What is Risk?

What is the *possibility* that something bad is going to happen?
Perception of Risk

• Individual
  ▪ fact based
  ▪ value driven
  ▪ experience
  ▪ cost vs. benefit

• Institutional
  ▪ a function of experience?
  ▪ ‘zero tolerance’
What is Risk Analysis?

• A scale of magnitude, qualitative or quantitative

• A framework; takes us from looking at the possibility of an adverse event occurring, to the likelihood or probability of that event occurring
So how do you do this &*^% Risk Analysis thing?

- Assemble a stakeholder team
  - Veterinary community
  - Medical community/PH
  - Owner/operators
  - Other professions
- Research, Research, Research
- Maintain objectivity and transparency
- If you need help look for it!
Risk Analysis paradigm

Fig. 1. Schematic diagram of the risk analysis paradigm.

Fig. 1. Schematic diagram of the risk analysis paradigm.

Hazard Identification

- What are the agents of concern?
  - Locally
  - Neighboring region
  - What could be ‘introduced’?
  - How can that happen?
- Each risk assessment should be ‘hazard specific’
- What is the population of concern?
Factors in Disease Transmission to Consider in the Hazard Identification process

Agent or Disease → Route(s) of transmission → Methods of exposure or contact → Result of contact → Population Dynamics

Agent class → Reservoir

Air borne
Direct contact
Vector borne
Cross contamination

Infectivity (ID50)
Potential for spread

Pathogenicity (what does it do)

Virulence (LD50)

Exposure dose (Amount X Time X Route)

Host susceptibility

Environmental factors contributing to agent survivability

Risk Analysis paradigm

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Risk Assessment * 3 Parts

• Frame the question, then assess the risk

• What is the likelihood that workers at Facility XYZ will acquire tuberculosis from an infected elephant?

• Define in 3 phases
  ▪ Release
  ▪ Exposure
  ▪ Consequence

* The fun stuff
Risk Assessment Phases

**RELEASE**
- YES
  - Shedding?
    - NO
    - YES
      - Prevalence
        - NO

**EXPOSURE**
- NO
  - Exposure?
    - NO
    - YES
      - CONSEQUENCE
        - NO INFECTION
          - LATENCY
          - DISEASE

Risk Assessment: Release

• Prevalence of *M. tuberculosis*
  ▪ Diagnostics
  ▪ Herd History
  ▪ Species

• Estimate the likelihood of release into the environment
  ▪ Active shedding? Do quantitative measures matter?
  ▪ site of any lesions in the elephant?

Images from CDC
Risk Assessment: Exposure

Likelihood that humans will come into contact with the organisms

• Frequency and duration of contact
• What dose matters
• Aerosolization/persistence
• re-suspension
• Facility design
  – Sunlight, ventilation
Risk Assessment: Consequence

- Chain reaction: so what?

- Consequence for population:
  - no infection
  - active disease
  - latency

- Consequence based on
  - total dose?
  - Virulence
  - Individual’s immune status
Risk Assessment: Consequence

• Summarize the risk to the population

• Consider spread beyond the population i.e. close contacts, family members, etc.

• Additional effects include:
  ▪ Psychological costs
  ▪ Cost of treatment $\$\$
Risk Analysis paradigm

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• What can be done to decrease the likelihood of the adverse outcome
  ▪ Testing, vacc, health certification, regulation, management protocols

• What can be done to reduce the consequence of the outcome should it occur?
Risk Management

Release:
- YES
  - Shedding?
    - NO

Exposure:
- YES
  - Exposure?
    - NO

Consequence:
- NO INFECTION
  - LATENCY
  - DISEASE
Risk Management

• Sensitivity Analysis
  - Test various scenarios
  - Can be qualitative or quantitative
Risk Analysis paradigm

Hazard Identification → Risk Assessment → Risk Management → Risk Communication

Fig. 1. Schematic diagram of the risk analysis paradigm.

Risk Communication

• Timely info to target audience

• Sometimes warn, sometimes reassure

• Communicate and document uncertainties
  ▪ Uncertainty vs. Variability
  ▪ Did we ask the right question?
  ▪ How good is the data?
Risk Communication

- Publish
- Present
- Personal communication
- Protocols
- Persistence
- Periodically review!
NOTICE OF WILDLIFE DISEASE RISK ASSESSMENT (DRA) TOOL DEVELOPMENT WORKSHOP
Risk Analysis ReCap

• Adding science to policy *decision making*
• Transparent method to organize, assess and study a problem/question/issue
• Requires communication
  ▪ Multidisciplinary
  ▪ Stakeholders
• Identifies data gaps and research needs