MRC Weatherall Institute of Molecular Medicine

SAFETY MANUAL

Additional information for laboratory workers

22/10/2022

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1. Introduction: Safety is everybody's business

The aim of this manual is to provide information regarding the hazards that exist in research laboratories. This is in addition to the information provided in the Safety Manual for all staff. The laboratories in the WIMM have been built to Containment Level 2 or higher. Depending upon the nature of the work they may only be being used at Containment Level 1. There are additional rules for those working in Containment Level 3 laboratories.

If there is anything you do not understand or isn't clear, ask your laboratory safety supervisor or the departmental safety officers. If you find anything that is broken or dangerous report it to your laboratory manager immediately.

In each laboratory there is a red safety file. Supervisors are responsible for making certain all the paperwork in these files is current.

- **COSHH** - The red safety file contains a copy of this manual, the Safety Manual for all staff and visitors that includes the MRC Weatherall Institute of Molecular Medicine Statement Safety Organization that includes a list of safety committee members, safety advisers and safety representatives. This file also contains risk assessments made under the general requirements of the Management of Health and Safety at Work Regulations. These include specific risk assessments under Control of Substances Hazardous to Health (COSHH) and Display Screen Equipment (DSE). Risk assessments should always be made before any work is undertaken. Everyone has a duty to update these documents and keep them current. A worked example and a blank can be found in Appendix 1. The current WIMM Statement of Safety Organisation and the two safety handbooks are available electronically from the WIMM website.
- **GM** - The red safety file also contains copies of the Genetic Modification (GM) risk assessments. Before working with any genetically modified organism you must check that the appropriate risk assessment has been completed and approved (see section 7.4 for further details).
- **WIMM Tissue Reference Handbook** – This white file is relevant to groups working with human tissue.
- **Radioactivity** - The yellow file containing the approved risk assessments and protocols for working with radioactivity is found in the individual radiation suites. Before you start to work with radioactivity you must have received the necessary training (See section 7.5).

The information in this handbook is based on the relevant University Policy Statements (UPSs) which can be found on the following website

www.admin.ox.ac.uk/safety

The Safety Office provide a number of training courses as well as holding a series of lectures on specific safety matters. See Appendix 2 for further details.

2. Safety Equipment to be held in each laboratory

The following equipment should be commonly available in each laboratory as appropriate to the work being carried out:

Laboratory coats

- White laboratory coats are issued to new members of staff. These will have the user's name, department and room number on them. Please be aware that the labelling process can take time. Coloured laboratory coats can be requested by those doing tissue culture. Please see your laboratory manager if these are required.

- Visitor's laboratory coats are available from the cupboard near the Link Door on the middle floor of the white building.
- Dirty laboratory coats-please empty the pockets and place in the cage for dirty laboratory coats near the Link Door.

Safety specs
Disposable gloves (non-powdered nitrile gloves should be used in preference to non-powdered latex gloves)
Gloves (heat resistant) (where appropriate)
Gloves (Cryo) - (where appropriate)
Face shields (UV/impact resistant) (where appropriate)
Sharps bins (disposal of needles, scalpel blades and other sharps)

All laboratories have access to a spillage kit – make sure you know where it is, how to use the contents and how to dispose of the waste. The spill kits are located by each ice machine and outside the WIMM Liquid Nitrogen Facility. In an emergency the yellow "sharps" bin can be used as a container for solid chemical waste. If in doubt contact Malcolm Shepherd the WIMM Waste Disposal Officer.

3. Safety in Laboratories

3.1 General

These guidelines with the Laboratory Rules form part of Good Laboratory Practice (GLP).
Eating, drinking, smoking, carrying uncovered food, taking medication (including the use of asthma inhalers), mouth pipetting and applying cosmetics in the laboratories is forbidden. Do not lick labels. Long hair must be kept tied back to prevent it becoming entangled in equipment, from becoming contaminated or catching fire. Always wear a fully fastened lab coat and any personal protective equipment stipulated in the risk assessment. Eye protection is mandatory if performing wet laboratory work in a Containment Laboratory in the WIMM (See UPS S5/09).

External outdoor clothing, such as jackets and coats, should not be stored or worn within the laboratory area. You want to avoid the possibility of contaminating outdoor clothing with chemicals or any biological agent. This measure will also ensure that contamination, whether chemical or biological is not carried home on your outdoor clothing. Corridors and walkways within rooms should be kept free from obstruction. You should not store bags on the floor by your feet. Lockers are provided for laboratory workers for storing personal items. Again, personal items brought into and used in the laboratory risk becoming contaminated. It is strongly recommended that bags and rucksacks are not brought into the laboratory and kept on the floor, where they could become contaminated if there was a spill.

Cover all cuts when working in the laboratory. A box of plasters (Band aids) can be found above the first aid box by the hand wash station in each laboratory. Have all cuts and burns, however minor, attended to by a first aid officer. Protective injections may be considered necessary depending on the cause of the injury. Advice can be sought from Occupational Health. The flow chart explaining what to do in the case of a needle-stick injury, puncture wound or animal bite is posted by the wash-hand basins throughout the WIMM. Essentially, if infectious agents could possibly have entered an open wound, or the eye, it is ESSENTIAL to contact Occupational Health or, if out of hours, the on-call microbiologist at the John Radcliffe Hospital in order to seek professional advice, even having flushed the wound under running water.

When leaving the laboratory areas always remove your laboratory coat and wash your hands. Those working in the washing up areas should have access to emollient creams in order to replace the moisture in their hands.

Avoid cluttering up laboratory benches. There should be a clear demarcation between office areas (clean) and bench work areas (potentially contaminated). Work areas and equipment should be cleaned after use. If there is a need to use benches for both types of work then the area should be decontaminated between activities.

Ensure that all bottles, flasks, etc. are clearly labelled with the contents, your initials and the date. Any containers containing waste such as ethanol supernatants or flow through from a column should be labelled such that if they are accidentally knocked over the spill can be dealt with safely. Flasks and bottles should never be carried by the neck alone but should also be supported from beneath or carried in a carrier or on a trolley. Samples stored in fridges and freezers must be in secure containers or if in flip-top Eppendorf type tubes, must be in suitable secondary containers.

Mop up all spilled liquids immediately as wet floors are EXTREMELY DANGEROUS. All Winchesters (2.5l bottles) should be transported in a wire basket or other suitable container. Do not store on high shelves or on the floor. Bottles of any description should not be stored on the floor.

Never use defective glassware; throw it away in the green wheelie bins that are located in the corridors on the laboratory floors. Pyrex cannot be recycled and must be placed into a sharps bin. Always rinse glassware thoroughly before placing in the plastic bins for washing up. Also, re-cycle tip boxes and plastic ware by placing them in the plastic waste bins. The bins have a clear/opaque liner.

Movement within the laboratory environment should be careful and purposeful, avoid running and other rapid movements that could harm others, or provoke spills, or loss of material, or damage to equipment.

The use of radios in laboratories and other areas, whilst not prohibited, should be discouraged as it can compromise communication or reduce the audibility of alarms. The use of personal music players or phones with headphones/ear buds within Containment Laboratories and corridors is prohibited.

Mobile phones can be used only in non-containment areas, office space, or clean write up areas. They must not be used at the laboratory bench. Do not charge mobile phones on open benches. You do not want to risk contaminating mobile phones with any biological or chemical. Departmental phones in Containment Level 1 and 2 laboratories must not become contaminated through the use of gloved, unwashed or otherwise potentially contaminated hands.

3.2 Personal Protective Clothing (PPE)

You should ensure that you fully understand the use and upkeep of the protective clothing and other safety aids that are provided in the laboratory. PPE should only be worn within the work area and should not normally be worn in public areas. PPE must not be worn where any food or drink is being consumed or in offices. Suitable footwear must be worn at all times in the laboratory area. This is regarded as low heeled, closed toe footwear made of a suitable material e.g. leather. Open-toed sandals, flip-flops, beach shoes are not suitable footwear in any laboratory area and must not be worn. Specialised footwear may also be required for example, in machine workshops, stores, dispensing cryogenic liquids, cold rooms or catering facilities. The risk assessment will determine the need for special footwear e.g. re-enforced toe, non-slip sole, chemical resistant.

Where a risk assessment identifies the need for PPE, then the correct type must be determined, assessed for suitability and compatibility and the users must be trained in its use, storage and maintenance. The PPE must then be used, stored and maintained properly.

Failure to comply with the wearing of appropriate PPE will result in a report being made to the WIMM Safety Officers. These remain on record for 1 year. If a group receives 3 separate active reports, the entire group and PI, will have to attend a WIMM Health and Safety training session.

3.2.1 Laboratory Coats:

All staff and visitors working in laboratory areas are required to wear laboratory coats, which should be side or back fastening, fully fastened. Items such as neckties or scarves should be secured inside the lab coat. Coats should be cleaned regularly. Dirty laboratory coats should be sealed in a red alginate bag and placed in the area designated by your lab manager. Clean laboratory coats are returned to laboratories by the autoclave staff. Laboratory coats are provided for your protection in the laboratory. In the case of chemical spillages, radiological, or biological contamination, the laboratory coat will be the primary barrier. For this reason, it is important the laboratory coats are worn when performing wet work in the laboratory. Dedicated laboratory coats must be used for particular tasks. Do not wear the same laboratory coat for handling microorganisms (bacteria and yeast) and working in a tissue culture suite. You should remove your laboratory coat immediately if you spill anything hazardous on it. The laboratory coat should be autoclaved before washing if it is contaminated with hazard group 2 or 3 biological agents or equivalent classes of genetically modified agents. Visitor's laboratory coats are located in a metal wardrobe on the middle floor near to the link door.

3.2.2 Gloves:

The need for protective gloves will be determined by the risk assessment.

Disposable powdered latex gloves must not be used; preferably disposable non-latex gloves must be used unless there is a risk assessment in place justifying the use of non-powdered latex gloves. Nitrile gloves are preferred.

Protective gloves must be worn when handling substances likely to cause injury e.g. glass tubing. When pushing a rubber teat onto a pipette, ensure that the sizes are compatible and hold the pipette close to the teat to avoid breakages. Use plastic Pastettes in preference to glass Pasteur pipettes. If there is a need to use glass Pasteur pipettes this should be justified in a risk assessment.

Heat resistant gloves must be worn when handling very hot material and cryogenic gloves when handling excessively cold material e.g. from -80ºC freezers or from liquid nitrogen.

Chemical resistant gloves are available since PVC gloves are permeable to many organic solvents such as acetone and ethanol etc.

Obtain advice from the WIMM Safety Officer if in doubt.

When moving between laboratories ensure removal of one glove to prevent contamination of doors etc. Gloved hands must not be used to open doors, press lift call buttons, telephones or any other communal equipment that would normally be considered clean by other members of staff. It is recognised that some tasks such as PCR it may be necessary to wear gloves to protect your experiment from environmental contamination. Equally, certain keyboards used to control equipment, such as those controlling the UV cameras in the darkrooms and the Nanodrop, will be used by operators wearing gloves and this fact should be indicated on the equipment. IT staff have the right to refuse to repair or examine equipment with keyboards that they believe to be contaminated in any way.

3.2.3 Safety Spectacles and face shields:

These must be worn whenever there is a risk of substances or materials splashing in the eyes. It is now mandatory to wear eye protection if doing wet work in any containment laboratory in

the WIMM (UPS S5/09). If a worker normally wears spectacles then the host department is expected to provide them with prescription safety spectacles. This applies to all staff and students working in containment level laboratories. Visitors who would normally wear prescription spectacles would be expected to wear over specs. Safety spectacles must be stored safely when not in use so that they do not get scratched and damaged. Safety spectacles designed to be used in the laser laboratories where open lasers can take place must not be used if damaged or scratched. When not in use they must be stored safely.

Special UV light face-shields, identified as such, must be worn when UV light sources are being used. See also section 10.1 for information about laser eye safety. Do not use UV spectacles, as these do not protect the rest of your face. Also ensure wrists are well covered by wearing a fully fastened laboratory coat with a suitable cuff length.

When retrieving samples from a cryostore you must wear the full-face shield, identified as such, provided together with eye-protection. These face shields do not provide protection against UV.

The suitability of wearing contact lenses for certain tasks should not be forgotten when eye protection is being considered as they can hinder flushing contaminants from the eye.

3.2.4 Respiratory equipment

Use of respiratory protective equipment must be decided by risk assessment and must be suitable for the purpose. Disposable respiratory protective equipment must not be re-used. If the risk assessment recommends that respiratory protective equipment should be worn to protect from exposure to airborne hazards then this should be face-fit tested to the user by the Divisional Safety Officer. Each worker should be provided with his/her own respiratory protective equipment.

3.2.5 Other PPE

The need for other personal protective measures, such as ear defenders or hard hats, is determined by the risk assessment. Although the sonicators are enclosed, some people find the noise levels irritating so ear defenders are provided for these users.

3.3 Pregnancy

Further to the statements in the ‘Safety Manual for all staff and visitors’ there are particular aspects to consider for pregnant women working in the laboratories. Ergonomics, such as the use of computing equipment and manual handling issues all need to be considered during and immediately after pregnancy. If you are pregnant, your line manager should arrange for a risk assessment to be carried out by the WIMM Safety Officer.

Pregnant women must seek advice about handling:

1. Carcinogens, mutagens, teratogens
2. Volatile solvents
3. Radioactivity

Pregnant women working with pathogens may wish to seek reassurance but there should be no exposure of any lab worker to such agents under normal working circumstances.

This advice will be given in writing and if objected to by the worker, this fact would be made known to the Safety Committee. Where necessary a pregnant member of staff will be offered transfer to other work. The WIMM Safety Officer, WIMM Biological Safety Officer, the WIMM Senior Radiation Protection Supervisor or their deputies are always available to give advice on safety matters, if in doubt consult them.

3.4 Special needs

Further to the statements in the 'Safety Manual for all staff and visitors' there are particular aspects to consider for people with special needs working in the laboratories. These may be temporary or permanent needs. These may include mobility and hearing issues. Specific risk assessments will need to be carried out. In the case of temporary mobility problems, it may be appropriate for an individual to do office type work whilst they are less mobile. If there is hearing impairment then a specific risk assessment will need to be performed to be certain that the individual can hear the fire alarm and if not, suitable arrangements made.

The WIMM Safety Officer, WIMM Biological Safety Officer, the WIMM SRPS or their deputies are always available to give advice on safety matters, if in doubt consult them.

If necessary a Personal Emergency Evacuation Plan should be completed see WIMM E050 Personal Emergency Evacuation Plans.

3.5 Fire

3.5.1 Flammable Solvents

Avoid over stocking, minimise working stocks on the bench <500ml. It is forbidden to store bottles containing more than 500ml of ether in the WIMM.
Never use flammable solvents in open containers near open flames or near to electrical equipment liable to produce sparks.
Do not store volatile, flammable solvents in conventional refrigerators or freezers. Such material must be stored in spark proof appliances. Each laboratory must have a suitably approved cupboard for storing flammable solvents or access to one. These must be kept closed.

4 Equipment and apparatus

Use all equipment in accordance with the manufacturer's instructions and pay attention to warning labels. Do not tamper of interfere with safety controls on items of equipment. Ensure that a competent person shows you how to use laboratory equipment before using that equipment. Complete the necessary log books if appropriate. See also Appendix 3 for the policy on the safe use of electrical apparatus.

Always use a stepladder or a step stool to reach equipment on high shelves. Do not over-stretch as this is a common cause of accidents.

4.1 Gas cylinders

Gas cylinders should be supported in a proper stand or wall brackets. They can if this is the only option be secured to a bench. Empty cylinders must also be supported. Cylinders should not be left free-standing for any reason. Regulators should only be changed by trained personnel. If in doubt contact Malcolm Shepherd the WIMM Buildings Manager or his assistant Manoj Sondhi.

4.2 Electrical

Do not operate:
a) electrical equipment in adverse or hazardous environments such as wet, corrosive, or dirty conditions or if the equipment will be exposed to flammable or explosive substances.
b) damaged equipment or equipment with worn or damaged power cables or plugs.
c) equipment with exposed conductors.
d) equipment with damp hands or when standing on damp surfaces.

All electrical faults must be reported immediately to the Laboratory Manager or Buildings Manager or Departmental Safety Officer and any equipment involved taken out of use. All

electrical repairs and wiring of plugs must be carried out or checked before use by a competent person.

All equipment in the cold rooms must only use power sources, which incorporate an earth leakage (residual current) circuit breaker. All 13amp power outlets are protected by RCDs except electrak sockets.

Use of electrophoresis apparatus is subject to a risk assessment. All electrophoresis power supplies and apparatus have to comply with UPS S11/07. Only trained individuals should be allowed to operate electrophoresis apparatus. Do not tamper/interfere with electrophoresis equipment. Do not detach leads from the lids of electrophoresis tanks. Equipment that is not being used safely will be confiscated.

4.3 Apparatus items

Centrifuges

Centrifuges are very dangerous when not operated strictly in accordance with the manufacturer's manual. It is essential to keep the lids of bench top centrifuges closed during operation. Centrifuges have an interlock on the lid such that they cannot be opened during operation. It is important that tubes should be appropriately balanced. It is essential that you report any problems to the relevant laboratory manager. Training for high speed and preparative centrifuges located in room 362 is required. Use of the floor standing ultracentrifuges is restricted to trained personnel. Please check seals on buckets and rotors. All four metal buckets must be in place when using bench top centrifuges. See also WIMM E063 Centrifuges.

Autoclaves

High-pressure equipment, such as autoclaves, must never be altered in any way except by the manufacturer. By law, these and other pressure vessels are inspected for insurance purposes on an annual basis. New equipment MUST be notified to Malcolm Shepherd for inspection and to be added to the insurance list of high-pressure equipment before use.

Cryostats and microtomes

Use of this equipment should be restricted where possible to Reception hours. Blades should only be changed during Reception hours and when there is someone else in the laboratory.

4.4 Repairs, transfer and disposal

When you find that something is broken or that there is a problem with it please report this to your laboratory manager. He/she will know what appropriate action needs to be taken. Before equipment is sent for repair, or transferred outside the MRC Weatherall Institute of Molecular Medicine for storage or disposal the DSO, or designated person (laboratory manager) must ensure it is decontaminated and certify in writing that it is free from:

a) Radiation Hazards
b) Biological Hazards
c) Chemical Hazards

Decontamination certificates are available from the Departmental Safety Officer. Certificates must be countersigned by the DSO, or other designated person, before equipment is released.

5 Waste Disposal

The following system has been adopted to ensure disposal of laboratory waste in compliance with current regulations. See also Appendix 4 on Decontamination and Waste Disposal.

Segregation of waste

The following colour coding has been adopted for waste:

COLOUR OF BAG / BIN	TYPE OF WASTE
Black Plastic Bags in red bins	Normal waste: paper, boxes, uncontaminated plastic wrappers, agarose gels wrapped in cling film, disposable gloves, weigh boats containing residual amounts of dry chemicals etc.
Recycling boxes	Pipette tip boxes, toner cartridges unless returned to manufacturer, paper.
Green wheelie bins for glass	Pyrex cannot be recycled. Rinse glass jars or bottles before placing them in the green glass recycling wheelie bins
Yellow “sharps” Bins	Contaminated ‘clinical type’ waste: tubes containing blood, bags containing blood, tissue, syringe bodies, needles, scalpels, razor blades, vials that have contained reagents, Pyrex. This ensures the destruction of all plastic syringes and anything that could be mistaken for a syringe.
Grey autoclave boxes	Tissue culture plastics, microbiological plates, plastic serological pipettes, contaminated gloves, contaminated pipette tips.
Red / orange / blue /green/ white metal bins	Radioactive waste as specified in Local Rules.

5.1 Chemicals

Unused chemicals must not be discarded via the waste bins or drains without first checking with your WIMM Safety Officer. Chemicals may require specialist disposal. Contact the WIMM Safety Officers who will advise on the correct procedure to follow. See also UPS S5/11 Hazardous waste disposal.

5.2 Solvents

Solvent waste (eg phenol/chloroform) is handled separately. Do not decant waste phenol/chloroform from centrifuge tubes, make certain the cap is secure and place the tube containing the phenol/chloroform in the appropriately labelled containers for phenol/chloroform waste in each laboratory. When full contact the WIMM Buildings Manager or his assistant by email
(Malcolm.shepherd@imm.ox.ac.uk or manoj.sondhi@imm.ox.ac.uk)
or the University Safety Office. Other solvent waste such as acetonitrile is collected separately into correctly labelled waste containers for disposal via the University Safety Office as outlined above. Do not mix waste solvents unless the risk assessment says it is safe to do so.
DO NOT ACCUMULATE WASTE SOLVENT IN THE LABORATORY OR DISPOSE OF VIA THE DRAINS.

5.3 ‘Sharps’

Syringe bodies, syringe needles, razor blades, tubes containing blood, tissue, blood bags, anything that links a sample with a specific patient etc must be placed in the yellow “sharps” bins. Only fill 2/3 of the way. Sharps bins are inspected on a Thursday and if 2/3 full replaced with empty ones. If in the meantime a yellow “sharps” bin is full, seal it before placing it in the corridor where it will be collected by the autoclave staff generally on a Thursday and replaced with an empty one. Individual scalpel blades are not to be used in the WIMM without a specific

risk assessment determining their use. Disposable scalpels are preferred as they pose less risk of injury. All blades are to be disposed of in the yellow “sharps” bins. Scalpels and scalpel blades are not to be left lying around. They should be disposed immediately after use.

DO NOT DISPOSE OF SUCH MATERIAL DIRECTLY INTO THE LABORATORY WASTE BINS.

5.4 Glassware

Broken glassware must not be mixed with general refuse but disposed of in the green wheelie bins clearly marked ‘GLASS RECYCLING NOT PYREX’. Unwanted glass bottles should be rinsed and placed in the large green wheelie glass bins. Pyrex is currently not recycled and is disposed of via the yellow “sharps” bin route.

5.5 Waste for autoclaving prior to disposal

All waste contaminated with Genetically Modified Microorganisms (GMMs) needs to be autoclaved prior to disposal. Contaminated glassware needs to be soaked with 1% Virkon for 15 minutes, rinsed well and then it can be sent for washing up. Depending upon the GMM the contaminated glassware may need to be autoclaved and this will be explained in the risk assessment.

Solid waste must be placed in the autoclave bags lining the grey autoclave bins. Do not over fill the grey autoclave bins. Lie pipettes horizontally and not pointing upwards as the grey boxes have to be able to be stacked on top of each other. If you fill a grey box or if the contents are ready to be autoclaved, gather the edges of the bag together, twist and carefully fold down over the waste. It is not the responsibility of the autoclave staff to re-pack these boxes. If they have been filled incorrectly the autoclave staff have been instructed to leave them where they find them. If you find you need more grey boxes please contact the WIMM autoclave staff. Do not have a major clear out of material requiring autoclaving just before a public holiday. Do not place anything containing formalin in the grey autoclave boxes.

Liquid waste from containment level 2 work should be treated with Virkon to give a final concentration of 1% and left for 15 minutes prior to disposal via the drains. This is the preferred means for plasma and serum and other protein rich biological waste. If the liquid is particularly rich in protein i.e. neat serum then 5% Virkon should be used. It is important to follow the disposal method in the risk assessment.

The WIMM autoclave staff collect the grey autoclave bins on a daily basis. Tissue culture suites take priority in the case of problems with the autoclaves. Note that there are separate ‘solid’ and ‘liquid’ bins. GMM liquid waste must not be discharged to drains without either being autoclaved or treated with Virkon. The method of disposal for a given product will be covered by the risk assessment.

In the event of a spill or breakage involving culture material or blood see Appendix 5.

5.6 Radioactive waste

See Local Rules of work with radioactive materials (WIMM RA000), which will be issued by the SRPS. See also Appendix 6.

5.7 Phenol waste

Used phenol/chloroform or Trizol should not be decanted. It should be left in the tube in which the extraction was carried out, the cap secured and the sealed tube placed in the phenol waste container in the laboratory. Each laboratory should have a white carboy for disposing of phenol waste. See Appendix 7 on “Working with phenol” and Appendix 8 on “Phenol Burns”.

DO NOT ALLOW WASTE TO BUILD UP AS IT COULD POSE A HEALTH OR FIRE HAZARD

6 Chemicals and Solvents

See also Appendix 9 on "Codes of Practice for Laboratories handling chemicals**"** and UPS S5/11.

6.1 COSHH and Risk assessments

Check the Material Safety Data Sheets of any new chemicals you use, or if you are unsure of how to use a known chemical in a new procedure. Ensure that the use of the chemical or the procedure is covered by a full COSHH risk assessment. Safety glasses or a face shield, and the appropriate gloves must always be worn when working with acids, alkalis, and other corrosive liquids and liquefied gases, as a protection against splashing - as per the risk assessment. Risk assessments should be reviewed annually. See also Appendix 1 for an example of a COSHH risk assessment.

Fume cupboards must always be used for toxic, fuming and unpleasant smelling chemicals. Fume cupboards are tested annually but, if your fume cupboard is not functioning, report it to the Buildings Manager immediately, DO NOT USE THE FUME CUPBOARD until tested and cleared by the Buildings Manager as being safe for use. Also report smells that come from outside a working area.
Mercury is an accumulative poison. There is no reason for anyone to work with mercury in the WIMM. Use of mercury thermometers is forbidden. Alcohol and digital thermometers are available and their use is mandatory.
Ethidium bromide where possible should be replaced by safer alternatives such as "Gel Red" that can be used at half strength. See Appendix 10 on "Working with ethidium bromide". Purchasing of powdered ethidium bromide is now prohibited.

6.1 Flammable solvents

All solvents should be stored in the flameproof cabinets or in other suitable flameproof containers, up to a maximum of 50 Litres per laboratory. These cupboards or boxes must be kept closed.

6.2 Hazard Signs

Containers of dangerous substance are labelled to show the nature of the hazard and the safety precautions required. The old British hazard warning symbols, a black symbol on an orange background, have been phased out and have no status in law. The globally harmonized colour coding for hazard warning symbols chemicals is in use, the new colours being a black symbol on a white background in a red diamond. Detailed information describing the dangers involved, preventive precautions, and action to be taken in the event of a dangerous occurrence is printed on the label below the danger symbol.

Globally harmonized symbols

Physical Hazards

Explosive | Flammable liquid | Oxidizing liquid | Compressed gases | Corrosive to metals

Health Hazards

Acute toxicity

Skin irritation

Corrosive to skin

Aspiration hazard/sensitizer
May cause allergic or asthmatic symptoms or breathing difficulties
Carcinogenic, mutagenic, specific target organ toxicity

Environmental hazards

Hazardous to the aqueous environment

6.3 Safety precautions for handling liquid nitrogen and material that has been in contact with the liquid

Do not enter the room containing the liquid nitrogen storage vessels if the low oxygen alarm is sounding as this signifies that the oxygen level is below the safe level to enter. The vast majority of samples requiring storage in liquid nitrogen in the WIMM are now stored in the vapour phase.

In addition to good laboratory practice:

ALWAYS PROTECT your eyes with a face shield or safety spectacles. Disinfect the face shield after use.
AWAYS WEAR gloves approved for the purpose.
Use only containers SPECIFICALLY DESIGNED for holding liquid nitrogen.
Ensure that you are wearing appropriate shoes.
Do NOT store liquid nitrogen in unventilated locations such as a cold room.
Do NOT dispose of excess liquid nitrogen by pouring it into a sink. Allow it to evaporate slowly at room temperature.

When charging a warm container or inserting objects into the liquid always perform these operations slowly to minimise boiling and splashing.

Use TONGS to withdraw samples immersed in the liquid and handle the tongs and the sample carefully.

NEVER store samples in LIQUID PHASE when the VAPOUR PHASE will suffice. Glass containers withdrawn from the liquid are liable to shatter explosively and must not be used. Any vials being returned to or new samples going into liquid nitrogen storage must go into VAPOUR PHASE. If a vial is being removed from liquid phase a face shield must be worn and the samples must be immediately placed into a secondary container with a closed lid to warm up. Alternatively, they should be stored for at least 24 hours in the vapour phase prior to removal.

Do not allow liquid nitrogen to drain onto the floor since this causes significant damage.

ALWAYS handle liquid nitrogen in WELL VENTILATED AREAS.

6.4 Safety precautions for handling dry ice (cardice)

In addition to GLP:
Use appropriate containers for storing dry ice.

Handle dry ice in well-ventilated areas.
Do NOT store containers of dry ice in unventilated locations such as a cold room as a build up of CO_2 can cause asphyxiation.
Do NOT seal boxes containing dry ice such that the evaporating CO_2 has nowhere to escape.
Do NOT place unwanted dry ice in the sinks. They will crack. If you have excess dry ice from a delivery, this should be placed in the dry ice storage boxes around the WIMM.
Any excess dry ice that cannot be placed in one of these storage boxes must be left in the laboratory and not a corridor until the box is empty at which time it may be put out for collection.
DRY ICE must not be put out as rubbish.

6.5 Centrally piped gases and compressed air

The building is supplied centrally with CO_2, N_2 and compressed air and argon in room 244. All connections to these systems must be overseen by Malcolm Shepherd or Manoj Sondhi.

6.6 Poisons, drugs, toxins and pathogens

Depending upon the nature of the work carried out in the WIMM there may be the need to work with various poisons or restricted chemicals, drugs or toxins. These need to be kept in locked cupboards when not in use. Use of certain compounds may require notification of the University Safety Office and a personal licence from the government if the compound is regarded as a drug precursor or can be used in the manufacture of chemical weapons. These are detailed in Memo M9/10 issued by the University Safety Office. Bear in mind that it may take more than 3 months to obtain a personal licence. It is important that an audit trail is kept for such items and that their use is monitored on a regular basis. The WIMM Safety Officer needs to be notified before any of these chemicals are purchased, used and disposed of.

7 Biological Hazards

Since many microorganisms can cause infection they and material possibly contaminated by them must be regarded as potentially dangerous and should be handled accordingly. Follow local regulations scrupulously. If in doubt consult the WIMM Biological Safety Officer. See Appendix 11 on “Biological Safety”. The definitions of the different types of containment laboratories are given in Appendix 12.

7.1 Introduction

The WIMM Biological Safety Officer must be informed about the proposed use of all new microorganisms, including infectious agents and genetically modified microorganisms not already in the building. This includes work with CRISPRs and TALENs.

7.2 Human Blood and Tissue:

A risk assessment should be made for all work involving handling of blood, blood products and other human tissues. In general deal only with blood or tissue from known human immuno-deficiency virus (HIV) and hepatitis B virus (HBV) negative donors. For those who work with HIV positive material this must be handled in containment level 3 laboratories by people who have received the appropriate training and have the correct risk assessments in place.

If working with samples from volunteers you must ensure that your work is covered by the Human Tissue Act or has approval from a Research Ethics Committee. See Appendix 13 "Rules for handling blood, blood products and other human tissues in the laboratory".

7.2.1 Blood:

Only suitably qualified staff are permitted to take blood samples and this must be in the Phlebotomy Room. The Occupational Health Room can be used if necessary. You are prohibited from working with samples of your own blood. You may work with blood from colleagues if these samples have been taken with the appropriate consent and the sample can be suitably anonymized. You must not culture or transform your own cells or cells from colleagues working in the WIMM.

7.2.2 Solid Tissue:

1. Group Leaders and the WIMM Safety Officer/HTA Designated Individual must be informed of all incoming human tissue via a risk assessment where not covered by an NHS REC or being purchased from NHSBT.
2. Human tissue must be manipulated using good microbiological practice in a Class II safety cabinet.
3. Further processing of human tissue should not occur outside these areas unless placed in a sealed container e.g. centrifuge bottle and swabbed with IMS (industrial methylated spirit) or 70% isopropanol or Virkon before moving the container.
4. Disposal of excess tissue should be done in consultation with the WIMM Facilities Manager and the WIMM Safety Officer/HTA Designated Individual.

7.3 Cell lines, hybrids

To be handled in tissue culture rooms using good laboratory practice. The WIMM Biological Safety Officer must be informed of new cell lines brought into the department by email.

7.4 Genetic manipulation

Genetic manipulation is defined as:

'The formation of new combinations of heritable material by the insertion of nucleic acid molecules, produced by whatever means outside the cell, into any virus, bacterial plasmid, or other vector system so as to allow their incorporation into a host organism in which they do not naturally occur but in which they are capable of continued propagation.'

All proposed work with genetically modified organisms must be notified to the WIMM Biological Safety Officer in advance of work commencing so that risk assessments can be carried out. Copies of the approved risk assessments for work with genetically modified organisms are kept in a red safety file in each laboratory.

Processing of human blood and tissue and genetically modified material by centrifugation must be done in sealed centrifuge buckets. In the event of breakage or leakage in the centrifuge, the full bucket lid assembly must be decontaminated as per approved method (Appendix 4). Centrifuges must not be left contaminated. Do not leave centrifuge rotors or buckets sitting in solutions such as Decon or Virkon as this will remove the anodized finish.

7.5 Radioactive biological hazards

Experiments that involve both infectious agents and radioactive isotopes are subject to the regulations that deal with the handling of organisms and also to those that deal with the handling of radioactive isotopes.

The WIMM Biological Safety Officer and the WIMM Senior Radiological Protection Supervisor must each give their approval before any such experiments are started.

See also Appendices 4 and 6 as well as UPS S1/12.

7.6 Use of syringes

Syringe needles must never be re-sheathed. Syringe needles should be discarded immediately after use. If using a syringe filter this must always be used in conjunction with a luer-lock syringe to prevent the filter coming away from the syringe and causing splashes. Syringes and syringe needles must always be disposed via the yellow “Sharps” bin route.

8 BMSU

All work must be covered by a Project Licence, Personal Licence and risk assessment. BMSU Local Rules also apply.

9 Non-Ionising Radiation

9.1 Ultra-violet light

All wavelengths of ultra-violet radiation are hazardous to some extent, but the region between 254nm and 300nm, which include the 254nm radiation used for bactericidal purposes, is especially dangerous.

The best way to avoid risk is to avoid exposure: -

1 NEVER expose your eyes to UV, use a face-shield.
2 NEVER expose your hands to UV even when wearing disposable gloves.
3 NEVER use a damaged UV source, as filtration may be reduced, thus increasing the danger.
4 All sources of UV must be marked with a hazard warning sign.
5 When using a safety cabinet fitted with both fluorescent and UV light, ensure that the UV is OFF when the fluorescent light is on.

9.2 Microwave Ovens

Microwave ovens are useful laboratory tools but can be extremely hazardous if used inappropriately. Do not place closed containers into a microwave oven because of the risk of explosion and ensure you are using microwave compatible containers. Take extreme care when removing bottles of liquid from a microwave; use the heat resistant gloves available. When melting small volumes of agarose, melt the agarose in several shorter bursts rather than relying on a fixed time. This prevents overheating, particularly of the plastic lid, if a Duran bottle is being used. If an oven appears damaged report this at once to the WIMM Safety Officer who will make sure that it is inspected. See Appendix 14 on “Use of Microwave ovens”. These are tested for leakage in association with the PAT testing programme.

10 Laser Safety

10.1 Lasers

There are a number of instruments throughout the Institute that contain lasers. All lasers except inherently safe class 1 lasers must be registered on a laser registration form, and class 3R, 3B or 4 lasers require a risk assessment. The relevant WIMM Laser Safety Officers have responsibility for lasers or equipment containing lasers and are responsible for maintaining records of all relevant lasers in the WIMM and providing advice when writing a risk

assessment, and guidance on the use of lasers. Anyone requiring further information regarding laser safety is referred to UPS S2/09.

11 Useful sources of information

Useful sources of information are given in Appendix 15.

Appendix 1

THE PRINCIPLES OF RISK ASSESSMENT

1. Identify the hazards
2. Who might be harmed and how
3. Evaluate the risks and decide on precautions
4. Record the risk assessment findings and implement them
5. Review your risk assessment annually or more frequently if appropriate and update if necessary

A hazard is the potential of a substance, activity or process to cause harm.
A risk is the likelihood of a substance, activity or process to cause harm.
Risk can be reduced by good management.

University of Oxford COSHH Assessment Form

Read the notes on completion before attempting to fill in this form. If insufficient space is available under any section, use a separate piece of paper and attach it to the form.	**File ref:** **Date:**

Department: Location of work:	Persons involved:

Description of procedure:

Substances used	Quantities used	Frequency of use	Hazards identified	Exposure route

Could a less hazardous substance (or form of the substance) be used instead? Yes/No
Justify not using it:

What measures have you taken to control risk?
Engineering controls:

PPE:

Management measures:

Checks on control measures:

Is health surveillance required?	Training requirements:

Emergency procedures:	Waste disposal:

Name and position of assessor: Signature:

Name of supervisor (student work only): Signature:

Name of head of department or nominee: Signature:

University of Oxford COSHH Assessment Form

Read the notes on completion before attempting to fill in this form. If insufficient space is available under any section, use a separate piece of paper and attach it to the form.	**File ref:** **Date:**

Department: **HIU** Location of work: **Rm.466 (Davis Lab)**	Persons involved: **Lab staff working in 466** **Students** **Visitors**	Signature :

Description of procedure:
Addition of 45.9mls of n-Butyric acid into 300mls water. Adding dropwise, 5M NaOH until pH 7.3 and to final volume of 500 mls of Sodium butyrate

Substances used	Quantities used	Frequency of use	Hazards identified	Exposure route
Butyric acid	**50 mls**	**Rarely (once every 4 years) Sodium butyrate used by other lab. researchers in Room 466.**	**Corrosive.** **Extremely strong odorous chemical.**	**Skin contact ; eye contact & inhalation.**

Could a less hazardous substance (or form of the substance) be used instead? Yes / **No**
Justify not using it:

What measures have you taken to control risk?
Engineering controls: Use of a chemical hood (externally extracted). Ensure proper container (opaque plastic drum for corrosive liquids) is available prior to preparation, for all tips and discarded items. Eye-wash bottles also need to be available and spillage granules.

PPE:
Compatible chemical resistant glove (nitrile), lab coat and also use of face-mask and goggles. Change gloves regularly when possible to ensure the chances of chemical "breakthrough" of the butyric acid is reduced.

Management measures:

Ensure waste is sealed in the container, kept in the chemical fume hood and removed from the lab areas as soon as possible.

Checks on control measures: **Liaise with Hazardous Materials Officer and give notice ahead of preparation.**

Is health surveillance required? **No**	Training requirements: **To be carried out by experienced laboratory personnel only.**

Emergency procedures: **If inhaled, remove to fresh air outside of labs & building.** **In case of contact, immediately wash skin with soap and copious amounts of water.** **In case of contact with eyes, flush with copious amounts of water for at least 15 mins.** **Spills to be covered with spillage granules and then removed to the designated waste container.**	Waste disposal: **Very dilute solutions can be disposed of down the sink in the chemical hood. All the used tips and gloves to be disposed into the designated waste container.**

Name and position of assessor: Signature:

John Smith (Postdoc)

Name of supervisor (student work only): Signature:

Prof. Simon Davis

Name of head of department or nominee: Signature:

Prof. Andrew McMichael

Appendix 2

TRAINING

Staff, Students and visiting workers should be trained to such a level that ensures “competency” in the nature of the task that is being undertaken. Training records must be maintained, signed by trainee and trainer and filed appropriately. In some instances, training records may need to be kept for 40 years.

The following courses are available to anybody who wishes to attend:

First Aid

Fire fighting equipment

DSE

Manual Handling

The University holds a series of courses covering specific aspects of safety. These include biological safety, chemical safety, safe use of gases, chemical safety, laser safety etc. throughout the year. You will receive notification of these courses from the WIMM Safety Officer. Attendance of any relevant course is mandatory. If working with radioactivity there are mandatory training courses. If working with lasers there are mandatory training courses. The WIMM holds training courses on the WIMM liquid nitrogen facility and the centrifuge laboratory, room 362 that are mandatory if you wish to have access to these rooms.

If you attend any University run health and safety courses the University Safety Office will notify the WIMM Safety Officer and the WIMM Administrator. Booking is done online using your single sign on account number.

Appendix 3

POLICY FOR THE SAFE USE OF ELECTRICAL APPARATUS WITHIN THE MRC WEATHERALL INSTITUTE OF MOLECULAR MEDICINE.

1 Before using electrical apparatus, carry out a visual inspection. The inspection should include looking for frayed cables, cracked plugs, exposed wires etc. If you suspect any problems notify your laboratory manager and/or WIMM Safety Officer.

2 An inspection and test of portable items of equipment is carried out regularly and recorded. Any item of equipment failing an inspection or test must be taken out of use immediately and the Electrical Safety officer informed. It should be identified with a 'Do not use' sticker and not brought back into use until it has been repaired and re-tested.

3 Electrical equipment may need to be identified by an asset number or appliance serial number where available and recorded. New equipment should be notified to the laboratory managers for identification and audit purposes.

Appendix 4

DECONTAMINATION and WASTE DISPOSAL

GENERAL RULES:

1 BLOOD, or any item that has been in contact with blood, **must** be decontaminated with VIRKON before leaving any laboratory unless it is a tube containing blood that is being disposed of by being placed in a yellow “sharps” bin.

2 All items treated with VIRKON must be drained thoroughly before placing in the yellow “sharps” bin for disposal.

3 GLASS must only be discarded in a SHARPS-BIN or the large green glass bins. Note that if the glassware has been in contact with blood it must be treated with VIRKON prior to disposal (**see rule 1**). Damaged Pyrex is currently disposed of in a yellow “sharps” bin.

4 All spills must be dealt with **immediately:**

a) Larger spills of BLOOD OR BODILY FLUIDS – VIRKON granules for 15 minutes.
b) Minor surface contamination – 1% VIRKON solution.
c) Contaminated equipment (centrifuge buckets/inserts etc) – 1% VIRKON for 15 minutes, with thorough rinsing to prevent corrosion. **Never** leave buckets/inserts soaking in VIRKON. Wash buckets or metal inserts by hand, not in a dishwasher.

5 All contaminated tips or tubes should be placed **carefully** in the appropriate receptacle. Contaminated items **must not** be left on the floor if they fall.

6 All workstations should be wiped down with 1% VIRKON solution when work is complete.

7 Areas of laboratory benching that are also used, as write up areas should be decontaminated between activities.

8 Discard jars of VIRKON must not be left standing indefinitely at the sink.

NOTE 1: 15 minute contact time is sufficient for all items at containment level 2. No solid waste should be left ‘soaking’.

NOTE 2: Percentages of VIRKON are **final** concentrations!

Trigene may also be used in place of Virkon. It is essential that if using Trigene the manufacturer’s instructions are followed.

NOTE 3: Any other disinfectants/antibacterial agents must have a risk assessment to cover their use.

Appendix 5

SPILLAGE OR BREAKAGE INVOLVING CULTURE MATERIAL OR BLOOD (CL2)

Handling of hazard group 3 is undertaken at CL3 and must be by prior arrangement with BSO and subject to approved risk assessment. Handling of spill involving hazard group 3 pathogens are detailed in the Codes of Practice and are not considered further here. See WIMM E066 CL3 Code of Practice.

Spillage of cultures or breakage of containers containing cultures may create aerosols. As a general guide the following procedures are recommended:

Do not bend down to inspect the damage, as this will immediately expose you to any aerosol.
If the spillage is small, cover promptly with Virkon granules, working from the outside towards the centre of the spill.
After 15 minutes the Virkon can be removed to a sharps bin for incineration.
The area can then be cleaned with disinfectant (Virkon solution 1%).

In the case of larger spills, contact the WIMM Safety Officers, who will assess the spill and will determine the action to be taken for clear up of the spill.

Appendix 6

HANDLING OF RADIOISOTOPES IN THE MRC WEATHERALL INSTITUTE OF MOLECULAR MEDICINE

Senior Radiation Protection Supervisor (SRPS): Dr Zoe Christodoulou 222379

Handling of radioactivity is restricted to trained personnel. Training is linked by card access to secure designated laboratories, which are rooms 358 and 416.

Legal framework

This document is in addition to the Local Rules for the use of isotopes in the University of Oxford **(S1/12)** that are distributed to each registered radiation worker. Before reading the Local Rules of the WIMM (WIMM RA000) new radiation workers and new arrivals to the Institute should familiarise themselves with the Local Rules of the University.
The use of radioisotopes within the United Kingdom is regulated by the 2017 Ionising Radiation Regulations Act. A separate act, the Environmental Permitting (England & Wales) Regulations 2010 deals with storage and disposal. Under this act the Institute now holds separate permits for open and closed sources as well as permits to accumulate and dispose of radioactive waste. These permits are displayed on the Health and Safety notice board. They detail the types of isotopes that can be used in the Institute, the total activity of each that we are allowed to hold and the amounts that we are allowed to dispose of via the drains, via the solid waste bin system and into the atmosphere. **Breaching any of these conditions can lead to prosecution and the withdrawal of the permits – thus effectively halting work with isotopes within the Institute.** The Act also lays down procedures under which isotopes have to be handled and limits activity handled to laboratories or areas fulfilling certain criteria. It is therefore of paramount importance that all users of isotopes are aware of how the regulations relate to them and how they should behave in order to remain within the law. **Guidance for the handling of isotopes should be obtained from the University Local Rules (S1/12), from your direct supervisor and from your Radiation Protection Supervisor. Handling of isotope stockpots and all dispensing from stock must be carried out in the designated laboratories. Experiments involving more than 74Mbq (2mCi) of ^{32}P must be discussed in advance with the SRPS as they will require the delineation of a temporary controlled area.**
In addition to our statutory obligations, the University uses outside contractors for the disposal of low-level solid and organic radioactive waste in accordance with Institute's permit conditions. For this to occur we need to ensure the following:

a) that we fulfil our legal obligations,

b) that the contents of radioactive low-level disposal bins are within the limits which our contract allows,

c) that we can at any time show documentary proof that we have fulfilled conditions a and b above,

d) that we demonstrate (and prove to external assessors) that we have a management system in place that will ensure that these conditions are met and can identify and remedy any deficiencies in the system,

e) that we have to be able to demonstrate that all relevant personnel are appropriately trained. (the local RPS conducts additional "in-house" training sessions).

1. Ordering and Storage

The details of the procedure for ordering radioactivity are to be found in WIMM RA001 Ordering Radioactive material in the WIMM and in the Local rules for work with radioactive materials.

All orders for isotope must be signed by your Radiation Protection Supervisor or Zoe Christodoulou

Because the Institute has a maximum quantity of each isotope that it is allowed to hold, this has been sub-divided into maximum quantities for each laboratory to ensure that these limits are not exceeded. The amount in store in each laboratory is audited continuously and the totals will be held by your RPS and Zoe Christodoulou. Thus, the RPS must ensure that new orders do not lead to a breach of the limits for your laboratory. Work with unusually large quantities of isotope or work with new isotopes *must* be cleared in advance with the Senior Radiation Protection Supervisor or Zoe Christodoulou.

2. Working with radioactive isotopes

Receiving isotopes

WIMM RA002 (Receiving and opening radioactive packages) details the way in which isotopes must be received and handled.

Risk assessments

All work with radioactivity requires a risk assessment that includes an estimate internal and external radiation exposure. A proforma can be found in the Appendix to WIMM RA000 Local Rules for work with radioactive materials.

Best Practicable Means

Under the regulations, all work with isotopes has to fulfil the criterion of “Best Available Technique” (BAT). In short this means that we have to be able to demonstrate that in any experiment, that the smallest quantity of isotope is being used that will allow statistically significant results to be obtained such that the minimum amount of isotope will subsequently enter the waste stream and hence the environment. To comply with this requirement the user must take into account the specific activity of the isotope concerned, the sensitivity of the detection system that is to be employed and the number of cells or the reaction volume to be used. Calculations must be made and recorded to show that these considerations have been taken into account. For details see UPS **S1/12.**

Loss, theft and spills

Details of the procedures to be used when any quantity of isotope has been lost, stolen or spilled can be found in the contingency plans in the Appendix to WIMM RA000 Local Rules for work with radioactive materials.

3. Disposal

WIMM RA003 Accumulation and disposal of radioactive waste details the procedures for disposal of radioactive waste in the WIMM. These can also be found in WIMM RA000 Local Rules for work with radioactive materials.

Only registered radiation workers are permitted to dispose of solid and liquid radioactive waste subject to the following restrictions:

There are two routes for disposal of isotopes, either via the drains or via the solid and organic waste bins that are collected regularly by the University Safety Office who arrange for their subsequent disposal.

Disposal via drains

Because of the limits imposed by our permit, we have set isotope disposal limits for each laboratory where radioactivity is handled. In practice this means having a single sink within each lab where disposal of isotopes is permitted and a green disposal record sheet nearby which *must* be filled in when isotope is disposed of. The monthly limits for each class of isotope are posted by the sink.

Before disposal of any isotope the record sheet must be consulted to ensure that the monthly limit has not been exceeded.

The record must include the type and quantity (in Mbq) of isotope as well as the date. The totals for each month for each laboratory must be recorded in MBq on the appropriate form by your RPS and retained within the laboratory for inspection. These totals are collated by Zoe Christodoulou and sent to the University Radiation Safety Office.

Disposal via solid waste bins

Our outside contractors place very strict limits on the contents of waste bins. Failing to abide by these could result in the contract being terminated and thus a total absence of solid waste disposal facilities.

The main points are as follows:-

Isotopes must be segregated according to half-life. This is because the shorter-lived isotopes are stored for decay (thus minimising any environmental contamination) while the long-lived isotopes are dealt with separately. This is achieved by means of colour coded bins as follows.

Red bins: Isotopes with half life of > 90 days (Principally ^{3}H and ^{14}C)

White bins: Isotopes with half lives > 61 days but < 90 days (eg ^{35}S)

Green bins: Isotopes with half lives > 30 days but < 61 days (eg ^{125}I)

Blue bins: Isotopes with a half-life < 30 days (eg ^{32}P, ^{33}P)

Orange bins: Scintillant and organic waste containing radioactivity. The limits are ^{3}H and ^{14}C 3 Mbq and for others 0.9Mbq.

All items placed in the bins *must* be recorded on the bin record sheet at the time of disposal so that an accurate inventory of the contents can be prepared. The amount of radioactivity discarded must be recorded in Mbq. The bin sheets are coloured to match the appropriate bins. There may be occasions where the waste generated cannot be disposed via one of the above routes. In this case a special collection may be arranged via the University Safety Office.

When disposing of any item, the bin record sheet must be consulted to ensure that the overall bin limit is not exceeded.

The contractors place other important restrictions on the contents of the bins. These are listed below:

Bins must **not** exceed any of the following limits:

3/4 full by volume, 37 MBq (1mCi) activity, five microSieverts dose on the external surface,

Sharps, glass and pipettes must be boxed before placing in the bin.

Bins must **not** contain any of the following:

Wastes containing a free liquid phase (ie, any liquid whatsoever),

Materials liable to give rise to fire or explosion hazard,

Combustible materials,

Fixed liquids with flashpoints < 22 degrees Celsius,

Phosphorus,

Hydrides of boron and other chemicals representing a fire hazard,

Strong oxidising agents,

Any material which reacts with water to evolve heat or flammable gases,

Any pressurised container,

Any waste liable to generate toxic gas or vapours,

Waste liable to be decomposed by microorganisms,

Any infectious, hazardous or pathogenic material,

Wastes which may corrode the container during storage.

In addition, RED bins must not contain any chelating agents (eg, EDTA), hydro carboxylic acids or polycarboxylic acids (eg citrate).

The primary responsibility for ensuring these conditions are met lies with individual workers under the guidance of their Radiation Protection Supervisor since they are the only ones who can effectively monitor them from day to day.

We *have* to comply by all the relevant regulations if we wish to continue to use and dispose of isotopes. This means that every user has to pay particular and detailed attention to recording *each and every* use and disposal of isotopes.

4. Pregnancy

If you are female, you should note that ionising radiation can be harmful to the foetus and you should inform the SRPS as soon as possible if you are pregnant. Ionising radiation can also be harmful to a nursing infant so inform the SRPS if you are breast-feeding. Information about the harmful effects of ionising radiation is given in the S1/12. A risk assessment will be performed by the WIMM Safety Officer and signed, see also UPS S1/12**.**

(Please note: the University is required by law to give the above information but exposure to ionising radiation in the course of normal work in the WIMM should give negligible risk).

It is important for a pregnant female to wear finger TLDs if working with ^{32}P for the duration of pregnancy.

Appendix 7

WORKING WITH PHENOL

Introduction
Phenol is used routinely in the laboratory, mainly for preparation of nucleic acids. It is highly toxic and can be rapidly absorbed across the skin. Additionally, small quantities on the skin can act as an anaesthetic at first, and may cause extensive damage before pain is felt.

Assessments
Before commencing work with phenol for the first time you must be familiar with the COSHH assessment for the particular type of work with phenol you are undertaking. If such an assessment has not been undertaken your supervisor should ensure that one is completed and that the control measures required are implemented. Basic safety information can be obtained from the Material Safety Data Sheet (MSDS) for phenol. N.B. This is not an assessment, users must extrapolate the information to the circumstances and volumes phenol is being used in.

Control measures

Management
The first level of control is elimination. Do you need to use phenol or is there a less hazardous technique available? If there is you should use that. N.B. Many proprietary nucleic acid extraction systems use phenol under a trade name - consult the material safety data sheet for the exact contents.

If phenol is required, only purchase the amount you need to complete your project and try to purchase it in a form you can readily use i.e. molecular biology grade pre-equilibrated with water or buffer at the appropriate pH for your needs - this reduces the amount of handling and exposure required. DO NOT RE-DISTILL PHENOL, high quality phenol is routinely available obviating the need for this extremely hazardous operation.

Users must be competent and fully aware of the hazards involved with working with phenol. Students and staff of limited experience must be supervised when handling phenol-containing solutions and colleagues working nearby should be made aware that phenol is being used.

Engineering controls
The current long-term exposure limit (LTEL) for phenol is 10 parts per million with a short-term exposure limit (STEL) of 10 ppm (phenol is a substance under review by the HSE, which means these exposure standards may be dropped further). Larger stock volumes should therefore always be handled in a fume cupboard to ensure the STEL is not exceeded. Smaller quantities may be handled on the bench but ensure no naked flames are in use nearby; phenol is highly flammable.

Phenol should be contained in shatterproof vessels (HDPE or polypropylene) and large volumes (> 1 litre) should not be handled except with extreme caution and only where absolutely necessary. Secondary containment must be used for transportation outside the laboratory and glass vessels should be avoided where possible. Phenol should not be dispensed using bottle-top pumps as it can crystallize in the dispensing lines causing a blockage. If no alternative is available then the pump must be thoroughly rinsed through with solvent (alcohol) and allowed to dry before storing.

Personal protective equipment (PPE)
Ensure appropriate personal protective equipment is specified for the type of operation being undertaken. Because of the aggressive nature of phenol, lab-coats, safety specs, and gloves must always be worn as a minimum. Due to the corrosive nature of phenol disposable gloves must be changed frequently to prevent splashes degrading them resulting in burns. Additionally, sturdy

footwear should be worn to prevent splashes to feet in the event of a spillage. All of these measures should be clearly specified in the COSHH assessment. PPE is the last line of defence should other control measures fail and an accident occurs. Its importance cannot be over-emphasized for work with phenol.

Emergency procedures

PEG 300 solution should always be readily available for use in the event of a spill on skin - phenol partitions preferably into PEG 300 from the skin (some investigators suggest that a water paste of polyvinyl pyrrolidone (PVP) is superior to PEG for skin decontamination and detoxification because PVP has the ability to form a complex with phenol). Ensure the internal stopper of the stock PEG 300 bottle is removed so that it can be quickly dispensed if required. Contaminated clothing should be removed and any exposed skin washed with copious quantities of water (to remove any non-absorbed phenol lying on the skin surface) for several minutes before applying PEG 300. Do not scrub the contaminated area as this will tend to both spread the contamination and enable phenol to more readily enter the body. PEG 300 should not be used on eyes, these should be washed with copious quantities of water or saline if available. Organic solvents should not be used to remove contaminating phenol as they will tend to assist the transport of phenol into the skin. Both the victim and anybody assisting should avoid secondary contamination from the washings and contaminated clothing - gloves should be worn. All phenol accident victims should be taken to Accident and Emergency for an assessment.

Medical information which may be of use to Accident and Emergency Staff is available from the Centre for Disease Control in the USA. Again, it is written in the American context but the same principles apply. Experience with UK Accident and Emergency departments has found them to be poorly informed for dealing with such incidents - they rely on a telephone link to the National Poisons Information Service and it may assist greatly in the treatment of phenol poisoning if this information is taken with any casualties.

Spillages should be absorbed with vermiculite (which should be readily available in laboratories routinely using phenol) and disposed of as for normal phenol waste.

Waste disposal

Please note the recommendations for disposing of phenol and phenol-contaminated waste in Safety Office Memo M15/98, issued following accidents involving phenol burns incurred during the disposal of waste.

> "In order to minimise contact with phenol wastes, no attempt should be made to empty small quantities from Eppendorf tubes etc. into larger containers. Instead, a suitable leak-proof container (i.e. one designed to hold liquids, not solids) should be chosen into which the phenol solutions complete with contaminated glass- or plastic-ware can be placed."

In practical terms, small items of plastic-ware containing or contaminated with phenol and phenol/chloroform (microfuge tubes, pipette tips etc.) should be disposed of directly into a suitable plastic container (10 litre plastic drum) in your laboratory. When full this should be sealed and the Facilities Manager informed. DO NOT ACCUMULATE STOCKS OF LIQUID PHENOL WASTE for disposal i.e. do not decant from plastic-ware to larger bottles or beakers on your bench - cap small volumes and place in the laboratory waste container.

Appendix 8

PHENOL BURNS

Green cards for people working with phenol are supplied by the University of Oxford Occupational Health Service. These can also be obtained from the WIMM Safety Officer. Seriously consider whether you need to use phenol and whether there are safer alternatives. These outline the actions that need to be taken in the case of a phenol burn.

Phenol is poisonous and can affect many systems of the body and is absorbed through intact or burnt skin. It is corrosive and causes severe burns.

First symptoms
Painless severe burns occur very rapidly on contact. The skin becomes moist and turns white and wrinkled. Occasional yellow staining.

Absorbed through burnt or unburned skin
Can affect many organs in the body quite rapidly

Action
Remove contaminated clothing carefully whilst irrigating, preferably under a shower or from hosepipe on tap.
N.B. First aider must double glove to irrigate and remove clothing. Scissors may be necessary.

Drenching
Flush with water continuously for 10 minutes.

Antidote
Use of Macrogol 300 (polyethylene glycol 300) (Sigma catalogue number 202371 ALDRICH). Wash area wearing gloves constantly with Macrogol. Macrogol is supplied by the laboratory manager. Please check the Macrogol is present in the lab before working with phenol.

Disposal of phenol
All phenol and phenol-contaminated plastic-ware must go intact into the phenol waste containers in each lab. Do not decant phenol.

Eyes
Irrigate with water only. Do not use Macrogol 300 in the eye.

Transfer to A and E department
Almost certainly necessary. All burns over $1cm^2$ must be seen by A and E, if smaller than this a decision can be taken locally.

Appendix 9

CODES OF PRACTICE FOR LABORATORIES HANDLING CHEMICALS

1. Know the potential hazards and safety precautions necessary for every procedure that involves working with chemicals in particular when handling stocks or concentrated solutions. Consult the appropriate COSHH form and Risk Assessment before using a chemical for the first time. IF IN DOUBT CHECK WITH YOUR SUPERVISOR FIRST.
2. Wear your laboratory coat and protective eyewear. The risk assessment may call for specific PPE. Realise that not all disposable gloves will give the same degree of protection.
3. Know the location and how to use the regular emergency equipment in your area e.g. fire apparatus, first aid kit, chemical spill kit etc.
4. Assess whether any specific safety equipment is required when carrying out a specific procedure e.g. antidotes to extreme poisons. If so have it to hand.
5. Do not carry out any experimental procedure involving dangerous chemicals or reagents unless you know that someone else is within calling distance.
6. Assess whether or not the experimental procedure may present a particular potential hazard to others working nearby, e.g. bulk use of toxic or flammable solvent. In this case ensure that everyone is aware of what you are doing.
7. Ensure that all chemical and reagents are properly labelled. Label all newly prepared compounds and solutions with name/initials, their contents, the concentration and the date.
8. Store known highly toxic compounds in a locked cupboard where possible. These have the skull and cross bones on their label. Store bulk quantities of flammable solvents and reagents in designated fireproof safety cabinets, separate from oxidizing and corrosive chemicals. Do not leave bulk chemicals (e.g. Winchesters) on shelves, benches or floors. Do not carry Winchesters by their necks, use appropriate carriers.
9. Treat any new, unlisted, or untested compound as potentially toxic and take appropriate precautions.
10. Do not place flammable solvents in refrigerators, freezers or cold-rooms unless you know that the cold store place has been specially modified for their storage and is spark proof.
11. Use a fume hood whenever possible for procedures involving toxic, hazardous or volatile substances, particularly when a heat source is necessary.
12. Follow the WIMM disposal policy. If in doubt consult Malcolm Shepherd the WIMM Waste Disposal Officer.
13. Kits for dealing with localised biological and chemical spillages are available on each floor. A kit for larger serious spillages is available from outside the WIMM liquid nitrogen facility on the ground floor.
14. Use of mercury thermometers is strictly forbidden.
15. Storage of bottles containing more than 500ml ether is forbidden.

Appendix 10

WORKING WITH ETHIDIUM BROMIDE

Ethidium bromide is a recognised mutagen and carcinogen because it intercalates with DNA. Ethidium bromide must be bought in liquid or tablet form if you need to use it. Purchase of powdered ethidium bromide is now banned. Consider safer alternatives such as Gel Red.

Always wear two pairs of gloves, avoid splashes and weigh out in a certified chemical fume hood or in an enclosed extract box.

All waste containing ethidium bromide should be collected and treated as follows:-

a) Very dilute buffer solutions can be disposed of with further dilution via the drains.
b) Gels should be wrapped in clingfilm or a plastic bag and placed in the domestic waste stream
c) Concentrated stocks and redundant solids should be held and disposed of via a chemical/special waste container.

Appendix 11

BIOLOGICAL SAFETY

Biological safety at the WIMM is overseen by the University Safety Office. Its regulations are detailed in The University of Oxford Biological Health and Safety Handbook, University Policy Statement S5/09 on Biorisk Management.

Training in biological safety is provided by the University Safety Office and is available for all new WIMM laboratory researchers.

Each laboratory has a specific set of written **biological work risk assessments**, covering current projects, and available to everyone in the lab. Refer to your lab's **RED safety folder**.

1. Work with microorganisms, pathogens, genetically modified (GM) animals and GM microorganisms

All work with microorganisms must have a risk assessment *prior to starting work*, complying with COSHH regulations.

Work with known pathogens must be assessed in one of the four hazard groups, notified to and confirmed with the University Safety Office, and carried out in facilities of a corresponding containment level, as recommended by the Advisory Committee on Dangerous Pathogens (ACDP).

In the case of Genetic Modification (GM) projects, an additional risk assessment must be carried out *prior to starting work*, according to the Advisory Committee on Genetic Modification (ACGM) recommendations. The written risk assessment assigns the GM microorganism (or GM animal) work to a containment level, and it must be approved by the WIMM GM Safety Committee and notified to the University Safety Office.
Low risk projects (Containment level 1 for GM microorganisms, containment level 1 for GM animals) may be started immediately upon committee approval and University notification. Higher risk projects (containment level 2 and above) must also be notified to the Health and Safety Executive (HSE), via the University Safety Office, at least 60 days in advance. No work on higher risk projects may start until the full notification procedure has been completed.

Electronic copies of GM risk assessment forms can be obtained from the WIMM GM Biological Safety Officer (Dr Zoe Christodoulou email: Zoe.christodoulou@imm.ox.ac.uk)

2. Work with Human (or Simian) Blood and Tissues (see OHS 1/03 and UPS 5/09 appendix 3)

www.admin.ox.ac.uk/uohs/ then go to the page on policies.

Transformation of one's own cells is dangerous and MUST NOT be carried out. Where transformed normal control samples are required, these should not be obtained from staff within the laboratory in which they are to be grown or used. Use screened blood from the NHS Blood Transfusion Service where possible.

A risk assessment should be made for all work involving handling of blood, blood products and other human tissues. The risk assessment should be specific for the procedures involved and take account of the nature and source of the samples to be handled.

Human and simian samples and some other animal samples may carry dangerous pathogens. High-risk samples include all simian samples and samples from diseased patients, and also human samples from outside Western Europe or from people living communally (eg, in Institutions). Consider the source of your samples when planning your protocols. Even if you have been immunised, the sample may not be risk-free for your colleagues. All human tissues will be contaminated with blood. Therefore, they should be regarded as potentially infected material. Other specimens such as faeces and urine are not regarded as posing HBV or HIV infection risk as long as they are not contaminated with blood.

Of particular concern is the possible presence of blood borne pathogens, most notably hepatitis C virus, HBV and HIV, in the material. Where it is known or strongly suspected that specific hazard group 3 pathogens are present then the samples must be handled at the corresponding containment level. In many cases however, it is not known which pathogens (if any) the samples may contain and therefore universal handling precautions should be adopted in the laboratory albeit not to the extent of specifying Containment Level 3.

Any samples that have not been screened should be regarded as potentially infected. Wherever possible material should be used that can be shown by screening to be pathogen free at source although this does not guarantee the sample is HIV negative because of the window between infection and sero-conversion. Blood obtained from the NHS Blood Transfusion Service may be regarded as low risk as it is screened and therefore the additional control measures specified here need not be applied.

All work on unscreened samples must be undertaken at a minimum of Containment Level 2 with additional precautions detailed below. Less stringent containment conditions must not be adopted unless a full risk assessment has been made, agreed by the University Safety Office.

In general, work at Containment Level 2 does not need to be confined to a safety cabinet unless there is reason to believe the specimen contains other pathogens that do require such containment. There is no substantive evidence which supports aerosol transmission of HBV and HIV. However, where handling or processing may generate large droplets or splashes containment control measures must be adopted. At Containment Level 3 all work must be undertaken in a microbiological safety cabinet.

The following paragraphs detail hazards that should be taken into consideration for particular types of work.
Some human cell culture systems incubated for short periods may support the replication of any HIV that may be present in the starting material. These include cell cultures for immunological and cytogenetic studies especially those involving peripheral white blood cells. Similarly, certain continuous lines of cells of human origin may be chronically infected with HIV or the virus may be inadvertently introduced during repeated passaging and use in the laboratory. Therefore in order to contain work of this type safely:-

- the cultivation of cells from known or suspected cases of HIV infection must be conducted at Containment Level 3,

- cells from persons not known or suspected to be infected with HIV may be handled at Containment Level 2 with the additional precautions detailed below for work on potentially contaminated material.

All work on sputum samples and specimens of lung tissues must be undertaken in a microbiological safety cabinet. Samples known to be from patients suffering from tuberculosis must be handled at Containment Level 3.

Workers should be aware that samples of neurological origin may contain slow viruses. This should be taken into account in the risk assessment and particular care taken when samples are handled.

Training

Training in the techniques to be adopted and the safety precautions to be followed should be given to all research staff. The degree of training will depend on the expertise of the person being trained but supervisors should not assume competence until it has been demonstrated. Particular care must be taken in the training of undergraduates and in their supervision. Young persons on work experience schemes should not work with blood, blood products or pathogens. They must at all times be closely supervised when working in any hazardous area.

A suitable training programme should be drawn up by each group, taking into account the nature of the work concerned. On the job training is important and work practices should be monitored. Any shortfall in standards should be brought to the attention of the laboratory supervisor and be addressed immediately.

Health Surveillance and Vaccination

The Institute requires that all workers involved with handling unscreened blood, blood products and other tissues be registered with the Occupational Health. Such registration is compulsory.

Staff handling material that may be infected with HBV should be vaccinated against the virus, and have their response checked. Where they are non-responders further advice will be given by the Occupational Health.

In summary users should read the relevant University Policy Documents (OHS 1/01 Immunisation

Policy, OHS 1/03 Taking Blood Samples, OHS 2/03 Needlestick Policy)

www.admin.ox.ac.uk/uohs/

then go to the page on policies and also to the page under Medical Students on “Safe use of needles and other ‘sharps’ ”.

Appendix 12

CONTAINMENT LABORATORIES

CONTAINMENT LEVEL 1

Good Microbiological Practice

1. The laboratory door should be closed while work is in progress.

2. Laboratory coats or gowns should be worn in the laboratory and be removed when leaving the laboratory area.

3. Safety spectacles MUST BE WORN AT ALL TIMES when working at the laboratory bench.

4. Eating, drinking, smoking, storing of food and applying cosmetics must not take place in the laboratory.

5. Mouth pipetting is prohibited in the laboratory.

6. Hands must be washed and disinfected:-

   when any contamination is suspected;
   after handling viable materials;
   before leaving the laboratory.

7. All procedures must be performed so as to minimise the production of aerosols.

8. Effective disinfectants must be available for immediate use in the event of a spillage and be used as prescribed in the 'Policy on Disinfection' or as agreed with the Biological Safety Officer.

9. Bench tops must be cleaned after use.

10. Used laboratory glassware and other materials awaiting sterilisation must be stored in a safe manner. All contaminated glassware must be disinfected before removal for washing.

11. All waste material must be rendered non-viable before disposal.

12. Materials for disposal must be in robust containers and be transported without spillage.

13. All accidents and incidents must be reported, as soon as possible, via the online Incident Reporting and Investigations System (IRIS) using this link Health & Safety Incident Reporting Form

14. The need to wear gloves is determined by the risk assessment. Gloved hands must not be used to open laboratory doors or telephones. Wearing of gloves to use keyboards is determined by the risk assessment. If in doubt ask the facility manager.

CONTAINMENT LEVEL 2

1. Access to the laboratory is limited to laboratory personnel and other specified persons.

2. The door to the laboratory must be closed when work is in progress.

3. Eating, drinking, smoking, storing of food and applying cosmetics must not take place in the laboratory.

4. Laboratory coats or gowns, which must have side or back fastening, must be worn in the laboratory and be removed when leaving the laboratory; they must be kept in the laboratory.

5. Safety spectacles MUST BE WORN AT ALL TIMES when working at the laboratory bench.

6. Mouth pipetting is prohibited in the laboratory.

7. Hands must be washed and disinfected:

   when any contamination is suspected;
   after handling viable materials;
   before leaving the laboratory.

8. In general, work may be conducted on the open bench, but care must be taken to minimise the production of aerosols. For known aerosol-generating manipulations, eg, vigorous shaking or mixing, ultrasonic disruption etc, the Microbiological Safety Cabinet must be used.

9. Effective disinfectants must be available for routine disinfection and immediate use in the event of a spillage and must be used as prescribed in the 'Policy on Disinfection' or as agreed with the Biological Safety Officer.

10. Bench tops must be disinfected after use.

11. Used laboratory glassware and other materials awaiting sterilisation must be stored in a safe manner. All contaminated glassware must be disinfected before removal from the laboratory for washing.

12. Plastic disposable pipettes must be discarded in the grey plastic boxes lined with an autoclavable bag.

13. Gas burners must not be used in Microbiological Safety Cabinets.

14. Material for autoclaving (eg, agar plates, tissues, etc) must be placed in the grey plastic boxes lined with an autoclavable bag.

15. All waste material must be made safe before disposal.

16. All accidents and incidents must be reported, as soon as possible, via the online Incident Reporting and Investigations System (IRIS) using this link Health & Safety Incident Reporting Form

17. The need to wear gloves is determined by the risk assessment. Gloved hands must not be used to open laboratory doors or telephones. Wearing of gloves to use keyboards is determined by the risk assessment. If in doubt ask the facility manager.

CONTAINMENT LEVEL 3

1. Access to the laboratory is limited to trained laboratory personnel and other specified persons listed outside the containment level 3 laboratory.

2. Eye protection MUST BE WORN AT ALL TIMES.

3. Consult “Code of Practice For Working With Infected Material” document located outside level 3 laboratories in the WIMM. See WIMM E066 CL3 Code of Practice.

Appendix 13

RULES FOR HANDLING BLOOD, BLOOD PRODUCTS AND OTHER HUMAN TISSUES IN THE LABORATORY

Do not start work unless you have received specific instruction and training. Before starting work, check with the Principal Investigator for the project that blood collection from volunteers has appropriate ethical approval. Further information on research ethical approval can be found at: https://www.hra.nhs.uk/about-us/committees-and-services/res-and-recs/

The following precautions must be taken when samples not requiring Containment Level 3 are handled.

For *all* samples:

1. Eating, chewing, drinking, smoking, applying cosmetics, storing of food and outdoor clothing in the laboratory is banned.

2. Mouth pipetting must not be used under any circumstances for any reason.

3. All workers in the laboratory must cover cuts and abrasions with a waterproof dressing.

4. Wash hands regularly and always before leaving the laboratory area.

5. Laboratory coats must be worn at all times whilst in the laboratory and removed before leaving. Eye protection is mandatory.

6. All specimen containers, glassware and used equipment must be immersed in disinfectant [**as prescribed in the 'Policy on Disinfection'**] before cleaning or disposal.

7. Surfaces must be disinfected with [**as prescribed in the 'Policy on Disinfection'**] following spillages. Bench tops must be disinfected after use.

8. Accidents:

   i) in the event of an accident resulting in a wound immediately encourage it to bleed, wash thoroughly with soap and water but *DO NOT SCRUB*, cover with a waterproof dressing.

   ii) in the event of contamination of skin, conjunctivae or mucous membranes immediately wash thoroughly.

   iii) all accidents and incidents must be reported, as soon as possible, via the online Incident Reporting and Investigations System (IRIS) using this link Health & Safety Incident Reporting Form

Additional Precautions for Handling Unscreened Samples in the Laboratory:

1. The use of sharps is banned unless there is no alternative. If sharps are used then they must be placed directly in sharps bins for disposal.

2. Sharps bins can be autoclaved wherever possible before being put out for collection for incineration. Please advise Malcolm Shepherd if this is required.

3. Gloves must be worn at all times when handling samples and be removed before leaving the laboratory.

4. Single use (disposable) gloves must not be reused. Multi-use gloves must be regularly checked for integrity.

5. In the event of gloves becoming damaged or grossly contaminated the gloves must be discarded, hands washed and new gloves put on.

6. Eye protection (goggles, safety glasses or safety visor) and a plastic apron if the work activity is likely to cause splashing.

7. Materials must only be handled at clearly identified, designated workstations.

8. On completion of work, the workstation and all equipment must be disinfected.

9. Samples must be centrifuged in sealed safety buckets.
10. All waste materials must be made safe before disposal.
11. All specimen containers, plastic ware and used equipment must be immersed in disinfectant (1% Virkon, minimum 15 minutes) before cleaning or disposal.
12. Identifiable human samples must be disposed of via the yellow “sharp” bin route.

Appendix 14

USE OF MICROWAVE OVENS

Microwave ovens are useful laboratory tools but can be extremely hazardous if used inappropriately. Microwaves are emissions tested annually when PAT tested.

General guidelines:

- Only use glass, ceramic or plastic vessels, never use metal or aluminium foil
- Never heat hazardous, volatile, or radioactive substances
- Never heat solid agar blocks especially if in a conical flask. Always break up agar first
- Remove caps from vessels and replace with an inverted plastic beaker or a foam bung before heating to prevent pressure build up
- Wear safety specs and heat-resistant gloves when handling heated vessels
- If solution has been allowed to boil let vessel cool for a couple of minutes before removing to prevent boiling over of superheated liquid when moved.
- Take into consideration the size of the vessel used to melt agarose relative to the volume of agarose being melted. E.g. A 500ml flask is not large enough for melting 400ml agarose.
- It is much safer to melt agar/agarose in short bursts rather than to set the timer for a fixed period of time as this may result in it overheating.

Rules for using a microwave oven (to be posted adjacent to oven):

The following items ONLY can be heated in this microwave oven:

- Water
- Agarose solutions (add ethidium bromide after melting agarose)
- Solid agar - chop up large volumes first with clean metal spatula
- Physiological salt solutions (Mg^{2+}, Na^{+}, Ca^{2+}, HCO^{3-}, CO_3^{2-}, Cl^{-})
- If you wish to use anything else please consult your supervisor and/or WIMM Safety Officer first. Items of food or drink must never be heated in this oven.

N.B. If wishing to melt a bottle of agar for pouring plates this is more quickly and safely done by re-autoclaving the bottle of solid agar rather than using a microwave.

Appendix 15

SOURCES OF INFORMATION

- MSDS are provided with every chemical when purchased which gives hazard (H) and precautionary (P) statements.
- Hazard spill charts are located throughout the WIMM to be used as a first reference in case of spillage.
- The University Safety Policy Statements are available from the WIMM Safety Officer. They contain working practices and are constantly updated to include new legislation or guidance.
- New information and minutes of safety committee meetings will be posted under Safety on the WIMM website.

Further information

- Safety memos also available from University of Oxford Safety website. www.admin.ox.ac.uk/safety
- Further information is also available from the Health and Safety Executive website www.hse.gov.uk
  and
  http://www.hse.gov.uk/biosafety/information.htm
- For help regarding the HTA either ask the WIMM Designated Individual or go to the website www.hta.gov.uk
- For help regarding research ethics committees go to www.hra.nhs.uk/**research**-community/.../**research-ethics-committee/**
- WHO Biosafety Manual
- http://www.who.int/csr/resources/publications/biosafety/en/Biosafety7.pdf
- Regulatory support
  http://www.mrc.ac.uk/Ourresearch/Ethicsresearchguidance/RegulatorySupportCentre/index.htm