We will start momentarily at 2pm ET

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Detecting Bioterrorism: Is Chemistry Enough?

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### Human anthrax in the US, 1950-2000

<table>
<thead>
<tr>
<th>Total</th>
<th>State</th>
<th>Year (# Cases)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>New Hampshire</td>
<td>1978 (2); 1966 (2); 1966 (1); 1957 (9)</td>
<td>Textile mills</td>
</tr>
<tr>
<td>≥ 9</td>
<td>North Carolina</td>
<td>1987 (1); 1978 (2); 1956 (≥ 5); 1953 (1)</td>
<td>Textile mills</td>
</tr>
<tr>
<td>5</td>
<td>South Carolina</td>
<td>1974 (1); 1960 (4)</td>
<td>Textile mills</td>
</tr>
<tr>
<td>5</td>
<td>Texas</td>
<td>1959 (5)</td>
<td>Animal outbreak</td>
</tr>
<tr>
<td>4</td>
<td>New Jersey</td>
<td>1975 (3); 1959 (1)</td>
<td>Gelatin plant; animal outbreak</td>
</tr>
<tr>
<td>2</td>
<td>California</td>
<td>1976 (1); 1968 (1)</td>
<td>Wool; animal outbreak</td>
</tr>
<tr>
<td>2</td>
<td>Louisiana</td>
<td>1971 (2)</td>
<td>588 animal cases</td>
</tr>
<tr>
<td>2</td>
<td>Pennsylvania</td>
<td>1961 (1); 1957 (1)</td>
<td>Textile mill, tannery</td>
</tr>
<tr>
<td>1</td>
<td>Florida</td>
<td>1974 (1)</td>
<td>Imported goatskin</td>
</tr>
<tr>
<td>1</td>
<td>North Dakota</td>
<td>2000 (1)</td>
<td>Animal outbreak</td>
</tr>
<tr>
<td>1</td>
<td>Ohio</td>
<td>1964 (1)</td>
<td>Goat hair</td>
</tr>
<tr>
<td>1</td>
<td>Oklahoma</td>
<td>1957 (1)</td>
<td>Animal outbreak</td>
</tr>
</tbody>
</table>

**“Amerithrax” letters**

- Images of letters from the Amerithrax case are shown, including envelopes addressed to Senator Daschle and Senator Leahy with postmarks indicating addresses in New York and Washington, D.C.
Each letter contained less than a sugar cube of material…

So how do you protect against a whole bag?

Audience Question:

When will the next biological attack occur?

- Within the next 5 years
- Within the next 10 years
- More than 15 years from now
- Never; this is much ado about nothing
Environmental Monitoring for Bioaerosols

COLLECT   EXTRACT   ANALYZE

How do you site bioaerosol collectors?

QUIC: Quick Urban & Industrial Complex Model
2005 Modeled Plume & Deposition

- Plume
- Deposition

Dosage (g/m$^3$)

Deposition (g/m$^2$)

2009 Collector Siting

Circle = air sampler; surface samples collected in vicinity
2009 Modeled Plume & Deposition

2009 results: 12 hours post-release
Circle = air sampler; square = surface samples
2009 results: 24 hours post-release
Circle = air sampler; no surface samples collected

2009 results: 48 hours post-release
Circle = air sampler; no surface samples collected
2009 results: 72 hours post-release

Circle = air sampler; no surface samples collected

Audience Question:
Do biological agents in the environment behave like other particles?

• Yes; one soil-bound particle is like any other
• No; bioagents behave differently
Summary

- Aerosol collectors in the US continuously monitor for threat agents to protect against a large-scale aerosolized biological attack.
- Collectors are typically sited using transport and dispersion modeling and historic wind data.
- Samples are analyzed using PCR.
- Experiments and modeling have shown these systems are effective at detecting the presence of DNA.
- Systems can warn public health in time to mount an effective response.

But does DNA in the air mean people are infected?

- It only means there’s DNA in the air.
- Current systems often can’t confirm viability.
- No rapid techniques to confirm human exposure.

- A recent USGS study found *B. anthracis* in 5% of soil samples collected on a north-south transect between Manitoba, Canada and Texas.
Audience Question:

If you were a public health official and *B. anthracis* DNA was found in the air in your city, what would you do?

- Nothing; it was probably from naturally occurring bacteria
- Wait for more information; if it’s really a problem, someone will show up sick soon
- Panic! Evacuate and/or begin mass prophylaxis with antibiotics or vaccines

References

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