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1. GENERAL POLICY STATEMENT ON SAFETY AND HEALTH MANAGEMENT

This School full endorses the UWA OSH policy. This handbook supplements the main UWA policy (UWA Occupational Health and Safety Policy [www.safety.uwa.edu.au/policies]) to provide and maintain safe and healthy working conditions, equipment and systems of work for its entire staff, students, contractors and visitors. To this end, information, instruction, training and supervision is provided as necessary. Responsibility is also accepted for the safety and health of other people who may be affected by the School’s activities, as far as is reasonably practicable. The evidence of accidents within the School is low due to the high quality of ongoing supervision and training of students and staff.

This laboratory induction document is to be read in conjunction with the School’s Safety and Health Manual and is to accompany a formal induction process.

Research students and staff must have completed an induction prior to independent use of the School’s laboratories.

This manual will be kept up-to-date to take account of changes in the Laboratory’s activities.

2. THE SCHOOL’S HEALTH AND SAFETY ORGANISATION

- Ultimate responsibility for safety and health in the School lies with the Head of School.
- Processes for identifying and controlling risk are effectively achieved with the participation of all staff at all levels.
- The organisational chart for the safety and health management structure is as follows:
3. THE SCHOOL’S HEALTH AND SAFETY MANAGEMENT STRUCTURE

<table>
<thead>
<tr>
<th>DUTIES</th>
<th>MEMBER</th>
<th>CONTACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>UWA Safety Committee</td>
<td>W/Professor Tim Ackland</td>
<td>6488 2668</td>
</tr>
<tr>
<td>School’s Safety &amp; Health Committee</td>
<td>A/Professor Tim Ackland (HOS)</td>
<td>6488 2668</td>
</tr>
<tr>
<td></td>
<td>Professor Paul Fournier</td>
<td>6488 1356</td>
</tr>
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<td></td>
<td>Mr Rob Hurn</td>
<td>6488 1865</td>
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<tr>
<td></td>
<td>Mr Chunbo Liu</td>
<td>6488 3945</td>
</tr>
<tr>
<td></td>
<td>PG student representative (Denny Wells)</td>
<td>6488 1385</td>
</tr>
<tr>
<td>First Aid Officers</td>
<td>Ms Bonnie Furzier</td>
<td>6488 3333</td>
</tr>
<tr>
<td></td>
<td>Mr Nat Benjanuvatra</td>
<td>6488 2437</td>
</tr>
<tr>
<td></td>
<td>Mr Steve Franklin</td>
<td>6488 2266</td>
</tr>
<tr>
<td>Fire Wardens</td>
<td>Mr Rob Hurn (Chief)</td>
<td>6488 1865</td>
</tr>
<tr>
<td></td>
<td>Mr Steve Franklin/Taku Korogi</td>
<td>6488 2266</td>
</tr>
<tr>
<td></td>
<td>Mrs Inga Carr</td>
<td>6488 2360</td>
</tr>
<tr>
<td></td>
<td>Technician</td>
<td>6488 7313</td>
</tr>
<tr>
<td></td>
<td>Mr Chunbo Liu</td>
<td>6488 3945</td>
</tr>
<tr>
<td></td>
<td>Mr Tony Roby</td>
<td>6488 2371</td>
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<tr>
<td></td>
<td>Mrs Georgia Wachmer</td>
<td>6488 2361</td>
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<tr>
<td></td>
<td>Ms Giovanna Biagioni</td>
<td>6488 3510</td>
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<tr>
<td></td>
<td>Mrs Karen Mau</td>
<td>6488 3510</td>
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</tbody>
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4. DOMESTIC SAFETY ARRANGEMENTS

For any activity/area in which staff have responsibility for the safety and health of others, they should familiarise themselves, and those within their care, with the basic domestic safety arrangements, such as:

- Location of First Aid Boxes
  2 x Pool Area (fixed)
  2 x Technical Area (1 portable and 1 fixed)
  1 x Unigym (portable)
  1 x Rehabilitation Clinic (fixed)

- Defibrillator in pool attendants’ office – G09
- Defibrillator in entrance between Physiology (1104) and Biochemistry (1105) labs
- Defibrillator in storage room at Water Polo pool (G113)
- Defibrillator ground floor foyer (Exercise Science North building)
- All pool supervisors have valid and current Senior First Aid Certificates

- Wheelchair available in the Rehabilitation Clinic (G100)
5. GENERAL SAFETY AND HEALTH PROCEDURES

5.1 Reporting and Investigating Safety and Health Issues

Any person within the School noticing a safety or health issue that they are unable to rectify themselves should immediately inform their Academic Supervisor and the School Manager. You may be asked to complete an Incident/Injury report form which may be downloaded from the UWA Safety and Health Office (SHO) web site on www.safety.uwa.edu.au/forms/incident.

5.2 Consultation for Safety and Health

All members of the School are encouraged to raise concerns about safety and health with the School’s Safety Officer.

Formal consultation regarding safety and health issues takes place through the School’s staff meeting format. Should an issue involving health and safety be placed on the staff meeting agenda for discussion not be resolved at the meeting, it is then referred to the Safety and Health Committee for further action.

Membership of the School’s Safety and Health Committee

<table>
<thead>
<tr>
<th>ROLE</th>
<th>CONTACT</th>
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</thead>
<tbody>
<tr>
<td>A/Professor Tim Ackland (chair)</td>
<td>6488 2668</td>
</tr>
<tr>
<td>Professor Paul Fournier (Lab Supervisor)</td>
<td>6488 1356</td>
</tr>
<tr>
<td>Mr Rob Hurn (School Manager/Safety Officer)</td>
<td>6488 1865</td>
</tr>
<tr>
<td>Mr Chunbo Liu (Safety &amp; Health Rep)</td>
<td>6488 3945</td>
</tr>
<tr>
<td>PG student representative</td>
<td>6488 1385</td>
</tr>
</tbody>
</table>

*** Radiation Safety Officer

5.3 Safety and Health Training

The School Manager/School Secretary ensures that all new staff and visiting academics are inducted as soon as practicable, by using the UWA Safety and Health Office checklist www.safety.uwa.edu.au/policies/.../policies/induction. All records of staff/visitors inductions are maintained by the School Manager (delegated responsibility to the School Secretary).

The School Manager ensures that all new postgraduate students are given the same information as new staff but are also made aware of the student guide to safety and health. All records of graduate student induction are maintained by the School Manager (delegated responsibility to the School Secretary).

(www.safety.uwa.edu.au/policies/.../policies/student_guide_to_safety_and_health)

Members of the School will not be expected to undertake any procedure for which they have not been adequately trained. The need for specialist training will be identified by the School Manager (or delegate) as part of the safety and health induction process or by the student’s Academic supervisor and all requests for such training are directed to either the Head of School or the UWA Safety and Health Office. Records will be kept of training sessions by the School Manager (or delegate).
5.4 Fire and Emergency Procedures
The UWA Emergency Procedures are outlined at the following site:
www.safety.uwa.edu.au/policies/emergency_fire_and_evacuation

If the fire warning alarm sounds, leave your area and proceed to the centre of the
Sport Science oval.

1. Do not risk your own life.
2. If required and once instructed, evacuate the building calmly.
3. Close all windows
4. Turn off all electrical equipment (i.e. computers, fans, etc.)
5. Close the door behind you and proceed to the Sport Science Oval.
6. Warn others on the way out.
7. Move at a quick walk: Do not run.
8. Do not use the Lift.
9. If a person is trapped, immediately inform a Fire Warden or Emergency
Response Officer (Security) on 2222.
10. People who panic: take their hand and lead them out. If they refuse to go any
further, leave them and report their location to Fire Warden.
11. People with a disability. In an evacuation, offer assistance, ask the person to
tell you how you can best help them. This may involve lifting, carrying and
escorting them from the building and may mean their wheelchair or walking
aid needs to be left behind.
12. Move to the centre of the Sport Science oval and wait for further instructions.
13. Do not congregate in car park areas or around buildings.
14. Do not return to the building until cleared by Fire Brigade or Fire Wardens.

5.5 Manual Handling
Please refer to the Safety and Health policy web site:

Manual handling is one of the most common and costly of workplace injuries. Manual
handling involves the use of human effort to lift, push, pull, carry, hold or restrain any
object or animal. It does not just relate to the lifting of heavy objects.

UWA has a policy on manual handling which requires areas to undertake risk
assessment of all manual handling hazards and implement strategies to reduce the
level of risk. This includes, but is not limited to, the provision of training and ongoing
supervision of staff and students involved in manual handling activities.

Worksafe’s code of practice can be downloaded at

- No one should undertake any manual handling task that they feel that they are
unable to manage; if in doubt, do not do the task and seek assistance. A safety
first attitude should be adopted.
• Be aware of the risk factors – the safety of the general environment (e.g. is it cluttered, is lighting adequate, are there any slip or trip hazards); the characteristics of the load (e.g. heavy, awkward, difficult to grasp); and be mindful of your own ability (e.g. fatigue, unwell, lacking in coordination).

• Where possible, use assistive equipment such as trolleys and lifting devices. Technical staff at the Workshop should be contacted for assistance and location of safety equipment.

• Always use correct manual handling technique – keep the spine neutral, bend with the knees using semi squat and avoid twisting, flexing forward with the spine, or sideways leaning of the spine.

Assistance with manual handling risk assessment and training in manual handling technique is provided by the UWA Safety and Health Office (phone 2784). Staff are encouraged to phone if they have concerns.

Relying on training of staff is not as effective in reducing manual handling injuries as proper workplace design and provision of equipment – please keep this in mind!

5.6 Safety in the Use of Computer Workstations

Please refer to the Safety and Health web site: http://www.safety.uwa.edu.au/policies/computer_workstation_ergonomics and note that the same principles for adopting correct posture at the computer applies to laptop as well as desktop computers and monitors. Be aware that if you are working from home, you should also apply the same principles.

Most people seem to have difficulty checking whether they have correct posture when set up at a computer, even after reading a pamphlet! If you need assistance or if at any time you start to develop symptoms, please contact the Occupational Therapist in the UWA Safety and Health Office. Since there are many computer “ergonomic” accessories on the market, the UWA Safety and Health Office provides free trial of equipment. It is a myth to think that using all things that are available will prevent problems and likewise, what works for one person may not suit another. A professional opinion may be warranted if you are having any difficulty with comfort at the computer.

5.7 Working Alone

If you intend working in the laboratory beyond 9pm, please email the Security Office to notify them of your presence: security@uwa.edu.au

Also, please refer to the UWA Safety and Health web site: http://www.safety.uwa.edu.au/policies/.../policies/isolation
5.8 Action in the Event of an Incident – First Aid Procedures

- The UWA First Aid Procedure Flowchart is outlined at the following site:

In the event of an injury or sudden illness the nearest First Aid Officer needs to be contacted who will be able to assess the situation and provide first aid treatment. If a First Aid Officer is not available then the person should be brought to the Medical Centre if possible, or the Centre should be contacted on 6488 2118, or an ambulance called through the emergency number (2222) for severe illness or injury.

If an incident or injury occurs at the University or during normal University activities, it must be reported to your School Manager on 64881865. If the incident occurs elsewhere, you should report it to the responsible person: Warden of a College, Manager of UWA Sports or Manager at the Sport Centre as appropriate. Alert UWA Security (2222) if outside normal University hours, but inform the appropriate person as soon as possible.

**FIRST AID AND INCIDENT PROCEDURES NOTICE**

All hazards and injuries must be reported, investigated and resolved. Any unresolved issues should be dealt with in accordance with the following:

- Notify Immediate Academic Supervisor
  - Issue still unresolved

- Notify Safety and Health Representative or School Manager
  - Issue still unresolved

- If a First Aid Officer is not available contact the Medical Centre on 6488 2118.

- Apply first aid at scene and contact ambulance if necessary.

- Notify Head of School
  - Issue still unresolved

- Notify UWA Safety and Health Office
  - Issue still unresolved

- Referred to the University Safety Committee
  - The above process should be followed at all times. WorkSafe can be notified if there is a risk of imminent and serious harm.

- All injuries must have an Incident/Injury Report completed
6.0 GENERAL SAFETY IN LABORATORIES

It is the duty of Academic Supervisor staff members and Technical staff to familiarise themselves with the Safety and Health legislation and Codes of Practice which are relevant to the work being undertaken in their area of responsibility and to ensure that other members of staff and students comply with these requirements.

Laboratories can be places of danger, as a lack of experience and knowledge may contribute to a safety and health incident. We can never totally eliminate the risks of an injury, however you can reduce the risks by abiding by these safety and health rules:

1. Ensure that you follow all instructions that your Supervisor gives you.
2. Wear the correct clothing such as covered shoes and laboratory coats. Laboratory coats can easily be forgotten and thought of as waste of time, however, they provide valuable protection against such things as spills.
3. Use appropriate personal protective equipment such as safety glasses, hearing and respiratory protection when needed. Remember to always wear your laboratory coat and other protective equipment.
4. Eating, chewing, drinking, smoking, taking medication, or applying cosmetics is forbidden in laboratories, as is mouth pipetting.
5. Never undertake potentially hazardous activities whilst working alone.
6. Familiarise yourself with the emergency preparedness procedures. Know the location of the nearest emergency shower, eyewash station, first aid kit, fire fighting equipment and emergency exits.
7. If a chemical spill occurs and you are unsure of how to deal with it, STOP and immediately contact your Academic Supervisor or the Laboratory Supervisor. The School Manager should also be contacted in due course. You should however always know how to clean up the chemicals you are working with prior to beginning your task.
8. **Never undertake repairs of electrical equipment.** Unauthorised modification to electrical equipment is not allowed; only qualified staff/contractors are permitted to carry out electrical work.
9. Ensure you know how to operate equipment and machinery safely before beginning your task.
10. When planning a new experiment always consider the hazards that might occur and take the necessary precautions to eliminate or reduce these hazards.
11. Always report all known or observable hazards, incident and injuries to your Academic Supervisor and complete and submit the necessary report forms (to the School Manager).
12. Be aware of posture ergonomics. Maintaining prolonged postures without regular breaks or changes are to be avoided.

Please refer to the UWA Safety & Health web site for emergency procedures:
6.1 Laboratory Housekeeping

- Good housekeeping in the laboratory can reduce the risk of injury. Keep corridors and doorways clear.
- Store chemicals in an appropriate cabinets or storeroom areas to ensure proper segregation.
- Always use the sharp disposal containers provided.
- Clean up all spills immediately.
- Keep laboratory free from clutter, clean-up work surfaces.
- Store gas bottles in the correct manner.

6.2 Cleanliness and tidiness

- Leave equipment and workspace as found. When you leave, the laboratory should be cleaner and tidier than you found it.
- Clean and sterilise surfaces and equipment after use. Be sure to come back and put the clean equipment away (e.g. do not leave mouthpieces and hoses in the sterilizing solution for more than an hour).
- Clean the equipment and also the floor around the equipment you used (blood, sweat etc).

6.3 Breakages/Malfunctions

Everyone must report all breakages and malfunctions. In the first instance, inform your Academic Supervisor and then the Technical staff and also place a sign on the equipment to let other lab users know there is a problem. Sign and date this notice. Be sure to record the performance of the major pieces of equipment in their respective logs to make it easier for the monitoring of consumables as well as the actual machinery.

6.4 Computers

- Do not install any software on a computer in the lab without informing the Laboratory Supervisor.
- Do not use the computers in the lab as storage space. Take the files you need to your own computer. Don’t leave files on lab computers without filing them in a folder with your name. Occasionally the hard drives will be cleaned and files with no clear purpose will be deleted.

6.5 Emergency Procedures

Lab users should be familiar with the locations of safety and emergency equipment such as fire extinguishers, fire alarms, first-aid kits, emergency telephones, exits and the School Evacuation Plan.

- The School Manager should be contacted (ext 1865) in the event of an accident.
- The UWA Emergency (ext 2222) is shown on the handset.
- A first aid kits are located in the technical area, Pool Office, Rehabilitation Clinic, Weights Gym and Water Polo store room.
- Defibrillators are located in the Pool Office (G09) and entrance between Physiology Lab. (1104) and Biochemistry Lab. (1105).
- Showers for rapid washing in the event of a chemical spill on skin are located in the Exercise Biochemistry lab and also downstairs in the technical storage area.
6.6 Safety Considerations

- Loose clothing and long hair must be kept away from moving equipment.
- Closed shoes must be worn when working in the lab.
- Always wear protective gloves when handling chemicals or biological samples and/or waste. Safety glasses are also recommended.
- DON’T risk needle stick injury by attempting to re-sheath needles. Find out more information on needle and syringe disposal/needle stick injuries.

6.7 Security

- Do not remove anything from the lab without permission from the Lab Supervisor.
- Always lock the laboratory door when unoccupied. Things can disappear very quickly.
- Keep your valuables safe while working in the lab.
- DON’T leave polar heart rate monitors and stopwatches in the lab.

7.0 LABORATORY-SPECIFIC SAFETY ISSUES

7.1 Supervisor Checklist for the Exercise Biochemistry Laboratory Induction

Academic Supervisors (including the Lab Supervisor) have a duty of care to the staff, students and visitors under their supervision. They also have a number of other obligations. The following information is used by Supervisors to structure an initial induction to laboratory safety matters in the Exercise Biochemistry Laboratory for new staff and students.

1. TRAINING NEW STAFF AND STUDENTS

All new staff and students must be trained. This includes the general safety information provided in this document. In addition, basic instruction must be given on:

- what are the emergency phone numbers
- where medical help can be obtained (in the School/UWA Health Service)
- where the fire alarm is and what to do when it sounds
- where fire extinguishers, fire blanket, spill kits (chemical and biological) and web-based safety information can be found, and what to do if these need to be used. For the fire extinguishers, point out the different kinds and when they are to be used
- what are the general laboratory rules
- how to dispose of hazardous (toxic or infectious) wastes
- how to dispose of sharps, broken glass, and any special wastes (blood, radioactive, etc) produced in procedures in your laboratory
- special procedures for research techniques used in your group (eg. use of liquid nitrogen, the use of animals & blood etc)
- the need to ask for exact instructions on the use of new procedures or unfamiliar equipment
2. PERSONAL PROTECTIVE EQUIPMENT.

The School must provide personal protective equipment for all people working in the Exercise Biochemistry Lab, appropriate to the procedures they are carrying out.

Every staff member must be provided with (at least):

- appropriate lab gowns or lab coats
- safety glasses
- access to disposable gloves
- instruction on when and how to use this personal protective equipment (PPE)
- any special PPE required for the activities to be carried out

3. RISK ASSESSMENTS.

Risk assessments must be made for hazards and potentially hazardous activities carried out in your laboratory or area.

4. CHEMICAL INVENTORY.

The Exercise Biochemistry Lab Supervisor must ensure that there is a chemical inventory that meets the School's minimum requirements. All chemicals must be correctly labelled (with hazard symbols) and stored. A current Poisons Permit must be kept.

5. YEARLY AUDITS.

The Lab Supervisor must conduct yearly audits of the laboratory, offices, and/or work area, and of the first aid kit.

6. ACCIDENT/INCIDENT REPORTING.

Accidents and incidents must be reported using the appropriate procedures.

7. IMPORT PERMITS.

It is important to ensure that all DOA permits for importing biological materials and that animal ethics approvals for all lab-work are current.

8. EQUIPMENT LABELS.

It is important to ensure that equipment in the Exercise Biochemistry Laboratory is appropriately labelled by the School.

9. WORK ENVIRONMENT.
A suitable work environment must be provided, taking into consideration:

- prevention of accidental exposure to risks from activities carried out by others in the work area
- noise levels, lighting, temperature, dust, draughts
- sufficient work space and satisfactory arrangement of furniture & equipment
- ergonomically comfortable benches, desks & computer work stations
- suitable secure storage for personal effects

10. TRAINING AND INDUCTION.

The Laboratory Supervisor must provide an induction into all of the School/University procedures and complete all relevant documentation.

7.2 Specific Procedures Other than those Listed under Section 6.0

Ordering New Supplies

For consumable items (tissues, gloves, paper towels etc.) let the Technical staff know.

For sharps (scalpels, needles, lancets etc.) drugs (local anaesthetic etc.) and chemicals (biochemistry kits etc.) tell your supervisor, who will then order the required goods through the School Purchasing Officer.

Poisons Cupboard

By Government regulation, products such as local anaesthetics (Xylocaine and Emla cream) must be stored in a locked cupboard. The Laboratory Supervisor holds the Poison’s Licence for the Lab, therefore they are responsible for maintaining a register of the stored products and he has keys to the cupboard.

To adhere to Government regulations, the cupboard should be locked again immediately after removing the required products.

7.3 General Laboratory Safety Rules

As part of the students’ research proposal, they will need to check the appropriate boxes on the Laboratory Usage form (a required attachment to your Proposal document) to (a) confirm that they have completed the laboratory induction and (b) have performed a Risk Assessment in regard to the proposed methodology. See the UWA web for Safety and Health policy statements on a wide range of topics relating to lab work www.safety.uwa.edu.au/policies.

Responsible behavior in the laboratory is essential. There are too many dangers if acids or other chemicals are spilt (as well as broken glassware) and thoughtless actions and irresponsible behavior will not be tolerated.
Food, drink, cosmetics and pharmaceuticals are not to be stored in, or consumed within laboratories. Chewing gum, sucking confectionary and applying cosmetics are governed by the same rules as eating and food storage.

Mugs, water bottles, cutlery, crockery and food storage containers are not to be taken into laboratories even if they no longer contain food.

No smoking is permitted anywhere in the Laboratory or in University buildings.

A lab apron or coat must be worn when you are wearing easily combustible clothing such as synthetic or light fabrics and when working with and/or transporting hazardous chemicals. Lab coats must be of sufficient length to protect the worker (ie. down to about the wearer's knees) and have long sleeves.

Laboratory coats must be removed outside the laboratory eg. the tea room, stores, media, toilets, library, office areas, etc.

Safety glasses must be worn for all hazardous activities in the laboratory such as handling corrosive or toxic liquids, ultra-violet light, liquid nitrogen, unless a risk assessment for that specific activity shows that the risks associated with not wearing them are acceptable.

Goggles or other special eye protection must be worn by those who already wear prescription glasses.

If your eyes come into contact with acid, alkali, abrasive or otherwise irritating substances, first rinse your eyes with sterile isotonic saline, then wash them with flowing water from a sink or eyewash station for at least 15 minutes. Seek medical attention immediately.

Footwear that completely covers the feet is required, because of the danger of broken glass and the possibility of chemical spills.

Rubber or disposable gloves should be worn when handling/working with:

- human blood or other body fluids
- dangerous chemicals
- infectious, or potentially infectious materials
- U/V light boxes
- radio isotopes

Disposable laboratory gloves are not to be worn in communal areas. Door handles, telephones, computer keyboards and computer mice (except in clearly labelled circumstances), lift buttons, etc. are not to be touched with gloves.

Check all pipettes are functioning properly and are accurately disposing the required volume. If the pipettes are more than 5% off then take them to Technical staff for recalibration.

Be careful with the equipment. The majority of the equipment in the laboratory is extremely expensive and can be easily broken. Always make sure you are shown how to use an apparatus BEFORE you use it.

Clean scales. Always clean the weighing scales BEFORE and AFTER use.
All gas cylinders should be secured and never left free standing.

## 7.4 Chemical Hazards

All personal protection equipment is kept next to the main entry of the Exercise Biochemistry Laboratory as well as a list of the equipment.

Know the location of fire extinguishers, fire blankets, safety showers and fire alarms. In addition, you need to know the location of MSDS (please see next section for more detailed information) and how to access and use them. All laboratory staff and students should know:

1. the hazards of a chemical as stated in the Management Safety Data Sheet (MSDS) and other appropriate references pertaining to that chemical
2. the location and proper use of emergency equipment
3. how and where to properly store chemicals when not in use
4. the proper method for transporting chemicals within the department
5. the appropriate procedures for emergencies, including evacuation routes, spill cleanup procedures and proper waste disposal.

If you don’t know, ask your Academic Supervisor.

Prior to using any hazardous chemicals all laboratory users must consult the relevant MSDS included in the MSDS file or download it if it isn’t in the file and add it to the MSDS file. These precautions will ensure lab users are aware of what to do in the event of an emergency involving those chemicals.

MSDS should be consulted to ensure all chemicals are stored in compatible containers.

MSDS should be consulted to ensure chemicals compatibility in the storage area. This information is provided in the MSDS file.

MSDS should be consulted to ensure the appropriate protective equipment (glove, glasses, lab coats) are used in accordance with MSDS requirements.

All solutions must be properly labelled, even if not hazardous by providing the following information:

- Hazard label if required
- Detailed description of the reagents found in the solution, with all hazardous chemicals underlined and concentrations listed
- Date when the solution was prepared
- Name of the person who made the solution

### Health Risk Information and Material Safety Data Sheets (MSDS)

All laboratory staff should know where to obtain information about the potential hazards of the chemicals they are using. This includes reading labels on bottles of chemicals, reading all documents that are shipped with the chemicals, reading the supplier’s catalogue, and seeking information from senior laboratory personnel.

Published reference Material Safety Data Sheets (MSDS) are available in the MSDS folder as well as from ChemAlert, the supplier and from a number of websites.

Staff MUST also ask for a Material Safety Data Sheet when any new chemicals are ordered. The MSDS must be kept on file in the laboratory where the chemical is going to
be used. This MSDS must not be older than 5 years (by the date on the MSDS, not the date it was obtained). The MSDS must be from the manufacturer/supplier that actually manufactured/supplied the chemical or product, and must refer to Australian legislation.

A MSDS should be added to the MSDS file for the purchase of any non-listed chemicals.

The Laboratory Supervisor should be consulted if staff require information/advice regarding chemical handling, storage, hazards, etc.

Paper copies of MSDS are kept next to the door in the Exercise Biochemistry Laboratory for hazardous chemicals.

ChemAlert is the University’s chemical management and database system. You can access MSDS information. Other useful MSDS sites are:

- **APS Chemicals.** Formerly APS Ajax. A good source of Australian MSDS. Click on "Online MSDS" at bottom of page. Requires registration and password.
- **Sigma-Aldrich-Fluka.** An American site for all their products and associated companies. Requires registration and password.
- **Merck MSDSs.** Available in Worksafe format. Click on "Support", then "Material Safety Data Sheets ".
- **BOC Gases** Australian formatted MSDS for their products and Mathieson products. Click on "Safety" then on "Safety Data Sheets".
- **MP Biomedicals** Formerly ICN, an American site with a wide range of chemicals. Click on "Technical" then "MSDS".
- **Chem Supply** An alternative Australian site. Look up product in "Catalogue" and click on MSDS sheet information.
- **CCINFO** Canadian searchable databases for free (if you have University of Melbourne web address).
- **MSDSOnline** An American site with lots of links.
- **Cornell University** MSDS database.
- **SIRI** (Safety Information Resources Inc).

**Storage of chemicals in fume cupboards is prohibited.**

In case a chemical spills on your body or clothing, wash the affected area with large quantities of running water for 15 minutes. Remove clothing that has been wet by chemicals to prevent further reaction with the skin.

Promptly clean all chemical spills and properly dispose of any spilt chemicals and cleanup the lab area.

Properly label and store all chemicals and equipment. All chemicals (including solutions and chemicals transferred from their original containers) should be labelled with their names, concentrations and hazards as well as the date and the experimenter’s name.

In addition, since many chemicals are absorbed through the skin, avoid direct skin contact. If you suspect skin contact with chemical substances such as bottled reagents, wash off these substances with large quantities of water. Wash your hands thoroughly with soap and water before leaving the laboratory. In addition, do not store or handle food or beverages in laboratory areas, including refrigerators used for chemical storage.

Report all injuries to your supervisor at once. Except for very superficial injuries, you will be required to get medical treatment for cuts, burns, or fume inhalation (see emergency procedures).
Avoid deliberately and directly breathing fumes of any kind. You should work in a chemical fume hood if there is the possibility that noxious or poisonous vapours may be produced.

Don’t use mouth suction to fill pipettes with water or chemical reagents, aqueous or organic. Always use a suction device provided.

Confine long hair and loose clothing in the lab, since either can catch fire or be chemically contaminated.

Keep your work area neat at all times. Clean up spills and broken glass immediately.

Clutter not only will slow your work but it leads to accidents. Clean your workspace, including wiping the surface and putting away all chemicals and equipment.

Be careful when heating liquids. Flammable liquids such as ethers, hydrocarbons, alcohols, acetone, and carbon disulfide must not be heated over an open flame.

Always carefully and slowly pour acids into water when mixing to avoid spattering.

Do not force a rubber stopper onto glass tubing or thermometers. Lubricate the tubing and the stopper with glycerol or water. Use paper or cloth toweling to protect your hands. Grasp the glass close to the stopper.

Dispose of excess liquid reagents by flushing small quantities down the sink. Discuss with your supervisor about disposing of large quantities.

Dispose of solids in approved containers. Do not return reagents to their original containers.

Properly label and store all chemicals and equipment. All chemicals (including solutions and chemicals transferred from their original containers) should be labelled with their names, concentrations and hazards.

Liquid Nitrogen Handling Procedures

Liquid N\textsubscript{2} is obtained from Physics, but can only be collected by walking there with one of our canisters and a trolley (see Technical staff). You can no longer drive there to pick it up as it is not permitted to transport liquid N\textsubscript{2} in a vehicle unless it is specifically designed for this purpose.

Use thick protective gloves when handling liquid N\textsubscript{2} to prevent burns.

Do not block access to emergency equipment or exits.

All chemicals & wastes should be placed in their proper storage area at the end of the day.

Glassware:
- Do not use broken, chipped, or cracked glassware.
- Clean all glassware after use.
- Don't pick up broken glassware with your bare hands. Use gloves/sweep it up.
- Deposit broken glass in a “Broken Glass Safety Box.”

Handle hot glassware with proper size and type of tongs or hot mitts.

Animal Handling Procedures
Experiments with animals must comply with UWA, State and Federal guidelines for the care and use of animals for scientific research. See “Handling and Disposal of Animals” included as an Appendix to this manual.

Radioisotope Handling Procedures (see section 7.7 for more information)
Experiments using radioactive material must comply with UWA and government guidelines for this type of research.

For further information, go to www.safety.uwa.edu.au/policies and see the Appendices.

Any experimental work involving DEXA scanning requires the person performing the scans to be a TRAINED OPERATOR, having taken a UWA radiation protection course and then being adequately trained in the operation of the scanner. There are NO EXCEPTIONS to this. See Professor Tim Ackland for further details.

Poisons Permit

The School holds a permit to purchase or obtain poisons or controlled substances for industrial, educational, advisory or research purposes. Professor Paul Fournier has a copy of our Poisons Permit.

Poison Control Plan

Each workgroup is required to document their Poisons Control Plan (PCP). The PCP must be reviewed annually prior to the annual renewal of the permit.

One copy must be filed in the clearly labelled MSDS folder in the laboratory area.

Chemical Inventory of hazardous chemicals

The Exercise biochemistry Laboratory keeps a chemical inventory of hazardous chemicals in its MSDS file (list of chemicals) that provides the following information:

- Name or product
- Pack size of how much is left
- Location (shelf, fridge, freezer, desiccator, etc)

Hazard Symbols and Notation

Hazardous chemicals are labelled with codes and symbols indicating potential health and safety risks. These may take the form of a symbol/pictogram (eg. hazard diamonds), or as (in small letters on the label) R and S codes, meaning risk and safety phrases. The meaning of the symbol/pictogram warnings are given below.

The absence of a warning on a label must not be interpreted that the substance can be used or handled without risk.
Toxic and Corrosive Chemicals

Toxic chemicals can enter the body by three routes:

- by ingestion through the mouth
- by inhalation through the lungs
- by absorption through the skin or via cuts or abrasions

Chemicals can exert toxic affects in a variety of ways. For example:

- by acute poisoning (ie. producing rapid deleterious affects immediately following ingestion)
- by producing chronic cumulative damage to tissues and organs after repeated exposure
- by sensitising some individuals to produce allergic reactions
- by acting in more insidious ways (eg. as carcinogens, mutagens or teratogens)
- by causing chemical burns and tissue destruction, which may be further complicated by the systemic toxic affects of substances like acids, alkalis and toxins

Remember that The use of appropriate equipment and handling techniques, backed up by wearing protective clothing (including gloves and safety glasses) is required for all toxic and corrosive materials.

Flammable Chemicals

This broad heading covers any chemical that will burn in the presence of oxygen and an ignition source (spontaneously combustible substances do not require an ignition source, and must be handled only by fully trained staff). However, the volatile chemicals, which have a low flash point, present the greatest risk.

The flashpoint is the temperature at which there is sufficient amount of vapour from the chemical to be ignited by a spark. For example, the flashpoint of diethyl ether is 40°C, acetone is 20°C, ethanol is 9°C and glacial acetic acid is 40°C. Special caution to avoid exposure to naked flames and spark sources must be taken when handling all liquids with
flash points at or below room temperatures. Remember that sparking is common in electrical switches, motors, refrigerators, etc.

Volatile flammables should always be handled in fume cupboards, away from electrical equipment and naked flames. Volatile flammables must be sealed and stored in the specially provided solvent cupboards. Large stocks (> 4 litres) MUST NOT be held in laboratory areas.

Heating and distilling flammable solvents requires special procedures and training. Do not carry out such operations in the Exercise Biochemistry Laboratory without approval from the Laboratory Supervisor. These procedures should be carried out in a fume hood, well away from any other work being done in the laboratory.

Naked flames (eg. bunsen burner) MUST NOT be used anywhere in the laboratory.

**NOTE: LIQUIDS WITH FLASH POINTS BELOW 10ºC MUST NOT BE STORED IN REFRIGERATORS, FREEZERS OR COLD ROOMS. THERE IS A REAL RISK OF FIRE AND EXPLOSION AS THESE ITEMS OF EQUIPMENT ARE NOT SPARK PROOF.**

**Reactive Chemicals**

Many chemical reactions produce large amounts of energy in the form of heat. If these reactions are not carried out under controlled conditions, they can result in explosions, vigorous splattering of material and ignition and/or evolution of possibly toxic gases. Examples, reactions between concentrated acids and bases, reactions between oxidising and reducing agents and some hydrations (eg. adding water to sodium, adding water to hydrides, mixing concentrated sulphuric acid with water or dissolving sodium hydroxide).

Inexperienced workers must be trained and supervised in the correct use of potentially reactive chemicals. See the next section for more details.

**Guidelines for Handling Chemicals**

1. Treat all chemicals as potentially harmful.
2. Note hazard warnings displayed on labels and read any literature supplied by the manufacturer eg. Material Safety Data Sheets.
3. The handling of volatile or highly toxic chemicals (particularly in situations likely to produce aerosols or fine powders) must be carried out in a fume hood.
4. When toxic or corrosive chemicals are being used, wear appropriate protective clothing, a laboratory coat, gloves and safety glasses. NOTE: Some organic solvents can penetrate rubber and/or plastic gloves. Therefore solvent proof chemical gloves may be required.
5. Learn first aid procedures relevant to the chemicals being used and know the location of safety equipment, safety showers, eye washes, spill clean-up kits and fire blankets. If you get chemicals in your eye, wash the eye with copious
amounts of water over a period of at least 15 minutes. Do not delay, every second counts! Hold the eye open or get a colleague to do this. Seek medical advice immediately.

6. Label all reagents clearly and identify special hazards. Labelling diamonds are obtainable from the stores.

7. Carcinogenic or highly toxic chemicals should be stored in sealed double containers in the lockable "poisons cabinet" in the laboratory. The outer container should be of an unbreakable material (eg. plastic or tin) and both containers should be fully labelled with the name of the chemical and the associated risk. Exceptions are chemicals that are corrosive, flammable or a gas, which should be stored in appropriate conditions (see Laboratory Supervisor).

8. Do not store corrosive chemicals at or above eye height nor on the floor where they may be knocked (eg. by cleaners).

9. Do not store strongly interacting chemicals next to each other. For example concentrated acids should be stored away from strong bases, oxidising agents should be stored away from reducing agents etc. chemicals that react to release toxic gases should also be stored separately. See below for more details.

10. Do not hold large stocks of flammable solvents in laboratory areas. Laboratory stocks should be kept in the specially provided metal solvent cupboards. Don’t store volatile solvents in refrigerators, freezers or cold rooms. NOTE: Solvent cupboards must not be used for storage of concentrated acids.

11. Dilution of strong acids: Acid into water (A comes before W). Putting water into strong acid may result in a violent explosion with splashing of acid.

12. Use Winchester carriers for transporting >1 litre bottles of solvents or corrosive liquids.

13. Clean-up all chemical spills immediately, using decontamination procedures where appropriate.

14. Never pipette by mouth. Always use a suction pump, aspirator bulb or safety pipette.

Additional Guidelines for High Risk Chemicals

Examples of high risk chemicals that may be used in the School are given below. Approval to conduct experiments involving such chemicals must be obtained from the Laboratory Supervisor.

The purchase, storage, dispensing and disposing of such chemicals may also require special care. See the Laboratory Supervisor if you are unsure of any procedure that may be your responsibility.

Carcinogens/mutagens/teratogens (confirmed or suspected)

There is a list of prohibited and notifiable carcinogenic substances. Check this list and comply with the notification regulations.

- Benzedrine
- Benzene
- Chemicals which bind to or modify DNA (eg. Ethidium bromide)
- Formaldehyde (paraformaldehyde)
- Glutaraldehyde

Acutely toxic (possibly fatal)

- Hydrogen cyanide - do NOT use this chemical unless you are well aware of all the safety procedures, including the provision of antidote, rescue arrangements and warning procedures
• Diisopropylfluorophosphate (DIFP)
• Dimethyl sulphate
• Cyanogen bromide
• Sodium azide
• Phenol, etc

**Chronic toxicity**

• Mercury
• Acrylamide
• Acetonitrile
• Chloroform and other chlorinated solvents, etc

**Explosion danger (depending on use)**

• Diethyl ether
• Acetone, etc

**Corrosive**

• Hydrochloric acid
• Sulphuric acid
• Nitric acid
• Sodium hydroxide
• Phenol, etc

**Incompatible Chemicals**

The following substances may react violently with one another and must be kept apart. The list, which is merely a summary of the most important examples taken from the whole array of hazardous materials, is offered as a modest contribution to safety in the laboratory.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Incompatible Chemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic Acid</td>
<td>Chromium (VI) oxide, nitric acid, alcohols, ethylene glycol, perchloric acid, peroxides, permanganates</td>
</tr>
<tr>
<td>Activated Carbon</td>
<td>Calcium hypochlorite, oxidising agents</td>
</tr>
<tr>
<td>Alkali metals</td>
<td>Water, carbon tetrachloride and other halogenated alkanes, carbon dioxide, halogens</td>
</tr>
<tr>
<td>Ammonia, laboratory gas</td>
<td>Mercury (in pressure gauges), chlorine, calcium hypochlorite, Iodine, bromine, hydrogen fluoride</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Ammonia, acetylene, butadiene, butane, methane, propane, hydrogen, petroleum benzene, benzene, powdered metals</td>
</tr>
<tr>
<td>Flammable liquids</td>
<td>Ammonium nitrate, chromium (VI) oxide, hydrogen peroxide, nitric acid, sodium peroxide, halogens</td>
</tr>
<tr>
<td>Hydrocarbons (Butane, propane, benzene etc.)</td>
<td>Fluorine, chlorine, bromine, chromium (VI) oxide, sodium peroxide</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>Copper, chromium, iron, metals and metal salts, alcohols, acetone, organic substances, aniline, nitromethane, combustible substances (solid or liquid)</td>
</tr>
<tr>
<td>Mercury</td>
<td>Acetylene, ammonia</td>
</tr>
</tbody>
</table>
Nitric acid, concentrated

Perchloric acid

Sulphuric acid

Acetic acid, aniline, chromium (VI) oxide, prussic acid, hydrogen sulphide, flammable liquids and gases

Acetic anhydride, bismuth/its alloys, alcohols, paper, wood

Potassium chlorate, potassium perchlorate, potassium permanganate

7.5 Chemical Spills

If people are directly affected or injured by the spill, address this first.

Render immediate first aid, wash off acid or base with lots of clean water or rinse out with eye wash. Emergency showers/eyewash stations are in most renovated labs. Contact first aiders or medical staff if needed.

After hours, ring Security ext 3020 or in the case of extreme UWA Emergency ext 2222.

When handling a chemical spill, a laboratory coat, gloves, safety glasses and closed in footwear MUST be worn as the minimum requirement.

Chemical spill kits are available (see below for details on their use).

Complete an incident report form and see the School Manager.

Liquid Spill

If the chemical is highly toxic or toxic fumes are released:

1. **EVACUATE IMMEDIATELY**.
2. Notify your Academic Supervisor, the School Manager/Laboratory Supervisor.
3. The Laboratory Supervisor will supervise/organise a clean-up.

If toxic fumes are not released:

1. Contain the spill by covering it with the appropriate material stored in each chemical spill kit station, located in the corridor of each floor (Green BDH cases labelled 'Spill Kit'). See below for detailed instructions on the use of these kits.
2. Place absorbent material, a towel, paper towel or "rag on a roll" over the spill to prevent it from running under appliances, cupboards, etc.
3. Notify the Laboratory Supervisor, the School Manager and your supervisor.
4. Use a broom and a mop to collect the wet material into a bag or container for disposal. Use more absorbent material or paper towel to ensure all liquid is soaked up.
5. Consult with the Laboratory Supervisor or the School Manager for the appropriate means of disposal of the waste.

Solid Spill

Most solid spills can be swept into a bag or container, which should then be sealed and labelled for disposal. Consult with the Laboratory Supervisor or the School Manager for the appropriate means of disposal.
Mercury Spill

Mercury (Hg) spills are usually derived from broken thermometers. Wearing gloves, scoop up the mercury using paper and place in a small sealable container, along with the remnants of the thermometer. Label the container “Mercury Waste” add your lab name & School, then close securely.

Chemical Spill Kits

The chemical spill kit is a removable plastic suitcase mounted on the wall next to the Exercise Biochemistry Laboratory.

1. SAFETY FIRST
   - Isolate spill area
   - Notify Lab Supervisor/School Manager
   - Wear adequate protection
     - eyes
     - hands
     - respiratory

2. IDENTIFY SPILL (use Material Safety Data Sheets, labels, etc.)
   - acid
   - caustic
   - solvent
   - other

3. SELECT CLEAN UP AGENT
   - Spill X-A for acid
   - Spill X-C for caustic
   - Spill-X-S for solvent

4. TREAT SPILL
   - encircle/cover with agent
   - mix agent into spill

5. RESTORE AREA
   - clean up
   - label
   - proper disposal

6. REFILL SPILL KIT WITH CONSUMABLES AVAILABLE FROM STORES

7. COMPLETE INCIDENT REPORT

7.6 Radioactive Hazards and Safety

Principles of Radiation Protection

The International Commission of Radiation Protection recommends:

- Avoid unnecessary personnel radiation exposures.
- Keep occupational exposures as low as possible.
- Do not exceed dose limits.

The basic tenet is ALARA - Exposure AS LOW AS REASONABLY ACHIEVABLE.

Commencing Work with Radioactive Material

Prior to commencing work with any radioactive material you are required to:
• Contact the School Radiation Safety Officer.
• Attend “Radiation Management Training” run by the University.
• Obtain a Radiation Monitoring Badge if required.
• Work to a Standard Operating Procedure that has been approved by the School Radiation Safety Officer.

**Simple Guidelines for Handling and Use of Radioactive Material**

• Familiarise yourself with the nature of the radiation emitted (alpha, beta, gamma, etc) by the isotopes and the tolerable levels of radiation permissible for both short and long term exposure. Remember distance from the radioactive source is the most effective way of reducing exposure.
• NEVER eat, drink, smoke or apply cosmetics whilst working with radioactive materials.
• NEVER mouth pipette radioactive materials up into pipettes; use a safety device.
• Work with appropriate shielding eg. Lead blocks for primary source $^{125}$I with gamma-emitters and perspex for $\beta$-emitters.
• Cover working areas with Benchcote (Polythene backed absorbent paper).
• Use plastic trays (clearly labelled) to hold your radioactive samples, pipettes, glassware, etc.
• Mop up all spillage's immediately using paper towels.
• Wear disposable rubber or polythene gloves while handling isotopes.
• Wear a film badge.
• Monitor radioactivity before and after every experiment using the hand held monitor where relevant (e.g. $^{32}$P, $^{125}$I, $^{35}$S) or random swabs (e.g. $^3$H).

The above are to serve only as guidelines. Specific precautions may be necessary with some isotopes. If you are ever in doubt, consult your supervisor before starting your experiment.

Great care must be taken when unpacking radioactive materials. Remember - any accidental breakages during transport may result in the packaging being seriously contaminated. Any equipment used with radioactive substances with a long half-life must be permanently labelled as such.

Laboratory benches and adjacent areas should be monitored on a regular basis. Spills should be reported immediately to your supervisor or the School Radiation Safety Officer.

**Internal Radiation Hazards**

Irradiation of internal organs and tissues can occur due to active materials entering the body by the following routes:

• **DIRECT SKIN IRRADIATION**
• **INHALATION**
  Depending on the particle size the material may become lodged in different areas, eg. large particles in the nose. Some elements concentrate in specific organs, eg. $^{125}$I in thyroid.
• **INGESTION**
  Usually insoluble material will pass through the gut and be excreted but soluble material will find its way to the whole body or to specific organs.
• **WOUNDS**
  This route operates in a similar way to ingestion.
Dose Limits

The School operates in accordance with the NH&MRC Code of Practice which recommends that employers introduce measures aimed at keeping exposures below 20mSv per year, averaged over 5 years with the continuing proviso that the effective dose should not exceed 50mSv in any single year.

Safety Notes

General: These notes apply to the following safety sheets for a number of different radionuclides.

Effective biological half-lives apply to the radionuclide in a simple inorganic form. If the nuclide is ingested in the form of an organic molecule which can become incorporated or absorbed by a metabolic process, the half-life in the body may be much longer. Consider tritium as an example; tritiated water has an effective biological half-life of 12 days whereas tritiated thymidine has a 190 day half-life.

Dose rates are not given for the weak gamma-emitters $^3$H, $^{14}$C and $^{35}$S because such figures are negligible in most practical circumstances. Doses from these radionuclides is only important when the active material is ingested.

Dealing with a Radioactive Spill

In the event of a spill, it is essential to minimise the spread of contamination.

- Report all spillages immediately to both your supervisor and the School Radiation Safety Officer.
- Cordon off the suspected area of contamination.
- Ascertain, if possible, the type of contamination, i.e. the nuclide(s) involved (as it may be necessary to use breathing apparatus, protective clothing or other equipment).
- Determine the area of contamination by monitoring after taking the necessary precautions.
- Starting from the outer edge, decontaminate the area in convenient sectors by wiping and scrubbing.
- Before moving on ensure that a sector is clean by monitoring.

Dispose of all radioactive waste according to the statutory requirements. Short-lived radionuclides, for example $^{32}$P, may be stored with suitable shielding and left to decay. After 4 half-lives less than 10% of the original activity remains, after 7 half-lives <1%, after 10 half-lives <0.1%.

For longer-lived radionuclides, for example $^3$H, this is impractical and alternative disposal arrangements should be made.

To minimise the dose to the extremities, tongs or other remove handling equipment should be used where appropriate.

Radiation warning signs are available from the store. Waste should be correctly stored, in lead-lined waste bins or perspex bins, in wet bags available from the store. There is a radioactive waste storage area on the ground floor where waste is stored until it can be removed. Work only in approved rooms and areas (fume cupboards etc). Avoid contaminating clean sites. Avoid using glass containers eg. centrifuge tubes where there is a possibility of breakages.
Radioactively labelled animals should be properly shielded and stored in a freezer or cold room until they have decayed to a level lower than 5mCi (or 6,000 cpm/gm of tissue) they then should be disposed of as biological waste via Medi-waste.

USE OF ISOTOPES

All radioisotope users at the University are required to have attended and passed the Unsealed Radioisotope Handling Course (3-day course) within the first year of using radioisotopes and preferably prior to starting such work. All procedures involving radioactive materials at UWA requires the user to have completed a protocol application before commencing the work. Protocol forms are available from the UWA Safety & Health Office (SHO) or from the School Radiation Safety Officer (SRSO). The forms must be completed and signed by the applicant and signed by the SRSO (thus ensuring that the appropriate school personnel are aware of the work proposed) before being sent to the SHO for a final assessment. The application is reviewed by the SHO and if approved it is signed and issued with a protocol number. Copies of the approved protocol are sent to the SRSO and the Applicant. Any changes to an agreed protocol must be approved by the SRSO and SHO. Such changes may include alterations to the procedure as submitted using larger activities or different radionuclides or performing the work in different radioisotope laboratories (which would also need to be registered).

Local Working Rules for Radioisotope Laboratory

1. **Personal conduct.** Eating, drinking, smoking and application of cosmetics in the lab are forbidden. No mouth operations are permitted. Avoid personal habits such as pen sucking or touching bare skin with potentially contaminated gloves. Always work carefully and tidily. When leaving the laboratory, monitor yourself, remove gloves, wash hands and monitor again.

2. **Laboratory preparation.** No unnecessary materials such as bags, brief cases or text books should be in the lab. Keep active and inactive areas separated and well labelled. Label all containers with the radionuclide, compound, activity, date and your name. All work with unsealed liquid radionuclides shall be carried out in a double container or over trays lined with absorbent paper to restrict the spread of any spilt liquid. The bench of the work area shall be covered with absorbent paper and the work area shall be identified with signs and/or radioactive marking tape.

3. **External radiation protection.** Arrange work so that the hands and body are kept at the maximum practicable distance from high specific activity radionuclides by the use of tongs or other handling devices. Use suitable shielding materials (such as perspex for beta radiations) wherever possible.

4. **Laboratory procedures.** Practice runs with non radioactive materials are necessary for all new procedures. Contaminated items must be well labelled.

5. **Airborne hazards.** Operations that have the potential to produce vapour, dust, spray or radioactive gas shall be carried out in a fume cupboard or a glove box.

6. **Monitoring.** A contamination monitor with suitable detection characteristics for the radiations from the radionuclides in use shall be available at each work station. Personal monitors (film badges) are not sensitive to radiations from H3, C14 and S35. When worn, monitors should be located at waist level, remain at work, be changed regularly (every two months) and submitted for assessment if known or suspected exposures or contamination has occurred.

7. **Solid wastes.** Solid radioactive wastes must be well packaged and labelled.

8. **Emergency procedures.** In the event of a spill verbally warn others, restrict unnecessary movement into and through the area, report the spill to the School Radiation Safety Officer treat contaminated personnel first and decontaminate laboratory and equipment.
1. **Personal protective equipment.** Laboratory coats, gloves and closed footwear must be worn at all times in the lab. Safety glasses should also be worn.

### Radioactive Waste Disposal Procedures

#### Liquid Radioactive Waste

- Liquid radioactive waste is best disposed of via the sewer system. Such waste may only be disposed of via flushing sinks connected to approve radioactive drains provided for this purpose.
- Ensure that the activity per flush is below the dilution concentration limit for each radionuclide.
- Organic solvents are not to be disposed of via flushing sinks.

#### Solid Radioactive Waste

- Solid waste must be sealed in a red plastic bag and placed in a cardboard radioactive waste box.
- Waste must be segregated by radionuclide and waste type unless otherwise permitted. For example, the following waste should be packaged in separate boxes:
  - radionuclide
  - animal carcasses (will be stored frozen and incinerated)
  - syringes in a sharps container (will be incinerated)
  - scintillation cocktail contained in counting tubes (may be incinerated)
- All sharps (needles & broken glass) must be enclosed in a hard container (metal tin or plastic sharps container) before being placed into waste boxes.
- An estimate of the total activity of each radionuclide must be written in the details section of each box. Only units of activity (Bq, Ci and their derivatives) are acceptable.
- **Do not** use counts per second or Bq per mL.
- Current WA Government regulations limit the activity of radionuclides in a waste box for landfill burial. Box limits for long lived radionuclides are:

<table>
<thead>
<tr>
<th>Radionuclide</th>
<th>Box Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$^3$H</td>
<td>48 MBq</td>
</tr>
<tr>
<td>$^{14}$C</td>
<td>4 MBq</td>
</tr>
<tr>
<td>$^{35}$Cl</td>
<td>2 MBq</td>
</tr>
<tr>
<td>$^{22}$Na</td>
<td>0.63 MBq</td>
</tr>
</tbody>
</table>

- Boxes should be sealed with 50 mm wide masking tape such that the box label is not obscured.
- **Do not use** *Caution - Radioactive* tape on waste boxes.
- **Ensure all wastes are labelled clearly and correctly.**

### 7.7 Blood and Spills

#### Blood Borne Diseases

Hepatitis and HIV (Human Immunodeficiency Virus) are the blood-borne viruses of greatest concern in the workplace. Special regulations apply to working with HIV and handling blood from AIDS patients.
• Hepatitis B vaccination is strongly recommended for workers handling human blood or tissues. Hepatitis B is a potentially fatal disease and is very contagious.
• The AIDS virus (HIV) affects the immune system and the majority of those infected develop other diseases which ultimately prove fatal. There is no available vaccine for HIV.
Infections with blood-borne pathogens occur through a direct route of entry e.g. cuts, burns, needle sticks, eyes.

Treat any blood or body fluids as infectious

In Case of Injury:
• If possible, have the injured person contain his/her own blood and bandage the wound him/herself.
• If serious, summon medical help and the Laboratory Supervisor and wait.
• Report all incidents involving exposure to blood or body fluids immediately to the School Manager.
• Complete an incident report form.

If you are personally involved:
• Avoid exposure to blood.
• Assess risk.
• Use infection control (gloves, goggles, respirator/mask).
• Wash hands after glove removal.
• Dispose of contaminated materials in an approved biohazard bag.
• Complete an incident report form.

In Case of Splashing with Blood:
• Wash affected area, scrub with soap and water (use eyewash if applicable).
• Wash objects and area thoroughly with bleach.
• Wear gloves while decontaminating.
• Dispose of contaminated materials in an approved biohazard bag.
• Complete an incident report form.

A) Needle and Syringe Disposal

These procedures provide guidelines for the appropriate disposal of needles and syringes used or found at the University and emergency action to be taken following a needle stick injury.

Safe Disposal of Needles and Syringes

Syringes used in Education and Research

UWA Schools are responsible for supplying sufficient and appropriate sharps containers to allow disposal of all syringes used in education and research. Schools are to ensure that syringes are disposed of by incineration at a government authorised facility. Employees, researchers and students are to place all needles and syringes in appropriate sharps containers immediately after use.
Syringes used in work with radioisotopes are to be placed in puncture proof containers within radioactive waste boxes. Syringes used in bio hazardous work are to be placed into commercial sharps containers and then into bio hazardous waste receptacles for disposal. All other syringes are to be placed in yellow sharps disposal containers.
What to do if you find a discarded needle and syringe?

Should you find a needle and syringe discarded in the laboratory or elsewhere on campus the following steps should be followed to minimise the likelihood of a needle stick injury.

2. Do not be alarmed.
3. If possible, acquire a sharps container. If one is not available a container with a well secured lid, preferably a screw top, will be appropriate. Rigid plastic containers are the best (eg. plastic milk, juice or soft drink bottles). Avoid using glass which may shatter, or an aluminium can which may be squashed.
4. Don’t touch the sharp point with your fingers or hands.
5. Pick up the used needle and syringe by the blunt end (away from the point).
6. Don’t try to put the plastic protective cover back on a needle if it has fallen off.
7. Put the needle and syringe (point first) into the container. More than one can be placed in the container but don’t overfill. Don’t carry the needle and syringe unless it is in a suitable container.
8. Make sure the container is tightly sealed.
9. Put the sealed container in a domestic rubbish bin (mobile green sulo bin) or deliver to Student Services Medical Centre at the Guild Village.

If you are uncomfortable in picking up the syringe please contact the Medical Centre on 64882118 for advice.

Needle stick injuries

Should a person suffer a needle stick injury, the following procedures should be followed.

1. Wash the area gently with soap and running tap water as soon as possible.
2. Apply an antiseptic and a clean dressing.
3. Obtain prompt medical advice from a doctor at the University's Medical Centre or an Emergency Hospital Department.
4. Place the needle in a rigid plastic container and take it with you to the doctor.
5. Complete the University’s "Confidential Incident/Injury Report Form" and contact the School Manager.

Should you become aware that discarded needles and syringes are becoming a problem within your area please report it to:

Student Services Medical Centre on 64882118
Security and UniPark on 64883020
Safety & Health Office on 64883938

Information for the above guidelines has been obtained from the "Safe Disposal of Needles and Syringes" publication produced by the Health Department of Western Australia.

7.8 Biological Hazards and Safety

Working With Biological Hazards

You are not permitted to carry out any experiments with biological materials without first assessing the risks involved and obtaining all necessary information, permits, and clearances before commencing.

- Detailed information about a wide range of infectious agents is available.
If working with human samples (e.g. blood, faeces etc) refer to this Induction manual for risks and exposure when handling human products.

Clearance and advice from the School Safety Committee should be obtained before commencing work with a new biological hazard.

Import permits are required from DAFF (Federal Department of Agriculture, Fisheries & Forests) to import biological materials from outside Australia. See School Manager if you are unsure of what to do.

Information on the containment levels required for handling different biological hazards is available in Australian Standard AS/NZS 2243.3 1995 Safety in Laboratories.

Ethics approval is required for and special NH&MRC regulations apply to animal experimentation.

7.9 Physical Hazards and Safety

Low Temperature Freezers

Insulated gloves must be worn when accessing and handling material from low temperature freezers (ie -70°C to -80°C) as direct contact with items, particularly metal objects can cause frostbite.

Dry Ice

Dry ice (solidified CO₂) has a temperature of about -60°C. Direct contact with dry ice or objects which have been in contact with it can produce frostbite to unprotected skin. Protective leather gloves must be worn during all handling procedures.

One kilogram of dry ice evaporates to give 535 litres of CO₂ gas. Thus good ventilation is required in areas where dry ice is in use, as an excess of CO₂ gas will displace the normal air leading to asphyxiation. As CO₂ is heavier than air, pockets of CO₂ can collect in enclosed low spaces.

When transporting dry ice, or items stored in dry ice, use a thermally insulated container with a loose-fitting lid. The thicker the insulation, the slower the dry ice will sublimate, ie change from solid to CO₂ gas. Do not use a completely airtight container as the sublimation of dry ice to CO₂ gas will cause any airtight container to expand and possibly rupture or explode.

Provided the dry ice is within a suitable container, transportation in an elevator should not be a problem. In a well-insulated container, dry ice does not change state very rapidly and in the event of an elevator malfunction, CO₂ emissions should not reach levels high enough to be hazardous.

NOTE: CO₂ is the body's regulator of the breathing function. It is normally present in the air at a concentration of 300 ppm by volume. Appreciable increases above this level will cause acceleration of breathing and heart rate. Concentrations in the order of 10% can cause respiratory paralysis. As the gas is odourless, colourless and tasteless, it cannot be detected by human senses. Therefore, this may happen without warning.

Ultraviolet Light

The wavelengths of ultraviolet light used either for germicidal action (eg. in laminar flow and biohazard units) or visualisation of DNA (eg. trans illuminators) are extremely...
damaging to the eyes, and prolonged exposure can also produce dangerous "sunburning" of the skin.

For this reason biohazard units are fitted with safety interlock switches to ensure that the UV lamp is off when the visible light and fans are on. Biohazard units are also provided with "night covers", which should be fitted to close off the work face opening when the UV lamp is in operation. The safety glasses supplied by the School provide full screening of the eyes from UV light but full UV absorbing face masks and gloves should be worn when you are working at a trans illuminator.

**Electrical Faults**

Repairs or modifications to apparatus or equipment should only be undertaken by a qualified tradesman. Cracked plugs, frayed leads or faulty insulation should be replaced by a suitably qualified electrical tradesman. Any faulty equipment should be immediately tagged out using the guidelines in the School Tag Out (Danger Tag) Procedure. Report any electrical faults to the Electronics Technician and complete an equipment repair form so that the item can be repaired or replaced. The use of double adaptors is prohibited. Power boards are a more practical and safe method of using single power points (with trip switches).

Never touch electrical equipment with wet hands or whilst standing on a wet surface.

**7.10 Waste Disposal**

**School Policy**

Waste minimization and segregation must be continually practiced. It is important to be mindful of financial and environmental considerations when deciding how to dispose of your waste - the more harmful the waste, the greater the monetary and environmental costs to dispose of it. Waste should be segregated so that only substances that really need to will take up these valuable resources. It is just as important to be mindful of environmental contamination and ensure that harmful substances are disposed of properly. Time spent segregating waste will save the School money and will reduce your impact on the environment.

**Types of Waste**

Hazardous wastes can be divided into a number of broad categories:

- **Sharps Waste**
- **Chemical wastes** – Scheduled Drugs and Poisons, Cytotoxic, Solvents, Non-Hazardous, Hazardous, Empty Containers
- **Biological wastes**
- **Radioactive wastes**
- **Pipette Tips**

Each poses particular waste disposal problems. Staff, who are embarking on new projects or developing new experimental procedures, should first consult their supervisor.
The University disposal company will not remove improperly packaged and labelled wastes. Therefore such packages will not be accepted at the various holding centres around the University. It is very important that staff who either: generate hazardous wastes or are responsible for waste disposal procedures within the School are aware of these requirements. Incorrectly labelled materials will remain in the School and every effort will be made to identify the work group responsible. The appropriate labels and containers can be obtained from the School Stores.

**Sharps**

All sharps (needles, lancets, scalpels etc) must be deposited into sharps containers! These are yellow containers with black seal down lids which come in various sizes and are available from the store. Do not fill these containers above the line on the side. Lids should be taped down. No other waste should be placed in these containers!

When full, the sharps container is to be placed into the large Medi-Collect bin for removal from the lab.

**Biological (Soiled) Waste**

All (non-sharp) items that have blood, tissue, saliva or sweat on or in them are to be placed into plastic bags marked for “Biological Waste”. This includes vacutainers, soiled tissues and swabs, used alcohol wipes, syringes etc. Unsoiled paper waste, such as tissue boxes, alcohol swab covers, etc must not be placed in these bags.

When full (or finished for the day) a biological waste bag should be clearly labelled with the appropriate sticker, firmly sealed and placed in the large Medi-Collect bin for removal from the lab.

**Paper and General (Unsoiled) Waste**

Other than sharps or soiled waste, all other paper and general waste that is unsoiled must be placed into a general waste bin. DON’T mix this type of rubbish with biological waste.

General waste bins will be emptied by the cleaners.

**7.11 Handling and Disposal of Animals**

**Animal handling**

All procedures on animals must comply with the Western Australia State regulations and the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes.

All procedures on animals must be approved by the Animal Ethics Committee (AEC) of The University of Western Australia (UWA). Any animal experimenter who wishes to use animals must have a current AEC approval for the research project to be carried out.

All animal users must have received formal training in animal handling and experimentation that is approved by the AEC. In the absence of such training, one must enrol in the Programme in Animal Welfare, Ethics and Science (PAWS) course offered at UWA.
All animal users (with the exception of Honours students under direct supervision) must hold a current Vivisection License from the Government of Western Australia.

All animals must be purchased through the Animal Care Unit of UWA.

No animal should be kept permanently in the School of Sport Science at UWA. Only short duration holding (less than three days) is allowed.

All animals should be held and experiments should be performed in the Animal Experimentation Room located in the Exercise Biochemistry Laboratory of the School of Sport Science, with the fume hood switched on to maintain adequate ventilation.

**Carcass disposal**

The animals should be killed by anaesthetic overdose and cardiac excision should be performed on the carcass prior to its disposal.

All carcasses and other biological materials should be double-bagged and only temporarily stored (less than 48 hours) in the freezers of the Exercise Biochemistry Laboratory at the School of Sport Science prior to being disposed of at the Animal Facility Unit on the Crawley Campus, UWA.

Radioactive carcasses should be stored and disposed of in accordance with Radiation Protection Office Guidelines.

The animal holding cages must be kept clean and stored away after usage.

**Contact details**

For more information on any of the issues raised above, please contact Professor Paul Fournier (64881356) or the AEC Secretary, Research Enterprises, Registrar’s Office, UWA.

### 7.12 Risk Assessments

Procedures that are hazardous or could cause harm to the health and safety of people carrying out the task or to people knowingly or unknowingly exposed to the hazard must have the risk associated with the procedure assessed. Guidelines on risk assessment are available from the University.

**NOTE:** Risk assessments are tools to allow you to formulate appropriate procedures, and this is their intended purpose. Use them to identify the level of risk associated with a process or piece of equipment, then see if you can eliminate, substitute or modify the procedures to reduce the risk.

A risk assessment can be completed with the following guidelines:

- The risk assessment process is designed to make you think about the procedures being assessed.
- The assessment is made based on the judgment of the people carrying out the assessment and these people should have competence and experience in the procedures being assessed and have access to and understand the protocols/SOPs that apply to that procedure.
- The values do not have to be those listed; they could lie between.
- Read across from the risk score column to determine what control measures are appropriate.
- Once the control measures are decided on, the risk assessment process will have to be repeated, taking the modified protocols.
- For the School, we understand the activity as the procedure and the identified hazards as the different hazards that are associated with that procedure. An example of an activity is the use of a centrifuge. Injury risks associated with improper use and hearing damage due to noise are two possible hazards that might be identified.
- Some translations used in our School (these are for guidance only):
  - Exposure: Continuously (8 hours/day, 5 days/week), Frequently (daily), Occasionally (<1/day, weekly), Infrequently (<1/week, monthly), Rarely (<1/month, yearly)
  - Consequences: Catastrophic (multiple deaths and serious injuries), Major (a death or serious injury), Moderate (an injury requiring days of treatment and recovery), Minor (an injury requiring hours of treatment or recovery), Insignificant (no real consequences).
- Note that you can use numbers between those suggested on the form, and that your assessment of likelihood should be based on the safety precautions and protective equipment being used.

Risk assessments should be reviewed every 3 years or when the activity changes.

7.13 Equipment Item – Standard Operating Procedures (SOPs)

Prior to using any equipment item in the Exercise Biochemistry Laboratory, students are required to consult the standard operating procedure sheet for that equipment.

A standard operating procedure sheet if available for the following equipment:

- pH meter
- Scale
- Microcentrifuge
- Spectrophotometer
- Pipette
- Micro tube heater

Additional training provided by the Lab Supervisor Professor P. Fournier is required for the following equipment:

- Flurometer
- Gel documentation system
- Electrophoresis equipment
- Hind quarter perfusion system
- Anaesthetic vaporiser
- IKA homogenizers