



## **Health and Safety Guidance**

### **Work with Human Body Fluids and Tissues**

#### **GUIDANCE/26/WHBFT/14**

Human body fluids and tissue potentially contain blood borne viruses and other agents. Work with blood samples or tissue from individuals therefore carries a risk of infection if the material is not handled with care.

There is existing guidance published by the Health and Safety Executive on the risks from Blood Borne Viruses (BBVs), as well as general guidance on managing risks in laboratories; this guidance supplements this, and advises on good practice specifically in relation to the handling of body fluids and tissues from humans in the laboratory setting.

The University Policy on Biological safety (UHSP/9/BS/14) provides a framework for managing risks from work involving biological materials. Colleges are required by the policy to have local rules for the handling of biological materials. General guidance covering the technical issues relating to laboratory work with biological materials is contained within a series of guidance notes, available on the Health and Safety Unit website. The specific guidance on work with human body fluids and tissue contain in this document supplements the general guidance should assist directly in the selection of appropriate controls and precautionary measures.

Further advice and information may be obtained from the Health and Safety Unit.

# Work with Human Body Fluids and Tissues

## INTRODUCTION

Human body fluids and tissue potentially contains blood borne viruses, and other agents.

The best known Blood Borne Viruses include Hepatitis B Virus, Hepatitis C Virus (and other hepatitis viruses) and Human Immunodeficiency Virus (HIV). A person (carrier) may be unknowingly infected and may be asymptomatic. Work with blood samples or tissue from individuals therefore carries a risk of infection if the material is not handled with care.

There is existing guidance published by the Health and Safety Executive on Blood Borne Viruses (BBVs), and general guidance on managing risks in laboratories – weblinks are supplied in the Biological Safety Policy; this guidance note supplements this, and advises on good practice specifically in relation to the handling of body fluids and tissues from humans in the laboratory setting.

**This guidance does NOT apply to deliberate work with any of the Blood Borne Viruses. Additional containment will be needed for any project involving the deliberate concentration or propagation of these viruses as they are classified as Hazard Group 3 agents. In addition, the use of transformed cell lines which continually produce infectious virions must be carried out at Containment Level (CL) 3. HSE will not accept derogation from working at full CL3 physical conditions for this type of work. The derogation from working at full CL3 is specifically aimed at diagnostic services where no attempt is made to propagate or concentrate the BBV agent. Culturing cells under these circumstances would be deliberate propagation, despite it not necessarily being the primary objective of the work.**

Guidance on the handling of TB positive human material can be found elsewhere in this document.

### Infectious materials

BBVs may be present in the following body fluids: blood, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, semen, vaginal secretions, amniotic fluid, breast milk, any other body fluid containing visible blood, as well as all unfixed organs, tissues and body parts.

Generally, urine, faeces, sweat, sputum, tears and vomit present a minimal risk of BBV infection unless contaminated with blood, though they may present other hazards, such as TB in sputum samples.

### Routes of transmission

The main route of transmission for BBVs is usually via a sharps injury (needlestick, cut, etc), or a splash onto a mucous membrane. There is no conclusive epidemiological evidence for transmission via the airborne route. However, there have occasionally been laboratory acquired infections that have not been clearly attributed to a known accident, and exposure has been assumed, in these cases, to have occurred via an infectious aerosol. Therefore, care should always be taken to minimise aerosol generation in the first place, and to contain aerosols, e.g. by using a microbiological safety cabinet.

Some agents may be easily transmissible via the airborne route, for example, *Mycobacterium tuberculosis*. These should always be handled in a safety cabinet within an appropriate facility, and if material is discovered to contain *M. tuberculosis* it should be handled within an appropriate facility or else autoclaved.

## Other viruses

**Cytomegalovirus** – is a common virus that is part of the herpes group of viruses and can be transmitted through human body fluids, such as blood, saliva, urine. It is estimated that up to 40% of the population have been infected with CMV. Once infected, an individual will stay infected for life. In most people CMV does not cause any symptoms and they will not know they are infected. However, infection can be hazardous during pregnancy as it can cause problems for the unborn child. This is particularly true if a pregnant woman has had no previous exposure to CMV before becoming pregnant. It is estimated that a third of women who become infected by the CMV for the first time during pregnancy will pass the infection on to their unborn baby.

Only 10% of unborn babies infected with the CMV virus will go on to develop problems, but unfortunately, these problems can be serious. They include: deafness, blindness, learning difficulties, restricted growth, and problems with the lungs, liver, or spleen. CMV infection can also cause stillbirths if the infection is contracted during the early stages of pregnancy.

**Human Papillomavirus** - is a DNA virus that infects the skin and mucous membranes. Some HPVs cause warts, while others present no symptoms. Persistent infection with some of the high risk HPVs (16 and 18 for example) may progress to precancerous lesions and invasive cancer, e.g. cervical cancer.

**Epstein Barr virus** – EBV, also called Human herpesvirus 4, is very common in humans. EBV infection is often asymptomatic, but commonly causes infectious mononucleosis, symptoms of which include sore throat, fever and swollen lymph glands. There are known associations between active EBV infections and problems during pregnancy, such as miscarriages or birth defects. Although symptoms of infectious mononucleosis usually resolve in a few months, EBV remains latent in cells in the throat and blood for life. It may reactivate and can be found in the saliva of infected individuals. EBV also establishes a lifelong latent infection in cells of the immune system. In some immunocompromised carriers of the virus there is the risk that lymphomas may develop. Other diseases associated with EBV include nasopharyngeal cancer.

## Work with neural and lymph tissue – TSE risk

Transmissible Spongiform Encephalopathies are caused by unconventional infectious agents, thought to be infectious proteins (without nucleic acid), known as prions. In TSEs, prion protein undergoes a structural change, and can theoretically infect and propagate by refolding abnormally into a structure which is able to convert normal molecules of the protein into the abnormally structured form. This renders the abnormal protein more resistant to degradation, and is associated with infectivity. Examples of TSE diseases include vCJD, classical CJD, and kuru in man, and BSE and scrapie in cows and sheep respectively.

TSE agents are not uniformly distributed in the tissues of affected persons, and infectivity levels vary at different stages of incubation. However, in general, during the clinical disease the CNS (including the retina) pose the highest risk, lymphoid tissue, cornea and dura mater are lower risk, and other body fluids and tissues, lower risk again. Recent media stories have concentrated on the potential risk from blood, following confirmed transmission of vCJD via blood transfusion. A risk assessment for work with blood should acknowledge the potential presence of the prion agent, even if CL2 controls are still considered adequate.

There is no known treatment or prophylaxis for TSE disease, and all are progressive and fatal. There have been no confirmed cases of TSE transmission to humans in the occupational setting, but it is assumed that if this were to ever occur it would most likely happen during an inoculation injury involving infected material, or by ingestion of infected material (highly unlikely in the laboratory setting). TSE agents are exceptionally resistant to conventional decontamination methods. Their infectivity is not affected by formalin, for

example, or by standard autoclaving. Any laboratory work with the agents is carried out at Containment Level 3 (with some derogations because of the absence of airborne risk). Additional precautions will be required because of the unusual nature of the prion proteins.

There is detailed guidance on minimising exposure to TSEs in the healthcare setting. This includes guidance on laboratory containment, control measures and disinfection procedures. This can be found at:

<https://www.gov.uk/government/publications/guidance-from-the-acdp-tse-risk-management-subgroup-formerly-tse-working-group>

## **Work with sputum and saliva samples**

Clinical laboratories treat all sputa as potentially containing *Mycobacterium tuberculosis* (ACDP Hazard Group 3), because occasionally these agents may be present. If CL3 is not used, care will need to be taken in how its absence is justified, by careful patient selection. If *Mycobacterium tuberculosis* (or another HG3 organism) is found in a sample the work should either immediately be moved to a CL3 suite for further manipulation, or the sample destroyed by autoclaving.

*Moraxella catarrhalis*, *Haemophilus influenzae* and *Streptococcus pneumoniae* (ACDP category 2) may also be present in sputa. It is also possible to find other category 2 pathogens such as *Staphylococcus aureus* or *Pseudomonas* sp. present in chronic lung disease, including Chronic Obstructive Pulmonary Disease (COPD). Sputa may contain these category 2 organisms as colonisers of the airways and oropharynx, and not just in infection. Likewise in poor quality sputum samples, contamination with the pharyngeal flora (predominantly 'viridans streptococci', category 2 pathogens) can occur.

Saliva samples may generally be handled at CL2.

## **Respiration experiments**

Where respiration experiments are carried out, in physiology laboratories for example, disposable mouthpieces should be used where at all possible, and these should be disposed of after each individual subject has completed the experiment. Any non-disposable mouthpieces must be thoroughly disinfected after each individual use.

## **Precautions for laboratory workers handling human body fluids and tissues**

All work with human materials needs to be risk assessed before it begins. Containment level 2 practices and procedures are required as a minimum for any work with human body fluids and tissues, even screened material. There may be pathogens present that have not been detected by the screening process and therefore the material should always be handled with care. The risk assessment must be reviewed regularly, and particularly following an accident or any change to the work. The main controls required are as follows:

- The entrance to the laboratory should be marked with Biohazard signs.
- Authorised access only is allowed.
- Laboratory coats, or appropriate protective gowns should be worn in the laboratory and fastened properly. Lab coats and gowns should be removed when leaving the laboratory to go to offices, tearooms, cafeterias, toilets or seminar rooms.

- There should be no eating, drinking, application of cosmetics, mouth pipetting or storage of food within the laboratory. All hand-mouth/eye/nose contact must be minimised.
- The use of sharps should be avoided. If it is necessary to use sharps an appropriate assessment of the risks should be carried out, and control measures put in place to reduce the likelihood of cuts/needlestick injuries. For example, using snub nosed scissors instead of pointed scissors, using chain mail gloves for high risk cutting procedures, and safe sharps disposal for needles. There is further information on sharps safety below.
- Work with human material, if carried out within a large facility, should be confined to a quiet, marked area of the lab, where there will be little interference from other lab users.
- Any open wounds, lesions etc should be covered with a waterproof dressing. Disposable gloves should be worn.
- The work area should be uncluttered and should be decontaminated before and after work takes place.
- Hands should be washed immediately in the event of contamination, and should always be washed after removing gloves, and before leaving the laboratory.
- Care should be taken to prevent contaminated gloves coming into contact with door handles, telephones and other surfaces that may be touched by people not wearing gloves.
- The use of glassware should be reduced to a minimum, and disposable plastic equivalents used instead. This includes the use of Pasteur pipettes. Plastic Pasteurs should be used, unless there is a good scientific reason for using glass, which should be justified by the risk assessment.
- All samples must be labelled, and stored in secondary containment to prevent leaks, within their designated refrigerator or freezer.
- In the event of a spill all contamination must be cleaned up immediately and the incident reported.
- If there is a risk of splashing eye and mouth protection may be needed.
- All procedures likely to generate aerosols, such as sonication, homogenisation etc, should be carried out within a microbiological safety cabinet. Where equipment is placed within a safety cabinet to contain aerosols an operator protection test should be carried out to ensure that the containment of the cabinet is not compromised.
- Sealed tubes should be used for centrifuging, and where at all possible sealed buckets should also be used to contain any aerosols in the event of tube breakage. The sealed bucket can then be removed and taken to a safety cabinet for decontamination. Disinfection with 1% Virkon is recommended for contaminated rotors and bowls, unless it is known or suspected that *Mycobacterium tuberculosis* is present, in which case an appropriate disinfectant, known to be effective against the MTb, must be used. Because Virkon is corrosive to metals, it should not be left in contact with the metal surface for a prolonged period, but should be washed off with water. Alternatively, a disinfectant such as Trigene, with no known corrosive properties may be used, if it is appropriate to do so.
- All waste should be carefully disposed of, particularly any sharps which should be placed directly into yellow sharps bins for ultimate disposal by incineration.

- Individuals should NEVER work on their own cells – if cells are transformed in culture the body's immune response may not provide protection in the event of re-exposure through a needlestick or other accident.

## Equipment

It may be difficult to completely remove the aerosol risk when using automated equipment, such as analysers. The risk should be minimised where possible by taking the following additional precautions:

Any equipment capable of creating and disseminating aerosols should be fitted with a guard or filter to minimise escape of aerosolised particles. Splashes should be contained by guards. Some equipment may be self-cleaning, but may be difficult to decontaminate effectively with disinfectants. If the equipment is likely to be damaged by disinfectants it should be purged thoroughly with water to dilute any infectious material. Manufacturers' instructions should always be followed.

## Sharps safety and dealing with accidents

Needlestick or sharps injuries occur where hypodermics, or other sharp implements penetrate the skin. This is of particular concern if the needle or sharp has been used on someone else first (to take blood), or used to break up cells or disaggregate tissue.

If you suffer a needlestick injury always encourage the wound to bleed. Wash under warm water. You should report the incident to your local Health and Safety Co-ordinator. If you are concerned about the possibility of infection – for example, if you are working with unscreened human blood or tissue, or known pathogenic organisms – you should contact the University's Occupational Health Unit for advice. If you are unable to contact anyone at Occupational Health, or if the incident occurs out of hours you should attend the QE Hospital A&E Department, where trained staff will be able to help and advise.

**If you have a needlestick injury from a source that is known to be HIV positive/Hepatitis B positive/Hepatitis C positive, you should contact Occupational Health and/or attend A&E immediately.**

Occupational Health will be able to check your vaccination records and your levels of immunity, if you have previously received HBV vaccinations. However, you should be aware of your vaccination history for HBV. If you have not been vaccinated, or are a non-responder you should inform the person advising/treating you. This is particularly important if you need to attend A&E.

If you are exposed to material from a known HIV source it is essential to respond quickly. Prophylaxis for HIV is available, which may help reduce the likelihood of contracting the infection. This needs to be administered **within an hour** of the injury occurring for maximum effectiveness.

## Safe Use of Sharps

To avoid being a victim of a sharps injury, you should follow these safe working practices:

- Only use sharps if there is no alternative. If you are using them for work with unscreened human blood or tissue, or for handling pathogenic micro-organisms, carefully consider finding an alternative method of work. Always carry out a risk assessment first;
- NEVER RE-SHEATH NEEDLES;
- Place all used sharps into a yellow sharps bin;
- Do not overfill sharps bins, and make sure the lid is always secure;

- Keep a sharps bin near you while you are working so that used sharps can be easily and safely discarded.

See also University Guidance Note 9: "Sharps injuries and Splash Incidents"

### **Immunisation**

Staff planning to work with human blood and/or tissue should seek advice on Hepatitis B immunisation from the University's Occupational Health Service.

### **Undergraduates**

There is a separate University guidance note on undergraduate projects. The policy of the University's Advisory Group on Biological Hazards is to discourage the handling of unscreened human blood by undergraduate students in view of the consequences of exposure to infection. This includes taking fingerprick samples in a large practical class. An exception may be made in the case of medical and dental students, in a controlled environment only, provided there is adequate safety instruction and risks are reduced to the minimum that is reasonably practicable. Students should always be presented with information on the hazards associated with the material they are handling, and on the correct procedures necessary to minimise the risks. This information should be reinforced verbally. Where unscreened blood is used close supervision will be required, and consideration given to HBV immunisation.