

Category A Students

Exposure Control Manual

Delta College

Revised by Delta College Employees and Student Exposure Committee Representatives from
the Academic Area, Administrative Area, Human Resources, Facilities Management, and
Student Services
Fall, 2016

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Table of Contents: Delta College Exposure Control Manual for Category A Students

Outcomes and Objectives	4
Overview of Manual	5
Part I: Scope and Application	7
Scope	7
History of Exposure Control.....	7
Definition of Terms	8
Part II: Exposure Control Plan For Category A Students	13
Exposure Determination	13
Programs and Courses Considered As Category A for Students	14
Task-Specific Standard Operating Procedures (SOPs)	14
Part III: Methods of Compliance	16
Isolation Precautions	16
History of Isolation Precautions	16
Standard/Universal Precautions: hand washing, PPE, sharps	17
Transmission-Based Precautions: airborne, droplet, contact	22
Engineering Controls.....	26
Work Practice Controls.....	27
Explanation of the Chain of Infection	28
Diagram of the Chain of Infection	30
Normal Flora of the Skin.....	32
Current Recommendations for Hand Hygiene	32
Hand Washing Using a Plain Soap Along With an Alcohol-Based Hand Agent.....	33
Hand Washing Using a Plain Soap or an Antimicrobial Soap	33
Surgical Hand Scrub.....	34
Nail Length and Artificial Nails	35
Category A Work Area Restrictions	35
Personal Protective Equipment (PPE)	36
Housekeeping Information.....	36
Handling of Infectious Specimens.....	36
Cleaning of Potentially Contaminated Equipment and Category A Work Areas	37
Two Alternatives for Environmental Cleaning	38
Handling of Infectious Waste	39
Information on Sterilization & Disinfection.....	45
Spaulding's Classification System	47

Laundry Handling Practices.....	47
Types of Chemical Disinfectants (Table)	47
Part IV: Information on HBV, HCV, and HIV, and HBV Antibody Titer Information,	51
Information on Hepatitis B Virus (HBV).....	51
Importance of HBV Antibody Titer Responder and Non-Responder Status for Category A Students	54
Information on Hepatitis C Virus (HCV)	55
Information on Human Immunodeficiency Virus and Acquired Immune Deficiency Syndrome (HIV-1 & AIDS)	57
Information on Human Immunodeficiency Virus Type 2 (HIV-2).....	60
Part V: Recommendations for Category A Students.....	61
Recommendations for Category A Students.....	61
Hepatitis B Vaccination Recommendations for Students	61
Part VI: Post-Exposure Evaluation & Follow-Up for Category A Students	62
On-Campus Exposure Incident & Follow-Up Procedures for Category A Students.....	62
Off-Campus Exposure Incident & Follow-Up Procedures for Category A Students.....	63
Information Provided to the Healthcare Professional	64
Health Professional's Written Opinion	64
Recommended Postexposure Prophylaxis for Percutaneous or Permucosal Exposure to Hepatitis B.....	65
What To Do In The Case of an Exposure to HCV	65
Recommendations for HIV Postexposure Prophylaxis (PEP)	66
Part VII: Communication of Hazards	68
Posting of Standard/Universal Precautions Signs.....	68
Education & Training for Category A Students.....	69
Part VIII: Recordkeeping	70
Medical Records, Education & Training Records.....	70
Availability and Transfer of Medical and Training Records.....	71
Sharps Injury Log	71
Effective Dates	71
Delta College Injury Report	72
Preliminary Employee Exposure Incident Report	73
Part X. Works Cited	75

Outcomes and Objectives

Outcome: The worker will demonstrate an understanding of the exposure control plan for Category A Students at Delta College.

Specific Objectives:

The Category A Student shall be able to:

- Demonstrate an understanding of the definitions of terms used within this manual.
- Describe the task-specific Standard Operating Procedure (SOP) for their area and its required personal protective equipment (PPE).
- Describe the use of Standard/Universal and Transmission-Based Precautions as it relates to their area.
- Diagram and describe the six essential links of the chain of infection.
- Describe the current recommendations for hand hygiene.
- Demonstrate an understanding of the proper methods for handling and disposing of infectious specimens and/or waste.
- Demonstrate an understanding of the proper methods for decontaminating equipment and work areas.
- Demonstrate an understanding of the current bloodborne pathogens that pose a potential risk for Category A Students.
- List current recommended vaccinations and postexposure procedures for Category A students.
- Recognize appropriate signs and symbols for hazardous waste communication.

Overview of Manual

Delta College's Exposure Control Manual for Category A Students addresses the following:

1. Outcomes and Objectives
2. Scope and Application
 - a. Scope
 - b. History of exposure control
 - c. Definitions of terms
3. The Exposure Control Plan
 - a. The exposure determination
 - b. Programs and/or courses considered as Category A for students.
 - c. Task-specific standard operating procedures
4. Methods of Compliance
 - a. Isolation Precautions
 - i. The history of isolation precautions
 - ii. Standard/universal precautions: hand washing, PPE, sharps
 - iii. Transmission-based precautions
 - b. Engineering Controls
 - i. List of engineering controls
 - c. Work Practice Controls
 1. List of work practice controls
 2. The chain of infection
 3. Normal flora of the skin
 4. Current recommendations for hand hygiene
 5. Nail length and artificial nails
 6. Category A work area restrictions
 - d. Personal Protective Equipment (PPE)
 - e. Housekeeping information
 1. Handling of infectious specimens
 2. Cleaning of potentially contaminated equipment and Category A work areas
 3. Handling of infectious waste
 4. Biohazard spill clean-up procedures
 5. Sharps prevention and procedure
 6. Information on sterilization and disinfection
 7. Laundry handling practices
5. HBV, HCV, and HIV, and HBV antibody titer information
 - a. Information on Hepatitis B
 - b. Importance of HBV antibody titer responder and non-responder status for category A Students
 - c. Information of Hepatitis C
 - d. Information on HIV-1 and AIDS
 - e. Information on HIV-2
6. Recommendations for Category A Students
 - a. Recommendations for Category A Students entering clinicals
 - b. Hepatitis B vaccination recommendations for category A Students
7. Postexposure evaluation and follow-up information
 - a. On-campus exposure incident and follow-up procedures for Students
 - i. Diagram of on-campus exposure management procedure
 - b. Off-campus exposure incident and follow-up procedures for Students

- i. Diagram of off-campus exposure management procedure
 - c. Information provided to the healthcare professional
 - d. Healthcare professional's written opinion
 - e. Recommended postexposure prophylaxis for percutaneous or permucosal exposure to hepatitis B
 - f. What to do in case of an exposure to HCV
 - g. Recommended HIV post-exposure prophylaxis
- 8. Communication of hazards
 - a. Posing signs and hazardous labels
 - b. Education and training
- 9. Recordkeeping
 - a. Medical records
 - b. Education and training records
 - c. Availability of medical and training records
 - d. Transfer of medical and training records
 - e. Sharps injury log
- 10. Effective dates
- 11. Work Cited
- 12. Appendices
 - a. Delta College Preliminary Exposure Incident Report Form
 - b. Delta College Injury Report Form

Part I: Scope and Application

Scope

Within the college, there are certain jobs that require tasks that involve exposure, or reasonably anticipated exposure, to blood or other potentially infectious material. These may include routine and nonroutine situations.

This manual covers all Students who could be reasonably anticipated to come in contact with blood and other potentially infectious materials as the result of performing their educational assignments and/or duties.

Good Samaritan acts, such as assisting a coworker with a nosebleed, would not be considered exposure due to educational assignments and/or duties.

Exposure to bloodborne diseases can result from contact with infectious body fluids. These include blood, blood products, semen, urine, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva, and other body fluids.

If differentiation between body fluid types is difficult or impossible, all body fluids shall be considered potentially infectious.

Pathogens may enter and infect the human body through openings in the skin, such as punctures, cuts, nicks, and abrasions. Pathogens may also gain access to the body through mucous membranes of the eyes, nose, mouth, or via sexual contact.

History of Exposure Control

A standard is defined in Webster's Dictionary as "an authoritative principle or rule that usually implies a model or pattern for guidance, by comparison with which the quantity, excellence, correctness, etc. of other things may be determined."

On December 6, 1991, OSHA published the *Occupational Exposure to Bloodborne Pathogens Rule* in 29 CFR Part 1910.1030, Subpart Z, of the Federal Register. This rule provided guidelines for facilities to reduce the risk of infection of students exposed to body fluids and tissues from infected persons, or equipment and surfaces that may have been contaminated.¹

On May 15, 1992, in compliance with federal regulations, Delta College published the *Delta College Exposure Control Manual For Bloodborne Pathogens & Other Infectious Agents*. The manual was developed by Gayle Hanna, Cindy Harvey, Fred Ross, and Sandy Wight.

On June 30, 1993, MIOSHA filed its final version of the *Standard for Bloodborne Infectious Diseases*, in R 325.70001-R 325.700018 of the Michigan Administrative Code, which was based on the OSHA rule.²

Over the years, both the OSHA and MIOSHA rules have been subject to interpretations and revisions, based on further knowledge of infectious diseases and their transmission. The targeted diseases now include hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), and other bloodborne diseases.

The Delta College manual was revised in June, 1999, by Gayle Hanna, Joyce Howard, Ginny Przygocki, April Sieh, Mike Spitz, and Sandy Wight. The manual included information and procedures for employees and students with the potential for risk of exposure to infectious agents.

OSHA revised the *Bloodborne Pathogens Standard* in conformance with the requirements of the Needlestick Safety and Prevention Act of November 6, 2000. The revised standard was entitled: *Occupational Exposure to Bloodborne Pathogens; Needlestick and Other Sharps Injuries; Final Rule*. It was published in the Federal Register on January 18, 2001, Volume 66, No. 12, pages 5318 to 5325. The effective date for the revised standard was April 18, 2001.³

MIOSHA revised the *Standard For Bloodborne Infectious Diseases* on February 6, 2001, to be in compliance with the OSHA revision. The revised Michigan standard takes effect on October 18, 2001.⁴

In May, 2001, the Delta College Infection Control Committee received a grant from the Delta College Foundation Office to develop the *Exposure Control Manual for Category A Students*. The manual was written in May, 2001, by Stephanie Baiyasi, Joyce Howard, Sheryl Linzy, Ginny Przygocki, April Sieh, and Mike Spitz. The manual is now used as part of the joint clinical student orientation sessions.

Following the reassignment of Health Service's responsibilities, a committee of representatives from the Human Resources, Facility Management, Risk management and Academic area reviewed and revised the current manual in fall of 2009. Since Fall 2009, the committee annually reviewed updates and sharps disposal methods.

Definition of Terms

The following definitions are provided for easy reference and apply throughout this manual.

Allergic contact dermatitis means a delayed hypersensitivity reaction which results from exposure to chemicals added to latex during harvesting, processing, or manufacturing. These chemicals can cause skin reactions similar to those caused by poison ivy. As with poison ivy, the rash usually begins 24 to 48 hours after contact and may progress to oozing skin blisters or spread away from the area of skin touched by the latex. It is also called chemical sensitivity dermatitis.

ALT means alanine aminotransferase. ALT is a liver enzyme. If levels of ALT rise above normal, this is a sign of injury or necrosis of the liver. Severe elevations indicate acute hepatitis.

Antibody titer means having a sufficient level of antibodies in the body to provide protection against a disease. An antibody titer greater than 10 mIU/mL of anti-HBs provides protection against Hepatitis B.

Anti-HBs means antibodies made by the body in response to Hepatitis B vaccination.

Asepsis means procedures that prevent contamination with microbes or their toxins.

Aseptic techniques means techniques and procedures performed in the laboratory that ensure asepsis by preventing contamination of the work area, worker and culture.

Biologically hazardous conditions means equipment, containers, rooms, materials, or combinations thereof, which contain or are contaminated with blood or other potentially infectious material.

Blood means human blood, human blood components, and products made from human blood.

Bloodborne pathogens means pathogenic microorganisms that are present in human blood and that can be potentially infectious. These organisms cause disease in persons as a result of direct contact with blood or body fluids, or indirect contact with blood-contaminated equipment and surfaces.

Category A worker means a worker who is involved in job responsibilities that requires procedures or tasks which involve exposure or reasonably anticipated exposure to blood or other potentially infectious material or that involve a likelihood for spills or splashes of blood or other potentially infectious material. This includes procedures or tasks conducted in routine and nonroutine situations.

CDC means the Centers for Disease Control and Prevention. It is located in Atlanta, Georgia. The CDC is recognized as the lead federal agency for protecting the health and safety of people, at home and abroad, providing credible information to enhance health decisions, and promoting health through strong partnerships. The CDC serves as the national focus for developing and applying disease prevention and control, environmental health, and health promotion and education activities designed to improve the health of the people of the United States.

Community-Acquired infections (CAIs) means drug-resistant microorganisms that were first found within healthcare setting, have now entered the community at large. Within these settings, these microorganisms have continued to evolve.

Contaminated means the presence of blood or other infectious materials on an item or surface.

Contaminated laundry means laundry that has been soiled with blood or other potentially infectious material, or may contain sharps.

Contaminated sharps means any object contaminated with blood or other infectious material that is capable of penetrating the skin, including any of the following: needles, scalpels, broken glass, broken capillary tubes, and exposed ends of dental wires.

Critical medical devices means medical devices or patient-care equipment that enters normally sterile tissue or through which blood flows.

Cross contamination means taking contaminants with you to the next patient or procedure. This occurs if Category A Students fails to wash their hands completely as they leave one patient or procedure. Cross contamination happens all too frequently in the health care setting.

Decontamination means the use of physical or chemical means to remove, inactivate or destroy bloodborne pathogens on a surface or item to the point at which they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use, or disposal.

Disinfect means to inactivate virtually all recognized pathogenic microorganisms, but not necessarily all microbial forms, on inanimate objects.

Engineering controls means controls (e.g., sharps disposal containers; self-sheathing needles; safer medical devices, such as sharps with engineered sharps injury protections and needleless systems) that isolate or remove the bloodborne pathogens hazard from the workplace. Engineering controls deal with the physical environment, including buildings and equipment.

Exposure means reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of a worker's educational or clinical responsibilities. This definition excludes incidental exposures that may take place, and that are neither reasonably nor routinely expected, and that the worker is not required to incur in the normal course of their training.

Exposure incident means a specific exposure of the worker's nonintact skin or mucous membranes (eye, nose, or mouth) to blood or other infectious body fluids, which results from the performance of a worker's educational or clinical responsibilities. This includes exposure via the parenteral route.

Hand washing facilities means a facility providing an adequate supply of running water, soap and single-use towels.

HBIG means Hepatitis B immune globulin.

- HBIG is composed of pre-formed antibodies that are injected into an exposed person.
- HBIG only provides short-term protection against HBV infection because it does not stimulate the body to produce its own antibodies to infection.

HBsAg means Hepatitis B surface antigen, a marker of infectivity. Its presence indicates either acute or chronic HBV infection.

HBV means hepatitis B virus.

HIV means human immunodeficiency virus.

Healthcare-Associated infections (HAIs) are infections associated with healthcare delivery in any setting (e.g., hospitals, long-term care facilities, ambulatory settings, home care).

Healthcare Students means all paid and unpaid persons working in healthcare settings who have the potential for exposure to infectious materials, including body substances, contaminated medical supplies and equipment, contaminated environmental surfaces, or contaminated air. These personnel may include, but are not limited to, emergency medical service personnel, dental personnel, laboratory personnel, autopsy personnel, nurses, nursing assistants, physicians, technicians, therapists, pharmacists, students and trainees, contractual staff not employed by the health care facility, and persons not directly involved in patient care but potentially exposed to infectious agents.

HICPAC means the Hospital Infection Control Practices Advisory Committee. HICPAC was established in 1991 to provide advice and guidance to the Secretary and Assistant Secretary for the Department of Health and Human Services (DHHS); the Director of the CDC; and the Director of the National Center for Infectious Diseases (NCID), regarding the practice of hospital infection control and strategies for surveillance, prevention, and control of nosocomial infections in US hospitals.

Infectious waste means any material which poses a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise mismanaged. This includes both hazardous biological and hazardous non-biological waste.

- *Hazardous biological waste* consists of medical and laboratory waste, including:
 - Medical waste consists of blood, excretions, exudates, secretions, suctionings, and disposable medical supplies which have come in contact with these substances, including but not limited to the following: catheters, bandages, gauze, disposable PPE, and any other disposable items used in the treatment of patients.
 - Laboratory waste consists of cultures, specimens, slides, and blood and tissue samples.
- *Hazardous non-biological waste* consists of combustible (plastic, wood, or paper) and non-combustible (metal or glass) material discarded from or in an area contaminated by contact with biological wastes.

Irritant contact dermatitis means the development of dry, itchy, irritated areas on the skin, usually the hands. It is the most common reaction to latex products. This reaction is caused by skin irritation from using gloves, exposure to powders added to the gloves, use of cleaners and sanitizers, and possibly by exposure to other workplace products and chemicals. The reaction can also result from repeated hand washing and drying, and incomplete hand drying. Irritant contact dermatitis is not a true allergy.

Latex allergy means an immediate hypersensitivity reaction that can be a more serious reaction to latex than irritant contact dermatitis or allergic contact dermatitis. Certain proteins in latex may cause sensitization (positive blood or skin test, with or without symptoms). Although the amount of exposure needed to cause sensitization or symptoms is not known, exposures at even very low levels can trigger allergic reactions in some sensitized individuals. Reactions usually begin within minutes of exposure to latex, but they can occur hours later and can produce various symptoms. Mild reactions to latex involve skin redness, hives, or itching. More severe reactions may involve respiratory symptoms such as a runny nose, sneezing, itchy eyes, scratchy throat, and asthma (difficult breathing, coughing spells, and wheezing). Rarely, shock may occur; but a life-threatening reaction is seldom the first sign of latex allergy. Such reactions are similar to those seen in some allergic persons after a bee sting.

MIOSHA means the Michigan Branch of the Occupational Safety and Health Administration, the office of the Michigan government responsible for the health and safety of all Students.

Needleless systems means a device that does not use needles for: (1) The collection of bodily fluids or withdrawal of body fluids after initial venous or arterial access is established; (2) The administration of medication or fluids; or (3) Any other procedure involving the potential for occupational exposure to bloodborne pathogens due to percutaneous injuries from contaminated sharps.

Noncritical medical devices means medical devices or patient-care equipment which comes in contact with intact skin but not mucous membranes.

Nosocomial infection means an infection that occurs within the health care setting. The patient did not enter the health care setting with this infection, but gained it while in the health care setting due to lack of proper aseptic technique on the part of the health care worker.

Occupational exposure means reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties.

OSHA means the Occupational Safety and Health Administration, the office of the federal government responsible for the health and safety of all Students.

Other potentially infectious material (OPIM) means any of the following:

- Any of the following human body fluids: semen, vaginal secretions, amniotic fluid, cerebrospinal fluid, peritoneal fluid, pleural fluid, pericardial fluid, synovial fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids.
- Any unfixed issue or organ, other than intact skin, from a living or dead human.
- Cell or tissue cultures that contain HIV, organ cultures, and culture medium or other solutions that contain HIV or HBV; and blood, organs, or other tissues from experimental animals infected with HIV or HBV.

Parenteral means exposure occurring as a result of piercing mucous membrane or the skin barrier, such as exposure through subcutaneous, intramuscular, intravenous, or arterial routes resulting from needlesticks, human bites, cuts, and abrasions.

Personal protective equipment (PPE) means specialized clothing or equipment worn by a worker to protect him or her from a hazard.

Regulated waste means any one of the following:

- Liquid or semi-liquid blood or other infectious materials.
- Contaminated items that would release blood or other infectious materials in a liquid or semi-liquid state if compressed.
- Items caked with dried blood or other infectious materials that are capable of releasing these materials during handling.
- Contaminated sharps.
- Pathological and microbiological wastes containing blood or other infectious materials.

Semicritical medical devices means medical devices or patient-care equipment that touches mucous membranes or non-intact skin.

Sharps with engineered sharps injury protections means nonneedle sharps or needle devices used for withdrawing body fluids, accessing a vein or artery, or administering medications or other fluids, with built-in safety features or mechanisms that effectively reduce the risk of an exposure incident.

Source individual means any individual, living or dead; whose blood or other potentially infectious material may be a source of exposure to the worker. Examples of a source individual include all of the following:

- A patient of a hospital or clinic.
- A client of an institution for the developmentally disabled.
- A victim of trauma.
- A client of a drug or alcohol treatment facility.
- A resident of a hospice or nursing home.
- Human remains.
- An individual who donates or sells his or her blood or blood components.
- A child with a daycare or school-related injury.

Standard operating procedures (SOPs) means any of the following which address the performance of the worker's job responsibilities so as to reduce the risk of exposure to blood and other potentially infectious material:

- Written policies.
- Written procedures.
- Written directives.
- Written standards of practice.
- Written protocols.
- Written systems of practice.
- Elements of an infection control program.

Standard/Universal precautions means the use of barriers (protective clothing, eye wear, masks, and gloves) to control the transmission of infectious diseases. A method of infection control in which all human blood and body fluids are treated as if known to be infectious for HIV/AIDS, HBV, HCV, and other bloodborne pathogens.

Sterilize means the use of a physical or chemical procedure to destroy all microbial life including highly resistant bacterial endospores.

Work practice controls means controls that reduce exposure by altering the manner in which a task is performed. Category A Students will use these controls to reduce transmission of pathogens regardless of route.

Part II: Exposure Control Plan For Category A Students

Exposure Determination

A Category A student means a student who is involved in educational assignments and/or training that requires procedures or tasks which involve exposure or reasonably anticipated exposure to blood or other potentially infectious material or that involves a likelihood for spills or splashes of blood or other potentially infectious material. This includes procedures or tasks conducted in routine and nonroutine situations. Within the college, there are certain programs and/or courses that require such procedures and tasks. They are listed below. Each Program Director will evaluate the students of the program to determine if the students are Category A. This will be done on an annual basis.

Programs and Courses Considered As Category A for Students

- Certified Nursing Assistant
- Criminal Justice
- Dental Assisting
- Dental Hygiene
- Elementary Education and Secondary Education
- EMS/EMT
- Fire Science Technology
- Health Fitness Specialist
- Nursing LPN
- Nursing RN
- Phlebotomy
- Physical Therapy Assistant (PTA)
- Radiography
- Respiratory Care
- Science courses with microbiology components and/or involving human specimen collection
- Surgical First Assistant
- Surgical Technology

Task-Specific Standard Operating Procedures (SOPs)

Task-Specific Standard Operating Procedures (SOPs) means any of the following which address the performance of the worker's job responsibilities so as to reduce the risk of exposure to blood and other potentially infectious material:

- Written policies.
- Written procedures.
- Written directives.
- Written standards of practice.
- Written protocols.
- Written systems of practice.

Task Specific Standard Operating Procedure by Job Classification of Title

Job Classification or Title	Task/Procedures	Personal Protective Equipment (PPE) Required
Certified Nursing Assistant	Emergency first aid.	Gloves, masks, eye protection, and protective clothing, as required by the activity.
	Other tasks which may involve a potential for mucous membranes or skin contact with blood, body fluids, tissues, or potential spills or splashes.	
Criminal Justice	Tasks which may involve a potential for mucous membranes or skin contact with blood, body fluids, tissues, or potential spills or splashes.	Gloves, masks, eye protection, and protective clothing, as required by the activity.
Dental Assisting & Dental Hygiene	Maintenance and cleaning of bathrooms or any body fluid spills.	ESP (Emergency Sanitation and Protection) kits, utility gloves, and eye protection.
	Other tasks which may involve a potential for mucous membranes or skin contact with blood, body fluids, tissues, or potential spills or splashes.	If splashing will occur, an impervious cover-up should be worn.
Elementary Education and Secondary Education	All intra-oral tasks.	Gloves, masks, eye protection, and protective clothing, as required by the activity.
	Other tasks which may involve a potential for mucous membranes or skin contact with blood, body fluids, tissues, or potential spills or splashes.	
EMS/EMT	Emergency first aid.	Gloves, masks, eye protection, and protective clothing, as required by the activity.
	Other tasks which may involve a potential for mucous membranes or skin contact with blood, body fluids, tissues, or potential spills or splashes.	
Fire Science Technology	Maintenance and cleaning of bathrooms or any body fluid spills.	ESP (Emergency Sanitation and Protection) kits, utility gloves, and eye protection.
	Other tasks which may involve a potential for mucous membranes or skin contact with blood, body fluids, tissues, or potential spills or splashes.	If splashing will occur, an impervious cover-up should be worn.
Health Fitness Specialist	First aid/emergency medical care.	Gloves, masks, eye protection, and protective clothing as required by the activity.
	Other tasks which may involve a potential for mucous membranes or skin contact with blood, body fluids, tissues, or potential spills or splashes.	
Nursing – LPN	Parenteral injections, IV's, N/G insertion, skin preps, and glucometers.	Gloves, masks, eye protection, and protective clothing, as required by the activity
Nursing – RN	Other tasks which may involve a potential for mucous membranes or skin contact with blood, body fluids, tissues, or potential spills or splashes	
Phlebotomy	Venipuncture.	Gloves, masks, eye protection, and protective clothing, as required by the activity.
	Other tasks which may involve a potential for mucous membranes or skin contact with blood, body fluids, tissues, or potential spills or splashes.	

Job Classification or Title	Task/Procedures	Personal Protective Equipment (PPE) Required
Physical Therapist Assistant	Tasks which may involve a potential for mucous membranes or skin contact with blood, body fluids, tissues, or potential spills or splashes.	Gloves, masks, eye protection, and protective clothing, as required by the activity.
Radiography	Tasks which may involve a potential for mucous membranes or skin contact with blood, body fluids, tissues, or potential spills or splashes.	Gloves, masks, eye protection, and protective clothing, as required by the activity.
Respiratory Care	Tasks which may involve a potential for mucous membranes or skin contact with blood, body fluids, tissues, or potential spills or splashes.	Gloves, masks, eye protection, and protective clothing, as required by the activity.
Science courses with microbiology and/or specimen collection	Inoculate bacterial and yeast cultures and perform lab tests on cultures. Collect and test human specimens, such as throat, urine, etc. Water technology testing for fecal coliforms. Clean-up of biohazardous spills. First responders to biohazardous materials or incidents.	Gloves, masks, eye protection, and protective clothing, as required by the activity.
Surgical Technology Surgical First Assistant	Tasks which may involve a potential for mucous membranes or skin contact with blood, body fluids, tissues, or potential spills or splashes.	Gloves, masks, eye protection, and protective clothing, as required by the activity.

Part III: Methods of Compliance

Isolation Precautions

History of Isolation Precautions

In 1985, largely because of the HIV epidemic, Universal Precautions were developed for all health care Students. These guidelines emphasized applying blood and body fluid precautions universally to all persons regardless of their infection status. These guidelines were updated in 1987 and 1988.⁵

In 1991, OSHA's final rule of the *Bloodborne Pathogens Standard* was published. It emphasized universal precautions.

In 1993, MIOSHA's final rule of the *Standard for Bloodborne Infectious Diseases* was published. It followed the OSHA rule and included universal precautions.

Other guidelines for infection control were also being practiced, such as Body Substance Isolation, Blood and Body Fluid Precautions, Category-Specific Isolation, and Disease-Specific Isolation.

By the mid-1990s many healthcare Students were uncertain about which guidelines to follow. Most health care settings were using a mixed combination of all the guidelines, referring to them as universal precautions. As a result, the *Standard and Transmission-Based Precautions* were agreed upon by the CDC, HICPAC, Public Health Service, and U.S. Department of Health and Human Services. These came out in draft form in 1994 and final form in 1996.⁶

In our manual we are linking Standard and Universal precautions together, since they both include the same isolation precaution practices. Standard/Universal precautions are practiced in

all healthcare settings, including hospitals, long-term care facilities, satellite clinics, and dental offices.

Standard/Universal Precautions⁶

Standard/Universal Precautions means the use of barriers (protective clothing, eye wear, masks, and gloves) to control the transmission of infectious diseases. A method of infection control in which all human blood and body fluids are treated as if known to be infectious for HIV/AIDS, HBV, HCV, and other bloodborne pathogens.

Universal precautions shall be observed to prevent contact with blood or other potentially infectious materials. Under circumstances in which differentiation between body fluid types is difficult or impossible, all body fluids shall be considered potentially infectious materials.

Standard Precautions are designed to reduce the risk of transmission of microorganisms from both recognized and unrecognized sources of infection and are meant to bring about the control of infections.

As a Category A worker, you are to apply Standard/Universal Precautions each and every time you may anticipate possible exposure to:

- Blood or body fluids, secretions, and excretions (except sweat), regardless of whether or not they contain visible blood.
 - Body fluids include urine, feces, pus, saliva, spit, tears, mucus, vomit, sputum, vaginal or penile secretions, afterbirth and any other fluid-like substance which could come from a patient.
- Non-intact skin.
- Mucous membranes.

An addition to the practice recommendations for Standard Precautions is *Respiratory Hygiene/Cough Etiquette*. While Standard Precautions generally apply to the recommended practices of healthcare personnel during patient care, Respiratory Hygiene/Cough Etiquette applies broadly to all persons who enter a healthcare setting, including healthcare personnel, patients and visitors. These recommendations evolved from observations during the SARS epidemic that failure to implement basic source control measures with patients, visitors, and healthcare personnel with signs and symptoms of respiratory tract infection may have contributed to SARS coronavirus (SARS-CoV) transmission. This concept has been incorporated into CDC planning documents for SARS and pandemic influenza.

Standard/Universal Precautions Include:

Hand Washing

- Hand washing is the single most important measure to reduce the risks of transmitting organisms from one person to another or from one site to another on the same patient.
- Wash hands after touching blood, body fluids, secretions, excretions, and contaminated items, regardless of whether gloves were worn.
- Wash hands:
 - Before applying gloves.
 - Between tasks and procedures on the same patient to prevent cross contamination of different body sites.
 - Between patient contacts (i.e., as you move from one patient to your next patient).
 - Immediately after removing gloves.
 - Before preparing or eating food.
 - Whenever it would be wise and prudent.
- Use a plain (nonantimicrobial) soap for routine handwashing.
- Use an antimicrobial agent or a waterless antiseptic agent for specific circumstances.

Use of Clean, Nonsterile Gloves

- Gloves are to be of an appropriate size, properly fitted, and a type appropriate for the task or procedure being performed.
- Decisions regarding types of gloves worn (powdered, non-powdered, latex, vinyl, etc.) should be determined before performing any tasks or procedures.⁷
- Gloves are worn to provide a protective barrier and to prevent gross contamination of the hands when touching blood, body fluids, secretions, excretions, mucous membranes, and nonintact skin.
- The wearing of gloves in specified circumstances to reduce the risk of exposures to bloodborne pathogens is mandated by the OSHA bloodborne pathogens final rule.

- Gloves are worn to reduce the likelihood that microorganisms present on the hands of Category A Students will be transmitted to patients during invasive or other patient-care procedures that involve touching a patient's mucous membranes and nonintact skin
- Gloves are worn to reduce the likelihood that microorganisms from a patient or an object can be transmitted to another person or object.
- Wear clean, nonsterile gloves when touching blood, body fluids, secretions, excretions, and contaminated items.
- When appropriate to the task or procedure being performed, wear sterile gloves.
- Put on clean gloves just before touching mucous membranes and nonintact skin.
- Change gloves between tasks and procedures on the same patient to prevent cross contamination of different body sites.
- Remove gloves: (1) promptly after use, (2) before touching noncontaminated items and environmental surfaces, and (3) before going to another patient.
- Dispose of gloves in a properly labeled container.
- Wash hands immediately after removing gloves.
- Wearing gloves does not replace the need for hand washing, because gloves may have small, unapparent defects or may be torn during use, and hands can become contaminated during removal of gloves.
- Irritant contact dermatitis, allergic contact dermatitis, and latex allergy are reactions a worker might experience to gloves. These should be discussed in detail by the supervisor.
- If a worker experiences any reaction to gloves, he/she must inform and consult the supervisor.⁷

Use of Clean, Nonsterile Masks and Eye Protection

- Wear a mask that covers both the nose and the mouth and eye protection (goggles, safety glasses, or a face shield) to protect mucous membranes of the eyes, nose, and mouth during procedures and patient-care activities that are likely to generate splashes or sprays of blood, body fluids, secretions, and excretions.
 - When appropriate to the task or procedure being performed, wear sterile masks and eye protection.
- The wearing of masks and eye protection in specified circumstances to reduce the risk of exposures to bloodborne pathogens is mandated by the OSHA bloodborne pathogens final rule.
- A mask is worn around patients whenever droplet precautions are in place. See the information on droplet precautions.
- Approved respiratory masks are to be worn around patients whenever airborne precautions are in place. See the information on airborne precautions.
- Dispose of masks in a properly labeled container.
- Eye protection must be properly disinfected for reuse.

Use of Clean, Nonsterile Gowns and Protective Apparel

- Gowns and protective apparel are to be of an appropriate size and type appropriate for the task or procedure being performed.
- Wear a clean, nonsterile gown or other protective apparel during procedures that will cause soiling of clothing or whenever the likelihood of splashes or sprays of blood, body fluids, secretions, and excretions exists.
 - Remove the soiled article as soon as possible and wash hands.

- When appropriate to the task or procedure being performed, wear sterile gowns or protective apparel.
- Gowns especially treated to make them impermeable to liquids, leg coverings, boots, or shoe covers provide greater protection to the skin when splashes or large quantities of infective material are present or anticipated.
- The wearing of gowns and protective apparel under specified circumstances to reduce the risk of exposures to bloodborne pathogens is mandated by the OSHA bloodborne pathogens final rule.
- Gowns or other protective apparel are also worn whenever contact precautions are being employed. See the information on contact precautions.
- Dispose of gowns or other protective apparel in a properly labeled container.

Patient-Care Equipment and Articles

Handle equipment and articles soiled with blood, body fluids, secretions, and excretions in a manner that prevents contamination to you, other persons, and environmental surfaces.

Treat patient-care equipment and articles in the following manner:

- Contaminated, reusable critical medical devices or patient-care equipment are sterilized after use to reduce the risk of transmission of microorganisms to other persons.
- Contaminated, reusable semicritical medical devices or patient-care equipment are sterilized or disinfected after use to reduce the risk of transmission of microorganisms to other persons.
- The type of reprocessing used for reusable critical and semicritical medical devices is determined by the article and its intended use, the manufacturer's recommendations, the policy of the facility, and any applicable guidelines and regulations.
- Contaminated, reusable noncritical equipment is cleaned and disinfected after use, according to the policy of the facility.
- Contaminated disposable (single-use) patient-care equipment is handled and transported in a manner that reduces the risk of transmission of microorganisms and decreases environmental contamination in the facility.
- The equipment is disposed of according to the policy of the facility and applicable regulations.

Refer to the section of the manual entitled *Information on Sterilization and Disinfection* for further information on the decontamination of patient-care equipment and articles. This section includes information on:

- Sterilization methods.
- Levels of disinfection.
- Spaulding's classification system of healthcare items.
- Types of chemical disinfectants.

Environmental Cleaning

There must be adequate procedures for the care, cleaning, and disinfection of environmental surfaces and equipment. These procedures are termed routine and terminal cleaning.

Environmental Cleaning--Routine Cleaning

- In a hospital or long-term care facility, routine cleaning is defined as the day-to-day cleaning of a room while a patient is there.
- Adequate disinfection of bedside equipment and environmental surfaces (e.g., bedrails, bedside tables, carts, commodes, doorknobs, faucet handles) is indicated for certain pathogens which can survive in the inanimate environment for prolonged periods of time.
- The room, or cubicle, and bedside equipment of patients on Transmission-Based Precautions are cleaned using the same procedures used for patients on Standard Precautions, unless the infecting microorganism(s) and the amount of environmental contamination indicates special cleaning.
- The methods, thoroughness, and frequency of cleaning and the products used are determined by the policy of the facility.
- No special precautions are needed for dishes, glasses, cups, or eating utensils.
- Either disposable or reusable dishes or utensils can be used for patients on isolation precautions.
- The combination of hot water and detergents used in dishwashers is sufficient to decontaminate dishes, glasses, cups, and eating utensils.
- In a dental office or satellite clinic, routine cleaning is defined as the process of cleaning which occurs in between patients.
- Adequate disinfection of environmental surfaces (e.g., countertops, dental units, dental chair, examining table, tables, carts, doorknobs, and faucet handles) is indicated for certain pathogens which can survive in the inanimate environment for prolonged periods of time.

Environmental Cleaning--Terminal Cleaning

- In a hospital or long-term care facility, terminal cleaning is defined as the process of cleaning after the patient leaves.
- Patients admitted to rooms that previously were occupied by patients infected or colonized with infectious pathogens are at increased risk of infection from contaminated environmental surfaces and bedside equipment if they have not been thoroughly cleaned and disinfected.
- In a dental office or satellite clinic, terminal cleaning would be the more thorough cleaning of the rooms which is done at the end of the day.

Linen and Laundry

- Although soiled linen may be contaminated with pathogenic microorganisms, the risk of disease transmission is negligible if it is handled, transported, and laundered in a manner that avoids transfer of microorganisms to patients, personnel, and environments.
- Rather than rigid rules and regulations, hygienic and common sense storage and processing of clean and soiled linen are recommended.
- The methods for handling, transporting, and laundering of soiled linen are determined by the policy of the facility and any applicable regulations.
- Used linen (bed sheets, blankets, towels, bibs, diapers, etc.) must be handled, transported, and processed in a manner that prevents contamination to you, other persons, and environmental surfaces.

Sharps and Devices

- Care must be taken with needles, scalpels, and all sharp instruments or devices to prevent injuries.
- Never recap used needles, or otherwise manipulate them using both hands, or use any other technique that involves directing the point of a needle toward any part of the body; rather, use either a one-handed "scoop" technique or a mechanical device designed for holding the needle sheath.
- Do not remove used needles from disposable syringes by hand, and do not bend, break, or otherwise manipulate used needles by hand.
- Place used disposable syringes and needles, scalpel blades, and other sharps in puncture-resistant containers located as close as practical to the area of use.
- Place reusable syringes and needles in puncture-resistant containers for transport to the reprocessing area.
- Use mouthpieces, resuscitation bags, or other ventilation devices as an alternative to mouth-to-mouth resuscitation methods in areas where the need for resuscitation is predictable.

Patient Placement

- In a hospital or long-term care facility, place a patient who contaminates the environment or who does not (or cannot be expected to) assist in maintaining appropriate hygiene or environmental control in a private room.
- When possible, a patient requiring Transmission-Based Precautions is placed in a private room with handwashing and toilet facilities, to reduce opportunities for transmission of microorganisms. See information on Transmission-Based Precautions.

Transmission-Based Precautions

Transmission-based precautions are used in hospitals and long-term care facilities that may have patients with specific diseases that are highly transmissible. These precautions do not apply to satellite clinics and dental offices. Clinics and dental offices would not treat such patients. Rather, they would educate and/or counsel the patient to receive treatment at a hospital.

- There are three types of Transmission-Based Precautions: (1) airborne, (2) droplet, and (3) contact.
- Transmission-based precautions apply to patients known or suspected to be infected with (1) a pathogen which is highly transmissible, and (2) an epidemiologically important pathogen, such as a multi-drug resistant microorganism.
- Transmission-based precautions are used in addition to standard precautions. This means you employ all Standard Precautions, plus the additional precautions that relate to the situation.
- When possible, patients requiring transmission-based precautions are placed in a private room.
- When a private room is not available, an infected patient is placed with an appropriate roommate.
- Sharing of rooms, referred to as cohorting patients, is useful especially during outbreaks
- Patients infected by the same microorganism usually can share a room, provided they are not infected with other potentially transmissible microorganisms and the likelihood of reinfection with the same organism is minimal.
- When an infected patient shares a room with a noninfected patient, it is important that patients, personnel, and visitors take precautions to prevent the spread of infection and that roommates are selected carefully.

- Limiting the movement and transport of patients requiring any of the transmission-based precautions reduces opportunities for transmission of microorganisms.
- When transport of infected patients is necessary:
- Appropriate barriers (e.g., masks, impervious dressings) must be used by the patient to reduce the opportunity for transmission to other patients, personnel, and visitors and to reduce contamination of the environment
- Personnel in the area to which the patient is to be taken should be notified of the impending arrival of the patient and of the precautions to be used to reduce the risk of transmission.
- Patients should be informed of ways by which they can assist in preventing the transmission of their infectious microorganisms to others.

Airborne Precautions

Airborne precautions are used in addition to Standard Precautions for patients known or suspected to have serious illnesses transmitted by airborne droplet nuclei. Small, infective particles (less than 5 micrometers in size) can be free floating or combined with dust particles in the air.

Airborne Diseases Include

- Pulmonary tuberculosis, confirmed or suspected, or extrapulmonary tuberculosis of the larynx.
- Measles (Rubeola).
- Varicella (Chickenpox).

Airborne Precautions Include

Patient Placement

- When possible, the patient is to be placed in a private room that has (1) monitored negative air pressure, (2) six to twelve air changes per hour, and (3) appropriate discharge of the air to the outdoors or monitored filtration of the air before it is circulated (i.e., HEPA or high-efficiency particulate air filter). The door to the room must be kept closed.
- See information on cohorting of patients under Transmission-Based Precautions.
- Some hospitals use an isolation room with an anteroom as an extra measure of precaution to prevent airborne transmission.

Respiratory Protection

- Approved respiratory masks are to be worn in patient's room whenever airborne precautions are in place.
- HEPA and N95 (N category at 95% efficiency) filter respirators meet the CDC performance criteria for tuberculosis respirators.

Susceptible Students

- A susceptible worker is a worker who has never had a documented case of measles (rubeola) or varicella (chickenpox) or has never been vaccinated against these diseases.
- Students who are reasonably healthy (not immunocompromised) and have had measles (rubeola) or varicella (chickenpox), or are documented to be up to date in their vaccinations against these diseases, are considered to be immune.
- Susceptible Students should not enter the room of patients with known or suspected measles (rubeola) or varicella (chickenpox) if Students who are known to be immune are available.

- Students susceptible to varicella are also at risk for developing chickenpox when exposed to patients with shingles; therefore, susceptible Students should not enter the room if Students who are known to be immune are available.
- If no other Students are available, susceptible Students are to wear approved respiratory masks.

Patient Transport

- The transport of such patients is only for essential purposes.
- See information on transport under Transmission-Based Precautions.

Tuberculosis

- When tuberculosis is suspected or confirmed, follow CDC *Guidelines for Preventing the Transmission of Tuberculosis in Health-Care Facilities*.⁸

Droplet Precautions

Droplet precautions are used in addition to Standard Precautions for patients known or suspected to have serious illnesses transmitted by large-particle droplets, greater than 5 µm in size, which can be spread by coughing, sneezing, or talking.

Droplet Diseases Include

- Invasive *Haemophilus influenzae* Type b (causing meningitis, pneumonia, epiglottitis, and sepsis).
- Invasive *Neisseria meningitidis* (causing meningitis, pneumonia, and sepsis)
- Diphtheria (pharyngeal).
- *Mycoplasma* Pneumonia.
- Pertussis (whooping cough).
- Pneumonic Plague.
- Group A Streptococcal infections (pharyngitis, pneumonia, or scarlet fever).
- Adenovirus infection, in infants and young children.
- Influenza.
- Mumps.
- Parvovirus B19.
- Rubella (German measles).

Droplet Precautions Include

Patient Placement

- When possible, the patient is to be placed in a private room.
- See information on cohorting of patients under Transmission-Based Precautions.
- Patients must be separated by at least 3 feet from other patients or visitors. (This is known as the 3-foot rule.)

Masks

- A mask must be worn when working within 3 feet of the patient.

Patient Transport

- The transport of such patients is only for essential purposes.
- See information on transport under Transmission-Based Precautions.

Contact Precautions

Are used in addition to Standard Precautions for patients known or suspected to have serious illnesses transmitted by direct patient contact or by contact with patient-care equipment and articles.

Contact Diseases Include

- Gastrointestinal, respiratory, skin, or wound infections or colonization with multi-drug resistant bacteria judged by the infection control program, based on current state, regional, or national recommendations, to be of special clinical and epidemiologic significance.
- Enteric infections with a low infectious dose or prolonged environmental survival, including:
 - *Clostridium difficile*
 - For diapered or incontinent patients infected with Enterohemorrhagic *E. coli* O157:H7, *Shigella*, *Hepatitis A*, or *Rotavirus*.
- Adenovirus, Respiratory Syncytial Virus (RSV), Parainfluenza Virus, or Enteroviral infections in infants and young children and immunocompromised adults.
- Skin infections that are highly contagious or that may occur on dry skin, including:
 - Chickenpox.
 - Congenital rubella.
 - Diphtheria (cutaneous).
 - Herpes Simplex Virus (neonatal or mucocutaneous - disseminated or primary, severe).
 - Impetigo.
 - Major (noncontained, draining) abscesses, cellulitis, and decubitus ulcers.
 - Pediculosis (Lice).
 - Scabies.
 - Staphylococcal Furunculosis in infants and young children.
 - Shingles (disseminated or in the immunocompromised host).
 - Major skin wounds or burns caused by *Staphylococcus aureus* and *Group A Streptococci*.
- Viral hemorrhagic conjunctivitis.
- Viral hemorrhagic infections (Ebola, Lassa, or Marburg).

Contact Precautions Include

Patient Placement

- When possible, the patient is to be placed in a private room.
- See information on cohorting of patients under Transmission-Based Precautions.
- Some hospitals use an isolation room with an anteroom as an extra measure of precaution to prevent contact transmission.

Gloves and Hand Washing

- Wear gloves when entering the room.
- Change gloves after having contact with infective material
- Remove gloves before leaving the patient's room and wash hands with an antimicrobial agent or a waterless antiseptic agent.
- After washing, be certain not to recontaminate hands before leaving the patient's room.

Gowns

- Wear a gown when entering the room.
- Remove gown before leaving the patient's room. After removing, be certain not to contaminate your clothing before leaving the patient's room.

Patient Transport

- The transport of such patients is only for essential purposes.
- See information on transport under Transmission-Based Precautions.

Patient-Care Equipment

- As much as possible, use equipment with a single patient or cohorted patients.
- Reusable equipment must be thoroughly cleaned and then disinfected or sterilized before being used with another patient.
- Dispose of single-use equipment in biohazard containers or according to the policy of the facility.
- There are additional guidelines to be followed when dealing with such drug-resistant organisms as MRSA (methicillin-resistant *Staphylococcus aureus*) and VRE (vancomycin-resistant *Enterococcus*).⁹

Engineering and Work Practice Controls

Engineering and work practice controls shall be used to eliminate or minimize exposure. Where occupational exposure remains after institution of these controls, personal protective equipment shall also be used.

Engineering Controls

Engineering controls are OSHA-MIOSHA controls that isolate or remove the bloodborne pathogens hazard from the workplace. Engineering controls deal with the physical environment, including buildings and equipment.

Each student must recognize the possibility of failure of a safety device. Accordingly, students shall adhere to Standard/Universal Precautions, always working with care and without placing unjustifiable reliance on mechanical devices as the sole means of avoiding the risk of personal contamination.

List of Engineering Controls

Engineering controls include, but are not be limited to, the following:

- Antiseptic solutions
- Autoclaves and monitoring equipment
- Biohazard bags for contaminated wastes
- Biohazard sharps disposal containers
- Biohazard transporting equipment
- Container for PPE that is stained, defective, or needs repair
- Covered trash receptacles with appropriate labels
- Disinfectant solutions
- Emergency Sanitation & Protection (ESP) kits
- Eye washing stations
- Glove boxes
- Laboratory hoods and biohazard transfer hoods for microbial cultures
- Laundry carts suitable for biohazardous material
- Laundry equipment, supplies and services
- Mechanical pipettors for specimen transfer
- Needleless systems
- Pocket mouth-to-mouth resuscitators
- Reasonably accessible hand washing facilities
- Self-sheathing needles

- Sharps with engineered sharps injury protections
- Soap dispensers
- Standard/Universal Precautions labels and signs
- Suitable lighting and ventilation equipment
- Towel dispensers or hand dryers
- Ventilated cabinets

Work Practice Controls

Work-practice controls means controls that reduce exposure by altering the manner in which a task is performed. Category A students will use these controls to reduce transmission of pathogens regardless of route.

Any worker required to perform tasks at off-campus sites which involve a potential for mucous membrane or skin contact with blood, body fluids, or tissues, or which involve a potential for spills or splashes, will comply with the policies of that facility.

List of Work Practice Controls:

Work-practice controls include, but are not be limited to, the following:

- Use of Standard/Universal Precautions at all times.
- Washing hands, using appropriate technique, before applying gloves.
- Wearing appropriate PPE when anticipating contact with infectious materials or contaminated surfaces (the selection of personal protective equipment is based upon the quantity and type of exposure expected.).
- Wearing masks and eye protection whenever splashes, spray, splatter or droplets of blood or other infectious materials may be generated and eye, nose or mouth contamination can be anticipated.
- Washing hands, using appropriate technique, immediately upon removal of gloves or if glove integrity is compromised.
- Immediately washing ungloved hands, using appropriate technique, after contact with patients or accidental contact with infectious materials or contaminated surfaces.
- Flushing exposed mucous membranes (eye, nose, and mouth) with water immediately upon exposure.
- Having mouth pieces, resuscitation bags and other resuscitation devices readily available for use in areas where the need for resuscitation is likely.
- Handling sharp objects carefully, including the following:
 - Not cutting, bending, or breaking needles.
 - Not reinserting a used needle into its original sheath using a two-handed method (If a needle needs to be recapped, such as in the Dental clinic, use the one-handed method or a mechanical device).
- Discarding sharp objects into an approved sharps disposal container immediately after use.
- For needles attached to IV tubing, removing the needle and/or intracath from tubing and discarding needle and/or intracath into a sharps disposal container.
- Disposing of all spills which contain or may contain biological contaminants in accordance with policies for hazardous waste disposal.
- Posting Standard/Universal & Transmission-Based Precautions signs in appropriate areas where Category A Students are assigned.
- Immediately reporting all exposure incidents to the appropriate supervisor.

- Eating, drinking, smoking, applying cosmetics or lip balm, and handling contact lenses are prohibited in work areas where there is a reasonable likelihood of occupational exposure.

Explanation of the Chain of Infection

Think of the steps leading to the development of an infection as being like a chain made of many links. If all the links of the chain are present, an infection will occur. If even one link can be broken, infection can be prevented. As a Category A student, you must strive to break the chain of infection. You must determine how each link in the chain can be broken.

The chain of infection includes causative agents, reservoirs, portals of exit, means of transmission, portals of entry, and susceptible hosts.

Causative agents include, but are not be limited to, the following:

- Bacteria
- Viruses
- Fungi
- Protozoa
- Helminths (which are parasitic worms)
- Prions

Reservoirs include, but are not be limited to, the following:

- People
- Equipment
- Water
- Solutions
- Medications
- Animals
- Soil

Portals of exit include, but are not be limited to, the following:

- Droplets
- Excretions
- Secretions
- Lesions
- Wounds
- Artificial openings such as catheters, IVs, and drains

Means of transmission include, but are not be limited to, the following:

- Direct contact
- Indirect contact
- Droplets
- Airborne
- Dust
- Fomites
- Vehicles
- Vectors

Portals of entry include, but are not be limited to, the following:

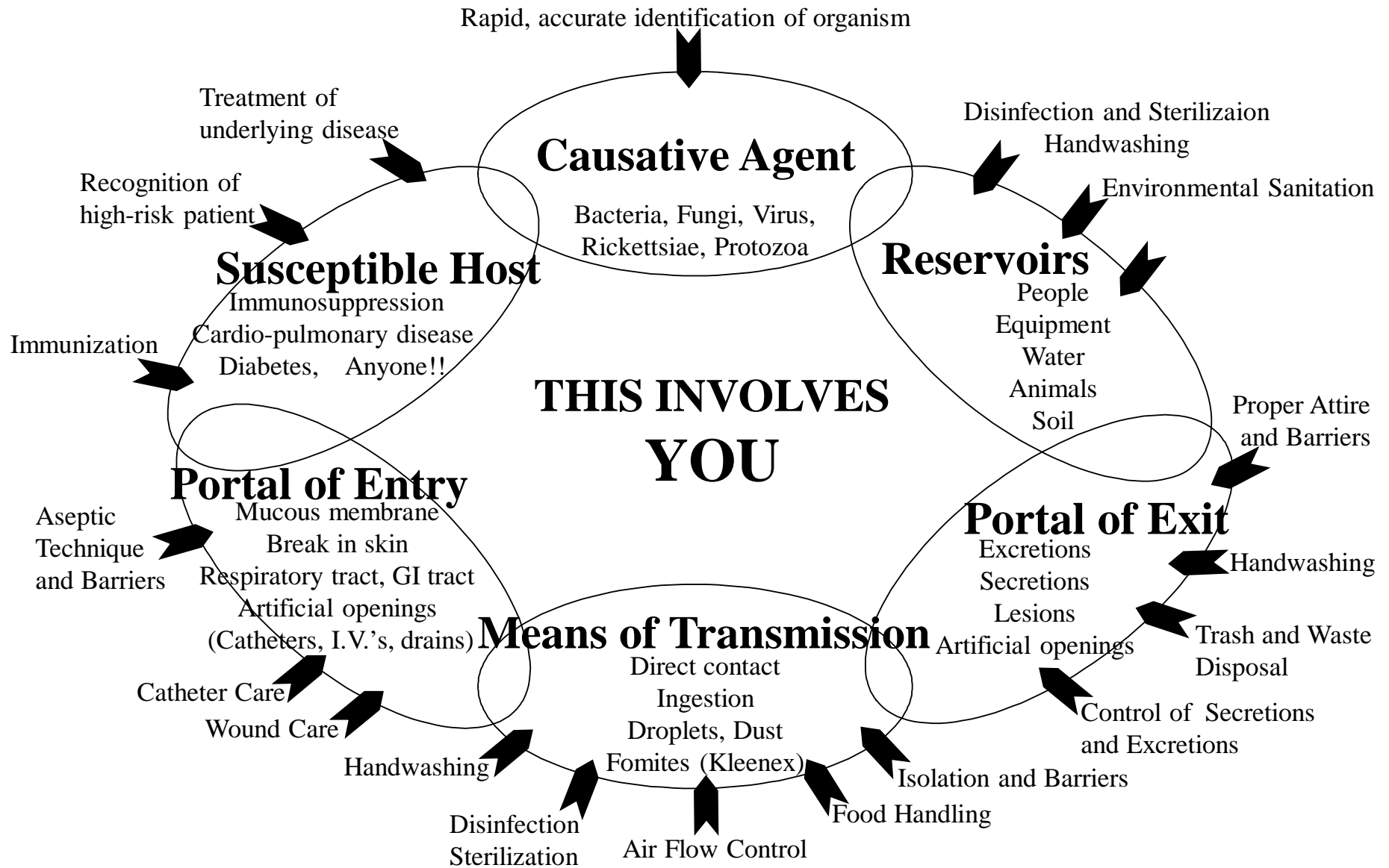
- Mucous membranes
- Breaks in the skin
- The respiratory tract
- The GI tract
- The GU tract
- Artificial openings such as catheters, IVs, and drains

Susceptible hosts include, but are not be limited to, the following:

- Immunocompromised persons
- Persons with chronic diseases
- Persons with cardiac diseases
- Persons with respiratory diseases
- Diabetics
- Surgical patients
- Persons with burns
- The elderly
- Infants
- Small children

Diagram of the Chain of Infection

Each link must be present to produce disease



BREAKING THE CHAIN OF INFECTION

Normal Flora of the Skin

The surfaces of the body are inhabited by microorganisms that we call our normal flora. We live in a symbiotic relationship with these organisms. Some actually help protect us. We, in turn, provide them with a home, food, and a safe environment.

Objects that are frequently in contact with our bodies carry populations of our flora on their surfaces. These include jewelry, keys, and our clothing.

In an exposure setting, we transfer flora to bedding, chairs, eating utensils and other objects that we contact.

Our normal flora is subdivided into resident flora and transient flora.

Resident Flora

- Resident flora is the regular, stable flora of the skin.
- They live in and colonize the deeper layers of the epidermis, hair follicles, and glands.

Transient Flora

- Transient flora is acquired by routine contact.
- They are found on skin surfaces and do not colonize the skin (i.e., do not multiply in high numbers).
- The types of transient flora found on the skin vary from person to person.
- Since they are picked up by personal contact, they are highly influenced by personal hygiene.
- Oily skin, humidity, and occupational exposure (contact from infected persons or objects) are further influences to the composition of transient flora.
- These transient flora can be transmitted by a Category A worker's hands unless the flora are removed by proper hand washing.

Current Recommendations for Hand Hygiene¹⁰

The CDC Guideline for Hand Hygiene provides health-care workers (HCWs) with a review of data regarding handwashing and hand antisepsis in health-care settings. In addition, it provides specific recommendations to promote improved hand-hygiene practices and reduce transmission of pathogenic microorganisms to patients and personnel in health-care settings.

Skin hygiene, particularly of the hands, is a primary mechanism for contact and fecal-oral transmission of infectious agents. Widespread use of antimicrobial products has prompted concern about bacterial resistance to antiseptics and damage to the skin associated with frequent washing. Water content, humidity, pH, intracellular lipids, and rates of shedding help maintain the protective barrier properties of the skin. When the barrier is compromised, skin dryness, irritation, cracking, and other problems may result.

Among persons in occupations such as health care in which frequent hand washing is required, long-term changes in the skin can result in chronic damage, irritant contact dermatitis and eczema, and changes in the flora of the skin.

- Irritant contact dermatitis, which is associated with frequent handwashing, is an occupational risk for health-care professionals, with a prevalence of 10% to 45%.
- Damaged skin more often harbors increased numbers of pathogenic flora.

- Healthcare workers with damaged hands are twice as likely to be colonized with pathogenic forms of *S. hominis*, *S. aureus*, Gram negative bacteria, *Enterococci*, and *Candida* (yeast), plus they have a greater number of species colonizing their hands.

The goal should be to identify skin hygiene practices that provide adequate protection from transmission of infecting agents while minimizing the risk for changing the make-up and condition of the worker's skin and increasing resistance of the bacterial flora.

Typical Types of Hand Hygiene

- Hand washing using a plain soap along with an alcohol-based hand agent.
- Hand washing using a plain or an antimicrobial soap.
- Surgical hand scrub.

Which level you employed at any particular time depends upon the activity you are involved in.

Hand Washing Using a Plain Soap Along With an Alcohol-Based Hand Agent

This is the current recommendation procedure used in healthcare settings.

This process requires the hands already be free of dirt. Alcohol loses its effectiveness in the presence of dirt and organic matter.

Step One: Begin washing hands with plain soap to remove dirt and debris.

Step Two: In between hand washing with plain soap, use alcohol-based hand agents.

- 60% to 70% ethanol or isopropyl alcohol hand rubs, containing emollients to minimize skin drying, are considered the best. Alcohol is thought to work by denaturing proteins. It works well against many kinds of microorganisms.
- Apply product to palm of one hand and rub hands together for one minute, covering all surfaces of hands and fingers, generating friction on all surfaces, until hands are dry.
- Technique only effective if sufficient amount of alcohol of appropriate concentration used. (Follow manufacturer's recommendations regarding volume to use.)
- Alcohol-based hand rubs may be used between several activities or patient contacts.
- Alcohol-based hand rubs may be used before and after gloving to perform routine activities and procedures.
- Frequent use of alcohol-based hand gels can cause drying of skin unless emollients, humectants, or other skin-conditioning agents are added to formulations.

Step Three: Wash hands with plain soap whenever hands are visibly dirty or begin to feel gritty (i.e., as if there is a build-up of the gel on them).

- Use hand lotions to support good skin health.

Hand Washing Using a Plain Soap or an Antimicrobial Soap

- The purpose of hand washing is to remove dirt, organic matter, and transient flora.
- Proper hand washing includes mechanical friction, use of appropriate soap, proper rinsing and drying.
- The facility you work in will determine when hand washing with plain soap is adequate or when hand washing with an antimicrobial soap is required.

Hand Washing Procedure:

Washing

- Wet your hands with warm, running water and apply soap.
- Your dampened hands should be thoroughly covered with either a plain soap or an antimicrobial soap (3 to 5 ml is recommended), then rubbed vigorously for 10 to 15 seconds, generating friction on all surfaces of the hands and fingers.
- Rub your hands together to make lather and scrub them well; be sure to scrub the backs of your hands, between your fingers, and under your nails.
- Washing should proceed from the tips of the fingers up to and including the wrists.
- Continue rubbing your hands for at least 20 seconds.

Rinsing

- Rinse your hands well under running water.
- Rinsing should begin from the fingertips downward to the wrists
- Hands should be thoroughly rinsed to remove soap and debris. (Note: Some hand washing procedures include the cleansing of the forearms.)

Drying

- Hands should be dried using paper towels
- Drying should proceed from the tips of the fingers up to and including the wrists.
- A paper towel should be used to turn off the faucet, trying not to recontaminate the hands.
- Sinks with foot controls or automatic shutoff are best.
- Warm-air dryers are used in public rest rooms, but are not recommended in the health care setting. These type of dryers dry the hands slowly, often have timed cycles that are too brief, can only be used by one person at a time, and could cause organisms to be blown back onto the hands.

Surgical Hand Scrub

The purpose of surgical hand scrub is to remove transient flora, plus reduce resident flora for the duration of surgery in case of glove tears.

Surgical Hand Scrub Procedure¹⁰

- Shorter, less traumatic hand scrub protocols are to be used instead of lengthy scrub protocols with brushes or other harsh mechanical action.
- Wet hands and forearms to elbows with cool water.
- Apply antiseptic soap (3 to 5 ml is recommended) and lather hands, wrists, and forearms.
- Clean under trimmed fingernails to remove visible dirt, always keeping fingertips up.
- Rinse thoroughly proceeding from fingertips to hands, wrists, and forearms.
- Lather hands and forearms again with antiseptic soap (3 to 5 ml is recommended).
- Now work on one hand at a time.
 - Rub fingertips and nails. Use approximately 15 seconds. (5 strokes per finger are sometimes used as a count).
 - Rub thumb and fingers. Stretch fingers to get into crevices. Rub palm and back of hand. Use approximately 45 seconds.
 - Rub wrists and forearms for approximately 15 seconds.
- Repeat steps with the other hand.

- Rinse thoroughly proceeding from fingertips to hands, wrists, and forearms.
- Dry hands with paper towels. Use separate towels for each hand. Dry from fingertips to elbows.
- Sinks with foot controls or automatic shutoff are best of all. If a paper towel is used to turn off the faucet, do not contaminate the hands.
- Hold hands up above waist and away from the body with the fingertips always up.
- Do not re-contaminate!

Nail Length and Artificial Nails

- The majority of normal flora is found around and under the fingernails.
- The current recommendation is that nails should be kept clean, short (less than ¼ inch), and smooth.
- Long nails are not allowed because they can harbor more transient flora. They make cleaning (washing, rinsing and drying) more difficult. Gloves are harder to get on over long nails, plus they lead to more tears.
- Many facilities do not allow any nail polish. If nail polish is allowed at all, it must be clear nail polish. Dark nail polish obscures the view, therefore interfering with the cleaning process.
- Artificial nails and extenders are not allowed in healthcare settings.
- Artificial nails have been found to harbor higher numbers of microorganisms.
- Due to the frequency of hand washing, the area underneath the artificial nails doesn't get sufficient time to dry. As a result, infections of the nail beds often occur. These infections are easily spread to patients while doing procedures, with or without gloves.
- Artificial nails are subject to breaking loose, creating unnecessary problems in the midst of a procedure.
- Since artificial nails are often long, they include the problems inherent with long nails.

Category A Work Area Restrictions

Eating, drinking, applying cosmetics or lip balm, and handling contact lenses are prohibited in areas where there is a routine likelihood of occupational exposure. Food and drink shall not be kept in refrigerators, freezers, shelves, cabinets, or on countertops or benchtops where blood or other infectious materials are present.

Mouth pipetting of infectious materials is prohibited.

All procedures will be conducted in a manner which will minimize splashing, spraying, splattering, and generation of droplets or aerosolization of blood or other infectious materials.

Methods which will be employed include:

- Use of gloves, masks, eye protection, and gowns or other apparel (as needed)
- Centrifuge covers
- Biological safety hoods
- Pipetting
- Microbiological culture transfers
- Dental dams, when appropriate
- Transport of biohazardous materials
- Management of ventilation

If a student needs to eat or drink more frequently due to a documented medical condition, they may excuse themselves from the work restricted area to a nearby environment that is safe and non-restricted to meet their medical needs.

Personal Protective Equipment (PPE)

Personal Protective Equipment (PPE) includes, but is not limited to, the following:

- Gloves, gowns, laboratory coats, masks, eye protection (goggles, safety glasses, or a face shield), mouthpieces, resuscitation bags, pocket masks and other ventilation devices.
- The type and characteristics will depend upon the task and degree of exposure anticipated.
- Appropriate equipment is that which is properly fitted and does not permit blood or other potentially infectious materials to pass through to reach the worker's work clothes, street clothes, undergarments, skin, eyes, mouth or other mucous membranes under normal conditions and for the duration of use.

Gloves: Gloves shall be worn when it can be reasonably anticipated that the employee may have hand contact with blood, other potentially infectious materials, mucous membranes, and non-intact skin, and when handling or touching contaminated items or surfaces. Disposable (single use) gloves such as surgical or examination gloves shall be replaced as soon as practical when contaminated or as soon as feasible if they are torn, punctured, or when their ability to function as a barrier is compromised.

Housekeeping Information

Handling of Infectious Specimens

All students shall adhere to Standard/Universal Precautions to guard against infection by bloodborne pathogens and other infectious agents when collecting or packaging biological specimens. When collecting, or assisting with the collection of, biological specimen workers shall comply with the requirements for the use of personal protective equipment (PPE).

The following procedures shall be used when collecting or packaging biological specimens:

- Use the proper collection devices.
- Do not use mouth pipetting or suctioning for blood or other infectious materials.
- Use safeguards against splashing, spraying, spattering and generation of droplets of blood or other infectious materials.
- Secure the specimen in an approved leak-proof puncture-resistant container.
- Seal the container immediately in the area in which the sample was taken.
- Clean obvious soiling from the outside of container using a detergent germicide.
- Properly mark or color-code the container if the container is not pre-coded.
- If leakage occurs or if there is any question about the integrity of the primary container, it shall be placed in a second approved container which shall also be labeled or coded.
- Any specimen which could puncture a primary container will be placed within a secondary container which is puncture resistant. The secondary container will be a larger sharps container, available from the same supply.
- Neutralize blood spills with appropriate disinfectant before cleaning them up.

- If the specimen may be transported out of Delta College, a biohazard warning label shall be visible on the approved red color-coded secondary container.
- Workers shall wash their hands immediately after closing the last container and before handling it for transport to storage or its destination.

Cleaning of Potentially Contaminated Equipment and Category A Work Areas

All students shall adhere to Standard/Universal Precautions to guard against infection by bloodborne pathogens and infectious agents when working with or around equipment or work areas and surfaces that may have been contaminated.

All equipment and work areas shall be thoroughly cleaned and decontaminated following manufacturer's instructions:

- Immediately, or as soon as feasible, after contact with blood or other potentially infectious materials.
- Immediately, or as soon as feasible, after use on a patient.
- At the end of the clinical shift.

All contaminated, disposable equipment shall be placed in a biohazard bag and disposed of as biohazardous waste.

Broken glassware which may be contaminated shall not be picked up directly with the hands. It shall be cleaned up using mechanical means and disposed of in puncture-resistant containers that are appropriately labeled or color-coded.

Because equipment designated as re-usable may be a source of environmental contamination unless properly cleaned, disinfected or sterilized, the Students must adhere to the following standards of practice.

Routine Cleaning of Equipment, Work Areas and Surfaces

Students engaged in cleaning and disinfecting equipment, work areas, or work surfaces shall use PPE that ensures there is no contact of contaminated material with their skin or personal clothing.

- Clean large equipment, stationary or portable, with an appropriate disinfectant avoiding splatter or dripping. If dripping is reasonably anticipated, use a drop cloth under the equipment being cleaned.
- Wipe gross soiling from small re-usable equipment and disinfect and/or sterilize using appropriate procedures.
- If spills occur around the equipment cleaning area, clean the spills immediately.
- All cleaning materials and PPE shall be disposed of as infectious waste or properly prepared for transport to the laundry as infectious laundry.

Cleaning and Disinfection Procedures

When you are cleaning and disinfecting equipment, work areas, or work surfaces, your disinfectants and procedures must be able to deal with all aspects of the surface or object being cleaned.

- All surfaces have defects. Dirt, debris, and microorganisms collect in defects such as grooves and cracks. It collects in places where the smooth surface is broken up by screw tops, joints and edges.

- You must pay special attention to defects in the surface, being certain to spray these completely during the soaking spray.

Two Alternatives for Environmental Cleaning

You must either employ a disinfectant that has the ability to function as a cleaning agent or you must first use a cleaning agent and then employ a disinfectant.

Use one of the following methods:

- “Apply, Wipe, Reapply” method.
- 4x4 Gauze Pads with Liquid Disinfectant.

Apply, Wipe, Reapply Method

- *Apply* the disinfectant over the entire surface to be cleaned.
- Use paper toweling or other acceptable material to *wipe* and dry the surface.
- *Reapply* the surface with a light, soaking spray. Allow the chemical to air dry for at least ten minutes.

4x4 Gauze Pads with Liquid Disinfectant

- Saturate 4x4 gauze pads with liquid disinfectant and spread over entire surface to be cleaned, wipe and dry the surface.
- Again, saturate 4x4 gauze pads with liquid disinfectant and spread over entire surface to be cleaned, wipe and dry the surface.
- This method avoids aerosolization of disinfectant.

Refer to the section of the manual entitled Information of Sterilization and Disinfection for further information on the decontamination of patient-care equipment and articles. This section includes information on:

- Sterilization methods.
- Levels of disinfection.
- Spaulding’s classification system of healthcare items.
- Types of chemical disinfectants.

Proper Use of Protective Coverings

Coverings which become overtly contaminated shall be replaced as soon as feasible. These contaminated coverings shall be placed in soiled laundry containers which are labeled for infectious materials or disposed of as infectious hazardous waste.

Cleaning Bins, Pails, Cans and Other Receptacles

Receptacles shall be emptied, cleaned, and decontaminated immediately, or as soon as feasible, upon contamination. Receptacles intended for re-use which have a likelihood of becoming contaminated shall be emptied, inspected and decontaminated daily.

Handling of Infectious Waste

When working with infectious waste at Delta College, Standard/Universal Precautions must be used. Medical waste (both regulated and unregulated) must be handled in a manner that poses no threat of disease transmission to the health care team, waste handlers, the environment, and the public at large.

Regulated Waste:

OSHA defines *Regulated Waste* as

- liquid or semi-liquid blood or other potentially infectious materials;
- contaminated items that would release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed;
- items that are caked with dried blood or other potentially infectious materials and are capable of releasing these materials during handling;
- contaminated sharps; and
- pathological and microbiological wastes containing blood or other potentially infectious materials.

Other Potentially Infectious Materials means the following human body fluids: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids.

Contaminated Waste:

OSHA defines Contaminated as the presence or the reasonably anticipated presence of blood or other potentially infectious materials on an item or surface. Contaminated waste may or may not be regulated as defined by OSHA.

Disposal of Regulated Waste

Contaminated Sharps Discarding and Containment:

Contaminated sharps shall be discarded immediately or as soon as feasible in containers that are:

- Closable;
- Puncture resistant;
- Leak-proof on sides and bottom; and
- Labeled or color-coded.

During use, containers for contaminated sharps shall be:

- Easily accessible to personnel and located as close as is feasible to the immediate area where sharps are used;
- Maintained upright throughout use; and
- Replaced routinely and not be allowed to overfill.

Other Regulated Waste Containment:

Regulated waste shall be placed in containers that are:

- Closable;

- Constructed to contain all contents and prevent leakage of fluids during handling, storage, transport or shipping;
- Labeled or color-coded (red biohazard bag); and
- Closed prior to removal to prevent spillage or protrusion of contents during handling, storage, transport, or shipping.

Regulated waste collection:

- Utility gloves must be worn at all times when gathering, transporting, or destroying regulated waste.
- Students will not transfer infectious waste into another container, sort through the contents of infectious waste bags, or sort among closed bags.
- All containers must be tightly closed or sealed, and should not be overfilled.
- If outside contamination of the regulated waste container occurs, it shall be placed in a second container.
 - A two-person method of double bagging is preferred, and shall be used if a second person is available.
 - The partner should cuff the clean bag over his hands and open it widely.
 - The person handling the defective or contaminated bag should place it carefully in the clean bag.
 - The clean bag should be closed securely by the partner holding the clean bag.
- Closed containers will be transported to F-149 within 24 hours; Delta College's designated collection area.

Disposal Compliance

- Universal precautions shall be followed to prevent contact with blood or other potentially infectious materials. See Standard/Universal precautions and PPE guidelines.
- All regulated wastes shall be disposed of in the red biohazard bags.
- Culture and stocks of etiologic agents and associated biological wastes, as well as laboratory wastes that have come in contact with pathogenic organisms, shall be disposed of in the red biohazard bags.
- Unregulated but lightly contaminated waste still requires reasonable precautions against bare handed touching and utility gloves or use of a barrier is appropriate for disposal.
- Under circumstances in which differentiation between body fluid types is difficult or impossible, the contaminated item shall be considered potentially infectious and disposed of in the red biohazard bags.
- If you are unsure that the contaminated item has the potential to be infectious, dispose the item in the red biohazard bag.
- If the contaminated item has the potential to release blood or other potentially infectious materials upon handling, dispose the item in the red biohazard bag.

Biohazard Spill Clean-Up Procedures and Sharps Exposure

Biologically hazardous conditions means equipment, containers, rooms, materials, or combinations thereof which contain or are contaminated with blood or other potentially infectious material. When such conditions exist, they shall be cleaned and decontaminated using the appropriate spill clean-up procedure.

There are two spill clean-up procedures, based on the location of the spill and the availability of appropriate cleaning equipment.

- In areas of the college where appropriate PPE and cleaning agents are readily available, these items shall be employed to clean and decontaminate the spill.
- In areas of the college where appropriate PPE and cleaning agents are not readily available, call Facilities Management Staff, at extension 9240, to receive an approved spill clean-up kit will be employed to clean and decontaminate the spill.
- All spills shall be immediately contained and cleaned up by Category A persons who are properly trained and equipped to work with potentially infectious materials.
- If a trained individual is not available in the area of the spill, contact the Facilities Management Staff, at extension 9240.
- If a spill or accident results in an exposure incident, it shall be immediately reported to Public Safety.

In an off-campus setting, Students will follow the policy of the facility regarding spill clean-up procedures.

Biohazard Spill Clean-Up Procedure without a Spill Clean-Up Kit

- Whenever possible, use an absorbent material designed to soak up the spill.
- Many disinfectants are inactivated by the presence of organic matter. This means the active ingredient of the disinfectant combines with the proteins in the blood, mucus, pus, urine, etc. When this happens, the active ingredient is no longer available to react with the microbial portion of the spill.
 - Therefore, it is necessary to remove as much of the organic matter as possible before you begin your standard clean-up procedure.
 - Some disinfectants that are affected by the presence of organic material include alcohols, quaternary ammonium compounds (QUATs), chlorine compounds, phenolics and hexachlorophene.
- Use paper toweling or other acceptable material to collect and remove the excess organic material to the Biohazard bag.
- Your gloves should follow right behind the paper toweling into the Biohazard bag.
- Put on new gloves before proceeding.
- Use either the standard "Apply, Wipe, Reapply" method or the 4x4 Gauze Pad method.

Biohazard Spill Clean-Up Procedure with a Spill Clean-Up Kit

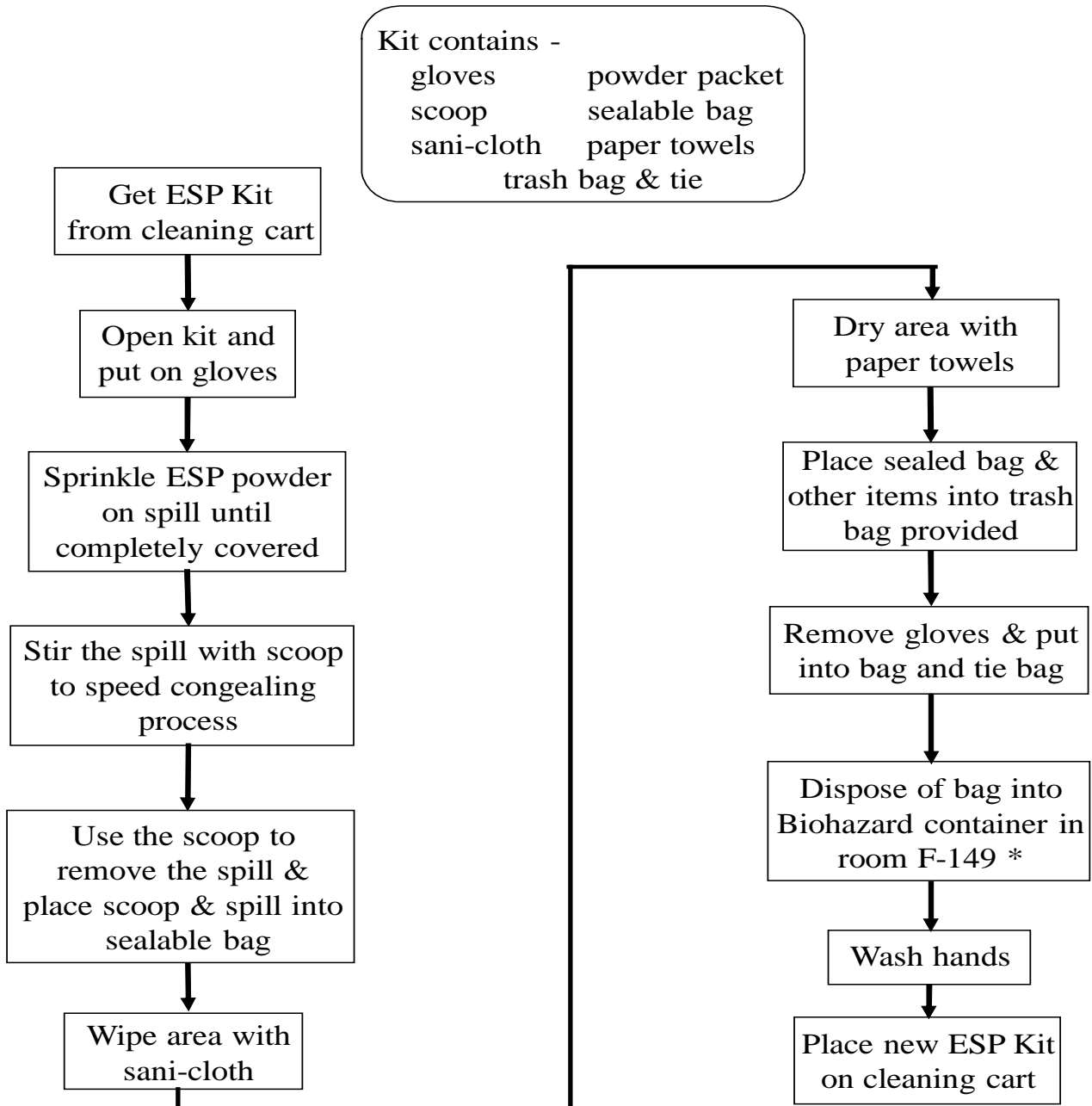
Spill clean-up kits are known as ESP (Emergency Sanitation and Protection) kits. Spill clean-up kits shall be located throughout the college wherever there is a potential for biologically hazardous conditions to exist. Each spill clean-up kit shall contain gloves, powder packet, scoop, sealable bag, sani-cloth, paper towels, and biohazard bag & tie. Materials used in the clean up and the biohazard bag containing the spill shall be placed in room F-107. If access to the key to F-107 is needed, see the Dental Receptionist F-132, Multi Media Learning Lab F-275, or Public Safety.

Sharps prevention and procedure

If you are stuck by a needle or other sharp or get blood or other potentially infectious materials in your eyes, nose, mouth, or on broken skin, immediately flood the exposed area with water and clean any wound with soap and water and a skin disinfectant if available. Report this immediately to your employer and seek immediate medical attention.

Diagram: Spill Clean-Up Procedure Using ESP Kit and Biological Waste and Sharps Disposal

Delta College Biohazard Spill Clean-up Procedure Using Emergency Sanitation & Protection (ESP) Kit



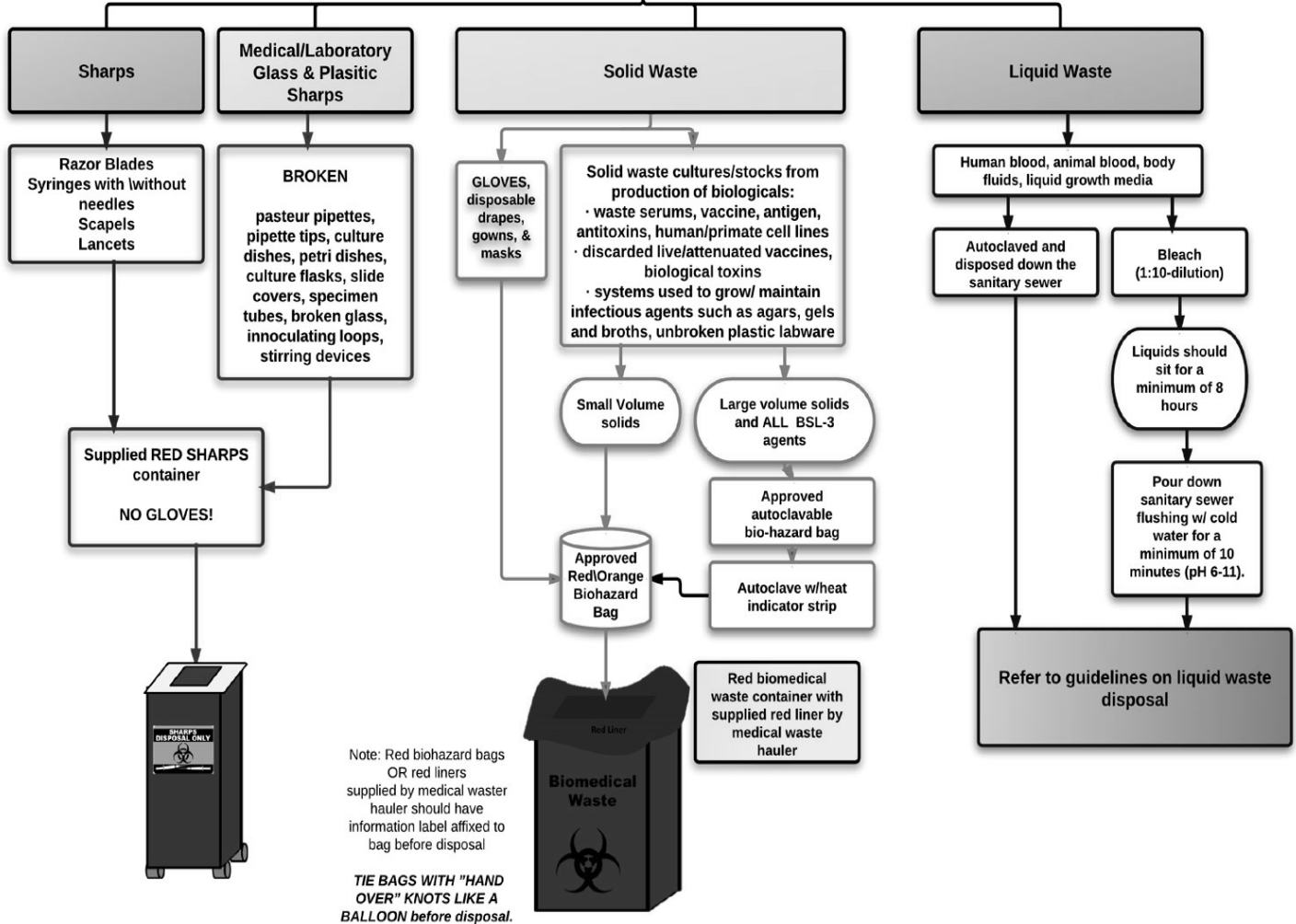
* If key is needed, call Health Service Director (9333) or Campus Police (9111)

Biological Waste and Sharps Disposal Chart

Storage of medical waste by the generator must not exceed seven calendar days from the date initial storage
 Alabama Department of Environmental Management Land Division—
 Solid Waste Program Regulations, Chapter 335-13-7, Medical Waste

Biomedical Waste

For any special cases please contact the Biosafety Officer at 460-6339



Information on Sterilization & Disinfection

Sterilization is the complete elimination or destruction of all microbes, including endospores and viruses.

- Sterilization can be accomplished by physical or chemical means.
- Objects must first be cleaned before they can be successfully sterilized.

Disinfection is a process that eliminates many or all pathogenic microorganisms, except for bacterial endospores, from inanimate objects.

- Objects must first be cleaned before they can be successfully disinfected.

Cleaning is the removal of all foreign material, such as soil or organic material, from an object. It is normally accomplished with water, mechanical action, and detergents or enzymatic products.

Sterilants are chemicals (special disinfectants) which may be used to achieve sterilization.

- The FDA (Food and Drug Administration) regulates sterilants.
- Sterilants require extended time cycles in order to achieve sterilization.
- Sterilization may destroy prions.

Disinfectants kill some, but not all, microbial life on inanimate objects. The EPA (Environmental Protective Agency) regulates disinfectants.

Antiseptics are chemicals safe to use on human skin and tissue to kill some, but not all, microbial life. Antiseptics are not normally used to disinfect inanimate objects. The FDA (Food and Drug Administration) regulates antiseptics.

Sterilization Methods

The three major sterilizing agents used: autoclaving (moist heat under pressure), dry heat sterilization, and ethylene oxide. Boiling is not an effective means of achieving sterilization because it does not kill endospores.

Moist Heat Sterilization: Autoclaves

- The most common setting for use of the autoclave is 121°C for 15-20 minutes at 15 psi.
- A limitation (disadvantage) of the autoclave is that it can damage heat-sensitive materials.
- Autoclaves must allow for drying of items at the end of its cycle. If not, moist items could again become contaminated.
- When using an autoclave, an indicator must be employed to verify the load.
- Biological Indicator¹¹
 - A biological indicator is a device intended to accompany products being sterilized through a sterilization procedure and to monitor adequacy of sterilization.
 - The device consists of a known number of microorganisms, of a known resistance to the mode of sterilization, in or on a carrier and enclosed in a protective package.
 - Subsequent growth or failure of the microorganisms to grow under suitable conditions indicates the adequacy of sterilization.
 - Biological indicators do not indicate that any given sterilizer load or device is rendered sterile. Instead, biological indicators indicate that conditions to inactivate the biological indicator organisms were achieved at the biological

indicator location in a particular cycle. When the user places biological indicators in the most difficult to sterilize location in a device load, the biological indicator result provides some assurance that organisms in devices were inactivated. Facilities use biological indicators as part of an infection control quality assurance program along with physical and chemical monitoring.

- *Bacillus stearothermophilus* (ATCC 7953 or 12980) is the indicator organism recommended for autoclaves. Bacterial spores are used as indicator organisms because they have high resistance to the various sterilization processes.
- Throughput Process Indicator¹¹
 - Some biological indicator designs include a throughput process indicator. Many process indicators consist of a dye that changes color when exposed to a sterilization process. These indicators help users distinguish processed biological indicators from unprocessed ones.
- Chemical Indicator¹¹
 - A chemical indicator is a device intended to accompany products being sterilized through a sterilization procedure and to monitor one or more parameters of the sterilization process.
 - The adequacy of the sterilization conditions as measured by these parameters is indicated by a visible change in the device.
- Autoclaves do not destroy prions when run at normal settings.
- Autoclaves are sometimes used to achieve flash sterilization.
 - Flash sterilization allows for sterilization of equipment and instruments in a shorter timeframe.
 - Flash sterilization is supposed to be used in emergency situations only.
 - The autoclave setting is 135°C for 10 minutes at 15 psi.

Dry Heat Sterilization

- The most common setting for dry heat sterilization is 200°C for 1 ½ hours.
- It requires increased temps and times as compared to moist heat sterilization (i.e., the autoclave.)
- *Bacillus subtilis var. niger* (ATCC 9372) is the indicator organism recommended for dry heat sterilization and ETO.¹¹

Ethylene Oxide (ETO)

Ethylene Oxide is a gaseous sterilizing agent used for commercial and medical applications.

- It is explosive and must be mixed with an inert gas such as carbon dioxide. Gas leaks are a medical emergency.
- It is effected by temperature and humidity.
- Requires 3-12 hours to achieve sterilization.
- Toxic residue must be removed for objects, which may require an additional 8-12 hours.

Levels of Disinfection

- *High-level disinfection* destroys *all* microorganisms and some bacterial endospores.
- *Intermediate-level disinfection* destroys mycobacteria, vegetative bacteria, most viruses, and most fungi, but not bacterial endospores.
- *Low-level disinfection* destroys most vegetative bacteria, some viruses, and some fungi, but not mycobacteria and not bacterial endospores.

Spaulding's Classification System

Critical medical devices means medical devices or patient-care equipment that enters normally sterile tissue or through which blood flows.

- Include items such as implants, scalpels, needles, cardiac and urinary catheters, dental instruments, and other surgical instruments.
- These items must be processed by sterilization.

Semicritical medical devices means medical devices or patient-care equipment that touches mucous membranes or non-intact skin.

- Include items such as respiratory therapy and anesthesia equipment, flexible endoscopes, cervical diaphragm fitting rings, laryngoscopes, endotracheal tubes, and dental mouth mirrors.
- These items must be processed by high-level disinfection.
- It is recommended that semicritical items be rinsed with sterile water after disinfection.
- Semicritical items, such as thermometers and hydrotherapy tanks, only require intermediate-level disinfection.

Noncritical medical devices means medical devices or patient-care equipment which come in contact with intact skin but not mucous membranes.

- Include bedpans, blood pressure cuffs, crutches, bed rails, linens, food utensils, bedside tables, wheelchairs, patient furniture, light switches, and safety eyewear.
- These items are processed by low-level disinfection.

Laundry Handling Practices

Linens will be handled as follows:

- All used linen is considered contaminated.
- Soiled linen and other laundry will be containerized without being sorted or rinsed before it is moved from the location in which it has been used.
- Soiled laundry shall be placed carefully into a properly color-coded or labeled non-absorbent leak-proof hamper or bag that is free of holes and tears
- Any worker handling soiled laundry shall wear protective gloves and a properly fitted gown that will prevent contact between the soiled material and personal clothing.
- Do not overfill the bag.
- If the first bag becomes wet or could reasonably be expected to become wet before arriving at the laundry, or if the integrity of the bag is compromised, it shall be placed in a second bag.
- When the bag is filled, close it immediately for transport. Filled bags will be left only in a location specifically designated for temporary storage.
- Linen is handled in accordance with published laundry guidelines available through the CDC.

Types of Chemical Disinfectants

The typical chemical disinfectants are organized in a table on the following pages.

Type of Disinfectant	Disinfection Level	How It Functions	Major Uses	Advantages	Disadvantages	Special Notes	Toxic Vapors/Residue
Alcohol	Intermediate	Denaturing proteins	Some can be effectively used for skin disinfection	Easy to obtain, inexpensive	Volatile; rapid evaporation does not allow for extended contact; does not kill endospores	Maximum microbicidal activity at concentrations between 60-90%	No/No
Chlorhexidine	Low to intermediate		Phenol derivative used for surgeons' hand scrubs; disinfect patients' skin prior to surgery; wound cleanser	Works well against <i>Staphylococci</i> Is effective against many gram-negative organisms		Sold under brand names such as Hibitane and Hibiclens	No/No
Chlorine	Intermediate	Oxidizing proteins and nucleic acids	Glassware and surface disinfection; water and wastewater treatment; disinfection of food-processing equipment	Effective, convenient, inexpensive	High pH decreases effectiveness; can be inactivated by organic molecules; reacts with many organics to form carcinogenic compounds	Solutions used in health care must be made up fresh daily	No/No

Type of Disinfectant	Disinfection Level	How It Functions	Major Uses	Advantages	Disadvantages	Special Notes	Toxic Vapors/Residue
Glutaraldehyde	Intermediate to high		High level disinfection at a 1.0-1.5% MEC; can be used as a sterilant if a treatment time of 10-12 hours is used	Noncorrosive to metal and does not damage lensed instruments, rubber, or plastics	Should NOT be used for non-critical items because too toxic and expensive. * Note on toxic vapors: Ceiling limit cannot exceed 0.2 ppm; 7-15 air exchanges per hour provide proper ventilation	Students should wear PPE, including nitrile rubber, butyl rubber, or polyethylene gloves & goggles to minimize mucous membrane contact	Yes, toxic vapors: Ceiling limit cannot exceed 0.2 ppm; 7-15 air exchanges per hour provide proper ventilation No residue.
Hydrogen Peroxide	Skin antiseptic	Creates hydroxyl free radicals which destroy cell membranes, DNA, & other cell components	3% as a skin antiseptic; 3-6% is a stable and effective disinfectant; 6-25% can be used as chemical sterilants				No/No
Iodine Tincture	Intermediate	Oxidizing proteins	Small-scale drinking water treatment and skin antiseptic	Effective at a wide pH range	Can be inactivated by organic molecules, but not as quickly as chlorine; may be corrosive; stains instruments, clothing, and skin; painful on nonintact skin		No/No

Type of Disinfectant	Disinfection Level	How It Functions	Major Uses	Advantages	Disadvantages	Special Notes	Toxic Vapors/Residue
Iodophors	Low to intermediate	Oxidizing proteins	Skin antiseptic	Less corrosive and less staining than iodine tinctures	Less effective than iodine tinctures; essential that it be properly diluted; <i>Pseudomonas aeruginosa</i> can grow in and contaminate some iodophor solutions	Essential that it be used in proper dilution	No/No
Peracetic Acid		Destroying cell membranes and denaturing proteins	Rapid action against all micro-organisms, including bacterial endospores; can be used as chemical sterilant	Remains effective in presence of organics	Unstable when diluted; can corrode copper, brass, bronze, plain steel, and galvanized iron		No/No
Phenolic	Low to intermediate	Destroying cell membranes and denaturing proteins	Clean surfaces	Remains active in presence of organics	Irritating to tissue		Yes/Yes
QUATs (Quaternary Ammonium Compounds)	Low, unless modified	Destroying cell membranes	Clean surfaces; food industry; general house-keeping	Inexpensive	Readily inactivated by detergents, fibers, & other compounds; <i>Pseudomonas aeruginosa</i> can grow in and contaminate some QUAT solutions		

Part IV: Information on HBV, HCV, and HIV, and HBV Antibody Titer Information^{12, 13}

Bloodborne pathogens are infectious microorganisms in human blood that can cause disease in humans. These pathogens include, but are not limited to, hepatitis B (HBV), hepatitis C (HCV) and human immunodeficiency virus (HIV). Needlesticks and other sharps-related injuries may expose Students to bloodborne pathogens. Students in many occupations, including first aid team members, housekeeping personnel in some industries, nurses and other healthcare personnel may be at risk of exposure to bloodborne pathogens. Engineering controls are the primary means of eliminating or minimizing student exposure and include the use of safer medical devices, such as needleless devices, shielded needle devices, and plastic capillary tubes.

Information on Hepatitis B Virus (HBV)^{14, 15, 16, 17, 12}

Transmission

Any person seropositive for HBsAg (hepatitis B surface antigen) is potentially infectious.

Transmission occurs when blood or body fluids from an infected person enters the body of a person who has not been vaccinated.

Infected persons may feel no symptoms at all, but their blood, saliva and other body fluids are infectious.

- Without proper precautions, they can spread these viruses to sexual partners, family members and even unborn infants.
- HBV is spread through having sex with an infected person without using a condom, sharing needles, through needlesticks or sharps exposures on the job, or from an infected mother to her baby during birth.

Persons at risk for HBV infection are also at risk for infection with hepatitis C virus or HIV.

Hepatitis B is not spread through food or water or by casual contact.

Sometimes people who are infected with HBV never recover fully from the infection.

- They carry the virus and can infect others for the rest of their lives; they are known as carriers.
- In the United States, about one million people are carriers of HBV.

If you are pregnant and you have HBV in your blood, you can give hepatitis B to your baby.

- Babies who get HBV at birth may have the virus for the rest of their lives, can spread the disease, and can get cirrhosis of the liver or liver cancer.

The HBV virus is particularly dangerous since it can even survive on dried surfaces at room temperature for at least one week.

- This means that a surface can be dangerously contaminated without any visible signs if the work areas are not thoroughly disinfected immediately after being contaminated with blood or other potentially infectious material.

Signs & Symptoms

You may have hepatitis B, be spreading the disease, and not know it. You don't have to turn yellow (jaundiced) to be infected!

- About 30% of persons have no signs or symptoms.
- Signs and symptoms are less common in children than adults.
- Signs and symptoms may include: jaundice (your eyes or skin may turn yellow), fatigue (you may feel extremely tired and not be able to work for weeks or months), loss of appetite, nausea, vomiting, fever, abdominal pain, and joint pain.
- Incubation period ranges from 45 to 180 days, with the average at 60 to 90 days.

Risk Groups

One out of 20 people in the United States will get hepatitis B some time during their life.

The risk is higher for:

- Persons with multiple sex partners or diagnosis of a sexually transmitted disease.
- Persons who have sex with someone infected with HBV.
- Men who have sex with men.
- Injection drug users.
- Infants born to infected mothers.
- Hemodialysis patients.
- Persons with hemophilia.
- Household contacts of chronically infected persons.
- Health care and public safety Students.
- Persons who are patients or work in homes for the developmentally disabled.
- Persons who travel to areas where hepatitis B is common.
- Infants/children of immigrants from areas with high rates of HBV infection.
 - If your parents were born in Southeast Asia, Africa, the Amazon Basin in South America, the Pacific Islands, and the Middle East.

Prevention

Hepatitis B vaccine is the best prevention.

- Get vaccinated against hepatitis B and always follow routine barrier precautions and safely handle needles and other sharps.
- Hepatitis B vaccine prevents hepatitis B disease and its serious consequences, including liver cancer. Therefore, it is considered to be the first anti-cancer vaccine.
- More than 95% of children and adolescents, and more than 90% of young, healthy adults develop adequate antibody to the recommended series of three doses.
- Vaccine-induced antibodies decline gradually over time.
 - As many as 60% of vaccinated persons lose detectable anti-HBs by 8 years.
 - However, their initial response indicates they will remain protected even when their levels become low or undetectable.

Do not share personal care items that might have blood on them (razors, toothbrushes).

Consider the risks if you are thinking about getting a tattoo or body piercing. You might get infected if the tools have someone else's blood on them or if the artist or piercer does not follow good health practices.

Use latex condoms correctly every time you have sex.

Never reuse needles and syringes.

If you are pregnant, you should get a blood test for hepatitis B.

- Infants born to HBV-infected mothers should be given HBIG and vaccine within 12 hours after birth.

If you have or had hepatitis B, do not donate blood, organs, or tissue.

Vaccine Recommendations

- The vaccination series includes 3 doses given initially, 1 month later, and 5 months from the first dose.
- The vaccination series is recommended for all children ages birth-18 years.
- Vaccination of risk groups of all ages should occur.
- If a person starts the series but does not complete it, the vaccine series does not need to be restarted. Start where the person left off to complete the series.
- The most common side effects from hepatitis B vaccination are pain at the injection site and mild to moderate fever.

Long-term Effects without Vaccination

Chronic infection occurs in:

- 90% of infants infected at birth.
- 30% of children infected at age 1-5 years.
- 6% of persons infected after age 5 years.

Death from chronic liver disease occurs in 15-25% of chronically infected persons.

There is no cure for hepatitis B; that is why prevention is so important.

Treatment & Medical Management

The HBIG, hepatitis B immune globulin, is given to a person who has been exposed to HBV and has not been vaccinated against HBV.

- HBIG is composed of pre-formed antibodies that are injected into the exposed person.
- HBIG provides short-term protection against HBV infection.
- HBIG does not stimulate the body to produce its own antibodies to the infection. It cannot give the person long-term protection. (Only vaccination can do that!)

If a person becomes infected with HBV, they should be evaluated by their doctor for liver disease.

- Alpha interferon and lamivudine are two drugs licensed for the treatment of persons with chronic hepatitis B.
- These drugs are effective in up to 40% of patients.
- These drugs should not be used by pregnant women.

Trends & Statistics

Hepatitis B can affect anyone. If you have had other forms of hepatitis, you can still get hepatitis B. The highest rate of disease occurs in 20-29 year olds.

Each year in the United States, more than 200,000 people of all ages get hepatitis B. Of these:

- More than 11,000 people are hospitalized.

- 20,000 remain chronically infected (develop chronic liver disease and are carriers).

There is an estimated 1.25 million chronically infected Americans.

- Of these, 20-30% acquired their infection in childhood.

Hepatitis B is responsible for an estimated 4,000 to 5,000 deaths each year in the United States due to cirrhosis and liver cancer.

In the last ten years, 100-200 healthcare workers have died annually as the result of HBV infection.

Importance of HBV Antibody Titer Responder and Non-Responder Status for Category A Students

It is highly recommended that all Category A students receive the 3-dose HBV vaccination series and have an antibody titer drawn 1-2 months after completion of the series.

- Category A students need to know if they are responders or non-responders to the vaccine.

The HBV vaccine stimulates the body to produce antibodies against the infection.

- Antibody status will be unknown unless an antibody titer (serologic test for anti-HBs) is drawn.
- A responder is defined as a Category A person with serum levels of anti-HBs greater than 10 mIU/mL
- A nonresponder is defined as a Category A person with serum levels of anti-HBs that are less than 10 mIU/mL.

For a nonresponder, it is recommended to repeat the 3-dose series and then test again for anti-HBs 1–2 months after the last dose of vaccine.

- If the Category A person is still negative after a second vaccine series, the person is considered a non- to hepatitis B vaccination.
- The person should be counseled that non-response to the vaccination series most likely means that the person is susceptible to HBV infection.
- It is possible that a Category A person is not responding because he/she is chronically infected with HBV.
- Counseling of the person should then be done to discuss what non-response to the vaccination series means for that specific person and what steps should be taken in the future to protect his/her health.

Antibody titer testing should only be done 1-2 months after the original vaccine series is completed.

- If the serologic test was not done 1-2 months after, it should not be done at a later date.
- If a Category A person for whom responder status is unknown is exposed, an antibody titer should be run at that time.

Information on Hepatitis C Virus (HCV)^{18, 19, 12}

Transmission

Transmission occurs when blood or body fluids from an infected person enters the body of a person who is not infected.

HCV is spread through:

- Sharing needles or syringes.
- Needlesticks or sharps exposures on the job. After needle stick or sharps exposure to HCV positive blood, about 2 healthcare workers out of 100 will get infected with HCV (range 0%-10%).
- From a mother to her baby during birth.

Signs and Symptoms

You may have hepatitis C, be spreading the disease, and not know it. You don't have to turn yellow (jaundiced) to be infected!

- About 80% of persons have no signs or symptoms.

Signs and symptoms include: jaundice (your eyes or skin may turn yellow), fatigue (you may feel extremely tired and not be able to work for weeks or months), loss of appetite, nausea, dark urine, and abdominal pain.

Incubation period for HCV is 6 to 7 weeks.

Risk Groups

The risk is higher for persons who:

- Received blood from a donor who has tested positive for hepatitis C.
- Have injected illegal drugs, even if they experimented a few times many years ago.
- Received a blood transfusion or solid organ transplant before July, 1992.
- Received a blood product for clotting problems produced before 1987.
- Have ever been on long-term kidney dialysis.
- Have evidence of liver disease (e.g., persistently abnormal ALT levels).
- Infants born to infected mothers.
- Healthcare and public safety Students.
- Have sex with multiple partners.
- Have sex with an infected steady partner.

Prevention

No vaccine is currently available for HCV.

Never share needles or syringes.

Do not share personal care items that might have blood on them (razors, toothbrushes).

If you are a health care or public safety worker, always follow routine precautions and safely handle needles and other sharps; get vaccinated against hepatitis B.

Consider the risks if you are thinking about getting a tattoo or piercing. You might get infected if the tools have someone else's blood on them or if the artist or piercer does not follow good health practices.

Use condoms correctly every time you have sex.

If you are HCV positive, do not donate blood, organs, or tissue.

Treatment & Medical Management

Available data does not support the use of anti-viral agents (e.g., alpha interferon) or HCIG (hepatitis C immune globulin) for postexposure prophylaxis and it is not recommended.

HCV positive persons should be evaluated by their doctor for liver disease.

Alpha interferon and ribavirin are two drugs licensed for the treatment of persons with chronic hepatitis C.

- Interferon, used alone, works in 10-20 persons out of 100 treated.
- Ribavirin, used alone, does not work.
- Combination therapy is currently the treatment of choice.
 - Combination therapy can get rid of the virus in up to 4 out of 10 persons.
 - Interferon combined with ribavirin works in about 30-40 persons out of 100.

There are 6 known genotypes and more than 50 subtypes of HCV.

- Knowing the genotype or serotype of HCV helps in making recommendations regarding therapy.
- Patients with genotypes 2 and 3 are three times more likely than patients with genotype 1 to respond to therapy with alpha interferon or the combination alpha interferon and ribavirin.
- When using combination therapy, the recommended duration of treatment depends on the genotype. For patients with genotypes 2 and 3, a 24-week course of combination treatment is adequate, whereas for patients with genotype 1, a 48-week course is recommended.

There are no licensed treatments or guidelines for the treatment of infants or children infected with HCV.

Trends & Statistics

Hepatitis C was known as "non-A, non-B" until 1989.

Blood banks have only been able to test for HCV since 1989.

- Transfusion-associated cases occurred prior to blood donor screening, but now occur in less than one per million transfused unit of blood.
- The number of new infections per year has declined from an average of 240,000 in the 1980s to about 40,000 in 1998.

Most infections are due to illegal injection drug use.

An estimated 3.9 million (1.8%) Americans have been infected with HCV, of whom 2.7 million are chronically infected.

About 5 out of every 100 infants born to HCV infected women become infected.

- This occurs at the time of birth, and there is no treatment that can prevent this from happening.
- Most infants infected with HCV at the time of birth have no symptoms and do well during childhood.

Long-term Effects

Persons infected with HCV mount an antibody response to parts of the virus, but changes (mutations) in the virus during infection result in changes that are not recognized by pre-existing antibodies. This appears to be how the virus establishes and maintains long-lasting infection.

- When this happens, the person is said to have a chronic HCV infection.
- Such a person is a carrier and is infective.
- Chronic infection occurs in 75-85% of all persons infected with hepatitis C.
 - Chronic liver disease occurs in 70% of those chronically infected persons.
 - Death from chronic liver disease occurs in <3% of those chronically infected persons.

Hepatitis C infection is the leading indication for liver transplant

Information on Human Immunodeficiency Virus and Acquired Immune Deficiency Syndrome (HIV-1 & AIDS)^{20, 21}

In 1984, 3 years after the first reports of a disease that was to become known as AIDS, researchers discovered the primary causative viral agent, the human immunodeficiency virus type 1 (HIV-1).

In 1986, a second type of HIV, called HIV-2, was isolated from AIDS patients in West Africa, where it may have been present decades earlier.

Both HIV-1 and HIV-2 have the same modes of transmission and are associated with similar opportunistic infections and AIDS. HIV-2 infections are predominantly found in Africa.

HIV-1 and AIDS will be discussed first.

Transmission of HIV-1

The human immunodeficiency virus attacks the body's immune system causing the disease known as AIDS, or Acquired Immune Deficiency Syndrome.

Although HIV/AIDS can be transmitted through contact with blood and some body fluids, it is not likely transmitted by casual contact.

HIV is spread by:

- Sexual contact with an infected person.
- Sharing needles or syringes.
- Babies born to HIV-infected women may become infected before or during birth or through breast-feeding after birth.
- One case of HIV transmission from acupuncture has been documented.

In the health care setting, workers have been infected with HIV after being stuck with needles containing HIV-infected blood or, less frequently, after infected blood gets into a worker's open cut or a mucous membrane (for example, the eyes or inside of the nose).

- The average risk for HIV transmission after a percutaneous exposure of HIV-infected blood is 0.3%, and after a mucous membrane exposure is 0.09%.

There has been only one instance of patients being infected by a health care worker in the United States; this HIV transmission was from one infected dentist to six patients.

Casual contact through closed-mouth or "social" kissing is not a risk for transmission of HIV.

- Because of the potential for contact with blood during "French" or open-mouth kissing, CDC recommends against engaging in this activity with a person known to be infected.
- CDC has investigated only one case of HIV infection that may be attributed to contact with blood during open-mouth kissing.

Biting is not a common way of transmitting HIV. In fact, there are numerous reports of bites that did not result in HIV infection.

Contact with saliva, tears, or sweat has never been shown to result in transmission of HIV.

Studies conducted by researchers at the CDC and elsewhere have shown no evidence of HIV transmission through insects—even in areas where there are many cases of AIDS and large populations of insects such as mosquitoes.

- HIV lives for only a short time inside an insect and, unlike organisms that are transmitted via insect bites, HIV does not reproduce (and does not survive) in insects. Thus, even if the virus enters a mosquito or another sucking or biting insect, the insect does not become infected and cannot transmit HIV to the next human it bites.
- HIV is not found in insect feces.

Signs & Symptoms of HIV-1

A person infected with HIV may carry the virus for several years without developing symptoms but will eventually develop AIDS.

Early symptoms are referred to as Acute Retroviral Syndrome. They include flu-like symptoms such as a low-grade fever, nausea, and fatigue.

Risk Groups for HIV-1

The risk is higher for persons who:

- Persons with multiple sex partners or diagnosis of a sexually transmitted disease.
- Persons who have sex with someone infected with HIV.
- Men who have sex with men.
- Injection drug users.
- Infants born to infected mothers.
- Hemodialysis patients.
- Persons with hemophilia.
- Household contacts of HIV-infected persons.
- Health care and public safety workers.
- Persons who are patients or work in homes for the developmentally disabled.
- Persons who travel to areas where HIV is common.
- Infants/children of immigrants from areas with high rates of HIV infection.

Prevention of HIV-1

Currently there is no vaccine to prevent this infection.

Do not share personal care items that might have blood on them (razors, toothbrushes).

Consider the risks if you are thinking about getting a tattoo or body piercing. You might get infected if the tools have someone else's blood on them or if the artist or piercer does not follow good health practices.

Use latex condoms correctly every time you have sex-vaginal, anal, or oral.

Never reuse needles and syringes.

If you are pregnant, you should get a blood test for HIV.

If you have or had HIV, do not donate blood, organs, or tissue.

The primary means of preventing occupational exposure to HIV and other bloodborne pathogens is to follow infection control precautions with the assumption that blood and other body fluids from all patients are potentially infectious.

- Safety devices have been developed to help prevent needlestick injuries. If used properly, these types of devices may reduce the occupational HIV exposure risk.
- Because many percutaneous injuries are related to sharps disposal, strategies for safer disposal, including safer design of disposal containers and placement of containers, are being developed.

Treatment & Medical Management of HIV-1

Studies indicate that dendritic cells in the mucosa and skin are the initial targets of HIV infection, and have an important role in initiating HIV infection of CD4 T-cells in regional lymph nodes.

Initiation of anti-retroviral postexposure prophylaxis soon after exposure may prevent or inhibit systemic infection by limiting the proliferation of virus in the initial target cells or lymph nodes.

Drugs used for treatment include:

- Nucleoside Reverse Transcriptase Inhibitors such as Zidovudine (RETROVIR; ZDV, AZT), Lamivudine (EPIVIR; 3TC), the combination of ZDV plus 3TC (COMBIVIR), Zalcitabine (HIVID, ddC), Didanosine (VIDEX, ddl), Stavudine (ZERIT, d4T), Ritonavir (NORVIR), Saquinavir (INVIRASE, hard-gel formulation) or (FORTOVASE, soft-gel formulation),
- Protease Inhibitors such as Indinavir (CRIXIVAN; IDV), Nelfinavir (VIRACEPT),
- Non-nucleoside Reverse Transcriptase Inhibitors such as Nevirapine (VIRAMUNE) and Delavirdine (RESCRIPTOR).

Trends & Statistics for HIV-1

As of June, 2000 the cumulative number of AIDS cases reported to CDC was 753,907.

- Adult and adolescent AIDS cases totaled 745,103 with 620,189 cases in males and 124,911 cases in females.
- 8,804 AIDS cases were reported in children under age 13.

As of June, 2000 the total deaths of persons reported with AIDS was 438,795, including 433,296 adults and adolescents, 5,086 children under age 15, and 413 persons whose age at death is unknown.

Of the adults reported with AIDS in the United States through June 30, 2000, 22,618 had been employed in health care. These cases represented 5.1 % of the 445,380 AIDS cases reported to CDC for whom occupational information was known.

- The specific occupations are as follows: 1,714 physicians, 114 surgeons, 4,928 nurses, 474 dental workers, 431 paramedics, 2,965 technicians, 1,019 therapists, and 4,985 health aides. The remainder are maintenance workers, administrative staff, etc.
- Overall, 74% of the health care workers with AIDS (including 1,345 physicians, 85 surgeons, 3,660 nurses, 374 dental workers, and 304 paramedics) are reported to have died.

The CDC is aware of 56 health care workers in the United States who have been documented as having seroconverted to HIV following occupational exposures.

- Twenty-five have developed AIDS.
- These individuals who seroconverted include 19 clinical laboratory workers, 23 nurses, 6 physicians, 2 surgical technicians, 1 dialysis technician, 1 respiratory therapist, 1 health aide, 1 embalmer/morgue technician, and 2 housekeepers/maintenance workers.

The CDC is aware of 138 other cases of HIV infection or AIDS among health care workers who have not reported other risk factors for HIV infection and who report a history occupational exposure to blood, body fluids, or HIV-infected laboratory material, but for whom seroconversion after exposure was not documented.

Information on Human Immunodeficiency Virus Type 2 (HIV-2)

The first case of HIV-2 infection in the United States was diagnosed in 1987. Since then, the Centers for Disease Control and Prevention (CDC) has worked with state and local health departments to collect demographic, clinical, and laboratory data on persons with HIV-2 infection.

- Of the 79 infected persons, 66 are black and 51 are male. Fifty-two were born in West Africa, 1 in Kenya, 7 in the United States, 2 in India, and 2 in Europe
- AIDS-defining conditions have developed in 17, and 8 have died.

Because epidemiologic data indicate that the prevalence of HIV₂ in the United States is very low, the CDC does not recommend routine HIV-2 testing in settings other than blood centers.

- Since 1992, all U.S. blood donations have been tested with a combination HIV-1/HIV-2 enzyme immunoassay test kit that is sensitive to antibodies to both viruses.

Persons at risk for HIV-2 infection include:

- Sex partners of a person from a country where HIV-2 is endemic.
- Sex partners of a person known to be infected with HIV-2.
- People who received a blood transfusion or a nonsterile injection in a country where HIV-2 is endemic.
- People who shared needles with a person from a country where HIV-2 is endemic or with a person known to be infected with HIV-2.

Part V: Recommendations for Category A Students

Recommendations for Category A Students^{22, 23, 24, 12, 13}

Health Record	Recommendation
Physical examination	A student must meet the minimal requirements of the clinical program they are entering with regard to the physical examination.
Hepatitis B series	If a student does not have documentation of completing the HBV series, it is recommended they do so.
HBV antibody titer	It is recommended that a HBV antibody titer should be drawn 1-2 months after completion of the series. If a worker completed the series in the past and a titer was not drawn at that time, none should be drawn now.
Td booster (tetanus & diphtheria)	If a student does not have documentation of completing a Td booster within the past ten years, it is recommended they do so.
MMR booster (measles, mumps & rubella)	Category A students that will be involved in direct patient care should have received 2 doses of MMR. If a student has not received the second booster, it is recommended they do so.
Chicken pox vaccination	Category A students that will be involved in direct patient care should be immune to chickenpox. If a student has had chickenpox, they are immune. If not immune, it is recommended that Category A students get the two-dose vaccination series.
Influenza vaccination	It is recommended that a student receive a yearly flu shot.

Hepatitis B Vaccination Recommendations for Students^{12, 13}

Prior to clinical experience or a practicum which has been classified as involving a risk of occupational exposure to bloodborne pathogens, the student will be advised of this risk and counseled regarding current HBV vaccination recommendations. The student will be encouraged to begin the vaccination series prior to enrollment in the program.

The HBV vaccination series includes 3 doses given at zero time, 1 month later, and 5 months from the first dose. It is recommended an antibody titer be drawn 1-2 months after completion of vaccination series to determine serologic response.

If a student declines to receive the HBV vaccination, this will be indicated on their HBV Vaccination Documentation and Waiver Form. Waivers will be filed in accordance with program requirements.

The student will be advised that some clinical sites will not accept students who have not completed the HBV vaccination series. This may delay the student's placement for their educational assignment or training. This in turn may further delay the student's fulfillment of program requirements and, therefore, graduation from the program.

If a student has an exposure incident, post exposure prophylaxis and vaccination shall be in accordance with current recommendations. Any Delta College student or visitor who has a potentially infectious exposure as a result of injury or accident, must report to Campus Security.

Part VI: Post-Exposure Evaluation & Follow-Up for Category A Students

On-Campus Exposure Incident & Follow-Up Procedures for Category A Students

1. First aid should be administered on site. Public Safety should be notified immediately.
2. The Public Safety shall continue first aid and make arrangements for additional medical attention as needed.
3. If this incident involved a potential infectious exposure, the student will be referred to seek further medical attention with:
 - The healthcare provider of their choice, or
 - To the contracted healthcare provider of the college. Expenses will be incurred by the student.
 - The source patient will be referred to the contracted healthcare provider of the college.
 - Expenses for source patient testing will be incurred by the college to ensure that proper information regarding source patient status is available to the exposed student.
 - If the student refuses further evaluation or treatment, this will be documented on the preliminary exposure incident report.
4. The Public Safety will complete the preliminary exposure incident report. A copy of the report will be given to the student, which will accompany them to the health care provider.
5. Delta College is not responsible for medical expenses relating to the exposure incident/injury. "Students enrolled for educational purposes in colleges are not considered employees of the college when they are practicing on fellow classmates or practicing on clients in clinics managed by the college for educational purposes. Therefore, if the student has an exposure incident in these situations, the college is not required to pay for the costs of medical care and medical follow-up." (MIOSHA response to Delta College inquiry, 3/26/99.)
6. A copy of the Delta College Injury Report will be forwarded from Public Safety to the appropriate campus offices, such as the supervisor, Human Resources, and Risk Management.

Off-Campus Exposure Incident & Follow-Up Procedures for Category A Students

1. If a student has a potentially infectious exposure as a result of injury or accident off campus during required program and/or course activities, the student will receive first aid and/or emergency treatment according to that facility's policies and in accordance with MIOSHA regulations.
2. When possible, the source patient will be identified and tested according to the facility's policies and in accordance with MIOSHA regulations.
3. Delta College is not responsible for medical expenses relating to the off-campus exposure incident or injury.
"Students enrolled for educational purposes in colleges are not considered employees of the college when they are practicing on fellow classmates or practicing on clients in clinics managed by the college for educational purposes. Therefore, if the student has an exposure incident in these situations, the college is not required to pay for the costs of medical care and medical follow-up. If the student is practicing or working in a clinic not managed by the college for educational purposes, the clinic would be responsible for medical care and medical follow-up as required in the bloodborne infectious diseases standard." (MIOSHA response to Delta College inquiry, 3/26/99.).
4. The incident must be reported by the student to the appropriate instructor or program director.
 - The instructor or program director must notify Campus Security of the incident.
 - The campus security officer will complete the Delta College Injury Report. A copy of the Delta College Injury Report will be forwarded from Campus Security to the appropriate campus offices

Information Provided to the Healthcare Professional

The healthcare provider responsible for the evaluation and follow-up of the exposure incident must be provided with the following information via the preliminary exposure incident report:

- Identity of the injured person.
- Job category (Category A or B).
- Exposure information:
 - a. Date, time and location of incident.
 - b. Route of exposure.
 - c. PPE - used or not used.
 - d. Vaccination status.
 - e. Serologic information - known or not known.

The healthcare provider shall inform the injured person of the source individual's test results and of applicable laws and regulations concerning disclosure of the identity and status of the source individual.

Health Professional's Written Opinion

Decisions concerning the ability of an infected employee to perform his/her job responsibilities in a competent and professional manner must be made by a physician.

At the time of an exposure to blood or infectious fluid between a worker and an individual/patient, Delta College has the responsibility to protect both persons. The college may need information regarding the infection status of both persons. This can only be done with their express written consent.

The student bears a responsibility for performing his/her duties in a safe and professional manner. Accordingly, disclosure to Delta College of the worker's infection status must be forthcoming from the worker or, if not by the individual, from the worker's physician when:

- It is required that the infected student provide care for an individual/patient in a manner which could create the potential for exposure to that individual/patient.
- The disease status has progressed to a stage that could adversely affect the worker's professional performance.

This, however, requires the expressed written consent of the student. Similarly, a patient who may have exposed a student to a serious infectious disease cannot be tested for the presence of infection without written consent.

Recommended Postexposure Prophylaxis for Percutaneous or Permucosal Exposure to Hepatitis B^{12, 13}

If a previously vaccinated Category A student for whom responder status is known (due to positive antibody titer) is exposed to a HBsAg seropositive patient, no treatment is necessary for HBV because the Category A person is protected.

If a previously vaccinated Category A student for whom non-responder status is known (due to negative antibody titer) is exposed to a HBsAg seropositive patient, treatment will be necessary.

- If this is the first exposure, the treatment will include 1 dose of HBIG and a vaccine booster. (Sometimes the exposure plus the treatment will trigger antibody response in the person.)
- If the person continues to be a non-responder, for further exposures treatment will include 2 doses of HBIG.

If a previously vaccinated Category A student for whom serologic status is unknown (because no antibody titer was drawn 1-2 months after completion of series) is exposed to a HBsAg seropositive patient, an antibody titer will need to be drawn. If the person shows inadequate levels of anti-HBs, treatment will be necessary. Treatment will include 1 dose of HBIG (hepatitis B immune globulin) and a vaccine booster.

What To Do In The Case of an Exposure to HCV^{12, 19}

Available data does not support the use of anti-viral agents (e.g., alpha interferon) or HCIG (hepatitis C immune globulin) for postexposure prophylaxis and it is not recommended.

For the source patient, baseline testing for anti-HCV should be done

For the student exposed to an HCV-positive source, baseline and follow-up testing including:

- Baseline testing for anti-HCV and ALT activity
- Follow-up testing for anti-HCV (e.g., at 4-6 months) and ALT activity. (If earlier diagnosis of HCV infection is desired, testing for HCV RNA may be performed at 4-6 weeks.)
- Confirmation by supplemental anti-HCV testing of all anti-HCV results reported as positive by enzyme immunoassay.

There are no recommendations to restrict a student who is infected with HCV.

The risk of transmission from an infected student to a patient appears to be very low.

As recommended for all Category A students, those who are HCV positive should follow strict aseptic technique and standard precautions, including appropriate use of hand washing, protective barriers, and care in the use and disposal of needles and other sharp instruments.

Recommendations for HIV Postexposure Prophylaxis (PEP)^{12, 21}

Due to the information now known about the initial progression of HIV infection, it is recommended that postexposure prophylaxis (PEP) begin within two hours of an exposure incident.

Studies indicate that dendritic cells in the mucosa and skin are the initial targets of HIV infection, and have an important role in initiating HIV infection of CD4 T-cells in regional lymph nodes.

Initiation of anti-retroviral postexposure prophylaxis soon after exposure may prevent or inhibit systemic infection by limiting the proliferation of virus in the initial target cells or lymph nodes.

- HIV infection among healthcare workers who were given zidovudine (ZDV) as post-exposure prophylaxis was reduced by 81%.

Recommendation for postexposure prophylaxis (PEP) depends on the determination of the type of exposure (known as the exposure code) and the determination of the HIV status of the infecting patient (the source of the exposure, known as the HIV status code).

- If the exposure is to a few drops of blood or body fluid with short duration of exposure and the HIV positive patient is asymptomatic and has a high CD4 count, PEP may not be warranted.
- If the exposure is to a few drops of blood or body fluid with short duration of exposure and the HIV positive patient has advanced AIDS, primary HIV infection, high or increasing viral load, or low CD4 count, then the basic regimen should be considered.
- If the exposure is to large amounts of blood or body fluid, a major blood splash, prolonged exposure, or involves a solid needle or a superficial scratch, and the HIV positive patient is asymptomatic and has a high CD4 count, the basic regimen is recommended. Most HIV exposures are in this category.
- If the exposure is to large amounts of blood or body fluid, a major blood splash, prolonged exposure, or involves a solid needle or a superficial scratch, and the HIV-positive patient has advanced AIDS, primary HIV infection, high or increasing viral load, or low CD4 count, then the expanded regimen is recommended.
- If the exposure is with a large-bore hollow needle, deep puncture, visible blood on device, or the needle was used in the source patient's artery or vein, no matter what the HIV status of the source patient, the expanded regimen is recommended.

The basic drug regimen includes 4 weeks of both ZDV (Zidovudine) and Lamivudine (LMV).

The expanded drug regimen includes the basic regimen (ZDV & LMV) plus either Indinavir or Nelfinavir.

If the HIV serostatus of the source patient is unknown, the source patient should be informed of the incident.

- If consent is obtained, serotesting should take place.
- If consent cannot be obtained, state and local laws must be followed for serotesting.

Baseline testing of exposed Category A student should be performed to establish serostatus at the time of exposure

- Testing should be repeated at 6 weeks, 12 weeks, and 6 months. Testing at 12 months may be considered in some cases.
- HIV testing should be performed on any Category A student displaying symptoms of Acute Retroviral Syndrome regardless of the time interval.

If the exposure source is unknown, or the source person's HIV serostatus is unknown, use of postexposure prophylaxis should be decided on a case-by-case basis.

Drug-toxicity monitoring should be performed at baseline and again 2 weeks after starting PEP.

Part VII: Communication of Hazards

Posting of Standard/Universal Precautions Signs

As a general and permanent reminder that the risk of exposure to bloodborne pathogens is ever present, *Standard/Universal Precautions* signs shall be placed in the dental clinic, nursing simulation labs, biology labs, Public Safety, and all appropriate healthcare laboratories.

STANDARD/UNIVERSAL PRECAUTIONS



Handwashing

Wash after touching **body fluids**, before and after **gloving**, and between **patient contacts**.



Gloves

Wear **Gloves** before touching **body fluids**, **mucous membranes**, **nonintact skin**, and **contaminated surfaces**.



Mask & Eye Protection

Protect eyes, nose, mouth during procedures that cause **splashes** or **sprays** of **body fluids**. **Eye protection** includes **goggles**, **safety glasses**, and **face shields**.



Gown

Wear a **Gown** during procedures that cause **splashes** or **sprays** of **body fluids**.



Patient-Care Equipment

Handle soiled equipment so as to prevent personal contamination and transfer to other persons.



Environmental Control

Follow classroom/clinical procedures for cleaning environmental surfaces, and equipment. Follow disposal rules.



Linen

Handle linen soiled with **body fluids** so as to prevent personal contamination and transfer to other persons.




Sharps and Devices

Prevent injuries from needles, scalpels, and other sharp devices. Place sharps in puncture-proof containers.



Only recap needles if instructed to do so.
Never recap needles using both hands.



Use Resuscitation Devices as an alternative to mouth-to-mouth resuscitation.

Labeling of Potentially Hazardous Materials

All containers of regulated waste, refrigerators and freezers containing blood or other infectious material and other containers used to store, transport or ship blood or other infectious material, shall be clearly labeled with an international biohazard symbol or placed in a red bag or red container which meets the requirements of the policies for handling trash and infectious waste.

All students shall practice Standard/Universal Precautions and comply with the specific requirements of local policy for handling trash and hazardous waste.

Education & Training for Category A Students

All students with potential for exposure will be required to access training education programs in the Bloodborne Pathogens Standard annually. Documentation of attendance will occur in the normal process.

The Human Resources or their designees shall maintain the required education and training records in a form which is easily accessible to supervisors and students.

Initial Education & Training

Initial education and training for Category A students begins at the orientation to their program.

Initial student education & training shall include:

- A session covering the Delta College Exposure Control Manual For Category A Students and the means for obtaining a copy.
- The means for obtaining copies of the OSHA Occupational Exposure to Bloodborne Pathogens Rule, the MIOSHA Standard For Bloodborne Infectious Diseases, and other guidelines referenced in the exposure manual.
- An opportunity for interactive questions and answers between students and the instructor(s).

Annual Education & Training

Each student has an individual responsibility for knowing his/her right to annual education & training.

Annual education & training shall include:

- A review of the Delta College Exposure Control Manual for Category A Students, revisions with regard to the plan, and the means for obtaining revisions.
- The means for obtaining revisions of the OSHA Occupational Exposure to Bloodborne Pathogens Rule, the MIOSHA Standard For Bloodborne Infectious Diseases, and other guidelines referenced in the exposure manual.
- An opportunity for interactive questions and answers between students and the instructor(s).

Education & Training for Changes in Tasks or Procedures

If changes in job tasks or procedures have occurred since the previous training, additional education & training must be provided.

Procedures for Handling Student Education & Training Records

The college is responsible for ensuring that completed occupational exposure education & training is documented in an accurate, complete and accessible form.

The following information shall be available in a form that allows training or supervisory staff or an individual student, to quickly verify the student's training status.

The dates of all sessions completed by the student and the annual occupational exposure education & training expiration date shall be clearly recorded.

A dated curriculum summary page must be filed for every class offered showing:

- The contents of the education & training sessions.
- The printed name, signature and title of all persons attending the session.
- The name and title of the instructor.
- The signature of the instructor.

Original education & training records shall be retained for not less than 3 years. Individual records of Occupational Exposure Education and Training are releasable and can be transferred as required and regulated by 29 CFR 1910.20.

Part VIII: Recordkeeping

Medical Records, Education & Training Records

Medical Records

Medical records shall be maintained in Human Resource Area under the control of the Human Resource Director. Student medical records shall not be disclosed or reported without the worker's express written consent to any person within or outside Delta College in accordance with HIPAA

Medical records shall be maintained for at least seven years.

Education & Training Records

Training records shall be maintained by the college. Student medical records shall not be disclosed or reported without the student's express written consent to any person within or outside Delta College.

Training records shall be maintained for at least three years.

The dates of all sessions completed by the student and the annual occupational exposure education and training expiration date shall be clearly recorded.

A dated curriculum summary page will be filed for every class offered showing:

- The contents of the education & training sessions.
- The printed name, signature and title of all persons attending the session.
- The name and title of the instructor.
- The signature of the instructor.

Availability and Transfer of Medical and Training Records

The confidentiality of the student's medical and training records will be maintained in accordance with state law. Only those individuals who need to monitor the worker's records, such as the Human Resource Director or appropriate designee should know the worker's health status. Express written permission for disclosure must be obtained from the worker involved in accordance with HIPAA.

In the event of an inadvertent or unauthorized disclosure, the Human Resource Director shall notify the worker immediately upon its discovery.

Transfer of Medical and Education & Training Records

The college shall, upon request of the student, make medical and training records available for examination and copying to anyone proving that they have written consent of the student, or to the Assistant Secretary (OSHA) and the Director (NIOSH) in accordance with 29 CFR 1910.20.

Sharps Injury Log

Human Resources is responsible to maintain a sharps injury log for the recording of percutaneous injuries from contaminated sharps.

The information in the sharps injury log shall be recorded and maintained in such manner as to protect the confidentiality of the injured student.

The sharps injury log shall contain at a minimum:

- The type and brand of device involved in the incident.
- The department or work area where the exposure incident occurred.
- An explanation of how the incident occurred.

Sharps injury information will be gathered by Public Safety through the use of the Delta College Preliminary Exposure Incident Report and the Delta College Injury Report form.

Effective Dates

The information contained in this manual goes into effect for the Category A student on day of the initial training session.

- For a Category A student in a course, this would be the starting day of the course.
- For a Category A student entering a clinical program, this would be the orientation session for their clinical program.

This information remains in effect throughout their course or clinical training. In other words, for as long as they are considered at risk for exposure.

DELTA COLLEGE INJURY REPORT

In the event of an injury, this form must be completed by the Instructor and then submitted to the Supervisor. The supervisor will provide a copy of this report to Public Safety.

File Class: 9700-6	Client is: <small>(Employee, Student, Patient)</small>	Sex: Male <input type="checkbox"/> Female <input type="checkbox"/>
Name: <small>(Last, First, Middle Initial)</small>		Telephone Number:
Address:		DOB:
Date of Injury:	Time of Injury:	Date/Time Injury Reported:
Student #:		Immediate Supervisor: Supervisor's Telephone #:
Location on campus:		Activity at time of accident (e.g. Lifting crate):
SPECIFIC LOCATION:		EMERGENCY CARE & PATIENT STATUS:
NATURE OF INJURY:		
PART OF BODY INJURED:		Date of Hire:
Witness: Address: Telephone Number:		
Details of accident (Describe fully events, conditions including environment, physical and emotional factors, which contributed to the injury. Use reverse side or additional sheets if needed).		
This report prepared by:		
Submit to: Immediate Supervisor and provide a copy to Delta College Public Safety Department at N-102, University Center, MI 48710		
Signature: _____		Date: _____

PRELIMINARY EMPLOYEE EXPOSURE INCIDENT REPORT

In the event of an exposure, this form must be completed by the Instructor and then submitted to the Supervisor.

Name: _____ Address: _____

Home Telephone: _____ Work Telephone: _____

Job: Category A Category B

Date/Time/Location of incident:

Exposure Information:

Describe the exposure incident (what happened, what body fluid was involved, how much, for how long?)

Route of Exposure (Check all that apply):

_____ Penetrating injury to skin or mucous membrane from:

_____ Sharp object (needle, scalpel, glass)

_____ Bite

_____ Other (describe)

_____ Spray to eyes, nose, mouth

_____ Other mucous membranes

_____ Intact skin

_____ Non-intact skin (wound, cracked or chapped skin)

Personal Protective Equipment (PPE) worn/used at time of exposure:

_____ gloves _____ goggles _____ mask _____ gown _____ CPR mask/shield _____ none

Vaccination Status:

Tetanus: _____ (date)

Hepatitis B: _____ has not had vaccine

_____ has started the vaccine but not completed

_____ has completed vaccine series

_____ has had antibody titer

Test Information:

Injured Person:
HIV: _____ Yes _____ No Date
Hepatitis B: _____ Yes _____ No
Hepatitis C: _____ Yes _____ No

Source Person Name: _____
Phone: _____
HIV: _____ Yes _____ No Date
Hepatitis B: _____ Yes _____ No
Hepatitis C: _____ Yes _____ No

I have been told of the need for further assessment and/or treatment by a Health Care Provider and I understand this information.

Signature: _____ Report Prepared by: _____

Part X. Works Cited

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- 2 *Bloodborne Infectious Diseases Standard*, MIOSHA, R 325.70004, R 325.70005, R 325.70007, R 325.70008, R 325.70009, R 325.70012, R 325.70013, R 325.70015, and R 325.70016 of the Michigan Administrative Code, pages 601 to 605, 612, and 613, 1993 Annual Supplement to the 1979 Michigan Administrative Code, <http://www.cis.state.mi.us/bsr/divisions/std/rules/genh/bid.htm>
- 3 *Occupational Exposure to Bloodborne Pathogens; Needlesticks and Other Sharps Injuries; Final Rule*, Federal Register, Vol.66, No. 12, pages 5318-5325, https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=16265&p_table=FEDERALREGISTER
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- 9 *Recommendations for Preventing the Spread of Vancomycin Resistance Recommendations of the Hospital Infection Control Practices Advisory Committee (HICPAC)*, MMWR, Vol. 44, RR-12, pages 1-13, 09/22/95, <http://www.cdc.gov/mmwr/PDF/RR/RR4412.pdf>
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- 11 *Guidance on the Content and Format of Premarket Notification [510(k)] Submissions for Liquid Chemical Sterilants and High Level Disinfectants*, U.S. DHHS, Center for Devices and Radiological Health, 12/18/97, <https://www.fda.gov/RegulatoryInformation/Guidances/ucm073773.htm>

12 *Updated U.S. Public Health Service Guidelines for the Management of Exposures to HBV, HCV, and HIV and Recommendations for Postexposure Prophylaxis*, MMWR Recommendations and Reports, June 29, 2001, 50(RR11);1-42, <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5011a1.htm>

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14 *Hepatitis B and You*, National Center for Infectious Diseases (NCID), <http://www.cdc.gov/ncidod/diseases/hepatitis/b/index.htm>

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