How to Plan for *B. pseudomallei* Exposure Cases – A Laboratory Perspective.

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Erin H. Graf, Ph.D., D(ABMM)

September 26, 2023
Agenda

• Introduction
  – *New and relevant OneLab™ Resources*
  – *Today’s Presenters*
• How to Plan for *B. pseudomallei* Exposure Cases – A Laboratory Perspective.
• Q&A
• Closing Remarks

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We invite you to use the customizable materials in this toolkit to share information about these resources with your networks, today!

What’s in the toolkit?

- Email Templates
- Social Media and Images
- Postcard
- Blog Post
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Lisa Speiser, D.O
Infectious Disease Physician, Mayo Clinic
HOW CLINICAL AND PUBLIC HEALTH LABORATORY PROFESSIONALS SHOULD PLAN FOR POSSIBLE *BURKHOLDERIA PSEUDOMALLEI* EXPOSURE AND CASES

LISA SPEISER D.O.

ERIN GRAF PH.D., D(ABMM)
LEARNING OBJECTIVES

1. IDENTIFY THE GROWTH CHARACTERISTICS OF *BURKHOLDERIA* PSEUDOMALLEI.
2. DISCUSS STANDARDIZED LABORATORY TESTS USED TO ISOLATE AND IDENTIFY *BURKHOLDERIA* PSEUDOMALLEI.
3. RECOGNIZE THE CHALLENGES OF IDENTIFYING *BURKHOLDERIA* PSEUDOMALLEI.
4. DEFINE HIGH-RISK VERSUS LOW-RISK EXPOSURE AND THE FREQUENCY OF LABORATORY-ACQUIRED MELIOIDOSIS.
5. EXPLAIN THE INDICATION FOR POST-EXPOSURE PROPHYLAXIS, AND ITS EFFICACY.
DISCLOSURES

• NO FINANCIAL DISCLOSURES
BURKHOLDERIA PSEUDOMALLEI

• AN AEROBIC GRAM-NEGATIVE ROD-SHAPED BACTERIUM COMMONLY FOUND IN SURFACE WATERS AND MUDDY SOILS
MELIOIDOSIS

- Transmitted via inhalation of contaminated dust or water droplets, ingestion of contaminated water, and ingestion of soil-contaminated food or other contact with contaminated soil, especially through skin abrasions.
  - Human cases increase significantly during times of heavy rainfall.
- High risk of mortality when treated, and an even higher risk of fatality if undiagnosed.
BURKHOLDERIA PSEUDOMALLEI

- FOUND IN TROPICAL CLIMATES, ENDEMIC TO ASIA, AUSTRALIA, SOUTH AMERICA, AND THE CARIBBEAN WITH MOST CASES FROM THAILAND AND NORTHERN AUSTRALIA

Global evidence consensus and geographic locations of occurrence data from 1910 to 2014.
2021 US OUTBREAK AND NEW RESERVOIRS

• MARCH-JULY 2021: CDC CONFIRMED 4 LINKED CASES (2 DEATHS) OF MELIOIDOSIS IN GEORGIA, KANSAS, MINNESOTA, AND TEXAS
  • LINKED TO AROMATHERAPY SPRAY SOLD AT WALMART STORES BETWEEN FEB AND OCT 2021
• B. PSEUDOMALLEI WAS DISCOVERED IN THE ENVIRONMENT ALONG THE GULF COAST OF MISSISSIPPI IN THE US IN 2022
MELIOIDOSIS – RISK FACTORS

- DIABETES
- COPD/CYSTIC FIBROSIS/BRONCHIECTASIS
- LIVER DISEASE/ALCOHOLISM
- CHRONIC RENAL DISEASE
- THALASSEmia
- MALIGNANCY/IMMUNOSUPPRESSION

* INCUBATION PERIOD RANGES FROM 1-21 DAYS; MEAN OF 4-9 DAYS, HOWEVER LATENT INFECTION CAN REACTIVATE AFTER YEARS

Signs and Symptoms | Melioidosis | CDC
CLINICAL

ACUTE PRESENTATIONS

• PNEUMONIA (50%)
• SEPTIC SHOCK (20%), BACTEREMIA
• INTRA-ABDOMINAL INFECTION, ABSCESS
• GENITOURINARY
• SKIN INFECTIONS
• LESS COMMON: ENCEPHALOMYELITIS, PROSTATE ABSCESS AND PAROTID INVOLVEMENT

CHRONIC (ILLNESS >2 MO DURATION) -10%

• CAVITARY LUNG DISEASE (“VIETNAMESE TUBERCULOSIS”)
• SKIN ULCERS AND NODULES
Lab Exposure Background

- Aortic tissue and swab sent for culture

Jessica Larsen, M(ASCP)CM

Mayo Clinic Arizona

Jessica Larsen, M(ASCP)CM, is a supervisor of microbiology at the Mayo Clinic Arizona. After working in various microbiology laboratories for the past 13 years, Larsen recently moved into a leadership position and now encourages other technologists to grow their skills and enhance their careers. As a new ASM member, she hopes to continue sharing knowledge and ideas to advance the field of clinical microbiology.
Risk Assessment Lab Changes

Standard Operating Procedures (SOPs) were updated

We performed competencies for Select Agent awareness and CAP LPX (lab preparedness) surveys

Failed miserably – had 6 new potential exposures!

We needed to do something DIFFERENT
Process Workflow Map

Steps in plating a specimen for culture
- Purple = Processing
- Blue = Technologist reading
- Plate manipulation on benchtop

Steps where our exposures occurred
- Visual inspection – opening lids
- Biochemical testing, ID, AST

Next = change management discussion
Impact Matrix

Decision making tool where each potential idea or strategy is assessed based on the level of effort required and the potential impact or benefit it will have.

6 Possible Solutions

1. All cultures manipulated in BSCs
2. Purchase lab automation to screen culture plates
3. Keep lids on for visual 1st inspection
4. Tape/Parafilm all plates
5. Bright labels on plates as reminder
6. Education module with scary real-life consequences
Process Workflow Map Changes

- Change implemented at 1st potential exposure step
- Demonstrate execution with mandatory learning module
  - Show LID-ON technique
  - New step of going directly to BSC if weak growth is present
Education Module

• Teach principles about Select Agents, exposures, and consequences
• Old workflow vs. New workflow
• Example scenarios
• Video demonstrations
  • Catalase aerosol production
  • LID-ON method technique
Education Module “Quiz”
Choose Your Own Exposure Adventure

Instead of traditional quiz → Gamify

• Put employee in driver's seat with real culture examples/photos
• Choose workup under BSC or take to benchtop?
  • Consequences = exposures, or delay of patient care
  • Give further explanation/guidance
  • Use scare tactics BUT allow people to make their own choices and feel good about making the right choice!

Ultimately, you must live with your choices!
Content creator

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Secret Test & Results

Secretly tested techs with organisms resembling Select Agents plated as "patient" samples

• **10 of 10 techs = 100% Success rate!!**
• Perfect execution through all the safe steps:
  • Noting weak growth on plates
  • Working under BSC for all staining and biochemical testing
  • Notifying Lab Director of inability to rule out a Select Agent

---

<table>
<thead>
<tr>
<th>Techs</th>
<th>Organism</th>
<th>Description</th>
<th>Gram</th>
<th>DOS notified</th>
<th>BSC w/up</th>
<th>Ox</th>
<th>Ind</th>
<th>Mot</th>
<th>Cat</th>
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<tbody>
<tr>
<td>Sintayehu</td>
<td>A3 - Burkholderia thailandii</td>
<td>Tiny NLF, biochems under GNB, safety pin</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>NEG</td>
<td>NEG</td>
<td>POS</td>
<td>NEG</td>
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<tr>
<td>Jaron</td>
<td>B5 - Ochrobactum anthropi</td>
<td>Gray, NLF, non-hep, work GNB</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>POS</td>
<td>NEG</td>
<td>POS</td>
<td>NEG</td>
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<tr>
<td>Angela</td>
<td>A6 - Roseomonas mucosa</td>
<td>Super tiny poor growth, NGC, plump</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>NEG</td>
<td>NEG</td>
<td>NEG</td>
<td>PO</td>
</tr>
<tr>
<td>Teri</td>
<td>A3 - Burkholderia thailandii</td>
<td>White (weak growth on MOG, GNB, bipolar)</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>POS</td>
<td>wk</td>
<td>NEG</td>
<td>-</td>
</tr>
<tr>
<td>Jera</td>
<td>A3 - Burkholderia thailandii</td>
<td>Tiny white on BAP/CHOC, GNB</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>POS</td>
<td>NEG</td>
<td>POS</td>
<td>W. POS</td>
</tr>
<tr>
<td>Bashi*</td>
<td>Burkholderia gladioli (real patient)</td>
<td>White good growth on BAP, GNB</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>NEG</td>
<td>POS</td>
<td>POS</td>
<td>NEG</td>
</tr>
<tr>
<td>Donna</td>
<td>A3 - Burkholderia thailandii</td>
<td>NH small white, better growth, small straight GNB</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>POS</td>
<td>NEG</td>
<td>POS</td>
<td>POS</td>
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<tr>
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<td>A3 - Burkholderia thailandii</td>
<td>Gray, growth on cap, chol, GNB, bipolar</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>POS</td>
<td>NEG</td>
<td>POS</td>
<td>NEG</td>
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Important Partnership with AZ PHL
Potential Select Agents in a New Era
Sustained Safety?
RISK ASSESSMENT

• EXPOSURE TO AEROSOLS REPRESENT THE GREATEST BIOHAZARD

Management of Accidental Laboratory Exposure to Burkholderia pseudomallei and B. mallei - PMC (nih.gov)
EXPOSURE EVALUATION

• IMMEDIATELY FOLLOWING EXPOSURE, THE SITE OF CONTAMINATION OR INOCULATION SHOULD BE WASHED WITH WATER FOLLOWED BY AN APPROPRIATE CUTANEOUS DISINFECTANT

• DESIGNATED SAFETY OFFICER FOR THE LAB SHOULD BE NOTIFIED

• HIGH RISK EXPOSURE EVENTS ARE INHALATION, INOCULATION (PUNCTURE), OR AEROSOLS INTO THE EYE, BUT ALL EXPOSURES SHOULD BE EVALUATED
POST-EXPOSURE MANAGEMENT

• EXPOSED WORKER/SUPERVISOR SHOULD DESCRIBE THE SPECIES AND SUSCEPTIBILITY PATTERN, AND TYPE OF EXPOSURE

• SHOULD BE INTERVIEWED REGARDING DRUG ALLERGIES AND CURRENT HEALTH STATUS INCLUDING RISK FACTORS FOR MELIOIDOSIS

• PLACED INTO A HIGH RISK OR LOW RISK CATEGORY
Consensus recommendations are to offer PEP to all employees with high- and low-risk incidents, regardless of their predisposing risk for melioidosis.

In animal models, postexposure prophylaxis (PEP) has been shown to effectively prevent acute melioidosis if administered within 24 hours of exposure.

However, PEP fails to prevent latent or persistent infection.
<table>
<thead>
<tr>
<th>Antimicrobial drug</th>
<th>Dosage</th>
<th>Frequency</th>
</tr>
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<tbody>
<tr>
<td>Trimethoprim-sulfamethoxazole (TMP-SMX)</td>
<td>2 × 160–800 mg (960 mg) tablets if &gt;60 kg, 3 × 80–400 (480 mg) tablets if 40 kg-60 kg, and 1 × 160–800 mg (960 mg) or 2 × 80–400 (480 mg) tablets if adult &lt;40 kg plus folate 5 mg/d</td>
<td>Every 12 h</td>
</tr>
<tr>
<td>Doxycycline</td>
<td>2.5 mg/kg/dose up to 100 mg orally</td>
<td>Every 12 h</td>
</tr>
<tr>
<td>Amoxicillin–clavulanic acid</td>
<td>20/5 mg/kg/dose. Equates to 3 × 500/125 tabs if &gt;60 kg, and 2 × 500/125 tabs if ≤60 kg</td>
<td>Every 8 h</td>
</tr>
</tbody>
</table>
SUSCEPTIBILITIES

- EXCLUSIVELY PERFORMED VIA PUBLIC HEALTH LABORATORIES, SAFETY RISK
- ESTABLISH SUSCEPTIBILITIES FOR ALL *B. PSEUDOMALLEI* ISOLATES IN CURRENT USE IN THE LABORATORY AND HELD IN A RECORD AVAILABLE TO SAFETY AND MEDICAL STAFF AFTER AN EXPOSURE EVENT.
  - PARTICULARLY IMPORTANT WHEN WORKING WITH CLINICAL *B. PSEUDOMALLEI* ISOLATES FROM ASIA BECAUSE ≈13% OF THAI ISOLATES ARE RESISTANT IN VITRO TO TMP-SMX, THE FIRST-LINE PEP AGENT.
  - TMP-SMX SUSCEPTIBILITY SHOULD BE TESTED BY E-TEST OR ANOTHER RELIABLE MIC-BASED METHOD
    - DISK TESTING TO DETERMINE SUSCEPTIBILITY OF *B. PSEUDOMALLEI* TO TMP-SMX IS UNRELIABLE AND SHOULD NOT BE USED
POST EXPOSURE MONITORING

- SELF-RECORD TEMPERATURE TWICE DAILY X 21 DAYS

- IN THE EVENT OF FEVER, COUGH, OR INFLAMMATION AT THE SITE OF KNOWN INOCULATION, BC X 2 SETS, SPUTUM, THROAT SWAB, AND UC (USING ASHDOWN MEDIUM OR B. CEPACIA AGAR) SHOULD BE PERFORMED AS WELL AS CXR

- A SAMPLE OF SERUM SHOULD BE TAKEN ON THE DAY OF THE EXPOSURE EVENT (DAY 1) AS WELL AS 1, 2, 4 AND 6 WEEKS AND TESTED FOR THE PRESENCE OF ANTIBODIES

- SEROCONVERSION WITH THE DEVELOPMENT OF AN ANTIBODY RESPONSE INDICATES EXPOSURE (HOWEVER SOME DO NOT HAVE DETECTABLE ANTIBODIES WITH CULTURE PROVEN MELIODOSIS)
MANAGEMENT OF SEROCONVERSION

• BASED ON EXPERT CONSENSUS: IF A WORKER SEROCONVERTS AFTER LABORATORY EXPOSURE, FURTHER CLINICAL EVALUATION AND AN EXTENDED COURSE OF ANTIMICROBIAL DRUG TREATMENT IS RECOMMENDED

• IN PERSONS WHO SEROCONVERT BUT REMAIN ASYMPTOMATIC AND CULTURE-NEGATIVE, THE PEP AGENT SHOULD BE CONTINUED FOR A TOTAL OF 12 WEEKS
LABORATORY ACQUIRED MELIOIDOSIS

• LABORATORY-ACQUIRED MELIOIDOSIS IS EXTREMELY RARE.

• REPORTS OF 2 PRIOR LABORATORY-ACQUIRED MELIOIDOSIS CASES IN THE UNITED STATES HAVE BEEN PUBLISHED, BUT NONE HAVE BEEN REPORTED SINCE 1981

• BOTH PUBLISHED CASES WERE ATTRIBUTED TO AEROSOL EXPOSURE
THANK YOU
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   - Registration passcode: **G172**
   - Select "PACE" credit type
   - Click "Launch"
   - Click on green "Mark Complete"

2. **Complete** webinar evaluation
   - Click green "Take Evaluation" button
   - Complete the evaluation

3. **Obtain** P.A.C.E Certificate
   - Click on the blue "Print Certificate" button to download
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