

Use of Classical Environmental Risk Paradigms in the Context of Assessing Risks from Bio-Agents



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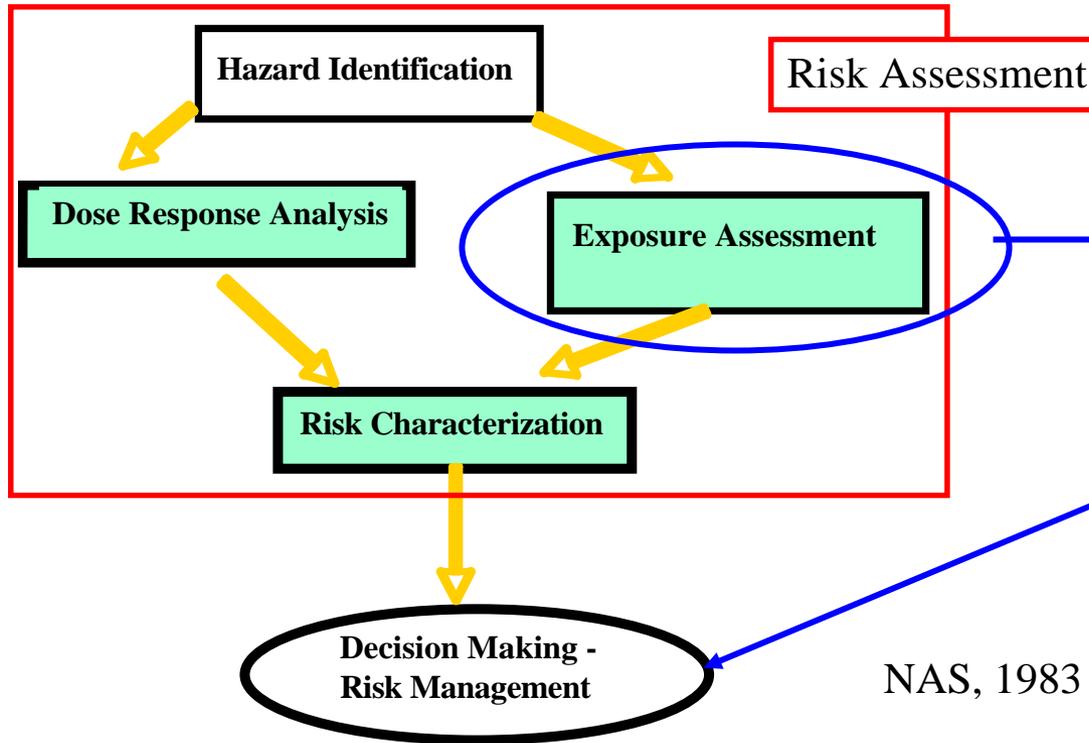
Objectives

- **Risk analysis has been used for environmental standard setting for decades**
 - To show how it can be used in this context
- **Illustrate with example**
- **Describe some of the work being done in CAMRA**

Some Questions

- A “detect” occurs; what is the potential risk to those exposed?
- What should the detection characteristics of sensor(s) system(s) be?
- What should target level after decon be?
 - And how do we verify it has been achieved?

The Risk Analysis Process



How to interpret information to assess whether exposure has/will pose an unacceptable risk

How to assess exposure

■ Exposure (# of organisms) is product of of

- Environmental concentration (#/volume)
- Exposure rate (volume/time inhaled or ingested)
- Exposure duration (time in contaminated environment)

By measurements, models or combination

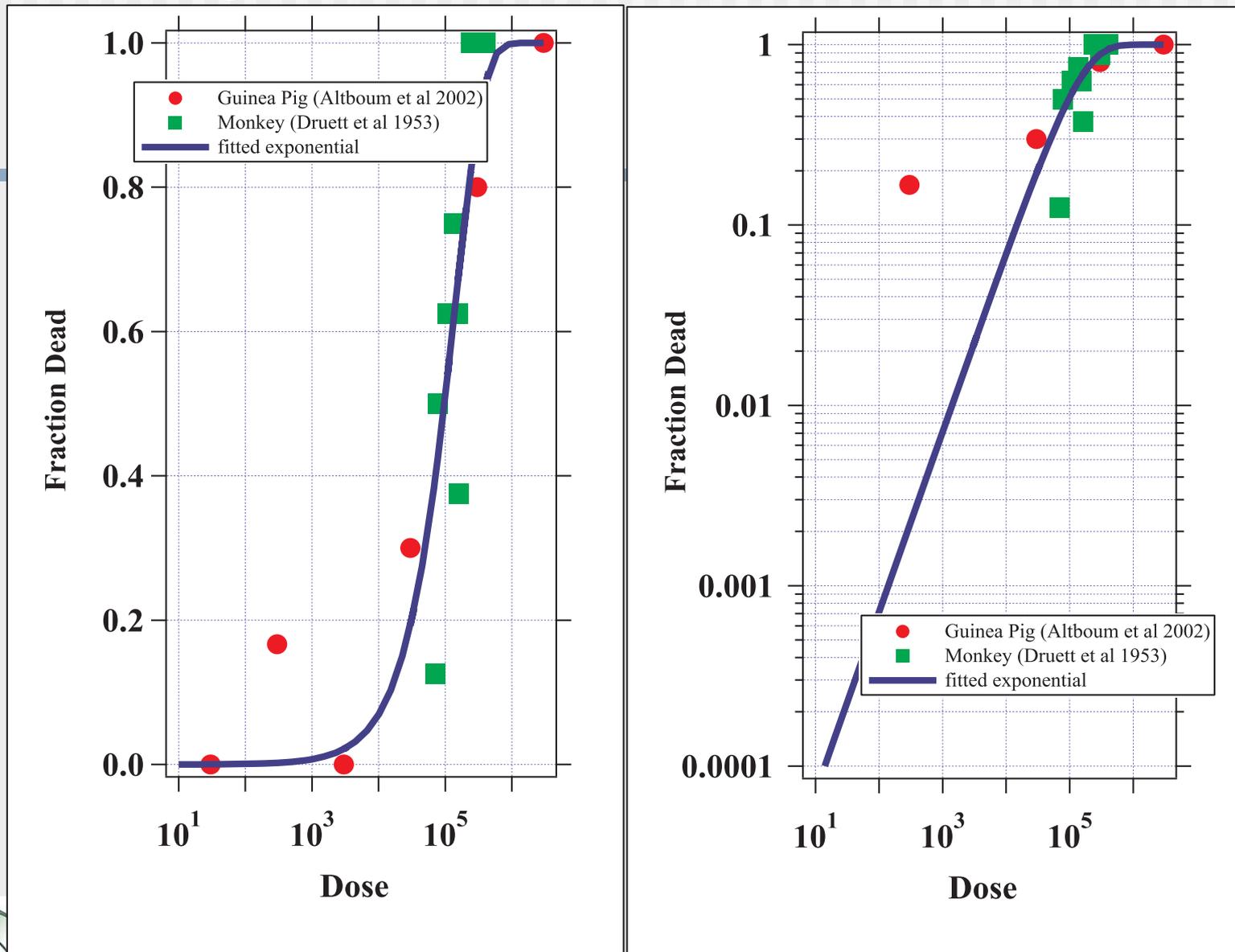
Some related work at CAMRA

- **Indoor air modeling using Markov Chain approaches**
- **Water distribution system modeling**
- **Assessment of fomite, aerosol, and water fate and transport**

Dose-Response

- **Key questions**
 - “mouse to man”
 - Host susceptibility
 - Strain potency
 - Effect of preparation
- **Initial insights from data-mining**

Example - Inhalation *B. anthracis*



Example

- Lets say we are designing for an indoor space where individuals spend 15 minutes in a potentially affected zone we want to protect
- Using $0.633 \text{ m}^3/\text{hr}$ as an inhalation rate, this gives an exposure of 0.16 m^3
- We are willing to “accept” a 1/10,000 risk

Critical Concentration

- This gives us an “acceptable” maximum dose of 15 spores
- So with the exposure of 0.16 m³, we need to detect 94 spores/m³ with “high” certainty (and “low” probability of false positives)

A short catalog of DR relationships under development at CAMRA

- **Cat A**

- Bacillus anthracis
- Yersinia pestis
- Variola major
- Lassa Virus
- Francisella tularensis

- **Cat B**

- Under discussion

Open Questions/In Progress

- **Validation using historical actual incidents**
- **How to extrapolate between routes**
- **Multiple exposures over time -- role of incubation and *in vitro* immunity**
- **Relation to population spread of contagious agents**

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