Bioterrorism Preparedness - Laboratory Analysis

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Abstract

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14

Bioterrorism Preparedness - Laboratory Analysis

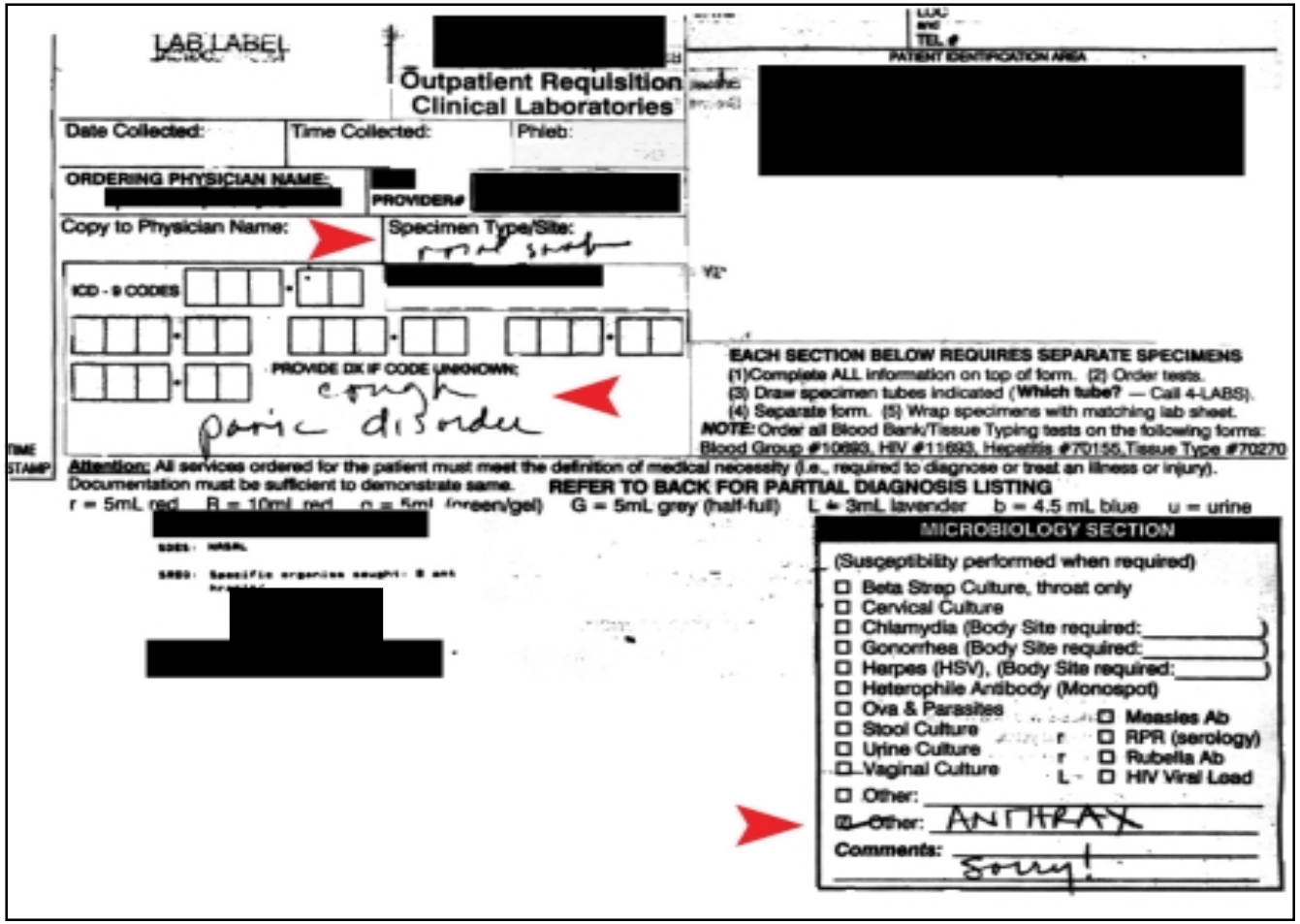
An account from the “real world” of the clinical microbiology laboratory

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

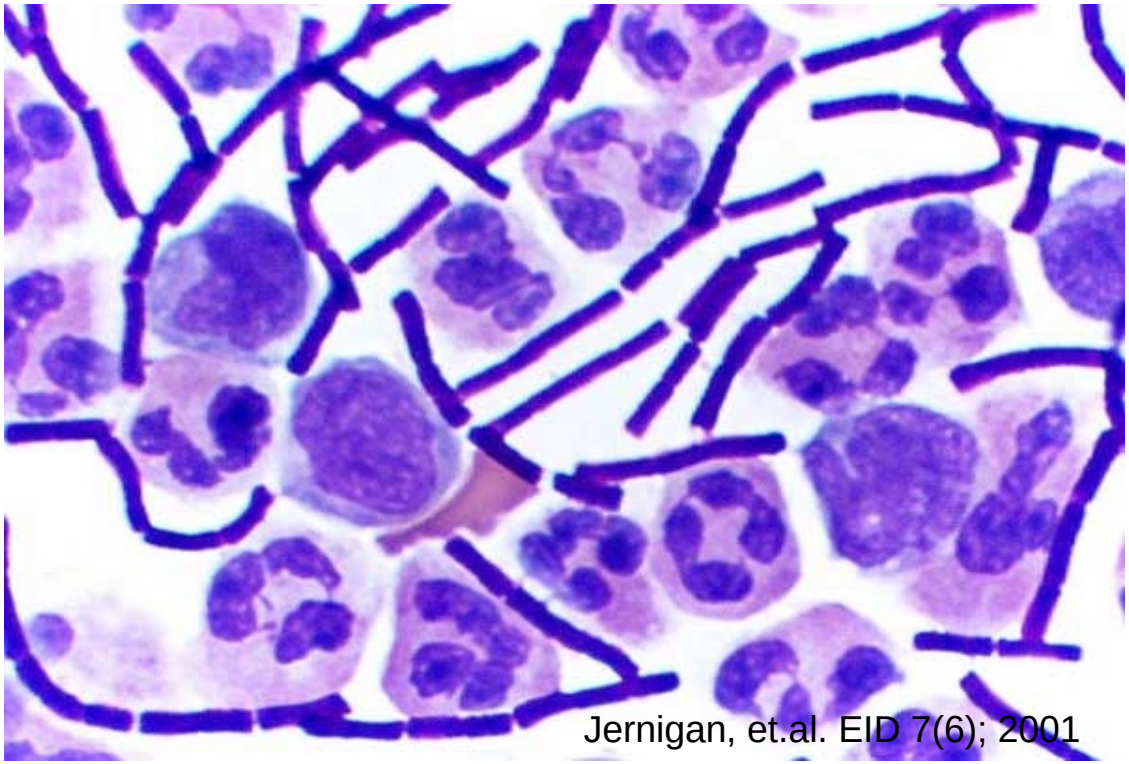
- Level A laboratory functions
  - Rule out / refer
  - Ship suspicious infectious agents to higher level labs for further study
- Level A laboratory activities
  - Formulate laboratory procedures
  - Train staff
  - Biosafety concerns
- Assistance from public health agencies

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

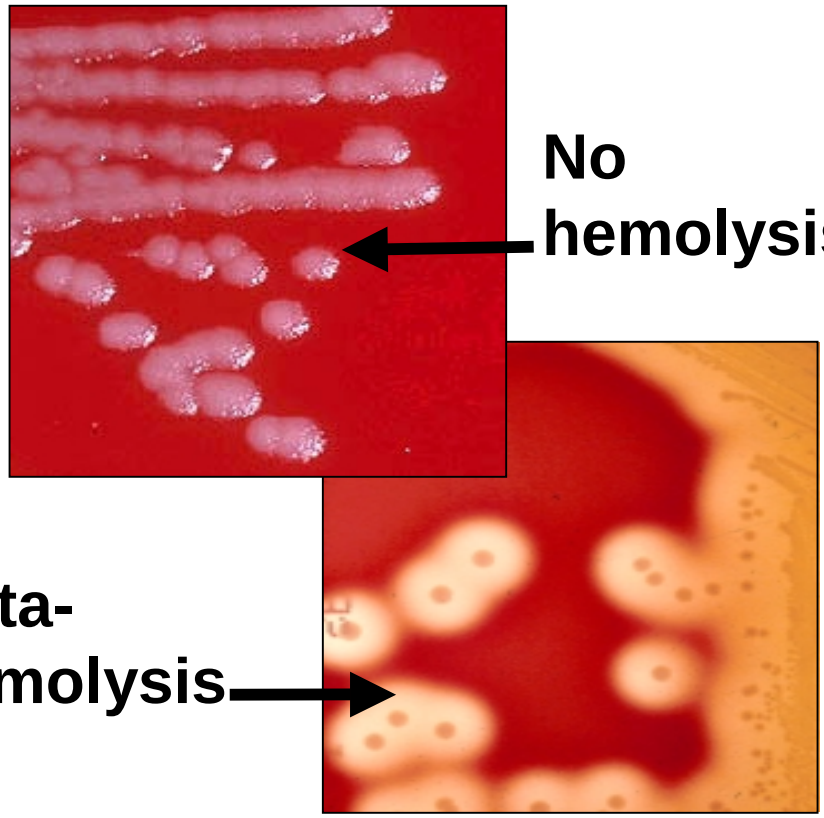


Jernigan, et.al. EID 7(6); 2001

*Gram stain: Differential stain, not specific, but can be extremely helpful

Level A Lab Example: *B. anthracis*

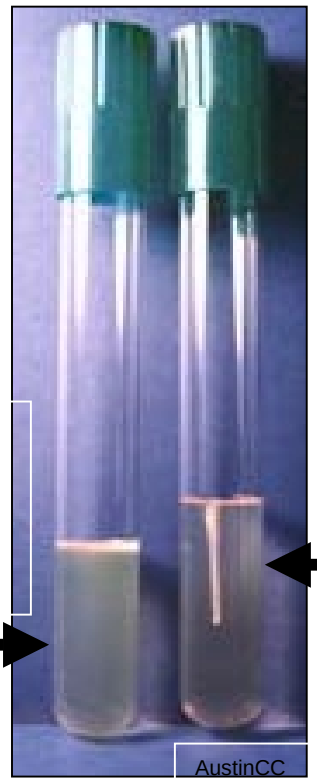
- Culture on blood agar*. Examine for characteristic colony morphology and lack of beta-hemolysis



*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 only near original inoculation stab (non-motile)

Growth throughout medium (motile)

*Minimal rule out tests (minimal manipulation of potentially dangerous cultures) are recommended for Level A labs

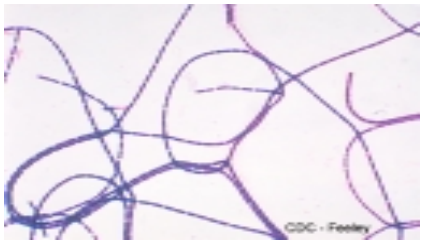
Level A Lab Example: *B. anthracis*

- 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?

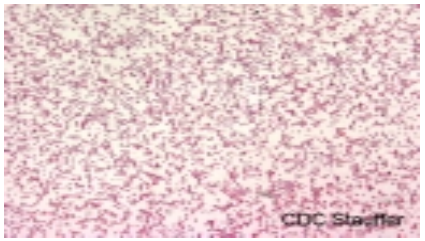
- Bigger seems to be “better”
  - Wider variety of pathogens encountered; personnel experienced in working with infrequently isolated agents
  - More and/or better biosafety equipment
  - Institutional support for needed resources is more likely in larger hospitals
- Small labs can still have successful preparedness programs

Level A Lab Preparedness

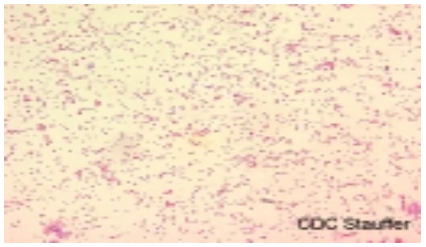


Anthrax

Plague



Tularemia



Brucellosis

Botulism-
Specimen processing/ shipping only

Smallpox, VHF-
More guidance needed for Level A labs

Environmental testing for *B. anthracis spores*

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