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# PREVENTION: BIOSAFETY AND BIOSECURITY



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# Laboratory Biosafety and Biosecurity

## ■ Biosafety

- A set of preventive measures designed to reduce the risk of accidental exposure to or release of a biological hazard
- Goal: reduce risk of accidental exposure to or release of potentially hazardous agents

## ■ Biosecurity

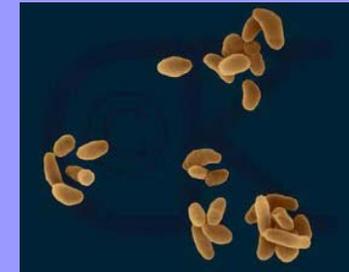
- A set of preventive measures designed to reduce the risk of theft of a biological material
- Goal: protect biological agents against theft and malicious use

## ■ Common strategy

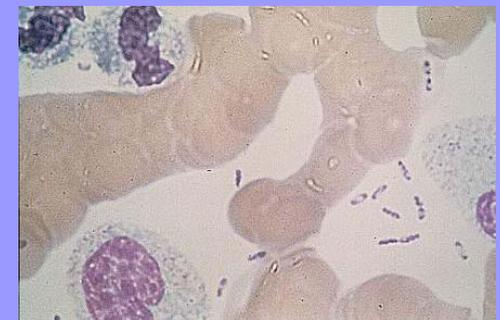
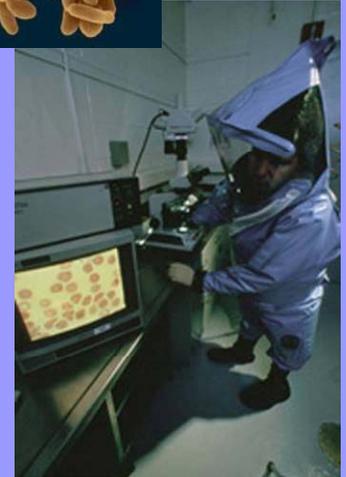
- Implement graded levels of protection based on a risk assessment

## ■ Methods of implementation must be carefully considered

- Biosecurity and biosafety should be integrated systems that avoid compromising necessary infectious disease research and diagnostics



*Francisella tularensis*



*Yersinia pestis*



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# Risk

- Is a function of the likelihood an adverse event will occur
- Laboratory work with pathogens will always involve some level of safety and security risk
  - Distinguish between “acceptable” and “unacceptable” risks
  - Cannot protect against every conceivable accident or adverse event
- Resources for risk mitigation are not infinite
  - Existing resources should be used efficiently



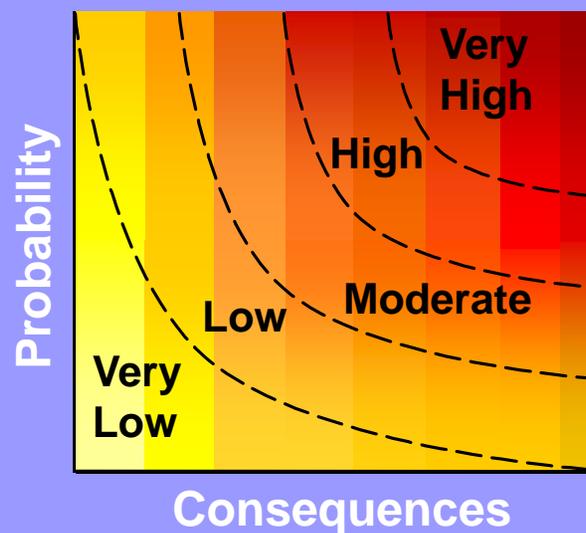
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# Laboratory Biosafety and Biosecurity Based on Risk Assessment

- Safety and security in a biological environment will never be perfect
- Most biological agents can be isolated from natural sources
- Critical not to compromise legitimate bioscience operations
- Management must distinguish between “acceptable” and “unacceptable” risks
  - Ensure that protection for an agent and the cost, is proportional to the risk of accidental release/exp 2009 theft and misuse of that material



- Protect against unacceptable risk scenarios

- Develop incident response plans for acceptable risk scenarios

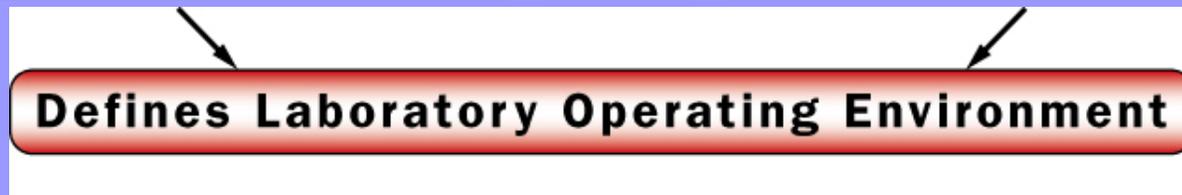
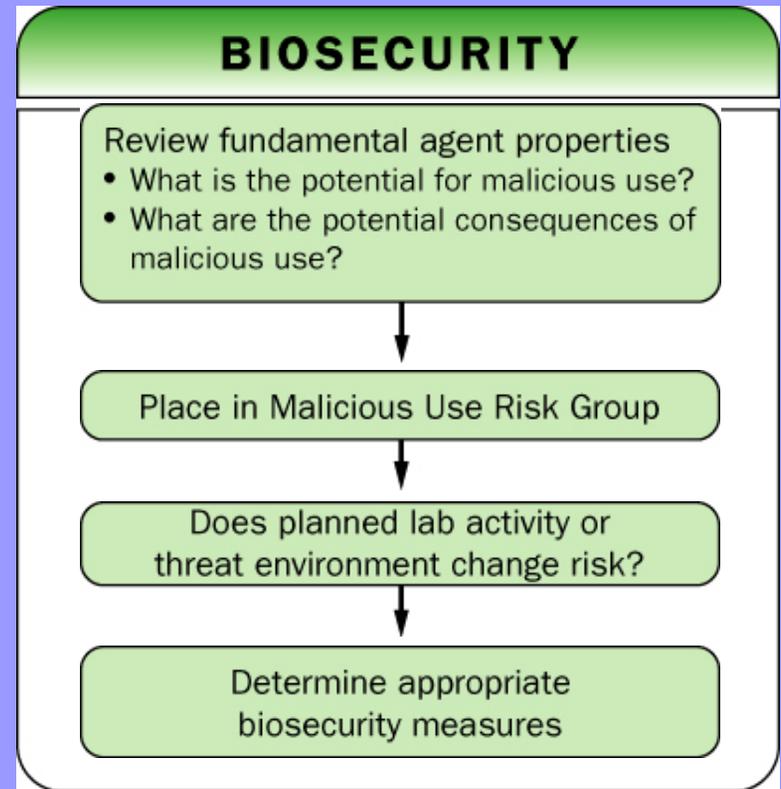
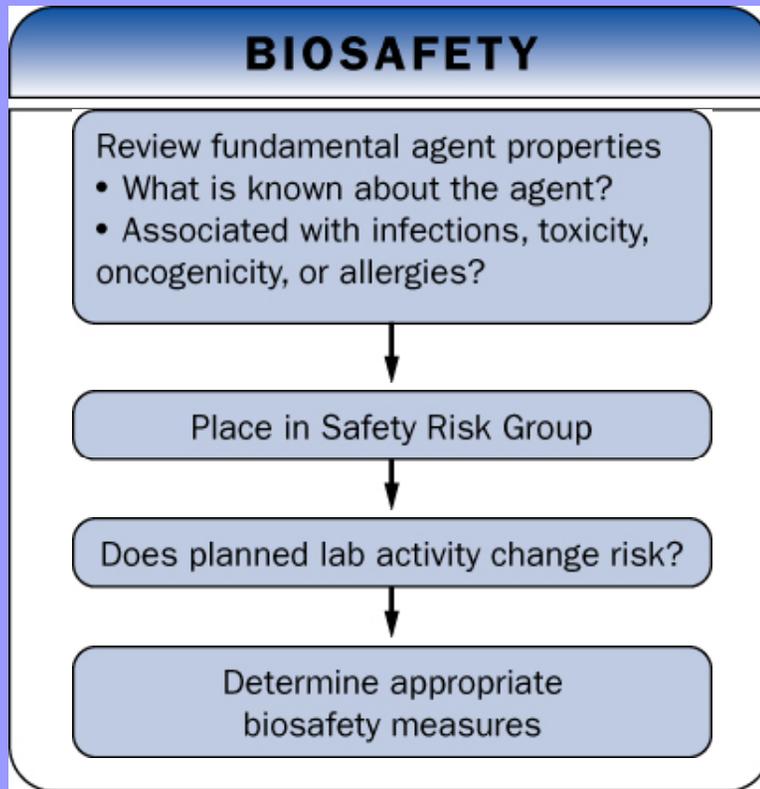


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# Risk Assessment: Integrated Biosafety and Biosecurity





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# Biosafety Risk Assessment

- Assess the biological material
  - Contagious
  - Routes of exposure
  - Host range
    - Affects multiple species
  - Type of material
    - Environmental or diagnostic specimen
    - Pure culture
- Assess what is being done with the material in the laboratory
  - Diagnostics
  - Procedures that may generate an aerosol
- Consider personal protection
  - Respirators
  - Gloves
- Law Enforcement should understand similar concepts when handling potentially contaminated crime scenes
  - Contaminated evidence
  - Collection procedures that generate aerosols
  - Personnel protective equipment





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# Biosafety: Personal Protective Equipment (PPE)

- **Purpose**
  - Provides a barrier to prevent exposure to infectious agents
- **Types**
  - Gloves
  - Footwear
  - Lab coats
  - Eye and face protection
  - Respirator
- **Limitations**
  - Does not eliminate the hazard
  - Integrity decreases with use
  - Not all protective equipment is created equal
    - Select the right equipment for the task at hand





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# Biosecurity Risk Assessment

- Evaluate assets
  - Biological agents
  - Information
- Evaluate lab activity
  - Increasing environmental stability
- Evaluate threat environment
  - Criminal activity
  - Extremist activity
  - Terrorist activity



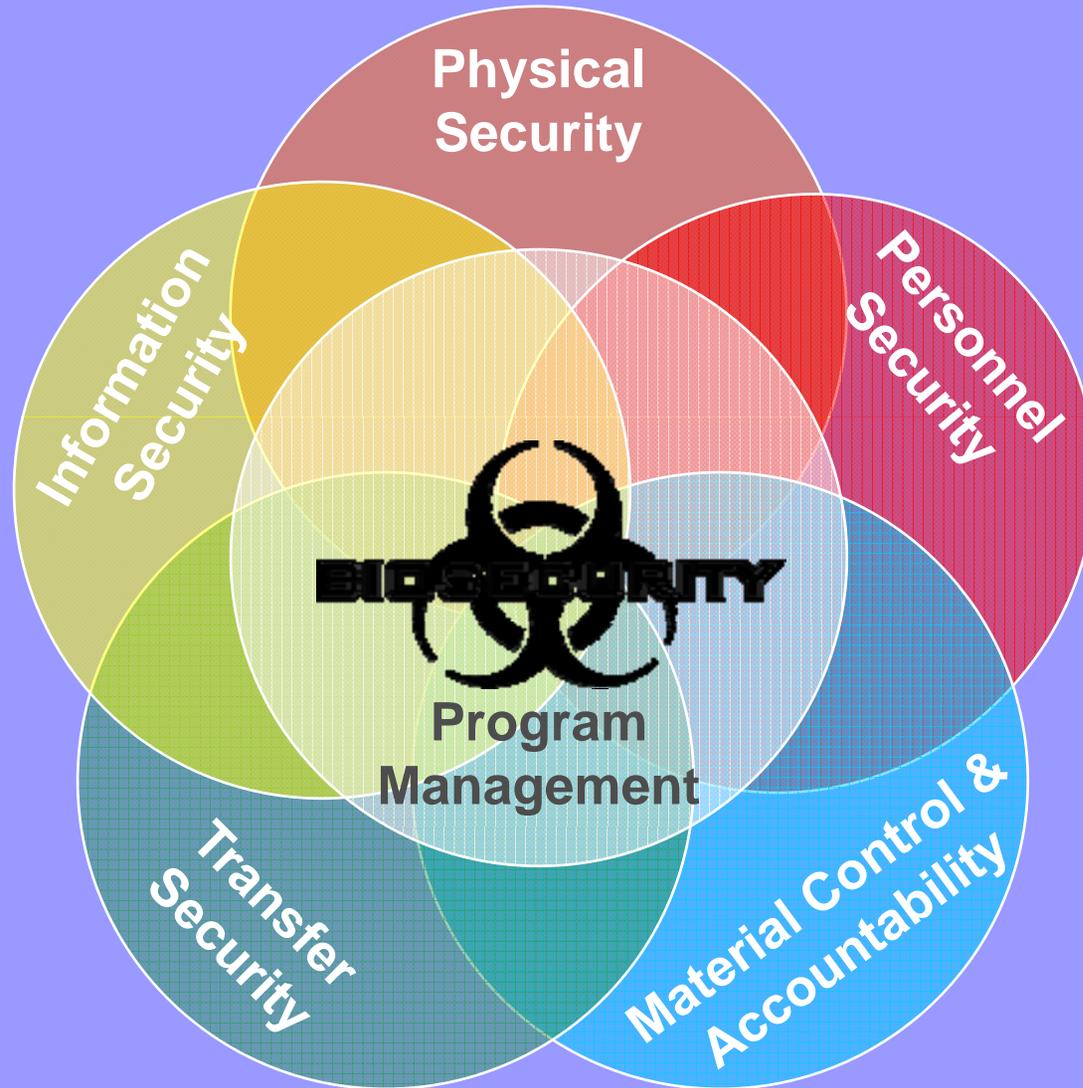


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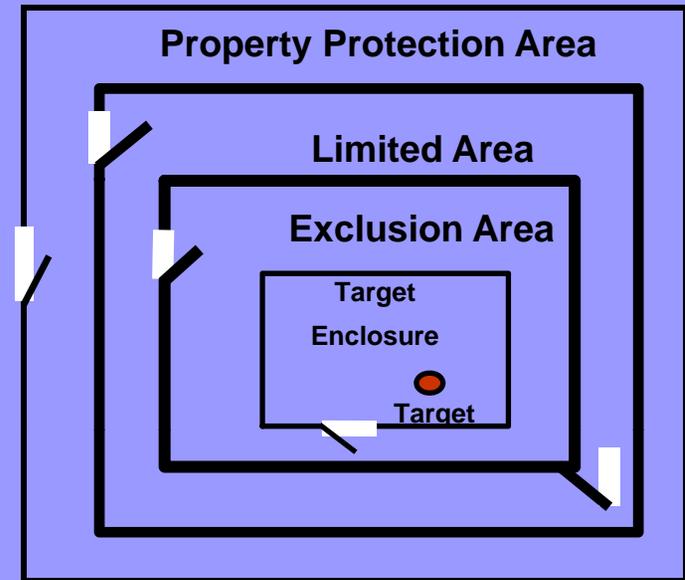
# Components of Biosecurity





# Physical Security

- Physical Structure
  - Property Protection Areas
    - Low risk assets
  - Limited Areas
    - Medium risk assets
      - Offices containing sensitive information
      - Hallways surrounding Exclusion Areas
  - Exclusion Areas
    - High or Extreme Risk assets
      - Computer network hubs
      - Electronic security system hubs
- Access Control
  - Only authorized individuals are allowed access
  - Implement stricter controls as you approach highest risk assets





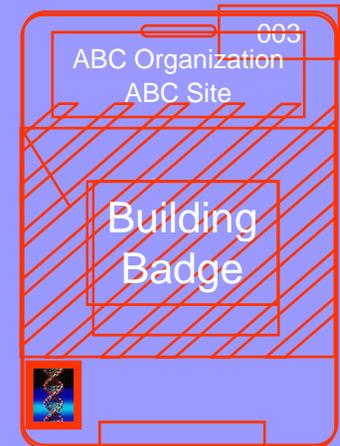
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# Personnel Security

- Personnel Screening
  - Pre-employment
  - Review and verify personal information
    - Work ethic
  - Comprehensive background investigations
    - Criminal history
- Badges
  - Access can be limited to specific areas
- Visitor Control
  - Equipment repair/maintenance personnel
  - Employee families
- Training





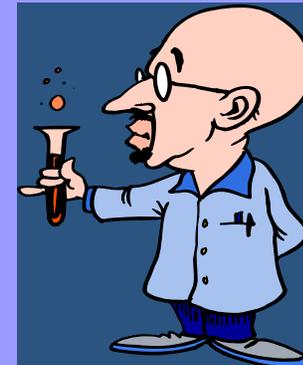
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# Material Control and Accountability

- Maintain control of biological material
  - During experimentation
  - During shipment
- Documentation
  - Biological agent name and description
  - Quantity
    - Based on containers NOT the number of organisms
  - Location of use and storage
- Control:
  - Physical
    - Lock and key
  - Administrative
    - Personnel, information, and transfer security
    - Recordkeeping
  - Tracking during shipment





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# Information Security

- Protect information that is too sensitive for public distribution
  - Label information as appropriate
  - Limit distribution to individuals with the "need to know"
  - Restrict methods of communication
  - Implement network and computer security
- Types of sensitive information:
  - Biological agent information
  - Experimental procedures and data
  - Security access information
  - Security system design
  - Personnel records





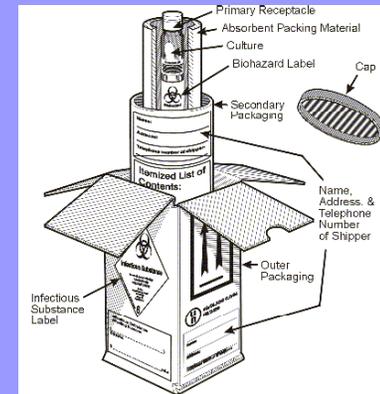
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# Transportation Security

- Control of biological material during transportation
  - Within a facility
  - Between facilities
    - Domestically
    - Internationally
- Packaging is important
  - International shipments of certain materials require specific packaging
- Independent carriers may be involved
  - Reputable carriers should be used
- Verify receipt of shipment
- International shipments of infectious materials (dangerous goods) must follow international regulations



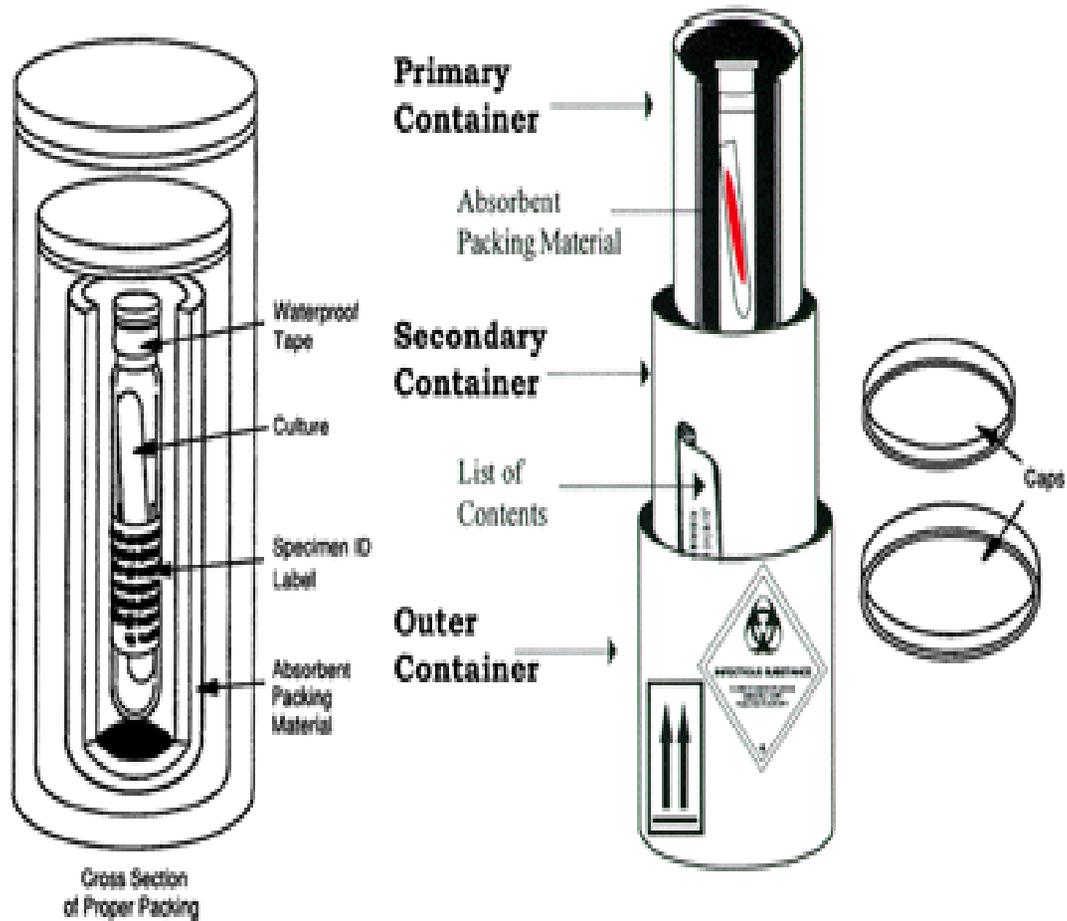


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# INFECTIOUS SUBSTANCE PACKAGING



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# Shipment Tracking

- “Paper trail” of bacterial agent transport and delivery
- Keep a running record of each individual who has possession of the biological agent during shipment
- Confirm receipt at destination
- Documentation should include:
  - Description of biological agent being shipped
  - Contact information for a responsible person
  - Record of any individual who assumes custody on behalf of someone else



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# Potential Role of Law Enforcement

- Physical Security and Access Control
  - Attempted unauthorized access
  - Suspicious person
  - Theft of keys
  - Attempted subversion of the security system
  - Security breach
- Personnel Security
  - Background investigation
  - Fraudulent application information or credentials
- Transportation Security
  - Package theft
  - Theft of carrier vehicle
- Information Security
  - Theft or loss of information
    - Laboratory notebook
    - Experimental procedures or data
    - Security access codes



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# Potential Role of Law Enforcement (continued)

## ■ Material Control and Accountability

- Investigate theft or loss
  - biological agents, equipment, information
- Investigate potential compromise of security system

## ■ Information Security

- Compromise of information
- Theft
- Suspicious requests for information

## ■ Additional

- Assess the threat environment
  - Local and regional criminal activity
  - Local and regional terrorist activity