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Biological Screening Workshop

Laboratory Orientation

Laboratory Orientation

- **Safety**
- **Clean technique**
- **Reagent preparation**
- **Use of basic equipment**
- **Quality assurance**

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Safety

- **National Forensic Science Technology Center (NFSTC)**
  - **Environmental, Health, and Safety Program (EH&S)**

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NFSTC EH&S Program

- **The NFSTC EH&S operations manual is divided into five separate sections or plans:**
  - **General Office Safety Plan**
  - **Laboratory Safety Plan**
  - **Emergency Action Plan**
  - **Chemical Hygiene Plan**
  - **Biohazard Exposure Control Plan**

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Laboratory Safety Plan

Rules that apply to all laboratory sections:

- **No eating, drinking, applying cosmetics or adjusting eye contacts**
- **No running, jumping, or horseplay**
- **All spills will be cleaned up immediately**
- **Know where the necessary spill kits are located**

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Laboratory Safety Plan (continued)

- **Always wash your hands before leaving the laboratory**
- **Leave the laboratory clean and organized**
- **No sandals or open-toed shoes**

- **Appropriate lab attire should be worn to protect against spills**

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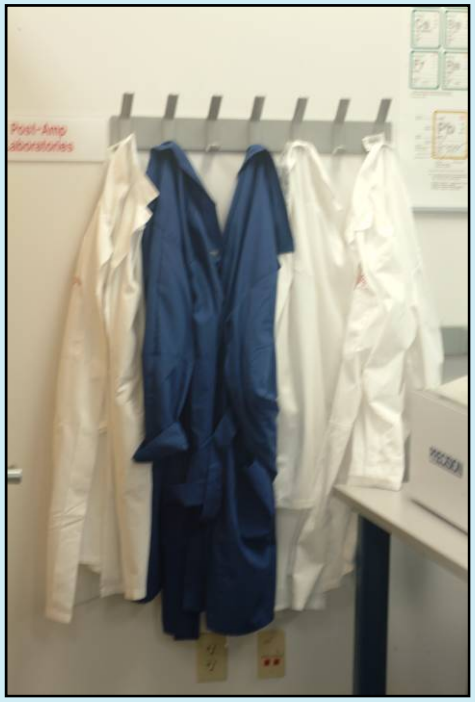
Laboratory Safety Plan (continued)

- **Lab coats are NOT to be worn outside of the laboratory areas**
- **Prevent chemical inhalation exposure (a mode of entry)**
  - **No "sniff-testing"**
- **Prevent chemical ingestion exposure (another mode of entry)**
  - **Never pipette by mouth**
  - **Always use a bulb to pipette**



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Emergency Action Plan

- **Know your evacuation routes**
- **Know fire extinguisher, AED, drenching hose, and first aid kit locations**

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Emergency Action Plan (continued)

- **Know what to do in case of a:**
  - **Fire emergency**
  - **Laboratory injury/accident emergency**
  - **Bomb threat emergency**
  - **Chemical spill/exposure emergency**
  - **Biological spill/exposure emergency**
  - **Hurricane emergency/preparedness**
  - **Other natural disaster emergencies/preparedness**

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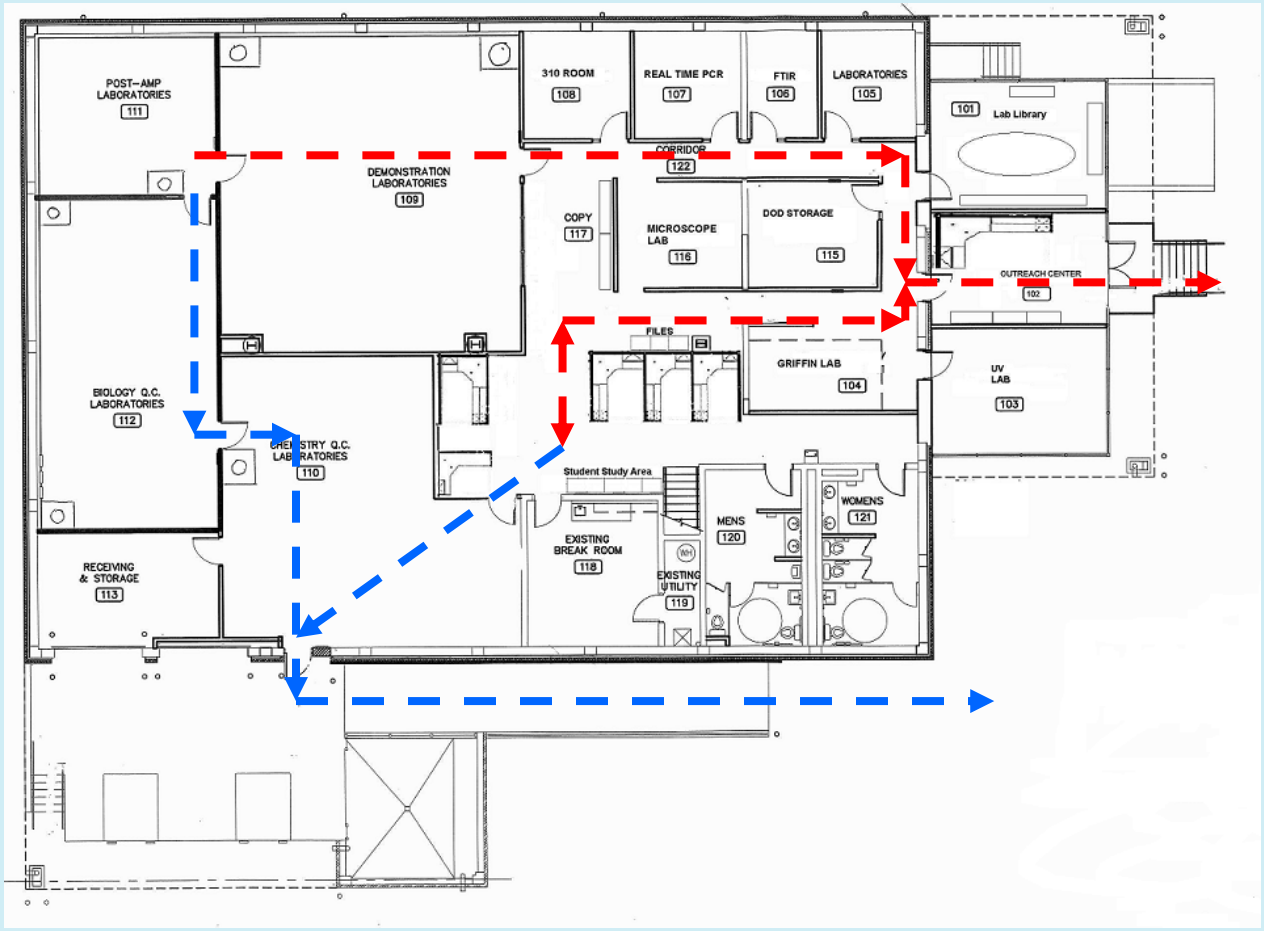
Emergency Evacuation Plan



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Chemical Hygiene Plan (a.k.a. Hazard Communication Plan)

- **Consult MSDS before using any chemical**
- **Always use personal protective equipment (PPE)**
  - **Gloves**
  - **Safety glasses**
  - **Lab coat**

- **Utilize chemical hoods to limit exposure**
- **Use and dispose of all chemicals properly**
- **Store chemicals appropriately**

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Chemical Hygiene Plan (a.k.a. Hazard Communication Plan)

- **Insure that all containers are properly labeled per the National Fire Protection Association (NFPA)**
- **Be familiar with the "Chemical Hygiene Plan" section of the NFSTC EH&S program manual**
- **Contact the safety officer or laboratory staff for use or disposal assistance if needed**

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Biohazard Exposure Prevention Plan

- **A biohazard is an biological agent that may be harmful to human health**
- **Biohazardous material may have been exposed to bloodborne pathogens (BBP) or Other potentially infectious materials (OPIM)**
- **Examples of BBP:**
  - **Hep A, Hep B, Hep C, HIV/AIDs**
- **Example of OPIM:**
  - **Semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva**

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Biohazard Exposure Prevention Plan

- **Treat all laboratory areas as being a potential biohazard**
- **Be familiar with the Biohazard Exposure Prevention Plan**
- **Use PPE at all times when handling biohazardous materials**
- **NEVER re-use or re-cap scalpels or needles!!!!**

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Biohazard Exposure Prevention Plan

- **Dispose of all biohazardous waste in properly designated containers (red bags, sharps containers, etc.)**
- **After performing daily tasks, always disinfect work areas with fresh 10% bleach solution**
- **Wash hands after removing gloves**
- **Use biological hoods when necessary to limit exposure**

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Biohazard Occupational Exposure

- **When a body fluid comes in contact with another person during the course of work via:**
  - **Sharps incident (e.g. needle stick or scalpel)**
  - **Non-intact skin**
    - **Chapped skin, dermatitis, or open wound**
  - **Eye membrane**
  - **Mucous membrane**

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Biohazard Exposure Incident

- **Perform basic first aid**
  - **Wash injury with soap and water immediately**
  - **Clean with antiseptic solution and apply appropriate bandage**
- **Report and document incident**
  - **Inform NFSTC staff and Safety Officer immediately**
  - **Inform your supervisor immediately**
- **Seek medical attention, if necessary**
  - **Depending on risk assessment, may include: blood draw for baseline testing, prophylactic treatment**

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Biohazard Exposure Incident (cont.)

- **Documentation**
  - **Purpose is to describe the injury to help determine the risk level of the event and should include details:**
    - **Type of injury (instrument, scalpel, hollow-bore or solid needle)**
    - **Degree of body fluid on contaminating instrument**
    - **Depth of injury**
    - **First aid procedure that was followed**
    - **Immunization history**
    - **Index case or reference sample history, if known**

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Clean Technique

- **Contamination can adversely effect the outcome of a case; therefore, it is essential that the laboratory/agency have procedures in place to limit, recognize, and address contamination**

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Clean Technique

- **Refers to the laboratory practices employed to reduce the risk of contamination**
- **Transfer of DNA :**
  - **From analyst to sample**
  - **From environment to sample**
  - **Between samples (cross-contamination)**

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Clean Technique – Work Surfaces and Equipment

- **Clean frequently**
  - **Before contact with evidence**
  - **Between evidence items**
  - **After evidence processing is complete**
- **Common practice is to place a barrier on the bench top while processing evidence and between evidence:**
  - **Glassine weigh paper**
  - **Kimwipes®**
  - **Butcher and benchcote paper**

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Clean Technique – Work Surfaces and Equipment

- **Instruments should be cleaned just prior to use**
  - **Forceps, scissors, scalpels, and tube openers**
- **Sterile disposable instruments should be opened just prior to sample processing and discarded after one use**
  - **Do NOT re-use disposable items**

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Clean Technique – Work Surfaces and Equipment

- **Clean with 10% bleach solution or a commercially available sterilization reagent such as Cidex® Plus**
- **Rinse with purified water or alcohol to prevent the build up of sodium hypochlorite crystals**
  - **Instruments or equipment cleaned with bleach should be rinsed to avoid corrosion**

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Clean Technique – Reagents and Sample Processing

- When possible, prepare reagents in bulk
  - Each analyst is then provided with an aliquot for his/her individual use
- Reagents should be kept closed when not in use
- Samples should be processed individually
  - Only one sample should be open at a time
- Unknown samples should be processed separately from reference samples
  - Processing may be separated by time and/or space

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Clean Technique – Good Lab Practices

- **Gloves should be worn throughout sample processing**
  - **At a minimum, gloves should be changed at the completion of each step of the process**
  - **If gloves become contaminated, discard them and replace with new ones**
- **Lab coats should be worn at all times while processing evidence**

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Reagent Preparation

- **Laboratory should establish quality control procedures that include:**
  - **Preparation**
    - **Use of both purchased and prepared reagents**
  - **Reagent container labeling**
  - **Documentation**
  - **Quality control testing**
  - **Storage conditions**
  - **Expiration dates, as appropriate**

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Reagent Preparation

- **For the purposes of this workshop, all reagents will be prepared by the instructors**
- **Students may need to perform simple and/or serial dilutions as directed by the instructor**
- **Dilutions of the body fluids have been prepared by the NFSTC staff**

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Dilutions – Simple Dilutions

- **A volume of a liquid material is combined with an appropriate volume of a solvent (or diluent)**
- **The dilution factor is the total number of unit volumes in which the material will be dissolved**
  - **For example, a 1:10 dilution is achieved by combining 1 unit volume of diluent + 9 unit volumes of the solvent**

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Dilutions – Serial Dilutions

- **Series of simple dilutions, used to quickly amplify the dilution factor**
  - **The source of dilution material for each step comes from the diluted material of the previous step**
- **The total dilution factor is calculated by multiplying the individual dilution factors of each step**
  - **1:10 of a 1:10 yields a 1:100**
  - **1:10 of a 1:10 of a 1:10 yields a 1:1000**

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Use of Basic Equipment

- **Students will be shown how to use all necessary laboratory equipment**
  - **Pipettes**
  - **Centrifuges**
  - **Alternate Light Source (ALS)**
    - **Ensure safety glasses are worn when using this piece of equipment**

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Quality Assurance

- **Quality Assurance (QA) consists of all the planned and systematic actions necessary to demonstrate that a product or service meets specified requirements for quality**
- **The planned and systematic actions are documented in the laboratory quality manual and standard operation procedures (SOP)**

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Quality Assurance

- **Components of a quality system include:**
  - **Use of adequate facilities**
  - **Use of validated methods**
  - **Use of properly calibrated and functioning equipment**
  - **Establishment and implementation of a corrective action, when needed**
  - **Proper training and continuing education for personnel**

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Quality Assurance (continued)

- **Components of a quality system include:**
  - **Use of appropriate evidence control procedures**
  - **Use of established analytical procedures**
  - **Reports**
  - **Participation in proficiency testing program**
  - **Participation a laboratory accreditation program**

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Quality Assurance

- **For the purposes of this training, all trainees will be required to document each test performed, following the procedures provided**
- **Procedures established by your laboratory system may vary slightly from those provided in this training**

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Questions?

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