Disease Risk Analysis

From Frustration to Fruition

Tiffany Wolf
Veterinary Population Medicine
University of Minnesota
What is wrong with this picture?

“Disease epidemics are possible, ... but we have no data that would allow estimation of the probability.”

“... Thus, we have omitted any consideration [of disease] ... from our modeling.”

“It is unlikely that the subspecies would survive a catastrophe that caused substantial mortality.”
What is Risk?

• Describing or characterizing risk
  – Likelihood of the occurrence of an adverse event.
  – Measurement (qualitative or quantitative)

• RISK = Likelihood X Magnitude
Many TYPES of questions of risk......

....everyone wants a ‘risk assessment’
Disease Risk Analysis Policy Questions

• What is the risk of diseases being transmitted between NHP and people at temples in SE Asia?
• What is the risk of introducing disease through the reintroduction of wildlife reared in zoos/sanctuaries into natural habitat?
• What is the risk of taking fish from the wild as brood stock for aquaculture?
• What is the risk of moving avian diseases around through large scale poultry or pet trade?
• What are the disease risks of having a captive monkey?
Risk Analysis
Perception vs. Reality

• Description = What are the risks (likelihood and mag)?
• Evaluation = Do they actually matter?
  – How much do they matter? At what point does it matter?
• There are different levels of acceptable disease risk!
  – Zero risk does not exist and should not be considered in a rational situation!
• How do I answer these questions for my program/boss or politician?
Risk analysis, animal health and trade


A valuable decision-making tool is now being used in the field of animal health. This issue of the Scientific and Technical Review introduces that tool – risk analysis.

Risk Assessment Frameworks

A General Framework for Animal Health Risk Assessment (Document #3)

United States Animal Health Association

1998 Committee Reports

Report of the USAHA Committee on Foreign Animal Diseases

Risk Assessment in International Trade
1. Problem description
   • what can go wrong?
   • how can it go wrong?
   • how likely is it?
   • how minimize?

2. Hazard identification
   • identifying and involving stakeholders
   • DRA goal scope

3. Risk assessment
   • how likely is it?

4. Risk management
   • formulate a plan
   • monitor and review

5. Implementation & review
Problem Description

Question: what is the risk of the spread of an emerging infectious disease from wildlife in the park to humans?

• Outline the context of the problem
• Formulate the question
  • Needs specificity
• Identify the goal of the DRA
  • State assumptions and limitations
• Specify the acceptable level of risk
Hazard ID: What and How

• Disease Ranking
  • A method of listing all diseases potentially important to the question or issue
  • Cannot assess all possibly important diseases
  • Criteria for ranking

• Pathway Analysis
  • Diagram the question
  • Identify areas where disease risk increases or decreases (critical control points)
  • Identify data needs for CCPs
Risk Assessment

• Release/Entry
  • Likelihood of agent being released from infectious individual into environment where it may or may not survive to remain infectious
  • fluids, soil, air, droplets, direct contact

• Exposure
  • Likelihood of susceptible (or not) individuals being exposed to the agent from wherever it was released

• Consequences
  • What happens after they are exposed
Connecting the Question to a Model

- Pathway characterization
  - Diagram the question
- Areas where disease risk increases or decreases (critical control points)
  - Become variables/parameters in the model
- Also helps to refine question and modeling tools needed

Diagram:
- **Other Animals Harboring Salmonella**
- **Animal Feeds** (CCP2)
- **Contaminated Streams and Pastures**
- **Transportation to Slaughter**
  - **Lairage**
  - **Stunning**
  - **Killing**
- **CCP2 Scalding**
- **Dehairing**
- **Singeing**
- **Polishing**
- **Evisceration**
- **CCP1 Chilling**
- **Cutting/Deboning**
Risk Management

• Where along the pathway can we decrease likelihood or consequences?

• How?
  • Screening
  • Vaccination
  • Treatment

• These can be tested using the same model

https://www.britannica.com/science/hemolymph
Implementation and Review

• Review of results
  • Report input

• Policy recommendations

• Ongoing monitoring and surveillance

• Update model as new data is acquired
  • iterative process!
Risk Communication

• Wildlife are special case
  – Extreme lack/uncertainty of data
  – Often difficult to collect and takes a lonnnng time

• Managers and politicians may be uncomfortable with the lack of disease data to support decisions

• Must engage stakeholders throughout the process
Summary

- Science –based process to support policy or management
- Inherently systems-based and multidisciplinary
- Goals of DRA workshop
  - Learn the jargon
  - Practice the process (at least the first half)
  - Understand how science can help inform policy
Thank You

Go outside and play... the mosquitoes can’t be that bad....

John Branch/San Antonio Express-News