shakers, homogenisers and mixers. (See Appendix 3)
- UV light. (See Appendix 4)

For all Policy and guidance documents visit the Health and Safety Units web site:

<https://intranet.birmingham.ac.uk/hr/wellbeing/worksafe/index.aspx>

## **SECTION F ENVIRONMENTAL INFORMATION**

The School Environmental Safety Coordinator position is currently vacant. The University's Environmental Policy is set out in document UEP/0/09 (see references below) and the aims and objectives for safeguarding the environment are outlined. Specific policies are evolving and their scope is likely to be wide ranging. However, key objectives have been identified and include the following:

- The promotion of sound environmental management policies and practices.
- Compliance with the requirements of relevant legislation.
- The promotion of environmentally responsible procurement.
- To minimise waste production, to reuse or recycle waste where appropriate and to regulate the treatment and disposal of residual waste.
- The promotion of good individual practice in an environmentally friendly manner.
- A duty of care on individuals to co-operate with the University in complying with policy requirements.
- A duty of care on individuals to report incidents at work that may cause harm to the environment.

The School has paper recycling points located on each floor, the Tower basement post room and on South ground in the photocopier room. Mixed recycling points are located in the Undercroft, together with battery recycling and household glass recycling. Toner and printer cartridge recycling is available in front of the basement Stores counter.

Further references

- UEP/0/09 (<http://www.environment.bham.ac.uk/index.shtml>)
- Environmental Agency ([www.environment-agency.gov.uk](http://www.environment-agency.gov.uk))

For all Policy and guidance documents visit the Health and Safety Units web site:

<https://intranet.birmingham.ac.uk/hr/wellbeing/worksafe/index.aspx>

## **SECTION G HORTICULTURAL SAFETY**

The School's horticultural safety is under the supervision of the College Scientific Facilities Manager, Mr Antony Jones (42726, email [a.c.jones.bcs@bham.ac.uk](mailto:a.c.jones.bcs@bham.ac.uk)) and the Chief Horticulture Technician Karen Staples, email [k.e.staples@bham.ac.uk](mailto:k.e.staples@bham.ac.uk)

### **Machinery and Powered Equipment**

Risk assessments must be in place before staff use powered machinery. Staff using machinery or powered equipment must have had full instruction and signed checklists to indicate that this instruction has been received and understood. Machinery must be in a safe condition and appropriate safety equipment must be provided and used. No one may use the powered horticultural equipment without the express permission of the Manager.

### **Pesticides, herbicides and agrochemicals**

Hazardous agrochemicals must be kept under lock and key; issue and use must be both controlled and recorded. Users must be familiar with specific hazards, and appropriate safety equipment and clothing must be provided and used. Anyone wishing to use any chemicals or materials in the Glasshouses or the field sites must ensure that a full COSHH assessment has been made and must obtain the approval of the Manager.

### **Genetic Modification of Plants**

The Genetically Modified Organisms (Contained Use) Regulations 2000 and the Environmental Protection Act 1990 (EPA) require that suitable and sufficient assessment of the risks to human health and the environment be carried out for activities involving the genetic modification of organisms. The primary role of the risk assessment is to determine the appropriate control measures that are needed to afford maximum protection to both human health and the environment. This, in turn, will determine the notification requirements for the proposed work. Risk assessments must be completed by Principal Investigators and submitted to the local GM Safety Committee for approval before work begins.

For many activities that involve plants, or micro-organisms associated with plants, the risks to human health will be outweighed by the potential for harm to the environment. Taken together, both the Contained Use Regulations and the EPA require that appropriate measures be taken to ensure that genetically modified (GM) plants or plant-associated genetically modified micro-organisms (GMMs) do not cause harm to either human health or the environment.

By following the advice and measures set out in the current guidance document from the Scientific Advisory Committee on Genetic Modification (SACGM), workers will be doing everything that is reasonably practicable to comply with the legislation for GM activities involving plants carried out in containment.

A guidance document can be found on the Health and Safety Unit's website ([www.hsu.bham.ac.uk](http://www.hsu.bham.ac.uk)) or on the Health and Safety Executive's website at:

<http://www.hse.gov.uk/biosafety/gmo/acgm/acgmcomp/part4.pdf>

### **Humidifiers and risk of exposure to *Legionella pneumophila***

There is a humidifier installed in the glasshouse area, to create appropriate conditions for growth for certain plant species. Any device that introduces aerosols into the atmosphere by design, or that can inadvertently create an aerosol, must be closely monitored and examined in any building's water system risk assessment to assess the likelihood of *Legionella* growth.

*Legionella pneumophila* exists widely in nature and is found in bodies of water such as ponds and lakes, and also in the soil. The disease is spread by people inhaling a contaminated aerosol of fine water droplets, typically containing a much higher concentration of the bacterium than is found in nature, deep into the alveoli of the lungs. Not everyone who inhales an infected aerosol will show symptoms of the disease. It depends on the dose inhaled and their susceptibility.

Humidifiers represent a relatively low risk but this is no reason for complacency. Humidifiers generally require specialist attention, and advice on safe operation and maintenance should be sought from the manufacturer or supplier (any quality supplier will be happy to give advice on this subject).

In addition, the University's water hygiene company will carry out any necessary testing on the humidifier. This is organised by the Estates department, and building risk assessments are reviewed by Estates every two years. Whenever equipment is installed that uses water from mains or tank fed services the School must contact their Maintenance Officer who will then inform the University's Statutory Standards Officer, so that this can be added to the building risk assessment.

The Scientific Facilities Manager should be informed of any changes to equipment.

### **Electricity, steam and heating**

Only staff authorised by the Manager may make adjustments to supplies or control gear and no portable or temporary electrical equipment may be installed without clearance from the Manager or Estates Services personnel.

### **Information**

The Manager is responsible for maintaining the library of Handbooks and Hazard Warning information governing the above equipment, chemicals and power/ heating supplies and services and will advise others in the School on the appropriate use of horticultural chemicals.

For all Policy and guidance documents visit the Health and Safety Units web site:

<https://intranet.birmingham.ac.uk/hr/wellbeing/worksafe/index.aspx>

## SECTION H RADIATION SAFETY

The School's Radiation Safety Coordinator is Dr Eva Hyde (Tel 45393, email [e.i.hyde@bham.ac.uk](mailto:e.i.hyde@bham.ac.uk)) assisted by Mr. Simon Ward (Tel 46557, [s.ward@bham.ac.uk](mailto:s.ward@bham.ac.uk)). The use of radioisotopes in University laboratories is governed by legislation in the Radioactive Substances Act 1993, the Ionising Radiations Regulations 1999, and the Health and Safety at Work Act 1974. Guidelines for the safe use of radioisotopes within the School of Biosciences are set out below. Supervisors (PIs or managers) are by definition Radiation Safety Supervisors in respect of the work done by individuals under their supervision, and should take steps to inform themselves of their responsibilities in that regard. More detailed information can be obtained in publications from the Health and Safety Unit.

### Users of radioisotopes must

- Have attended the University Radiation Safety Course or have evidence of attendance of an equivalent course at another institution prior to starting work with radioactive materials.
- Wear appropriate monitoring badges at all times when in laboratory areas and collect and return badges when instructed. Lab coats should not be worn in offices or other similar communal areas.
- Check that a scheme is in place for the protocol being used before ordering the isotope and commencing work.
- Ensure isotopes are securely stored, especially when not in immediate use. Each stock vial/bottle must have an associated record card that should be updated each time an aliquot is taken out.
- Follow instructions for safe working with radioisotopes as given by the University Health & Safety Unit and more experienced members of the laboratory.
- Only use areas designated for radioisotope work.
- Keep the laboratories clean and tidy.
- Complete records of monitoring for contamination. Monitoring appropriate areas (i.e. benches and floors), equipment etc for contamination should be carried out at suitable intervals. Any contamination found should be removed where possible. Notify Supervisor where contamination cannot be removed or is excessive.
- Dispose of all isotopes in accordance with the University guidance & HMIP/EA Certificate of Authorisation.
- Complete records of isotope stocks and disposal. They must be up to date and legible.
- **Ensure that all personal protective equipment e.g. shielding, drip trays, radiation monitors etc is in good condition and appropriate for the task.**



## **Supervisors must**

- Ensure that all work is being carried out in accordance with the relevant University requirements and in accordance with the relevant scheme/protocol.
- Ensure that all laboratory members using radioisotope have received adequate training and are considered suitable and able to carry out the tasks. Any person who is found to persistently leave areas contaminated or is not considered to be competent should be prohibited from working with radioisotopes.
- Ensure that schemes are in place for all protocols.
- Ensure that all radioactive work areas are clearly defined.
- Ensure that all radioactive work areas are kept clean and tidy and are regularly monitored for contamination. Any contamination found should be removed or the contamination reported to the School radiation Coordinator.
- Where there has been a significant spill, accident or incident involving radioisotopes, this should be reported to the School Radiation Protection Coordinator and University Radiation Protection Adviser.
- Countersign all orders for radioisotopes.
- Ensure that all isotopes are being stored according to the relevant University requirements.
- Ensure that records of radioisotope stocks, usage and disposal are kept, and supply the College Safety Office and the Health and Safety Unit with this information when requested.
- Ensure that all isotopes are being disposed of according to the relevant University requirements and HMIP/EA certificates of authorisation.

## **Training**

All users should have attended the Radioisotope training course run by the University Health and Safety Unit or have evidence that they have attended an equivalent course at another institution. Contact Dr Gus Zabierek (45253, email: [g.a.zabierek@bham.ac.uk](mailto:g.a.zabierek@bham.ac.uk)). It is also advised that all members of laboratories where significant quantities of isotopes are used attend the course.

## **Personal Monitoring**

If it is a requirement of the Approved Scheme, users should wear a radiation dosimeter and, if deemed appropriate, finger dosimeters. Advice on the need to wear finger dosimeters can be obtained from the School Radiation Co-ordinator, the College H&S Manager or the Health and Safety Unit. The College H&S Manager administers dosimeters from the College Safety Office.

## **New School Radiation Scheme**

A new School Radiation Scheme, referred to as an Approved Scheme, must cover all work. Each laboratory is responsible for writing a scheme for each protocol using radioisotopes. Example schemes can be obtained from the College Safety Office.

Proposed schemes should be submitted to Simon Ward for checking and allocation of a scheme number. The School Finance Office will only process radioisotope orders if a valid scheme is in place. The signature of Simon Ward is required on order forms as a check for a valid scheme number. The PI listed on the scheme must countersign all orders for radioisotopes.

### **Radioisotope Audit**

It is essential that the School has an accurate record of radioisotopes stored within the Building. The PI listed on the scheme under which the isotope is ordered is responsible for making sure that correct records for each batch of isotope are kept, including use and disposal. Upon delivery to the School a record card (R1) should be completed. On side A (R1A) will be details of usage including volume removed, user and date. Side B (R1B) will contain disposal information listing in detail the **volume** of the isotope stock disposed to drain, atmosphere, bin and high level waste. Users are also required to note the volume of the original isotope stock that has been disposed of on the W1S forms located close to the appropriate designated sinks. These forms should be kept up to date and returned to the Health and Safety unit at the end of each month. This is very important as it is the only way that the University maintains central data on the levels of radioisotopes across the whole of the site. It is important this information is accurate.

### **Disposal of Radioactive Waste**

For complete guidance you should refer to information published by the University Health and Safety Unit. It is the responsibility of the user to dispose of radioactive waste according to relevant University requirements and properly document each disposal on the R1B form. A WS1 form, present at each designated sink, should also be completed when radioactive waste is disposed to drain. The information on the WS1 form should be consistent with the information on the R1B form. It is the responsibility of the PI responsible for ordering the isotope to make sure that radioactive waste is being disposed of correctly and that disposal is being recorded.

### **Isotope Areas**

Proper laboratory management is the responsibility of the PI designated as laboratory supervisor. His/her responsibilities include checking:

- Good housekeeping of the laboratory.
- The laboratory is monitored regularly.
- Very low level solid radioactive waste is being disposed to the external refuse bins in accordance with the relevant University requirements.
- High level waste is being disposed/accumulated according to the relevant University requirements.
- ALL disposals and accumulations of radioactive waste, whether it be to drains, to dustbins, to atmosphere, to high level solid decay store or to scintillant/organic liquid disposal, are being recorded properly.

## **Glossary**

- **Scheme**, a risk assessment for each experiment using radioisotopes. One scheme per protocol.
- **R1A**, stock record card detailing usage, there will be one for each “pot/batch” of isotope.
- **R1B**, isotope waste disposal card, there will be one for each “pot/batch” of isotope and it will be linked to the equivalent R1A form.
- **WS1**, record card of isotope disposal via designated sinks, one per sink.

## IONISING RADIATION - HAZARD/RISK MANAGEMENT

Hazard	Possible harm	Model Controls
Work with ionising radiation	Exposure to radiation which is dependent on the source of radiation. Effects can be short term or long term depending on radiation doses received The level of harm can range from minor to major/fatal	Depending on the work, exposure to radiation may not be the only hazard, all risks need to be assessed and prioritised. All persons working with ionising radiation must have received training and instruction and should work to a protocol/system of work. Risk assessments need to be carried out. COSHH and Genetic Modification assessment where applicable and appropriate.
Sealed/closed sources	External hazard only  Dependent on dose rate and exposure time  The level of harm can range from insignificant to major/fatal	Smallest sources should be used. For sources with a dose rate greater than $1 \mu\text{Sv h}^{-1}$ at 10 cm a dose assessment should be carried out. Protection control measures include time, distance and shielding. Use of handling tools, avoidance of direct handling of sources. Classification of working areas. Warning signs. Appropriate supervision, training and instruction. Where provided, dosimeters are used to monitor exposure. Appropriate records for source movements. Disposal via appropriate authorised routes.
Radiation generators, x-ray diffraction and fluoroscopy	External hazard only  Dependent on dose rate and exposure time  The level of harm can range from insignificant to major/fatal	Where appropriate, radiation monitoring is to be carried out to ensure that any radiation leakage from enclosed systems is eliminated or minimised to as low as practicable. For sources with a dose rate greater than $1 \mu\text{Sv h}^{-1}$ at 10 cm, a dose assessment should be carried out Protection control measures include time, distance and shielding. Classification of working areas. Warning signs. Appropriate supervision, training and instruction. Where provided, dosimetry is used to monitor exposure
Open sources Weak beta emitters, e.g. H-3, C-14, S-35. Very limited quantities of weak $\gamma$ emitters, e.g. I-125	External/Internal hazard < 3.7 MBq (<100 $\mu\text{Ci}$ ) H-3, C-14 & S-35 <185 kBq (<5 $\mu\text{Ci}$ ) I-125. Not a significant hazard	Good laboratory practice Appropriate supervision, training and instruction. Record keeping requirements Disposal via appropriate authorised route
Open sources  Significant quantities, e.g. H-3, C-14, S-35 & P-33. >3.7MBq (>100 $\mu\text{Ci}$ )  I-125 and other sources >37 kBq (>1 $\mu\text{Ci}$ )	External/Internal hazard  The degree of harm is dependent on the quantities involved	Smallest quantity should be used. An assessment should be carried out. Protection control measures include time, distance, shielding and minimisation of contamination. Use of handling tools, avoidance of direct handling of sources with high dose rates. Finger TLDs should be used to monitor extremity doses where large quantities greater than 37 MBq (1 mCi) of P-32, I-125 and Cr-51 are used. Classification of working areas. Warning signs. Appropriate supervision, training and instruction Where provided, doseimeters are used to monitor exposure. Good laboratory practice. Appropriate records for source movements. Disposal via appropriate authorised routes.

Note: Where after a dose assessment has been carried out and there is the potential of the annual effective dose being greater than 6 mSv (whole body) or and equivalent dose of 150 mSv (extremity), the worker will need to be designated as "classified" radiation worker. The Radiation Protection Adviser must be consulted in this case prior to the work commencing.

# GUIDANCE NOTES ON THE ACCUMULATION AND DISPOSAL OF RADIOACTIVE WASTE

## AQUEOUS WASTE

### ACCUMULATION

The University is not permitted to accumulate this category of waste.

### DISPOSAL

Radioactive aqueous waste must be disposed of on the same day as it was generated and only via the designated sinks. These designated sinks are identified by being labelled " Only this sink should be used for the disposal of radioactive isotopes". Such waste must be thoroughly flushed into the sewer system and care must be taken to ensure that there is no spread of radioactivity by splashing. The area should be monitored after disposal to ensure that the radioactivity has been disposed of and has not been retained in the sink or immediate drainpipes.

### LIMITS

The University is restricted in the quantities of radionuclides that it can dispose of via the sinks. In order to ensure that the University is able to comply with these limits, individual Schools/Departments have been allocated local limits (see below) which are a fraction of these University limits.

Category 1	H-3 & C-14 (in total)	250 MBq (6.8 mCi) per calendar month per Department/School
*Category 2	Alpha emitting radionuclides	(see below)
Category 3	all other radionuclides (total)	200 MBq (5.4mCi) per calendar month per Department/School.
Category 4	Uranium, Thorium & compounds	5 gms of Uranium/Thorium per day per Department/School.

\* No disposals of Category 2 (alpha emitting radionuclides) should be made without the prior consent of the Radiation Protection Adviser (RPA.) in the Health & Safety Unit.

Any proposed individual disposals in excess of 111 MBq (3 mCi) there is a need to obtain the prior consent of the RPA. In addition the RPA maintains a check on the quantities of radionuclides coming into Departments/Schools and will if necessary require details concerning likely intended disposal dates and quantities before authorising the disposal.

## ORGANIC LIQUID

This in practice mainly applies to organic solvents used for liquid scintillation counting but also applies to other organic liquid solvents such as phenol and acetone etc.

### ACCUMULATION

The University is limited in the length of time, quantities and volume of material it can accumulate and dispose of under this category of radioactive waste.

In order to ensure that the University complies with these limits individual Schools/Departments have been allocated local limits (see below) which are a fraction of these University limits.

i.e.

H-3 & C-14 (in total)	12.5 MBq (338 $\mu$ Ci) per Department/School per 200 days
All other radionuclides (in total)	0.5 MBq (13 $\mu$ Ci) per Department/School per 200 days

No Department/School must accumulate more than 250 litres of liquid during the 200 day period.

## STORAGE & DISPOSAL

Departments/Schools should store such waste under conditions and in such containers appropriate for the type of solvent. e.g. acetone in Winchester bottles within a fire resistant container. Low flash point Scintillation cocktails can be stored in the counting vials and stored in heavyweight gauge plastic bags within suitable plastic (lidded) containers. Care must be taken to ensure that the total weight of vials and scintillation fluid within a plastic bag does not exceed 10 kgs (22lbs). All individual containers i.e. Winchesters or plastic bags must be labelled as to the contents (radionuclide(s), quantities (MBq), solvent, volume(litres) and date of production). Suitable forms ("W2") can be obtained from either the Departmental/School Radiation Protection Co-ordinator or from the RPA. The containers must also be labelled as containing radioactive waste by the use of suitable adhesive tape. A duplicate of the "W2" form attached to the waste must be sent to the RPA. as soon as the waste is produced.

The Department/School must arrange suitable storage until such time as the Health & Safety Unit is able to arrange disposal of the waste or transfer of the waste to its' own storeroom.

## SOLID WASTE

### CLASSIFICATION

There are two categories of radioactive solid waste:

- Very Low Level Solid Waste. ("Dustbin waste")
- Other solid waste ("High Activity Solid Waste")

"*Dustbin waste*" is that solid waste that can be disposed of along with all other non-radioactive non-hazardous waste to bins that are destined for "Landfill" disposal.

"*High Activity Solid Waste*" is that waste which has too much radioactivity (see below) for it to be disposed of as "Dustbin waste" and as such has to be treated/disposed of differently.

### VERY LOW LEVEL SOLID WASTE

This waste is divided into two categories:

1. Waste contaminated with H-3 and/or C-14.
2. Waste contaminated with all other radionuclides excepting H-3/C-14/Alpha emitters.

N.B. It should be noted that the University is not permitted to dispose of solid waste contaminated with Alpha emitting radionuclides to "Dustbin".

### Limits

#### (H-3 & C-14)

No single item must contain more than 400kBq (10 $\mu$ Ci) in total of H-3 and C-14.

There must be no more than 4MBq (100 $\mu$ Ci) in total of H-3 and C-14 in any Dustbin of waste (Volume 100 litres). This waste must be disposed of to external Refuse bins within 14 days of being produced.

To ensure that the 14 day limit is not exceeded, waste should be disposed of on a weekly basis.

#### (All Other Radionuclides)

No single item must contain more than 40kBq (1 $\mu$ Ci) in total of these radionuclides.

There must be no more than 400kBq (10 $\mu$ Ci) in total of these radionuclides in any Dustbin of waste (Volume 100 litres). This waste must be disposed of to external Refuse bins within 14 days of being produced. To ensure that the 14 day limit is not exceeded, waste should be disposed of on a weekly basis.

### HIGH ACTIVITY SOLID WASTE

This refers to all radioactive contaminated solid waste that has levels of radioactivity exceeding those defined for "Dustbin Waste". In addition it includes all solid waste that is contaminated with alpha emitting radionuclides.

## Limits

The University is limited in the quantities of radionuclides that it can accumulate and dispose of under this category, the maximum period for which it can store this material prior to disposal and the final destination for its disposal.

In order to ensure that the University complies with these University limits individual Schools/Departments have been allocated local limits (see below) of these University limits (per Department/School per 800 days).

I-125	25MBq (675 $\mu$ Ci)
P-32	25MBq (675 $\mu$ Ci)
H-3	75GBq (2000 mCi)
C-14 & S-35 (in total)	2.5MBq (67.6 $\mu$ Ci)
Sr-90	75MBq (2 mCi)
Na-22 & Zn-65	40MBq (1mCi)
Ni-63	150MBq (4mCi)
All other radionuclides	25MBq (675 $\mu$ Ci)

The maximum period of Accumulation is 800 days and the maximum volume permitted to be stored in total is 250 litres per Department/School.

## CLASSIFICATION & MONITORING

Individual items of suspected or known to be contaminated solid waste must be individually monitored at the time of production and a reasonable assessment made of the amount of radioactivity present. Where possible contaminated items should be rinsed with water to remove any readily removable material (e.g. flushing of Eppendorf tips etc. ). Due regard must be made of the likely radiation dose, ease of effective rinsing and contamination effects this rinsing procedure will cause.

It is essential that the quantity/volume of "High Activity Solid Waste" is reduced to a minimum and that where possible contaminated waste is disposed of to Sinks or as "Dustbin" waste.

Where "Users" are likely to produce waste that is Biologically/Clinically/Chemically hazardous i.e. classified as "Special Waste" under the Special Waste Regulations 1996, then advice must be sought from the Health and Safety Unit prior to generating this type of waste.

## Storage & Disposal

The bins used for storage of "Dustbin" waste must be made of plastic or any light and readily decontaminable material. e.g. "Swing bins". They must contain an inner Black plastic bag (to contain the waste) of reasonable strength and thickness. The bin (not the black bag) must be labelled with the Radiation Trefoil (size 10cm x 10cm approx.) and a sign designating it for "Very Low Level Solid Waste". Only radioactive contaminated materials must be placed in these bins. The bin must be suitably sited/shielded to reduce radiation doses from P-32, I-125 etc. to persons within the laboratory.

## IMPORTANT NOTES

**The "Cleaning Staff" MUST NOT be allowed to dispose of "dustbin" waste.** This must be carried out by a "User". The bins must be emptied to external refuse bins every 14 days or more often dependent upon the volume and activity of the waste produced. It is suggested that the bin is emptied when it is three-quarters full or contains nearly the limit of activity permitted (e.g. 400kBq(10 $\mu$ Ci) for all radionuclides excepting C-14/H-3) or within 14 days whichever occurs first.

It is not necessary to mix radioactive solid waste with non-active waste as the "Dilution" needed to conform with the Environment Agency Certificate requirements is achieved in the External large Refuse bins. It is essential to ensure that all radiation signs are either removed or totally defaced from waste that is destined for "Dustbin".

Material that is too radioactive to be discarded to "Dustbins" and cannot be easily and safely decontaminated must be stored in suitable containers appropriate for the radiation type e.g. Perspex boxes for P-32, lead lined boxes for I-125 etc. Disposal of this type of waste is via the Health & Safety Unit who must be notified when this waste is generated. (see below).

Radioactive Solid waste classified as "high activity solid waste" can be stored to enable the radioactivity to decay down to a level where it can be reclassified as "dustbin" waste and disposed of as such. It is essential that the conditions of accumulation, storage and disposal are complied with. This means that "high activity solid waste" must not be stored for more than 800 days and disposed of within 14 days once it has been reclassified as "dustbin" waste. Where this happens the RPA. must be notified.

## RECORD KEEPING

Records relating to "Dustbin waste" must be made in the relevant column on the standard form (W1) indicating the date of generation of the waste, the radionuclide and the quantity (MBq,  $\mu$ Ci etc. ). This record must be returned to the R.P.A. via the School/Department Radiation Protection Co-ordinator within 10 days after the end of the month in which the disposal(s) took place.

## ESTIMATION OF RADIOACTIVITY BY MONITORS

Note: The information given below assumes no attenuation by paper, gloves, pipette tips etc. Care and allowance must be exercised when there is the possibility of shielding/attenuation of the radiation.

	Attenuation (paper sheet)	Attenuation (Thick plastic sheet e.g. glove)
H-3	100%	100%
C-14	$\approx 90\%$	100%
S-35	$\approx 86\%$	100%
P-32	Nil	$\approx$ Nil
I-125	Nil	$\approx$ Nil

### Minimonitor model 900EL or model 900EP15

(Average/expected responses) (370Bq = 10nCi)

	Point Source Response @ 1cm (370Bq)	Point Source Response @ 20cm (370Bq)	Distributed source Response @ 1cm (3.7 Bq/cm <sup>2</sup> )
H-3 (Emax 0.018 MeV)	Not Detectable	Not Detectable	Not Detectable
C-14 (Emax 0.159 MeV)	$\approx 21$ c.p.s	Not Detectable	$\approx 5.4$ c.p.s.
S-35 (Emax 0.167 MeV)	$\approx 22$ c.p.s.	Not Detectable	$\approx 5.7$ c.p.s.
P-32 (Emax 2.27 MeV)	$\approx 92$ c.p.s.	$\approx 1.6$ c.p.s	$\approx 22$ c.p.s.

### Minimonitor Gamma Probe models

(370Bq = 10nCi)

	Point source Response @ 2cm (370Bq)	Point source Response @ 20 cm. (370Bq)	Distributed source Response @ 1 cm. (3.7 Bq/cm <sup>2</sup> )
I-125 (Probe type 42)	$\approx 33$ c.p.s.	$\approx 0.33$ c.p.s.	$\approx 3.3$ c.p.s.
I-125			



(Probe type 44)	≈ 100 c.p.s.	≈ 1 c.p.s.	≈ 14 c.p.s.
I-125			
(Probe type 41)	≈ 16 c.p.s.	≈ 0.16 c.p.s.	≈ 1.3 c.p.s.

The above data is only a guide as to the likely response for each type of radiation monitor/probe. The data located on a label attached to the radiation monitor must be referred to in order to determine the actual monitor response.

## CRITERIA FOR CONTROLLED AND SUPERVISED AREAS

### FOR UNSEALED SOURCES DESIGNATION BASED ON ACTIVITY USED (LOWER LIMIT)

Radionuclide	Supervised Area	Controlled Area
H-3	300 MBq	1.8 GBq
C-14	100 MBq	600 MBq
S-35	50 MBq	300 MBq
P-32	5 MBq	30 MBq
P-33	40 MBq	240 MBq
I-125	6 MBq	36 MBq
Cr-51	40 MBq	240 MBq

Where there is more than one radionuclide, the sum of the fractions need to be less than 1.

For all Policy and guidance documents visit the Health and Safety Units web site:

<https://intranet.birmingham.ac.uk/hr/wellbeing/worksafe/index.aspx>

## Appendix 1

### Fire Wardens -

<b>Designated area</b>	<b>Wardens</b>
Tower Basement	Derek Green (GEES – Mel Bickerton and Richard Johnson)
Tower Ground	Rita Godfrey and Steve Minchin
Tower First	(to be appointed)
Tower Second	Kay Wroe and Mala Patel
Tower Third	(Nick Cotton and Andy Lovering – temporarily)
Tower Fourth	Bob Harris, Shrikant Jondhale and Farhat Khanim
Tower Fifth	Helen Cooper and Neil Hotchin
Tower Sixth	Preethi Ramanathan
Tower Seventh	Eva Hyde and Rosemary Parslow
Tower Eighth	Steve Publicover, Jared Smith and Mohammed Zafar
North Basement	Peter Jones (BMSU)
North Ground	Andy Moss (GEES)
North First	(to be appointed)
North Second	Bob Hall
North Third	No cover as no permanent occupants
East First	George Lloyd and Sarah Batt
East Second	Kay Wroe and Mala Patel
South Ground	Leslie Shough, Ria Westwood and Jan Simmons
South First	Jo Hothersall
South Second	Steve Price, Ruth Perry and Julia Lodge
West Ground	Ruth Merrifield and Mohammed Baalousha (GEES)
West First	Norman Day and Chrystala Constantinidou
West Second	Jenny Dryden and Clair Davies
West Third	Karen Staples

The Fire Safety Co-ordinator for Biosciences is Rita Godfrey and for GEES Warren Eastwood.

## Appendix 2

### Use of Autoclaves

#### **Standard operating procedure for autoclave operation.**

##### **1. Associated risks.**

Autoclaves are sterilisers using high-pressure and high-temperature steam. The potential safety risks for the operators are:

- Heat burns from hot materials and autoclave chamber walls and door.
- Steam burns from residual steam coming out of the autoclave and materials on completion of cycle.
- Hot fluid scalds from boiling liquids and spillage in autoclave.
- Hand and arm injuries when closing the door.
- Injury in the case of an explosion.

##### **2. Risk management.**

- Autoclaves are inspected annually and certified.
- Autoclaves used for the disposal of bio hazardous materials are subject to annual working tests, logging and in use efficiency testing.
- An authorised training session must be successfully completed prior to use of the autoclaves.
- It is the supervisor's responsibility to ensure that their students and staff are trained before operating the autoclave.
- Procedural and instructional documents must be followed.
- Personal protective clothing and equipment must be worn when loading and unloading the autoclave.
- Equipment to protect against scalds and burns:
  - ❖ Heat insulated gloves.
  - ❖ Face shield providing coverage of the face and neck.
  - ❖ Splash apron or closed laboratory coat.
  - ❖ Closed toed footwear.

##### **3. Operator instructions.**

###### **Training**

- All operators must have successfully completed an authorised training session on the safe operation procedures of autoclaves.

###### **Material preparation**

- Ensure that the material is able to be autoclaved – oil's, waxes, flammable materials, radioactive materials and samples containing solvents or substances that may emit toxic fumes should not be autoclaved.
- Glassware should be inspected for cracks prior to autoclaving.
- Prepare and package material suitably:
  - ❖ Loose dry materials should be wrapped or bagged in steam penetrable paper or loosely covered in aluminium foil. Wrapping too tightly will impede steam penetration, reducing the efficiency of the process.
  - ❖ All containers must be covered by a loosened lid or steam-penetrable bung.

- ❖ Plastics must be heat resistant e.g. Polycarbonate, PTFE and most polypropylene.
- ❖ Loosen all lids to prevent pressure build up.
- ❖ Place bags of agar plated or other materials that may boil over or leak in a secondary container large enough to contain the total spill of the contents.
- ❖ Bags must not be tightly sealed to allow steam penetration.
- ❖ Bio hazardous materials must be labelled as such.

#### **4. Loading Autoclave**

- Wear insulated gloves and closed toed shoes.
- Place material in autoclave.
- Do not overload autoclave; allow sufficient room around materials to allow steam circulation.
- Close door according to individual autoclave instructions.

#### **5. Operating autoclave.**

- Refer to manufacturers' instructions.
- Bench autoclaves: Ensure that the equipment is stable and not in an exposed position at the beginning of the run. Remember to add water; ensure safety valves are not blocked and that lid is securely fastened.
- Bench autoclaves should be stored dry when not in use to avoid pitting.

#### **6. Unloading autoclave.**

- Ensure that the pressure is 0 and the load temperature is below 80°C before opening the door. Wear heat insulating gloves, closed toed shoes, face shield and splash apron or closed lab coat and stand back from the door as a precaution carefully opening the door to allow residual steam to escape.
- Allow sterilised materials to stand for 5 to 10 minutes to allow steam to clear and trapped air to escape from liquids.
- Wear safety equipment as above.
- Do not agitate containers of super heated liquids or remove caps before unloading.
- Place unloaded items on an area clearly identified as hot.

#### **7. Equipment Malfunction.**

- Report any malfunction in the equipment to Mr S Godfrey. Do not attempt repairs.
- Label autoclave as faulty.

#### **8. Accident.**

- Report all accidents or incidents to the College Safety Office and complete an accident/incident form.

#### **9. Spill cleanup.**

- It is the responsibility of the user to ensure that all spills in the autoclave are cleared up before leaving the equipment

## **Appendix 3**

### **Shakers, homogenisers, omnimixers and vortex-mixers**

1. Read manufacturer's instructions and operate for the first time under supervision of an experienced person.
2. When using homogenisers or omnimixers, insert a Perspex shield between operator and mixer or carry out in a Safety Cabinet behind the glass screen. Protective spectacles are insufficient
3. Check caps, bottles, cups seals and gaskets before use to ensure they make a proper seal.
4. Vortex mixing must be in sealed containers if the material is toxic or infective.
5. In all cases allow a short time for aerosols to settle before opening the container.
6. After use, ensure all equipment is cleaned and disinfected.

## **Appendix 4**

### **Ultraviolet light sources and Lasers**

1. Ultraviolet radiation from bactericidal lamps and TLC plate viewers can cause Conjunctivitis and skin burns. Repeated doses can cause skin cancer.
2. As far as possible, avoid exposure. Ensure the source is properly shielded and never look directly at it.
3. If working under an ultraviolet source, shield your skin with rubber (not plastic) gloves and your eyes with protective glasses. Limit exposure; the maximum permissible emission level is  $10^{-7}$  W/cm<sup>2</sup> for an 8 hour day,  $2 \times 10^{-7}$  W/cm<sup>2</sup> for 4 hours and so on. Data for each source is kept by the equipment supervisor.
4. UV light emitted from microscope lamps should not be directly visible; seek expert advice if in doubt.
5. Use of UV lamps is carefully monitored to ensure lamps are replaced before they exceed their working life.

In the event of a UV lamp shattering during use, mercury vapour will be released from the broken lamp. Should this occur, evacuate the room immediately, close the door and do not allow anyone to re-enter the room. The College Technical Services Manager or College H&S Manger should be informed immediately so that emergency remedial action may be carried out.

6. Use of any equipment involving exposed laser beams must be discussed with the Laser Safety Coordinator (Ken Jakeman, K.J.Jakeman@bham.ac.uk).

## **Appendix 5**

### Handling Microbiological Hazards: Good Microbiological Practice

This is additional to the safety instruction detailed under Good Chemical Practice. Particular attention should be paid to instructions regarding food & drink, protective clothing and hand washing.

Aseptic techniques for handling microbiological hazards on the open bench should protect the worker from infection and the work from contamination. The required manual dexterity should be achievable with practice. **See the advice in Section C (page 20) on flame sterilization of spreaders.**

- (i) The work area should be uncluttered and free from dust and draughts.
- (ii) Equipment should be arranged logically.
- (iii) A commercially available biocide-impregnated cloth may be spread on the bench to absorb spills.
- (iv) Work is normally performed near a flame that is used for sterilising loops, flaming glassware etc.
- (v) Aerosol production must be kept to a minimum.
- (vi) Containers should be opened as briefly as possible.
- (vii) Movements should avoid jerkiness.
- (viii) The bench should be swabbed with disinfectant after use.

Loops and wires should be <5cm long (to minimise aerosol formation by vibration) and uncorroded. Loops should be completely closed and <3mm diameter. They must be cooled before use.

Flame-sterilization of spreaders and slides – **See the advice in Section C (page 20).**

Pipettes must be undamaged and fitted with a pipette filler. Pipettes should be held near the top and inserted into the filler with a rotary motion (avoiding leverage) until secure. Do not use force when inserting pipettes into fillers. Forcible expulsion of the last drop is a potent source of aerosols. Pipette plugs may reduce contamination but offer limited resistance to the passage of micro-organisms. Pipettes should be filled carefully and discharged slowly with the tip close to the agar/liquid surface to minimise aerosol production. Air must not be bubbled through cultures. Solutions may be mixed by repeatedly drawing up a portion into the pipette and discharging carefully. Inadvertent contact of pipette tips with hands, body and equipment must be avoided. Used pipettes must not be placed on the bench etc. but must be completely immersed (point downwards) into disinfectant pots. Discard Pasteur pipettes into appropriate disinfectant pots also.

Pipettors (Finn, Oxford, Gilson etc.). The disposable tips have fine orifices and may create significant aerosols, particularly if the last drop is forcibly expelled. Pipette tips must be disposed of as sharps.

Sharp instruments such as scalpel blades, scissors etc. should be used as little as possible when handling microbiological hazards. No attempt must be made to arrest the fall of a dropped instrument. Sharps must be discarded into appropriate containers or decontaminated, cleaned and stored safely.

Glassware must be robust (particularly centrifuge tubes) and be closed with a cap, lid or plug. Plugs made of foam or rolled cotton wool must be close fitting. Contamination of caps etc. and aerosol formation through frothing or agitation of vessel contents must be avoided. Tubes and bottles should be kept in racks made of plastic or plastic coated wire.

Pouring liquid cultures should be avoided as aerosol formation and splashing may result.

Organisms isolated from the environment. Pathogenic organisms may be isolated from many sources including soil, polluted water, sewage and contaminated food. All unidentified organisms isolated should be treated as pathogenic until shown to be otherwise.

Fungal colonies must be manipulated with care to avoid dispersal of spores.

#### Disposal of microbial cultures and GM contaminated waste.

All general glassware (except pipettes & tissue culture glassware) containing microbial cultures/GM contaminated waste for disposal should be placed directly into metal discard cans; loosen screw caps slightly before placing glassware into the cans. Do not place test-tube racks into the cans. Do not place glassware containing chemicals into the cans. Do not over-fill cans with glassware. All agar plates and other plastics (e.g. Eppendorfs) for disposal should be placed into autoclavable bags that are then placed inside the metal cans for autoclaving. You must use a leak-proof container to support autoclave bags that are being used in the laboratory for the collection of GM waste. This is to minimize the risk of GM contamination from leaking bags. Do not over-fill the bags as these must be contained within the cans with the lid in place for transportation.

Discard both graduated and Pasteur pipettes into suitable containers containing 2.5% chlorox for overnight disinfection. Glassware used for tissue cultures should be put in 10% chlorox and left completely immersed for 24 hours before washing up.

Contaminated "sharps" (hypodermic needles, scalpel blades, tips etc.) should be put in the special containers provided. When full the containers should be autoclaved prior to disposal.

### Disinfectants

There is no 'universal disinfectant' and disinfection is a less reliable method of decontamination than steam sterilization. Specific disinfectants may have to be used in special circumstances but, in general, disinfectants must be available at each work

station for: (1) swabbing work surfaces before and after use; (2) dealing with accidents; (3) discarding pipettes and tissue culture glassware.  
 When working with genetically modified organisms or category 2 pathogens the disinfectant must be validated for use for that organism.

Disinfectants may be used in the following manner, or where appropriate and subject to a risk assessment, alternatives such as Virkon may be appropriate.

Graduated pipettes and Pasteur pipettes	2.5% Hypochlorite solution (e.g.Chlorox), complete immersion overnight: no autoclaving
Tissue culture glassware (e.g.Chlorox); no	10% Hypochlorite solution complete immersion overnight: autoclaving
Surfaces (benches, safety cabinets, spills)	either 1% Tego, 1-2.5% Chlorox, Or 70% ethanol

A visor must be worn when handling undiluted Chlorox.

## **Appendix 6**

### MANUAL HANDLING

Manual handling includes any lifting, transporting, supporting or putting down of a load by hand or bodily force. The University policy document “Manual Handling Operations ” UHSP/6/MHO/95 details the risks and responsibilities regarding manual handling. Instructions are provided in the document “Guidance on Manual Handling” which is available from the Safety Unit, as is the policy document. Avoid, as far as is reasonably practicable, the need to undertake manual handling operations that involve a risk of injury. Where this is not reasonably practicable, make a suitable and sufficient assessment of risk having regard to specified factors:

1. The task - Lifting/carrying distance, posture i.e. standing, stooping, twisting etc.
2. The load - Weight, shape, rigidity, edges/projections, temperature, contents etc.
3. The environment - Space constraints, uneven surfaces, steps & slopes etc.
4. Individual capacity - Strength, height, fitness, pre-existing injury etc.

Having performed a risk assessment, take steps to reduce the risk of injury to the lowest level reasonably practicable.



1. Make use of mechanical aids - trolleys, lifting tables, hoists etc.
2. Eliminate twisting and stooping movements.
3. Store heavy items between knee and shoulder height.
4. Reduce carrying distances.
5. Clear away obstacles.
6. Split loads.
7. Change personnel and/or employ team lifts.
8. Wear protective clothing - gloves, safety boots/shoes, face/eye protection if there is a risk from splashing if the load were dropped. Wear overalls to protect clothing if appropriate.

Inform your supervisor of any physical conditions affecting safety or any changes that may affect existing risk assessments.

Do not attempt to carry loads beyond your capacity - get help if necessary.

Use the correct techniques - see “Guidance on Manual Handling”.

You must report any accidents or incidents to the appropriate manager IMMEDIATELY. Complete an Accident/Incident form and submit it to the College Safety Office.

### **Hypodermic needles**

- Hypodermic needles must not be used where a safer alternative is available;
- Syringes with hypodermic needles attached should not be used as storage containers.
- Hypodermic needles must not be re-sheathed
- Following completion of a task utilising hypodermic needles they must be disposed of to a sharps bin as soon as possible and the sharps bin located as near as possible to the site of use
- If a hypodermic is dropped then it must be recovered and disposed of safely. It is not acceptable to leave such needles for recovery by cleaning or servicing staff.
- All needlestick injuries must be reported to the College H&S Manager and an Accident/Incident form completed.

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