

Emergency numbers

University Security Emergency Contact number dial 6666 (24 hour)

Emergency Services dial 6666

Security Control Room dial 6817 (24 hour)

In Event of emergency dial 6666. University Security will take your call and direct emergency services to correct building.

If emergencies have been reported direct to (9) 999 Notify the Security Control Room on 6817 immediately afterwards.

Important Contacts

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SAGE GM Chair	Prof Angharad Gatehouse	

Chemical Engineering & Advanced Materials

School Biosafety Manual Version 2.1

This document must be read and understood by all researchers carrying out work with Biological agents within CEAM.

Dr R O'Kennedy

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2 Introduction

Safety is everyone's responsibility. You have a duty to yourself and others to maintain a safe working environment in the offices and laboratories. We depend on you to ensure that potential hazards and risks are identified, contained and minimised. This document is intended to help us all to achieve these objectives. The handbook must be read in conjunction with the School Health and Safety Policy and Handbook. The University rules and guidance on Biological safety are on the University Safety Office (USO) website at www.safety.ncl.ac.uk. These rules must be followed. This handbook identifies additional requirements for working and handling of all biological agents in CEAM.

3 Scope

This document covers the use of all biological agents¹ and genetically modified microorganisms (GM) used in the CEAM. This covers the use of all Hazard Group 1 (HG1) and many Hazard Group 2 (HG2) biological agents. An example of a HG1 organism is *S. cerevisiae* while all *Clostridia* belong to HG2. The possession and use of all HG3 and HG4 biological agents is not permitted in CEAM. Please contact the Biological Safety Supervisor (BSS) or University Safety Office (USO) for further details on Biosafety, hazard groups and BioCOSHH and SAGE GM Chair for more information on GM risk assessments.

This document applies to two functional areas :

1. All CEAM Laboratories where biological agents are used. General Biosafety rules which apply to the use of biological hazards within the department.
2. BioLab (Rm C313) : Additional requirements apply to all work carried out in the BioLab

¹ The COSHH definition of a biological agent is a microorganism, cell culture or human endoparasite, whether or not genetically modified, which may cause infection, allergy, toxicity or otherwise create a hazard to human health. This includes microorganisms (eg bacteria, viruses, fungi and transmissible spongiform encephalopathy agents), parasites (eg malarial parasites, amoebae and trypanosomes), the microscopic infectious forms of larger parasites (eg ova and infectious larval forms of helminths), cell cultures (eg primary or continuous human or animal cell lines) and nucleic acids (eg oncogenes or viral infectious clones).

When you have read this document please complete the form 10.2.3 in the appendix and give a signed copy to the Biological Safety Supervisor.

4 Biosafety in CEAM

The laboratories within CEAM have a diverse number of projects some of which use biological agents. In order to accommodate teaching and research in these areas, general biosafety standing rules apply to all laboratory areas (Section 7). Additional standing rules apply to the BioLab (rm 313) contained facilities (Section 8), which have been set up for use of genetically modified organisms and some CL2 biological agents.

The standing rules are mandatory and repeated non-compliance will result in suspension of laboratory access.

4.1 Biosafety Principles.

Biological agents present a different range of health and environmental risks than chemical agents. In addition, genetic modification of biological agents can change their risk profile, potentially changing a relatively benign biological agent into a significant health or environmental risk. Risk assessments (RAs) are carried out with the objective of minimising the risk to you and your colleagues. RAs are not only in the interests of our well-being but also in complying with legal requirements.

Please remember that the paperwork alone will not protect you from chemical biological hazards. While the paperwork is a legal requirement of COSHH, failure to comply with the control measures can result in severe health impacts on you and your colleagues as well as lab closures and/or prosecution. You should seek guidance from the School Biological Safety Supervisor and your supervisor when preparing, implementing and reviewing Biosafety. University rules and guidance on biological safety is given on the University Safety Office USO website (www.safety.ncl.ac.uk).

The principle behind Biosafety is appropriate biological risk assessment (or BioCOSHH RA). The objectives behind the BioCOSHH RA are

1. Identify and categorise the hazards associated with the use of a particular biological agent (or related group of biological agents) and evaluate the risks to people and the environment.

2. Use a biological containment level suitable for the identified hazards.
3. Put procedures, infrastructure and training in place to mitigate identified risks to an acceptable level.
4. Ensure workers are properly informed, trained and supervised to enable them to safely and competently perform the work.
5. Periodically review compliance with the procedures, infrastructure and training so that the risks continue to be acceptable.

Principal Investigators (PIs) and Staff members are responsible for preparing appropriate BioCOSH RAs. With appropriate training, researchers can prepare or amend RAs. However, the final responsibility lies with the PI to check that the RA is appropriate and maintained correctly. (See Section 5 for further details on preparing BioCOSH RAs). PIs are also responsible for monitoring and reviewing that researchers comply with risk assessments, school and university safety policies. This is to ensure that other staff, students and visitors are safe and working safely.

4.2 Genetic Modification (GM)

A GM risk assessment is required by law for the possession or use of any genetically modified organisms (GMO). GMOs cannot be brought into Newcastle University until the principal investigator a GM risk assessment has been approved by the University GM Safety Committee (GMSC) and the approval certificate from the University BSO has been issued. Managers and PIs are responsible for preparing GM risk assessments. Template GM risk assessment forms are available on the USO website (www.safety.ncl.ac.uk).

If you wish to do any GM work you must apply for permission from the University GMSC. A GM risk assessment must be submitted by the principal investigator by email to the SAGE GM Chair. The University BSO issues advice and approval for GM risk assessments on behalf of the University GMSC.

Enquiries on GM risk assessment and genetically modified organisms should be directed to your SAGE GM Chair. Further information can be obtained from the School Biosafety advisor. You must follow and comply the rules and guidance on the GM risk assessment page of the USO website .

4.3 Training

Training is an essential component of laboratory biological safety. Staff Supervisors / Principal Investigators are responsible for assessing the safety training needs of their researchers. Staff Supervisors / Principal Investigators should attend University Safety training on Chemical & Biological risk Assessment and where appropriate Genetic modification risk assessment. Table 1 detail basic safety training requirements for researchers and principal investigators.

	CEAM Laboratories				BioLab Laboratory			
	No Biological work		Biological Work		No Biological work		Biological Work	
	PI	RA	PI	RA	PI	RA	PI	RA
University Chemical Safety Training	Y	Y	Y	Y	Y	Y	Y	Y
University Biological Safety Training	N	N	Y	Y	N	N	Y	Y
Local Chemical Safety Training	Y	Y	Y	Y	Y	Y	Y	Y
Local Biological Safety training	N	N	Y	Y	N	Y	Y	Y
GM Risk Assessment	N	N	Y*	Y*	N	N	Y*	Y*

Note. PI = Principal Investigator / Staff Member ; RA = Research assistant / Associate

Table 1. Biosafety Training matrix

5 BioCOSH H Risk assessment

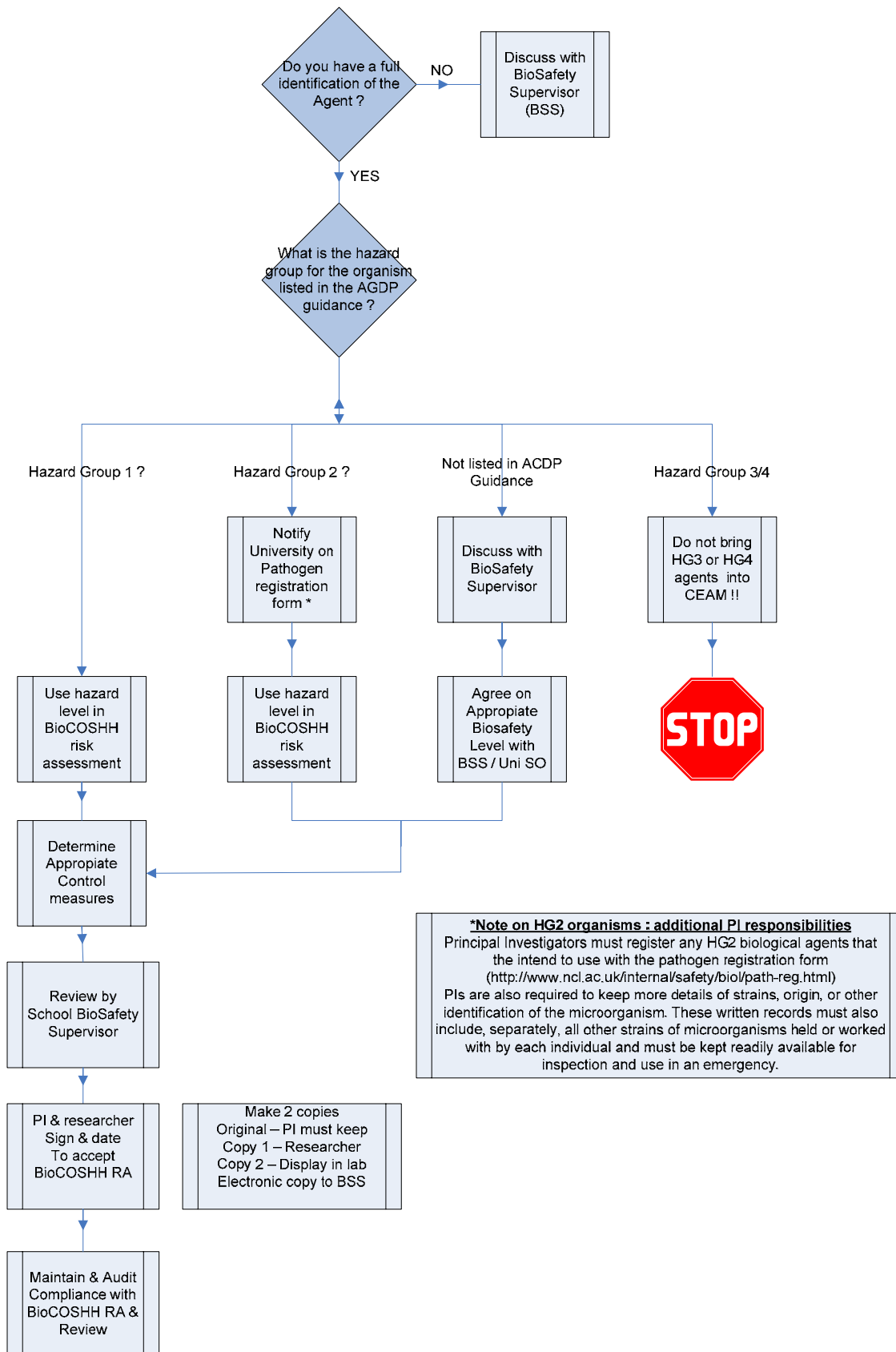


Figure 1. BioCOSH H risk assessment Flow chart. A template BioCOSH H risk assessment form is available on USO website(www.safety.ncl.ac.uk)

5.1 BioCOSHH Risk Assessment : Notes

Essential steps to protect humans, animals, plants and the environment from risks associated with biological agents or hazards. Figure 1 shows a summary of the steps required to prepare a BioCOSHH risk assessment. Template and examples of BioCOSHH risk assessment form are available on the USO website.

- 1) It is the responsibility of managers and principal investigators to ensure that BioCOSHH risk assessments are done in advance and by competent persons.
- 2) BioCOSHH risk assessments and other relevant records must be kept by managers and principal investigators.
- 3) BioCOSHH risk assessments must be reviewed and revised where they are no longer valid or where there are significant changes to personnel, activity or risks.
- 4) Consult and communicate with workers and safety officers.
- 5) BioCOSHH risk assessments and controls must be suitable and sufficient and proportionate to the risks.
 - a) Consider the biological agents or hazards and the work activity.
 - b) Decide who or what might be harmed and how.
 - c) Assess risks relating to biological agents and hazards by deciding on the hazard group (HG1-HG2) and containment level (CL1-CL2).
 - d) Decide what control measures are necessary to prevent or adequately control exposure and minimise the risks.
- 6) Control measures must be implemented, monitored and maintained.
- 7) Ensure there are plans and procedures to deal with emergencies.
- 8) Ensure workers are properly informed, trained and supervised to enable them to safely and competently perform the work.
- 9) School Biological Safety Committee and University Biological Safety Committee permission is required for hazard group 3 (HG3) and several hazard group 2 (HG2) biological agents. HSE notification and consent is required for work with HG3 and a few HG2 biological agents.

5.2 Work Activity Risk assessment

In addition to BioCOSHH, it may also be necessary to carry out a work activity risk assessment. A template for work activity risk assessment is in section 10.2.1. This type of risk assessment should be used for multiple step procedures which contain a complex combination of hazards such as an assay or a bioreactor run

1. List all the main phases in the work practice. Remember to consider experimental preparation and waste disposal.
2. List the known chemical, biological, physical, ergonomic and environmental hazards for each process step.
3. Write a short description of the controls and working practices used to mitigate the risk of a particular hazard. Associated procedures / training requirements should be detailed in **“Procedures, accompanying risk assessments, other supporting documents”**
4. Evaluate the risk before and after implementing control measures. Use H for high, M for medium and L for low.

Note any further improvement that can be made to control measures where appropriate.

5.3 Documentation Management

A copy of the signed BioCOSHH, COSHH and process risk assessment should be available close to where the work is carried out.

The Principal Investigator must keep the original signed version of risk assessments. An electronic version controlled copy of each risk assessment should also be kept. If amendment is required, please create a new electronic version and do not overwrite the original.

Researchers should keep signed copies of risk assessments together in a personal safety and training file. This safety & training file may be requested for inspection during laboratory safety audits.

For some HG 2 organisms, PIs must keep a separate record of all other strains held, who is working with them and the type of work carried. Details on the original source of the organism and the location of stocks must also be kept.

6 Emergency procedures

6.1 Reporting Incidents, Accidents Injuries and near misses

All incidents and accidents must be reported immediately to your manager/principal investigator, and safety officer. All incidents must also be reported on the USO accident reporting form. (www.safety.ncl.ac.uk).

6.2 Accidental biological exposure

The potential for accidental exposure to biological agents through ingestion or inhalation should be minimised by complying with procedures laid out in an appropriate risk assessments. In the event of accidental exposure, make your work area safe to prevent exposure of others and contact a staff member immediately.

6.3 Sharps injuries

Many laboratory accidents arise from the handling of glassware and sharp objects. Such injuries may provide a ready means for toxic substances and biological materials to enter the body, and should be treated immediately. Immediately wash the wound out with clean water and contact a departmental first aider for assistance. Be able to provide clear details of the chemical and biological nature contaminants on the broken glass.

6.4 Biological Spillages

Biological spillages are categorised on the basis of spill volume. The flow chart in Figure 2 provides details on procedures.

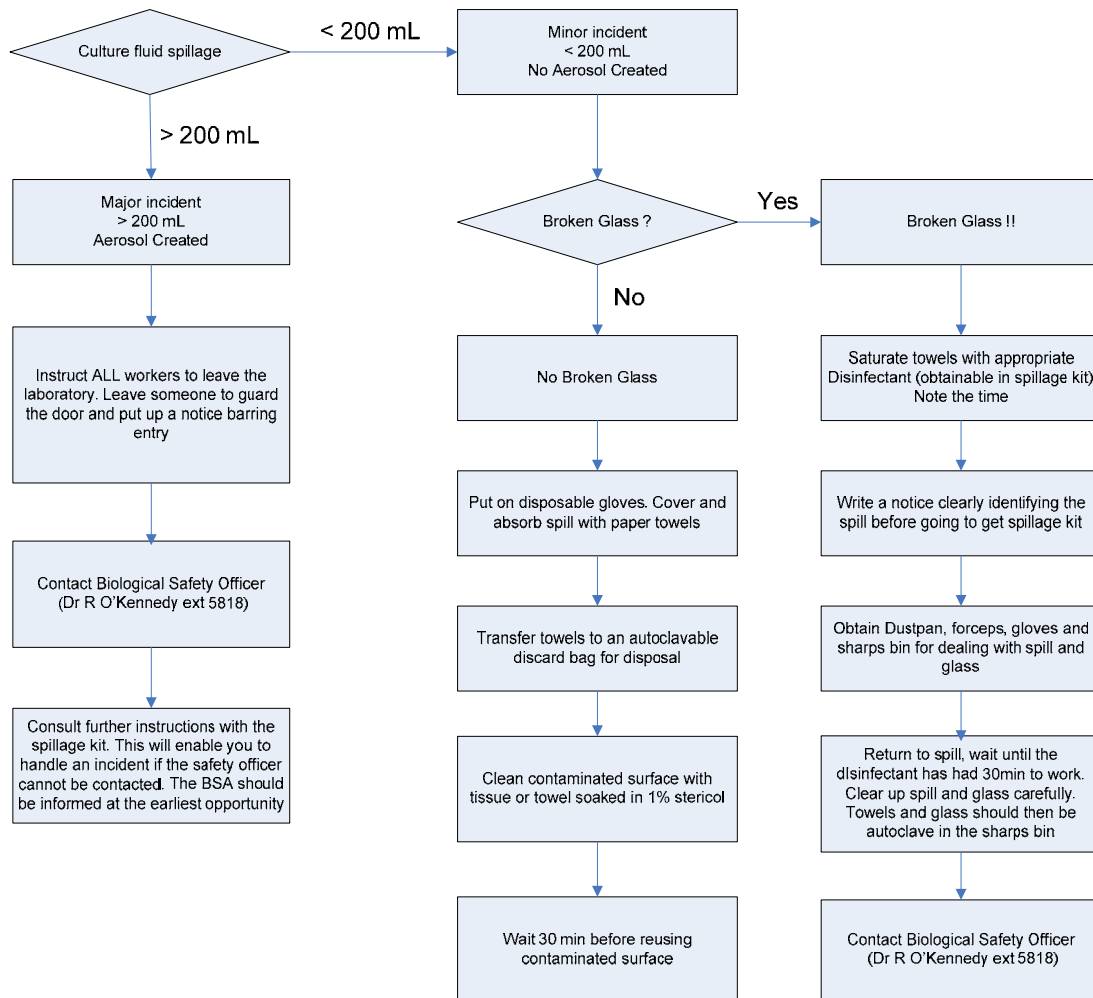


Figure 2. Dealing with Biological Spills

6.5 Dealing with Biological Centrifuge Spills.

1. IN THE EVENT OF BROKEN TUBE IN THE CENTRIFUGE, TURN OFF POWER TO THE CENTRIFUGE. NOTE THE TIME...
2. INSTRUCT ALL WORKERS TO LEAVE THE LAB IMMEDIATELY. PLACE A NOTICE ON THE DOOR BARRING ENTRY. IF POSSIBLE LEAVE SOMEONE TO GUARD THE DOOR.
3. CONTACT THE BIOLOGICAL SAFETY SUPERVISOR (DR O'KENNEDY) OR MR PAUL STERLING
4. OBTAIN FORCEPS, ROTOR SPANNER, GLOVES, NON-CHLORINATED DISINFECTANT, AUTOCLAVE BAG, TISSUES AND A SHARPS BIN,
5. ALLOW 2 HOURS FOR AEROSOLS TO SETTLE.
6. RE-ENTER THE LAB AND CAREFULLY OPEN THE CENTRIFUGE. REMOVE ROTOR AND SPRAY WITH 70% ETHANOL OR IMS AND PLACE IN AUTOCLAVE BAG.
7. SATURATE TOWELS WITH NON-CHLORINATED DISINFECTANT AND LEAVE IN CENTRIFUGE BOWL FOR 30 MIN.
8. CAREFULLY REMOVE BUCKETS AND INSERTS FROM ROTOR AND IMMERGE IN A NON-CHLORINATED DISINFECTANT FOR 30 MIN
9. WIPE DOWN ROTOR WITH NON-CHLORINATED DISINFECTANT AND USE TOWELS TO DRY.
10. CAREFULLY REMOVE TOWELS AND BROKEN GLASS FROM CENTRIFUGE BOWL. TRANSFER TO STAINLESS STEEL BUCKET. TRANSFER ANY BROKEN GLASS FROM ROTOR BUCKETS & INSERTS INTO STAINLESS STEEL BUCKET

11. DRY ROTOR BUCKETS AND INSERTS. REINSTALL ROTOR.

7 BIOSAFETY STANDING RULES IN ALL CEAM LABORATORIES

- 1. BIOCOSHH AND PROCESS RISK ASSESSMENTS (WHERE APPROPRIATE) MUST BE AGREED, SIGNED AND DATED BY RESEARCHERS AND PRINCIPAL INVESTIGATORS BEFORE ANY WORK CAN BE CARRIED OUT.**
- 2. ALL WORK MUST CONFORM TO COSHH REGULATIONS ON SUBSTANCES HAZARDOUS TO HEALTH AND BIOCOSHH REGULATIONS.**
- 3. WHILE IN THE LABORATORY, YOU MUST WEAR A LABCOAT AND SAFETY GLASSES AT ALL TIMES. THE LABCOAT MUST BE FASTENED. LABCOAT MUST NOT BE STORED ALONG WITH OUTDOOR CLOTHING.**
- 4. REMOVE ANY GLOVES AND WASH YOUR HANDS BEFORE LEAVING THE LABORATORY.**
- 5. DO NOT ENTER OFFICE AREAS WEARING LABCOATS OR GLOVES.**
- 6. EATING, DRINKING AND SMOKING IN ALL LABORATORIES IS STRICTLY FORBIDDEN.**
- 7. MOUTH PIPETTING IS STRICTLY FORBIDDEN.**
- 8. REAGENTS, SAMPLES AND PLATES MUST BE LABELLED WITH YOUR INITIALS, CONTENTS, ORGANISM (IF APPLICABLE) PREPARATION DATE AND EXPIRY DATE.**
- 9. ALL BIOLOGICAL WASTE AND BIOCONTAMINATED WASTE MATERIAL MUST BE DECONTAMINATED BY AUTOCLAVE STERILIZATION BEFORE APPROPRIATE DISPOSAL.**
- 10. UNDERGRADUATE AND MASTERS RESEARCHERS MUST NOT WORK ON THEIR OWN IN THE LABORATORY. A PERSON SUITABLY TRAINED AND AUTHORISED TO ENTER THE LABORATORY MUST BE PRESENT IN THE LABORATORY DURING ANY WORK UNDERTAKEN.**
- 11. POSTGRADUATE, UNDERGRADUATE STUDENTS AND MASTERS STUDENTS MAY NOT WORK IN THE SCHOOL OUTSIDE NORMAL WORKING HOURS (9-5PM MON-FRI) WITHOUT THE PERMISSION OF THEIR SUPERVISOR. OUT OF HOURS PERMISSION FORMS MUST BE COMPLETED AND SIGNED BEFORE 4PM.**

8 STANDING RULES IN BIOLAB (C313)

1. **BiOCOSHH, GM AND PROCESS RISK ASSESSMENTS (WHERE APPROPRIATE) MUST BE AGREED, SIGNED AND DATED BY RESEARCHERS AND PRINCIPAL INVESTIGATORS BEFORE ANY WORK CAN BE CARRIED OUT.**
2. **ALL WORK MUST CONFORM TO COSHH REGULATIONS ON SUBSTANCES HAZARDOUS TO HEALTH AND BiOCOSHH REGULATIONS.**
3. **YOU MUST WEAR A LABCOAT AND SAFETY GLASSES AT ALL TIMES. THE LABCOAT MUST BE FASTENED.**
 - a. USE ONLY THE COLOURED HOWIE LABCOATS PROVIDED. DO NOT UNDER ANY CIRCUMSTANCE REMOVE THESE COATS FROM THE LAB.
 - b. OUTDOOR COATS MUST BE STORED OUTSIDE THE BIOLAB.
 - c. ADDITIONAL PERSONAL PROTECTIVE EQUIPMENT (PPE) SHOULD BE WORN WHEN REQUIRED.
4. REMOVE ANY GLOVES AND WASH YOUR HANDS BEFORE LEAVING THE LABORATORY.
5. DO NOT ENTER OFFICE AREAS WEARING LABCOATS OR GLOVES.
6. **EATING, DRINKING AND SMOKING IN ALL LABORATORIES IS STRICTLY FORBIDDEN.**
7. **MOUTH PIPETTING IS STRICTLY FORBIDDEN.**
8. REAGENTS, SAMPLES AND PLATES MUST BE LABELLED WITH YOUR INITIALS, CONTENTS, ORGANISM (IF APPLICABLE) PREPARATION DATE AND EXPIRY DATE. UNLABELLED ITEMS WILL BE DISPOSED OF.
9. ALL BIOLOGICAL WASTE AND BIOCONTAMINATED WASTE MATERIAL MUST BE DECONTAMINATED BY AUTOCLAVE STERILIZATION BEFORE APPROPRIATE DISPOSAL.
10. LAB USERS ARE RESPONSIBLE FOR KEEPING ALL LAB AREAS CLEAR AND SAFE FROM THEMSELVES AND OTHERS.
11. DO NOT BRING IN UNAUTHORISED EQUIPMENT WITHOUT THE EXPRESS PERMISSION OF PAUL STERLING OR DR O'KENNEDY
12. ONLY USE EQUIPMENT ON WHICH YOU HAVE RECEIVED APPROPRIATE TRAINING. IT IS THE SUPERVISORS RESPONSIBILITY TO ACCESS EQUIPMENT TRAINING REQUIREMENTS FOR EACH RESEARCH PROJECT.
13. UNDERGRADUATE AND MASTERS RESEARCHERS MUST NOT WORK ON THEIR OWN IN THE LABORATORY. A PERSON SUITABLY TRAINED AND AUTHORISED TO ENTER THE LABORATORY MUST BE PRESENT IN THE LABORATORY DURING ANY WORK UNDERTAKEN.
14. **POSTGRADUATE, UNDERGRADUATE STUDENTS AND MASTERS STUDENTS MAY NOT WORK IN THE SCHOOL OUTSIDE NORMAL WORKING HOURS (FROM 5.30 PM - 8.00 AM, WEEKENDS AND HOLIDAYS) WITHOUT THE PERMISSION OF THEIR SUPERVISOR. OUT OF HOURS PERMISSION FORMS MUST BE COMPLETED AND SIGNED BEFORE 4PM.**

9 Biosafety Guidance and Good Microbiological Practice (all CEAM laboratories)

CROSS CONTAMINATION

THE USE OF PERSONAL ELECTRONICS SUCH AS MOBILE PHONES, LAPTOP COMPUTERS SHOULD BE MINIMISED.

MOBILE PHONES SHOULD BE USED OUTSIDE THE LAB. BEFORE YOU MAKE OR RETURN A CALL, REMOVE YOUR LABCOAT, WASH YOUR HANDS AND LEAVE THE LAB.

MP3 PLAYERS AND OTHER PERSONAL MUSIC PLAYERS WITH EARPHONES SHOULD NOT BE USED IN THE LAB. APART FROM THE POTENTIAL OF CROSS CONTAMINATION, EXCESSIVE VOLUME MAY MEAN THAT YOU ARE NOT BE ABLE TO HEAR EMERGENCY ALARMS.

CARDBOARD

CARDBOARD BOXES ARE A FIRE HAZARD AND A POTENTIAL SOURCE OF CONTAMINATION.

PLEASE REFRAIN FROM USING CARDBOARD BOXES FOR LONG TERM STORAGE IN LABORATORIES

PLEASE DISPOSE OF CARDBOARD BOXES APPROPRIATELY

PETRI DISHES

AGAR PLATES MUST NOT BE USED FOR LONG TERM STORAGE (>14 DAYS) OF MICROBIAL CULTURES.

FOR LONGER TERM STORAGE, USE AGAR SLANTS OR -70 °C GLYCEROL STOCKS.

WHEN PLATES ARE NOT IN USE, PLATES SHOULD BE SEALED IN CLEARLY LABELED PETRI DISH BAGS.

BAGS MUST BE CLEARLY LABELLED WITH STRAIN, INCUBATION DATE, RESEARCHER AND EXPIRY DATE.

10 Appendices

10.1 *Glossary of terms*

ACDP – Advisory Committee on Dangerous Pathogens

BioCOSHH RA –BioCOSHH risk assessment

GM RA –GM risk assessment

BSS – Biological Safety Supervisor

CEAM. School of Chemical Engineering and Advanced Materials

GMM – Genetically Modified Microorganism

GMSC – Genetic Modification Safety Committee

HSE. Health and Safety Executive

HG- Hazard Group

Hazard –Any thing that can cause harm

Risk –The chance of a hazard causing harm

PI – Principal Investigator

USO University Safety Office (safety.ncl.ac.uk)

10.2 Forms

10.2.1 CEAM WORK ACTIVITIES RISK ASSESSMENT

Location of Work Activities:		Ref No:
Department:	Assessor:	Date:
Review Date:	NB Assessments must be reviewed at intervals not exceeding 2 years	

I am satisfied the controls and working practices specified in this risk assessment will adequately control the risks from the work activities identified.

Manager's name (capitals): _____ **Signed:** _____ **Date** _____

Work Activities Assessed

Work Activities	Hazards	Controls and working practices	Risk before and after controls etc. Implemented		Further improvements to controls	Procedures, accompanying risk assessments, other supporting documents
			Before	after		

10.2.2 Notes on preparing a work activities risk assessment

1. The aim of a work activity RA s to capture risk assessment for a multi step process such as an complex assay, operation of process equipment such as a chemical reactor or bioreactor.
2. List all the main phases in the work practice. Remember to consider experimental preparation and waste disposal.
3. List the chemical, biological, physical, ergonomic and environmental hazards for each process step.
4. Write a short description of the controls and working practices used to mitigate the risk of a particular hazard.
Associated procedures / training requirements should be detailed in “**Procedures, accompanying risk assessments, other supporting documents**”
5. Evaluate the risk before and after implementing control measures. Use H for high, M for medium and L for low.
Note any further improvement that can be made to control measures where appropriate.

10.2.3 Biological Safety Registration for Researchers and Guest workers

Researcher Name _____

Supervisor / PI name _____ School / Department _____

Working in (Lab Name) _____

From (Date) _____ To (date) _____

<i>Please indicate Y/N that you agree to comply with the statements below and initial each</i>		Initials
I confirm that I have read the School Biological Safety Manual <u>and</u> that I will comply with these local biosafety rules.	Y/N	
I am aware of local and university safety policies and I agree to carry out work in accordance with these (See Table below)	Y/N	
I agree to maintain a record of the required documentation (BioCOSHH, COSHH, Process Risk assessments).	Y/N	
I will safety dispose of all biohazardous waste material that I produce	Y/N	
Upon completing my research work I will safety dispose of all waste material prior to leaving	Y/N	

University Safety Policies

Chemical Safety	Biological Safety	Other
COSHH regulation	Safe work with Microorganisms	Disposal of Hazardous Waste
Good chemical Practice	Genetic modification	Unattended Experiments
Carcinogens	Immunisation	Out of hours work

Signed _____

Date _____

Researcher

Signed _____

Date _____

FT Staff Supervisor / Project Principal Investigator

Signed _____

Date _____

School Biological Safety Supervisor

Signed _____

Date _____

BioLab Technical Manager

Revision History

<i>Verson</i>	<i>Date</i>	<i>Reason for change</i>	<i>Changed by</i>	<i>Notes</i>
<i>1.0</i>	<i>19/7/2010</i>	<i>New document sent for review 4/Aug/2010 by school safety committee and USO</i>	<i>ROK</i>	<i>Not released</i>
<i>2.0</i>	<i>4/8/2010</i>	<i>Amended comments from JG,ROK SSC and USO</i>	<i>ROK</i>	<i>Released 15/10/2010</i>
<i>2.1</i>	<i>29/10/2010</i>	<i>Added revision history table. Updated Form 10.2.3</i>	<i>ROK</i>	