

**Centre for the Cellular Microenvironment (CeMi)
& Biomedical Interfaces at Glasgow (BIG) Research Groups**

Biomedical Engineering Level 6 Labs (rooms 607, 608, 610, 611, 614)

Rankine Building

CODE OF PRACTICE

1. General Introduction

The adoption and practice of good safety procedures is of paramount importance both for the health of fellow workers and for the integrity of the fabric of the laboratories at the Division of Biomedical Engineering.

No work should be carried out in the laboratory in rooms 607, 608, 610, 611 and adjoining rooms without prior permission of the **Lab Guardians Professor Manuel Salmeron-Sanchez** or **Professor Nikolaj Gadegaard**.

Access to rooms 610 and room 607 on level 6 is via security coded doors on the main corridor 637; room 611 is accessed from the main corridor through room 607 or through the coded door of room 611A (see Fig. 1). Only trained personnel should have access to the security codes. When the lab is occupied, the door should be left unlocked so that access can be gained in an emergency. The doors should be locked when the lab is unoccupied.

The Biomedical Engineering Level 6 Labs include:

- The **Biology Lab** (Lab responsible: **Dr. Vineetha Jayawarna**) is divided into four separate areas: two Cell Culture Rooms (608 and 607B), an AFM Room (610), and a Molecular Biology Room (610) (see Fig. 1).
- The **Synthesis Lab** (Lab responsible: **Dr. Marco Cantini**) is located in room 607A (see Fig. 1).
- The **General Lab** (Lab responsible: **Dr. Badri Aekbote**) includes room 611, room 607 and the Microscopy Room 607C (see Fig. 1).

- The labs also include a Sterilising and Washing Room (611A), a Plant Room (611C), and a Liquid Nitrogen Storage Room (614A) (see Fig. 1); the lab technician has responsibility for these rooms.

2. Lab safety

No work should be carried out until all necessary safety documentation has been prepared or read and understood and the local safety manual signed.

Necessary safety information include: Code of Practice, School of Engineering Safety Handbook (including other essential safety information found at <https://www.gla.ac.uk/schools/engineering/students/> 'Health & Safety Information For The School Of Engineering'), General Risk Assessment, and COSHH forms (including detailed protocol of the activity related to the specific COSHH form). Hard copies of this information can be found in the Lab Safety Folder available in the lab.

New staff and students should make themselves aware of the positions of safety equipment in the various labs. These are:

- **Emergency telephone number** is **4444**, telephones are located next to access/exit door in room 610, on desk in 607, next to access/exit door in room 607A, and near furnace in room 611 (See Fig. 1 📞).
- **Fire Extinguishers** are located on the wall in room 610, on the wall at the door of room 607, on the wall at door of room 607A, in 611 on the floor at door to 611D, on wall in 611B near the door (See Fig.1 ✖).
- **Fire blanket** next to the hand washing sink in room 610, next to the exit door to room 611D in room 611 (See Fig.1 🔴).
- **First Aid kits** on the cupboard next to the sink in room 610 and on wall near the door to room 607A in room 607. (See Fig.1 ✖).
- **Eye shower** in room 610 (next to the sink) and 611 (next to sink); the lid of the eye shower should be opened prior to starting any work in the lab and closed after leaving the lab (See Fig.1 ▲).
- **Emergency shower** and **Eye shower** in room 607A (in the corner next to the emergency exit leading to the room 605 (See Fig.1 ▲)).
- **Safety goggles/spectacles** and other **protective clothing** can be found in all labs. Safety goggles are found in a drawer beside the sink in room 610, in a drawer labeled goggles in 607A and on the shelf of the first bench in 611. Laboratory coats can be found in locker 31 in the corridor, labelled lab coats, on the coat rack at the entrance to room 607, in room 610, and in rooms 608 and 607B. Face mask respirators can be found in the drawers at the entrance to room 607A.
- **Emergency exit:** refer to level 6 emergency plan to know the route to evacuate the building in case of incidents. More information can be found on the emergency exit plan at the level 6 lift.
- The **Lab Safety Folder** (containing: signatures of authorized personnel, Code of Practice, General Risk Assessment, COSHH forms, blank copies of Injury or Dangerous Occurrence Report forms, School of Engineering Safety Handbook, and other essential safety information) is available in room 610 and 607A.

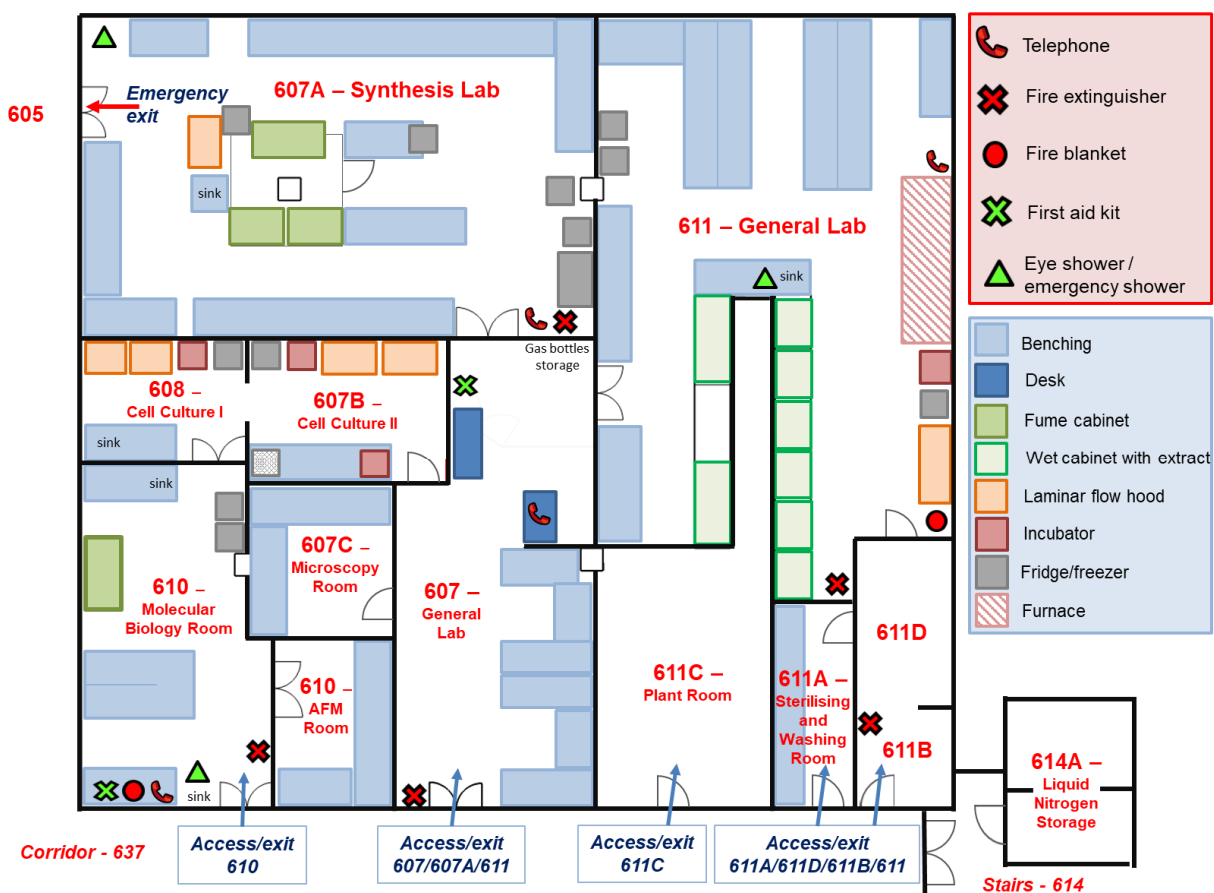


Figure 1. Lab floor plan

Any work outwith 9 am to 5 pm requires discussion with Professor Manuel Salmeron-Sanchez or Professor Nikolaj Gadegaard and explicit permission obtained before out of hours running of experiments is undertaken. No one is to work alone when using hazardous materials or processes.

If you are planning to work in the lab for an extended period of time outwith 9 am – 5 pm Monday to Friday, you must always have a partner in the building that you keep in regular contact with. If you are going to be in the lab for a short period of time, (e.g. changing cell media) you must let someone know when you enter and leave the building, but this person does not have to be in the vicinity (e.g. text, phone call). Whether you are working in the lab for a short or long period of time you must always sign the out of hours book when you enter and leave the building. This can be found at the janitors on level 4.

All new staff and research students who wish to work out with normal working hours must fill in the safety documentation; this is found in room 610 and online <https://www.gla.ac.uk/schools/engineering/students/>.

If anyone wishes to use new or additional procedures (biological or chemical), they MUST inform their supervisor of this **BEFORE** ordering any chemicals, biochemicals, microorganisms etc. or starting the practical work. A COSHH form or risk assessment must be completed using the School web-based database and approved by their supervisor. A hard copy of the COSHH form and a detailed protocol related to that particular COSHH form should also be kept in the laboratory and signed by all those

involved in that activity. In addition, people should e-mail or otherwise inform others in the group if performing a new and particularly hazardous procedure.

Lab coats or other protective clothing, as required, must be worn at all times in the lab. Where necessary, safety spectacles must also be worn.

Personal belongings such as bags and coats should be stored in owner's office or a locker, not left on the open floor. Books and paper in the labs should be kept to a minimum.

No food or drink may be consumed in the laboratory.

If you find yourself following a possibly unfamiliar procedure or performing an experiment and are unsure of what to do next or if something is going wrong, seek assistance from somebody rather than end up having an accident.

All accidents or mishaps must be reported, preferably to a supervisor or colleague. Blank copies of accident report forms are kept in the "Lab Safety" folder in both labs.

3. Covid-19 measures

- Guidance from the HSE, UK Government and Scottish Government to manage the risk related to Covid-19 pandemic must be applied to the labs. This includes physical distancing, frequent hand washing and hygiene measures, cough etiquettes and face covering in enclosed public space. Considerations for codes of practice and risk assessment for the James Watt School of Engineering can be found here (see the '**Covid-19 Draft Code of Practice & Risk Assessment**' at <https://www.gla.ac.uk/schools/engineering/informationforstaff/safety/>).
- Physical distancing within the labs means a maximum capacity of 10 people working at any given time, as follows:
 - 1 person in room 610 – Molecular Biology Room,
 - 1 person in room 610 – AFM Room,
 - 1 person in room 608 – Cell Culture I,
 - 1 person in room 607B – Cell Culture II,
 - 1 person in room 607C – Microscopy Room,
 - 2 people in room 607A – Synthesis Lab,
 - 3 people in room 611 – General Lab,
 - 0 people in room 607 – General Lab.

Movements between rooms and within a room with multiple occupants should be limited and physical distancing must be observed.

The access/exit door to room 610, the access/exit door to rooms 607/607A/611, the door between room 607 and room 607A, and the door between room 607 and room 611 are to be kept open at all times during working hours.

- Demand to use the rooms will be managed by the PIs, the Lab Guardians and the Lab Responsibles in collaboration with the Safety Coordinator, according to an online working rota. Lab users should book shifts on the rota via an online booking system after consultation with their supervisors or line managers and before accessing the lab. Impact on the overall capacity of the Rankine building will be reviewed by the Technical Services Manager.

- Lab users must wash their hands regularly and wipe workstation surfaces, materials, and equipment at the start of their work and before leaving. Door handles must be cleaned regularly.
- Emergency support (First Aiders and Fire Area Officer) might be constrained due to Covid-19 restriction on building capacity. Task risk assessments need to be reviewed to include the above Covid-19 measures and to evaluate which work can be safely undertaken with reduced access to emergency support. A Covid-19 risk assessment template can be found here (https://www.gla.ac.uk/media/Media_723618_smx.docx).

4. Biological safety (Good Microbiological and Mammalian Cell Culture Practice)

Regulations covering the use of microorganisms and biological materials (human or animal cell cultures) are set in COSHH forms. Here are some simple guidelines that you should follow to work safely:

- All cell culture work must be carried out in biological safety cabinets in cell culture room
- Label cultures carefully and accurately
- Be tidy; avoid clutter
- Clear out fridges and freezers regularly
- Cover any cuts or abrasions with a waterproof dressing
- Discard contaminated disposables into autoclave bags, and washables into a biocide solution such as Virkon
- Put contaminated tips, Eppendorf tubes etc. in suitable containers; don't leave them lying on the bench
- Don't put contaminated pipettes down on the bench; release the tip downwards into a jar of disinfectant and completely immerse them
- Put a biocide in water baths to prevent bacterial growth; replenish monthly
- Don't eat, drink or apply cosmetics in the lab, or put things like pens in your mouth
- Don't mouth-pipette
- Swab benches regularly with a disinfectant such as 1% Virkon
- Wipe up spills of microorganisms and clean contaminated area with disinfectant; always ensure that supplies of an appropriate disinfectant at a suitable working dilution are available in case of contamination or spillages
- Wash your hands regularly and whenever leaving the lab
- Wear protective clothing (lab coat and disposable gloves)
- Have your lab coat laundered regularly. Keep it in the lab. Don't wear your lab coat outside the lab, unless you are handling /carrying biological materials
- Don't bring bags, coats etc. into the lab
- Transport biological materials in two layers of robust sealed containers (this will maintain containment if they are dropped)
- For work with animal cells, similar practises as highlighted above for microbiological work applies. It is also important to notice that both cell culture labs have only been set up for work with animal cells as well as human cell lines (commercially available). Whereas the lab is certified for work with primary derived animal cells, **under no circumstances should any work take place with unscreened primary human cells. This includes both blood and tissue derived cells.**

5. Chemical Safety

Any work with solvents, corrosive chemicals, concentrated and moderate strength acids and alkalis must be carried out in the fume cupboard with safety glasses, appropriate gloves and other applicable protective clothing worn. Consult the MSDS of each chemical before using it and the COSHH form of the related activity, and consequently wear appropriate protective clothing and operate in accordance with the procedures established in the COSHH form. Used gloves and paper towels must be disposed of according to the MSDS of the chemical employed and to the procedures established in the COSHH form of each activity. Used gloves and paper towels can be put into normal waste bins if it is not explicitly specified otherwise in the related COSHH form.

Liquid monomers, solvents and other chemical used in the Synthesis Lab (room 607A) for polymerization must be dealt with according to the specific procedures established in the corresponding COSHH form. Appropriate protective clothing must be worn, including safety spectacles, non-disposable rubber gloves covered with disposable gloves, and face mask respirators when necessary. All personnel present in the lab or coming into the lab must be informed prior to commencing any hazardous activity and appropriate safety precautions must be taken, as specified in the related COSHH form.

In the event of spillage of any chemical, follow the procedure established in the MSDS of the material and the COSHH form of the related activity. Inform the personnel present in the lab and evacuate the area if necessary. Carefully read and understand the COSHH form of each activity before commencing it to be sure of the emergency procedures in case of incidents. Do not start any activity if no clear course of action is known in case of incidents, such as spillage of chemical onto the floor or on any person. Check that all emergency equipment/material is in place and readily available (e.g., activated carbon in the case of spillage of liquid monomer onto the floor, emergency shower in the case of spillage of any hazardous chemical onto anyone). In case of doubt, always consult your supervisor or the responsible of the lab before starting any activity within the laboratory.

In the event of an acid or alkali spillage on anyone immediately soak the affected area with copious amounts of water.

6. Waste disposal

- **GLASS:** All non-contaminated broken glassware, slides and coverslips must be disposed of in the broken glass bins.
- **SHARPS:** All sharps, i.e., scalpel blades, needles should be disposed of in the small sharps boxes.
- **BIOLOGICAL WASTE** (*"Biohazard" - cell cultures, contaminated waste*): An appropriate procedure for disposal of used cultures must be recorded in the COSHH assessment for any work with cultures or microorganisms. All biological waste must be handled with appropriately before disposal.

Liquid culture waste must be chemically sterilized by disinfectants (1% Virkon) or by autoclaving prior to disposal into the drain. Used disinfectant solutions must be washed down the sink with copious amounts of water (at least 20 times excess).

For **solid biological waste** disposal, there is a university service collecting the waste to be autoclaved (on monthly basis). There are two types of solid biological waste, hard waste (e.g. all contaminated plastic ware - pipette tips, plastic pipettes, cell culture flasks, petri dishes etc.), and soft waste (contaminated paper towels, gels, gloves...); both types must be labelled as. All biological waste must be kept in yellow biohazard bins.

Contaminated glassware must be soaked in an appropriate disinfectant (1% Virkon).

For work involving genetically modified material, a GM risk assessment must be completed. Anyone working with genetically modified organisms should consult the COSHH form and dispose of biological material in autoclave bags, which are being collected by university service together with biological waste.

- **CHEMICAL WASTE:** Waste solvents must be disposed of into clearly labeled waste bottles/cans located in the fume cupboards or safety cabinets. As far as possible avoid mixing of materials, using separate containers for different solvents. Halogenated and non-halogenated organic solvents must be stored separately. Solvent contaminated with liquid monomers should be stored separately. Any excess of liquid monomer used for polymerization should be polymerized and dealt with as solid (plastic) waste.

A special waste uplift is arranged on a regular basis.

Acid should be disposed of in the fume cupboard as follows: Fill a large beaker with water then slowly add the acid to the water to dilute, pour the dilute acid down the drain in the fume cupboard, and flush with copious amounts of water.

7. Weighing chemicals

All chemicals are to be treated, as potentially harmful and so good laboratory practice should be adhered to, that is:

- Wearing lab coat, gloves and safety spectacles.
- Wearing face masks when weighing any chemicals of fine particle size.
- Rinsing used spatulas & disposing of used weigh boats.
- Cleaning up any spillage (use brush for analytical balance).

All areas and balances should be left clean.

When weighing harmful or toxic chemicals, gloves, safety goggles and facemask must be worn. All spatulas and glass/plasticware must be rinsed with copious amounts of water before washing.

Potentially toxic and hazardous volatile liquid chemicals must be weighed inside a fume cupboard using appropriate protective clothing and following the safety procedures described in individual COSHH forms.

8. Spillages and accidents involving cultures of microorganisms

If your hands are contaminated, wash thoroughly with soap and water.

If a tube, culture bottle or flask is broken, the contaminated area should immediately be flooded with disinfectant (1% Virkon) which should be allowed to act for 60 minutes. Stop all work in the area and post a warning notice. The area should then be cleaned up with paper towel, washed with water, and allowed to dry. Broken glass should never

be picked up by hand. Use forceps or a pan and brush and disinfect them after use. Waste paper must be put into the biohazard bin.

Contaminated clothing should be removed and autoclaved.

9. Aerosols and droplets infection hazard

Aerosols constitute a major infection hazard and may persist in the air for some time. Sources of aerosols and droplets include:

- Opening the screw caps of universals,
- Opening ampules,
- Opening of Snap-On actions, e.g., closures on plastic containers or plug stoppers,
- Any pipettes when transferring dilutions etc.,
- Breakages of containers in centrifuges,
- Accidental breakages,
- Homogenizing by mechanical means (particularly at high speeds),
- Operation of centrifuges.

Guard against excessive production of aerosols. Pipette carefully; avoid blowing bubbles or spray. When pipettes are rinsed, e.g., between dilutions, or the contents are discharged into media or disinfectant, submerge the tip of the pipette and expel the contents gently, without blowing bubbles.

10. Handling of liquid nitrogen

All cell culture stocks are stored in cryotubes in a small Dewar flask in Room 610 with a hard copy of stock list in the filing cabinet in the same room (e-copy available).

As liquid nitrogen temperature is quite low (-196°C), there is a risk of cold burns therefore it has to be handled with great care. When working with the Dewar, wear protective heavy gloves, lab coat and goggles/face shield provided. In addition, as liquid nitrogen is constantly boiling and evaporating, it must never be kept in tightly sealed containers because of high risk of explosion.

Cryotubes removed from liquid nitrogen may explode without warning. The explosion is thought to be caused by small amount of liquid nitrogen entering the tube through microscopic cracks during storage, and then rapidly expanding as the tube thaws. When thawing the tubes, a lab coat, gloves and safety goggles should be worn.

Liquid nitrogen stock Dewar is kept in room 614A; use the same protection as before when collecting liquid nitrogen from the stock Dewar.

11. Use of equipment

Do not use any equipment in the labs without previous authorization from the responsible of the lab and without having received a proper training. Each piece of equipment has been assigned a code and personnel responsible for its proper use and maintenance; a list of equipment together with a form stating the personnel responsible for its maintenance and the people authorized for their use is available in both labs.

Few notes:

- pH meter: Never leave the electrode exposed to dry out.
- Sterile hoods: Always clean the hood **before and after use**: Disinfect with 10% Chemgene, Wipe down all surfaces with 70% ethanol. Once work is complete, disinfect with 10% Chemgene wipe down all surfaces with 70% ethanol and UV light for 20mins. Please refer to Biological Safety Cabinet SOP for full details. All new staff should receive training before using the safety cabinets.
- Centrifuges: Always balance tubes in a rotor to avoid centrifuge damage.
- Fluorescence microscope & AFM: Do not use without appropriate training. If you are not sure, ask senior member of staff for help.

12. Final points for all labs

ALL containers, beakers, bottles etc. must be correctly labelled with owner's name, date and contents. Unlabelled containers or those not properly labelled will be disposed of.

Anyone storing material in fridge/freezers should try to keep this to a minimum; there is limited scope for long-term storage.

Keeping a minimum amount of paper in the lab reduces dust.

NEVER mouth pipette, use electronic pipet filler or pi-pump provided.

If any equipment breaks or is not working tell the level 6 person responsible (Prof. Salmeron-Sanchez, Prof. Nikolaj Gadegaard, Dr. Jayawarna, Dr. Cantini, Dr. Badri Aekbote) immediately.

Updated 16th June 2020