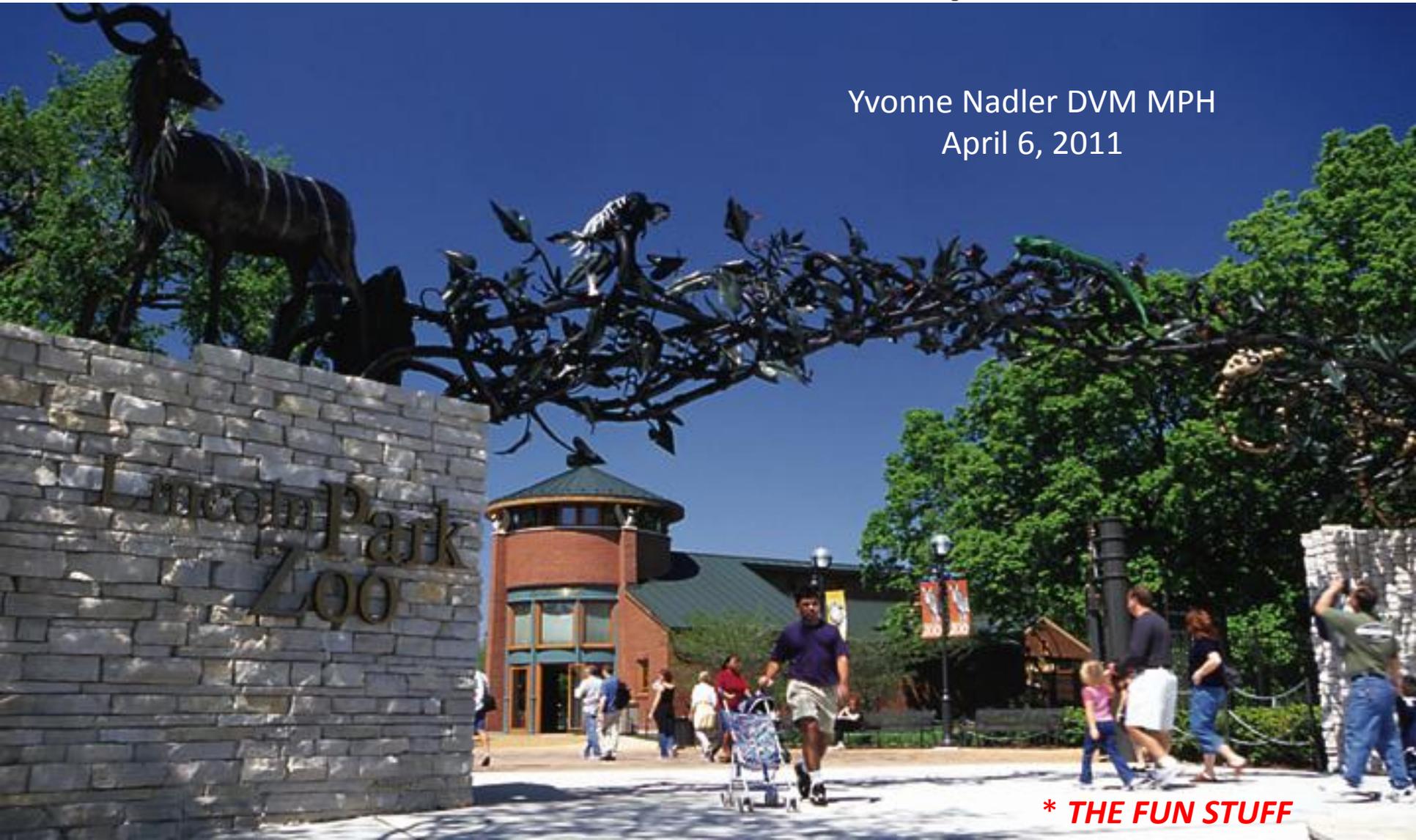# Risk Assessment* and Zoonotic Implications

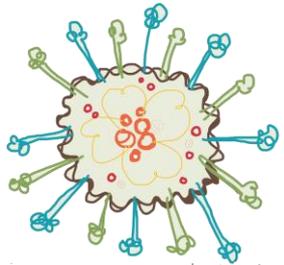Yvonne Nadler DVM MPH
April 6, 2011

THE FUN STUFF

What is Risk?

What is the *possibility* that something bad is going to happen?
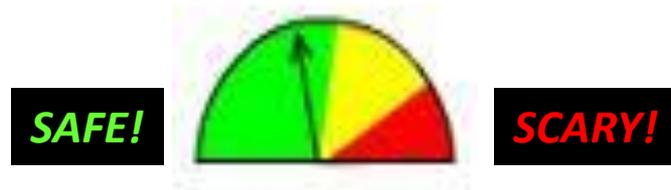
FOREIGN ANIMAL DISEASE

Perception of Risk

- Individual
  - fact based
  - value driven
  - experience
  - cost vs. benefit

- Institutional
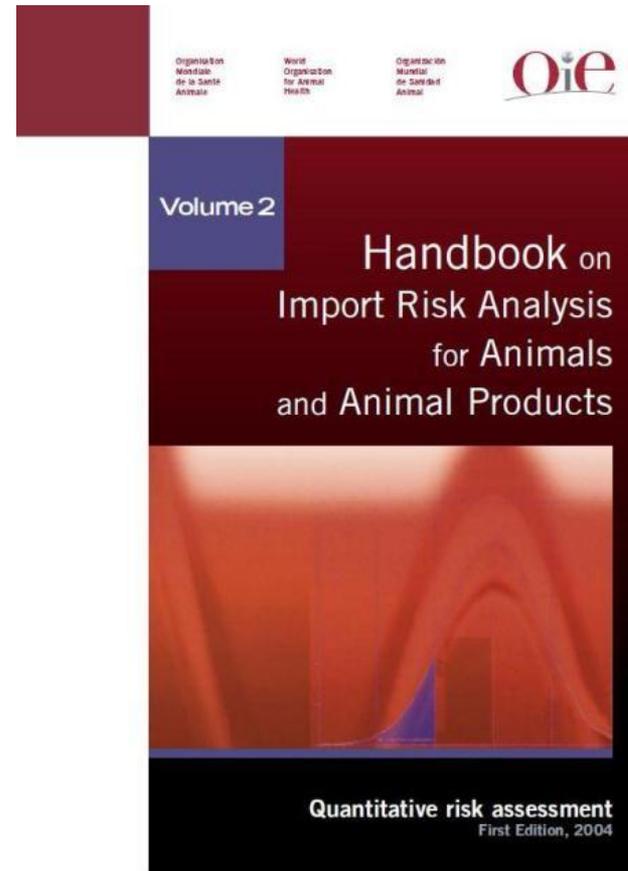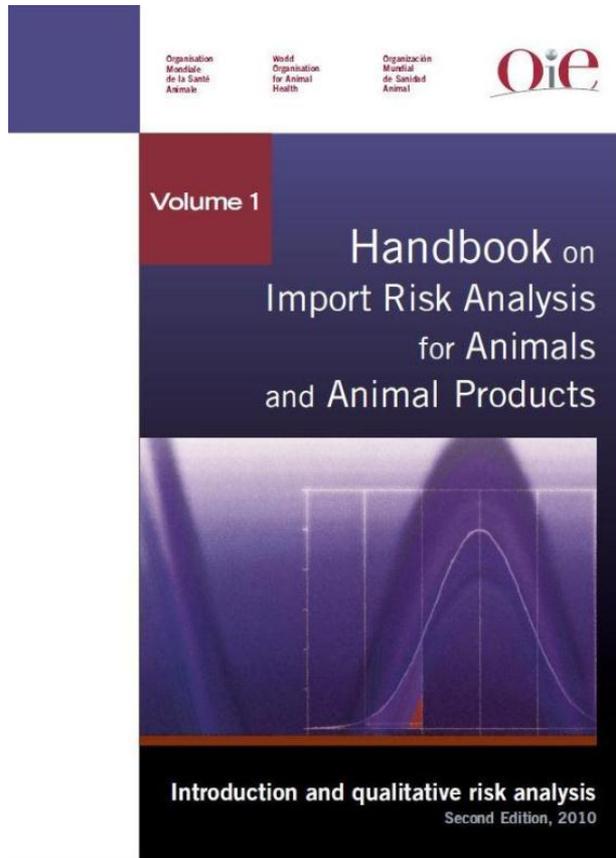 - a function of experience?
  - 'zero tolerance'

What is Risk Analysis?

- A scale of magnitude, qualitative or quantitative

SAFE!   SCARY!

- A framework; takes us from looking at the *possibility* of an adverse event occurring, to the *likelihood or probability* of that event occurring

Frameworks

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

Hazard Identification → **Risk Assessment** → **Risk Management** → **Risk Communication**
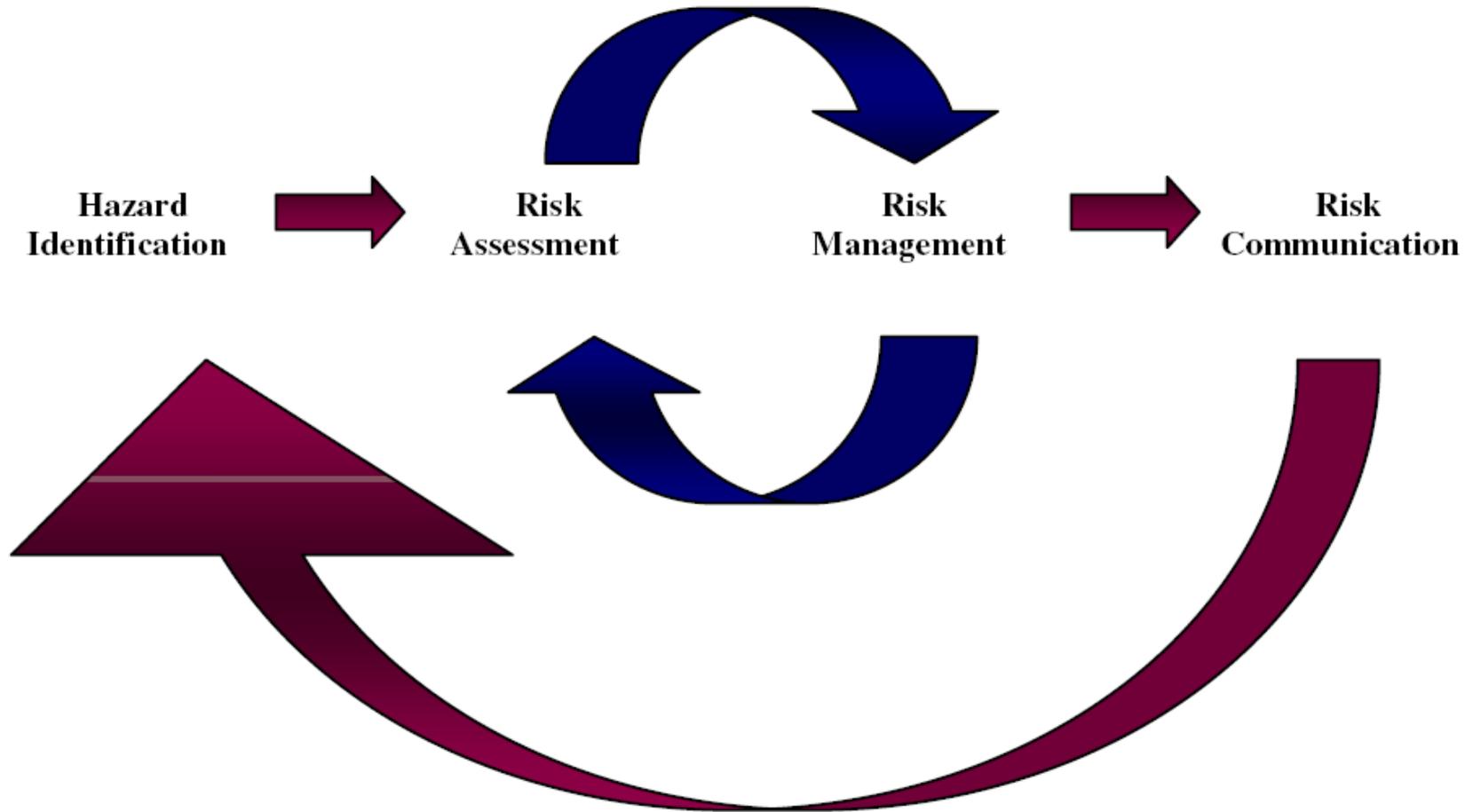
Fig. 1. Schematic diagram of the risk analysis paradigm.
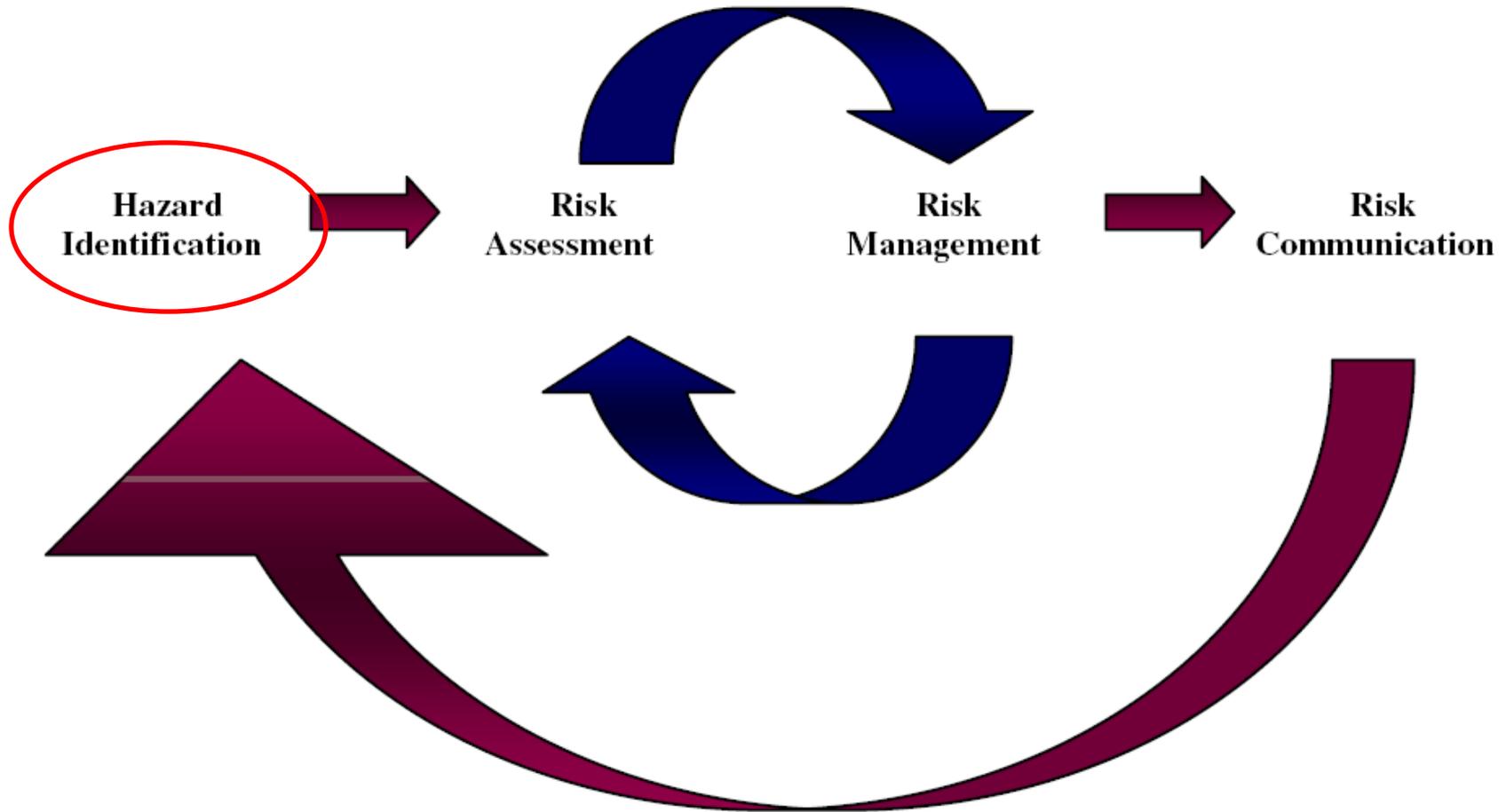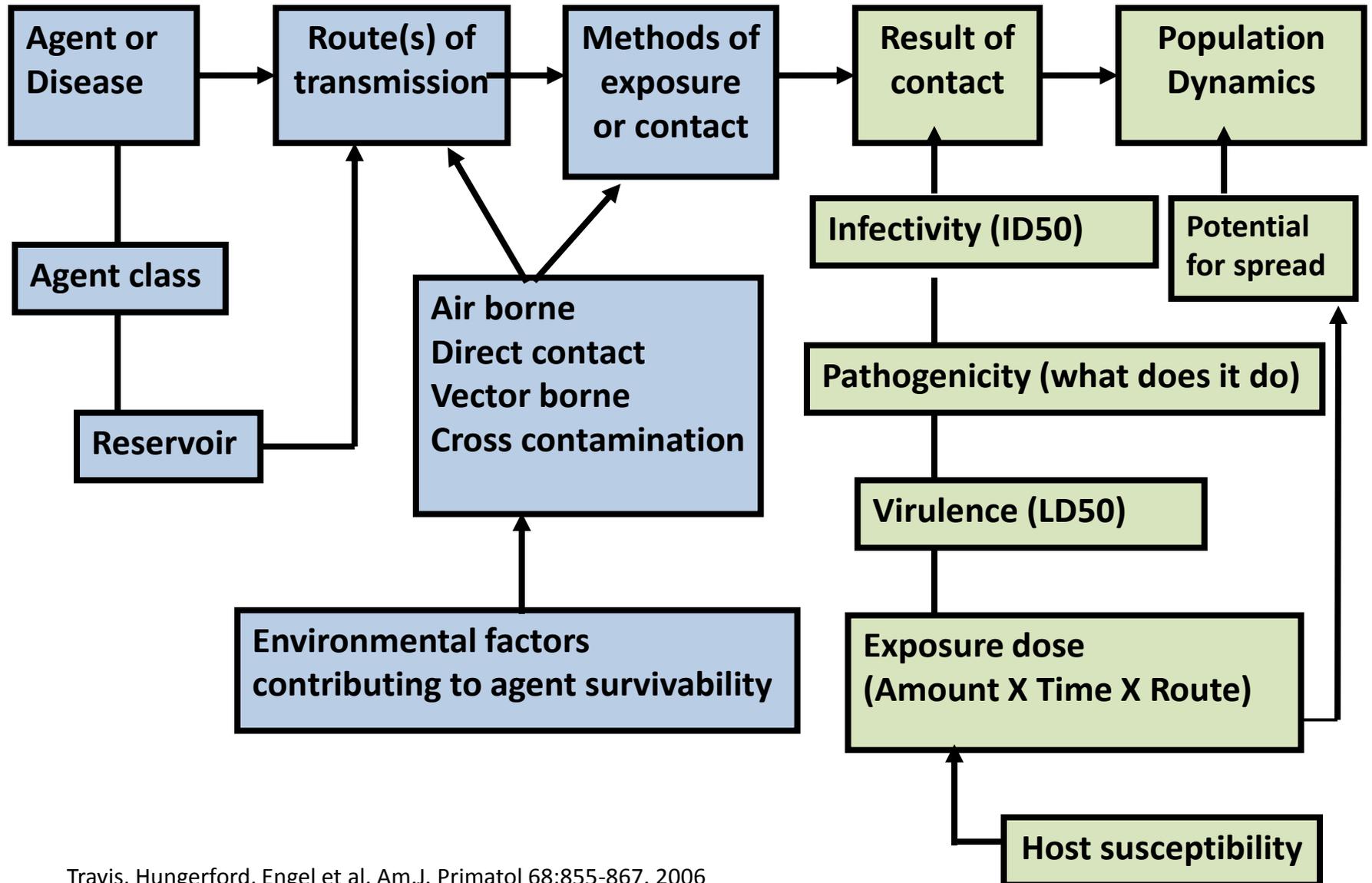
Risk Analysis paradigm

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

Environmental factors contributing to agent survivability

Infectivity (ID50)
Pathogenicity (what does it do)
Virulence (LD50)
Exposure dose (Amount X Time X Route)

Potential for spread

Host susceptibility

Travis, Hungerford, Engel et al. Am.J. Primatol 68:855-867. 2006

Risk Analysis paradigm

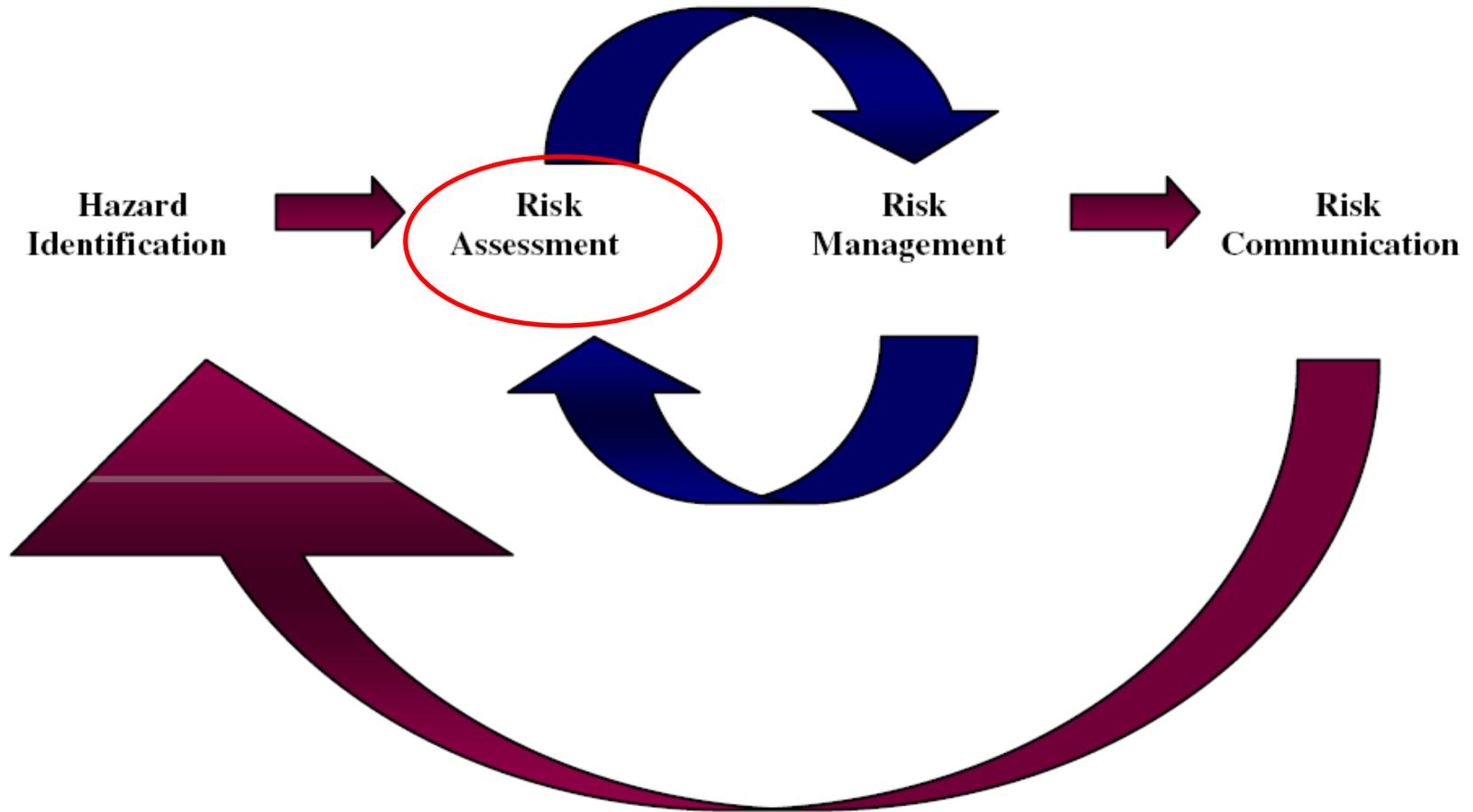Fig. 1. Schematic diagram of the risk analysis paradigm.

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
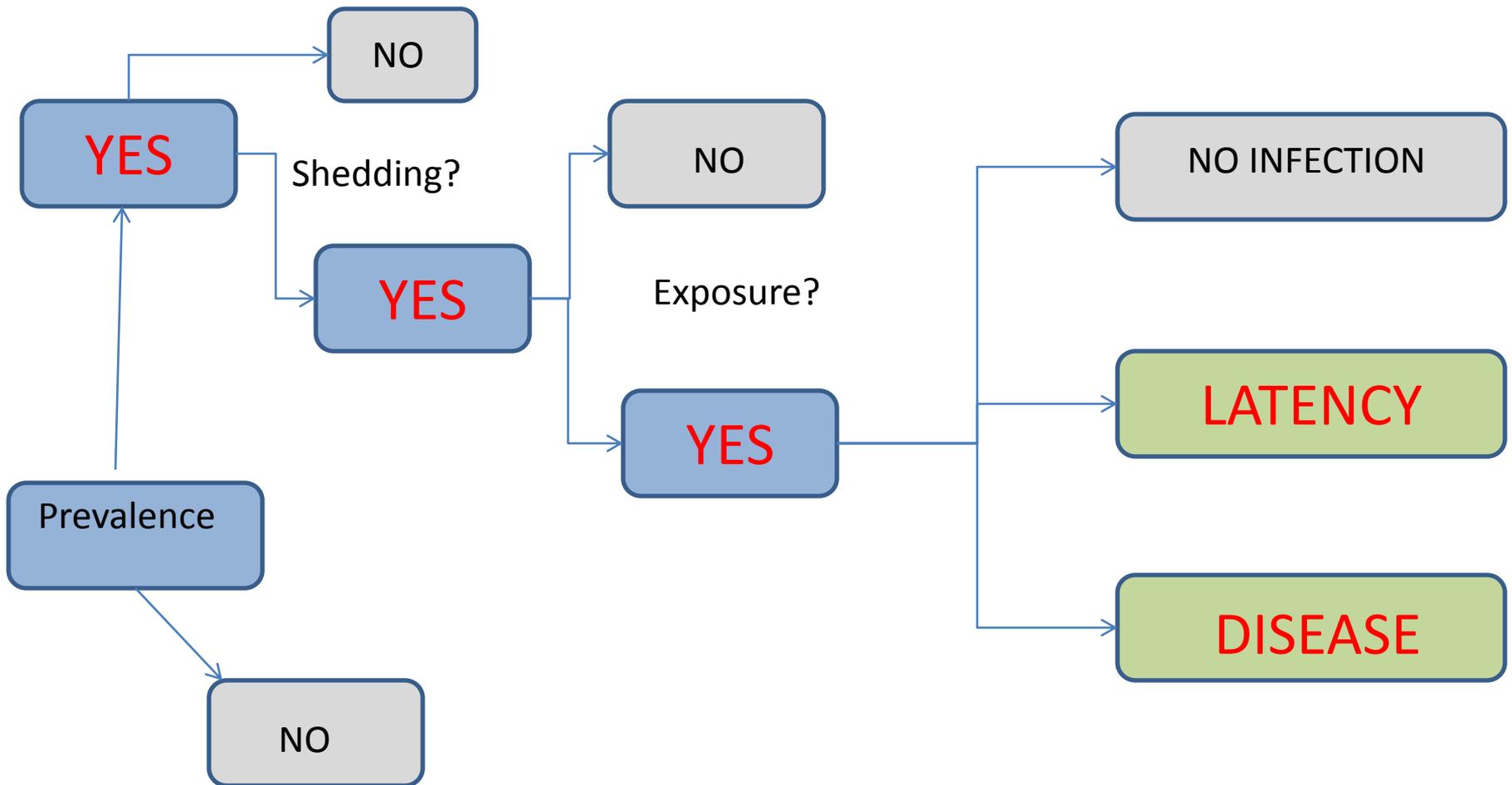 - Release
  - Exposure
  - Consequence

The fun stuff

Risk Assessment Phases

RELEASE **EXPOSURE** **CONSEQUENCE**

NO

YES

Shedding?

YES

Prevalence

NO

NO

Exposure?

YES

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?
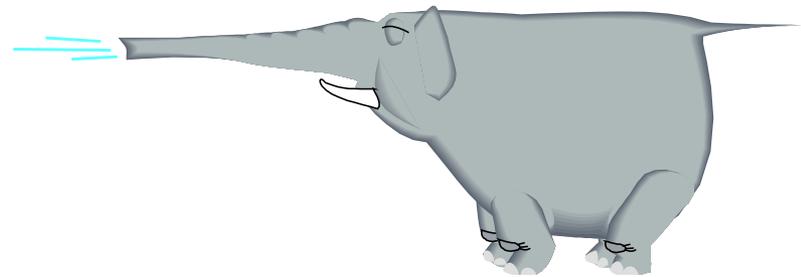   - site of any lesions in the elephant?
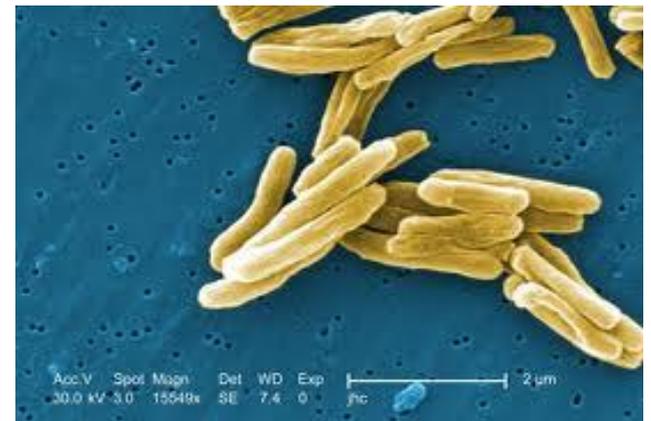
Images from CDC

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

- Chain reaction: so what?

- Consequence for population:
  - no infection
  - active disease
  - latency
- Consequence based on
  - total dose?
  - Virulence
  - Individual's immune status
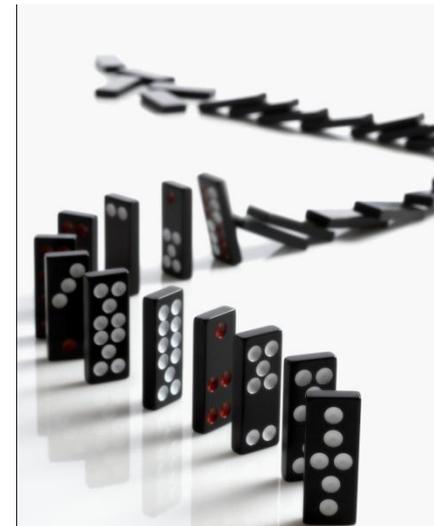
Risk Assessment: Consequence

- Summarize the risk to the population

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

- Additional effects include:
    - Psychological costs
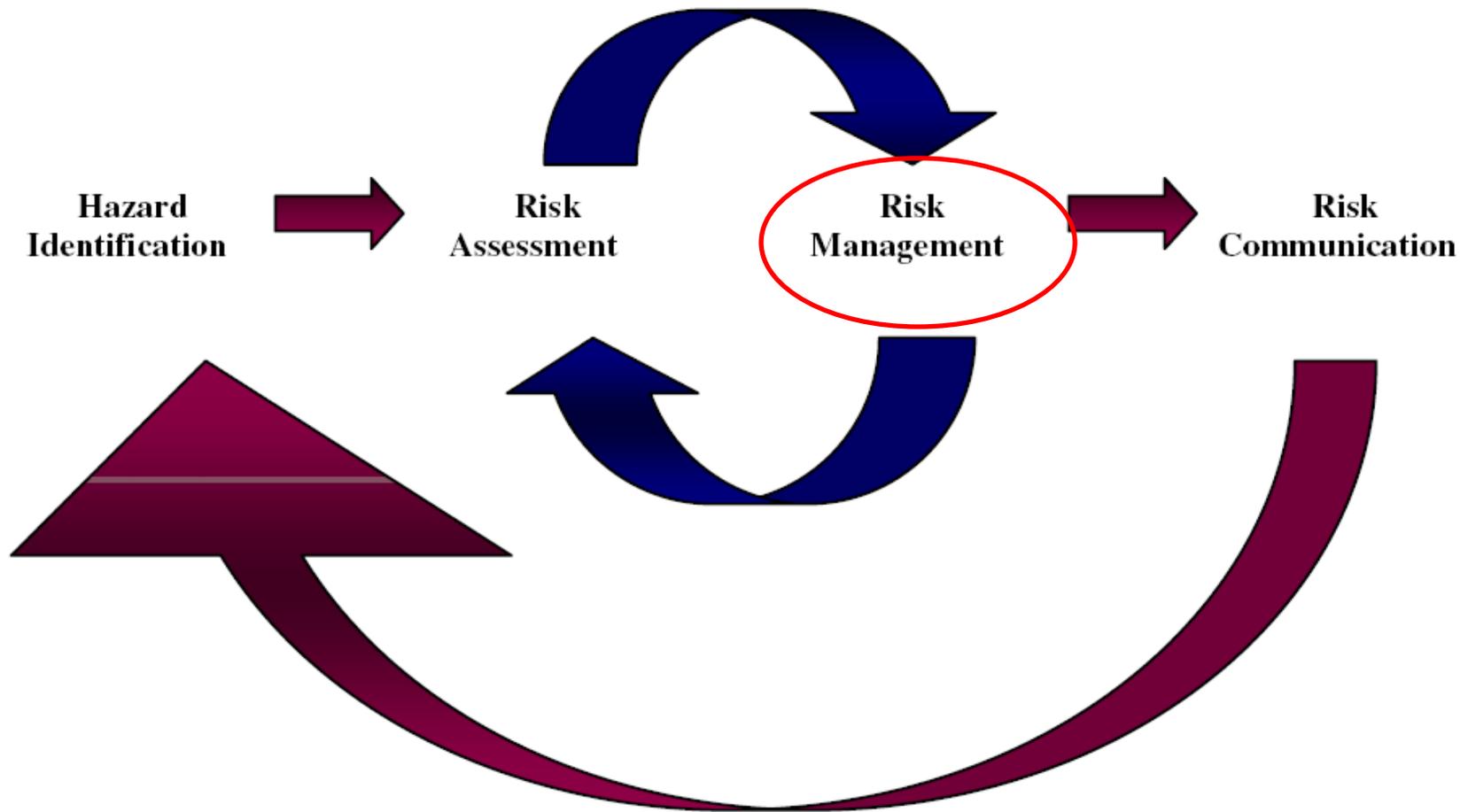   - Cost of treatment

Risk Analysis paradigm

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

Risk Management

Lincoln Park Zoo

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

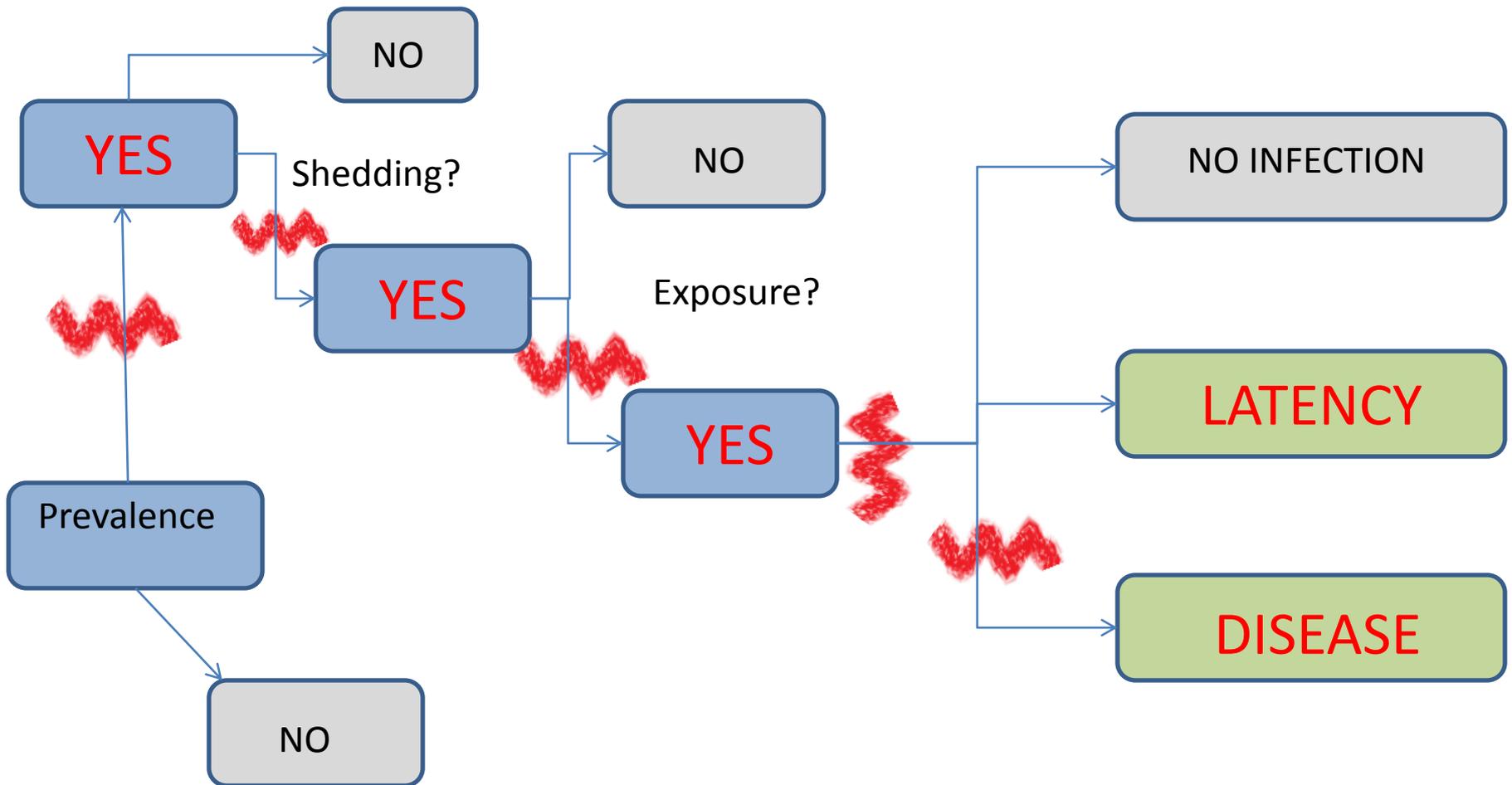- What can be done to *reduce the consequence of the outcome should it occur?*
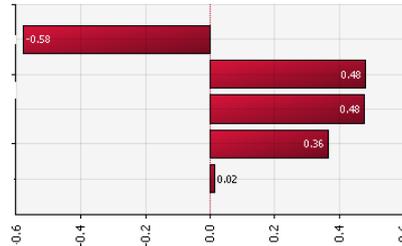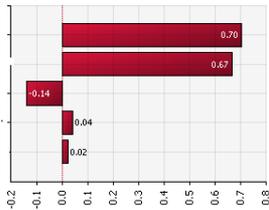
Risk Management

RELEASE **EXPOSURE** **CONSEQUENCE**

NO

YES

Shedding?

Prevalence

YES

NO

NO INFECTION

Exposure?

YES

LATENCY

DISEASE

Risk Management

- Sensitivity Analysis

  - Test various scenarios

  - Can be qualitative or quantitative

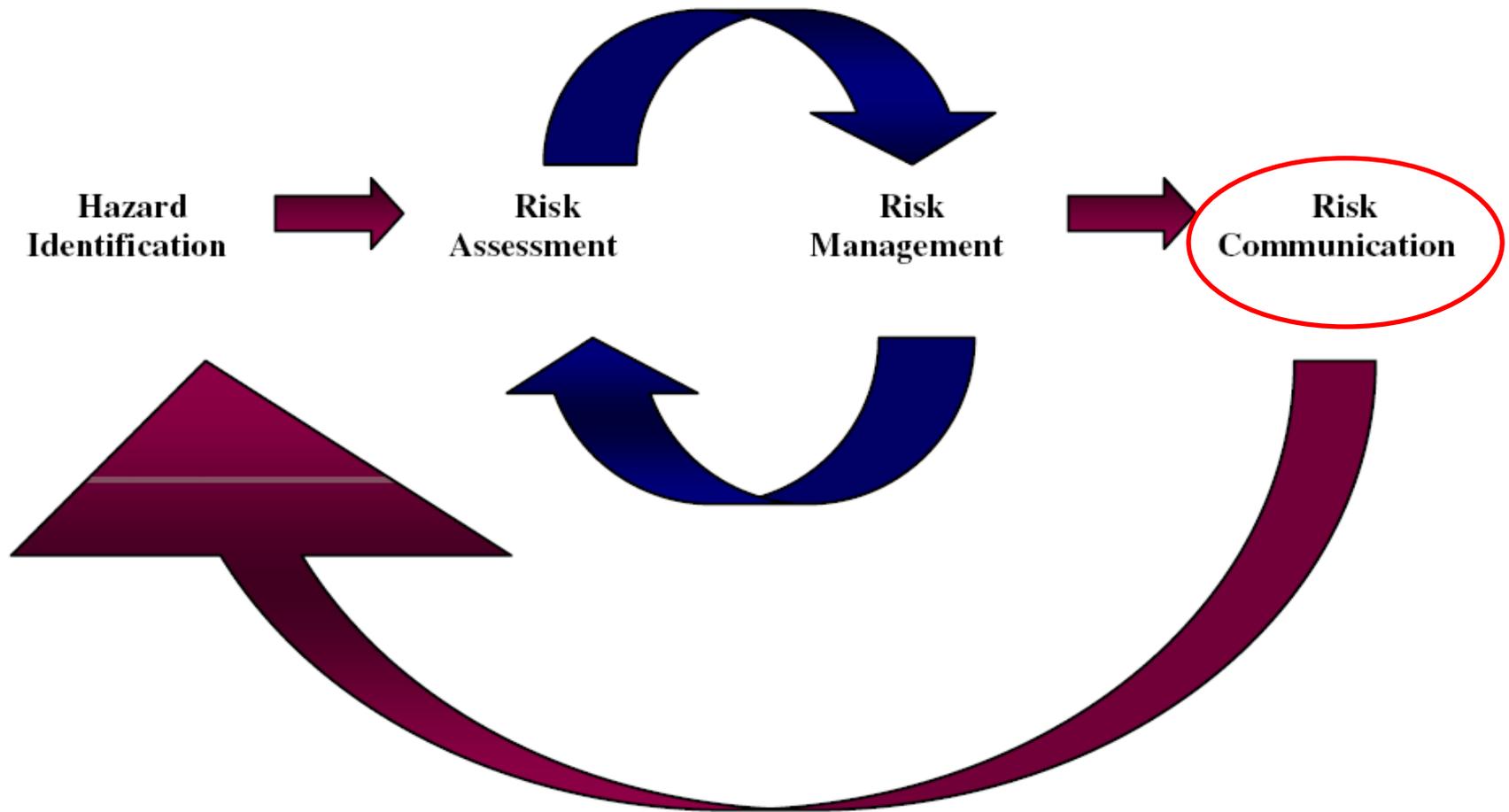# Risk Analysis paradigm

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**
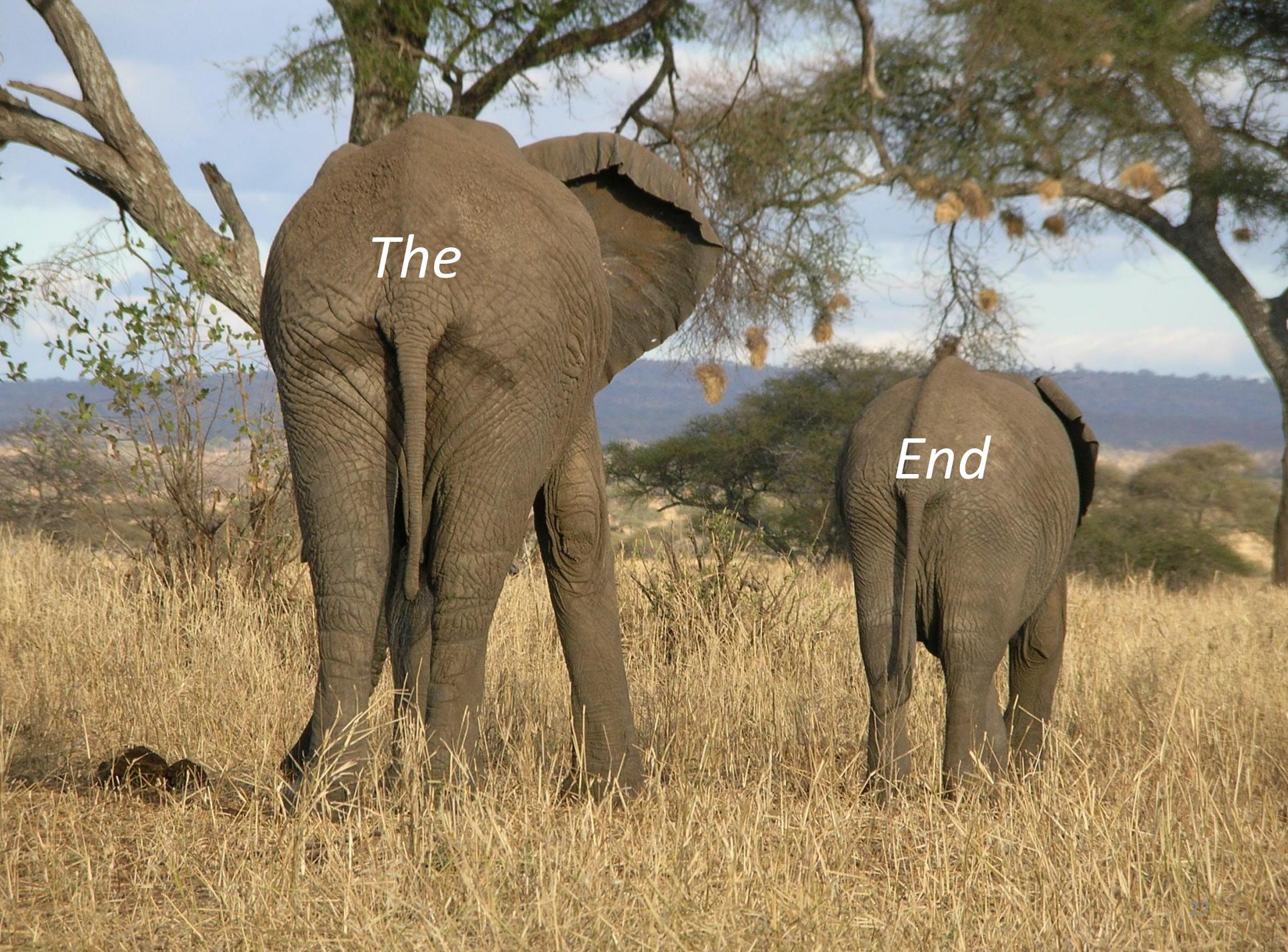- **Protocols**
- **Persistence**
- **Periodically review!**

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

The

End