Bioterrorism:

Background and Significance

Materials from:

- Minnesota Department of Health,
- Dr. Brent L. Iverson and the Outreach Lecture Series of the Environmental Science Institute of the University of Texas at Austin, and Rashid A. Chotani, M.D., MPH
- Lisa Astuto-Gribble, Sandia National Labs

Take-Home Lessons:

1. Biological weapons are cheap to make and easy to conceal.

2. They have been of little military significance thus far, but of tremendous value from a propaganda perspective

3. Points 1. and 2. make biological weapons ideal for terrorism

4. American scientists are still playing “catch-up”, but have created several promising approaches to reduce the threat of biological weapons

An Abbreviated History

Biological Weapons have been contemplated since antiquity

An Abbreviated History

1763 - British commander Sir Jeffrey Amherst orders blankets used in smallpox clinic given to Native Americans as gifts

Sir Jeffrey Amherst

Christopher, *et al*., JAMA, **1997**, *278*, 412-417

An Abbreviated History

WWI: Livestock and cavalry horses targeted in Europe using animal-specific diseases (ex: glanders, from *Burkholderia malleri*). This was apparently very successful.

1st Lt. Lieutenant R.F. Okershauser making a Mallein test for glanders. All animals receive this treatment every 20 days for glanders. La Valdahon, Doubs, France. 01/28/1919

An Abbreviated History

WWII: Japanese launched at least 11 attacks on Chinese cities using pathogens including anthrax, cholera, salmonella, and plague.

Christopher, *et al*., JAMA, **1997**, *278*, 412-417

An Abbreviated History

The main impact of biological weapons has been propaganda:

China, the Soviet Union, and North Korea accused the US of using biological weapons in the Korean war.

Leitenberg, M. Crit. Rev. Microb., **1998**, *24*, 169-194

Christopher, *et al*., JAMA, **1997**, *278*, 412-417

An Abbreviated History

Biological Weapons have been contemplated since antiquity

There are confirmed recent terrorist/criminal examples:

1984 in rural Oregon a religious cult infected 751 residents with food poisoning through Salmonella contamination at 10 restaurants in an attempt to win local elections.

Christopher, *et al*., JAMA, **1997**, *278*, 412-417
Torok, *et al*., JAMA, **1997**, *278*, 389-395
Kolovic, *et al*., JAMA, **1997**, *278*, 396-398

Bhagwan Shree Rajneesh and Ma Anand Sheela, oregonlive.com

MN Patriots Council, Douglas County, 1991

An Abbreviated History

Biological Weapons have been contemplated since antiquity

There are confirmed recent terrorist/criminal examples:

Early 1990's the Japanese Aum Shrinrikyo cult released Anthrax in Tokyo, but no known victims. Apparently, this was not "weaponized" correctly.

Christopher, *et al*., JAMA, **1997**, *278*, 412-417

Torok, *et al*., JAMA, **1997**, *278*, 389-395

Kolovic, *et al*., JAMA, **1997**, *278*, 396-398

An Abbreviated History

Biological Weapons have been contemplated since antiquity

There are confirmed recent terrorist/criminal examples:

1996 the pathogen that causes dysentery was introduced into pastries in the break room of the St. Paul's Medical Center in Dallas, infecting 45.

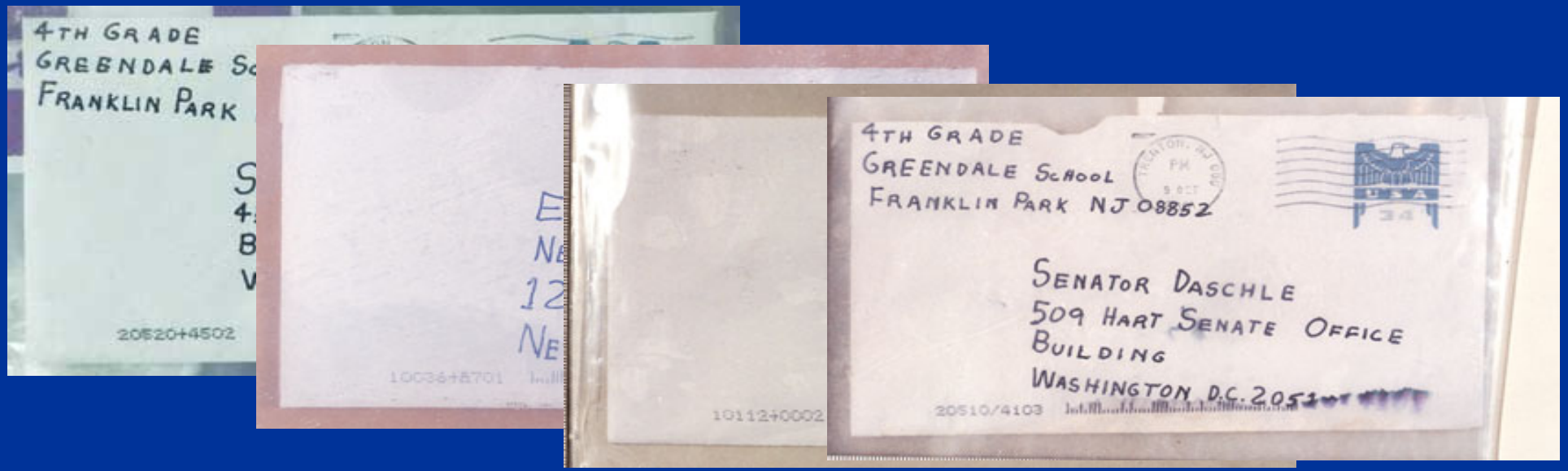
Christopher, *et al*., JAMA, **1997**, *278*, 412-417
Torok, *et al*., JAMA, **1997**, *278*, 389-395
Kolovic, *et al*., JAMA, **1997**, *278*, 396-398

An Abbreviated History

Biological Weapons have been contemplated since antiquity

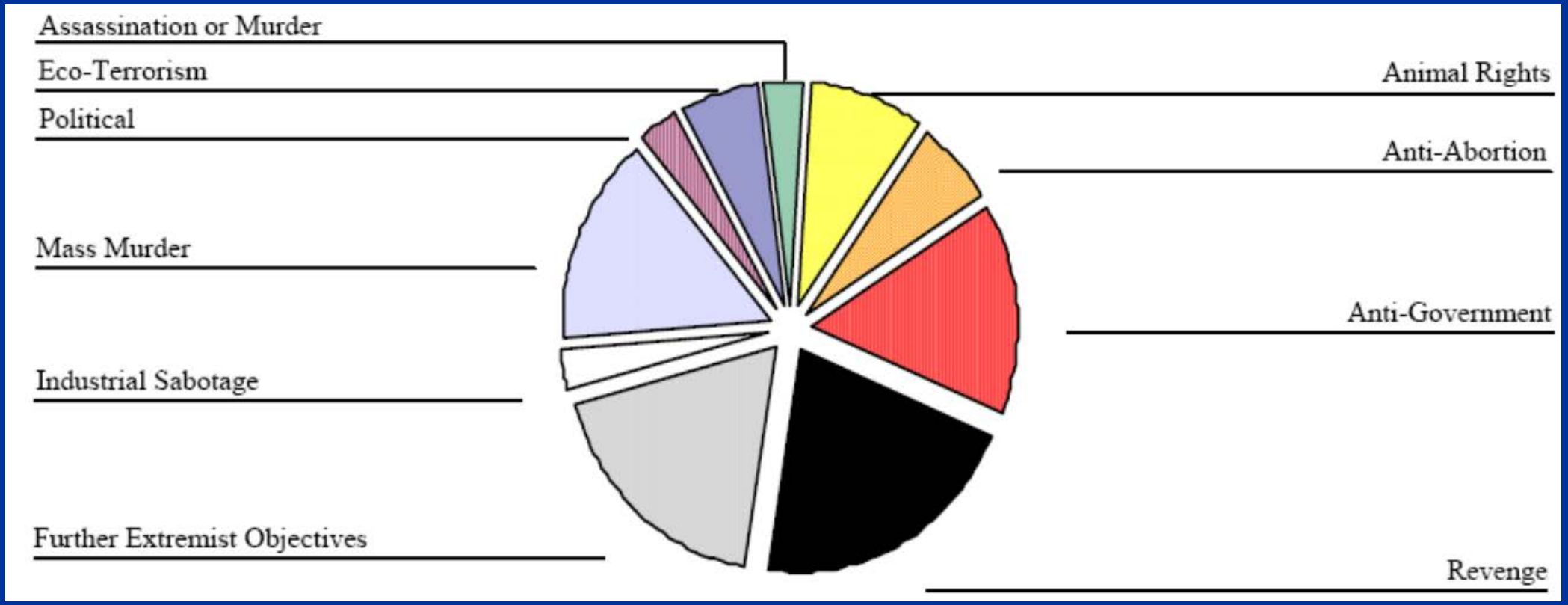
There are confirmed recent terrorist/criminal examples:

September of 2001 Anthrax laden letters sent to several locations in US. 22 confirmed cases of anthrax were reported, 11 cases of inhalation anthrax, 5 deaths.



Inglesby, *et al*., JAMA, **2002**, *287*, 2236-2252

Review of 33 incidents from 1960 – 1999



(J.B. Tucker 1999. Emerging Infectious Diseases)

Efforts to control materials

US Domestic Efforts to Reduce Access to Dangerous Biological Materials

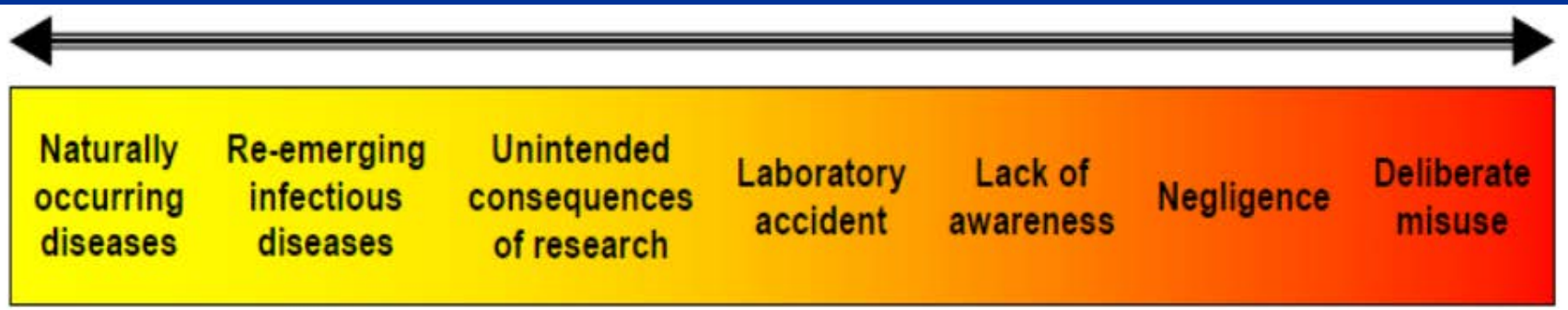
- **Realization that bioscience facilities are potential sources of biological weapons material**
- **USA PATRIOT Act of 2001 – US Public Law 107-55**
  - Restricted Persons
- **Bioterrorism Preparedness Act of 2002 – US Public Law 107-188**
  - US Select Agent Rule
  - Hazardous Material transport security
- **No international standards for managing dangerous pathogens internationally**

National Animal Disease Center, Ames, Iowa

Centers for Disease Control and Prevention, Atlanta, Georgia

International
BIOLOGICAL THREAT REDUCTION

Alternative motivations



Wilton Park, September 2009

Advantages of Biologics As Weapons

- May be easier, faster to produce and more cost-effective than other weapons
- Potential for dissemination over large geographic area
- High morbidity and mortality
- Creates panic
- Person-to-person transmission possible (smallpox, plague, and viral hemorrhagic fever)
- Difficult to diagnose and/or treat

Ideal Characteristics for Potential Biological Terrorism Agent

- Inexpensive and easy to produce
- Can be aerosolized (1-10 μm)
- Survives sunlight, drying, heat
- Cause lethal or disabling disease
- Person-to-person transmission
- No effective treatment or prophylaxis

Biological Agents Ranking System

Public Health impact criteria based on:

- **Morbidity and mortality**
- **Delivery potential**
- **Public perception (fear, civil disruption)**
- **Public health preparedness needs**

Level A Bioterrorism Agents

- Anthrax (*Bacillus anthracis*)
- Smallpox (Variola major)
- Plague (*Yersinia pestis*)
- Botulism toxin (*Clostridium botulinum*)
- Tularemia (*Francisella tularensis*)
- Viral hemorrhagic fevers (VHF)

Other Potential Bioterrorism Agents

- Brucellosis (*Brucella* species)
- Glanders (*Burkholderia mallei*)
- Q fever (*Coxiella burnetii*)
- Cholera (*Vibrio cholera*)
- *Salmonella* sp. and *Shigella* sp.
- Venezuelan Equine Encephalitis (VEE)
- Staphylococcal Enterotoxin B
- Ricin (from castor beans)
- T-2 Mycotoxins

(Note that this is not a complete listing)

Estimated Casualties From a Hypothetical Bioterrorism Release*

Agent	Downwind Reach (km)	Dead	Sick**
Rift Valley Fever	1	100	10,000
Typhus	5	2,500	30,000
Brucellosis	10	150	27,000
Plague	10	6,500	27,000
Q Fever	>20	50	60,000
Tularemia	>20	4,500	60,000
Anthrax	>20	24,000	60,000

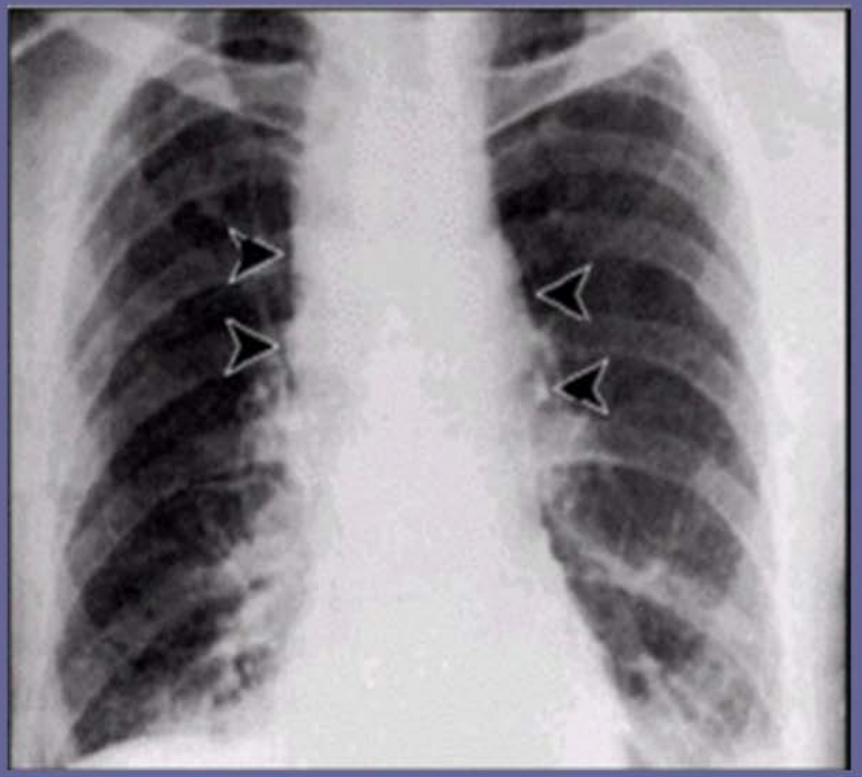
*50 kg by aircraft, 2 km line upwind of a city of 500,000
** Includes deaths

Symptoms of Potential Bioterrorism Diseases - Challenges of Detection

Agent	Clinical Effect	Initial Symptoms
Anthrax	Mediastinitis	Headache
Plague	Pneumonia	Fever
Q fever	Pleuritis, hepatitis	Malaise
Tularemia	Pneumonia	Cough
Smallpox	Pustules	

Inhalational Anthrax

Normal chest x-ray

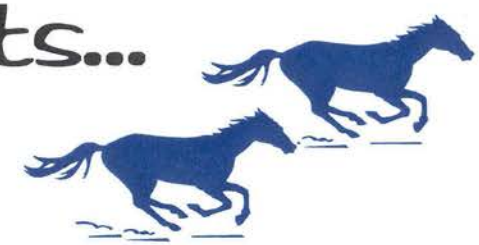


Mediastinal widening with inhalation anthrax (*JAMA* 1999:281:1735-1745)

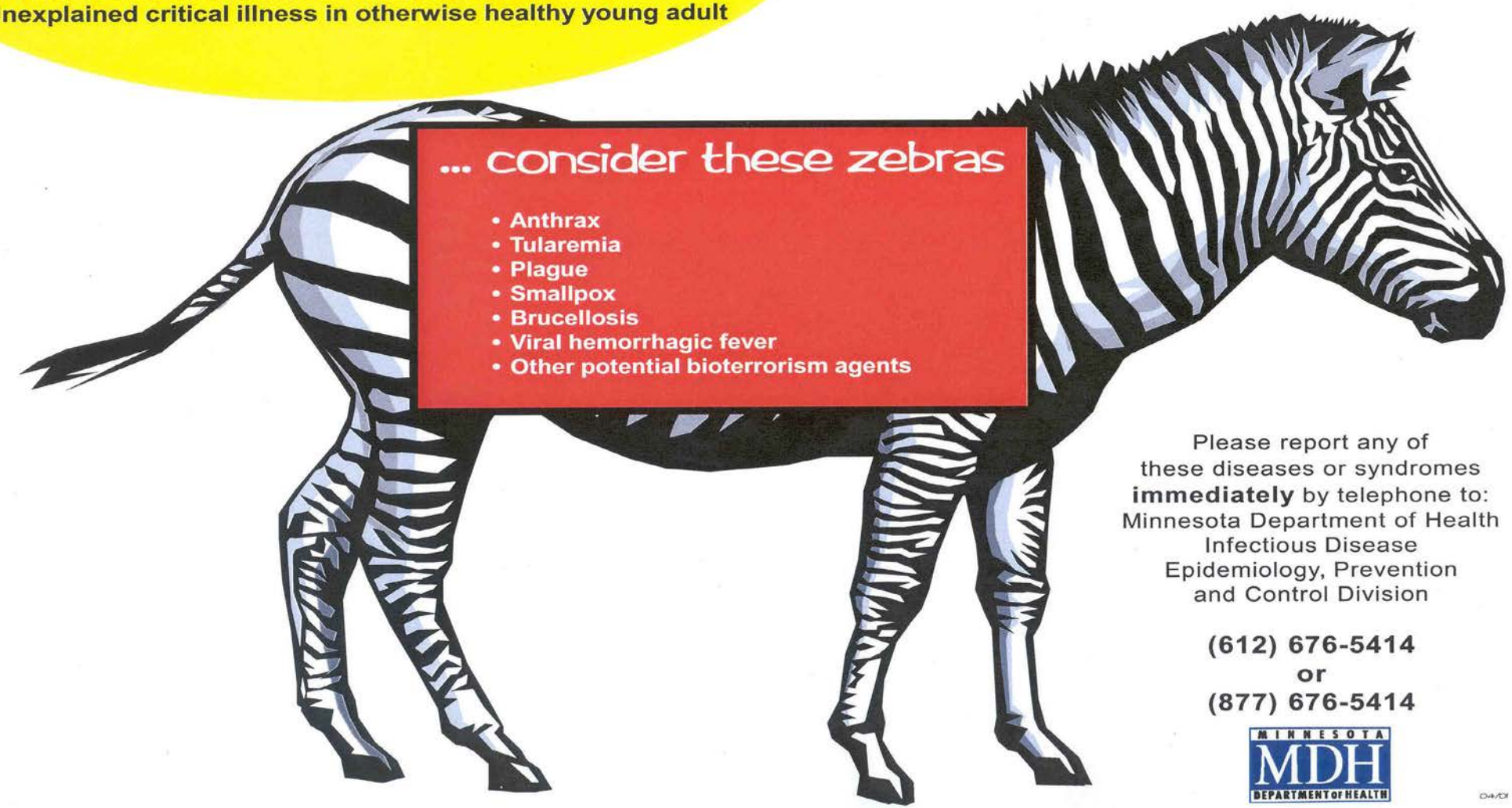
Biological Terrorism?
Epidemiologic Clues

- Tight cluster of cases
- High infection rate
- Unusual or localized geography
- Unusual clinical presentation
- Unusual time of year
- Dead animals

If you hear these hoofbeats...



- Widened mediastinum on thoracic radiograph
- Influenza-like illness in summer months
- Pneumonia death in otherwise healthy young adult
- Vesicular rash that starts on extremities
- Hemorrhagic fever syndrome
- Cluster of unusual, severe or unexplained illnesses
- Unexplained critical illness in otherwise healthy young adult



... consider these zebras

- Anthrax
- Tularemia
- Plague
- Smallpox
- Brucellosis
- Viral hemorrhagic fever
- Other potential bioterrorism agents

Please report any of these diseases or syndromes **immediately** by telephone to:
Minnesota Department of Health
Infectious Disease Epidemiology, Prevention and Control Division

(612) 676-5414
or
(877) 676-5414

MINNESOTA MDH DEPARTMENT of HEALTH

04/01