Bloodborne Pathogens Training
Self Study Guide

Yale University

Environmental Health & Safety

http://ehs.yale.edu/
203-785-3550

July 2016

Exposure Incidents

Report exposure immediately; you may need immediate therapy.

Needlesticks/puncture wounds:
Wash the affected area with antiseptic soap and warm water for 15 minutes.

Mucous membrane exposures:
Flush the affected area for 15 minutes using an eyewash.

For all exposure incidents:

- Notify Principal Investigator, manager or supervisor (if available) to initiate accident or exposure incident report.
- Seek medical assistance immediately (within 1-2 hours) from:
  - Yale Health Center, Acute Care (203-432-0123).
    55 Lock Street, New Haven, CT
  - Employee Health (203-432-7978) Monday through Friday from 8:30a.m. to 5:00 p.m.
  - Medical Area employees may also go to the Yale-New Haven Hospital (YNHH) Personnel Health Services (203-688-2462), CCSS Building, 20 York St., Monday through Friday from 7:30 a.m. to 4:00 p.m. or the Y-NHH Emergency Room (203-688-2222) from 4:30p.m. to 7:30 a.m.

All employees should receive follow up care through
Yale Employee Health (203-432-7978)

Emergency Phone Numbers

Police and Fire, on campus: 911
Police and Fire, from cell or off-campus: 911, (203)432-4400
Yale Health Center: (203) 432-0123
Employee Health: (203)432-7978
Y-NHH- Emergency Room: (203) 688-2222
YNHH – Personnel Health Services: (203)688-2462
Environmental Health & Safety emergency line 203-785-3555

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OSHA Bloodborne Pathogens Standard

The standard, Occupational Exposure to Bloodborne Pathogens, 29 CFR 1910.1030, was issued on December 6, 1991 to protect employees (occupationally exposed) with "reasonably anticipated" skin, eye, mucous membrane, or parenteral contact with human blood or other potentially infectious materials that may result from performance of an employee's duties. The law outlines the requirements necessary to limit employee exposure to bloodborne pathogens such as Hepatitis B virus (HBV), Hepatitis C virus (HCV), the Human Immunodeficiency virus (HIV), and other microorganisms which may be present in these materials, as even a single exposure could lead to disease or death. Bloodborne pathogenic microorganisms can also cause diseases such as malaria, syphilis, babesiosis, brucellosis, leptospirosis, arboviral infections, relapsing fever, Creutzfeldt-Jakob disease, adult T-cell leukemia/lymphoma (caused by HTLV-I), HTLV-I associated myelopathy, diseases associated with HTLV-II, and viral hemorrhagic fever.

According to the Standard, blood is defined as human blood, human blood components, and products made from human blood.

Other potentially infectious material (OPIM) includes: blood products, body fluids (semen, vaginal secretions, cerebrospinal, synovial, pleural, pericardial, peritoneal, amniotic, or any body fluid visibly contaminated with blood), any unfixed tissue or organ (other than intact skin) from human, cell culture media containing HIV, HBV, or other bloodborne pathogens, or tissue and other materials from animals experimentally infected with HIV, HBV, or other bloodborne pathogens. OSHA also considers all primary and continuous cell cultures as potentially infectious if not screened and shown negative for the presence of all bloodborne pathogens.

Objectives and Responsibilities:

OSHA issued the standard to protect more than 5.6 million employees whose job responsibilities involve occupational exposure. The standard is also expected to prevent over 8,000 bloodborne infections and more than 200 deaths each year. It requires **Employers** to:

- develop a written Exposure Control Plan (ECP) to protect its workers;
- conduct an exposure determination to identify exposed employees;

- provide safety training encompassing good work practices and the use of engineering controls on an annual basis;
- provide personal protective equipment at no cost; and
- offer free HBV vaccine and post-exposure medical evaluation and follow-up.

In addition to these responsibilities, management must also review and evaluate the effectiveness of the Exposure Control Plan at least annually and update it as necessary.

Supervisors of occupationally exposed employees are responsible for overall application of the Exposure Control Plan. Supervisors must ensure that workers know and follow safe work procedures outlined in the plan, which protective equipment is available, and that appropriate training has been provided.

Employees must plan and conduct work in accordance with the procedures in this plan and develop good personal work habits. The employee should become familiar with procedures for limiting exposure to human blood and other potentially infectious materials, and always use Universal Precautions when working with these materials. Universal Precautions is an approach to infection control where all blood and other potentially infectious materials are treated as if known to be infectious for HIV, HBV, HCV and other bloodborne pathogens.

Compliance Implementation Dates

The effective dates for the OSHA Bloodborne Pathogens Standard were:

March 6, 1992	Effective date of Standard
May 5, 1992	Exposure Control Plan
June 4, 1992	Information and Training Requirements and Recordkeeping
July 6, 1992	All other provisions

Exposure Control Plan (ECP)

The ECP identifies occupationally-exposed employees at Yale and is designed to minimize or eliminate their exposure to human blood and other potentially infectious material (OPIM). The ECP lists the job classifications of exposed

employees and also lists tasks and procedures that may involve exposure. The Yale University Exposure Control Plan is in conformity with the Standard as it establishes practices and procedures for employees who work with human blood and OPIM.

Accessibility of Exposure Control Plan/Bloodborne Pathogens Standard

Yale's Exposure Control Plan is available at the following locations to assure employee access to this document:

Chemistry Department Instrument Room
Sterling Chemistry Laboratory
225 Prospect Street

Center for Science and Social Science Information
Kline Biology Tower
219 Prospect Street

Law School Library
127 Wall Street

Environmental Health & Safety
135 College Street, Suite 100

Divinity School Library
409 Prospect Street

Medical School Library
333 Cedar Street

Yale Health Center
Acute Care
55 Lock Street

The Exposure Control Plan can be retrieved on the World Wide Web on the Office of Environmental Health and Safety website (http://ehs.yale.edu/), in the Policies and Programs section.

Update of Exposure Control Plan

The Exposure Control Plan will be reviewed and updated at least annually or when necessary to reflect new or modified tasks and procedures, or new and revised employee positions with occupational exposure.

Exposure Determination

All employers with occupationally exposed employees must prepare a written exposure determination that provides the job classifications or titles and the tasks and procedures that may involve exposure.

Employees are required to perform their exposure determination by completing the Training Requirement Assessment through the Training Management System (TMS) http://ehs.yale.edu/training. The Training Requirement Assessment must be completed at time of hire by new employees and thereafter annually.

Training

The occupationally exposed employees identified in the ECP will be provided with OSHA Bloodborne Pathogens Training prior to their initiation of work with human blood or OPIM. Retraining is also required for these employees on an annual basis, or whenever new tasks are introduced that were not covered during the initial training. New tasks must be reviewed to assure appropriate protective measures are incorporated. Training may be provided on specific tasks by the Principle Investigator or his/her designee.

Training will be provided at no cost to employees and scheduled during normal working hours. Employees will be provided with a copy of the OSHA Bloodborne Pathogens Standard and an explanation of its contents. They will also receive:

- a general explanation of the epidemiology and symptoms of bloodborne diseases;
- an explanation of modes of transmission of bloodborne pathogens;
- an explanation of the Yale Exposure Control Plan and where to obtain a copy of it;
- an explanation of the appropriate methods for recognizing tasks and procedures that might involve exposure to blood or other potentially infectious materials;
- an explanation of the use and limitations of practices that will prevent or reduce exposure, including appropriate engineering controls, work practices and personal protective equipment (PPE);
- information on PPE that addresses types available, proper use, location, removal, handling, decontamination, and disposal;
- an explanation of the basis for selection of PPE;
- information on the Hepatitis B vaccine, including its efficacy, safety, and the benefits of being vaccinated;

information on the appropriate actions to take and persons to contact in event of an emergency;

- procedures to follow if an exposure incident occurs, including the method for reporting the incident;
- information on the medical follow-up that will be made available, and on medical counseling provided to exposed individuals;
- an explanation of signs, labels, and/or color coding; and
- a question and answer session with the trainer.

Training records will be maintained on file for at least 3 years.

Human Immunodeficiency Virus (HIV)

HIV is a retrovirus that causes the Acquired Immune Deficiency Syndrome (AIDS) - a severe life-threatening illness which suppresses the body's ability to fight infection and can impede neurological function. There are two known strains, HIV-I and HIV-II. HIV-I is the etiologic agent of AIDS in North and South America, Europe and Central and East Africa. HIV-II is endemic only in West Africa.

HIV replicates primarily in human macrophages and T4 lymphocytes. Invasion of these two vital components of the immune system gradually depletes the number of cells necessary for normal immune function. As a result, an infected individual's susceptibility to opportunistic infections is increased.

Bloodborne pathogen transmission has occurred: (1) by transfusion of blood from HIV infected donors; (2) through receipt of clotting factors for treatment of hemophilia; (3) through unprotected sex; (4) through the sharing of needles for injection of drugs; (5) through accidents in health care settings with needles or other sharps contaminated with HIV infected blood; and (6) accidental blood splashes on mucous membranes. Up to 30% of infants born to HIV infected mothers may be infected with HIV themselves. The exposure occurs either <u>in utero</u> or during labor and delivery. There are also reports of HIV virus transmission during breast feeding.

Post-exposure prophylaxis is available for occupational exposure to HIV. The CDC recommends that workers who have an exposure incident be evaluated within 1-2 hours for a risk assessment and possible prophylactic treatment with

antiviral drugs. All potential HIV exposures must be reported and evaluated within 1 hour to insure optimal treatment.

Approximately 0.3% of health care workers who suffer a percutaneous exposure (e.g. needlestick injury) involving blood from an HIV seropositive individual will seroconvert. When post-exposure prophylaxis is promptly and properly administered, it is believed to be very effective. There have been only 6 reported cases of post-exposure prophylaxis failure as of September 2005.

Hepatitis B Virus (HBV)

HBV is a hepadnavirus. As the name indicates, it is a DNA virus which infects the liver and replicates in liver cells (hepatocytes). HBV is released into the bloodstream from infected hepatocytes. HBV infection may result in a long term carrier state with either mild or severe chronic liver disease including primary hepatocellular carcinoma. The virus is found all over the world with over 400 million carriers worldwide. There are estimated to be about 1,000,000 to 1,400,000 carriers among "healthy" adults in the United States. Total infection with HBV is 5 to 10 times the carrier rate since most infections of adults result in clearance of viremia followed by immunity. Of those people who develop chronic HBV infections (6% of persons infected as adults), 15-25% will eventually die of liver disease. More than 50% of foreign-born persons in the United States from central and southeast Asia, the Middle East, and Aftica are HBV antigen positive, with 5-15% chronically infected. It is estimated that 60,000 new infections occur in the US annually. 4,000 - 5,000 deaths due to chronic liver disease occur each year, including about 200 deaths of health care workers with occupationally contracted HBV.

Blood and blood products are the most effective vehicles for the transmission of HBV. Hepatitis B surface antigen (HBsAg) has been found in virtually all body secretions and excretions; however only blood, saliva, breast milk, semen and vaginal fluids have been shown to be infectious.

Accidental direct percutaneous inoculation (needlestick or other sharp) is the most efficient HBV transmission method. Percutaneous transfer of HBV infected serum or plasma without direct puncture can occur through minute cutaneous scratches or abrasions and through contamination of mucous

membranes. Indirect transfer of infective material to skin or mucous membranes can occur by way of contaminated medical devices, gloves or other environmental surfaces.

The efficiency of HBV transmission by the various methods is due to the extraordinary amount of circulating infectious HBV in the blood of infected individuals who are either in the acute phase of infection or who are HBAg carriers and are positive for Hepatitis B "e" antigen (HBeAg). The presence of HBsAg and HBeAg and of HBV viral DNA in an individual's serum is a sign of relatively high infectivity. HBsAg and HBeAg positive human serum can be diluted a hundred million times and still induce HBV infection in experimental animals.

HBV is an extremely stable virus in the environment. Studies at the CDC demonstrated HBV in HBsAg and HBeAg positive sera remained infectious after drying on a surface at 42% relative humidity for at least a week.

Hepatitis C Virus (HCV)

HCV or parenterally transmitted hepatitis nonA-nonB (NANB) virus is an enveloped RNA virus. HCV infection is the most common chronic bloodborne infection and is a major cause of liver disease in the United States. An estimated 4.1 million Americans have been infected with HCV. There are 26,000 documented cases of HCV in the US annually. 55% - 85% of persons with HCV infection become chronically infected, and chronic liver disease with persistently elevated liver enzymes develops in approximately 70% of those with chronic HCV infections. Persons with chronic hepatitis C are at risk for cirrhosis and primary hepatocellular carcinoma.

Most HCV transmission is associated with direct percutaneous exposure to blood. Health care workers (HCW) are at occupational risk for acquiring this viral infection. However, no vaccine is available to prevent hepatitis C, and immune globulin and antiviral agents are not recommended for postexposure prophylaxis.

The severity of HCV infection ranges from inapparent to, in rare cases, fulminating fatal disease. While 80% of those infected have no symptoms,

symptomatic chronic HCV infection often improves within 3 to 5 years after infection. More than 35% of HCV infections progress to chronic liver disease over a period of years. 1%-5% of those infected will eventually die from HCV.

Antibody is not detected in HCV infected individuals until an average of 15 weeks after the onset of hepatitis (22 weeks) and may remain undetectable for a year. HCV viremia may persist throughout the course of disease and is not always cleared. Asymptomatic persons may still carry the infection in their blood, resulting in a long-term carrier state.

Hepatitis B Virus Vaccination

A safe and effective vaccination, Hepatitis B vaccine is roughly 96% effective at preventing HBV infection upon exposure. The vaccine is prepared in yeast, and thus contraindicated for those allergic to products which contain yeast, such as bread or beer. The vaccination is provided in a series of 3 shots given on days 0, 30, and 180. All 3 shots are required for effective vaccination. Employees must be tested for antibody to Hepatitis B surface antigen 1-2 months after the completion of the series. Employees who do not respond to the primary vaccination series will be offered a second three-dose vaccine series and will then be retested. Non-responders after the second series will be medically evaluated. Current research shows protection remains even if titers fall. Booster shots are not recommended at this time. If a routine booster dose of Hepatitis B vaccine is recommended by the US Public Health Service at a future date, the employer must make the booster dose available to its employees.

All occupationally exposed employees will be offered free Hepatitis B virus vaccinations after training and within 10 days of hire or before initiating work with human blood or OPIM. If an employee declines the vaccination, s/he must sign a waiver form. An employee who declines the vaccination may change his/her mind at any time and decide to accept the offer of the free vaccine. The vaccine is also offered to unvaccinated employees who experience an "exposure incident."

The Hepatitis B Vaccine Notification Form must be completed for each occupationally exposed employee. The form is available at http://ehs.yale.edu/forms-tools/hepb-form. The Employer is not required to offer

the vaccination to those employees who have already received the vaccine, or to those whose antibody status has shown the employee to be immune, or to those for whom the vaccine is contraindicated for medical reasons.

Please call Employee Health (432-0071) to make arrangements to receive the vaccine, or if you have further questions regarding the vaccine.

Routes of Exposure to Bloodborne Pathogens and Other Biohazards

General Routes of Exposure:

- sexual contact
- intravenous drug use
- blood transfusions (blood supply screened since 1985 for HBV, since 1992 for HCV)
- perinatally from mother to offspring (before, during or after birth)

Occupational Routes of Exposure to Bloodborne pathogens:

- Needlestick or skin puncture with other contaminated sharp
- Through non-intact skin (dermatitis, eczema, open wound, minor abrasions)
- Contact with mucous membranes (eyes, nose, and mouth)
- Indirectly from hands to face or through open skin after contact with a contaminated surface

For additional information please see the table on the next page.

Routes of Transmission for Infectious Agents in the Laboratory

ROUTE: EXAMPLES	PROTECTION ACHIEVED WITH:
MUCOUS MEMBRANES: Through mucous membranes of the eyes, nose or mouth (splash, splatter).	Face Protection**:** full face shield or safety glasses and surgical mask Biosafety cabinet Protective shield Good microbiological work practices
INHALATION: Breathing in respirable sized aerosols (<10 um) generated by centrifuge leaks, spills, pipetting, vortexing, sonicating, etc.	BIOSAFETY CABINET: Sealed rotors or canisters for centrifuges Safety containment equipment HEPA filtered respirator Good microbiological work practices
INGESTION: Mouth pipetting, eating, drinking, smoking in the lab.	GOOD MICROBIOLOGICAL PRACTICES: Mechanical pipettes No eating, drinking or smoking in the lab or clinic Frequent hand washing
PERCUTANEOUS: Through intact or non-intact skin via needlestick, puncture with a contaminated sharp object, animal scratch, bite, through wounds, abrasions, or eczema.	Use extreme precautions with sharps Immediate disposal into a rigid leakproof needlebox Substitute plastic for glass Animal restraints Cut resistant gloves, sleeves Waterproof bandages, double gloves
CONTACT (Indirect Transmission): Via mucous membranes or non-intact skin from hands that have been in contact with a contaminated surface (i.e. benches, phones, computers, equipment handles) or failure to wash hands after working.	Decontamination of work surfaces Handwashing Good personal hygiene (avoid touching your face with gloved or non-gloved hands). Do not apply cosmetics within the lab or clinic.

Signs, Labels & Color Coding

Laboratory Safety Information card will be posted at lab entrance. The card will have information on the materials handled inside the laboratory and the name and phone number of the principal investigator or other responsible person.

Biosafety Level Wall Sign will be posted at the entry ways to laboratories working with human blood and other potentially infectious materials. The biosafety level wall sign has the universal biohazard symbol, the word "Biohazard" and "BSL2" under the symbol.

Biohazard Door Signs HIV and HBV research laboratories and production facilities, laboratories working with certain infectious agents that require special provisions for entry, (e.g.; vaccination) or BSL2+ and BSL3 laboratories must have a biohazard door sign posted on all laboratory access doors.

The biohazard door sign is fluorescent orange-red with lettering or symbols in a contrasting color. The following elements must be included on the door sign:

BIOHAZARD
(Name of infectious agent)
(Special entrance requirements)
(Name, telephone number of the principal investigator or other responsible person)

Biohazard labels are affixed to containers of medical waste, refrigerators, freezers, incubators, sonicators, waterbaths, centrifuges and other equipment containing or used with BSL2 or BSL3 agents, human blood or other potentially infectious material. Biohazard labels must be affixed to all containers used to

store, transport or ship BSL2 or BSL3 agents, human blood or other potentially infectious materials.

The labels must be fluorescent orange-red with letters and symbol in a contrasting color. Biohazard Labels must have the international biohazard symbol and bear the legend "Biohazard" (see figure below).

BIOHAZARD

All labels must be an integral part of the container or will be affixed as close as possible to the container by string, wire, adhesive, or any other method that prevents their loss or unintentional removal. The use of labels may be waived if: (1) waste is placed in red bags or red containers; (2) containers of blood, blood components, or blood products are labeled as to their contents and have been released for transfusion or other clinical use; or (3) individual containers of blood or other potentially infectious materials are placed in a labeled secondary container during storage, transport, shipment or disposal.

Temporary biohazard labels may be placed on equipment that is only sporadically used for work with human blood or other potentially infectious material. For example, a temporary sign incorporating the biohazard symbol, the identity of the material, and the name of the employee who will be operating the centrifuge may be placed on a centrifuge just prior to a run with human blood, other potentially infectious material or other BSL2 material. The sign should remain in place until the employee has disinfected the interior bowl of the centrifuge and rotor after use. Once decontaminated, the sign can be removed, returning the equipment back to standard BSL1 lab use.

Transporting

1) On campus transport (hand carried within buildings - not outdoors)

When transporting biological materials on campus within a building or series of buildings the following requirements must be met:

Two leak proof containers are required for on campus transport within a building or series of buildings. Sealed primary containers of human material or other potentially infectious material transported outside of the laboratory must be placed into a sealed secondary container bearing a biohazard label on which the name of the material has been written. If the primary container is glass, use a rigid, unbreakable secondary container as broken glass may penetrate a sealed plastic sample bag (for compliance with the OSHA Bloodborne Pathogens Standard). Also, use paper towels or other absorbent material to separate primary glass containers from each other and from the secondary container to minimize the potential for breakage. The amount of absorbent must be sufficient to absorb the contents of the primary container.

<u>Suitable examples as packaged above include:</u>

- Commercial plastic transport containers
- Plastic vacutainer or specimen container inside a labeled and sealed plastic bag.
- Glass vacutainer inside a sealed plastic bag, placed within a rigid unbreakable labeled secondary container (such as a plastic tool box, sewing box, fish & tackle box).
- Plastic 2 ml cryovial inside sealed and labeled conical tube.

2) On campus transport (hand carried outdoors)

Triple packaging is required for on campus transport between buildings when hand carried outdoors. Sealed primary containers of human material or other potentially infectious material transported outside of the laboratory must be placed into a sealed secondary container bearing a biohazard label on which the name of the material has been written. If the primary container is glass, use a rigid, unbreakable secondary container as broken glass may penetrate a sealed plastic sample bag. Also, use paper towels or other absorbent material to separate primary glass containers from each other and from the secondary container to minimize the potential for breakage. The amount of absorbent must be sufficient to absorb the contents of the primary container. The secondary

container is then placed into a sturdy outer packaging. An itemized list of contents must be placed between the secondary and outer packaging. The outer packaging should bear a biohazard label on which the name of the material has been written.

Suitable examples of outer packaging include:

- Labeled fiberboard box in good condition
- Labeled sturdy plastic container (Sealed cooler or sealable plastic tool box)

For information on transporting human material or other potentially infectious material off campus or on public roadways please refer to the EHS web site at http://ehs.yale.edu/research-materials-shipping for additional information and training requirements.

Engineering Controls

Engineering controls must be used as a primary method of eliminating or controlling exposure to blood or OPIM. Engineering controls place a barrier between the employee and the biohazard. The following engineering controls should be used whenever feasible to minimize the potential for exposure to bloodborne pathogens.
Where engineering controls will reduce employee exposure either by directly removing, eliminating or isolating the hazard, they must be used.

Safe sharps devices: consists of needleless systems and sharps with engineered sharps injury protection that decreases the danger of accidental needlesticks. Safe sharps devices must be utilized whenever feasible.

Needleless systems provide an alternative to needles for various procedures to reduce the risk of injury involving contaminated sharps. Examples include:

- IV systems that administer medication or fluid through a catheter port using non-needle connections.
- Jet injection systems that deliver liquid medication beneath the skin or through a muscle.

Sharps with engineered sharps injury protection include non-needle sharps and needle devices containing built-in safety features that are used for collecting

fluids, administering medications or other fluids, or other procedures involving the risk of sharps injury. There are many types of devices in this category with new products continually being introduced. Examples of available items include:

- Syringes with a sliding sheath that shields the attached needle after use,
- Needles that retract into the syringe after use
- Shielded or retracting catheters
- IV delivery systems that use a catheter port with a needle housed in a protective covering
- Scalpels with retracting blades into handle or a sliding sheath that shields the blade after use

Needleless systems and needles that include safety features must be strongly evaluated by the employer to prevent or minimize exposure. The employer must also evaluate whether these devices could prevent future incidents as part of its responsibility under the law in evaluating exposures that occur in the workplace. The employer must solicit input from non-managerial employees regarding the identification, evaluation and selection of effective engineering controls, including safer medical devices. The employer must document each evaluation and continue to pursue engineering controls that are designed to prevent occupational exposure. Finally, where a new engineering control is issued, suitable training on its use must be provided to the employees and documented.

Contact the Office of Environmental Health and Safety for information on safe sharps devices, needleless systems or needle protected devices or evaluation of safety devices.

Biological Safety Cabinet (BSC): A BSC is a primary containment device that protects the worker, others in the room, the environment and provides clean sterile air to protect the experiment by filtering both supply and exhaust air through High Efficiency Particulate Air (HEPA) filters. The front view screen also protects the worker's face from splash or spatter.

- Load all supplies within the cabinet before starting your experiment
- Disinfect the cabinet work surface before and after use
- Periodically clean under the front grille and work surface
- Collect waste within the cabinet to minimize disruption of the front air curtain by moving hands in and out of the cabinet
- Perform work at least 4" inside the front work area

- Keep both the front and rear grilles clear for effective use of the cabinet
- Never store items on top of the biological safety cabinet as stored items could interfere with exhaust airflow or damage the HEPA filter located there
- Ensure that other lab occupants minimize travel in and out of the lab and movement directly behind the operator when work with human blood or OPIM or other BSL2 material is in progress. This will reduce disruption of the air flow into the cabinet.
- Disinfect all items with an appropriate disinfectant prior to removing them from the BSC.

For detailed information on the proper use of a Biological Safety Cabinet, see Appendix E of the Bloodborne pathogen Training Manual for Clinical and Laboratory Personnel.

Biomedical Waste Containers: Are use to contain and discard used and unused biomedical waste. Multiple biomedical waste containers are available from EHS. Biomedical waste containers must be rigid, puncture-resistant, closeable, leak-proof on the sides and bottom, and labeled with the universal biohazard symbol and the word biohazard. Specific sharps containers are available for discarding contaminated sharps. A contaminated sharp is any object contaminated with human blood, blood products, or other potentially infectious material that is also capable of puncturing the skin. General guidelines for biomedical waste container use are below. For additional information please see the section on biomedical waste disposal in this guide.

- Place a sharps container in the immediate vicinity of sharps use
- Discard intact needle and syringe and other sharps immediately after use
- Proper use of sharps containers eliminates the need to recap, bend, break or manipulate sharps waste by hand.
- Do not containers to overflow – close and replace when they are 2/3 to 3/4 full
- Keep containers upright throughout use

Shields (splash guards): Use a shield when working outside of the biological safety cabinet on the open bench when the potential for splash or splatter of human blood or other potentially infectious materials exists. Decontaminate the inside portion of the shield at the end of the experiment. Splash guards protect against splashes - not aerosols

Tongs, forceps, hemostat: Mechanical devices for handling or collecting contaminated sharp objects, such as needles and syringes, scalpels, and broken glass. Never manipulate sharps directly by hand. Pick up contaminated broken glass with tongs, scoops, or dust pan and brush. Use forceps or a hemostat to change scalpel blades or use scalpel blades with safety features. If needles must be removed from the syringe, use forceps, a hemostat, or a safe sharps device designed for removing scalpel blades.

Centrifuges and other aerosol generating equipment: Centrifuges with automatic locking mechanisms or solid lids prevent the centrifuge lid from being opened while the rotor is still in motion, thereby preventing the release of aerosols. The locking device is released after the centrifuge head has stopped revolving. Centrifuges without automatic locking mechanisms or solid lids shall be replaced by those with automatic locking mechanisms and solid lids as soon as possible. Ensure that O-rings are in place on centrifuge rotors, and other locations where they are required for proper use of the equipment. Use safety buckets or gasketed carriers for low to moderate speed centrifugation. Safety buckets with gasketed covers are designed to contain the contents of the tubes or item being centrifuged in the event of a breakage or leak. Sealed sonicators, homogenizers, and blenders are also available for primary containment when working with blood, OPIM or other BSL2 material. Aerosol generating equipment may also be placed within a biological safety cabinet for added containment. Place the equipment as far to the rear of the cabinet work area as possible and do not perform any other work within the cabinet while the equipment is in operation.

Gauze pads, cotton pledglets: Can be utilized to contain splatter when opening vacutainer tubes of blood or microfuge tubes. Place pads or disinfectant soaked pads over the top of the tube, and open in a direction away from your body, preferably behind a shield.

Cotton plugged pipettes, filtered pipettes: Use to contain aerosols generated during pipetting operations.

Vacuum traps and filters: Use traps for the collection of liquid waste from cell

culture experiments in addition to in-line HEPA or hydrophobic filters to contain any aerosols generated during waste collection. This will protect the vacuum pump or house vacuum source from potential contamination. Place the filter after the collection and overflow flasks and just before the vacuum pump or house vacuum port. If the collection and overflow flask is located on the floor outside the biological safety cabinet, ensure that it is protected from physical damage by placing the flasks in a protective container. A cardboard box or Styrofoam container is suitable for this purpose. Also, change bleach solutions in the collection flask periodically as the concentration of chlorine will dissipate upon exposure to light and air. Periodically flush dilute bleach solutions through sections of plastic tubing for decontamination. For a complete description, refer to "vacuum line chemical traps and filters" information in the Bloodborne Pathogens Training Manual for clinical and laboratory personnel.

Universal Precautions & Work Practice Controls

Universal Precautions are infection control practices in which all blood and other potentially infectious materials are treated as if infectious for HIV, HBV, HCV or other bloodborne pathogens. Universal Precautions are protective measures employees use to eliminate or minimize exposure to infectious agents that may be present in human blood, tissues or certain body fluids. Individuals who handle blood or OPIM must wear appropriate personal protective equipment to prevent contact with potentially infectious materials. Employees must consistently apply the same practices for all work with the potential for exposure. A summary of good work practices is provided below.

- Organize and plan work procedures with your safety and the safety of others in mind. Keep an uncluttered work space. Always make sure all necessary safety materials and exposure control equipment are available and in good working order. Keep an EPA registered tuberculocidal disinfectant or undiluted household bleach and paper towels nearby in case of a spill. A freshly made 10% bleach solution or manufacturer's recommended concentration of another EPA registered tuberculocidal disinfectant must always be used to clean a spill.
- Decontaminate all work surfaces with sodium hypochlorite solution (10% dilution of household bleach) or manufacturer's recommended dilution of another EPA registered tuberculocidal disinfectant upon the completion of work and after any spill. Prepare disinfectant solutions at least weekly, and in

the event of a spill.

- Know the location of the eyewash and know how to use it. Test the eyewash weekly to flush the system.
- Always remove laboratory coats, gowns, smocks, gloves, shoe covers and all other personal protective equipment and wash hands when leaving clinical or laboratory areas for general access areas such as lunchrooms, libraries and administrative offices.
- Eating, drinking, smoking, applying cosmetics and lip balm and handling contact lenses are prohibited in potentially contaminated work sites. Hand creams and lotions are permitted because they are not considered to be cosmetics. Use non-petroleum based hand creams only. Petroleum based hand creams can compromise the integrity of some brands of gloves.
- Food and drink must never be stored in refrigerators, freezers, cabinets or bench tops where blood or other potentially infectious materials may be present.
- Always wear gloves when handling human blood, tissue, or other potentially infectious materials.
- Wash hands and change gloves between patients.
- Always wear a lab coat or gown in the laboratory and remove before leaving the lab.
- Do not touch your face, skin or handle clean surfaces, material, or equipment while wearing gloves.
- Use mechanical pipetting devices – never pipette by mouth
- Avoid the use of sharps. If sharps are absolutely necessary, use appropriate safety devices when working with potentially infectious materials.
- All procedures involving blood or other potentially infectious materials must be performed in a manner that minimizes splashing, spraying, spattering and generation of droplets. This precaution decreases the chances of direct personal exposure and reduces the contamination of bench tops, instruments or other surfaces in the work area. Use appropriate containment equipment for all such procedures.
- Avoid mixing biohazardous materials by drawing and expulsion through pipettes. When delivering pipette contents into a container, allow the contents to run down the container wall or deliver the contents as close as possible to the fluid or agar level. Avoid dropping pipette contents from a height. Mix covered solutions by swirling or vortexing.
- Transport human blood and OPIM in two leakproof containers with absorbent between the containers. Label the outer container with the universal

biohazard symbol bearing the name of the material, the name of the PI and the lab phone number.

- Discard all sharps into approved sharps containers as an intact unit immediately after use. Sharps containers must be located in the immediate vicinity of sharps use.
- Never bend, break, recap, or otherwise manipulate needles by hand. Don't remove the needle from the syringe. If you must remove the needle from the syringe, use a hemostat, forceps, or safe sharps device – never remove by hand
- Dispose of sharps containers when they are 2/3 to 3/4 full. Do not allow containers to overfill. Never reach inside or attempt to force items into a sharps container.
- Wear gloves consistently and wash hands frequently. The use of gloves should not be considered a substitute for careful hand washing after working with infectious material or between patients.
- Wear close-toed shoes at all times. Sandals or open-toed shoes do not provide adequate foot protection and are inappropriate in clinical, laboratory or animal care areas.

Precautions with Reusable Sharps

Procedures involving reusable sharps (such as large bore needles, razor blades, scalpels, and fine tip forceps) may present additional risk for needlestick or other injuries. Employees may face potential exposure to contaminated reusable sharps during collection, transport, decontamination, or while removing or changing blades.

According to the Occupational Safety and Health Administration (OSHA), "reusable sharps must be immediately placed in a leakproof (sides and bottom) puncture-resistant container that is labeled with a biohazard symbol or colored red." Containers must be maintained and used in a manner that prevents an employee from manually handling contaminated sharps.

The following precautions will minimize the risk of percutaneous injuries from contaminated sharps.

- Use disposable safe sharps devices whenever possible; not reusable sharps.

- Don't change scalpel blades by hand. Use a forceps, hemostat, or safe sharps device designed for removing scalpel blades. Keep your hands away from the blade.
- Place a leakproof puncture-resistant tray that contains an EPA registered tuberculocidal disinfectant or 10% household bleach in the immediate work area. Label the collection tray with the biohazard symbol. Reusable sharps may also be autoclaved.
- Place reusable sharps in the collection tray immediately following use. Lay sharps in the same direction within the collection tray.
- Allow a sufficient contact time for disinfection (at least 20 minutes). If items are covered with debris a detergent or enzymatic cleaner should also be used, clean them using a small bristle brush, keeping your hand away from the blade. Decontaminate the brush after use.
- After decontamination, remove reusable sharps from the container with tongs or forceps. If bleach is used as a disinfectant, rinse items with ethanol or water to remove any corrosive residues.
- Substitute plastic for glass wherever feasible.

Handwashing

Hand washing is the single most important personal hygiene measure to remove microorganisms that may have contaminated hands during manipulation of specimens, equipment and supplies or while treating patients or contacting environmental surfaces. Each clinical or laboratory area must have readily accessible handwashing facilities. Hands should be washed well with soap and water for at least 15 seconds:

- after removing gloves and personal protective equipment
- before leaving the laboratory or clinic
- before eating, drinking, smoking, or applying cosmetics; and
- after using the restroom.

Ensure that all hand washing stations are equipped with an adequate supply of soap and paper towels.

In areas that don't have running water, antiseptic wipes or alcohol based hand rub shall be used to pre-wash hands. Employees must follow up by washing

their hands at a sink with running water as soon as feasible after using the antiseptic wipes or alcohol based hand rub.

Repair, Relocation or Discard of Equipment used with Blood or OPIM

Employees must decontaminate all equipment used for work involving blood or OPIM before sending it out for repair, scheduling on-site service, relocating or disposal. Once the equipment has been decontaminated with an appropriate disinfectant (10% household bleach or an EPA registered tuberculocidal disinfectant) for an adequate contact time (at least 15 minutes), affix a Biosafety Notice to the equipment. The completed Biosafety Notice indicates when the equipment was decontaminated, what disinfectant was used, and the name of the person who performed the decontamination. Biosafety Notices can be obtained from the Office of Environmental Health and Safety at 737-2121 or online at http://ehs.yale.edu/forms-tools/biological-safety-equipment-notice-tag

If all areas of the equipment cannot be accessed and decontaminated, a biohazard label must be placed as close as possible to the area of the equipment that remains contaminated; indicate on the Biosafety Notice what portion of the equipment remains contaminated.

Personal Protective Equipment (PPE)

Personal protective equipment (PPE) is used to prevent blood or OPIM from making direct contact with an employee's mucous membrane, skin or clothing. The type and amount of PPE required depends upon the task to be performed and the type of anticipated exposure. The types of PPE utilized to prevent exposure to potentially infectious materials include disposable (single use) gloves, rubber utility gloves, protective body clothing (i.e. gowns, lab coats, jumpsuits, aprons), full face protection (face shield or surgical mask and protective eyewear), emergency ventilation devices, surgical caps, hoods or head covers, and shoe protection.

Yale will provide all required PPE at no charge to each occupationally exposed employee. Yale is responsible for cleaning, repairing, disposing and replacing PPE. All PPE must be easily accessible; of proper size; and must not permit

blood or OPIM to pass through or to reach the employee's outer or inner clothing (including uniforms), skin, eyes, mouth, or other mucous membranes.

Hypoallergenic gloves, glove liners, powderless gloves or different glove brands must be provided to employees who exhibit allergic reactions to the gloves normally provided. It is important to note that latex gloves have proved effective in preventing transmission of many infectious diseases to health care workers. For some workers, exposures to latex may result in: skin rashes; hives; flushing; itching; nasal, eye, or sinus symptoms; asthma; and (rarely) shock. Reports of such allergic reactions to latex have increased in recent years – especially among health care workers.

Gloves are worn to prevent skin contact with blood or OPIM, and must be utilized whenever employees may have potential contact with blood or OPIM.

Gowns, coats and jumpsuits protect the wearer's clothing and skin from contamination. As with all PPE, the type of clothing required would depend on the task being performed and the degree of exposure anticipated.

Long sleeved protective clothing with snug fitting cuffs is preferred over open or short sleeves. Snug fitting cuffs prevent splashes, splatter and aerosols from making contact with exposed skin on the lower arms. Longer single use gloves can be pulled over snug fitting cuffs to seal out any infectious materials.

Plastic, vinyl or rubber aprons are usually worn over other PPE (i.e. lab coat or gown) when extra protection is desired. Aprons are generally used for protection against liquid spills, splashes or soiling of blood or OPIM. Plastic, vinyl or rubber aprons may also be used to provide protection from steam and hot water in locations such as animal handling facilities, autoclave rooms and laboratory glass washing rooms.

Full face protection must be worn whenever there is potential for the generation of splashes, spray, splatter or droplets of blood or OPIM to the eyes, nose, mouth or other facial areas. Face protection is not required when performing all work inside a biosafety cabinet. However, if there is a potential for splashing from a dropped container during transport, face protection must be worn.

Surgical masks are protective against droplets, splashes and sprays. Surgical masks do not protect the worker from aerosol exposure. Masks must cover both the nose and the mouth. Some surgical masks are available with attached eye shields. Moisture from expired air may eventually saturate the mask, making breathing difficult. Change the mask once it has been compromised. To prevent inhalation of infectious aerosols a respirator is used. If your work requires the use of a respirator you must be trained and medically evaluated. Please contact EHS for assistance

Head covers are worn when gross contamination or splashing on the head is reasonably anticipated. These situations may arise when performing autopsies, orthopaedic surgery or working in animal facilities.

Shoe covers or booties shall be worn when gross contamination is reasonably anticipated, such as when cleaning a floor spill. Areas where shoe protection may be necessary include animal rooms, surgery and autopsy rooms, etc. Shoe covers are required to prevent contamination migration and direct and indirect transmission.

Emergency ventilation devices such as mouthpieces and resuscitation bags protect personnel while performing artificial resuscitation. Emergency ventilation devices must be readily available for use in areas where the need to perform artificial resuscitation is anticipated.

General PPE work practices include:

- Removing PPE as soon as feasible if contaminated or penetrated by blood or OPIM. Autoclave, disinfected or spot-treated contaminated PPE before sending out to be laundered. Disposable PPE may be discarded in the biohazard waste.
- Always wash hands thoroughly with soap and water after PPE removal.
- All PPE must be removed prior to leaving the work area for common areas such as cafeterias, offices, etc.
- PPE must be placed in a designated area or container, for storage, washing, decontamination or disposal. Contaminated gloves must be discarded in the medical waste stream. Uncontaminated gloves may be discarded in the general trash.

- Inspect PPE before use to ensure that it is clean and intact.
- Never wash or reuse disposable examination gloves.
- Change PPE whenever it has become compromised, soiled or torn. Reusable PPE can be spot decontaminated by treating with disinfectant; lab coats with extensive contamination can be autoclaved.
- An ample supply of PPE must be available and in the appropriate sizes.
- When working with infectious agents dedicate PPE for the project and remove PPE before leaving the lab. Install hooks to facilitate storage of lab coats; never wear PPE to non-lab areas such as offices, the library or lunch rooms.
- Do not touch door handles, elevator buttons, telephones, computers or other clean surfaces or items with gloved hands. Do not wear gloves in hallways.
- Supervisors are responsible for taking necessary measures to ensure their employees wear the appropriate PPE outlined for specific tasks.

Disposal/Cleaning

Disinfect reusable PPE (such as face shields, goggles, safety glasses, etc.) with a 10% bleach solution or an EPA registered tuberculocidal disinfectant after use and when visibly soiled. Discard disposable (single-use) PPE (gloves, gowns, masks, etc.) in the medical waste stream if contaminated; otherwise discard in the general trash. Contaminated items that may be laundered (such as lab coats) should be placed in a biohazard bag and autoclaved if extensively contaminated, or "spot disinfected" if contamination is isolated. Never take used PPE home to launder. Select a cleaner that follows Universal Precautions.

Housekeeping and Decontamination

The worksite shall be maintained in a clean and sanitary condition. All employees share in this responsibility.

- Keep working solutions of EPA registered tuberculocidal disinfectant (or 10% bleach colution) available in the work area. Prepare 10% bleach solutions at least weekly.
- Have concentrated disinfectant, such as household bleach, available for spill response.
- Remove and replace bench covers or pads when overtly contaminated and at the end of the experiment, but at least daily.

- Decontaminate all work surfaces with an appropriate disinfectant after completion of a procedure, when surfaces are overtly contaminated, and immediately after any spill of blood or OPIM.
- Decontaminate equipment used for work with blood and OPIM after each use and before any service work is performed on the equipment.
- Decontaminate all bins, pails or other receptacles that could become contaminated with blood or OPIM periodically or as soon as feasible after visibly contaminated.
- Decontaminate any reusable tools and instruments after use and before reprocessing.
- Waterbaths, waterbath sonicators and water trays in incubators should contain a disinfectant or other microstatic agent to minimize bacterial, fungal or algal growth. Change the water periodically or whenever growth is observed.
- Check freezers and refrigerators periodically. Promptly remove any broken vials, ampoules or tubes containing blood or other potentially infectious material and decontaminate the inside of the freezer or refrigerator.
- General trash receptacles must be inspected daily to insure that sharps and other biomedical waste items are not inadvertently discarded in the general waste stream. Improperly discarded sharps can result in puncture wounds and cuts to custodians and other support staff.

Custodians are responsible for activities such as sweeping and mopping floors, removing general trash, and cleaning general environmental surfaces such as floors and walls. Custodians are instructed not to touch any laboratory or clinical equipment, materials, supplies or special wastes unless instructed by their supervisor to do so. Custodians are instructed not to pick up medical waste from the floor or to remove general trash if they find medical waste in the trash receptacle. Custodians are not responsible for cleaning and decontaminating laboratory spills.

Disinfectants:

Appropriate disinfectants include:

- household bleach (5.25% available chlorine) diluted 1:100 to 1:10 (for porous surfaces or spills)
- iodine (75 - 1600 PPM)
- tuberculocidal disinfectant registered with the Environmental Protection Agency

Some items may require cleaning to remove excess debris before application of the disinfectant. Whenever feasible, remove all visible blood with disinfectant soaked towels before applying the disinfectant.

Allow at least 15 minutes of contact time when using a disinfectant to decontaminate work surfaces, lab equipment or spills.

Detailed spill response procedures are provided in the Emergency Spill Response Procedures section in this booklet.

Biomedical Waste Disposal

General Guidelines:

- Ensure that sharps containers are available in the immediate work area where sharps are used.
- Empty sharps containers when they are 2/3 to 3/4 full.
- Don't leave bags of waste on the floor; place bags within rigid leakproof containers.
- Transport waste to the autoclave in a secondary leakproof container to prevent spills.
- Decontaminate any reusable containers after contamination.
- Decontaminate all liquid waste, including cultures and stocks of BSL1 or BSL2 agents, cell cultures, and all rDNA effluents before disposal. Treat with household bleach to achieve a final concentration of 10% bleach against the volume of waste treated. Allow a 30 minute contact time before pouring down the sink drain.
- Train all laboratory personnel in biowaste classification and decontamination procedures.

Blood, OPIM, and Human Cell Cultures

Liquid waste can be treated with household bleach as described above and discarded down the sink drain if it is connected to a sanitary sewer system.

Sharps Waste

All needles, syringes (with or without a needle attached), razors, glass tubes or

glass pipettes contaminated with blood or OPIM, contaminated broken plastic and any other contaminated sharp object must be discarded within a rigid, leakproof, puncture resistant container that is labeled with the universal biohazard symbol. In compliance with the State of Connecticut Biomedical Waste Regulation, this waste must be treated and rendered unrecognizable. Yale will collect this waste and discard in an appropriate manner.

Waste from Experiments with Human Pathogens (BSL2 Agents)
Solid waste from experiments involving human pathogens, infectious agents classified at BSL2 or higher, must also be treated and rendered unrecognizable. Collect this waste in containers labeled with the universal biohazard symbol, autoclave, and then package for final disposal EHS.

Emergency Spill Response Procedures

Prepare and maintain a spill response kit. Basic equipment is some concentrated disinfectant (chlorine bleach), a package of paper towels, household rubber gloves, biohazard bags, and forceps to pick up broken glass or other sharps. The contents of the kit can be kept in a small sharps container or plastic container. The following response guidelines are recommended for dealing with an unplanned release of potentially hazardous biological material in the workplace.

For All Biohazard Spills
1. Leave the spill area and post a warning sign. Keep all others out of the spill area.
2. Remove contaminated clothing, turn exposed areas inward, and place in a biohazard bag.
3. Wash all exposed skin with soap and water.
4. Inform Supervisor, and, if assistance is needed, consult Office of Environmental Health and Safety (785-3555).
5. Assemble clean-up materials (disinfectant, paper towels, biohazard bags, forceps and sharps container if necessary).
6. Put on protective clothing (lab coat, gown or jump suit, full face protection, utility gloves or double gloves, and booties if necessary).

Blood Spills
(for blood or other material with a high organic content and low concentration of infectious microorganisms)

1. Wear gloves, eye protection, and a labcoat (or tyvek).
2. Absorb blood with paper towels or disinfectant-soaked paper towels and place in a biohazard bag. Collect any sharp objects with forceps or other mechanical device and place in a sharps container.
3. Using a detergent solution, clean the spill site of all visible blood.
4. Spray the spill site with 10% household bleach and allow to air-dry for 15 minutes.
5. After the 15 minute contact time, wipe the area down with disinfectant-soaked paper towels. Discard all disposable materials used to decontaminate the spill and any contaminated personal protective equipment into a biohazard bag. Decontaminate any reusable items with disinfectant.
6. Wash your hands.

Biosafety Level 2 (BSL2) Agent or Cell Culture Spill

1. Allow aerosols to disperse for at least 30 minutes before reentering the laboratory. Meanwhile, assemble clean-up materials (disinfectant, paper towels, biohazard bags, and forceps).
2. Put on protective clothing (lab coat or tyvek, face protection, utility gloves, and booties if necessary). Depending on the nature of the spill, it may be advisable to wear a HEPA filtered respirator instead of a surgical mask.
3. Cover the area with disinfectant-soaked towels, and then carefully pour disinfectant around the spill. Avoid enlarging the contaminated area. Use more concentrated disinfectant as it is diluted by the spill. Allow at least a 20 minute contact time.
4. Handle any sharps objects with forceps or other mechanical device (tongs, autoclavable broom and dustpan, plastic scoops, two pieces of cardboard, etc.) and discard in a sharps container.
5. Soak up the disinfectant and spill, and place the materials into a biohazard bag. Note: Since smaller pieces of broken glass may not be visible, avoid wiping the floor or work surface directly with hands. Use a thick wad of paper towels to wipe the work surface or push paper towels into a dustpan with a piece of cardboard.
6. Wipe surrounding areas (where the spill may have splashed) with disinfectant.

7. Spray the area with 10% household bleach solution and allow to air-dry (or wipe down with disinfectant-soaked towels allowing a 10 minute contact time). Place all contaminated paper towels and any contaminated protective clothing into a biohazard bag and autoclave.
8. Wash hands and exposed skin areas with disinfectant or antiseptic soap and water.

Spill in a Biosafety Cabinet

1. Leave the biosafety cabinet turned on and begin clean-up immediately.
2. While wearing PPE (gown and gloves) cover the spill area with paper towels or disinfectant soaked towels. Do not place your head inside the cabinet to clean the spill. Keep your face behind the front view screen.
3. If necessary, flood the work surface, as well as drain pans and catch basins below the work surface, with disinfectant.
4. Spray or wipe cabinet walls, work surfaces, and inside the front view screen with disinfectant.
5. Soak up disinfectant in work area; drain disinfectant from the catch basin into a container after a 15 minute contact time.
6. Lift front exhaust grill and tray, and wipe all surfaces. Ensure that no paper towels or soiled debris are blown into the area below the grill.
7. *After appropriate contact time, wipe all metal surfaces that were cleaned with bleach with 70% ethanol to prevent degradation of the metal.*
8. Autoclave all clean-up materials and protective clothing. Wash hands and exposed skin areas with antiseptic soap and water.
9. Notify your PI and supervisor.
10. The Office of Environmental Health and Safety should be notified if the spill overflows into the interior of the cabinet. It may be necessary to do a more extensive decontamination of the cabinet.

Centrifuge Spill

1. When centrifuging infectious agents, utilize sealed tubes and either a sealed rotor or safety buckets for containment. Ensure that all O-rings or gaskets are in place and in good condition.
2. Wait 5 minutes before opening the centrifuge following the end of a run with potentially hazardous biological material. If a spill is identified after the lid is opened, carefully close the lid, and evacuate the laboratory for at least 30 minutes. Post a sign at the lab door indicating "Biohazard Spill: Do Not Enter," then call EHS for additional information or instruction.

3. In the event a spill is detected during centrifugation, turn off the centrifuge, leave the lid closed, and evacuate the laboratory. Post a sign at the lab door indicating "Biohazard Spill: Do Not Enter," then call EHS for additional information or instruction. Allow aerosols to settle for at least 30 minutes.
4. Remove any contaminated protective clothing and place in a biohazard bag. Wash hands and any exposed skin surfaces with soap and water.
5. Notify your supervisor and the Office of Environmental Health and Safety.

After 30 minutes:

1. Enter lab with personal protective equipment and spill clean-up materials. Full face protection, a lab coat and utility gloves should be worn.
2. Transfer rotors and buckets to a biological safety cabinet. Immerse in 70% ethanol or a non-corrosive disinfectant effective against the agent in use, and allow at least a one hour contact time. Intact, unbroken tubes may be wiped down with disinfectant after the soak and placed in a new container. Handle any broken glass with forceps and place in a sharps container.
3. Carefully retrieve any broken glass from inside the centrifuge with forceps and place in a sharps container. Smaller pieces of glass may be collected with cotton or paper towels held between the forceps. Carefully wipe the inside of the centrifuge with disinfectant. Spray the inside of the centrifuge with disinfectant and allow to air dry.
4. If bleach is used, follow by wiping with 70% ethanol to remove any corrosive residues.
5. Place contaminated items and disposable personal protective equipment in an appropriate biomedical waste container and autoclave.
6. Wash hands with soap and water.

Exposure Incidents & Post-Exposure Follow-Up

OSHA defines an exposure incident as a specific eye, mouth, other mucous membrane, non-intact skin, or parenteral contact with blood or OPIM that results from the performance of an employee's duties. The most common exposures in the workplace are through needlestick or puncture with another contaminated sharp such as a glass Pasteur pipette or scalpel blade, splash to the face (eyes, nose or mouth), and contamination of an open wound, cut or abrasion with blood or OPIM.

Immediately after an exposure, the **Employee** must:

- Wash the affected area (flush face in eyewash for 15 minutes, wash punctures or contaminated skin with soap and water for at least 15 minutes)
- Notify his/her supervisor (if available)
- Seek medical assistance within 1-2 hours.

Seek medical assistance and post-exposure follow up immediately at Yale Health Center's – Acute Care located at 55 Lock Street.

The **Supervisor** must complete a Department Head's Report of Injury form and a Health Service Report form, documenting the route of exposure and the circumstances under which the incident occurred. The injured employee will be sent with the forms to Acute Care at 55 Lock Street for treatment and counseling. It is essential that the employee gets to medical assistance immediately, especially for high risk exposures. Employees can be sent without forms, if necessary. However, the forms must be sent within 48 hours.
University Health Services will provide the **post-exposure evaluation and follow-up** at no cost to employees who experience "exposure incidents."

All employees who have an "exposure incident" will be offered a confidential post-exposure medical evaluation and follow-up through the Department of Employee Health. The post-exposure medical evaluation and follow-up includes the following:

- A review/evaluation of the route of exposure and the circumstances under which the incident occurred.
- An attempt to identify the source individual, if possible, and his/her HIV and HBV infection status.
- The employee will be offered the option of having blood drawn for baseline blood collection (storage) or for HIV and HBV serological status testing.
- The employee will be offered post exposure prophylaxis when medically indicated.
- Hepatitis B immune globulin and Hepatitis B vaccine can be provided to those who have not had or completed the vaccine series. Post-exposure drug therapy is also available for high risk HIV exposures.
- The employee will be given appropriate treatment and counseling concerning precautions to take during the period after the exposure incident. The employee will also be given information on what potential illnesses to be alert

for and to report any similar symptoms to appropriate personnel.

The University must provide the employee with a copy of the evaluating health care professional's written opinion within 15 working days of the completion of the original evaluation. The opinion for post-exposure evaluation and follow-up will indicate: (1) that the employee has been informed of the results of the evaluation; and (2) that the employee has been told about any medical conditions resulting from exposure to blood or "other potentially infectious materials" that require further evaluation or treatment. All other findings or diagnoses will remain confidential and will not be included in the written report. All laboratory tests are conducted at no cost to the employee. Contact the Department of Employee Health (203-432-0071) if you have post-exposure evaluation or follow-up questions.

Medical Records must be maintained for the duration of the worker's employment plus 30 years.

Yale University
Office of Environmental Health & Safety
BLOODBORNE PATHOGEN POST-TEST

Name: _____ Date: _____
(Please Print)

Department: _____ NetID: _____

T= True F= False

T F 1. There is currently no vaccine for Hepatitis C virus, the bloodborne pathogen that affects the liver, causes jaundice, cirrhosis and hepatocellular carcinoma.

T F 2. You would be considered as "occupationally exposed" if you handle containers of human blood.

T F 3. At Yale, all entry ways to research and clinical areas that handle human blood and other potentially infectious materials must be posted with a BSL2 Biohazard sign.

T F 4. Face and eye protection are worn when blood or other potentially infectious materials may splash or splatter in the eyes, nose, mouth or other facial areas.

T F 5. Centrifuge's used for human material must have a solid lid and an interlock mechanism to prevent opening of the centrifuge lid while in operation.

6. Occupational exposure to the primary bloodborne pathogens may occur via:
   a. contact with mucous membranes of the eyes, nose and mouth
   b. contact with broken or non-intact skin or
   c. skin puncture
   d. all of the above

Post test continued on next page

7. Which of the following statements is FALSE?

    a. OSHA and the CDC encourage occupationally exposed employees to obtain the free Hepatitis B vaccine unless there are medical contraindications.
    b. The vaccine provides the most effective (96-99%) protection against HBV
    c. The vaccine also protects against the Hepatitis D virus which requires co-infection with Hepatitis B virus to establish an infection
    d. The vaccine is given in a single injection

8. When an employee selects and implements the use of a sharp with engineered sharp injury protection, the employer must:

    a. Solicit input from non-managerial employees
    b. Document the evaluation of the engineering control
    c. Train employees in the use of the engineering control and document the training
    d. All of the above

9. What is the correct method to properly decontaminate a surface?

    a. use an appropriate disinfectant such as household bleach, or an EPA registered disinfectant
    b. use an appropriate concentration of disinfectant
    c. use an appropriate disinfectant contact time
    d. All of the above

10. If you are exposed to blood, body fluids or other potentially infectious materials by a needlestick, cut, bite, splash to a mucous membrane surface (such as eyes, nose or mouth), or contact with non-intact skin, you should immediately wash your hands and the affected area for 15 minutes, then:

    a. notify your supervisor and seek a medical evaluation immediately (within 1 to 2 hours after the exposure incident)
    b. call you personal health care physician and let them know
    c. call the employee health office and set up an appointment within the next several days
    d. call for an ambulance
    e. let your supervisor know, and if appropriate, make arrangements for a medical evaluation.

Complete and return to: Bloodborne Pathogens Program
EHS
135 College Street, Suite 100

PLEASE NOTE: Carefully tear quiz from booklet before returning.