Bioterrorism Preparedness - Laboratory Analysis

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An account from the “real world” of the clinical microbiology laboratory
Clinical Laboratories - The Need for Preparation

- Agents likely to be used by terrorists
  - Unfamiliar, rarely encountered organisms
  - Potential for misidentification, mishandling of specimens, laboratory acquired infection
- Public health agency-sponsored training in the Northeast began in 1999
- Laboratory Response Network (LRN)
- Were we prepared in the autumn of 2001?
Autumn, 2001 - Anthrax!

- Wake-up call for clinical microbiologists
- Expect the unexpected
- Preparedness is an absolute necessity
LRN Level A Lab Preparedness

• Level A laboratory functions
  – Rule out / refer
  – Ship suspicious infectious agents to higher level labs for further study

• Level A laboratory activities
  – Formulate laboratory procedures
  – Train staff
  – Biosafety concerns

• Assistance from public health agencies
Activities of Clinical Micro Labs

- "Average" Labs
  - Microscopic examination of specimens
  - Culture of specimens and isolation of many bacterial and fungal pathogens
  - Identification and susceptibility testing

- "Advanced" Labs
  - Viruses (culture, direct detection)
  - Mycobacteria (culture, susceptibility)
  - Certain fungi (culture and identification)
  - Molecular testing
Level A Lab Example: *B. anthracis*

- Gram stain* of CSF, positive blood culture or wound culture shows large gram-positive rods

*Gram stain: Differential stain, not specific, but can be extremely helpful"
Level A Lab Example: *B. anthracis*

- Culture on blood agar*. Examine for characteristic colony morphology and lack of beta-hemolysis.

*Agents of anthrax and plague are “easy” to grow. Agents of tularemia, brucellosis are harder to recover, may require special media.*
Level A Lab Example: *B. anthracis*

- Perform identification tests. For *B. anthracis*, perform motility test*

  - Growth throughout medium (motile)
  - Growth only near original inoculation stab (non-motile)

*Minimal rule out tests (minimal manipulation of potentially dangerous cultures) are recommended for Level A labs
Level A Lab Example: *B. anthracis*

- Ruled in?
  - *Bacillus* species with characteristic colony morphology, non-hemolytic, non-motile

- REFER
  - Contact Level B lab
  - Ship suspect isolate
Level A Lab Preparedness - Where Are We Now?

• Bigger seems to be “better”
  – Wider variety of pathogens encountered; personnel experienced in working with infrequently isolated agents
  – More and/or better biosafety equipment
  – Institutional support for needed resources is more likely in larger hospitals

• Small labs can still have successful preparedness programs
Level A Lab Preparedness

- Anthrax
- Plague
- Tularemia
- Brucellosis
- Botulism - Specimen processing/shipping only
- Smallpox, VHF
- Environmental testing for B. anthracis spores

More guidance needed for Level A labs
Clinical Lab Preparedness – Next Steps

- Extend training (category B agents)
- Enhance communication/cooperation with higher level public health labs
  - NLS
- Dissemination of some Level B procedures to select Level A labs
  - ?Rapid, specific tests/reagents
  - ?BSL3 activities in select labs
  - ?Surge capacity
Level A Clinical Microbiology Laboratories

• Can be instrumental in early recognition
• Must be trained, alert and vigilant
• Form partnerships with public health labs for BT preparedness assistance, BT response plans, and overall improvement of the public health system