

Division of Laboratory Systems



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

Lisa Speiser, D.O

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

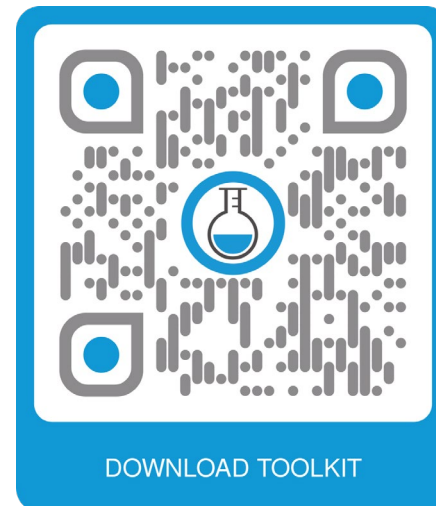


ONELAB PARTNER TOOLKIT



OneLab Partner Toolkit is now updated with all OneLab elements!

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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Presenter



Lisa Speiser, D.O

Infectious Disease Physician, Mayo Clinic

Presenter



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

Director, Clinical Microbiology
Associate Professor, 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

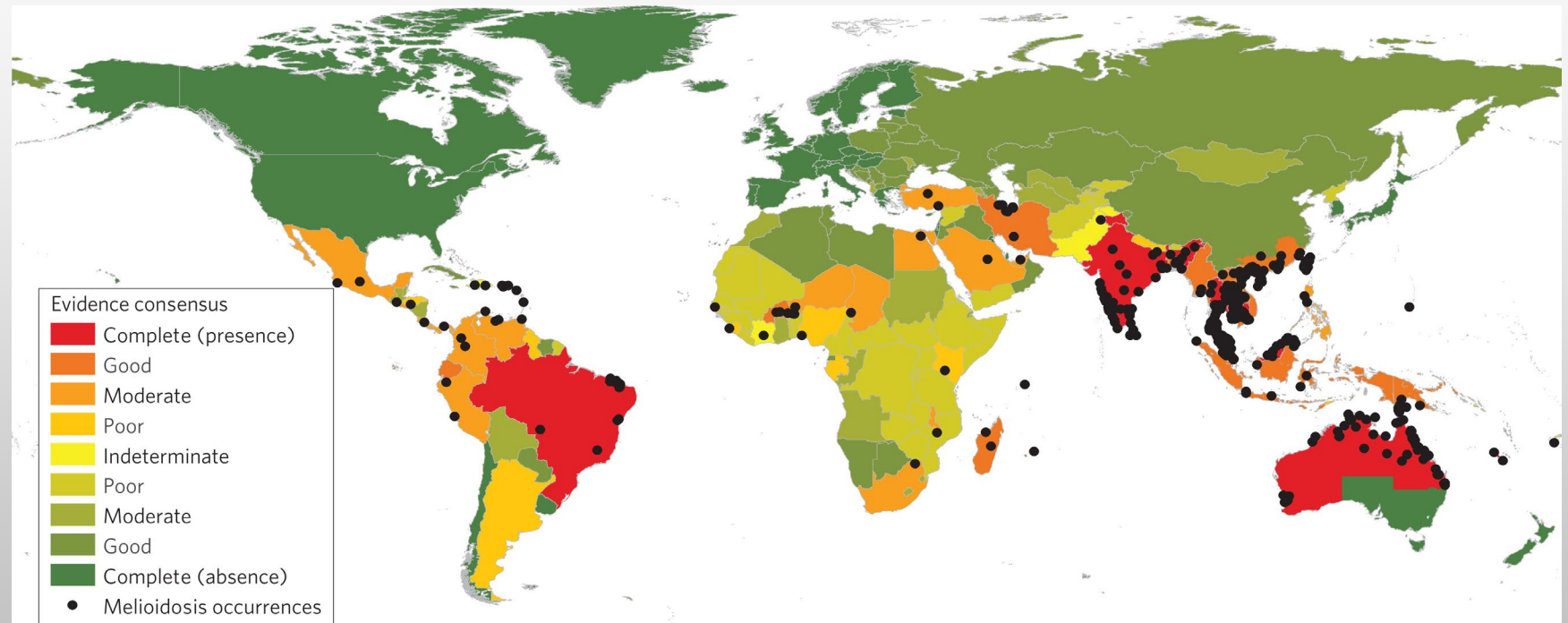


MELIOIDOSIS

- 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

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.

Task assessment performed on laboratory workflow processes

¹Mayo Clinic Arizona, Phoenix, Arizona, USA, and ²Northern Arizona University, Flagstaff, Arizona, USA

CASE

A 58-year-old male with type 2 diabetes mellitus presented to our emergency department on December 21, 2020, with a 3-day

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is.



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

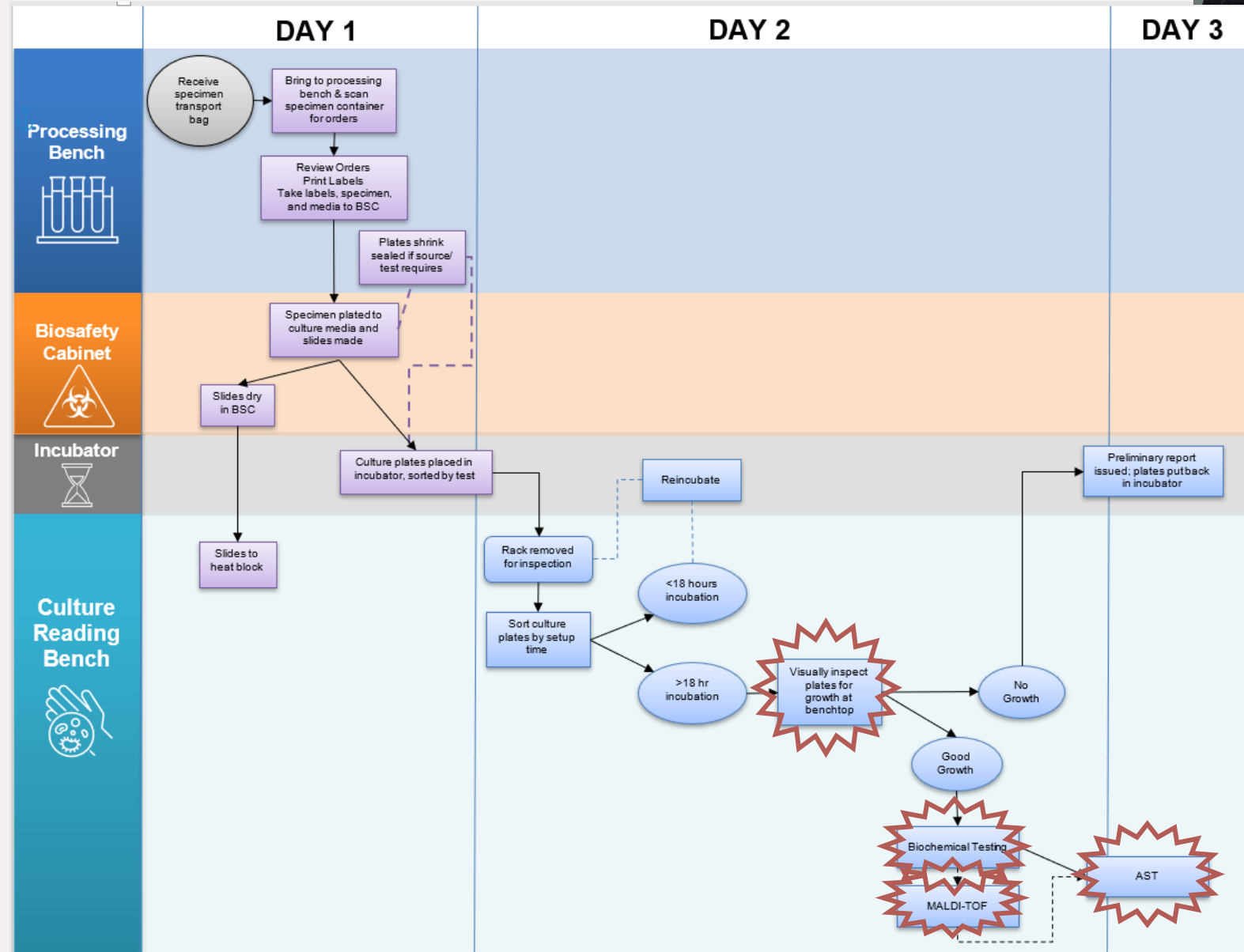
Steps in plating a specimen for culture

- Purple = Processing
- Blue = Technologist reading
- Plate manipulation on benchtop

Steps where our exposures occurred

- Visual inspection - opening lids
- Biochemical testing, ID, AST

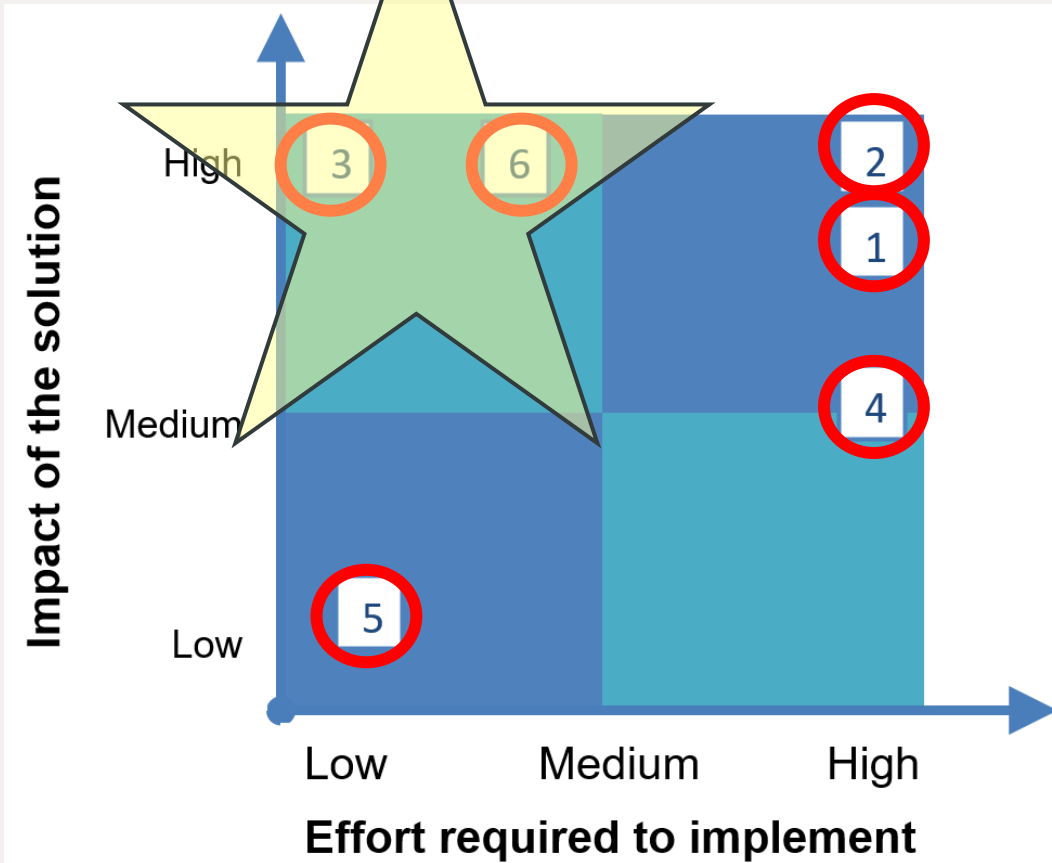
Next = change management discussion





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.



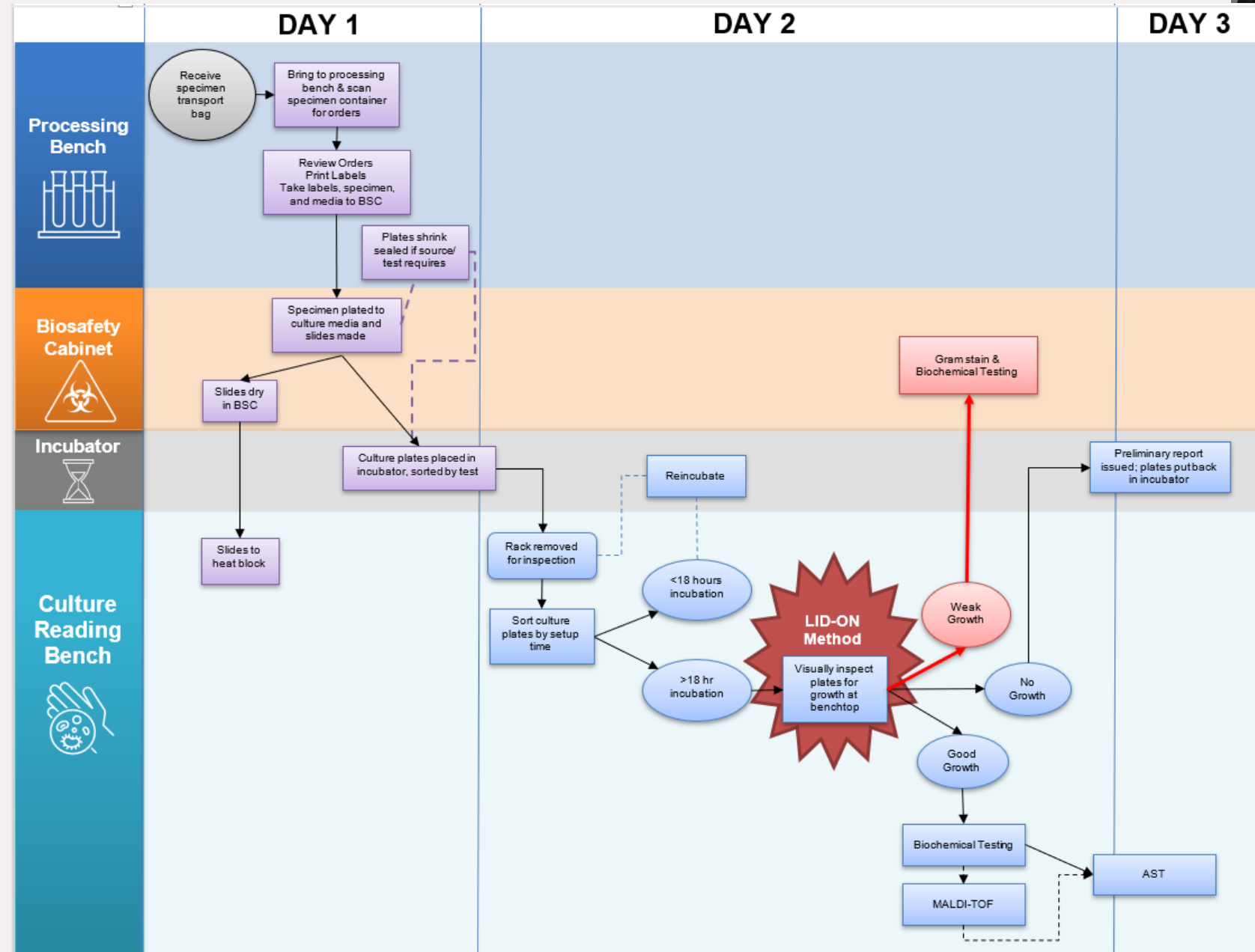
6 Possible Solutions

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

Microbiology Bench Culture Reading Technique: LID-ON Method

BEGIN MODULE

This slide has sound

Select Agents in the Laboratory

Growth characteristics that should make a technologist suspicious of Select Agents include:

- Slow growing, tiny Gram-negative rods or coccobacilli (especially with no growth on MacConkey agar)
- Slow growing organisms which appear to have no discernable Gram stain morphology (may appear as "Gram-negative dust")
- Fat Gram-negative rods with bipolar staining

This slide has sound

Lab exposure consequences

- Even if you do not contract the disease from a Select Agent exposure, the prophylactic treatment mandated is

This slide has sound

▶



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!

Microbiology:
Choose your own adventure!

Bench Technologist – Plate Reading Edition

This part of the module will take you through multiple scenarios.
At each point in the identification process, pick the route that you would take if you were working the culture on the bench.

Good luck!

BEGIN

A NETFLIX INTERACTIVE FILM

Congratulations!
You have completed this module.
Please exit this window to record your learning.

How did you do?

Correct Response

Incorrect Response

Scenario #1: *E. coli*

Scenario #2: Potential Select Agent

Scenario #3: *A. xylosoxidans*

Scenario #4: *H. influenzae*

Scenario #5: Potential Select Agent

Scenario #6: *N. sicca*

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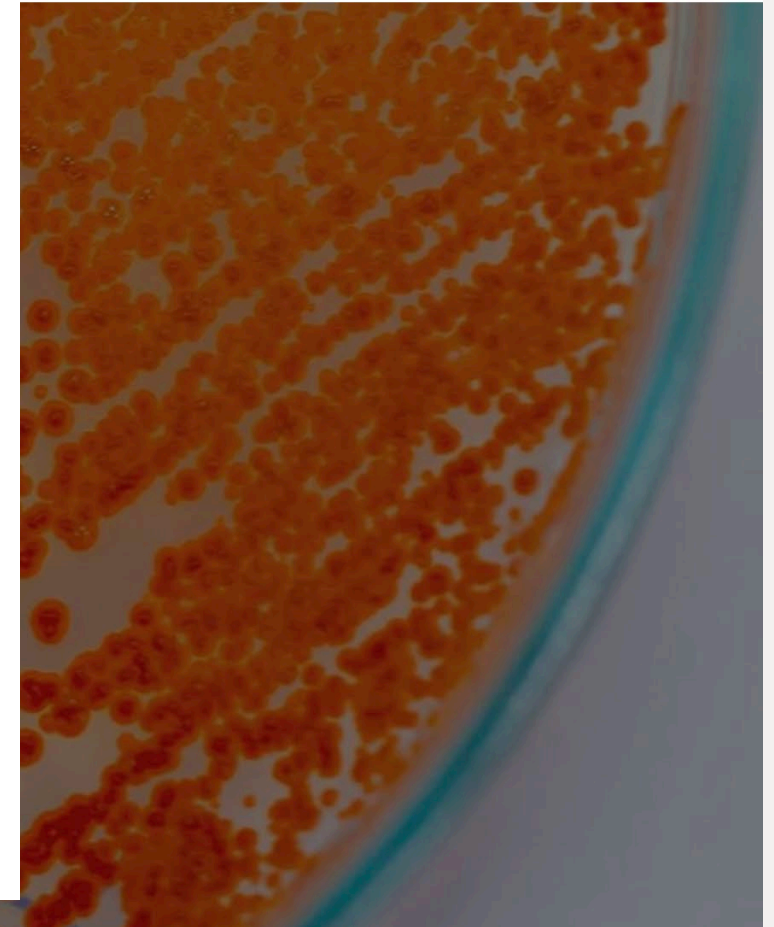
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Education Specialist II

Department of Laboratory Medicine and Pathology

Mayo Clinic, Phoenix, Arizona

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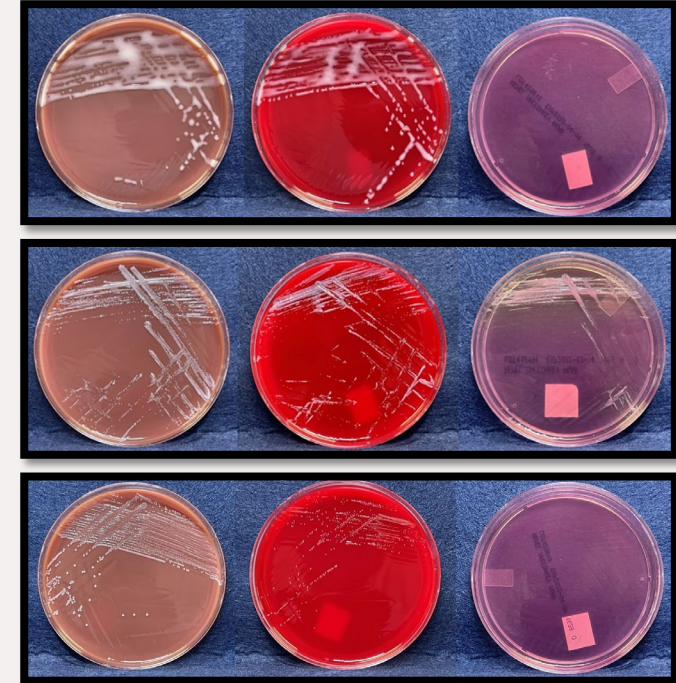




Secret Test & Results

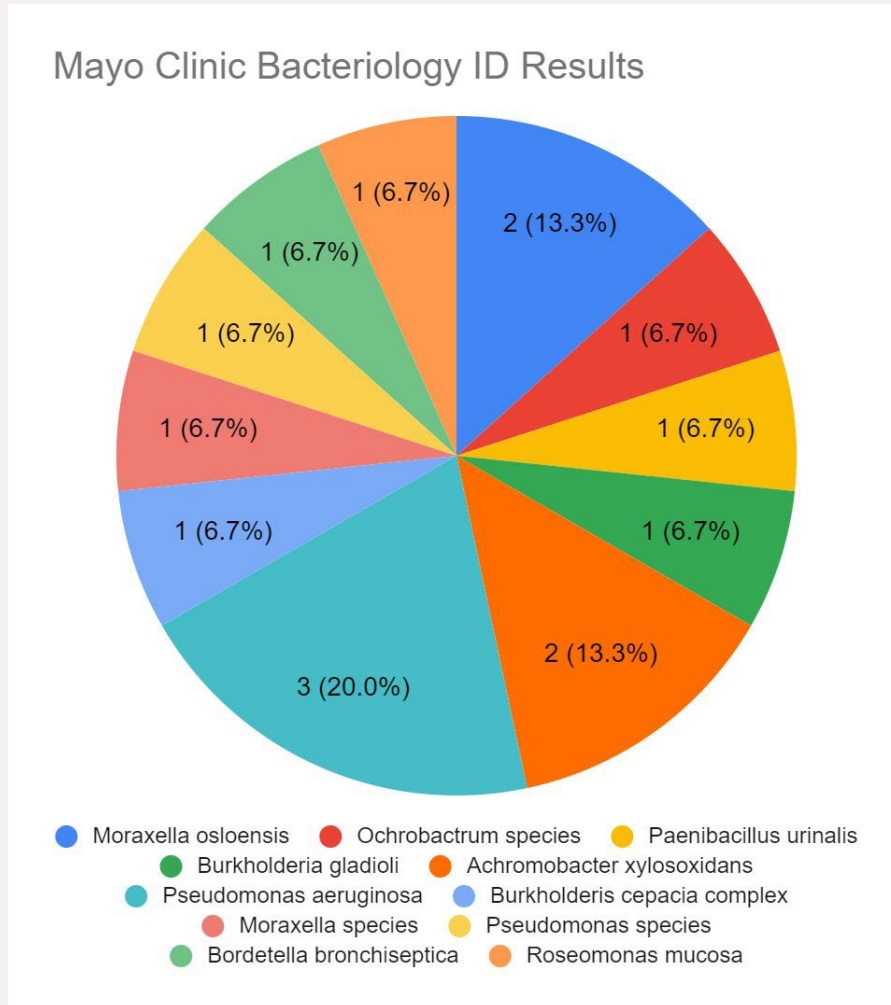
Secretly tested techs with organisms resembling Select Agents plated as "patient" samples

- 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



Techs	Organism	Description	Gram	DOS notified?	BSC w/up?	Ox	Ind	Mot	Cat
Sintayehu	A3 - Burkholderia thailandensis	Tiny NLF, biochems under	GNB, safety pin	Y	Y	NEG	NEG	POS	NEG
Jaron	B5 - Ochrobactum anthropi	Gray, NLF, non-hem, work	GNB	Y	Y	POS	NEG	POS	NEG
Angela	A6 - Roseomonas mucosa	Super tiny poor growth, NLF	GNCB, plump	Y	Y	NEG	NEG	NEG	POS
Teri	A3 - Burkholderia thailandensis	White (weak growth on M) NLF	GNB, bipolar	Y	Y	POS(wk)	NEG	-	NEG
Jera	A3 - Burkholderia thailandensis	Tiny white on BAP/CHOC, NLF	GNB	Y	Y	POS	NEG	POS	W. POS
Bashi*	Burkholderia gladioli (real patient)	White good growth on BAP/CHOC	GNB	Y	Y	NEG	NEG	POS	NEG
Donna	A3 - Burkholderia thailandensis	NH small white, better growth	small straight GNB	Y	Y	POS	NEG	POS	POS
Nazilla	A3 - Burkholderia thailandensis	Gray, growth on bap, choc	GNB, bipolar	Y	Y	POS	NEG	POS	NEG

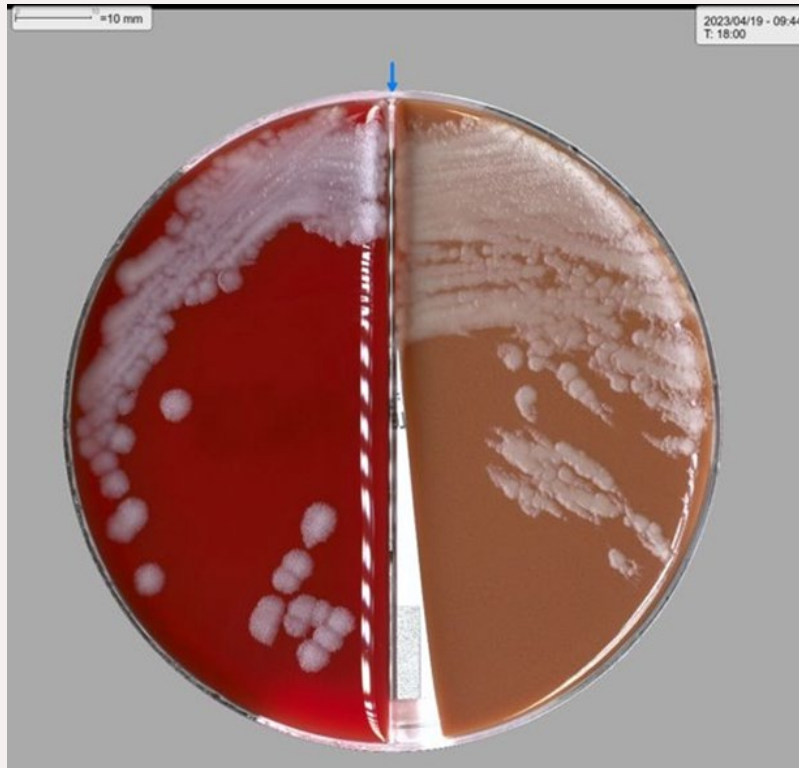
Important Partnership with AZ PHL



Potential Select Agents in a New Era



Sustained Safety?



RISK ASSESSMENT

- EXPOSURE TO AEROSOLS REPRESENT THE GREATEST BIOHAZARD

Risk assessment of laboratory incidents involving *Burkholderia pseudomallei*

Low risk

Inadvertent opening of the lid of an agar plate growing *B. pseudomallei* outside a biologic safety cabinet

Inadvertent sniffing of agar plate growing *B. pseudomallei* in the absence of contact between worker and bacterium

Splash event leading to visible contact of *B. pseudomallei* with gloved hand or protected body, in the absence of any evidence of aerosol

Spillage of small volume of liquid culture (<1mL) within a functioning biologic safety cabinet

Contamination of intact skin with culture

High risk

The presence of any predisposing condition without proper personal protective equipment (PPE): diabetes mellitus; chronic liver or kidney disease; alcohol abuse; long-term steroid use; hematologic malignancy; neutropenia or neutrophil dysfunction; chronic lung disease (including cystic fibrosis); thalassemia; any other form of immunosuppression

Needlestick or other penetrating injury with implement contaminated with *B. pseudomallei*

Bite or scratch by experimental animal infected with *B. pseudomallei*

Splash event leading to contamination of mouth or eyes

Generation of aerosol outside biologic safety cabinet (e.g., sonication, centrifuge incident)

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

INDICATIONS FOR POST- EXPOSURE PROPHYLAXIS (PEP)



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 2

Recommended *Burkholderia pseudomallei* postexposure antimicrobial drug prophylaxis

Antimicrobial drug	Dosage	Frequency
Trimethoprim-sulfamethoxazole (TMP-SMX)	2 × 160–800 mg (960 mg) tablets if >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 <40 kg plus folate 5 mg/d	Every 12 h
Doxycycline	2.5 mg/kg/dose up to 100 mg orally	Every 12 h
Amoxicillin–clavulanic acid	20/5 mg/kg/dose. Equates to 3 × 500/125 tabs if >60 kg, and 2 × 500/125 tabs if ≤60kg	Every 8 h

[Open in a separate window](#)

[Management of Accidental Laboratory Exposure to *Burkholderia pseudomallei* and *B. mallei* - PMC \(nih.gov\)](#)

SUSCEPTIBILITIES

Resulting Agency

DTL

Susceptibility

	Burkholderia pseudomallei SUSCEPTIBILITY, MIC (MCG/ML)		
Amoxicillin + Clavulanate	8/4 mcg/mL	Susceptible	
Ceftazidime	2 mcg/mL	Susceptible	
Doxycycline	2 mcg/mL	Susceptible	
Imipenem	0.25 mcg/mL	Susceptible	
Meropenem	1 mcg/mL		
Tetracycline	4 mcg/mL	Susceptible	
Trimethoprim + Sulfamethoxazole	<=.5/9.5 mc...	Susceptible	

- 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 MELIOIDOSIS)

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





Questions?

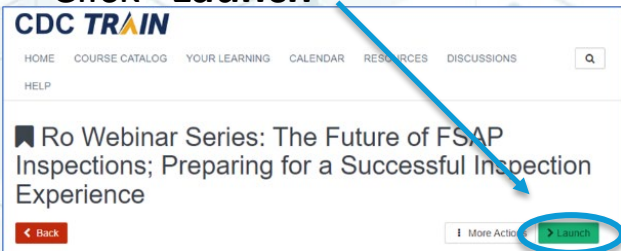
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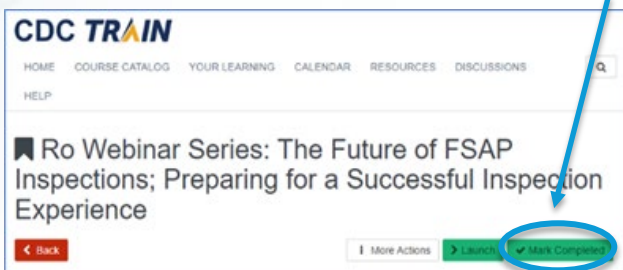
1. Attend entire webinar/**register** for course on TRAIN

- Register for the course in TRAIN
- Registration passcode: **G172**
- Select **"PACE"** credit type

• Click **"Launch"**

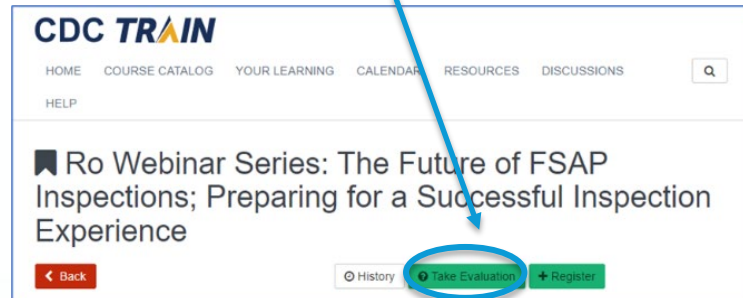


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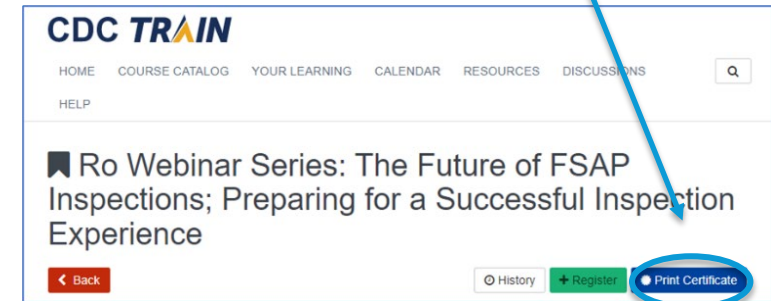
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- Click on the blue **"Print Certificate"** button to download





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