



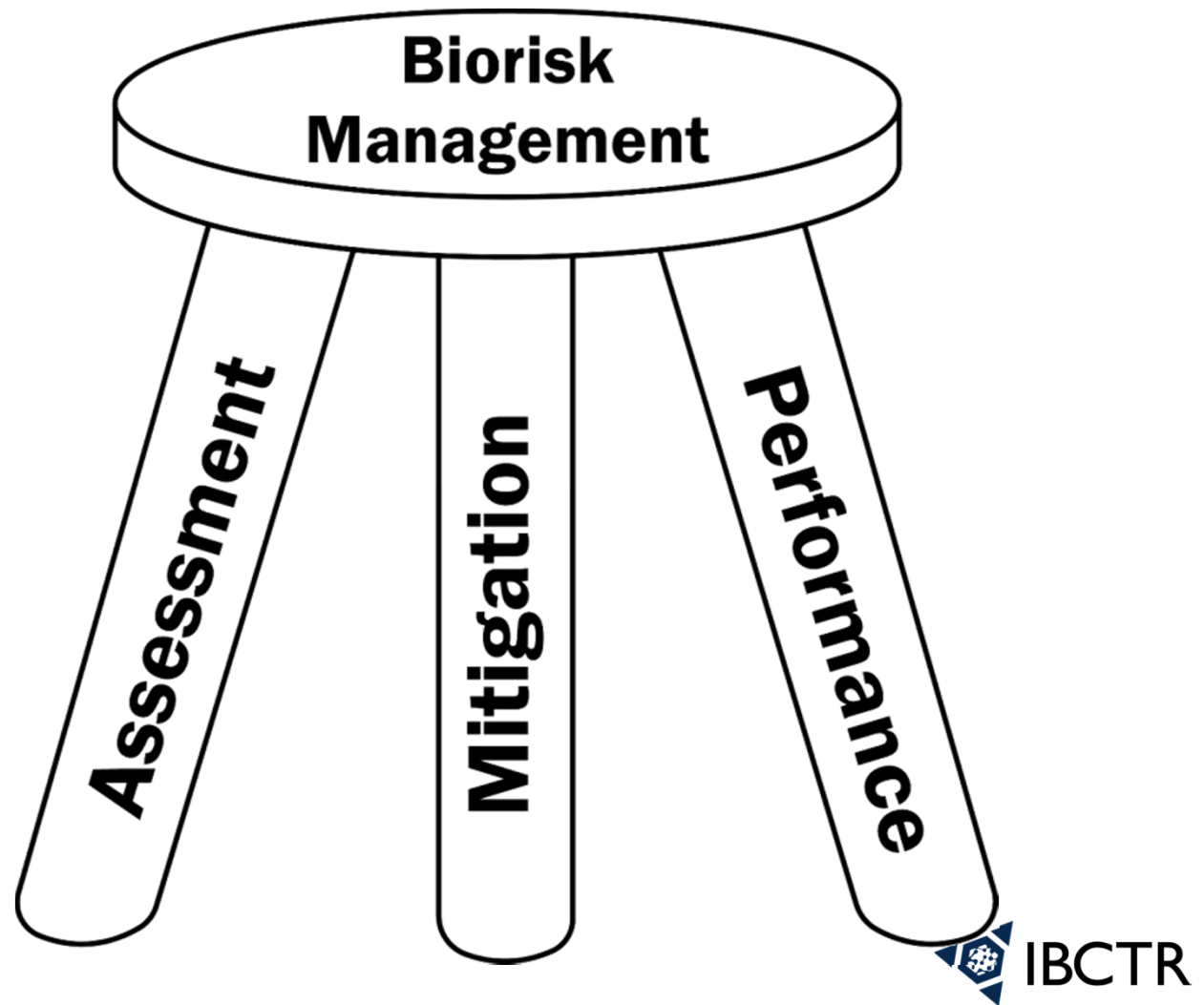
# IBCTR

INTERNATIONAL BIOLOGICAL  
and CHEMICAL THREAT REDUCTION

SAND2016-9251C

# Introduction to Laboratory Biosecurity

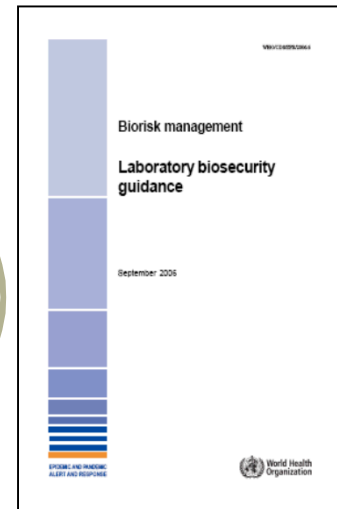
# Biorisk Management: the **AMP** Model



# WHO Definitions

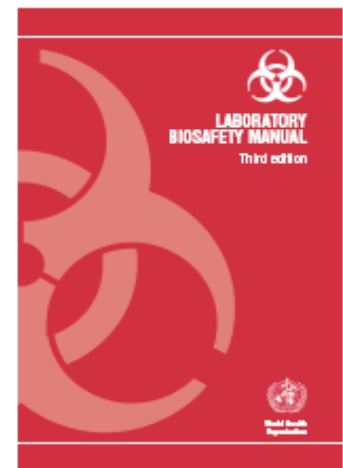
**Laboratory biosecurity:** protection, control and accountability for valuable biological materials within laboratories, in order to prevent their unauthorized access, loss, theft, misuse, diversion or **intentional** release.

*Biorisk management - Laboratory biosecurity guidance (World Health Organization, 2006)*



**Laboratory biosafety:** containment principles, technologies, and practices implemented to prevent unintentional exposure to pathogens and toxins, or their **unintentional** release

*Laboratory biosafety manual, Third edition (World Health Organization, 2004)*



# Introduction to Laboratory Biosecurity

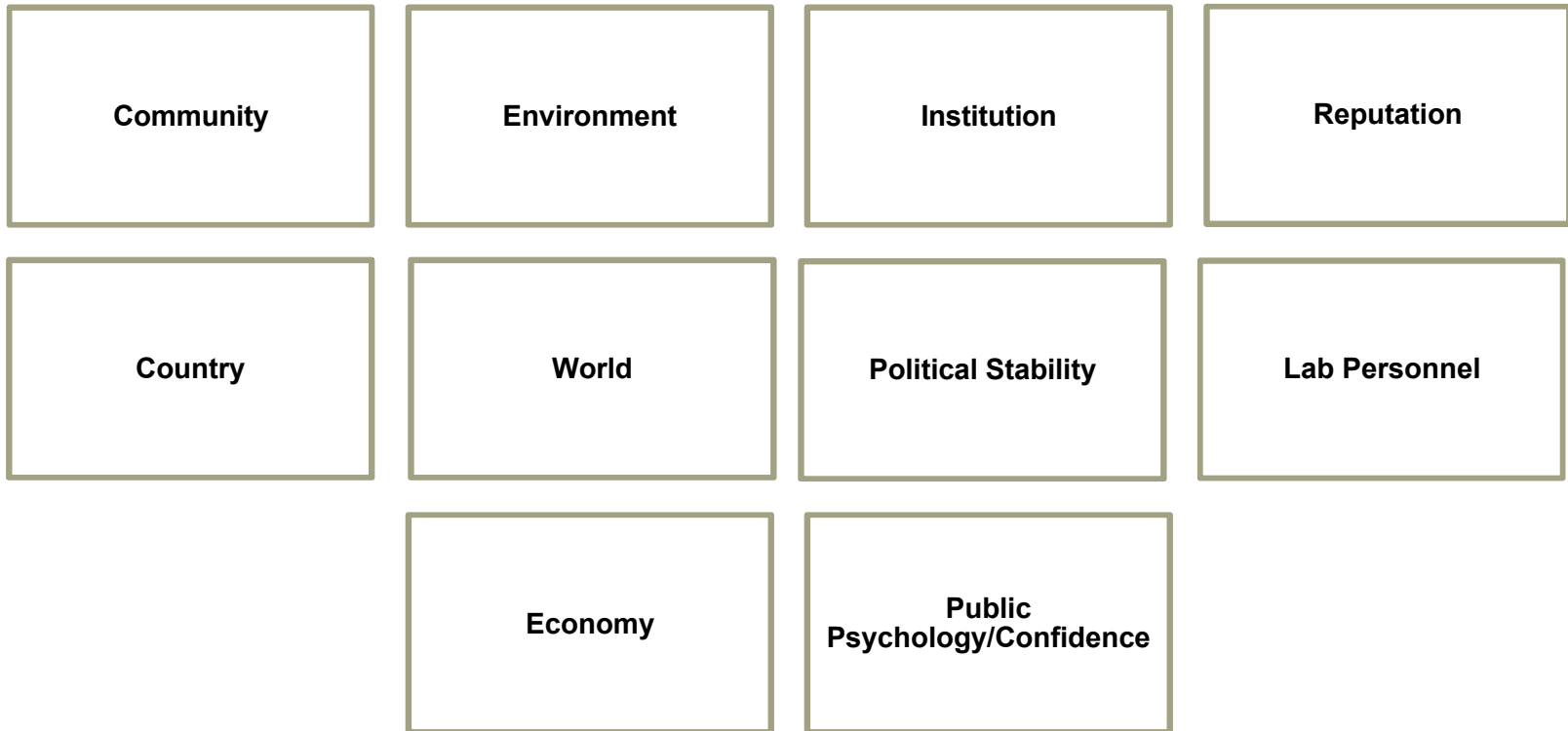
## Group Activity:

In your groups, discuss and answer the following two questions:

1. **Who/what** could be harmed by a biosecurity incident?
2. **Why** would a person or group commit a biological attack?

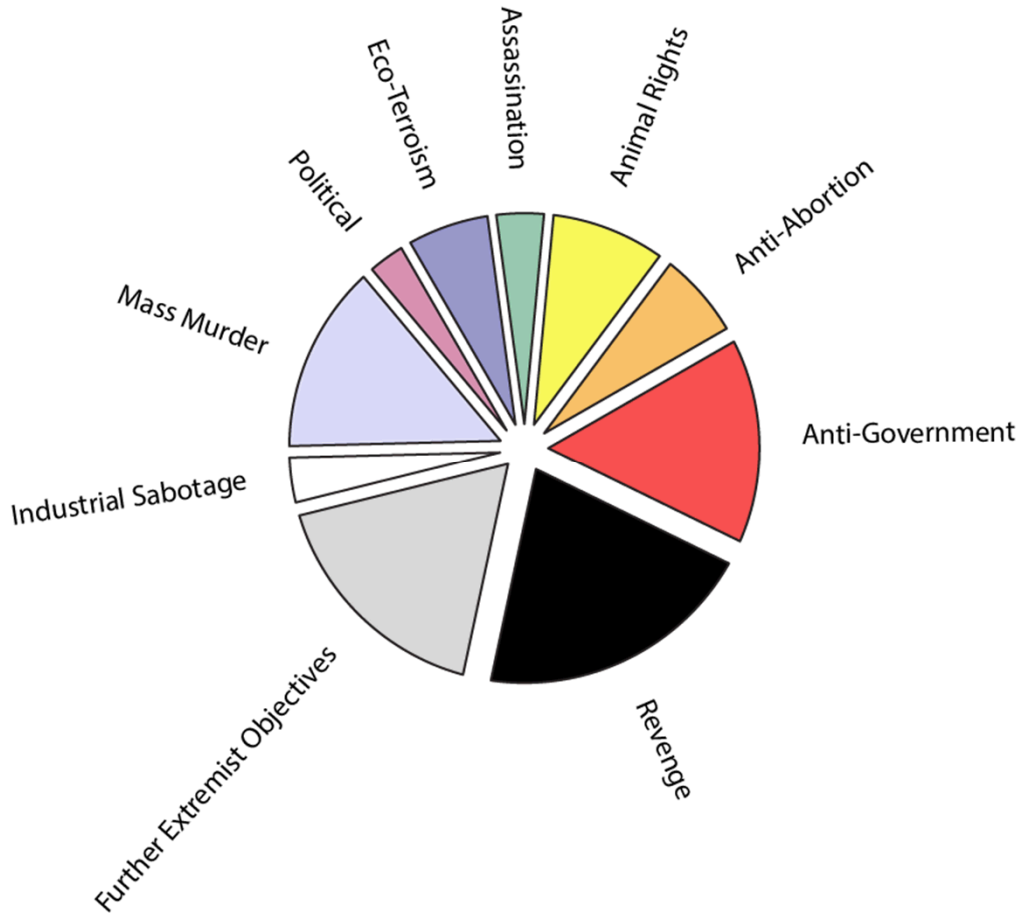
Take **10 minutes** and be prepared to share your answers with the group.

# Who/what could be harmed by a biosecurity incident



# Bioterrorism and Biocrime Motives

33 alleged incidents involving biological agents from 1960 to January 1999



## Slide 6

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**L9**

This needs to be updated. 17 year old data.....

LOFTAdmin, 7/20/2016

# Biosecurity Threats

- People outside bioscience facilities (**outsiders**) who want to commit malicious acts
  - Arson and sabotage
  - Stealing pathogen collections or research animals
  - Purchasing pathogens
- People within bioscience facilities (**insiders**) using their position to commit malicious acts
  - Blackmailed or coerced employees
  - Disgruntled employees
  - Criminals
  - Research theft: intellectual property, data, materials, or cultures

# Biosecurity Outsider Threat Examples

## Rajneeshees - 1984

- Contaminated restaurant salad bars in Oregon with *Salmonella* spp.



*Bhagwan Shree Rajneesh*

## Aum Shinrikyo – 1990s

- Aerosolized and disseminated biological agents in Tokyo
  - Vaccine strain of *Bacillus anthracis*
  - Inactive strain of *Clostridium botulinum*



*Attempted aerosolization of Bacillus anthracis and botulinum toxin*

# Biosecurity Insider Threat Examples

Location: Dallas, TX

Perpetrator: Diane Thompson

- Clinical laboratory technician

Objective:

- Unclear, possibly revenge against former boyfriend and cover-up by infecting co-workers

Organism:

- *Shigella dysenteriae* Type 2
- Acquired from clinical laboratory of of the St. Paul Medical Center where she worked

Dissemination

- Contaminated pastries in the break room
- Infected 12 of her coworkers

Outcome

- Arrested, convicted, 20 year sentence



# Biosecurity Insider Threat Examples

Location: MacDonald college in Canada

Perpetrator: Eric Kranz

- Postgraduate student in Parasitology

Objective:

- Revenge after he was evicted from his house by his four roommates for not paying his share of the rent

Organism:

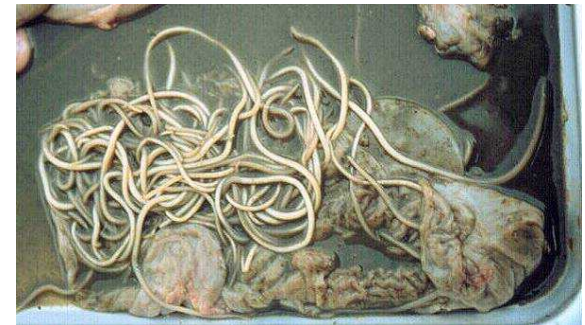
- *Ascaris uum*

Dissemination

- Contaminated food in the house with *Ascaris suum* before he left
- Two of the boys suffered acute respiratory failure

Outcome

- Kranz was tried for attempted murder



# Biosecurity Insider Threat Examples

Location: Japan

Perpetrator: Dr. Mitsuru Suzuki

- Physician
- Training in bacteriology

Objective:

- Revenge

Organism:

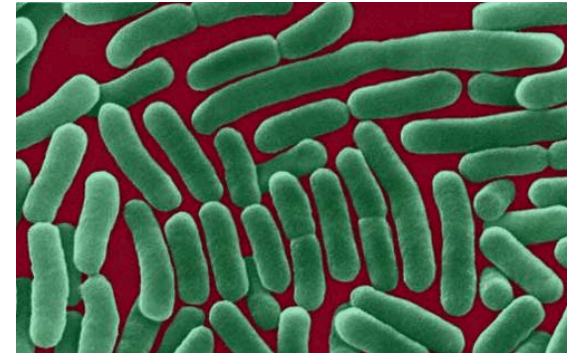
- *Shigella dysenteriae* and *Salmonella typhi*
- Stolen from the Japan's National Institute of Health

Dissemination

- Sponge cake, other food sources
- Later implicated in 200 – 400 illnesses
- 4 deaths

Outcome

- Official investigation started after anonymous tip to Ministry of Health and Welfare
- Charged with infecting people, but not with any deaths



# Biosecurity Insider Threat Examples

Location: More than 60 sites in US

Perpetrator: FBI names Bruce Ivins

- Research Scientist

Objective:

- Unknown

Organism:

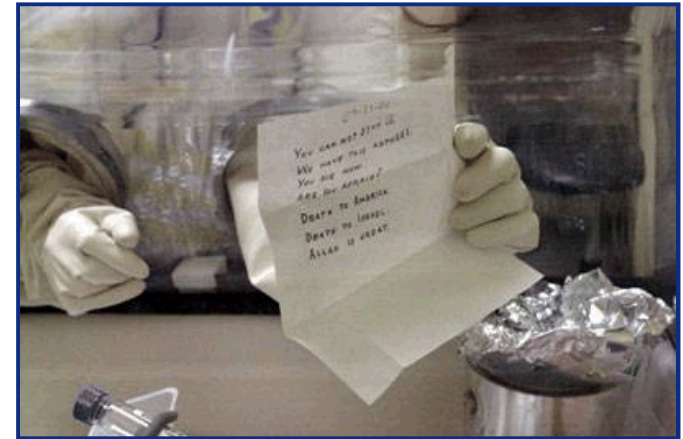
- *Bacillus anthracis*
- Stolen from US research laboratory

Dissemination

- 7 letters sent through postal system
- 22 confirmed cases of anthrax
  - 11 Cutaneous
  - 11 Inhalational (5 deaths)

Outcome

- FBI unveils evidence against Ivins
- Ivins dies of an apparent suicide



ANTHRAX INVESTIGATION

**FBI Discusses Microbial Forensics—  
But Key Questions Remain Unanswered**

# Security Cultural Change

**Laboratories** may require a **cultural change** toward security.

1. Some **laboratory workers** may not recognize potential for intentional misuse.
2. In **academic** settings, openness is valued.
3. In a **clinical** setting, security does not typically consider biological materials.

# Unique Challenges

## Group Activity:

In your groups, discuss and answer the following two questions:

1. **Why** would an adversary select biological material in a laboratory over a conventional weapon?
2. **How** does securing biological materials differ from securing: money, dangerous chemicals, nuclear material, etc.,.)

Take **10 minutes** and be prepared to share your answers with the group.

# Unique Challenges

## Viruses and Bacteria can **multiply**

- difficult to count (and thus, keep track of) in the laboratory

## Potentially, one need only steal a **small amount**...

- more can always be grown from that seed stock

## Stand-off **detection difficult**

- Detection of theft is almost impossible. Vials are small. Biological agents do not give off energy (unlike radiological materials)

Biological materials are relatively **easy to obtain** and **inexpensive** to produce



# Unique Challenges

## Where can you find biological materials?

### Laboratories

- Animal and public health
- Research
- University
- Clinical/diagnostic

### Vaccine production and testing facilities

### Culture collections and repositories

### Outbreaks

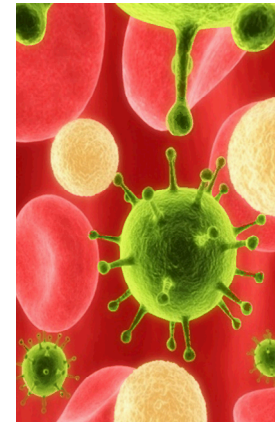
### Environment



# Unique Challenges

## Which biological materials should be secured?

- Only well-characterized strains? Closely related strains?
- Genetic material? Reagents? Experimental Results? Sequence Information?
- Waste? Animals?



A proper **Risk Assessment** can help determine security needs

# Unique Challenges

## Plenary Discussion:

In what ways could an effective **biosecurity** program enhance **biosafety** as well?

# Some Potential Answers

**Hazard  
Inventory**

**Access control**

**Focus on  
management  
systems**

**Training  
process**

**Better  
situational  
awareness  
among staff**

**Overlapping  
SOPs**

**Overlapping  
Risk  
Assessment  
Process**

# Biosecurity versus Biosafety

A goal of a laboratory is to operate safely and securely, but at times these goals may be at odds with each other.

## Discussion:

In each of the following three examples, how are safety and security at odds with one another?

1. Signage
2. Exits
3. Emergency Response

# Unique Challenges Summary

Size and Form

Replication

Detection

Availability

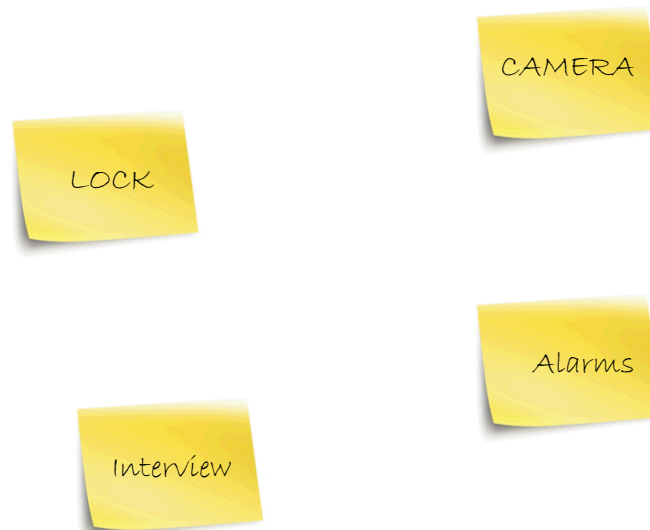
Security Culture

Safety Considerations



# Biosecurity Risk Assessment

How do you decide which biosecurity mitigation measures you need?



**A Biosecurity Risk Assessment!**

# 2 Principles of Biosecurity Risk Mitigation

**1) Graded Protection**

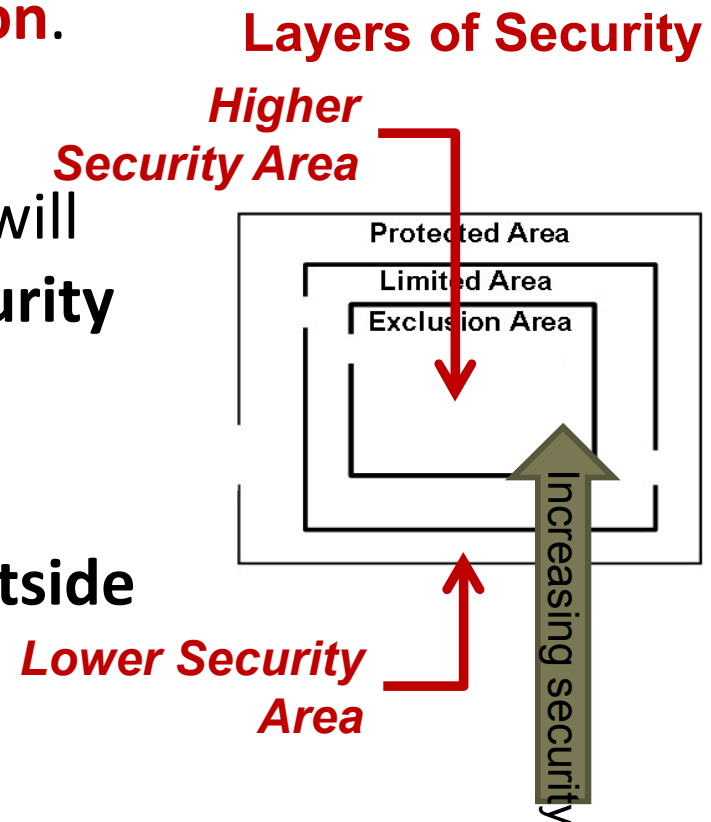
**2) Balanced Security**

# Graded Protection

An important concept in security is **Graded Protection**.

Different areas of a facility will have different **levels of security** based on risk.

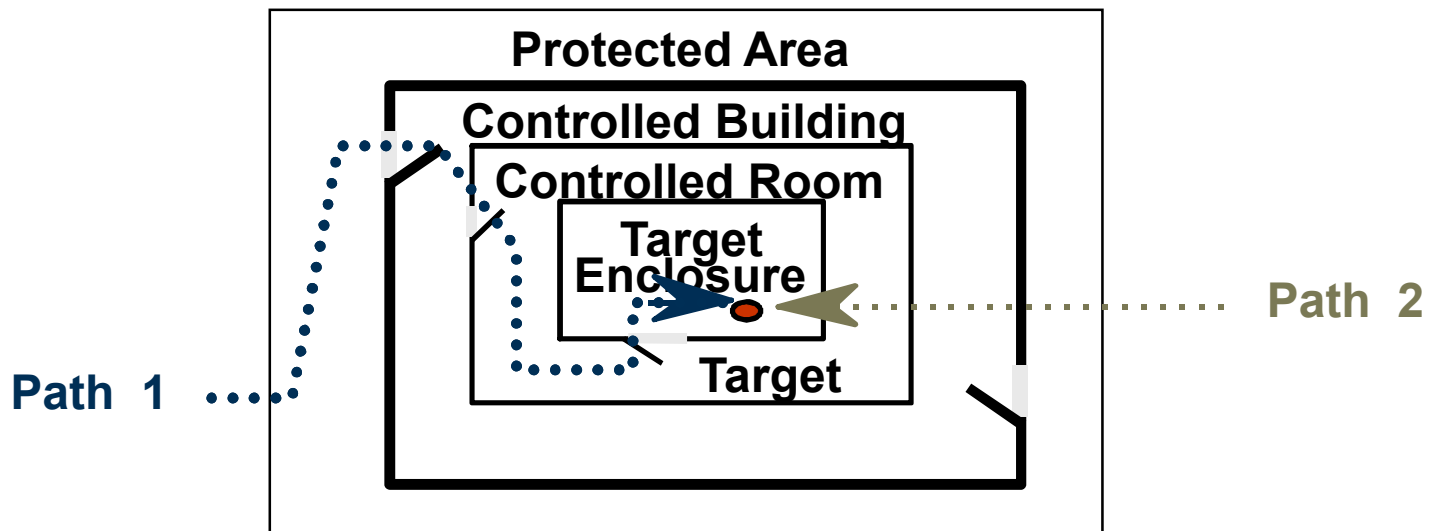
Increasing security **from outside to inside** the facility.



# Balanced Security

Balanced security = no weak path

For every possible adversary path, cumulative security measures encountered along path will be similar regardless of adversary path



# Laboratory Biosecurity Exercise:

## Group Activity:

**In your groups, brainstorm a list of biosecurity measures.**

**Place** your answers on sticky notes, **one answer per sticky note**, and be prepared to discuss with the rest of the class.

# 5 Pillars of Biosecurity Risk Mitigation

1. Physical Security
2. Personnel Management
3. Material Control & Accountability
4. Transport Security
5. Information Security

# Physical Security

**Physical Security** is a combination of measures used to protect laboratories and their assets from physical intrusion.



# Personnel Management

**Personnel Management**, in the context of biosecurity, is the policies and procedures used to ensure that individuals given access to sensitive biological materials **should** have that access.



# Security Awareness

**Security Awareness:** knowledge and attitudes possessed by an organization (lab management and workers) regarding biological security concerns and the appropriate responses to protect biological assets.



# Material Control & Accountability

**Material Control & Accountability** is an awareness of what exists in the laboratory, where it is, and who is responsible for it.



# Transport Security

**Transport Security** is the protection of biological materials when they are transported outside laboratory areas.



# Information Security

**Information Security** is the protection of **sensitive** and **valuable** information from theft or diversion.



.3CTR

# Final Review

## Review

For **10 minutes**, let's discuss what we have learned about **Laboratory Biosecurity**.

What did we learn?

What does it mean?

Where do we go from here?