Safety Services Guidance

Guidance on working with blood and body fluids

Key word(s):	Blood, body fluids, sputum, blood borne viruses, BBV
Target audience:	Laboratory personnel

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Introduction

1. The guidance aims to set out the factors to consider when assessing and controlling the risks for research activities in laboratories involving blood and body fluids. It is not aimed at workers carrying out procedures in clinical settings at the point of contact with patients or volunteers or in any health care situation. A summary of requirements designed to protect health care workers from blood borne viruses (BBVs) exposure is provided in The Health and Social Care Act 2008: Code of practice for the prevention and control of infection and related guidance (known as The Hygiene Code). For work undertaken in clinical pathology laboratories please refer to Health Services Advisory Committee (HSAC) publication “Safe Working and the prevention of infection in clinical laboratories and similar facilities” (ISBN 071762 5133).

Assessing the risks

2. All human tissues will be contaminated with blood and therefore they should be regarded as potentially infectious for BBVs – human immunodeficiency virus (HIV), hepatitis B and C viruses (HBV and HCV) and human T cell lymphotrophic virus (HTLV).

3. HIV has been detected in blood and blood products, in serum, plasma, breast milk, semen, vaginal and cervical secretions, urine, saliva, tears, peritoneal fluid, pleural fluid, pericardial fluid, synovial fluid, amniotic fluid and both cerebrospinal fluid (CSF) and brain tissue. There is also evidence that certain specialised cells lining the gut support the multiplication of HIV. Possible HIV contamination should therefore be taken into account when handling materials of these types in the laboratory.

4. Other specimens such as faeces and urine are not regarded as posing HBV or HIV infection risk as long as they are not contaminated with blood. However, faeces in particular will contain various other pathogens. Sputum samples and specimens of lung tissues may contain Mycobacterium tuberculosis. Samples of neurological origin may contain the disease-form of prion proteins.

5. Several factors should be taken in to account when assessing likely incidence. These include known medical history of a patient or donor, whether the samples are from individuals showing clinical symptoms of infectious disease, and the incidence of the various pathogens that are endemic in the local population. Any samples that have not been screened should be regarded as potentially infectious. The following provides some guideline examples:

- The National Blood Service (NBS) will usually release out-of-date or surplus transfusion blood for non-clinical purposes. Since it has rigorous exclusion criteria for at risk donors and the blood is screened prior to release, blood obtained from the National Blood Transfusion Service may be regarded as one of the lowest risk sources (although this does not guarantee the sample is HIV negative because of the window between infection and seroconversion).
- Samples from the general population in the UK would be regarded as low risk for BBVs whereas those from areas of the world where hepatitis and HIV are endemic would be regarded as higher risk.
- If samples are from a specific group in the UK in which the incidence of BBVs was known to be significantly increased, such as intravenous drug users, then these too would be regarded as higher risk.
- If samples are from individuals known to be, or because of clinical indications strongly suspected to be, infected with BBVs or other Hazard Group 3 pathogens, these would be regarded as high risk. In some stages of infection, the titre of virus in samples will be very high and this too should be taken in to account as part of the risk assessment.

6. It is a requirement under the COSHH Regulations to always consider whether a less hazardous substance, or form of the substance, can be used instead. If it can, then it should be used or justification be given as to why it is not being used. In many cases there will be good reasons for using samples from specific sources since these are the subject of the research. However if material is needed for control purposes or a specific source is not required, then the least hazardous should be used.

7. Summary of points to consider when assessing the risk:

Source of material	Do you know the prevalence of infection in the source population? Can you use pre-screened material to reduce to the risk? Have samples been taken during a particular stage of infection when viral titres could be high?
Risk of inadvertent cultivation	Are you working with material that contains cells that support the cultivation of BBVs, and if so will culture length allow viral production to significant levels?
Nature of activity	Will the work increase the likelihood of exposure eg through the use of sharps or by the generation of splashes or aerosols?

Controlling the risks

8. All work on unscreened samples must be undertaken at a minimum of Containment Level 2 with the additional precautions given in the Appendix. These

precautions supplement the basic Containment Level 2 requirements and are to provide extra protection against percutaneous inoculation, and contamination of the skin, mucous membranes and working surfaces. The rigour with which these control measures are applied should be proportionate to the risk. For higher risk samples, for example those from a source population where there is a higher likelihood of the presence of BBVs (but the samples are not known or strongly suspected to carry BBVs or other pathogens), particular effort should be directed at segregating the work from general laboratory activities and avoiding all possibility of percutaneous inoculation.

9. In general, work at Containment Level 2 does not need to be confined to a safety cabinet unless there is reason to believe the specimen contains other pathogens that do require such containment. There is no substantive evidence that supports aerosol transmission of HBV and HIV. However where handling or processing may generate aerosols, large droplets or splashes, appropriate containment control measures must be adopted. The notable exception to the above is for work on sputum samples and specimens of lung tissues. These must always be handled in a microbiological safety cabinet because of the potential risk from Mycobacterium tuberculosis, even if there is no reason to believe the pathogen is present. Similar samples known to be from patients suffering from tuberculosis must be handled at Containment Level 3.

10. The majority of work with material that could contain BBVs can take place in a Containment level 2 laboratory with additional measures to control the risk of skin penetrating injuries from sharps and contamination of skin, mucous membranes (eyes, nose, mouth) and working surfaces.

11. The Health Services Advisory Committee guidance recommends the following procedures when working with specimens that may contain blood borne viruses:

    - Unauthorised access to the working area should be prevented so as not to disturb the person conducting the work and to prevent accidental physical contact
    - Procedures should be conducted in designated area of the laboratory with sufficient space for working safely
    - Use of a microbiological safety cabinet or other form of primary containment when infected material may be dispersed
    - Designated working area should be clear of unnecessary equipment
    - Wear gloves, and other PPE such as eye protection where appropriate
    - Cover cuts, grazes and broken skin with waterproof dressings
    - Avoid using sharps and glassware
    - Clean and disinfect benches and equipment

- Implement a disinfection policy

12. The risk assessment should address the above. In open-plan, multi–user CL2 laboratories, such work should be undertaken in a designated side room or separated from other work activities because of the risk of disturbance. This could be achieved either by spatial separation such as in a clearly defined designated work station in the lowest occupancy area, or temporally (e.g. at the beginning or end of a work period). Appropriate signage should be displayed.

13. The risk assessment should address the need for immunisation against Hepatitis B and laboratory personnel should be aware of action to take in the event of exposure to potentially infectious material particularly via percutaneous injury.

14. Where it is known or strongly suspected (clinical indications) that blood borne hepatitis viruses, HIV or HTLV are present then the samples must be regarded as high risk materials and handled at a minimum in a derogated Containment Level 3 facility as described in the Appendix unless any viruses that may be present are to be concentrated or propagated, either intentionally or otherwise, in which case full Containment Level 3 must be applied.

15. If other Hazard Group 3 pathogens are known or strongly suspected to be present in the material then the samples must only be handled in a full Containment Level 3 facility. This is a requirement under the COSHH Regulations. Certain viruses are exempted from all the requirements of Containment Level 3 which allows derogation of certain control measures; the University Biosafety Adviser should be contacted for further advice.

16. Contingency plans need to be in place in the event of percutaneous injury with known or strongly suspected HIV positive samples should prophylactic measures be required.

17. If specimens are being sent to another laboratory which are known or strongly suspected to contain a HG3 biological agent, there is a duty under health and safety law to pass this and other relevant information onto the receiving laboratory so that the receiving laboratory can carry out their own risk assessment and use the most appropriate containment measures. Sample must be packaged according to University guidance on transport of dangerous goods.

18. Infectious waste should be autoclaved on site. If disposed of without autoclaving, incineration should be the final destination point as the use of alternative treatment plants does not achieve complete inactivation.

19. Any research work involving blood and body fluids, samples that are knowingly infected with BBVs, or suspected to be infected (e.g. specimens from populations

with a high incidence of HIV), or involving a technique which is likely to lead to the propagation of BBVs must be identified and recorded on the University application form using the link below. The application will need to be approved by the biological safety committee: Application to Handle Biological Materials and COSHH Risk Assessment

Appendix - Control measures

Containment Level 2 with Additional Precautions

All work on unscreened samples must be undertaken at a minimum of Containment Level 2 with the additional precautions given below. These precautions supplement the basic Containment Level 2 requirements and are to provide extra protection against percutaneous inoculation, and contamination of the skin, mucous membranes and working surfaces. The rigour with which these control measures are applied should be proportionate to the risk.

Protocols for the safe conduct of the work should be agreed and strictly adhered to

- Local rules should be drawn up to ensure that working practices take into account the measures necessary to control exposure that may arise from the specific work activity. Laboratory rules, disinfection, waste disposal and emergency procedures must be specified.

Each procedure should be conducted in a designated area of the laboratory with sufficient space for working safely

- Work should be conducted at a delineated work station which is clearly identified. Work with higher risk materials should ideally be undertaken in a separate room or, if this is not practicable, within a designated area of a larger laboratory.
- There should be sufficient room to work safely. There should be enough bench space to ensure the workstation is not cluttered and working practices are not compromised due to lack of space.

Access of unauthorised persons to the working area should be prevented to ensure that the person carrying out the work is free from the risk of disturbance or accidental physical contact with others

- Access to the laboratory must be restricted to authorised persons who have received training for work in that laboratory.
- Systems of work should be in place to ensure that the person carrying out the work is free from the risk of disturbance from others in the laboratory.

A microbiological safety cabinet or other form of primary containment should be used when infected material may be dispersed, by for example, tissue homogenisation, vigorous mixing etc.

- Where required, a microbiological safety cabinet should be available for use in the laboratory and any procedures that may give rise to potentially infectious aerosols must be conducted in the cabinet.

The designated working area should be kept clear of any unnecessary equipment

- The work station should be cleared of any unnecessary equipment or apparatus before the work starts.

Gloves and other personal protective items appropriate to the task (e.g. eye protection) should be worn throughout the work

- Gloves should be worn at all times when handling samples in the laboratory. This is particularly important when handling higher risk samples.
- If during use gloves become punctured or grossly contaminated they should be removed and disposed of, hands should be washed and clean gloves put on.
- On completion of handling samples gloves should always be removed and discarded, and hands should be washed.
- Single use (disposable) gloves should not be re-used.
- Eye protection (goggles or safety glasses) and a plastic overall should be worn if splashing is likely to occur.

Lesions on exposed skin should be covered with waterproof dressings

- Since infections can occur via lesions in the skin all workers in the laboratory should cover cuts and abrasions with a waterproof dressing. This is particularly important when handling higher risk samples.
- In addition, good basic hygiene practices, including regular handwashing, must be practised at all times.

The use of glassware and sharps should be avoided

- The use of glassware and sharps should be banned. If this is not feasible then handling procedures should be designed to minimise the likelihood of puncture wounds. Wherever possible glass items should be replaced with plastic alternatives. Glass pipettes must not be used. These measures are particularly important for higher risk samples.
- If it is necessary to use sharps, then used sharps should be placed directly into a sharps bin. Equipment should not be put down and transferred later as this increases the risk. Unless safe means have been introduced needles should never be resheathed. All sharps and hypodermic needles must be disposed of directly to a sharps container which conforms to the British Standard 7320: 1990. Sharps bins should not be overfilled, used sharps protruding from bins are very dangerous for those who have to handle them.
- All sharps and hypodermic needles must be disposed of directly to sharps containers which conform to the British Standard 7320: 1990. All sharps which may be contaminated with pathogenic organisms should, wherever possible, be autoclaved in their boxes before collection for incineration.

- The term sharp should be taken to refer to any item that is sharp and not be restricted to needles and scalpels. Commonly used items that could easily cause damage to the skin include all glass items (including microscope slides and cover slips), ampoules, pointed nose forceps, dissection instruments, scissors, wire loops that are not closed circles and gauze grids used in electron microscopy work. This list is not exhaustive and all items should be assessed for sharp edges.

The bench surface and any equipment used should be decontaminated immediately on completion of a session of work

- Contamination of benches and equipment should be avoided and at the end of each working session (or day) these should be routinely cleaned and disinfected.
- Ideally, dedicated equipment should be used for work with higher risk materials.
- Equipment must be fully decontaminated prior to maintenance work. A signed statement should be issued to this effect before maintenance work is allowed.

A satisfactory disinfection policy must be in operation

- Disinfectants should be used in accordance with the disinfection policy. Suitable disinfectants, concentrations and contact times should be specified for work involving human blood and/or other tissues. Examples of suitable disinfectants include hypochlorites and Virkon. Use of 70% alcohol is not recommended. Use of glutaraldehyde based disinfectants must be avoided.
- All surfaces should be disinfected immediately following any spillage, at the end of the working day and before any maintenance or cleaning staff are permitted to work in the area where work with blood or blood products has been carried out.
- All contaminated waste must be disposed of safely. Local rules must specifically state laboratory procedures and arrangements for disposal of contaminated materials.

Derogated Containment Level 3 for work with high risk materials

All work on samples known or strongly suspected (clinical indications) to contain BBVs must be undertaken at a minimum in a derogated Containment Level 3 facility as described below unless any viruses that may be present are to be concentrated or propagated, either intentionally or otherwise, in which case full Containment Level 3 must be applied.

A derogated Containment level 3 laboratory should be regarded as equivalent to full Containment level 3 with regard to working practices and only differ from certain structural features of full Containment Level 3 in that

- the laboratory need not be sealable for fumigation,
- laboratory extract air need not be HEPA filtered, and
- in some cases it is not necessary to have the room at negative pressure.

A derogated Containment Level 3 laboratory should have the following features:

- the laboratory should and be to high standard with impervious benches and floors and a hand wash basin at the exit,
- the laboratory should be self-contained as far as reasonably practicable and separate from other activities in the building. Only designated high risk activities should be undertaken in the laboratory;
- access to the laboratory must be restricted to entry only by a key or card code issued to authorised persons who have received training for work in that laboratory. The door must be kept closed when work is in progress and locked at all times the room is unoccupied;
- a biohazard sign must be clearly posted at the entrance of the laboratory along with a sign indicating derogated Containment Level 3;
- the door or wall must contain a transparent panel or other means of viewing the occupants;
- as far as reasonably practicable the laboratory should must contain its own equipment (e.g. incubator, refrigerator/freezer, centrifuge etc.) in order that all work with potentially infected material is restricted to within the laboratory. Samples must be stored safely, ideally within the laboratory;
- an autoclave must be available for the sterilisation of waste. This should preferably be located within the laboratory but if this is not practicable then it should be readily accessible nearby; and the waste transported in closed containers;
- laboratory coats (Howie type) must be worn at all times in the laboratory, be kept in the laboratory when not in use, must not be used in any other areas

outside the laboratory and must be autoclaved before being sent for laundering.

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