CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH – SAFETY PROCEDURE

Reviews and Revisions

Date	Reason	Reviewer	Next review date	Approved by
22/3/17	Rewritten to include biological agents and also to use correct template for safety procedures	Lee Rounds	22/3/18	UKSMG

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INTRODUCTION

This procedure has been developed to provide guidance about work with substances that are hazardous to health and identifies what is required to ensure compliance with the Control of Substances Hazardous to Health Regulations 2002 (amended) (COSHH).

The COSHH Regulations require employers to protect staff and other people against health risks that may arise from work activities involving hazardous substances.

Employers must ensure that work is not undertaken that is liable to expose any staff or other people to any hazardous substances unless a suitable and sufficient assessment of the risks created by that work has been undertaken and that suitable and sufficient control measures have been implemented to reduce that risk to the lowest level reasonably practicable.

GENERAL PRINCIPLES

What are substances hazardous to health?

The COSHH regulations apply to a very wide range of substances and preparations – mixtures of two or more substances – with the potential to cause harm if they are inhaled, ingested or come in contact with or are absorbed through the skin, for example,

Solids, Dusts/ Particulates, Vapours, Fumes, Smoke, Liquids, Fibres, Gases, Mist, Biological agents

These include individual chemical substances or preparations such as paint, cleaning materials, pesticides and insecticides.

Substances hazardous to health can occur in many forms:

- Chemicals may be classified as very toxic, toxic, harmful, corrosive, irritant, sensitising, carcinogenic, mutagenic or toxic to reproduction;
- Dust of any kind can become a substance hazardous to health when it is present in concentrations in the air equal to or greater than 10mg/m3 time weighted average over an 8hour period of inhalable dust or 4mg/m3 of respirable dust, time weighted average over an 8hour period. Dust is produced by many processes, including material removal, e.g. grinding, sanding, abrasive cutting and blasting, buffing and polishing; and also in many Faculty teaching and research projects and workshops;
- Nanoparticles which are particles with a size of <100nm and act as a severe respiratory hazard
- Asphyxiate gases which act by reducing the oxygen content of the atmosphere are classified as hazardous substances. These include inert gases, such as nitrogen and argon, but also certain flammable gases;

- Any Biological agents which can cause harm to human health. Biological agents are any microorganism, cell culture or human endoparasite, including any that have been genetically modified, which may cause any infection, allergy toxicity or otherwise create a hazard to human health.

When conducting a COSHH assessment it may involve chemicals, biologicals or a combination of both.

DEFINITIONS

Classification and labelling chemicals

The Classification, Labeling and Packaging Regulation (CLP) align the European Union system of classification, labeling and packaging chemical substances and mixtures to a Globally Harmonized System (GHS) and came into force on 1 June 2015.

Those ordering and using hazardous chemicals will notice only the new hazard warning 'pictograms' on labels, as well as changes to information given in the Safety Data Sheets (SDS). The old black and orange hazard symbols will no longer be relevant.

Hazard warning symbols: red / black diamonds called 'pictograms'

Hazard warning statements

Risk and Safety phrases (R and S phrases) have been replaced by Hazard and Precautionary statements (2015), any materials with a R&S label should be discarded:

- **Hazard statements are separated into:**
  H200s for Physical hazards
  H300s for Health hazards
  H400s for Environmental hazards

- **Precautionary statements are separated into:**
  P100s for General
  P200s for Prevention

P300s for Response
P400s for Storage
P500s for Disposal

A key precautionary statement in terms of storage is P405 – items labelled with this phrase MUST be stored under lock and key

Signal Words

These indicate the severity of the hazards

- **"Danger"** (for more severe hazard categories);
- **"Warning"** (for less severe hazard categories).

Materials with more than one hazard will be labelled with the most significant Signal Word.

Control measures and procedures for the storage, use, and disposal of the material must be in place before the material is obtained.

Emergency procedures required in the event of accident, spillage or fire must also be identified and in place before the material is obtained.

The new Hazard statements give a more comprehensive coverage of hazardous properties.

The Precautionary statements are far more detailed and are allocated according to the relevant hazards:

- New health, safety and environmental classification criteria for chemicals, requiring reclassification of many chemicals
- New Safety Data Sheets
- A global signal word of either 'Danger' or 'Warning' to be used on chemical labels. These words will replace words such as corrosive, harmful, irritant, flammable previously used on labels.

Solids

A solid is defined as meeting one or more of the following criteria:

- Coarse Powder: 90% of material >1mm (including tablets, sachets, capsules or powder vials)
- Standard powder: 10% of material >20µm, 10%<1mm
- Micro particulate powder: 90% of material < 20 µm
- Nano particulate powder 90% of material < 100nm

Gases

With the exception of chemically inert gases (helium, nitrogen, argon, carbon dioxide) all operations involving the use, or significant release (>3% total lab volume) of gas should be carried out in a fume cupboard. All inert gases must be handled in a well-ventilated area. When using gases outside of a fume hood a risk assessment must be conducted.

Skin (Dermal or "D") Hazards

The effect of harmful substances on the skin may be local (corrosives), systemic, where the material is absorbed, or both (e.g. phenol). There may also be the effect of skin sensitisation.

Skin effects are not easily quantified as much depends on the area and location of the skin affected, and the properties of the material involved.

The prime barriers to skin contact are gloves and eye/face protection. Manufacturers and resistance data is published for a large selection of glove types and thickness. This information should be consulted prior to use. The choice of gloves will be dictated both by the hazard identified, protection factor and the suitability for the task. A compromise between protection and dexterity may be needed. Be aware that gloves have an expiry date and should not be used past this date.

Flammable Chemicals

Under the CLP Regulations, a material may be flammable (H226), highly flammable (H225) or extremely flammable (H224), indicated by the appropriate risk phrase on the label or SDS. The majority of such materials are liquids. When using any flammable solvents, users should be aware of the potential sources of ignition, such as open flames, sparks, electrical switches, thermostats and sources of static electricity.

Carbon dioxide and/or dry powder extinguishers should be readily accessible.

Reactive Chemicals

The CLP Hazard phrases, with appropriate pictogram, will indicate whether a material is an oxidising agent. If an oxidising agent is used in a laboratory procedure, it will undoubtedly be used to make use of that property. Problems may arise in storage - oxidising agents should be stored away from any organic materials, particularly those known to have reducing properties.

Temperature

Certain procedures may involve materials or objects at temperatures considered by the human body to be extreme, i.e. less than 0° C and greater than 70° C. Short or prolonged exposure to temperatures outside this range may cause tissue damage and therefore appropriate handling using thermally resistant gloves or suitable tongs is necessary. Special training is required to handle cryogenic materials like solid carbon dioxide and liquid nitrogen.

Explosive Chemicals

An explosive substance is one which may explode under the effects of flame or which is more sensitive to shocks or friction. An explosion can be considered as a rapid exothermic reaction or decomposition in which gases are produced. This causes a sudden vast increase in pressure within a confined space.

Conditions, which can ultimately result in materials exploding, include:

- Mechanical shock
- Friction
- Temperature
- Violent chemical reactions between reagents.

Substances capable of undergoing explosions include:

- Highly flammable materials if ignited in confined space
- Other thermodynamically unstable materials; classes of such materials include acetylides, acetylenic compounds, polynitro compounds, azides, diazo compounds, fulminates, certain nitrates, peroxy compounds, vinyl monomers, epoxides.
- Materials used on site include picric acid, sodium perchlorate, perchloric acid, alkali metals, diazonium salts, sodium azides, and organometallic compounds such as Grignard reagents and lithium aluminium hydride.

Expired Chemicals

- Many chemicals have an expiry date and as such should be checked before use.
- Chemicals that have been opened may degrade over time and must be checked for suitability prior to use.

Approved Code of practice for Dangerous Pathogens (ACDP) - Hazard Groups

Biological agents are officially classified by ACDP or DEFRA according to the risks to human health, animals, plants and the environment.

ACDP classifies human pathogens into four ACDP hazard groups

- Group 1 - Unlikely to cause human disease
- Group 2 - Can cause human disease and may be a hazard to employees; it is unlikely to spread to the community and there is usually effective prophylaxis or treatment available.
- Group 3 - Can cause severe human disease and may be a serious hazard to employees; it may spread to the community, but there is usually effective prophylaxis or treatment available.
- Group 4- Causes severe human disease and is a serious hazard to employees; it is likely to spread to the community and there is usually no effective prophylaxis or treatment available.

The full approved list can be found at http://www.hse.gov.uk/biosafety/biologagents.pdf

Northumbria University does not have the facilities to store or work with ACDP Group 3 or 4 pathogens. Such pathogens (or samples suspected of containing such pathogens) should not be brought on site.

Any Biological Agent listed as ACDP group 2 must be subjected to an assessment.

Biological agents assigned to Group 1 are not listed in the ACDP Approved List. The non-appearance of an organism on this list should not automatically be taken to mean it is Hazard Group 1.

The categorisation of unlisted agents needs to be determined by Risk Assessment and reasons for placing in Group 1 listed there. As a rule of thumb unknown or unlisted agents should initially be categorised as the highest Group until evidence to place them in Hazard Group 1 is available.

Blood from human volunteers can be handled as Hazard Group 2 as long as a suitable risk assessment has been produced.

RESPONSIBILITIES

COSHH risk assessments must address specific intended work and not individual materials and the principal investigator or manager of the work is responsible for ensuring the risks associated with the work are properly assessed and recorded.

Assessment - Academic/Principal investigators(PI)/Post Graduate Researchers (PGR)

Listed below are the essential steps necessary to protect human health and the environment from risks associated with hazardous substances.

- The information contained in these will assist you in carrying out the assessment;
- Prior to using a material, the academic or PI is responsible for ensuring the assessment is undertaken and appropriately authorized, but should work with technical lead in the area. Competent PGR students can undertake assessments after suitable training.

    - Request the most up to date Safety Data Sheet (SDS)
        - Consult and communicate with technical staff and safety officers;
        - Assess risks to human health and the environment arising from the use of the hazardous substances in the work;
            - Where chemicals are the primary hazard use the COSHH form
            - Where biological agents are the primary hazard use the bioCOSHH form
        - COSHH assessments must be suitable and sufficient, and proportionate to the risks;
        - Consider the hazardous substances and the work activity;
        - Decide who or what might be harmed and how;
        - Decide what control measures are necessary to prevent or adequately control exposure and minimize the risks;
        - Decide whether health surveillance and monitoring of exposure is required;
        - Ensure there are plans and procedures to deal with emergencies.

Procurement - Academic/Principal investigators(PI)/Post Graduate Researchers (PGR)

Prior to ordering any new chemical or biological agent a suitable COSHH assessment must be submitted by the Academic / Primary Investigator/PGR for review and subsequent assessment by the technical manager.

- Send the purchase requisition and COSHH assessment for approval
- Highlight significant risks (e.g. Radioactive/ Hazard Group 2 Bio agents/CMR/ Toxic/ Pregnant risk)

Procurement - Technical manager's/ Faculty safety officers (designated deputy)

- Assess the suitability of the COSHH assessment
    - If not suitable send back
- Once approved ensure the material that has been ordered is delivered to the correct location for use.
- Ensure an electronic copy of the COSHH assessment is uploaded
- Paper copies of the assessments should be lodged with the technicians supervising the laboratories in which the work is taking place.

Use - Academic/Principal investigators(PI)/Post Graduate Researchers (PGR)

- Ensure worked are properly informed, trained and supervised to enable them to safely and competently perform the work;
- Information from the assessments should be passed on to those at risk and other lab users. This can be through written instructions, standard operating procedures or verbal briefings.
- Ensure workers have read and understood the COSHH assessment and follow the control measures
- The supervisor or manager must carefully monitor the work. (*Monitoring is necessary to ensure compliance in the implementation of all the control measures identified as necessary through the COSHH risk assessment. If your risk assessment is suitable and sufficient for the work, then each identified control measure is necessary to prevent or control exposure to risk. Compliance is therefore both necessary and a legal requirement).*
- Ensure that when the work is completed all materials are appropriately disposed of or stored in correctly
- Ensure materials are transported between areas using non-breakable or suitable containers
- Liaise with technical support to ensure the chemical inventory for the work area has been updated
    - If the chemical is a CMR 1a or 1b alert the laboratory technician to update the CMR inventory

Use - All relevant staff (COSHH)

Are required to

- Read and follow all assessments
- Where the COSHH assessment is not sufficient bring it to the attention of the Academic/Principal Investigator.

Review and Revision - Technical Manager's/Faculty Safety Officers (designated deputy)

- Ensure COSHH assessments and other relevant records are maintained.
- Ensure COSHH assessments are reviewed annually and revised where they are no longer valid or where there are significant changes to activity or risks. (e.g. as a result of changes to the work or monitoring).

- When reviewing the risk assessment, the effectiveness of the preventative or control measures should be carefully re-examined. If review of the risk assessment concludes that changes are required, then those changes must be made to the assessment stored in the Risk Library. New hard copies should be circulated to the workplaces and old versions removed.
- Ensure COSHH assessments not being used or out of date are archived and removed from the folder.

Review and Revision – Central H&S/ Faculty Safety Officer

It is also necessary to ensure that the control measures and procedures continue to be appropriate. Regularly scheduled inspections of the specialist workplaces are arranged by the Faculty Safety Officer/ Central H&S and external audits are arranged by the University. These check what activities people are undertaking to ensure that the work is done safely. The type of monitoring needed is proportional to the risks, with higher risk work (e.g. laboratory work) requiring a higher level of monitoring than lower risk work (e.g. office work).

Where problems are identified such as with the risk assessment, controls or the need for additional training or supervision then action must be taken and the necessary changes or improvements must be made to the risk assessment, procedures, instructions, training or supervision.

TRAINING

All staff must participate in initial awareness type training for COSHH management or be instructed in this procedure.

Training records will be maintained by Human Resources.

FORMS

COSHH assessment form
bioCOSHH assessment form

RELATED DOCUMENTS

Safe use and control of CMR agents
Safe use of Fume hood
Safe use of MSC

These websites provide important and useful information on hazardous substances and chemical safety.

http://www.hse.gov.uk/pubns/priced/l5.pdf

http://www.hse.gov.uk/coshh/basics.htm

Appendix 1

Principles of Good Practice for Control of Exposure to Hazardous Substances

The COSHH Regulations specify principles of good practice for the control of exposure to substances hazardous to health which employers must follow to protect their employees. To achieve the appropriate level of control you should select and apply the appropriate control measures from those approved by the COSHH Regulations.

- Design and operate processes and activities to minimise emission, release and spread of substances hazardous to health;
- Take into account all relevant routes of exposure, inhalation, skin absorption and ingestion, when developing control measures;
- Control exposure by measures that are proportionate to the health risk;
- Choose the most effective and reliable control options which minimise the escape and spread of substances hazardous to health;
- Where adequate control of exposure cannot be achieved by other means, provide, in combination with other control measures, suitable personal protective equipment;
- Check and review regularly all elements of control measures for their continuing effectiveness;
- Inform and train all employees on the hazards and risks from the substances with which they work and the use of control measures developed to minimise the risks;
- Ensure that the introduction of control measures does not increase the overall risks to health and safety.

Controls

Control measures will predominantly reflect the potential routes of exposure or release. Thus where the airborne route is the significant contributor, risk control measures to be considered would include the use of a fume cupboard (chemical) or a Microbial Safety Cabinet (powders and Bio agents).
If the substances are hazardous through ingestion, then the main control measure is likely to be through good laboratory hygiene.
Finally, if absorption through the skin or via a skin puncture could result in harm, some form of skin cover would be necessary, mainly through hand and face protection.

The COSHH Regulations include special provisions for preventing or adequately controlling exposure to carcinogens and mutagens. The major reasons for this are that the development of the clinical effects may take many years after first exposure, often with no early warning of adverse effects, and that cancer is frequently fatal. By their very nature there is no absolutely safe measure or amount of these substances. The University has a specific procedure relating to CMRs and these must be followed when obtaining, storing on using such material.

Broadly, the control of risks involves a systematic approach which requires the application of the most effective control measures which are reasonably practicable and the selection of risks control measures should be done using a hierarchical approach.
The most effective control measures must be used in preference to the least effective ones starting with elimination, followed by substitution, engineering controls, management controls and lastly PPE. Once you have decided that you cannot eliminate or substitute less hazardous substances, you

are required to implement control measures that prevent or minimise exposure to risk. Control measures should be selected in this order of priority according to the level of risk identified in the COSHH risk assessment.

Elimination

This will involve redesigning the work to remove the hazardous substance. For example, changing the process, technique or activity so that the substance is not needed or generated. If hazard elimination is not successful or practical, then the next control measure is considered.

Substitution

Replace the hazardous substance or material or process with a less hazardous one. For example, the use of a less toxic chemical, a less volatile or flammable solvent, a different form of the same chemical, or a non-carcinogen instead of a carcinogen. If no suitable replacement is available, then the next control measure is considered.

Engineering controls

Installing or using additional machinery such as local exhaust ventilation to control the risk. For example, separating the hazardous substance from workers by methods such as using fume cupboards. If this method is not effective, then the next control measure is considered.

Administrative controls

Administrative controls are procedures to organise and do the work safely. For example, reducing the time the worker is exposed to the hazardous substance. It could also include safe work practices, the prohibition of eating and drinking in laboratories, the provision of training and the performance of risk assessments.
The scale or frequency of the procedure or quantities used could be reduced. Only after all the previous measures have been tried and found to be ineffective in controlling the risks should personal protective equipment be considered.

Personal Protective Equipment

This is the last control measure to be considered. If chosen, personal protective equipment (PPE) should be selected and fitted to the person who uses it. In most cases a combination of engineering controls, management controls and PPE are chosen to effectively control the risks. Where PPE is the main control method it should where practical be used in conjunction with another method of PPE and safe work practices.
All laboratory areas are multi user hence individuals need to protect themselves against the work they are undertaking and also other possible hazards in the lab environment. All users of laboratory areas are required to wear Lab coats (fastened), Safety Spectacles, and Closed Toe footwear.
The use of Latex containing products (this includes latex gloves) is prohibited within the University due to the risk of allergic reaction. If latex containing products are the only option, a suitable risk assessment must be produced, and submitted to The Central H&S Team.

Appendix 2

Guidance to Completing the COSHH Risk Assessment record

Administrative Information

In this section you need to give basic information about the project or work and who is responsible for management of the work.

Section 1 Project or Activity

1.1 Brief description of the project or activity

You should provide a brief but sufficiently detailed description of the work to enable workers, other people and non-experts to understand the exact nature of the work. You should consider all of the relevant characteristics including the harmful and environmental properties of the hazardous substances.

Section 2 Hazards

In this section you need to describe the hazardous substances which will be used or to which people could be exposed in the work.

2.1 Hazardous substances used and generated

You should provide details of the hazardous substances. The COSHH Regulations apply to a very wide range of substances: solid, liquid, gas or vapour. They apply to individual substances or complex mixtures wherever exposure might occur whether relating to scientific research, laboratory work, field work, building maintenance or cleaning etc. The hazardous substances are classified into the following types.

- Chemicals;
- Carcinogens, mutagens or reproductive toxins;
- Dusts or fumes;
- Asphyxiates;
- Other substances hazardous to health.

Proper assessment of the risks from substances requires sufficient information on any hazardous properties. There are many sources of information used to identify the hazardous properties of substances. Safety Data Sheets (SDS) contain important information as to the health and safety hazards posed by proprietary chemicals or substances, required exposure control measures, first aid requirements, spillage containment, safe disposal requirements, etc.

It is a legal requirement that the supplier provide these at no cost. SDS do not in themselves constitute a risk assessment, but are merely the starting reference point for such an assessment, as the SDS only gives you information about the substance itself. You must assess the risk from use of the substance in the actual work activity.

There are also some very useful independent websites for obtaining SDS information. The information should be used with caution as the generic substance may not be identical to the

substance you have, and this is particularly important where a preparation or mixture of substances is concerned. In such cases you should always obtain the dedicated product SDS from the supplier.

2.2 Carcinogens and mutagens

Carcinogens are substances than can cause cancer while mutagens are substances that can cause heritable genetic damage. COSHH gives specific guidance on risk assessment of carcinogens and mutagens because of the peculiar nature of the risks associated with carcinogens and mutagens. The basic principles are no different from those for risk assessment of other hazardous substances as described elsewhere in COSHH and in this guidance, but due care should be taken to properly take into account the peculiar and insidious nature of the risk.
A comprehensive list of substances defined as carcinogens or mutagens for the purposes of COSHH is in the HSE EH40 Workplace Exposure Limits. A number of known carcinogens are prohibited substances and a list of these substances is given in Schedule 2 of the COSHH Regulations.

2 (a) Hazardous substances
You should provide the names of the hazardous substance which will be used or could be generated during the activity or the substance to which people might be exposed during the work. The name of the substance should be put in the relevant box. Some substances may go into more than one box (e.g. it may be a dust and a carcinogen).

2 (b)Hazard Statements
You should provide the risk Hazard (H) Statements and numbers for the substance. These statements provide standard information on the risks of substances. The specific phrases for each substance can be found on labels, material safety data sheets or from information on supplier's websites.

2 (c) Precautionary Statements
You should provide the safety Precautionary Statements and numbers for the substance. These statements provide standard information on the suitable controls. The specific phrases for each substance can be found on labels, material safety data sheets or from information on supplier's websites.

2 (d) Workplace Exposure Limits
A number of substances hazardous to health have been given a workplace exposure limit (WEL). A WEL is the maximum concentration limits of an airborne hazardous substance to which workers may be exposed by inhalation. WELs can be obtained from the safety data sheets or information on the HSE EH40 Workplace Exposure Limits website.
These limits are set to protect the health of workers and are averaged over a specified time period referred to as a time weighted average (TWA). Two time periods are used: long term (8 hours) and short term (15 minutes).
The long term exposure limit (LTEL) is intended to control chronic effects that require prolonged or accumulated exposure (e.g. lung and liver disorders), whilst the short term exposure limit (STEL) are intended to control acute effects that may be evident after only brief exposures (e.g. respiratory irritations and eye lacrimation).
The list also denotes whether a substance is a respiratory sensitizer, or can be absorbed through the skin. In order to comply with the COSHH Regulations the WEL must not be exceeded. A substance

that has not been assigned a WEL is not necessarily harmless. Seek advice from the supplier about suitable exposure levels (i.e. a level that will allow exposure day after day without any harmful health effects).

Section 3 Risks

In this section you need to describe the risks relating to the hazardous substance which will be used or to which people will be exposed in the work. You must consider the ways by which harm could be caused from exposure to the hazardous substance in your work. You will then need to make an assessment of the overall level of risk of harm to human health and the environment from exposure to the hazardous substance in the work to enable appropriate containment and control measures to be established.

3.1 Human diseases, illnesses or conditions associated with hazardous substances
You should provide details of any human diseases, illnesses or conditions associated with exposure to the hazardous substance. For example, benzene can cause cancer and many organic solvents can cause respiratory irritation or asthma.

3.2: Potential routes of exposure
You should provide details of the potential routes of exposure to the hazardous substance. The potential for the hazardous substance to cause ill health will depend upon the manner in which the substance can harm the body (target organs, or systems, at risk), route of entry to the body by which the substance is hazardous (hazard route) and the route of entry which leads to exposure to the substance (exposure route).
Substances may be harmful by one or more of the following exposure routes. For example, the hazardous substance could enter by:

- Inhalation (e.g. respiratory problems, transfer into circulatory system, CNS disorders);
- Ingestion (e.g. poisoning, gastrointestinal problems);
- Injection (e.g. hypodermic needle stick, or cut by contaminated sharp, poisoning, transfer into circulatory system, CNS disorders);
- Absorption (e.g. corrosive burns, dermatitis, absorption into the body through the skin, transfer into circulatory system, CNS disorders).

3.3 Use of hazardous substances
You should provide details of the use of the hazardous substance or how people will be exposed to the substance. For example, will the work be small, medium or large scale or will it involve fieldwork.

3.4 Frequency of use
You should provide details of how often the hazardous substance will be used or the activity carried out or how often people will be exposed to the hazardous substance.

3.5: Maximum amount or concentration used
You should provide details of the maximum amount or concentration of the hazardous substance used or to which people will be exposed.

3.6 Potential for exposure to hazardous substances
You should assume that no control measures are in place when assessing the overall potential for exposure to hazardous substances in the work. Note the scale of your proposed operation and the

significant risks of harmful exposure of humans or the environment if things go wrong such as in the absence or failure of control measures or a catastrophic event.

3.7 Who might be at risk?

You should provide details of who will be doing the work and if any other people will be affected by the work.

Specify which persons might be directly at risk of exposure to the hazardous substance in the work (e.g. staff, students) and who might be indirectly at risk (e.g. porters, cleaners, or maintenance workers). Could people sharing your workplace be affected by your work (e.g. many labs host more than one working group).

Consider whether any particular groups of people might be at increased risk or adversely affected by the work and therefore might not be able to do the work. These include new or expectant mothers, young persons under 18, disabled workers, those allergic to particular substances, and employees who may be more susceptible to some illnesses because of their individual health status. Contact Occupational Health for information on these risks.

There may also be stages in the process where other workers who are not members of your team are involved and may be affected (e.g. the stores person receiving the goods, the autoclave operator, those disposing of the waste). Their line managers should ensure they are trained and that their own work is assessed.

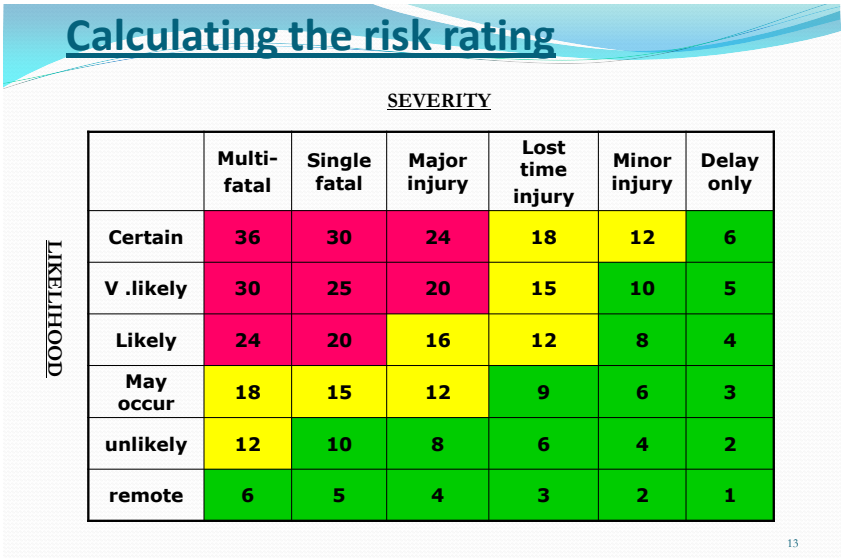
3.8 Assessment of risk to human health

You need to decide on the overall level of risk of harm to human health from exposure to the hazardous substance in this work. Please note that this is the level of risk without the use of controls. In the controls section you will specify the necessary control measures which are required to reduce the level of exposure to the lowest level that is reasonably practicable, and in any case to a level which is adequate to protect human health. To help you estimate the level of risk you should use the information below and the risk estimation matrix. This will give you an estimate of the potential risks to human health of the work. Select only one of the following terms: Effectively zero, Low, Medium/low, Medium or High.

Estimating the level of risk

The risk of the activity is determined by the hazardous substance and how it's used in the work. The level of risk of harm is calculated from a combination of the likelihood and severity of harm caused in given circumstances. Risk of harm = Likelihood x Severity (Low, High, Very high)

- Severity of harm were it to occur (negligible to multiple fatalities)
- Likelihood of harm occurring (remote to certain)



	Multi-fatal	Single fatal	Major injury	Lost time injury	Minor injury	Delay only
Certain	36	30	24	18	12	6
V .likely	30	25	20	15	10	5
Likely	24	20	16	12	8	4
May occur	18	15	12	9	6	3
unlikely	12	10	8	6	4	2
remote	6	5	4	3	2	1

Likelihood of harm	
Remote	1
Unlikely	2
May Occur	3
Likely	4
Very Likely	5
Certain	6

Severity of Harm	
Negligible (no injury)	1
Minor injury	2
Lost time injury	3
Major injury	4
Single fatality	5
Multiple Fatalities	6

Risk : the risk in using the substance = Likelihood x Severity		
Low	1 to 10	Good lab practice required
High	12 to 18	Specific Identified Control Measures must be used
Very High	20+	Trained personnel only

3.9 Assessment of risk to environment

You need to decide on the overall level of risk of harm to the environment from exposure to the hazardous substance in this work. Please note that this is the level of risk without the use of controls. In the controls section you will specify the necessary control measures which are required to reduce the level of exposure to the lowest level that is reasonably practicable, and in any case to a level which is adequate to protect the environment. This will give you an estimate of the potential risks to the environment of the work. Select only one of the following terms: Low, High or Very High.

Section 4 Control Measures

In this section you need to describe the control measures which will be used to protect people and the environment from exposure to the hazardous substances in the work. The COSHH Regulations require that the risk of exposure to hazardous substances is either prevented, or where this is not reasonably practicable then adequately controlled.

Control measures are actions taken or systems used to reduce the risks of exposure to hazardous substances. These include:

- engineering controls (e.g. containment laboratories, safety cabinets and fume cupboards);
- management controls (e.g. safe operating procedures, training, supervision);
- Personal protective equipment (e.g. lab coats, gloves, spectacles).

The purpose of the COSHH risk assessment process is to enable you to select the most suitable controls or combination of controls that are proportionate to the risk. Where practicable, harmful substances must be substituted for non-harmful or less harmful ones and only if it is not reasonably practicable to prevent exposure to substances, should employers select control measures to reduce the risk of exposure to an acceptable level.

Detailed guidance on work with hazardous substances is given in the HSE COSHH Approved Code of Practice and Guidance and HSE COSHH: A Brief Guide to the Regulations.

- HSE Control of Substances Hazardous to Health Regulations: Approved Code of Practice and Guidance
- HSE COSHH: A Brief Guide to the Regulations

Specific control measures and containment levels are required for activities with hazardous substances and these are described in the COSHH Regulations and extensive guidance is given in the HSE COSHH Approved Code of Practice and Guidance. The controls required for the hazardous substances must be specified in the COSHH risk assessment and implemented.

4.1 Containment

You should provide details of where the work will be done and how the hazardous substances will be properly contained. It's important to consider the potential routes of exposure in deciding what sort of control measures will be required. Consider if the work can be done in a laboratory or will specialised facilities be required. Will the work require total enclosure (e.g. glove box, flexible film isolators or Class 3 safety cabinets), partial enclosure (e.g. fume cupboard, Class 1 or 2 safety cabinets), local exhaust ventilation (e.g. exhaust ducting from machine tools, soldering or welding operations, some laboratory equipment) or general ventilation? You should also consider whether you will need to control access to the area where the work will be done by limiting it to authorised persons only.

The fundamental purpose of local exhaust ventilation (LEV) is to capture any contamination in a stream of air and either dilute it or filter it so that it poses less of a risk to the operator and those nearby. The risk assessment process will show when and what type of LEV might be necessary. Some LEV is relatively portable and used to reduce exposure to substances such as soldering fume, or dusts or vapours of low to medium toxicity or of nuisance value that are produced from a single small source.

4.2 Other controls
You should provide details of any special control measures that you intend to use for this work (e.g. avoidance of use of sharps, hygiene measures etc.).

4.3 Storage of hazardous substances
You should consider at this stage the quantity you need and the facilities required to store the hazardous substances or materials. Special conditions may also be required such as ventilation and security. You should take care not to store incompatible chemicals with or in close proximity to each other.

4.4 Transport of hazardous substances
You should provide details of how you will safely transport the hazardous substances or materials. For example, will the substances or materials need special packaging or multiple containment.

4.5 Personal protective equipment (PPE)
You should provide details of the personal protective equipment (PPE) which will be required to protect the body, hands, eyes, face etc. (e.g. laboratory coats, gloves or eye protection). The risk assessment may specify that PPE is required to control exposure to a hazardous substance when it is not possible to achieve adequate control over exposure by any other means and then it should be used only in addition to other appropriate measures.
The PPE must be suitable to adequately protect against a particular hazardous substance. Consider the potential routes of exposure to the hazardous substances when deciding on appropriate PPE. All PPE must be carefully selected and properly maintained including cleaning and workers should be fully trained in its use and limitations. It is important that the PPE is used appropriately. **Particular care should be taken to indicate appropriate glove material if required**.

4.6 Respiratory protective equipment (RPE)
If necessary, you should provide details of the respiratory protective equipment (RPE) which will be required to protect the respiration (e.g. disposable masks, respirators or breathing apparatus). The RPE must be suitable to adequately protect against a particular hazardous substance and this is particularly important for respiratory protection. Consider the potential routes of exposure to the hazardous substances when deciding on appropriate RPE. RPE which relies on a tight-fit to the face for protection (disposable filtering dust mask, reusable half face and full face masks, and breathing apparatus) must be face-fit tested for each individual wearer. Testing must be carried out by trained competent persons.
Once face fit tested to a particular respirator (type and manufacturer) a certificate of test must be obtained and this recorded. The worker must only wear that type and manufacture of respirator on which they were tested and do not require to be retested unless their facial characteristics change significantly (e.g. weight loss, major dentistry). Wearers of respirators that rely on a tight fit to the face for protection must be clean shaven in the area of the respirator face seal. Facial hair, or stubble, compromises the face seal and such people must not be supplied with a tight fitting respirator as a means of exposure control. A respirator option for those with beards is a powered hood which supplies filtered air at positive pressure to the breathing zone of the wearer by a soft or hard top hood that encompasses the head.
Disposable respirators (e.g. dust masks) only protect against some particulate, fume and oil or water based mists (all classed as particulate) and they do not provide protection against gases or vapours. Disposable respirators or filtering face piece (FFP) masks are available in three classes P1, P2 and P3 providing differing protection factors. For protection against hazardous substances reusable half or full face respirators require to be fitted with filters suitable to protect against the particular hazard

present in the work. Detailed advice on this should be sought from the respirator manufacturer. All RPE must be carefully selected to be appropriate, properly maintained and serviced including cleaning and workers should be fully trained in its use and limitations. RPE must be thoroughly examined and tested at suitable intervals.

4.7 Waste management and disposal

You should provide details of how hazardous substances will be managed and disposed of when they are no longer required. Consider the types of waste materials (e.g. solids, liquids, gases, organic, inorganic, mixed etc.). Some substances may need to be inactivated before disposal. Use puncture proof, leak proof, sealable containers for sharps (Sharps bins). Dispose of waste safely using appropriate containers and route. Waste must be safely stored, transported and disposed. Some work may require specialised waste disposal. For chemicals it is often a false economy to save money by buying more than you need only to be faced with the problem later of disposal.
For further assistance, contact the Sustainability Officer in the Campus Services.

4.8 Monitoring exposure

In some cases, specialized monitoring may be required to measure personal exposure or environmental levels of certain especially harmful hazardous substances (e.g. allergens or certain very toxic chemicals). COSHH requires that you measure the concentration of hazardous substances in the air where the risk assessment concludes that there could be serious risks to health if control measures failed or deteriorated, workplace exposure limits might be exceeded or control measures might not be working properly.
This is not required if you can show by another method of evaluation that you are preventing or adequately controlling exposure to your employees. Special monitors can be used for continuous monitoring of levels of oxygen or carbon dioxide such as where asphyxiate gases are used or stored. Monitors must be maintained and serviced in accordance with the manufacturer's instructions and emergency procedures must be produced to ensure that everyone who may be involved knows what to do should it be activated.
Monitoring exposure is rarely required but is a complex process and must be carried out by a competent person using validated methods (e.g. air sampling and testing). If you have need advice contact the Health & Safety Office.
Guidance on where monitoring is required can be found in the COSHH Approved Code of Practice and Guidance.

4.9 Health surveillance

Health surveillance is required for certain occupational diseases or adverse health effects (e.g. cancer, allergy, asthma, dermatitis) to check that people exposed to hazardous substances are not made sick from their work (e.g. work with carcinogens, allergens, asthmagens or respiratory sensitizers). This is usually where there is an identifiable disease or adverse health condition related to work, valid techniques are available for detecting indications of the disease or condition, if there is a reasonable likelihood that the disease or condition will occur under the particular work, and where surveillance is likely to further the protection of health of workers. Health surveillance may involve preliminary and ongoing surveillance, questionnaires, interviews, examination, tests, monitoring or referrals.
If you need advice on whether the work requires health surveillance contact the Health & Safety Office. Guidance on where health surveillance is required can be found in the HSE COSHH Approved Code of Practice and Guidance

4.10 Instruction, training and supervision

You should provide details of special instructions, training, and supervision that are required to do the work safely. Employers must provide workers with adequate information, instruction and training on health hazards created by exposure to hazardous substances to enable them to carry out their work safely.

This should include local rules, safe working practices, standard operating procedures and the effective application of routine and emergency control measures and procedures. Suitable information and instruction should also, where required, be provided to other persons such as contractors and visitors. It is important that information, instructions and training is appropriate to the level of risk and in a form which will be understood by those involved in the work. It is also vital to keep the information up to date, taking into account any significant changes in the type of work or the methods used.

The control measures will not be effective if those involved in the work do not know their purpose, how to use them properly or the importance of reporting faults. Records of information, instruction and training should be kept. All workers must be adequately supervised and this is especially important where highly hazardous substances, specialist facilities or equipment are concerned.

The principal investigator or manager must decide on the level of supervision required to do the work. Some work may not be carried out without direct personal supervision; some may not be started without the advice and approval of supervisor while other work can be carried out without direct supervision.

Section 5 Emergency Procedures

In this section you need to describe the emergency control measures and procedures which will be used to protect people and the environment from exposure to the biological agents and hazards in the work in an emergency.

5.1 Emergency procedures

You should provide details of the procedures that will be required to deal with accidents, incidents and emergencies that could cause any employee or other person to be exposed to a hazardous substance or an accidental release of hazardous substances. The manager, principal investigator and staff are responsible for ensuring that accidents and emergencies are properly dealt with since these are the experts in the hazardous substances and the work. You need to assess the potential for accidental exposure and implementing emergency procedures for your work. Emergency procedures and plans must be prepared in advance.

The primary objective of the emergency procedures is the containment of the hazardous substance and the minimisation of risks to health. You should consider all of the relevant factors which may include assessing situations, instructions, informing others of accidents, isolation of area, evacuation, seeking assistance, PPE, RPE, preventing spread of contamination or spills, decontamination of work area or laboratory, safe waste disposal, first aid treatment and medical treatment if required.

Anyone not concerned with the emergency action should be excluded from the area. Only people essential for carrying out repairs and other essential work may be permitted in the affected area and they must be provided with appropriate personal protective equipment and any necessary equipment or plant.

Emergency and spillage procedures should also be specified in any standard operating procedures (SOP) and laboratories may require spillage kits. In addition, it is often very useful to provide important emergency procedures as bullet pointed instructions on a laminated A4 sheet which can be placed where the hazardous work is done (e.g. stuck on the wall above the lab bench or on a piece of equipment).

Appropriate training must be provided in the accident and emergency procedures. All staff must understand and be able to implement the emergency procedures. If an emergency occurs, procedures must be put into effect as soon as possible to minimise harm and return the situation back to normal as quickly as possible. Accidents, incidents and emergencies must be reported immediately or as soon as practicable to supervisors, safety officers or managers and using the incident report form on the Health & Safety Office website.

5.2 Minor spillage or release
You should provide details of the procedure that will be used to deal with a minor spillage or release. Specify the contents of any spillage kit.

5.3 Major spillage or release
You should provide details of the procedure that will be used to deal with a major spillage or release. Specify the contents of any spillage kit. Where there is a risk that an electrical ignition could cause an explosion then the building should be evacuated without sounding the alarm.

5.4 Fire Precautions
You should provide details of how you would deal with a fire affecting the hazardous substances in the work. Specify the best types of firefighting methods which can be used to deal with an emergency.

5.5 First aid
You should provide details of the first aid procedures which would be needed to deal with the specific hazardous substances in this work in case of an accident or emergency.
You should consider all of the relevant factors to establish effective emergency first aid procedures. This may include removing contaminated clothing as quickly as possible, removing contamination from skin, eyes and mouth by thorough washing with water, dealing with minor cuts and small puncture wounds, washing wounds with soap and water and dressing wounds. Use PPE if required when helping injured persons. Seek help where required from first aiders, GP or hospital. Emergencies should be taken straight to hospital and call ambulance if necessary (Call Security on extension 3200). Explain the incident and hazardous substances to medical staff and if possible give them with a copy of the COSHH risk assessment.

5.6 Emergency contacts
You should provide the names and contact details of people to contact in case of an accident or emergency. This must include the name of the principal investigator or manager who is in charge of and understands the work together with details of other relevant persons including the workers doing the work and colleagues involved in the work.

Section 6 Approval

In this section the assessor and person responsible for authorising the assessment must sign electronically the form to state that they the risks have been suitably and sufficiently assessed and that they have reviewed and approved the risk assessment. The manager, principal investigator or person in charge of the work is responsible for ensuring the risks associated with their work are properly assessed and recorded. The principal investigator or manager may delegate the work of preparing a risk assessment to any competent member of the team but responsibility for approving the risk assessment remains with the principal investigator or manager.

6.1 Assessor

The person who carries out the risk assessment must electronically sign this part of the form.

6.2 Principal investigator / Responsible person

The person responsible for the work (supervisor, line manager or principal investigator) must electronically sign this part of the form to confirm that they have reviewed and approved the risk assessment. You must check that the assessment has been carried out correctly and to a suitable and sufficient standard identifying the hazards, risks, who might be at risk and the selection of appropriate controls for the work

Appendix 3

Guidance to Completing the COSHH Risk Assessment record

Administrative Information

In this section you need to give basic information about the project or work and who is responsible for management of the work.

Section 1 Project or Activity

1.1 Brief description of the project or activity

You should provide a brief but sufficiently detailed description of the work to enable workers, other people and non-experts to understand the exact nature of the work. You should consider all of the relevant characteristics including the harmful and environmental properties of the hazardous substances.

Section 2 Hazards

In this section you need to describe the hazardous substances which will be used or to which people could be exposed in the work.

Biological agents are officially classified by ACDP or DEFRA according to the risks to human health, animals, plants and the environment. ACDP classifies human pathogens into four ACDP hazard groups while DEFRA classifies animal pathogens into four DEFRA hazard groups and classifies plant pathogens and pests into complex groups.

Northumbria University does not have the facilities to store or use ACDP Cat 3 or 4 pathogens. Such pathogens (or samples suspected of containing such pathogens) should not be brought on site.

2(a) Pathogens (ACDP/DEFRA Hazard Group 1)

Agents unlikely to cause human disease.

These are not listed in the ACDP Approved List though the non-appearance of an organism on this list should not automatically be taken to mean it is hazard group 1. The categorisation of unlisted agents needs to be determined by Risk Assessment and reasons for placing in Group 1 listed here. As a rule of thumb unknown or unlisted agents should initially be categorised as the highest Group until evidence to place them in Group 1 is available.

2(b) Pathogens (ACDP/DEFRA Hazard Group 2)

Agents that can cause human disease and may be hazardous to employees.

This is unlikely to spread to the community and there is effective prophylaxis or treatment available.

These agents can be found listed in the ACDP Approved list available at http://www.hse.gov.uk/biosafety/biologagents.pdf

2© Human Clinical Material or Animal Tissues

Human and animal cell cultures include primary or continuous cell lines and cancer cell lines. Human and animal cell cultures are potentially hazardous because they may contain adventitious biological agents. The cells or medium may be contaminated.

All those individuals who come into contact with a subject's blood or body fluids may be at risk from infections such as HIV or Hepatitis B. When handling body fluid samples, the means of transmission may be by direct contact with an infected sample via sharps injury or splashing on to broken skin or mucous membrane. It is impossible to identify those subjects who might be infected and therefore

every individual MUST be assumed to be seropositive. Procedures laid out in the document "Procedures for Blood Sampling and Handling of Unscreened Blood and other Clinical materials" must be followed and should be signposted in the risk assessment.

2(d) Toxins
Some microorganisms produce powerful toxins which are harmful to humans. Toxigenic microorganisms can be transmitted by many routes although they do not necessarily need to be viable for their toxins to cause harm since the microbial toxins can be hazardous. Inhalation or ingestion of toxigenic microorganisms or microbial toxins produced by microorganisms can cause infection and toxigenicity. Not all toxigenic microorganisms are human pathogens, for example many fungi and cyanobacteria produce powerful toxins.

2(e) Carcinogens
Some biological agents are carcinogens and can cause cancer (e.g. HBV, HCV or HDV). Most carcinogenic microorganisms are viruses but some are bacteria. Humans and animal tissues especially cancer cells and cell lines may contain cancer viruses and although there are normally strong immune rejection reactions to non-self-cells and tissues there is no such protection against any cancer causing agents in the cells.

2(f) Allergens
Many biological agents or hazards including animals, plants, microorganisms or their products can be allergenic and cause hypersensitivity reactions (e.g. occupational asthma. dermatitis or anaphylaxis). Hypersensitivity reactions can be mild or severe (e.g. fatal). Once sensitized, very low concentrations of allergens may elicit allergic hypersensitivity reactions. Sometimes the consequences of an exposure may be sufficiently severe for the person to be unable to safely continue working in areas where they might be exposed to the agents or hazards.

2 (g,h) Human or Animal primary or continuous cell cultures
Human and animal cell cultures include primary or continuous cell lines and cancer cell lines. Human and animal cell cultures are potentially hazardous because they may contain adventitious biological agents. The cells or medium may be contaminated.

2(k,l) Animals and Plants
Work being planned with animals or plants should first be discussed with the Faculty Safety Officer. Animals may have zoonotic agents which are harmful to humans. Plants may also have agents which are harmful to humans or the environment.
Specific licenses or approvals may be required

2(m) Soils
Use of soils imported from outside the EU is covered by DEFRA license and SOPs ("SOPs and Rules for Material obtained under the License to Import, Move and Keep Prohibited Soil)" The procedures laid down in this document must be followed.
Environmental samples can contain pathogenic organisms which may be unintentionally concentrated or propagated in the laboratory. Microorganisms isolated from the environment should be treated as potentially pathogenic until shown to be otherwise.

Section 3 Risks

In this section you need to describe the risks relating to the biological agents and hazards which will be used or to which people will be exposed in the work. You must consider the ways by which harm

could be caused from exposure to the biological agents and hazards in your work. You will then need to make an assessment of the overall level of risk of harm to human health and the environment from exposure to biological agents and hazards in the work.

3.1 Human diseases, illnesses or conditions associated with biological agents or hazards
You should provide details of any human diseases, illnesses or conditions associated with exposure to the biological agents or hazards.
Infection and disease are complex processes affected by multiple agent, host and environmental factors (e.g. agent or host genotype, virulence, host immunity) and humans have many physical, chemical and biological and immunological defence mechanisms. Exposure to biological agents or hazards may lead to asymptomatic, subclinical, acute, chronic, persistent or fatal infections or other diseases. Some biological agents or hazards may cause harm only to an exposed individual while others may constitute a serious risk of infection to other people, close contacts or the community. Don't assume that an agent is safe if there is no information available or any uncertainty especially if you are dealing with a novel agent or isolate. In these cases, you should adopt the precautionary principle and always assume that any biological agent or hazard is potentially harmful until proven otherwise.

3.2 Potential routes of infection
You should provide details of the potential routes of exposure to the biological agents or hazards. The potential for biological agents or hazards to cause ill health will depend upon the manner in which

- the substance can harm the body (target organs, or systems, at risk),
- route of entry to the body by which the substance is hazardous (hazard route) and
- the route of entry which leads to exposure to the substance (exposure route e.g.
    - inhalation (e.g. microorganisms, toxins, allergens, dusts or aerosols),
    - ingestion (e.g. microorganisms, toxins, allergens, soil, contaminated food or drink),
    - injection (e.g. microorganisms, toxins, allergens, wounds, arthropod bites,
    - sharps injuries such as hypodermic needle stick, scalpel, broken glass, animal bites or scratches),
    - absorption (e.g. microorganisms, toxins, allergens, direct or indirect contact, intact skin, mucus membranes).

Exposure may result from direct contact with a laboratory culture, an infected host, tissue, body fluid, secretion or excretion or indirect contact with an infected object.

3.3 Use of biological agents or hazards
You should provide details of the use of biological agents and hazards or how people will be exposed to the biological agents and hazards.
For example, will the work be small, medium or large scale or will it involve laboratory work, fieldwork, animals or plants. Environmental samples can contain pathogenic organisms which may be unintentionally concentrated or propagated in the laboratory. Microorganisms isolated from the environment should be treated as potentially pathogenic until shown to be otherwise. Harmful microorganisms may be present in some working environments e.g., the microorganism which causes Legionnaires disease may be found in plumbing systems, water baths etc.

3.4 Frequency of use
You should provide details of how often the biological agents and hazards will be used or the activity carried out or how often people will be exposed to the biological agents and hazards.

3.5 Maximum amount or concentration used
You should provide details of the maximum amount or concentration of the biological agents and hazards used or to which people will be exposed.

3.6 Levels of infectious aerosols
You should provide details of the levels of any infectious or harmful aerosols which might be produced by the work. Aerosols are any airborne substances including solids (e.g. microorganisms, dusts, soils or spores) liquids (e.g. microbial cultures or liquid samples) and gases.
You should assume that no control measures are in place when assessing the potential levels of aerosols produced in the work. Note the scale of your proposed operation and the significant risks of harmful exposure if things go wrong such as in the absence or failure of control measures or a catastrophic event. Airborne agents can be potentially dangerous especially if an agent can be infectious or harmful by the inhalation route. Some microorganisms and especially spores are readily spread by the airborne route but others do not survive well and may die once the fluid in the droplet has evaporated.

3.7 Potential for exposure to biological agents or hazards
You should assume that no control measures are in place when assessing the overall potential for exposure to biological agents and hazards in the work. Note the scale of your proposed operation and the significant risks of harmful exposure of humans or the environment if things go wrong such as in the absence or failure of control measures or a catastrophic event.

3.8 Who might be at risk
You should provide details of who will be doing the work and if any other people will be affected by the work. Specify which persons might be directly at risk of exposure to the biological agents and hazards in the work (e.g. staff, students) and who might be indirectly at risk (e.g. porters, cleaners, or maintenance workers). Could people sharing your workplace be affected by your work (e.g. many labs host more than one working group). Consider whether any particular groups of people might be at increased risk or adversely affected by the work and might not be able to do the work. Immunosuppressed people may be very susceptible to infection. Some groups such as pregnant women may be more at risk from certain biological agents than others.

3.9 Assessment of risk of activity to human health (prior to the use of controls)
You need to decide on the overall level of risk of harm to human health from exposure to biological agents and hazards in this work. Please note that this is the level of risk without the use of controls. In the controls section you will specify the necessary control measures which are required to reduce the level of exposure to the lowest level that is reasonably practicable and in any case to a level which is adequate to protect human health. To help you estimate the level of risk you should use the information below and the risk estimation matrix provided in the COSHH section of this document (page 21).

3.10 Assessment of risk of activity to environment (prior to the use of controls)
You need to decide on the overall level of risk of harm to the environment from exposure to biological agents and hazards in this work. Please note that this is the level of risk without the use of controls. In the controls section you will specify the necessary control measures which are required to reduce the level of exposure to the lowest level that is reasonably practicable and in any case to a level which is adequate to protect the environment.

Section 4 Controls to reduce Risks as low as possible

4.1 Containment

You should provide details of where the work will be done and how the biological agents and hazards will be properly contained. It's important to consider the potential routes of exposure in deciding what sort of control measures will be required.
Consider if the work can be done in a laboratory or will specialised facilities be required. Will the work require

- total enclosure (e.g. glove box),
- partial enclosure (e.g. Class 1,2 safety cabinets),

You should also consider whether you will need to control access to the area where the work will be done by limiting it to authorised persons only.

4.2 Containment Level

You must decide on the appropriate containment level that will be required for your work with biological agents or hazards according to ACDP or DEFRA requirements. Laboratories at Northumbria are classified as Containment levels 1 or 2.

4.3 Microbiological safety cabinets (MSC)

You should provide details of microbiological safety cabinets which will be required to control infectious aerosols and dangerous biological agents and hazards.

4.4 Other controls

You should provide details of any special control measures that you intend to use for this work (e.g. avoidance of use of sharps, hygiene measures etc.).

4.5 Storage of biological agents

You should consider at this stage the quantity you need and the facilities required to store the biological agents and hazards. Special conditions may also be required such as ventilation and security.

4.6 Transport of biological agents

You should provide details of how you will safely transport the biological agents and hazards. For example, will the substances or materials need special packaging or multiple containment.

4.7 Inactivation of biological agents

You should provide details of how you will inactivate the biological agents and hazards used in the work. The proper inactivation and disposal of waste is very important part of such work. There are chemical and physical methods of inactivating biological agents and hazards and you should provide a brief statement in this section about the disinfection or autoclaving methods to be used Hazardous biological agents must be inactivated by a validated means and this needs to be explicit by using effective procedures for both validation and monitoring and keeping adequate records of these for inspection on request by the HSE. The effort involved in effective validation and monitoring varies considerably depending on the risks and inactivation method used.

Disinfection

The general disinfection solution used at Northumbria is 1% Virkon

- to maintain its effectiveness Virkon should be made fresh every 7 days

- Virkon is corrosive to metal and should not be left in contact with metal surfaces for longer than 10 minutes

However, disinfectants must be validated for the particular biological agent under conditions matching those of intended use, and there must be appropriate procedures in place for regularly monitoring effectiveness.

Autoclaving

Autoclaving is the most effective inactivation method and by far the easiest and least time consuming to both validate and monitor. For these reasons it is strongly recommended that all hazardous biological waste including all liquid waste and waste destined for incineration be autoclaved unless there is a very good reason to use another method. It is accepted by HSE that any biological agent will be inactivated by autoclaving under conditions that maintain 121ºC for at least 15 min with full steam penetration (Note, the minimum 15 min excludes the time required to reach 121ºC).

Inactivation is defined as achieving a sufficient % kill commensurate with the risks, although 100% kill is normally required.

Autoclave runs should contain a test strip whose colour change indicates that correct conditions have been achieved. Autoclaves should also be validated annually to ensure the correct parameters are being achieved.

4.8 Personal Protective Equipment

You should provide details of the personal protective equipment (PPE) which will be required to protect the body, hands, eyes, face etc. (e.g. laboratory coats, gloves or eye protection). The risk assessment may specify that PPE is required to control exposure to a biological agent or hazard when it is not possible to achieve adequate control over exposure by any other means and then it should be used only in addition to other appropriate measures. The PPE must be suitable to adequately protect against particular biological agents or hazards. Consider the potential routes of exposure to the biological agents and hazards when deciding on appropriate PPE. All PPE must be carefully selected and properly maintained including cleaning and workers should be fully trained in its use and limitations. It is important that the PPE is used appropriately.

4.9 Respiratory protective equipment (RPE)

You should provide details of the respiratory protective equipment (RPE) if required (e.g. disposable masks, respirators or breathing apparatus). The RPE must be suitable to adequately protect against a particular biological agents and hazards and this is particularly important for respiratory protection. Consider the potential routes of exposure to the hazardous substances when deciding on appropriate RPE. RPE which relies on a tight-fit to the face for protection (disposable filtering dust mask, reusable half face and full face masks, and breathing apparatus) must be face-fit tested for each individual wearer.

4.10 Health surveillance or immunisation

Health surveillance is required for certain occupational diseases or adverse health effects (e.g. cancer, allergy, asthma, dermatitis) to check that people exposed to hazardous substances or biological agents are not made sick from their work (e.g. work with carcinogens, allergens, asthmagens or respiratory sensitizers). This is usually where there is an identifiable disease or adverse health condition related to work, valid techniques are available for detecting indications of the disease or condition, if there is a reasonable likelihood that the disease or condition will occur under the particular work, and where surveillance is likely to further the protection of health of

workers. Health surveillance may involve preliminary and ongoing surveillance, questionnaires, interviews, examination, tests, monitoring or referrals.
If you need advice on whether the work requires health surveillance contact the Health & Safety Office. Guidance on where health surveillance is required can be found in the HSE COSHH Approved Code of Practice and Guidance

4.11 Instruction training and supervision
You should provide details of special instructions, training, and supervision that are required to do the work safely. Employers must provide workers with adequate information, instruction and training on health hazards created by exposure to hazardous substances to enable them to carry out their work safely.
This should include local rules, safe working practices, standard operating procedures and the effective application of routine and emergency control measures and procedures. Suitable information and instruction should also, where required, be provided to other persons such as contractors and visitors. It is important that information, instructions and training is appropriate to the level of risk and in a form which will be understood by those involved in the work. It is also vital to keep the information up to date, taking into account any significant changes in the type of work or the methods used.
The control measures will not be effective if those involved in the work do not know their purpose, how to use them properly or the importance of reporting faults. Records of information, instruction and training should be kept. All workers must be adequately supervised and this is especially important where highly hazardous substances, specialist facilities or equipment are concerned.
The principal investigator or manager must decide on the level of supervision required to do the work. Some work may not be carried out without direct personal supervision; some may not be started without the advice and approval of supervisor while other work can be carried out without direct supervision

4.12 HSE consent or DEFRA license
The possession or use of high hazard biological agents requires written permission from the Faculty Safety Committee (FSC). You must obtain permission from the FSC and University Safety Office if you wish to do work with the HG 2 agents *Bordetella pertussis, Corynebacterium diphtheriae* and *Neisseria meningitidis*. The possession or use of any of these agents requires consent from the Health and Safety Executive. The University Biological Safety Officer (BSO) will submit your completed BioCOSHH risk assessment and a completed CBA1 form to the HSE with a request for consent. The biological agents must not be acquired or used unless the BSO gives permission and consent is obtained from the HSE.
Many animal and plant pathogens and pests are covered by specific legislation which may require a DEFRA licence. It is the responsibility of principal investigators and Schools to determine whether a licence is required and to obtain the licence from DEFRA.

Section 5 Emergency Procedures
You should provide details of the procedures that will be required to deal with accidents (such as needle stick injuries), incidents and emergencies that could cause any employee or other person to be exposed to, or an accidental release of, a biological agent. You need to assess the potential for accidental exposure and implementing emergency procedures for your work. Emergency procedures and plans must be prepared in advance.
The primary objective of the emergency procedures is the containment of the biological agent and the minimisation of risks to health. You should consider all of the relevant factors which may include assessing situations, instructions, informing others of accidents, isolation of area, evacuation,

seeking assistance, PPE, RPE, preventing spread of contamination or spills, decontamination of work area or laboratory, safe waste disposal, first aid treatment and medical treatment if required. Emergency and spillage procedures should also be specified in any standard operating procedures (SOP) and laboratories may require specialist kits or disinfectants.
Appropriate training must be provided in the accident and emergency procedures. If an emergency occurs, procedures must be put into effect as soon as possible to minimise harm and return the situation back to normal as quickly as possible. Accidents, incidents and emergencies must be reported immediately or as soon as practicable to supervisors, or managers and using the incident report form on the Health & Safety Office website.

Section 6 Approval

In this section the assessor and person responsible for authorising the assessment must electronically sign and date the form to state that they the risks have been suitably and sufficiently assessed and that they have reviewed and approved the risk assessment. The manager, principal investigator or person in charge of the work is responsible for ensuring the risks associated with their work are properly assessed and recorded. The principal investigator or manager may delegate the work of preparing a risk assessment to any competent member of the team but responsibility for approving the risk assessment remains with the principal investigator or manager.

6.1 Assessor
The person who carries out the risk assessment must electronically sign this part of the form.

6.2 Principal investigator / Responsible person
The person responsible for the work (supervisor, line manager or principal investigator) must electronically sign this part of the form to confirm that they have reviewed and approved the risk assessment. You must check that the assessment has been carried out correctly and to a suitable and sufficient standard identifying the hazards, risks, who might be at risk and the selection of appropriate controls for the work