



Risk Assessment

SAND No. 2008-0480P

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company,
for the United States Department of Energy's National Nuclear Security Administration
under contract DE-AC04-94AL85000.

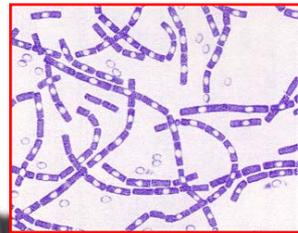
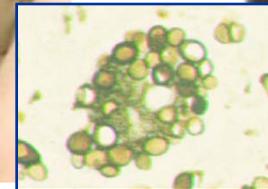
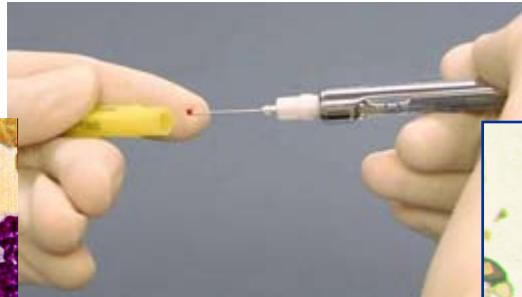




Risk



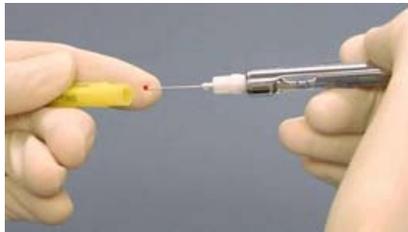
- **Is a function of the likelihood an adverse event will occur**
 - Risk = Potential * Consequences
- **Laboratory work with pathogens will always involve some level of safety and security risk**
 - Distinguish between “acceptable” and “unacceptable” risks
 - Cannot protect against every conceivable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



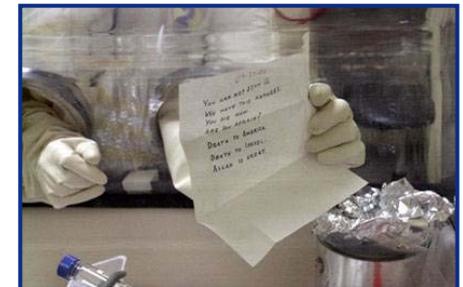
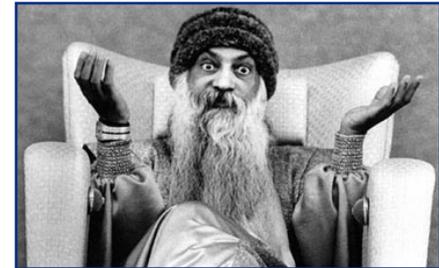


Class Discussion: Risk Perceptions

Biosafety Risks



Biosecurity Risks





Laboratory Biorisks

Risk = f (Likelihood, Consequence)

- **Likelihood**

- For security assessments, the likelihood of the adverse event, often referred to as the Threat Potential, includes the Threat, because it is a deliberate event
- For safety assessments, the likelihood of the adverse event does not incorporate the Threat, because it is an accidental event

- **Consequences**

- Of infection from accidental exposure or malicious release

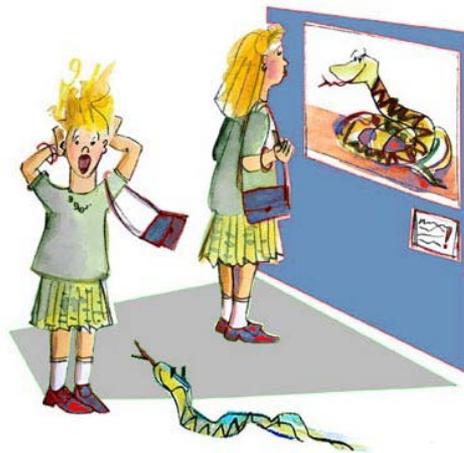
- **Risks**

- To laboratory workers
- Risk of accidental or deliberate exposure to community
- Risk of accidental or deliberate exposure to animal community



Risk Assessment Principles

- **Define the problem**
- **The problem should drive the choice of method for the assessment**
- **The risk assessment method should be as simple as possible**
 - *Elaborate when needed*
- **Those conducting risk assessments should be explicit about uncertainties**
- **Risk assessment methods can incorporate one or more approaches**



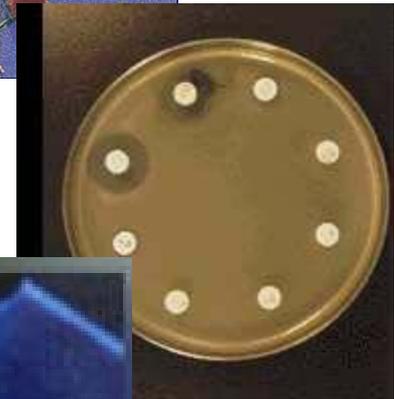
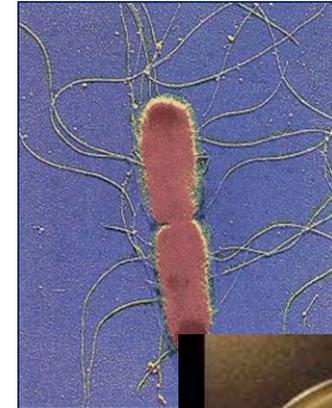


Biosafety Risk Assessment

- 1. Characterize biological agents and laboratory activities**
 - a. Evaluate the specific biologic agent hazards
 - b. Evaluate laboratory procedure hazards
 - c. Evaluate in-place hazard mitigation measures

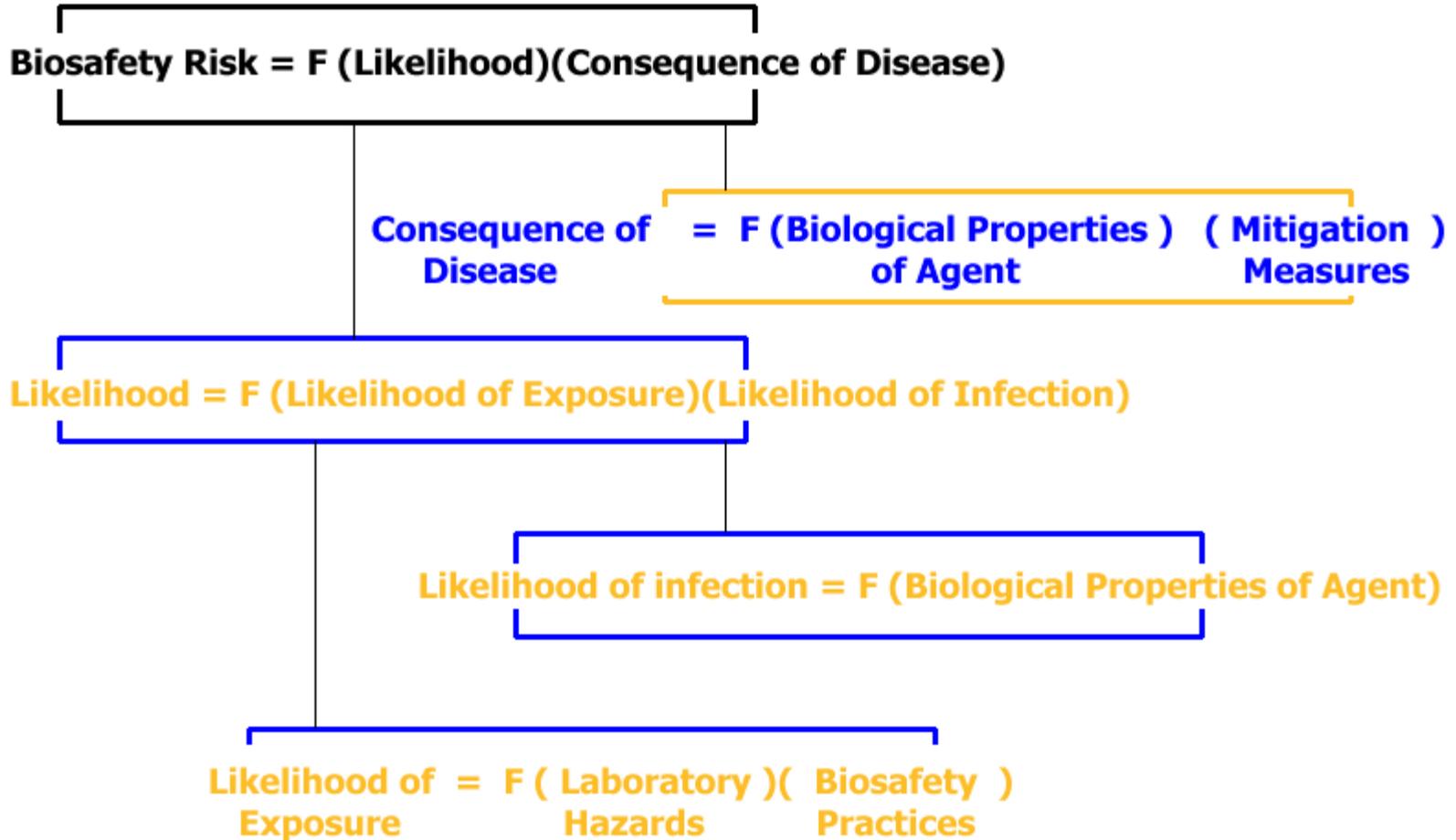
- 2. Evaluate scenarios**
 - a. Create scenarios consisting of the specific agent and specific laboratory procedures
 - b. Determine the likelihood of exposure based upon the procedure and the likelihood of infection based upon the agent as related to the method of exposure

- 3. Characterize the risk**
 - a. Evaluate the overall likelihood and consequences of each scenario
 - b. Determine acceptable and unacceptable risks; develop risk statement





Biosafety Risk Variables in More Detail





Biosecurity Risk Assessment

- 1. Characterize biological agents and threats**
 - a. Evaluate pathogens and toxins at a facility (asset assessment)
 - b. Evaluate adversaries who might attempt to steal those pathogens or toxins (threat assessment)

- 2. Evaluate scenarios**
 - a. Create scenarios consisting of “specific adversaries” attempting to steal and misuse a specific biological agent
 - b. Determine how the various scenarios could be perpetrated (vulnerability assessment)

- 3. Characterize the risk**
 - a. Evaluate threat potential and consequences of each scenario
 - b. Determine acceptable and unacceptable risks; develop risk statement





Biosecurity Risk Variables in More Detail

$$\text{Biosecurity Risk} = (\text{Threat Potential}) * (\text{Consequences})$$

Consequences = *Population, Economic, Psychological, Operational*

Threat Potential = *Site Vulnerability, Agent Task Complexity, Adversary Attributes*

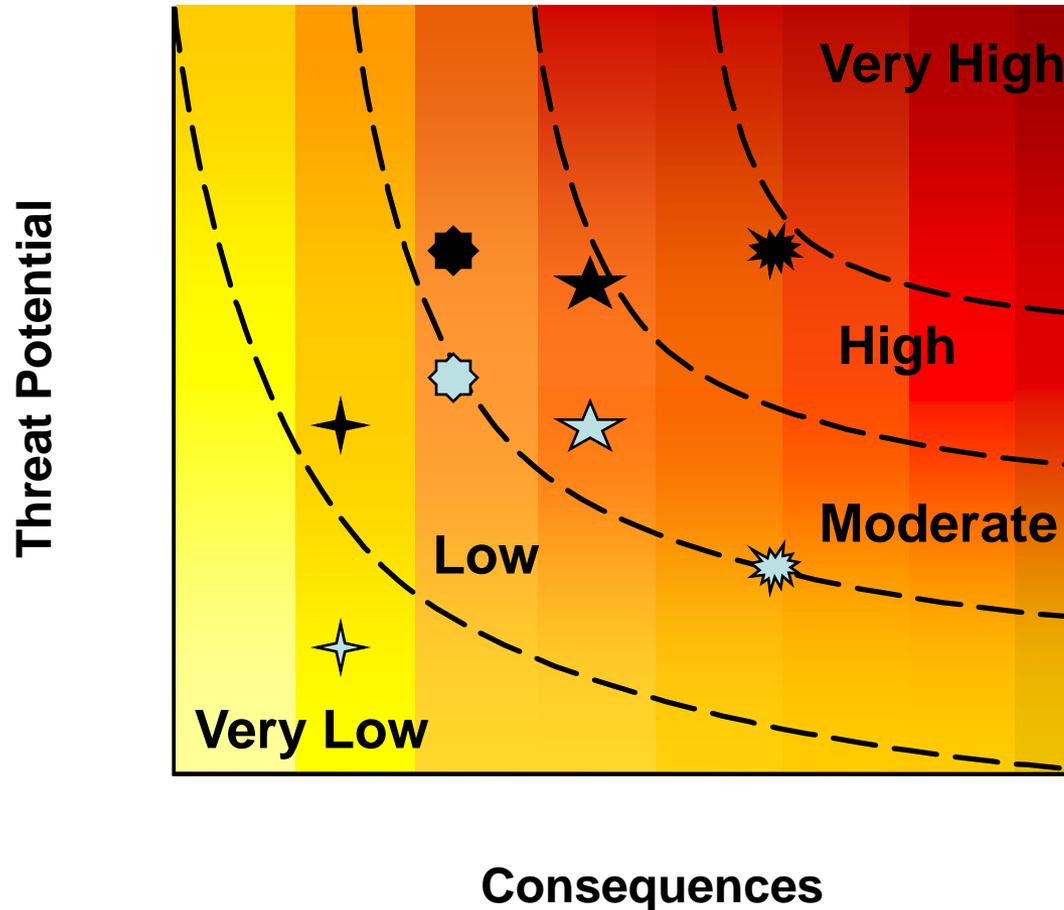
Adversary Attributes = *Motive, Means, Opportunity*

Agent Task Complexity = *Acquisition, Development, Dissemination*

Site Vulnerability = *Physical Security, Personnel Security, MC&A, Information Security, Transport Security, Program Management*



Characterizing Scenarios by Risk: Hypothetical Results



- Protect against unacceptable risk scenarios

- Develop incident response plans for acceptable risk scenarios