Experience with Rash Illness and Gram Positive Rod Surveillance Systems Geared at Improving Sensitivity and Timeliness of Detection of Initial, Sentinel Cases of Smallpox and Anthrax - Connecticut

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Outline of Presentation

- PHP Surveillance Objectives
  - Need for systems to increase probability to detect single cases of smallpox and anthrax
- Smallpox Detection Systems
  - Chickenpox-related
  - Hospital Admission Syndromic Surveillance for rash illness detection.
- Anthrax Detection System
  - Gram positive rod surveillance.

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Surveillance Challenges in Detection and Response to BT

Overall Goal: ***Have as sensitive and timely systems as possible for detection of possible BT events***

Challenges:

1. Make current clinician & lab systems more *sensitive* to BT agent detection & reporting as *timely* as possible
2. Increase *sensitivity* & *timeliness* of recognition of single cases of Category A BT agent disease
3. Increase *sensitivity* & *timeliness* of outbreak detection
4. Develop potentially useful data-sources to provide relevant information for rapid investigation and intervention decision-making around:
    - suspect BT case and outbreak reports
    - results of environmental monitoring

CT DPH

Challenge 1
Improve sensitivity and timeliness of all clinician and lab reporting

Importance: Recognition of something unusual most likely to come from clinicians and/or labs; outbreaks often recognized by analysis of disease/lab reporting data.

Possible Strategies:

1. Required & easily carried out 24/7 clinician and lab reporting
2. Electronic reporting systems
   - Automated electronic laboratory reporting.
   - Web-based clinician, hospital & lab reporting.

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Challenge 3
Increase sensitivity & timeliness of outbreak detection

Importance: Outbreak of illness may be first manifestation of a BT event.

Possible Strategies

1. Make outbreaks of any kind & individual cases of unusual disease officially reportable 24/7
2. Routine use of PFGE fingerprinting and sharing of information across state lines to identify clusters (both intra- and interstate), e.g., for *Salmonella* & for *E. coli* O157H7
3. Implement syndromic surveillance: ED visits, hospital admissions, 911 calls, use of over-the-counter drugs
4. Environmental monitoring (Biowatch, BDS)

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Challenge 4
Develop potentially useful data sources for rapid investigation & intervention decision-making

Importance: Whenever have a possible problem, need to examine potential magnitude, geographic limitations and be able to monitor it.

Possible Strategies:

1. Syndromic surveillance systems (may be of most use for this purpose)
2. HAN contacts – rapid communication with hospitals, labs, EDs, LTCF, ID physicians, veterinarians
3. Other contacts - poison control, medical examiner
4. Electronic reporting of deaths

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Challenge 2
Increase potential to detect single cases of Category A BT agents

Importance: Category A agents have most potential to meet terrorist ends; consequences of missing or delayed recognition of a single or first case are potentially huge; one case should be considered a possible outbreak meriting full investigation; can't afford to wait for large-scale outbreaks.

Possible Strategies:

1. Require 24/7 reporting of Category A (& B) agents.
2. Develop lab capacity to rapidly confirm diagnosis.
3. Develop special surveillance efforts to detect and monitor course of ***individual cases*** of possible Category A disease: e.g., rash with fever, gram positive rods

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Objective of Presentation

Describe 3 systems developed and tried in Connecticut to decrease the potential to miss or delay diagnosis of an initial or single case of smallpox or anthrax – results from first year with each.

Smallpox Detection Systems

- Chickenpox-related
- Hospital Admission Syndromic Surveillance for rash illness detection.

Anthrax Detection System

- Gram positive rod surveillance.

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Smallpox Surveillance Using a Chickenpox Surveillance System

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System Objectives

1. To increase the likelihood of recognizing initial smallpox cases

2. To stimulate clinician use of telephone reporting on a regular basis for suspect cases of smallpox

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Methods

- Chickenpox had been a physician-reportable disease since 2001.
- In January 2003, selected unusual cases of suspected chickenpox added to the list of Category 1 reportable diseases: reportable by telephone immediately on suspicion.
  - All persons with suspected chickenpox requiring hospital admission
  - All suspected cases in adults ≥18 years, even if not hospitalized

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Methods 2

- All cases, whether reported through telephone system or reported to regular chickenpox system, followed up by field epidemiologists hired with PHP funding:
  - Evaluated using CDC smallpox algorithm
  - If in moderate/high risk category
    - diagnostic specimens obtained for varicella by rapid testing methods; digital photos of rash taken
    - information obtained on recent patient movements during likely exposure period
  - Evolution of the patient's rash and illness monitored

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Results 1
Cases Reported, Jan – Dec 2003, CT

Type of Report	n	(%)
Telephone Report	22	(41)
Regular Varicella (Mail) Report	32	(59)
Total	**54**	**(100)**

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Results 2
Time from Patient Medical Evaluation to DPH Follow-Up

Type of Report	# Days	Median
Telephoned	0 – 3	0 days
Mailed	0 – 53	5 days

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Results 3
Location Where Patient Presented and Mechanism of Report

Location	n	% Tele
Clinic/Physician Office	22	41%
Emergency Department	10	90%
Hospital Outpatient Clinic	11	9%
Other	11	27%

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Results 4
Smallpox Risk Classification Using CDC Algorithm

Smallpox Risk	n (%)
Low	52 (96)
Moderate	2 (4)
High	0 (0)

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Digital photo of patient assessed as being at moderate risk of smallpox

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Conclusions

- System detects the type of unusual chickenpox cases that could be misdiagnosed smallpox
- Timely – all telephone and most paper reports are able to be followed-up by public health before they might evolve into classical smallpox.
- Sensitive – detects single cases
- Enhances clinician reporting of suspected smallpox
  - Only two of these cases were reported as possible smallpox.

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Smallpox Surveillance Using a Hospital Admissions Syndromic Surveillance System

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Background of HASS - 1

- **Established 9/11/2001 in response to WTC**

- **Daily reporting mechanism for each hospital:**
  - Reporter (usually ICP) reviews unscheduled admissions for previous 24 hours
  - manually categorizes based on admission diagnosis into 11 syndromes
    - Include fever with rash; pneumonia
  - enters numbers in each category into web-based reporting system

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Background of HASS - 2

Maintained post-9/11 with following objectives:

1. Detect and monitor individual admissions with selected unusual syndromes of concern:
   - rash illness and fever to r/o smallpox
   - pneumonia in a HCW to r/o SARS

2. Have a system to assess magnitude and distribution of a problem brought to attention by other systems (e.g., influenza, anthrax)

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Background of HASS - 3

Public health response to data received:

1. Active same-day follow-up of admissions for:
   - rash illness and fever to r/o smallpox
   - pneumonia or ARDS in a HCW to r/o SARS
   - perceived clusters
2. Daily – weekly review of data by syndrome looking for unusual levels of activity
3. Comprehensive review whenever have a question to ask (e.g., are there signs of influenza activity? are admission patterns for meningitis/encephalitis increasing during peak WNV season?)

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Methods for Smallpox Surveillance Using HASS

Similar to chickenpox surveillance system.

- All cases followed up the same day as reported by field epidemiologists hired with PHP funding:
  - Evaluated using CDC smallpox algorithm
  - If in moderate/high risk category
    - diagnostic specimens requested for varicella by rapid testing methods; digital photos of rash requested, if necessary
    - information obtained on recent patient movements during likely exposure period
  - Evolution of the patient's rash and illness monitored

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Results 1
Fever and Rash Reports, July 03-Jun 04

Total Cases

- 78 cases reported over 12 months
- 57 cases verified as truly fever with rash
  - Cases excluded usually had either fever or rash, but not both.
- State 12 mo. incidence = 1.7 per 100,000 population
- County-specific incidence:
  - 3 biggest (77%) range : 1.5 – 1.7 per 100,000
  - 5 smaller (23%) range: 0.8 – 3.5

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Results 2
Smallpox Risk Classification Using CDC Algorithm

Smallpox Risk	n (%)
Low	56 (98%)
Moderate	1 (2%)
High	0

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Results 3
Outcome of Follow-up

Outcome of follow-up:

- 29 (51%) had diagnosis made
- 28 discharged without concrete diagnosis

Diagnoses	**Percent** (N=57)
Drug hypersensitivity	11%
Varicella	7%
Urticaria	4%
Other infectious: e.g., ehrlichiosis, Kawasaki, mening, RMSF, toxic shock, viral exan. Parvo, roseola.	2% each
Other non-infectious: e.g., contact dermatitis, erythema nodosum, Stevens-Johnson, psoriasis	2% each

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Conclusions

- System detects serious fever and rash illness that could be mistaken with initial smallpox presentation
- Timely – enables immediate f/u by public health
- Sensitive – detects single cases
  - Even geographic distribution suggests reporting may be relatively complete
- Enhances clinician reporting of suspected smallpox
  - None of these cases reported as suspect smallpox, few reported from chickenpox surveillance system.

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Anthrax Surveillance Using a Gram Positive Rod Laboratory Reporting System

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Background

- Most cases of inhalational anthrax in 2001 had positive blood cultures, with rapid growth within 24 hours of inoculation.

- Blood culures from the 2001 anthrax case in Connecticut grew within 8 hours of inoculation, but took 48 hours of local lab work-up before possible anthrax was reported, and another 24 hours to confirm. Consequences of these delays:
  - Patient became comatose, unable to be interviewed
  - Antibiotics for possibly exposed persons weren't started until 5 days after growth initially occurred.

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System Objectives

- To detect suspected individual cases and clusters of anthrax as soon as there was any diagnostic evidence.
- To establish a 24/7 telephone reporting system with laboratories.
- To establish surveillance for invasive Clostridium infections.
  - Previous outbreaks of public health importance associated with spore-contaminated ligament transplants, injectable opiates.

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Methods for Surveillance

Beginning January 2003, labs required to telephone-report GPR isolates 24/7 occurring within 24 (32) hours of culture inoculation.

- Follow-up by epidemiologist on call:
  - Determine laboratory characteristics, then discuss with clinician:
    - if growth in aerobic bottles and syndrome consistent with anthrax (respiratory sx, sepsis)
    - if growth in anaerobic bottles, <50 years old and no GI disease (possible sentinel case of *Clostridium* cluster)
  - Otherwise, daily follow-up with lab to see what is being found; selected Bacillus isolates sent to State lab.

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Methods for Evaluation

- Reviewed results for 10 month period, March – December 2003, when reporting well-established.
- Conducted audit of all hospital laboratories to determine completeness of reporting.
- Conducted interviews of all involved in case follow-up to determine time spent.

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Results 1
Reports from March – December 2003

- 171 isolates with incubation period <24 hours
  - Rate: 6 per 100,000 per year
  - 132 (77%) reported
  - 75% of reports were by telephone – half during off-hours
- Isolates with growth in <24 hours:
  - Bacillus 53%
  - Clostridium 24%
  - Diptheroids 12%
  - Other 8%
- Clustering: rare to have more than 3 isolates on single day

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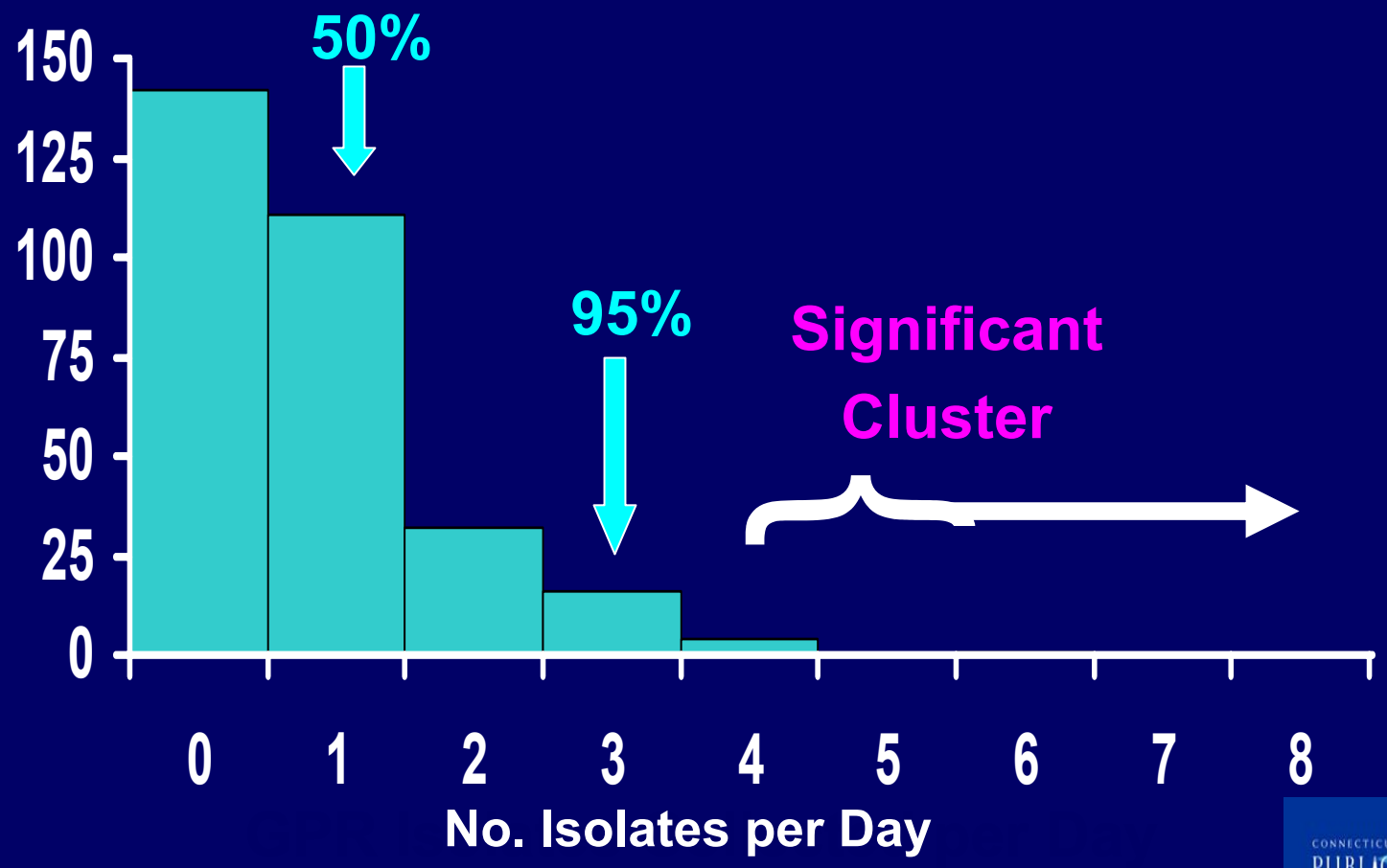
Results 2
Count of Gram-Positive Rod Isolates by Day of Collection: ≤32 hours



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Results 3
Workload

- 56 staff hours required on average per month for March–September 2003
- 45 staff hours required for September 2003 (most recent month assessed)
- 20% staff time outside office hours (<30 minutes per night on call)

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Conclusions: GPR Surveillance

- Have successfully initiated 24/7 reporting by laboratories, creating a timely system for detection of sentinel or single anthrax and clostridium cases.
- System is highly sensitive: detects almost all individual *Bacillus* and *Clostridium* isolates for further evaluation
- System detects possible clusters of GPR isolates in a timely and sensitive manner
- System is feasible to maintain (< 1 FTE)

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Overall Conclusions

- Have piloted 3 separate surveillance systems to meet the PHP challenge to minimize the potential to miss single cases of smallpox and anthrax.
- All three systems are meeting their objectives and are feasible to maintain with PHP resources. Total resources to maintain all three systems is 1-2 FTEs
- Systems have enhanced relationships with individual providers, hospitals and laboratories.

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Discussion and Recommendations

- Have heard little about other states pursuing systems that are potentially as sensitive as these in detection of smallpox and anthrax – most focus on large outbreak detection using syndromic surveillance.

- Needs to be more national discussion and consensus on what the objectives should be for public health preparedness surveillance at all levels. Relative merits and sustainability of different strategies for trying to achieve these objectives should be part of the discussion.

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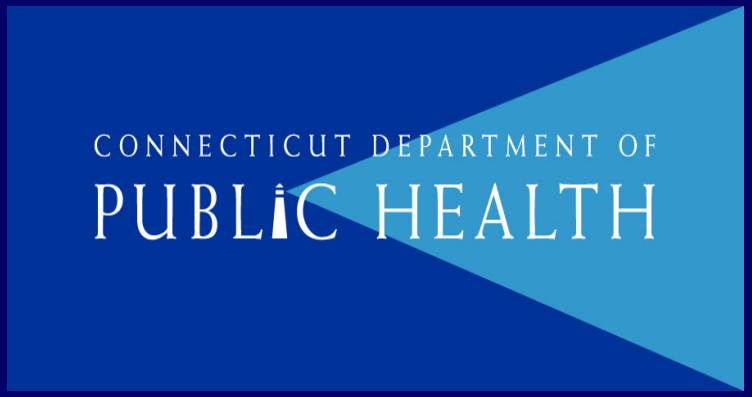
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