



Standard Operating Procedure (SOP) for handling human tissue samples in the United States Transuranium and Uranium Registries.

Introduction

Personnel in the USTUR laboratories handle human tissue, urine, and feces during the analysis of these materials for various diseases and radionuclides. However, human tissue and bodily fluids can transmit infectious agents, such as viruses, bacteria, and parasites. Transmission of the human immunodeficiency virus (HIV), that causes acquired immunodeficiency syndrome, AIDS, greatly concerns everyone today. Of equal or greater concern are the viruses that cause Hepatitis B, A, and C (HBV, HAV, and HCV respectively). Each year hepatitis, with its associated cirrhosis and primary liver cancer, is responsible for many hospitalizations and deaths in the United States and worldwide.

All human tissue, bodily secretions, and excretions must be considered potentially infective for blood-borne and other pathogens. If all fluids and tissues are treated as infective, then there is no need to test samples for antibodies to HIV, HBV, HAV, or HCV. A negative test for antibodies to any one of these viruses may give the analyst a false sense of security in handling the material. Some antibody tests are known to give both false negative and false positive results. A false negative test may occur during the 4-12 weeks after infection, before antibody levels become detectable by present test methods. However, these individuals are already infectious. With a falsely positive test result a scientifically valuable sample may be rejected erroneously. For these reasons the Centers for Disease Control in Atlanta, Georgia recommend against routine antibody testing of human tissue and bodily fluid samples. Instead, personnel must perform their work strictly adhering to consistent infection control precautions to minimize potential exposure to all pathogens.

The USTUR complies with all applicable federal, state, and university regulations pertaining to the receipt and handling of potentially infectious human tissue samples. Thus, the Registry does not accept tissue samples from any one without prior testing for HIV, HBV, or HCV at

the facility performing the autopsy. Consequently, the Registries do not accept tissue donations from individuals who are known or are reasonably likely to be HIV, HBV, or HCV positive.

Description of operations

The following operations are performed by all Registry personnel involved in the handling of human tissue samples and/or bodily fluids while working in the National Human Radiobiology Tissue Repository (NHRTR).

1. Pickup and log in of urine and other biological samples.
2. Preparation of urine sample for analysis or storage.
3. Preparation of tissue samples for analysis, including defleshing and scraping of bones, dissecting, and disposal of tissue waste.
4. Preparation of fecal material for analysis or storage.

The following hazards are associated with operations performed in the NHRTR laboratories:

1. Mucous membrane (eyes, mouth) exposure to splattered tissue excretions or splashed liquids.
2. Contamination of open wounds, (including unapparent lesions and chapped or inflamed skin) by organisms in materials spilled on bench tops, floors, or directly into wounds.
3. Contamination wounds caused by puncture with contaminated needles, scalpels, or broken glassware.
4. Contamination of other personnel from inad-

equately cleaned work areas where bodily fluids or tissues were manipulated.

5. Contamination of janitorial staff from improperly disposed tissue and fluids or contaminated tools such as scalpels, or broken glassware.

Health, safety, and environmental concerns

Both HIV and HBV are transmitted sexually, by homosexual or heterosexual contact with an infected partner; percutaneously, by intravenous exposure to infected blood or blood products (transfusions, hemophilia clotting factors, or contaminated needles used to inject drugs); and perinatally, from infected mother to newborn. HIV has been isolated from blood, semen, vaginal secretions, saliva, tears, breast milk, cerebrospinal fluid, amniotic fluid, and urine, and is likely to be isolated from other bodily fluids, secretions and excretions. HBV is found in the blood, serous fluid, and in any other body substance that may contain blood or blood products.

Despite a common blood-borne route of transmission for these viruses, studies with health care workers who deal regularly with infective bodily fluids show that HBV is relatively more transmissible than HIV. The risk of acquiring HBV after accidental puncture with a needle contaminated by an HBV carrier is from 6-30%, whereas present research documents the risk for HIV infection under similar accidental conditions at less than 1%. Because of the long incubation period for HIV it is possible that this value may need to be revised upward in the future. During the acute stage of hepatitis, viral levels reach approximately 10^8 viral particles/milliliter of blood. In contrast, HIV has been shown to be present in blood at levels of approximately 100 viral particles/milliliter. Hence the risk of getting HBV is greater than the risk of getting HIV due primarily to the greater concentration of viral particles.

In the United States the highest rates of infection with HIV and HBV are still found in homosexually active men and users of illicit drugs. Laboratory analysts are at greater risk than the general public for these infections but their risk is less than for a practicing homosexual or intravenous drug abuser. As an analyst your level of risk is proportional to the amount and types of infective bodily fluids that you handle, and the precautions you use when handling these materials. You are at greater risk when handling blood and tissues than when you

handle urine. All of the health care workers who have become anti-HIV positive were exposed to blood. In each case the worker had experienced a puncture with a contaminated needle, or had dermatitis, chapped skin or mucous membrane exposure to contaminated blood. However, if you practice stringent infection control techniques your level of risk will decrease significantly. It is mandatory that you cover all wounds. If you cannot cover a wound you must not work with human biological materials until the wound can be covered or is healed. Even minor wounds, such as scratches, and chapped or severely inflamed skin can provide a portal of entry for pathogenic microorganisms. As an analyst you must be aware of the potential sources of transmission of infectious agents.

Pregnant analysts are not known to be at any greater risk than their non-pregnant co-workers. However, if an analyst develops HIV or HBV infection during pregnancy, the infant is at risk of perinatal transmission and/or from breast-feeding with infective breast milk.

Hepatitis A virus, bacteria, such as Salmonella and Shigella, and parasites, such as Giardia, are greater hazards when dealing with fecal material. Hepatitis A, typhoid fever, dysentery, and food poisoning are debilitating and, at the very least, unpleasant though they are not often as fatal as AIDS and hepatitis B. Both Giardia and hepatitis A virus can cause a carrier state that may last for years and cause intermittent flare-ups. Poor hygienic conditions, intimate person-to-person contact, contaminated food or drinking water, and other modes of fecal/oral transmission facilitate transmission of intestinal organisms. In the laboratory this means that all analysts must wash their hands often and be aware of hand- to-mouth contamination, such as nail biting, pencil chewing, or other hand-to-face movements.

Indirect transmission of HIV, HBV, and HAV is possible via contamination of common environmental surfaces in a laboratory, such as glassware, pipettes, bench tops, telephones, and even pens, with infective bodily fluids. The probability of disease transmission with a single such exposure is very low, but frequent exposure makes this mechanism potentially efficient over a long period of time. As an analyst you must constantly be aware of potential contamination of yourself, laboratory furniture, accessories, and waste. Knowledge of the modes of transmission of pathogens plus good common sense will minimize your risks to acceptable levels.

Recommended prophylaxis

As an employee of the USTUR-WSU who deals directly with human bodily fluids, excrement, and/or tissues you will have the opportunity to receive, free of charge, vaccine to Hepatitis B virus. If you refuse the vaccine, you must sign a waiver to that effect that will be placed in your personnel file.

Procedures for safe operation

1. Limited access will be observed in NHRTR laboratories where human materials are processed. The access will be limited to the duly responsible staff and technicians when human materials are present or when the above listed operations are being performed.
2. Biohazard safety signs will be posted on the doors of the NHRTR rooms to warn of the use of human biological materials.
3. Radiation signs will be posted on the doors of the NHRTR labs where the use of radioactive materials is authorized.

General laboratory rules

1. Do not eat, drink, apply cosmetics, or smoke in a laboratory where human materials are processed to prevent accidental oral, mucous membrane, or parenteral exposure to pathogenic microorganisms.
2. Keep all work areas free of clutter to prevent accidents and errors and to facilitate routine and consistent cleaning.
3. Do not mouth pipette anything in the laboratory to prevent oral or mucous membrane exposure to pathogens and dangerous chemicals. Use an appropriate mechanical pipetting device, such as an automatic pipettor, or a pipette fitted with a rubber bulb or plastic pipette pump, to transfer all fluids in the laboratory.
4. Wear closed-toed shoes when working in the laboratory to protect your feet from accidental injury due to broken glassware and spills of chemicals and human materials.

General rules for working in a laboratory where human tissues or bodily fluids are handled

- a. Before starting any work, bandage or cover open wounds, minor cuts and scratches, badly chapped or abraded skin, or skin with severe dermatitis. This includes your hands and any skin that is left uncovered by clothing, such as ears, face, legs, etc. One way to detect minor cuts or scratches is to pour a small amount of vinegar or isopropyl alcohol onto your skin. It will sting if there are any lesions, no matter how small.
- b. Do not work with bodily fluids if such wounds cannot be completely covered.
- c. Wash hands with soap and water before gloving, immediately after removing or changing gloves any time during the workday, and when leaving the laboratory area at any time.
- d. If you have handled tissues, fluids, or the containers they come in, you must remove your gloves and wash your hands with soap and water before leaving the laboratory for any reason.
- e. Take care not to put fingers, pens, or any other items into your mouth because this is a potential mode of transmitting pathogens.
- f. Be aware of contaminating your laboratory environment.
- g. After touching anything in your laboratory (phones, markers, notebooks, light switches, etc.) that may have become contaminated with bodily fluids or tissue, decontaminate the object by the method listed below then wash your hands thoroughly.
- h. Before starting work, choose the safety apparel appropriate to the day's work.
- i. Each day make up fresh solutions of bleach by adding 10 milliliters of household bleach to 100 milliliters of water (1:10 dilution). This makes a solution that is approximately 500 parts per million (ppm) of free available chlorine, which will sterilize any known pathogen.
- j. If a commercial cleaner is to be used instead of

bleach it should be one that is labeled "hospital disinfectant" and "tuberculocidal". Carefully follow the manufacturer's instructions and make appropriate dilutions for routine use. Distribute these dilutions conveniently about the work areas of the laboratory.

k. Before starting work, wipe down work surfaces with the 1:10 dilution of bleach and water, or the commercial germicide mentioned above.

l. Each day before starting the day's work spread an absorbent, disposable, plastic-backed pad on work surfaces.

m. Use disposable needles, scalpels and other sharp instruments whenever possible.

n. Carefully remove all contaminated safety apparel before leaving the laboratory for any reason.

Safety apparel

a. Wear disposable latex gloves, safety glasses and a lab coat with a closed front whenever you are handling bodily fluids.

b. Cover the lab coat with an impervious plastic apron for procedures in which spattering is likely, such as scraping of bones.

c. Wear a surgical type face mask and safety glasses or a chin-length plastic face shield whenever the possibility of splashing, or spattering, is likely to result in facial contamination.

d. For housekeeping chores, such as cleaning up spills or sinks, when the extra dexterity of latex gloves is not needed, wear reusable utility or Playtex-type gloves. After use, decontaminate these gloves by rinsing in water and then dipping in 1:100 dilution of bleach. Carefully remove gloves and hang them up to dry.

Disposal of needles and scalpels

a. Use only disposable needles or scalpels and exercise appropriate extra care when using either, especially after it has become contaminated by insertion into human material.

b. Do not cap, cut, or manipulate by hand contaminated needles or scalpel blades because this increases the risk of accidental puncture or cuts.

c. Dispose of needles and scalpels into puncture-proof containers that may be autoclaved if necessary without exposing the contents to the environment.

d. Locate the container as close as practical to the area where the instrument is used.

e. Do not overfill the disposal container.

f. The disposal container should be labeled "Biological Hazard" and "Sharp Instrument Disposal".

g. After a container is full, securely close it and place into contractor supplied Biohazardous Wastes containers for pick up by the current laboratory waste disposal contractor. Before pickup, the container should be surveyed for gross alpha contamination.

Decontamination of laboratory after spills

a. Blot up the spilled material with paper toweling. If the spill is a hazardous material, the paper toweling will be placed in appropriate plastic bags, labeled, and stored in the fume hood until time of disposal.

b. If visible material is still present, then clean the spill area with an appropriate detergent.

c. Wipe or spray the area with a 10% bleach solution. Allow the area to air dry.

d. Survey the area for gross alpha activity.

e. Dispose of contaminated gloves into the biohazardous waste containers.

f. Wash your hands with soap and water.

Decontamination of laboratory accessories

a. Wear heavy utility gloves, such as Playtex gloves.

b. Wash reusable instruments, such as scissors or metal spatulas, well with an appropriate detergent,

such as Liqui-Nox or Alconox. Rinse well with water. This step will remove excess blood, fluids or fecal material from heavily soiled items.

c. Sterilize the instruments by submersion into 10% bleach for 10-15 minutes. Rinse instruments in water and allow to dry before reuse.

d. Survey the equipment items for gross alpha activity.

Disposal of waste

a. Bag all items contaminated with human material in the contractor supplied orange biohazardous plastic waste bags for disposal. These bags may be used until full, but do not overfill.

b. A contract has been awarded by the USTUR-WSU to BFI Medical Waste Systems of WA, Inc. for pickup and disposal of non-radioactive, potentially infective medical waste.

c. All radiologically contaminated infectious waste items, i.e. lab coats, gloves, should be autoclaved in a dedicated autoclave, and disposed of through the normal university radiation safety waste program.

d. Ordinarily there are no tissue wastes to dispose of, all blood or urine not collected for radiochemical analysis or storage is dried down in the hood and an aliquot counted before disposal.

End of work cleanup

a. All laboratory surfaces and laboratory equipment items used to perform the day's tasks should be surveyed with an appropriate survey meter designed for the task. If no alpha activity is detected, wipe down all laboratory surfaces at the end of the workday with toweling soaked in a 1:100 dilution of bleach in water or with the manufacturer's suggested dilution of a commercial germicide that is labeled "hospital disinfectant" and "tuberculocidal".

b. Routinely clean and disinfect laboratory surfaces that are touched frequently, such as telephones, automatic pipettors and desktops, with the same solutions. This will reduce the chances of inadvertent surface contamination in the laboratory.

c. Survey all laboratory surfaces.

Storage

Class I, II, and III liquids will be purchased only in small volumes and will be stored in metal safety cans. All flammable/combustible materials will be stored in a metal safety cabinet; all corrosive chemicals will be stored in a certified acid cabinet. In addition, a notebook of Material Safety Data Sheets will be kept in the laboratory.

Removal of safety apparel

a. Carefully remove all protective clothing and eyewear after use and before leaving the laboratory for any reason.

b. Wear disposable gloves, masks, and aprons only once. Once soiled, dispose of them in an impervious, plastic hazardous waste bag.

c. Remove safety glasses and face shields and inspect for splatters. If contaminated, decontaminate with bleach solution.

d. Wash hands thoroughly with soap and water.

Training

Your immediate supervisor, or a safety officer familiar with the laboratory practices and biohazards, will instruct you in safety procedures. This training will include the information that follows:

1. How hepatitis A, B, and C viruses, HIV and other pathogenic microorganisms are transmitted;
2. How to choose protective clothing and equipment by knowing the limitations of different types available;
3. Where to find the protective clothing and equipment, and how to use it properly;
4. How to remove, handle, decontaminate, and dispose of contaminated clothing and equipment;
5. How to decontaminate areas and persons in the event of spills or personal exposure;

6. How to report accidents and start the appropriate medical monitoring system in cases of suspected exposure; and
7. How to survey your laboratory area in which radioactive materials are used and maintain records of the results.

This information will be reviewed on a yearly basis or when a change is made in the SOP. Records of these reviews will be kept in personnel files and will include the dates, content, and instructor of the training sessions.

Management of parenteral or mucous membrane exposure

If you sustain a potentially infective injury, such as a wound from a contaminated scalpel or splash of bodily fluids into the eyes or nose, the following steps should be initiated:

1. Immediately rinse the wound with copious amounts of water, and then cleanse the wound with an antiseptic, such as Betadyne scrub. If a splash has been sustained to the eyes, wash well with water or balanced salt irrigation solution;
2. Immediately notify your supervisor;
3. Your supervisor will then fill out an accident report in accordance with the WSU Administrative Requirements outlined in the Health and Safety Manual;
4. Your supervisor will evaluate the conditions associated with your injuries and will undertake corrective measures to prevent any reoccurrence of such injuries.

Responsibilities

The responsibility for compliance with this SOP resides with all staff members and supervising personnel working with potentially infective materials.

Source materials

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