Biological hazards

– **Infectious disease control**

Clinical laboratories >

This information bulletin provides examples of several safe work practices, which could form the basis of more detailed procedures to be adopted in individual work situations or clinical laboratories in various health care environments.

Introduction

This information provided in this bulletin is based on the Australian National Council on AIDS, Hepatitis C and Related Diseases (ANCAHRD*) that take Account of Human Immunodeficiency Virus (HIV) and Other Blood-borne Agents. This information bulletin should be read in conjunction with the National Code of Practice for the Control of Work-related Exposure to Hepatitis and HIV (Blood-borne) Viruses [NOHSC: 2010(2003)], which is an Approved Code of Practice under section 187A of the *Workers Rehabilitation and Compensation Act*. Staff occupied in the propagation or research of HIV or blood-borne pathogens are referred to other relevant safe work procedures or guidelines.

**ANCAHRD has since been replaced with the Ministerial Advisory Committee on AIDS, Sexual Health and Hepatitis (MACASHH).*

Universal precautions are based on the concept that all blood, blood products, and body fluids of all persons are potential sources of infection, independent of diagnosis or perceived risk.

All staff must adhere rigorously to protective measures, which minimise exposure to these agents. The use of universal precautions involves placing a barrier between staff and all blood and bodily fluids.

Safe work practices

Safe work procedures should be developed within the framework of risk identification, risk assessment and risk control. The implementation of effective controls impacts on many areas in the workplace, including the selection and purchasing of equipment, staffing, policy and procedures in the workplace, provision of information and training, and the recording an monitoring of exposures to blood or body fluids.

Work practices and the choice of personal protective equipment should be based on universal precautions

Training

It is essential that all staff working in clinical laboratories receive initial and ongoing training to enable them to do their duties in a healthy and safe manner. This training should enable them to anticipate and manage situations in which they may be exposed to infectious organisms such as HIV or the Hepatitis B virus. Training and instruction should ensure that the safety aspects of new practices and equipment have been considered and that standard practices are being followed.

It is recommended that an orientation check list should be completed with each new staff member and that a copy of the laboratory's safety practices be signed by the new staff member when reading is completed.

A laboratory safety manual should be kept and updated at least annually. The manual should identify specific hazards and provide detailed instructions to staff concerning the particular practices and protection measures required in all activities. Supervisory staff must monitor safety practices and ensure that their staff adheres to the documented safe working practices.

It is also important that laboratory staff have access to appropriate professional counseling and follow-up services are available after any possible and definite exposures to blood and body fluids.

Laboratory hazards

HIV has been isolated from blood, semen, vaginal secretions, saliva, tears, breast milk, cerebro-spinal fluid, amniotic fluid and urine and is likely to be isolated from other body fluids, secretions and excretions. To date, blood is the only body fluid implicated in the transmission of HIV in the health care environment. Nevertheless, until further epidemiological studies are available, these guidelines apply to blood and all body fluids whether visibly contaminated with blood or not. HIV and other blood-borne pathogens may be transmitted in the laboratory directly by percutaneous inoculation, for example, needle stick injury and the contamination of non-intact skin or mucosal surfaces, for example, splashing or touching eyes with contaminated hands. Environmentally mediated transmission of HIV, although theoretically possible, has not been documented. Aerosols (as distinct from droplets) have not been shown to be a mode of transmission of HIV or the Hepatitis B virus.

Laboratory practices

In addition to specific precautions, staff should adhere to the following general principles of safe laboratory practice:

- Laboratory access should be restricted to authorised staff only.
- Eating, drinking and smoking must not take place in the laboratory.
- Food must be stored outside the laboratory work area. Food must not be stored in any cabinet or refrigerator containing specimens or reagents.
- Staff must discipline themselves to avoid hand or implement contact with their skin or mucosal surfaces (eyes, nose or mouth).
- Mouth pipetting is prohibited. Manual devices must be used.
- Sharps must be handled with extreme caution. Percutaneous injury with sharps is the most common mode of blood-borne pathogen transmission in health institutions. The use of needles and syringes should be minimised.
- Needle recapping, removal or manipulation of needs must only carried out using a device which eliminates the risk of percutaneous injury. The wearing of latex gloves will not protect against needle stick injury. Other sharps, or potential sharps such as glass pasteur pipettes, should be handled with care.
- Routine procedures with blood or body fluids can be performed on an open bench. Procedures that generate droplets should be eliminated or modified. In particular, the withdrawing of needles from blood collection bottles may generate sprays which can be averted by using tissues or gauze wads. Alternatively, the procedure can be carried out using a protective shield. Procedures that have a high potential for generating droplets such as blending, sonicating or vigorous mixing should be carried out with shield protection or in a safety cabinet (Class 1 or 2)
- Work surfaces should be decontaminated at least once a day and after any spill.

Specimen transport

Specimens for transport within institutions should be placed in a leak-proof, sealable primary container. Snap-top closures should be avoided. The specimen container should then be transported in a secondary leak-proof container such as a zip-lock clear plastic bag. Request slips should be protected from contamination. The use of a double compartment clear plastic bag is recommended. The use of phlebotomists of racks to transport blood specimens is permissible.

Personnel who transport specimens should be trained in safe handling practices and in decontamination procedures in case of a spill. Specimen reception staff should examine all specimens for leaks before opening the secondary container.

Irreplaceable specimens in containers that are found to be contaminated should be handled with gloves and decontaminated before being sent to the work area. If the specimen is able to be readily replaced, the sender should be informed of the contamination and a fresh specimen obtained. If a request form is contaminated, it should be place in a clear plastic bag and a photocopy taken. The copy should then be annotated and the original safely discarded.

Specific warning labels on specimens from patients with HIV or the Hepatitis B virus are not recommended on the basis that all specimens are regarded and treated as infectious.

Specimens for transport between institutions should be packed and labeled in compliance with the carrier's conditions, government and postal regulations and International Air Transport Association regulations, whichever is appropriate.

Decontamination

The results of inactivating studies on HIV indicate that no changes in currently recommended sterilisation, disinfection and housekeeping strategies are required. Chemicals effective against the Hepatitis B virus are effective against HIV. Sodium hypochlorite is recommended as a safe and effective agent for surface disinfection. Some unpainted metals are corroded by sodium hypochlorite and a phenolic or iodophor may be substituted. In each case, the manufacturer's instruction for the use of disinfectant should be followed. Due to their toxicity, it is not recommended that glutaraldehydes be used as surface disinfectants.

Spills

In the case of spills, the following action should be taken:

- Gloves must be worn. Remove the blood or body fluid with absorbent material.
- Using a detergent solution, clean the spill site thoroughly.
- Wipe down the spill site with disposable towels soaked in a disinfectant solution containing 500ppm of available chlorine.
- Disposal of all contaminated waste material into leak-proof bags (see the section on Waste Disposal).

Note: If the spill site is porous or cannot be adequately cleaned prior to disinfection, then a solution containing at least 5,000ppm of available chlorine should be used. Commercial laundry bleach (approximately 5% available chlorine) is suitable and is diluted with tap water 1:10 to obtain 5,000ppm and 1:100 to obtain 500ppm.

Hypochlorite solutions must be prepared daily.

Equipment

Instruments and equipment should be used in such a manner that minimises surface contamination or the production of droplets. Spillages should be immediately decontaminated. In the event of breakage or leakage within a centrifuge, as with spills, gloves must be worn and the centrifuge decontaminated, remembering to disinfect the outside of all unbroken vials.

Equipment surfaces exposed to potential contamination should be disinfected daily. If necessary, the equipment manufacturer's advice should be sought regarding compatibility of disinfectants with surfaces or functions. All instruments and equipment that require servicing or repair must be cleaned free of blood and body fluids and disinfected before leaving the laboratory.

Contaminated linen

All contaminated linen must be returned to the laboratory and must be stored in contamination bags until collected for laundering.

Waste disposal

The disposal of laboratory waste must be in compliance with local and State regulations. Specimens containing blood, blood products or body fluids should be regarded as infectious as should all sharps. Needles and sharps must be discarded into puncture-resistant containers (sharps containers) which must be kept close to relevant work areas. See Australian Standard AS 4031 Non-reusable Containers for the Collection of Sharp Items Used in Health Care Areas.

Infectious waste must be disposed of in leak-proof bags or vessels. In general, incineration of infectious waste is the preferred method of terminal disposal. If this is not practicable, then autoclaving and disposal as general waste is acceptable. Blood and body fluids may be disposed of by discarding them into the sewer, taking care to avoid splashing.

Handwashing

Attention to handwashing is an essential safety precaution at protecting against transmission of faecal/oral pathogens. Washing with soap and water is recommended. Medicated soaps offer no additional benefit and may in fact lead to an increased disruption of skin integrity. The use of moisturising hand cream is recommended.

Hands must be washed:

- immediately they are contaminated with blood or body fluids;
- before eating, drinking, smoking or leaving the laboratory to use toilet facilities;
- after removing gloves or gown (if gloves are breached, then they should be removed immediately and hands washed);
- at the completion of the work day or session.

Specimens that may potentially contain respiratory pathogens should be handled at all times with respiratory precautions documented elsewhere.

Laboratory design

The following principles of laboratory design should be followed:

- Laboratory space and placement of equipment should not induce crowding or inhibit cleaning.
- Laboratory surfaces and floors should be made of impervious material to facilitate disinfection.

- Facilities for hand washing with elbow or foot-operated taps should be provided in each work area. Eyewash stations should also be available in each work area.
- Adequate and conveniently located biohazard containers for disposal of contaminated materials or sharps should be provided.
- Adequate decontamination containers for reusable articles should be provided.
- Laboratory doors and specimen storage areas should be marked as containing a biohazard. To avoid spillages, stored specimens should not be stacked too high.
- Offices and study areas should be separated from laboratory work areas.

Personal protective equipment

The use of personal protective equipment serves as a barrier to exposure. All staff who are required to wear personal protective equipment while on duty should be trained in its correct fit and use. While on duty, laboratory staff should have access to the following equipment:

- Staff should wear gloves when contact with blood or body fluids is envisaged. The gloves should be well fitting, disposable and readily available. Gloves should be changed if visibly contaminated or breached. Hands should be washed whenever gloves are removed. Gloves should be removed before handling telephones, performing office work, leaving the laboratory etc.
- Staff should use facial protection that is, safety glasses, a mask or face shield, when there is a risk of splashing or spraying blood or body fluids.
- Staff should wear gowns, preferably with a closed front, while performing laboratory tasks. Gowns should be changed immediately they are grossly contaminated. Before leaving the laboratory for non-laboratory areas, gowns should be removed and left in the laboratory. Routine laundering will render clothing non-infectious. Local regulation may require all blood-stained gowns to be labeled ''infectious'.
- All skin defects, such as exudative lesions, cuts, abrasions, etc, should be covered with a waterproof dressing.

Management of blood exposures

Vaccination

It is recommended that all laboratory staff handling blood or body fluids receive Hepatitis B vaccination and their response should be serologically confirmed one month after receiving the third dose. If the response is poor, a fourth dose should be offered and the response ascertained one month later. These results should be held by the Occupational Health Unit.

Baseline serum

It is not recommended that sera be taken routinely from new or current staff working in clinical laboratories. If specific laboratories feel that their procedures or agents being handled are in a higher risk category than routine clinical laboratories, they may adapt biological safety Level 3, for which the taking of baseline sera is recommended. Such sera must be securely stored bearing in mind the legal implications in compensation cases.

Accident reporting

All institutions must formulate written protocols to be followed when staff suffer blood or body fluid exposure. The protocols should include accident and incident reporting, immediate first aid advice and provision and address the issue of patient consent with regard to comatose patients.

If a laboratory worker has a parenteral or mucous membrane exposure to blood or body fluid, the source material should be identified, where practicable, and tested for HIV and Hepatitis B and C virus presence.

Source material positive or unknown

If source material is positive for HIV antibody/virus/antigen or Hepatitis B virus antigen, or is not available for examination, the worker should be counselled regarding the risk of infection and should be evaluated clinically and serologically for evidence of HIV and Hepatitis B virus infection.

HIV: Immediate therapy (within 24 hours) with azidothymidine (AZT) should be considered when the source is HIV positive. The worker should be advised to report any acute febrile illness which occurs within three months of the exposure. An illness that is characterised by fever, rash or lymphadenopathy and/or meningism may indicate recent HIV infection. The worker's serum should be re-tested for seroconversion at three moths and, if negative, again at six months.

Hepatitis B Virus: If the worker responded effectively to vaccination and less than five years has elapsed since vaccination, then neither source nor worker need to be tested further for the Hepatitis B virus. If the worker did not respond effectively to vaccination, then HBIG (0.06 ml/kg) should be given as soon as practical and repeated one month later. If the worker has never received vaccination, then HBIG should be given and Hepatitis B vaccination commenced.

Source material negative

HIV: No follow-up of the worker is necessary unless the patient is at high risk of HIV infection and subsequently demonstrates HIV infection. In such cases, the worker should be tested again at three months.

Hepatitis B Virus: No investigation is necessary. If the worker has not been vaccinated, then commence vaccination.

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