NDCN Safety Policy 002: Biological Safety

1) Contents

2) Introduction

This policy details the local rules that should be applied by all users of biological material within NDCN.

It should be read in conjunction with the University Safety Policy S5/09 Biorisk Management[1].

3) Training & Supervision

All individuals likely to handle biological material should read this policy as part of their training. They will also be asked to attend the University's biological training seminars[2], which are held regularly by the University Safety Office.

Individuals will also be given on-the-job training by suitable member(s) of their group. The level of training required must be identified by the work supervisor. At the very minimum, Individuals must be taken through all relevant risk assessments and made aware of the safety precautions drawn up.

All individuals are encouraged to review their work and the safety precautions in place. If they identify areas that are not covered or they deem to be unsafe, then they should bring this to the attention of the research group supervisor or BSO immediately.

Adequate level of supervision must be in place until a new user is deemed competent by the work supervisor.

4) Risk Assessments

Micro-organisms are encountered in the laboratory when cultured for research purposes and where samples or tissues of human or animal origin are handled.

In line with the Control of Substances Hazardous to Health (COSHH) Regulations, 1999 an assessment must be made of the potential risk associated with handling any of these materials.

All individuals who may be at risk must have access to this assessment and their attention must be brought to any specific control measures needed.

The Biological Safety Officer (BSO) will keep record of such Risk Assessment (RA); a copy is also kept by the Group where the material is handled.

All laboratories within NDCN are classed as Containment Level 2, therefore only any organism classed as Hazard Group 1 or 2 can be handled.

In the case of Genetic Modification (GM), a specific GM Risk Assessment must be made and will supersede the need for a COSHH RA.

Approval must be given by NDCN Genetic Safety Committee before GM work can commence.

5) Work With Micro-organisms

All new microorganisms brought into the Department must be reported immediately to the Biological Safety Officer, who maintains a register and inform the University Safety Office as necessary.

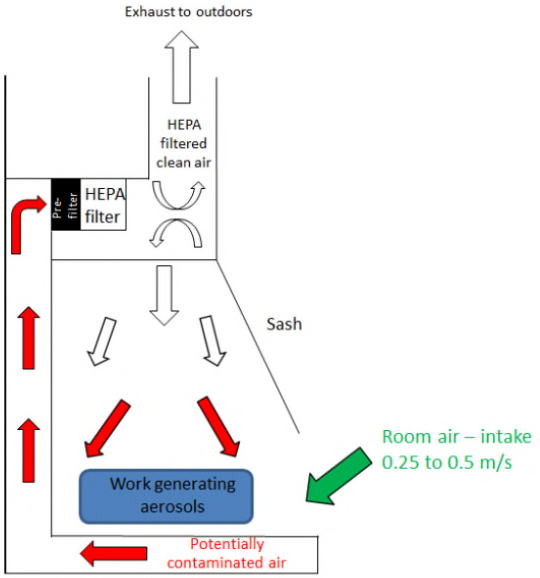
Most microorganisms have been classified either by the *Advisory Committee on Dangerous Pathogens* (ACDP) for known Human Pathogens[2] or by the Department for Environment, Food & Rural Affairs (DEFRA) for known Animal Pathogens and such containment level must be follow up.

Please note that handling some specified Animal Pathogens will require a license before work can commence.

It is acceptable to work with Hazard Group 3 within the Department ONLY if they are inactivated before they enter the building by a validated method (this must be recorded and evidence prior to work starting).

6) Microbiological safety cabinets

A Microbiological safety cabinet (MSC) provides user protection by creating a downdraft airflow of HEPA filtered air. Exhaust air is also filtered through another HEPA filter is to ensure there can be no release of micro-organisms. All operating MSC in NDCN are Class II double extract HEPA filtered units.



MSC must be validated by the means of a KI test on an annual basis. A yearly return to the Safety Office ensures that all units are recorded and serviced as required.

MSC must be located in such a way to prevent disruption of airflow whilst in use. Siting of MSC is done in accordance with the Biological Safety Officer. As reference, see in appendix 1 the minimum distance for MSC airflow stability.

MSC must be adequately cleaned after work to prevent contamination, it is recommended to use ChemGENE as routine disinfectant to avoid corrosion of stainless steel surface. Virkon is a strong chlorine-based detergent which whilst being recommended for decontamination procedure, is advised-against for equipment maintenance.

When cleaning beneath the working surface, make sure the motor is off to avoid paper being sucked in the motor and causing damage.

As per NDCN safety policy 018- Working safely with UV, it is not recommended for use in MSC, if required, than a written approval from the Safety Office must be sought in order to justify its use.

7) Good Microbiological Practice

The fundamental requirement of working with microorganisms is containment, by containing the organism, the risk to individuals is minimised and therefore controlled.

Many control measures can be achieved by 'Good Microbiological Practice (GMP)':

- Ensure you are registered with the University Occupational Health Services for work with Biological Material before commencing any work.
- Personal effects are to be stored outside of the laboratory area, away from possible contamination.
- Use of headphones is accepted, but only if it does not compromise the researcher from hearing alarms or call of help from colleagues.
- Cuts and abrasions must be covered with a waterproof dressing before commencing any work.
- Personal items and clothing must be kept separately from the laboratory.
- Labcoats, gloves and safety glasses must be worn when working at the bench and cabinet.
    - Note that wearers of prescription glasses are required to wear either prescription safety glasses or over glasses safety glasses whilst working in the laboratory.
    - Cost of such glasses will be covered by the Department for mid to long term staff, students or visitors
- Never re-use Disposable Gloves as this is likely to lead to infection.
- Change gloves frequently, especially if walking through different area of the laboratories.
- If it is necessary to keep gloves on when travelling between laboratory areas, **always take one glove off to open doors and carry items in the other**.
- Completely remove all protective clothing before leaving the laboratory and wash hands before leaving the laboratory.
- Eating, drinking, chewing, smoking, mouth pipetting and applying of make-up is forbidden.
- Keep your working area free of clutter: plan and lay out your work so that everything needed is ready to hand.
- Before starting and once the work has been completed, wash down the bench area with a suitable disinfectant such as Chemgene.
- Ensure that appropriate storage, use, disposal and emergency procedures have been established before ordering any hazardous biological agent.
- Use wherever possible techniques that minimise the production of aerosols (such as ultrasonic disruption, vortexing).
- A Microbiological Safety Cabinet (MSC) should always be used for procedures involving microorganisms that are infectious by inhalation.

- User must be trained in the appropriate use of a MSC.
    - Avoid the use of glassware or sharp objects, particularly when handling human samples.
    - Do not remove infectious or contaminated material from the laboratory to another area unless it is suitably packaged in a sealed and labelled container.
    - Report all accidents and dangerous occurrences at the earliest opportunity, by recording them on an accident report form.
    - If exposure to a microorganism has occurred, advice can be sought from the Biological Safety Officer (BSO) or Occupational Health.

8) Genetically Modified Organisms (GMO)

Genetic manipulation relates to any activity involving genetically modified organisms including, but not limited to, culture, storage, transport, destruction or disposal.

A suitable GMO risk assessment must be submitted to NDCN Genetic Modification Safety Committee before any material can be stored on site.

Experiments with low risk assessments (i.e. Containment Level 1) need to be approved by NDCN CGM, however experiments assessed as Containment Level 2 must obtain approval from the Health Safety Executive via the BSO & University Safety Office. *This can take up to 45 days to obtain and so early notification is important.*

All individuals working with the assessment must be informed of the required measures and they should also inform the BSO when they begin work.

9) Work with cell lines

Many mammalian cell lines are tumour-derived or have been transformed/immortalised using genes encoding viral proteins. Cell lines, particularly those derived from human sources may therefore contain endogenous virus genes, and must therefore be handled as potentially infectious human material. Primary cultures from animal or human sources should also be treated as potentially infected due to unknown pathogens that may be present in the samples.

Tissue Culture work can only be carried out within the West Wing with the permission of the Research group supervisor. It must always be done within one of the Tissue Culture rooms and unless there is an evidenced reason not to, carried out within a Class II Microbiological Safety Cabinet. Finally all work must be carried out to GMP as set out above.

Maintenance of cell cultures over extended periods by serial passage is a high-risk approach to provision of cells for research, as even continuous cell lines that appear to be stable may show genotypic and phenotypic variation over extended period of serial passage.

Long-term passage also raises the risk of laboratory accidents, contamination with micro-organisms or cross-contamination with other cells.

10) Work with human samples

Blood, blood products and other human tissues must not be handled within the Department without the permission of the Research group supervisor.

A specific Biological COSSH assessment for handling human samples must be completed and handed to NDCN BSO at the earliest opportunity before work starts.

All persons working with blood must be registered with Occupational Health and will be offered Hepatitis B vaccination if not previously vaccinated.

- Good Microbiological Practice must be followed at all time.
- Samples must be centrifuged in sealed buckets.
- After spinning the bucket must be opened under a BSC.
- Never carry out transformation of cells from your own blood or other tissue.

As with cell line work, long term culture of primary human poses risk to adventitious pathogens that may be present in the samples, the work risk assessment must specifically address this issue if cells are cultured over 100hours.

11) Work with Naked DNA/Oncogenes

The risks associated when handling naked DNA are generally low since DNA is unlikely to transverse the natural defence barriers of the body. However it can enter the body if the skin is damaged or punctured, so naked DNA should never be considered as risk-free.

DNA encoding for a potentially hazardous product, such as toxin, allergen, growth factor or oncogene must be carefully evaluated using a DNA COSHH risk assessment form.

12) Decontamination and Disinfection

a) Decontamination

Individuals are responsible for cleaning their work areas and ensuring they are always left clean and safe to use.

Individuals must also ensure that any equipment that becomes contaminated is appropriately disinfected and cleaned immediately. As an absolute requirement all equipment must be disinfected before any maintenance work is carried out.

Biological material must be inactivated prior to disposal to ensure that no pathogen or GM are released from the laboratory.

b) Disinfection

i. Virkon

Virkon is a broad spectrum disinfectant[3] and the University preferred choice to inactivate biological material. However, it is highly corrosive should only be used on culture and plasticware as metal part of equipment will be damaged upon exposure to Virkon.

Virkon must be prepared freshly every week, it contains a colour indicator to indicate its activity. *Virkon is a strong corrosive and should be purchased in tablet to avoid inhalation of powder during its preparation. Virkon should not be sprayed also to avoid inhalation.*

Biological material are typically inactivated by contact with a 1-2% solution (final concentration) for 30 minutes.

Inactivated waste cultures can be poured away into the laboratory sink. Treated plastic ware must be disposed of in the orange clinical waste bags.

ii. Chemgene

Chemgene is also a broad spectrum disinfectant ideal[4] for surface and equipment decontamination. As it isn't recommended by the Safety Office this is not used to inactive biological material.

It is available in two format in NDCN laboratories:

- Neat solution – *this is an irritant and must be handled with care*
- 1/20 – ready to use dilution in a spray bottle, diluted this is no longer an irritant

iii. 70% Industrial Methylated Spirit (IMS)

70% IMS can also be used as a surface or equipment decontaminant – but not to inactivate biological cultures. Note that above 70% IMS evaporates too quickly and is not as efficient.

IMS is a flammable and must never be used on live or near live equipment (such as centrifuges). Contact of the flammable droplets with heat or live electrical will cause a fire.

13) Reference

[1]University Safety Policy S5/09 Biorisk Management https://safety.web.ox.ac.uk/biorisk-management

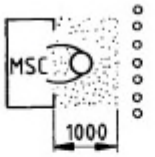
[2]Safety Office training: Biological Safety & Genetic Modification, an Introduction https://cosy.ox.ac.uk/accessplan/LMSPortal/UI/Page/Courses/book.aspx?courseid=SAFE00002

[3]Virkon disinfectant http://www.day-impex.co.uk/virkon-disinfectant.html

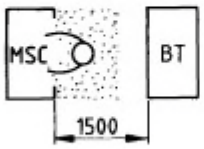
[4]Chemgene disinfectant http://medi-mark.co.uk/industry/product/chemgene-hld4l-laboratory-disinfectant

Annexe 1

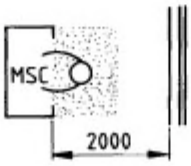
a) Separation of an undisturbed zone around a safety cabinet from traffic routes



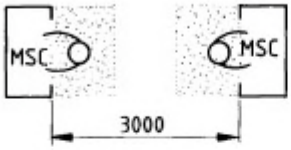
b) Spacing when the same operator uses a safety cabinet and a bench top opposite, or where occasional traffic only is anticipated



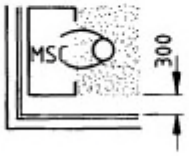
c) Spacing determined by airflow requirements with an opposing wall



d) Spacing determined by airflow requirements when safety cabinets are opposite each other

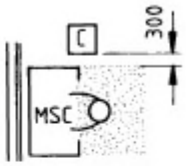


e) Spacing determined by airflow requirements with adjacent walls

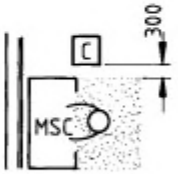


Dimensions in millimetres

f) Spacings that avoid undue disturbance to airflow. Face of column not in front of plane of cabinet aperture



g) Spacing to avoid undue disturbance to airflow when face of column is in front of plane of cabinet aperture



h) Spacings that avoid undue disturbances to airflow in relation to door openings

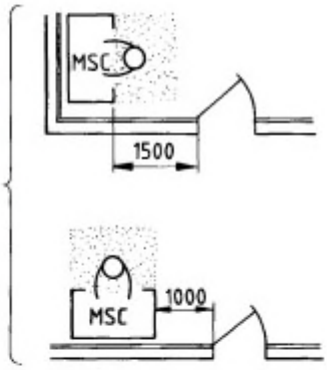


Figure 1 — Recommendations for minimum distances for avoiding disturbance to the safety cabinet and its operator