Agents of Bioterrorism: Argument for and Against a List That Needs Cropping

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### CDC and NIAID Category A, B & C Priority Pathogens

#### Category A
- *Bacillus anthracis* (anthrax)
- *Clostridium botulinum*
- *Yersinia pestis*
- Variola major (smallpox) and other pox viruses
- *Francisella tularensis* (tularemia)
- Viral hemorrhagic fevers
  - Arenaviruses
    - LCM, Junin virus, Machupo virus, Guanarito virus
    - Lassa Fever
  - Bunyaviruses
  - Hantaviruses
  - Rift Valley Fever
- Flaviruses
  - Dengue
- Filoviruses
  - Ebola
  - Marburg

#### Category B
- *Burkholderia pseudomallei*
- *Coxiella burnetti* (Q fever)
- *Brucella* species (brucellosis)
- *Burkholderia mallei* (glanders)
- Ricin toxin (from *Ricinus communis*)
- Epsilon toxin of *Clostridium perfringens*
- *Staphylococcus* enterotoxin B
- Typhus fever (*Rickettsia prowazekii*)
- Food and Waterborne Pathogens
  - Bacteria
    - Diarrheagenic *E.coli*
    - Pathogenic Vibrios
    - *Shigella* species
    - *Salmonella*
    - *Listeria monocytogenes*
    - *Campylobacter jejuni*
    - *Yersinia enterocolitica*
  - Viruses (Caliciviruses, Hepatitis A)
  - Filoviruses
    - Ebola
    - Marburg

#### Category C
- Additional viral encephalitides
  - West Nile Virus
  - LaCrosse
  - California encephalitis
  - VEE
  - EEE
  - WEE
  - Japanese Encephalitis Virus
  - Kyasanur Forest Virus

#### Emerging infectious disease threats such as Nipah virus and additional hantaviruses.

### NIAID priority areas:
- Tickborne hemorrhagic fever viruses
  - Crimean-Congo Hemorrhagic fever virus
- Tickborne encephalitis viruses
- Yellow fever
- Multi-drug resistant TB
- Influenza
- Other Rickettsias
- Rabies

Natural vs. Criminal Disease

- Textbook description
- Clinical experience
- Epidemiology considerations
- Genetically engineered agents
- Typical vs. atypical disease progression
- Confusion in communication
- Panic factor
Ideal Bioweapon

- Highly pathogenic – incapacity or death
- Person to person spread – aerosol, water, food
- No immunity in at risk population
- Identity of the pathogen obscure
- Resistance to antimicrobial agents
- Stability in disseminating vehicle
- Little risk to perpetrator
- Availability of bioweapon
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    - Pathogenic Vibrios
    - *Shigella* species
    - *Salmonella*
    - *Listeria monocytogenes*
    - *Campylobacter jejuni*
    - *Yersinia enterocolitica*
  - Viruses (Caliciviruses, Hepatitis A)
  - Protozoa
    - *Cryptosporidium parvum*
    - *Cyclospora cayatanensis*
    - *Giardia lamblia*
    - *Entamoeba histolytica*
    - *Toxoplasma*
    - *Microsporidia*

### Category C
Emerging infectious disease threats such as Nipah virus and additional hantaviruses.

#### NIAID priority areas:
- Tickborne hemorrhagic fever viruses
  - Crimean-Congo Hemorrhagic fever virus
- Tickborne encephalitis viruses
- Yellow fever
- Multi-drug resistant TB
- Influenza
- Other Rickettsias
- Rabies

Priority of Potential Pathogens: Category A, B, C

- **A:** HIGH – Fits all or most criteria
  - Readily available
  - Minimal risk to terrorists- vaccine, antimicrobials
  - Technology for production simple

- **B:** MARGINAL – possibly fits many criteria

- **C:** UNREASONABLE
  - Herd immunity
  - Complex production – BSL4
  - Arthropod delivery system
### Category A

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- *Clostridium botulinum*
- *Yersinia pestis*
- Variola major (smallpox) and other pox viruses
- *Francisella tularensis* (tularemia)
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    - Hantaviruses
    - Rift Valley Fever
  - Flaviruses
    - Dengue
  - Filoviruses
    - Ebola
    - Marburg

*Vibrio vulnificus*  
*Bordetella pertussis*  
*Norwalk Virus*  

### Category B

- *Burkholderia pseudomallei*
- *Coxiella burnetti* (Q fever)
- *Brucella species* (brucellosis)
- *Burkholderia mallei* (glanders)
- *Ricin toxin* (from *Ricinus communis*)
- Epsilon toxin of *Clostridium perfringens*
- *Staphylococcus enterotoxin B*
- Typhus fever (*Rickettsia prowazekii*)
- Food and waterborne pathogens
  - *Diarrheagenic E.coli*
  - Pathogenic *Vibrios*
  - *Shigella species*
  - *Salmonella*
  - *Listeria monocytogenes*
  - *Campylobacter jejuni*
  - *Yersinia enterocolitica*

### Category C

- Emerging infectious disease threats such as Nipah Virus and additional hantaviruses

#### NIAID priority areas:

- Tick borne hemorrhagic fever viruses
  - Crimean-Congo Hemorrhagic Fever Virus
- *Tickborne Encephalitis Viruses*
- *Yellow Fever*
- *Multi-drug resistant TB*
- *Influenza*
- *Other Rickettsias*
- *Rabies*
- *Erlichiae spp. Verotoxin*
Category A Pathogens (ANW)

*Bacillus anthracis* (anthrax)
Variola major (smallpox)
*Francisella tularensis* (tularemia)
*Yersinia pestis* (plague pneumonia)
*Vibrio vulnificus* (septicemia)
*Burkholderia pseudomallei* (meloidosis)
*Bordetella pertussis* (whooping cough)
*Shigella dysenteriae* (dysentery)
Norwalk virus (gastroenteritis)
Ricin toxin
Summary Points

• There are many agent threats
• Prioritizing threat agents essential
  – Practical realities
  – BSL4 facilities few, expensive
  – Arthropod delivery adds complexity
  – Viral biology, production, stability complex
• Top concerns are pathogens, toxins easy to obtain, weaponize
• Preventive efforts include
  – Surveillance strategies
  – Laboratory strategies
  – Vaccine strategies
  – Isolation strategies
  – Thoughtfully informing public