The public is exposed to a lot of information about potential biological attacks

Initiation of BioWatch at the State of the Union on January 28, 2003: “…deploying the nation's first early warning network of sensors to detect biological attack”

What are the key issues around BW and BW defense?
What are distractions?
Biosecurity is a multifaceted problem that requires integrating many disparate components

<table>
<thead>
<tr>
<th>Anticipate</th>
<th>Prepare</th>
<th>Prevent</th>
<th>Detect</th>
<th>Response</th>
<th>Attribute</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data</strong></td>
<td><strong>Validation</strong></td>
<td><strong>Threats</strong></td>
<td><strong>Vaccines</strong></td>
<td><strong>Response</strong></td>
<td><strong>Pathogen biology</strong></td>
</tr>
<tr>
<td>• Collections</td>
<td>• Signatures</td>
<td>• Weaponized</td>
<td>• Development</td>
<td></td>
<td>• Infectivity</td>
</tr>
<tr>
<td>• All source</td>
<td>• Assays</td>
<td>• GM</td>
<td>• Efficacy</td>
<td></td>
<td>• Signatures</td>
</tr>
<tr>
<td>• Directed</td>
<td>• Processes</td>
<td>• Individual</td>
<td>• Deployment</td>
<td></td>
<td>• Manipulation</td>
</tr>
<tr>
<td>discovery</td>
<td>• Chain-of-custody</td>
<td>• State sponsored</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Interpretation   | Backgrounds      | Epidemiology       | Surveillance            |                 |
| • Feasibility    | • Natural        | • Early detection  | • Sensitivity           |                 |
| • Intent         | • Manufacturing  | • Privacy          | • Specificity           |                 |

**Link all of these components into a coherent architecture**
We would like to know even more!

BW attacks sound scary
- Genetically modified threat
- Bio Terror & Bio Error

“Mother Nature” as terrorist
- Re-emergent diseases
- Influenza
The human and economic impact of endemic pathogens can be amplified.

The systems-level challenge is to counter numerous potential threats.

- Endemic
- Clever Use
- Modified
  - Genetic mods
  - Weaponized
A stratified view of bioterrorist threats

- **Scale?**
  - Level I (1 – 1000)
  - Level II (1000 – 10,000)
  - Level III (>10,000)

- **Agent?**
  - Aerosol
  - Food supply
  - Water supply
  - Carrier
  - Contagious
    - Treatable (Plague)
    - Non-Treatable (Ebola)
  - Non-Contagious
    - Treatable (Anthrax)
    - Non-Treatable (EEV)

- **Detect?**
  - To Prevent
  - To Protect
  - To Treat & / or Isolate
Looking for solutions: there are significant benefits to early detection of a biological attack

Treatments and quarantines must be administered early

<table>
<thead>
<tr>
<th>Disease</th>
<th>Incubation period (days)</th>
<th>Intervention window (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smallpox</td>
<td>12 to 14</td>
<td>3 to 4</td>
</tr>
<tr>
<td>Pulmonary Anthrax</td>
<td>5 to 7</td>
<td>1 to 2</td>
</tr>
<tr>
<td>Plague</td>
<td>3 to 4</td>
<td>1</td>
</tr>
<tr>
<td>Influenza</td>
<td>2 to 5</td>
<td>3</td>
</tr>
</tbody>
</table>

A combination of complementary strategies are needed for early detection
Examples for preventing, detecting, and responding to WMD events
Examples for preventing, detecting, and responding to WMD events

Prevent

Environmental detection

Response and restoration

Signatures

Exposed

Contagious

Forensics and attribution

Backgrounds
Examples for preventing, detecting, and responding to WMD events

- Prevent
- Environmental detection
- Response and restoration

Signatures

Detect to prophylax

Detect to warn

Exposed

Contagious

Forensics and attribution
Examples for preventing, detecting, and responding to WMD events

Emerging Threat

Prevent

Environmental detection

Response and restoration

Detect to prophylax

Detect to warn

Triage Dx

Epidemiology to treat

Consequence management

Forensics and attribution

Signatures

Backgrounds

New strategies

Contagious

Exposed
Developing new operational capabilities took several years and integration across multiple disciplines.
Early detection combined with models of dispersion are valuable

- Bio attacks may not be visible
- Want to act before symptoms present
- Identify affected area / people / livestock
- Prophylax, treat and clean-up

- BUT timelines are not short enough!
What community norms can be established, promoted or enforced?

- Biological Weapons Convention is intent-based
- US offensive BW program terminated in 1969
  - ‘Frozen’ perspective on BW
  - Recent investments in biodefense
- Are BW the “poor man’s” nuke?
  - Role of deterrence?
  - What value does attribution provide?
  - When would a nation turn to BW?
  - When would a terrorist group?
  - Latency?
- Contrast to other areas
  - OPCW, for example
There are critical shortfalls in the nation’s infrastructure for dealing with bio-terrorism

- **Life science R&D exploding**
  - Inherent “dual benefit”
  - Proliferating
  - 1969 out-of-date reference
  - BWC

- **Countermeasures not keeping up**
  - Large cost and time from concept to regulatory approval
  - Increasing antibiotic and antiviral resistance
  - Few novel antibiotics in the pipeline
  - Vaccines not commercially attractive

- **Similar issues in agriculture and food**

Countermeasure developers must adopt more rapidly than adversaries
An example of rapid response
2003 Exotic Newcastle Disease Virus outbreak
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