STANDARD OPERATING PROCEDURE

CNSI, NPC Laboratory: Rooms B123, B133 &B139

PURPOSE

The purpose of this document is to specify the procedures used to handle materials provided by other Laboratories outside of the Nano and Pico Characterization Lab for the purpose characterization by scanning probe microscopy (SPM) and related methods. This SOP does not intent to supersede the SOP of the original PI's laboratory which supplied the samples, therefore this SOP is in addition to the original PI's SOP. The respective laboratories are required to indicate any and all biohazards emanating from their materials and have SOP's and IBC approvals in place under which the experiments will be conducted. However, given the fact that the NPC works with over 50 PI's on campus, a common standard for handling has to be set to guarantee biosafety. This document will set this standard.

SCOPE

This SOP applies to any and all work carried out in the NPC laboratory that is not expressively defined as BSL-1 work.

RESPONSIBILITIES

The Principal Investigator is responsible for reviewing this SOP annually and updating this document as needed — as well as any and all other applicable documents.

All research personnel are responsible for reading and complying with the provisions herein.

SAFETY TRAINING REQUIREMENTS

In addition to receiving laboratory specific training for handling any samples for HTS, all research personnel handling samples must take the following EH&S safety training requirements.

A. Biosafety Cabinet (once)
B. Biosafety A,B,C's – Biosafety Level 2 (at least every 3 years)
C. Medical Waste Management (at least every 3 years)
D. Hazardous Chemical Waste Training (once), if this study involves hazardous chemicals

DEFINITIONS:

Sample: Any material received from an outside laboratory or stored material in the NPC.
BSL: Bio-safety-level (see this folder in the handout from the Biosafety ABC for more information)
NPC: Nana and Pico Characterization Lab

REFERENCES:

Biosafety in Microbiological and Biomedical Laboratories, 5th Edition, especially section III and appendix H, which are attached to this SOP and are to be reviewed by any user starting to work in the NPC laboratory.

MATERIALS and/or EQUIPMENT:

This SOP applies to ALL equipment in the NPC Lab and ALL experiments.

PROCEDURES:

Use UNIVERSAL PRECAUTIONS as set forth below:

Universal Precautions are suitable for activity involving any BSL-2 grade material. Biosafety Level 2 (BSL 2) represents the laboratory safety level that corresponds to Universal Precautions. See the attached handout from UCLA EH&S for details.

It is important to understand that at these levels we are dealing with research, diagnostic or production activities thought to pose little or minimal hazards to workers. To date, these procedures and practices have been considered sufficient to protect the work force.

The control of potential biohazards at the BL-2 level is provided by use of standard microbiological practices with the addition of personnel protective equipment (lab coat and gloves).

All persons processing laboratory specimens should wear gloves. Gloves should be changed and hands washed if the gloves are crossly contaminated or damaged and after completion of sample processing.

All specimens of cell culture or any other samples should be placed into a well-constructed container or plate with a secure, well-fitting lid.

Avoid contaminating the outside of the container or plate.

Take care to minimize the formation of droplets, spatters, splashes. Class 2 Biological Safety Cabinets should be used whenever there is a high potential to produce droplets or aerosols. This includes non-contact dispensing, blending, sonicating, vigorous mixing (vortexing), and homogenization. Biological safety cabinets are not needed for other routine work. Other primary containment devices (e.g., plates with lids or centrifuge safety cups with lid) should be used when manipulating samples outside a biological safety cabinet.

Mouth pipetting must not be done. Mechanical pipetting devices must be for all liquids in the laboratory.

Laboratory work surfaces should be decontaminated after a spill of any sample and at the completion of work.

Contaminated clothing is processed according to institutional policy. See hygiene plan and Blood Born Pathogen control plan for details.

Laboratory equipment should be cleaned and decontaminated prior to being repaired or transported to the manufacturer.

All persons should wash their hands before leaving the laboratory. Protective clothing should be removed before leaving the laboratory in the gowning area of the MSSR.

A special word about gloves: OSHA and CDC propose that gloves be worn when there is potential or hand skin contact with samples, potentially infectious material, or surfaces contaminated with these materials. Gloves should be worn when:

- Performing routine laboratory work with blood, potentially infectious body fluids, and tissues and all other samples.
- Handling items (potentially) contaminated with blood or body fluids, including sample container or plates, laboratory instruments, counter tops, etc.
- Gloves should be changed immediately if contamination is visible.

Wear facial protection (mask and eye covering or preferably a face shield) during procedures that are likely to generate droplets of fluids to prevent exposure to mucous membranes of the mouth, nose, and eyes.

Wear protective body clothing when there is a potential for splashing or spraying samples. Wash hands or other skin surfaces thoroughly and immediately if contaminated with samples.

Universal precautions apply to all samples.

Wash hands immediately after gloves are removed.

The use of any sharps is strongly discouraged at the NPC Lab. In the unusual event that sharps are necessary, take extraordinary care to avoid accidental injuries caused by needles, scalpel blades, laboratory instruments, etc. when performing procedures, cleaning instruments, handling sharp instruments, and disposing of use needles. Place used needles, disposable syringes, skin lancets, scalpel blades, and other sharp items into a puncture-resistant biohazard container or plate (sharps container or plate) for disposal. The container or plate should be located as close as possible to the work area.

No food or drinks are allowed (neither consumption nor storage) in the laboratory, neither is the application of make-up, lip balm or smoking.

Persons under the age of 16 are not allowed.

Closed shoes without high heels are required at all times.

Clothing that covers the legs fully is required at all times.

PRECAUTIONS:

For project specific precautions see, read and understand the individual PI's SOP.

EMERGENCIES (SPILL and/or EXPOSURE):

Below is the general spill clean-up procedure:

Spill procedures

1. Place paper towel over spill to contain.

2. Spray towel with diluted fresh 10% bleach to disinfect (Contact time at least 10 minutes)
3. Clean up area with water, then 70% Ethanol (Contact time at least 10 minutes)

There are as well spill cleanup procedure posters posted throughout the laboratory in case of emergency.

For exposures and further details refer to the SOP of the PI from which the sample originated.

Spill/exposure reporting:

Report all spills or exposures to the Principal Investigator and EH&S Biosafety Office 310-825-5689.

Notify Dr. Adam Stieg immediately in the case of any spills or exposures at 310-206-2144 or 310-983-1026.

Waste Disposal:

All biohazard waste is disposed of using universal precautions as set forth above. Refer as well to the biohazard waste disposal poster posted in the lab.

All processed biohazardous samples and plates have to be disposed of using the biohazard waste containers in the laboratory. The waste is then disposed of in accordance to UCLA EH&S policies. Wastebags which are full, should be tied with a square not, placed in a secondary, leakproof, rigid biohazard container, which is closed with a lid before being removed from the laboratory on a cart. The bags are then disposed of by autoclaving, which is located on the 5th floor of the CNSI and are to be handled according to UCLA EH&S policy, see biosafety ABC handouts. If the outside of the container is contaminated, it can not be removed from the laboratory but needs to be decontaminated according to UCLA EH&S practices.

APPENDIX (Relevant Literature)

Working with Human, NHP and Other Mammalian Cells and Tissues

Although risk of laboratory infection from working with cell cultures in general is low, risk increases when working with human and other primate cells, and primary cells from other mammalian species. There are reports of infection of laboratory workers handling primary rhesus monkey kidney cells,[1] and the bloodborne pathogen risks from working with primary human cells, tissues and body fluids are widely recognized.[2,3] OSHA has developed a bloodborne pathogens standard that should be applied to all work in the laboratory with human blood, tissues, body fluids and primary cell lines.[4] Procedures have also been published to reduce contamination of cell cultures with microorganisms.[5,6]

POTENTIAL LABORATORY HAZARDS

Potential laboratory hazards associated with human cells and tissues include the

bloodborne pathogens HBV, HIV, HCV, HTLV, EBV, HPV and CMV as well as agents such as *Mycobacterium tuberculosis* that may be present in human lung tissue. Other primate cells and tissues also present risks to laboratory workers.[7] Cells immortalized with viral agents such as SV-40, EBV adenovirus or HPV, as well as cells carrying viral genomic material also present potential hazards to laboratory workers. Tumorigenic human cells also are potential hazards as a result of self-inoculation.[8] There has been one reported case of development of a tumor from an accidental needle-stick.[9] Laboratory workers should never handle autologous cells or tissues.[1] NHP cells, blood, lymphoid and neural tissues should always be considered potentially hazardous.

Recommended Practices

Each institution should conduct a risk assessment based on the origin of the cells or tissues (species and tissue type), as well as the source (recently isolated or well characterized).

Human and other primate cells should be handled using BSL-2 practices and containment. All work should be performed in a BSC, and all material decontaminated by autoclaving or disinfection before discarding.[6,10,11,12] BSL-2 recommendations for personnel protective equipment such as laboratory coats, gloves and eye protection should be rigorously followed. All laboratory staff working with human cells and tissues should be enrolled in an occupational medicine program specific for bloodborne pathogens and should work under the policies and guidelines established by the institution's Exposure Control Plan.[4] Laboratory staff working with human cells and tissues should provide a baseline serum sample, be offered hepatitis B immunization, and be evaluated by a health care professional following an exposure incident. Similar programs should be considered for work with NHP blood, body fluids, and other tissues.

REFERENCES

1. Doblhoff-Dier O, Stacey G. Cell lines: applications and biosafety. In: Fleming D, Hunt D, editors. Biological safety: principles and practices. Washington, DC: ASM Press; 2000. p. 221-39.
2. Centers for Disease Control and Prevention. Update: universal precautions for prevention of transmission of human immunodeficiency virus, hepatitis B virus and other bloodborne pathogens in healthcare settings. MMWR Morb Mortal Wkly Rep. 1988;37:377-82, 387-8.
3. Centers for Disease Control and Prevention. Guidelines for prevention of transmission of human immunodeficiency virus and hepatitis B virus to healthcare and public safety workers. MMWR Morb Mortal Wkly Rep. 1989;38;No.SU-06.
4. Occupational exposure to bloodborne pathogens. Final Rule. Standard interpretations: applicability of 1910.1030 to established human cell lines, 29 C.F.R. Sect. 1910.1030 (1991).
5. McGarrity GJ, Coriell LL. Procedures to reduce contamination of cell cultures. In Vitro. 1971;6:257-65.
6. McGarrity GJ. Spread and control of mycoplasmal infection of cell culture. In Vitro. 1976;12:643-8.
7. Caputo JL. Safety procedures. In: Freshney RI Freshney MG, editors. Culture of immortalized cells. New York: Wiley-Liss; 1996.
8. Weiss RA. Why cell biologists should be aware of genetically transmitted viruses. Natl Cancer Inst Monogr.1978;48:183-9.
9. Gugel EA, Sanders ME. Needle-stick transmission of human colonic

adenocarcinoma (letter). N Engl J Med. 1986;315:1487.
10. Barkley WE. Safety considerations in the cell culture laboratory. Methods Enzymol. 1979;58:36-43.
11. Grizzle WE, Polt S. Guidelines to avoid personnel contamination by infective agents in research laboratories that use human tissues. J Tissue Cult Methods. 1988;11:191-9.
12. Caputo JL. Biosafety procedures in cell culture. J of Tissue Cult Methods. 1988;11:233-7.

Section III

Principles of Biosafety

A fundamental objective of any biosafety program is the containment of potentially harmful biological agents. The term "containment" is used in describing safe methods, facilities and equipment for managing infectious materials in the laboratory environment where they are being handled or maintained. The purpose of containment is to reduce or eliminate exposure of laboratory workers, other persons, and the outside environment to potentially hazardous agents. The use of vaccines may provide an increased level of personal protection. The risk assessment of the work to be done with a specific agent will determine the appropriate combination of these elements.

LABORATORY PRACTICE AND TECHNIQUE

The most important element of containment is strict adherence to standard microbiological practices and techniques. Persons working with infectious agents or potentially infected materials must be aware of potential hazards, and must be trained and proficient in the practices and techniques required for handling such material safely. The director or person in charge of the laboratory is responsible for providing or arranging the appropriate training of personnel.

Each laboratory should develop or adopt a biosafety or operations manual that identifies the hazards that will or may be encountered, and that specifies practices and procedures designed to minimize or eliminate exposures to these hazards. Personnel should be advised of special hazards and should be required to read and follow the required practices and procedures. A scientist, trained and knowledgeable in appropriate laboratory techniques, safety procedures, and hazards associated with handling infectious agents must be responsible for the conduct of work with any infectious agents or materials. This individual should consult with biosafety or other health and safety professionals with regard to risk assessment.

When standard laboratory practices are not sufficient to control the hazards associated with a particular agent or laboratory procedure, additional measures may be needed. The laboratory director is responsible for selecting additional safety practices, which must be in keeping with the hazards associated with the agent or procedure.
Laboratory personnel, safety practices, and techniques must be supplemented by appropriate facility design and engineering features, safety equipment, and management practices.

SAFETY EQUIPMENT (PRIMARY BARRIERS AND PERSONAL PROTECTIVE EQUIPMENT)

Safety equipment includes BSCs, enclosed container or plates, and other engineering controls designed to remove or minimize exposures to hazardous biological materials. The BSC is the principal device used to provide containment of infectious splashes or aerosols generated by many microbiological procedures. Three types of BSCs (Class I, II, III) used in microbiological laboratories are described and illustrated in Appendix A. Openfronted Class I and Class II BSCs are primary barriers that offer significant levels of protection to laboratory personnel and to the environment when used with good microbiological techniques. The Class II biological safety cabinet also provides protection from external contamination of the materials (e.g., cell cultures, microbiological stocks) being manipulated inside the cabinet. The gas-tight Class III biological safety cabinet provides the highest attainable level of protection to personnel and the environment.

An example of another primary barrier is the safety centrifuge cup, an enclosed container or plate
designed to prevent aerosols from being released during centrifugation. To minimize aerosol hazards, containment controls such as BSCs or centrifuge cups must be used when handling infectious agents.

Safety equipment also may include items for personal protection, such as gloves, coats, gowns, shoe covers, boots, respirators, face shields, safety glasses, or goggles. Personal protective equipment is often used in combination with BSCs and other devices that contain the agents, animals, or materials being handled. In some situations in which it is impractical to work in BSCs, personal protective equipment may form the primary barrier between personnel and the infectious materials. Examples include certain animal studies, animal necropsy, agent production activities, and activities relating to maintenance, service, or support of the laboratory facility.

FACILITY DESIGN AND CONSTRUCTION (SECONDARY BARRIERS)

The design and construction of the facility contributes to the laboratory workers' protection, provides a barrier to protect persons outside the laboratory, and protects persons or animals in the community from infectious agents that may be accidentally released from the laboratory. Laboratory directors are responsible for providing facilities commensurate with the laboratory's function and the recommended biosafety level for the agents being manipulated.

The recommended secondary barrier(s) will depend on the risk of transmission of specific agents. For example, the exposure risks for most laboratory work in BSL-1 and BSL-2 facilities will be direct contact with the agents, or inadvertent contact exposures through contaminated work environments. Secondary barriers in these laboratories may include separation of the laboratory work area from public access, availability of a decontamination facility (e.g., autoclave), and hand washing facilities.

When the risk of infection by exposure to an infectious aerosol is present, higher levels of primary containment and multiple secondary barriers may become necessary to prevent

infectious agents from escaping into the environment. Such design features include specialized ventilation systems to ensure directional air flow, air treatment systems to decontaminate or remove agents from exhaust air, controlled access zones, airlocks as laboratory entrances, or separate buildings or modules to isolate the laboratory. Design engineers for laboratories may refer to specific ventilation recommendations as found in the *ASHRAE Laboratory Design Guide* published by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE).[1]

BIOSAFETY LEVELS

Four BSLs are described in Section 4, which consist of combinations of laboratory practices and techniques, safety equipment, and laboratory facilities. Each combination is specifically appropriate for the operations performed, the documented or suspected routes of transmission of the infectious agents, and the laboratory function or activity. The BSLs described in this manual should be differentiated from Risk Groups, as described in the *NIH Guidelines* and the World Health Organization Laboratory Biosafety Manual. Risk groups are the result of a classification of microbiological agents based on their association with, and resulting severity of, disease in humans. The risk group of an agent should be one factor, to be considered in association with mode of transmission, procedural protocols, experience of staff, and other factors in determining the BSL in which the work will be conducted.

The recommended biosafety level(s) for the organisms in Section 8 (Agent Summary Statements) represent those conditions under which the agent ordinarily can be safely handled. Of course, not all of the organisms capable of causing disease are included in Section 8 and an institution must be prepared to perform risk assessments for these agents using the best available information. Detailed information regarding the conduct of biological risk assessments can be found in Section 2. The laboratory director is specifically and primarily responsible for assessing the risks and applying the appropriate biosafety levels. The institution's Biological Safety Officer (BSO) and IBC can be of great assistance in performing and reviewing the required risk assessment. At one point in time, under the *NIH Guidelines*, BSOs were required only when large scale research or production of organisms containing recombinant DNA molecules was performed or when work with recombinant DNA molecules was conducted at BSL-3 or above. IBCs were required only when an institution was performing non-exempt recombinant DNA experiments. Today, however, it is strongly suggested that an institution conducting research or otherwise working with pathogenic agents have a BSO and properly constituted and functioning IBC. The responsibilities of each now extend beyond those described in the *NIH Guidelines* and depend on the size and complexity of the program. Generally, work with known agents should be conducted at the biosafety level recommended in Section 8. When information is available to suggest that virulence, pathogenicity, antibiotic resistance patterns, vaccine and treatment availability, or other factors are significantly altered, more (or less) stringent practices may be specified. Often an increased volume or a high concentration of agent may require additional containment practices.

Biosafety Level 1 practices, safety equipment, and facility design and construction are appropriate for undergraduate and secondary educational training and teaching laboratories, and for other laboratories in which work is done with defined and characterized strains of viable microorganisms not known to consistently cause disease in

healthy adult humans. *Bacillus subtilis, Naegleria gruberi,* infectious canine hepatitis virus, and exempt organisms under the *NIH Guidelines* are representative of microorganisms meeting these criteria. Many agents not ordinarily associated with disease processes in humans are, however, opportunistic pathogens and may cause infection in the young, the aged, and immunodeficient or immunosuppressed individuals. Vaccine strains that have undergone multiple *in vivo* passages should not be considered avirulent simply because they are vaccine strains.
BSL-1 represents a basic level of containment that relies on standard microbiological practices with no special primary or secondary barriers recommended, other than a sink for handwashing.

Biosafety Level 2 practices, equipment, and facility design and construction are applicable to clinical, diagnostic, teaching, and other laboratories in which work is done with the broad spectrum of indigenous moderate-risk agents that are present in the community and associated with human disease of varying severity. With good microbiological techniques, these agents can be used safely in activities conducted on the open bench, provided the potential for producing splashes or aerosols is low. Hepatitis B virus, HIV, the salmonellae, and *Toxoplasma* spp. are representative of microorganisms assigned to this containment level. BSL-2 is appropriate when work is done with any human-derived blood, body fluids, tissues, or primary human cell lines where the presence of an infectious agent may be unknown. (Laboratory personnel working with human-derived materials should refer to the OSHA *Bloodborne Pathogen Standard* [2] for specific required precautions).

Primary hazards to personnel working with these agents relate to accidental percutaneous or mucous membrane exposures, or ingestion of infectious materials. Extreme caution should be taken with contaminated needles or sharp instruments. Even though organisms routinely manipulated at BSL-2 are not known to be transmissible by the aerosol route, procedures with aerosol or high splash potential that may increase the risk of such personnel exposure must be conducted in primary containment equipment, or in devices such as a BSC or safety centrifuge cups. Personal protective equipment should be used as appropriate, such as splash shields, face protection, gowns, and gloves.
Secondary barriers such as hand washing sinks and waste decontamination facilities must be available to reduce potential environmental contamination.

Biosafety Level 3 practices, safety equipment, and facility design and construction are applicable to clinical, diagnostic, teaching, research, or production facilities in which work is done with indigenous or exotic agents with a potential for respiratory transmission, and which may cause serious and potentially lethal infection. *Mycobacterium tuberculosis*, St. Louis encephalitis virus, and *Coxiella burnetii* are representative of the microorganisms assigned to this level. Primary hazards to personnel working with these agents relate to autoinoculation, ingestion, and exposure to infectious aerosols.

At BSL-3, more emphasis is placed on primary and secondary barriers to protect personnel in contiguous areas, the community, and the environment from exposure to potentially infectious aerosols. For example, all laboratory manipulations should be performed in a BSC or other enclosed equipment, such as a gas-tight aerosol generation chamber. Secondary barriers for this level include controlled access to the laboratory and ventilation requirements that minimize the release of infectious aerosols from the

laboratory.

Biosafety Level 4 practices, safety equipment, and facility design and construction are applicable for work with dangerous and exotic agents that pose a high individual risk of life-threatening disease, which may be transmitted via the aerosol route and for which there is no available vaccine or therapy. Agents with a close or identical antigenic relationship to BSL-4 agents also should be handled at this level. When sufficient data are obtained, work with these agents may continue at this level or at a lower level. Viruses such as Marburg or Congo-Crimean hemorrhagic fever are manipulated at BSL-4.
The primary hazards to personnel working with BSL-4 agents are respiratory exposure to infectious aerosols, mucous membrane or broken skin exposure to infectious droplets, and autoinoculation. All manipulations of potentially infectious diagnostic materials, isolates, and naturally or experimentally infected animals, pose a high risk of exposure and infection to laboratory personnel, the community, and the environment.
The laboratory worker's complete isolation from aerosolized infectious materials is accomplished primarily by working in a Class III BSC or in a full-body, air-supplied positive-pressure personnel suit. The BSL-4 facility itself is generally a separate building or completely isolated zone with complex, specialized ventilation requirements and waste management systems to prevent release of viable agents to the environment.

The laboratory director is specifically and primarily responsible for the safe operation of the laboratory. His/her knowledge and judgment are critical in assessing risks and appropriately applying these recommendations. The recommended biosafety level represents those conditions under which the agent can ordinarily be safely handled. Special characteristics of the agents used, the training and experience of personnel, procedures being conducted and the nature or function of the laboratory may further influence the director in applying these recommendations.

ANIMAL FACILITIES

Four standard biosafety levels are also described for activities involving infectious disease work with commonly used experimental animals. These four combinations of practices, safety equipment, and facilities are designated Animal Biosafety Levels 1, 2, 3, and 4, and provide increasing levels of protection to personnel and the environment. One additional biosafety level, designated BSL-3-Agriculture (or BSL 3-Ag) addresses activities involving large or loose-housed animals and/or studies involving agents designated as High Consequence Pathogens by the USDA. BSL 3-Ag laboratories are designed so that the laboratory facility itself acts as a primary barrier to prevent release of infectious agents into the environment. More information on the design and operation of BSL 3-Ag facilities and USDA High Consequence Pathogens is provided in Appendix D.

CLINICAL LABORATORIES

Clinical laboratories, especially those in health care facilities, receive clinical specimens with requests for a variety of diagnostic and clinical support services. Typically, the infectious nature of clinical material is unknown, and specimens are often submitted with a broad request for microbiological examination for multiple agents (e.g., sputa submitted for "routine," acid-fast, and fungal cultures). It is the responsibility of the laboratory director to establish standard procedures in the laboratory that realistically address the

issue of the infective hazard of clinical specimens.
Except in extraordinary circumstances (e.g., suspected hemorrhagic fever), the initial processing of clinical specimens and serological identification of isolates can be done safely at BSL-2, the recommended level for work with bloodborne pathogens such as HBV and HIV. The containment elements described in BSL-2 are consistent with the OSHA standard, *"Occupational Exposure to Bloodborne Pathogens."* [2,3] This requires the use of specific precautions with **all** clinical specimens of blood or other potentially infectious material (Universal or Standard Precautions).[4,5] Additionally, other recommendations specific for clinical laboratories may be obtained from the Clinical Laboratory Standards Institute (formerly known as the National Committee for Clinical Laboratory Standards).[6]

BSL-2 recommendations and OSHA requirements focus on the prevention of percutaneous and mucous membrane exposures to clinical material. Primary barriers such as BSCs (Class I or II) should be used when performing procedures that might cause splashing, spraying, or splattering of droplets. Biological safety cabinets also should be used for the initial processing of clinical specimens when the nature of the test requested or other information suggests the likely presence of an agent readily transmissible by infectious aerosols (e.g., *M. tuberculosis*), or when the use of a BSC (Class II) is indicated to protect the integrity of the specimen.

Footnote: In 1996 the United States Hospital Infection Control Practices Advisory Committee introduced a new set of guidelines, "Standard Precautions," to synthesize the major features of Universal Precautions (blood and body fluid) with Body Substance Isolation Precautions (designed to reduce the risk of transmission of pathogens from moist body substances).[6] Standard Precautions apply to (1) blood; (2) all body fluids, secretions, and excretions except sweat, regardless of whether or not they contain visible blood; (3) non-intact skin; and (4) mucous membranes. For additional information on Standard Precautions see reference 6 or the CDC website (www.cdc.gov).

The segregation of clinical laboratory functions and limited or restricted access to such areas is the responsibility of the laboratory director. It is also the director's responsibility to establish standard, written procedures that address the potential hazards and the required precautions to be implemented.

IMPORTATION AND INTERSTATE SHIPMENT OF CERTAIN BIOMEDICAL MATERIALS

The importation of etiologic agents and vectors of human diseases is subject to the requirements of the Public Health Service Foreign Quarantine regulations. Companion regulations of the Public Health Service and the Department of Transportation specify packaging, labeling, and shipping requirements for etiologic agents and diagnostic specimens shipped in interstate commerce (See Appendix C).
The USDA regulates the importation and interstate shipment of animal pathogens and prohibits the importation, possession, or use of certain exotic animal disease agents which pose a serious disease threat to domestic livestock and poultry (See Appendix F).

SELECT AGENTS

In recent years, with the passing of federal legislation regulating the possession, use, and transfer of agents with high adverse public health and/or agricultural consequences (DHHS and USDA Select Agents), much greater emphasis has been placed in the emerging field of biosecurity. Biosecurity and Select Agent issues are covered in detail

in Section 6 and Appendix F of this document. In contrast with biosafety, a field dedicated to the protection of workers and the environment from exposures to infectious materials, the field of biosecurity prevents loss of valuable research materials and limits access to infectious materials by individuals who would use them for harmful purposes. Nevertheless, adequate containment of biological materials is a fundamental program component for both biosafety and biosecurity.

REFERENCES

1. McIntosh IBD, Morgan CB, Dorgan CE. ASHRAE laboratory design guide. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc; 2001.
2. Occupational exposure to bloodborne pathogens. Final Rule. Standard interpretations: applicability of 1910.1030 to established human cell lines, 29 C.F.R. Sect. 1910.1030 (1991).
3. Richmond JY. HIV biosafety: guidelines and regulations. In: Schochetman G, George JR, editors. AIDS testing. 2nd ed. New York: Springer-Verlag; 1994. p. 346-60.

4. Centers for Disease Control and Prevention. Update: universal precautions for prevention of transmission of human immunodeficiency virus, hepatitis B virus and other bloodborne pathogens in health-care settings. MMWR Morb Mortal Wkly Rep. 1988;37:377-82,387-8.
5. Garner JS. Guideline for isolation precautions in hospitals. Infect Control Hosp Epidemiol. 1996;17:53-80.
6. National Committee for Clinical Laboratory Standards. Protection of laboratory workers from occupationally-acquired infections; approved guideline, 3rd ed. Pennsylvania: Clinical and Laboratory Standards Institute; 2005.