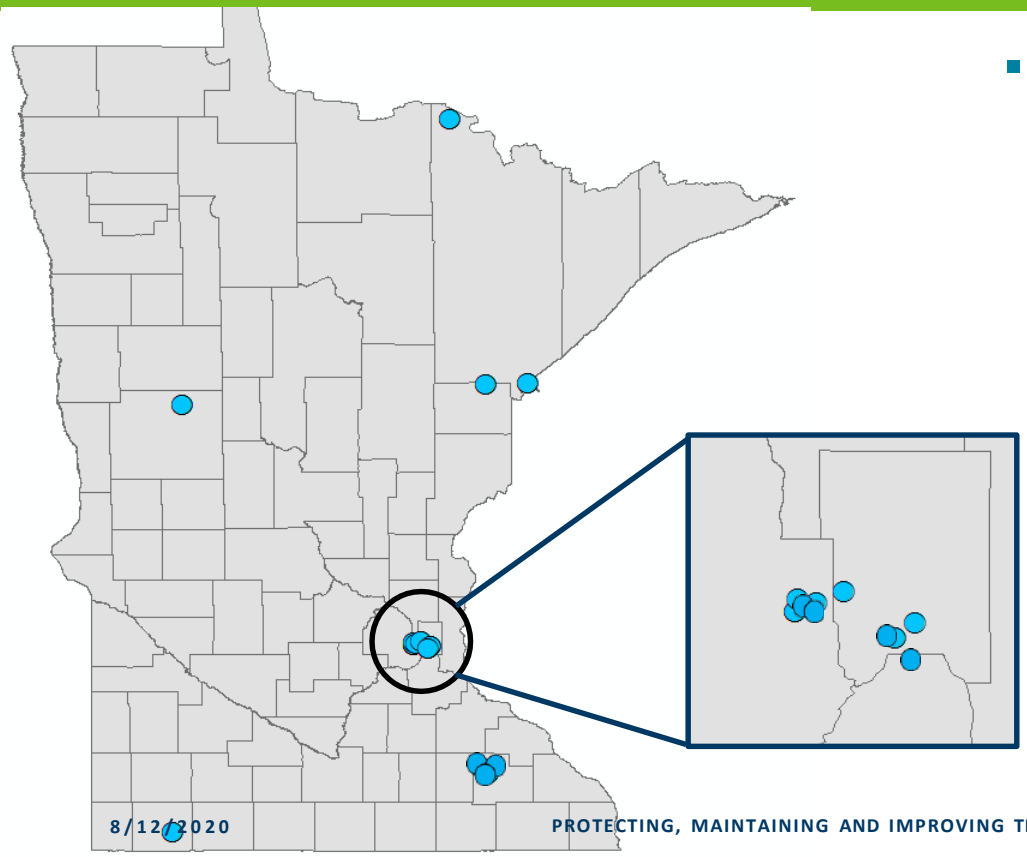
Minnesota Department of Health

Laboratory Practices

September 24, 2020

Laboratory Exposures in Minnesota, 2002–2018



- **31 Laboratory Exposures**
  - **17 *Brucella* exposures, ≥ 138 people exposed, 2 lab acquired infections**
  - **5 *Burkholderia*, 1 *Coxiella*, 5 *Francisella*, 2 *Coccidioides*, 1 *Histoplasma***

MLS Labs Need Biosafety Training

- Training approaches
  - Web training on Risk Assessments
  - In-person regional conferences
    - 1st year just laboratorians
    - 2nd and 3rd year laboratorians and infection control practitioners
  - Site visit assessments
  - Yearly Challenge Set

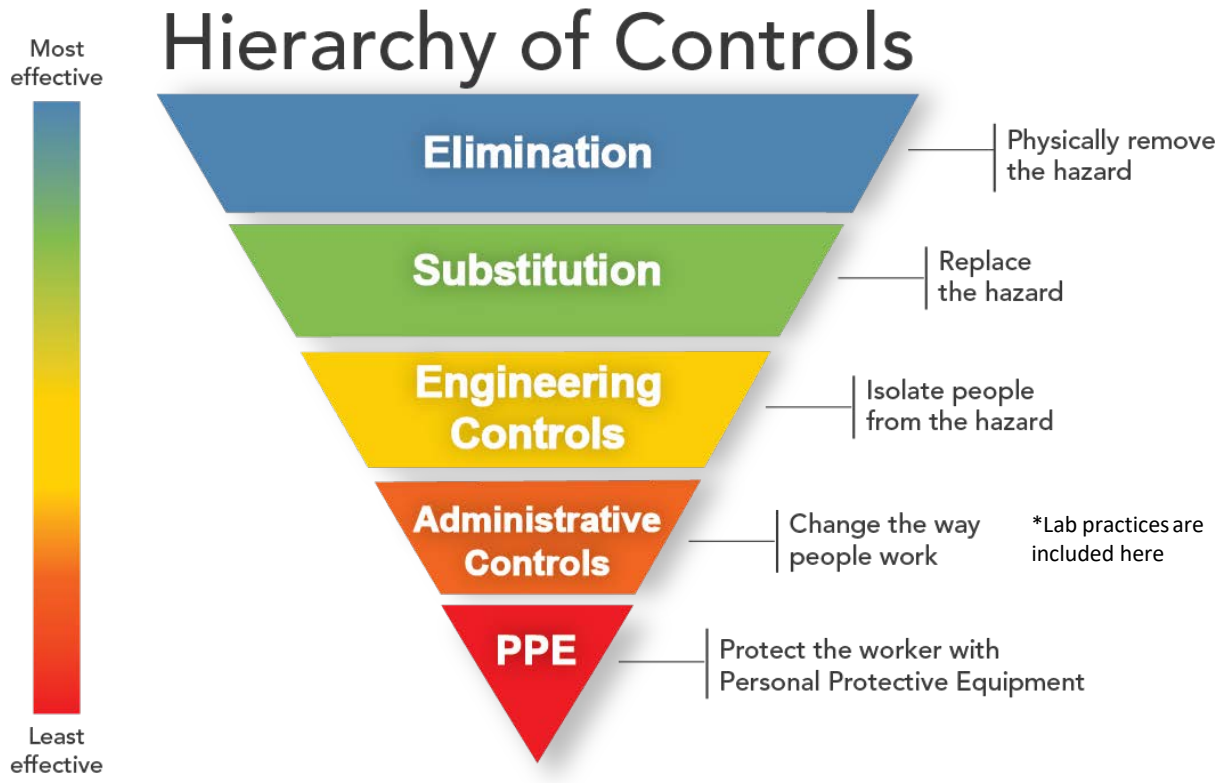
Biosafety Risk Assessment

- Examines *likelihood* and *consequence* of exposure
- Specimen collection to disposition
- Patient admission to discharge
- Mitigate risks
  - Risk is never zero

Challenges in the Clinical Setting

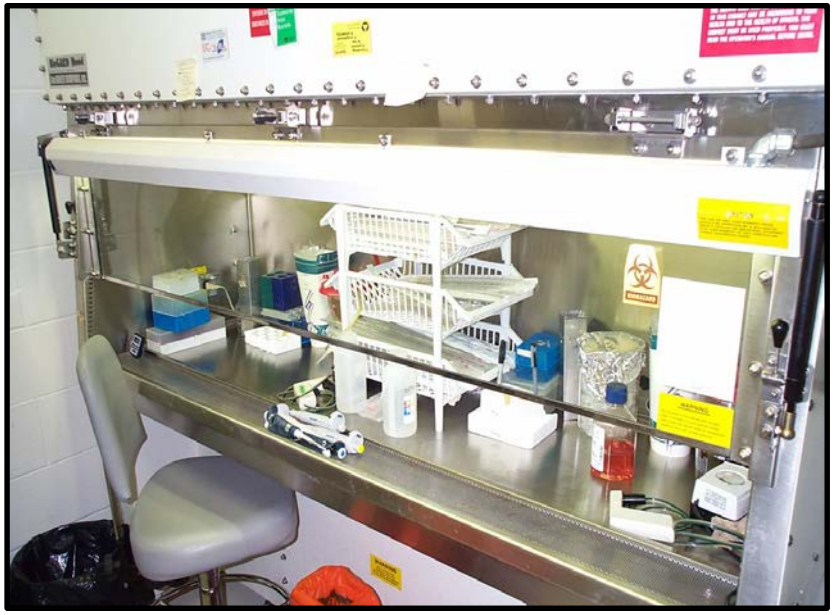
- Risk of Samples is unknown
- Unfamiliar with agent (rare agents)
  - Work conducted on open bench before risk is known
- Lack of time or money for training (limited staff)
  - Unsafe practices
  - Assumption that BSC and PPE are effective
- Lack of management support
  - PPE usage not always enforced
- High stress
  - Critical nature of work
  - High workload and fast pace
- Limited staff and resources leads to more stress
  - High workload, insufficient BSCs, facility/infrastructure issues

Hierarchy of Controls

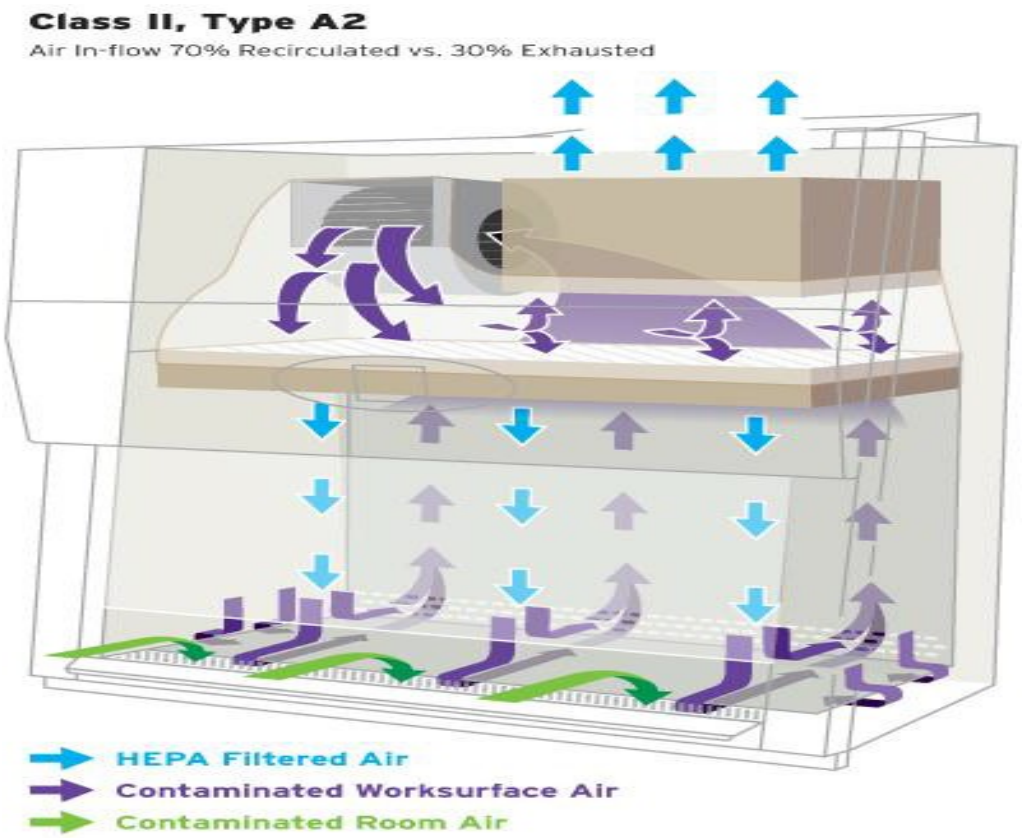



Engineering Controls

What is Wrong?



How Does a Class II A2 BSC Work?



BSC Best Practices

- Turn on BSC and run for at least 5 minutes
- Decontaminate work surface before and after
- Slow arm movements, perpendicular to the sash
- Minimize moving in and out of the BSC
  - Work clean to contaminated
  - **Don't over load the BSC**
  - Work at least 4 inches inside the grill

Preferred BSC operating location:

- Isolated from other work areas
- Removed from high traffic areas
- Away from laboratory entry doors
- Away from lab HVAC exhaust and supply vents
- 12-14" away from ceiling and walls

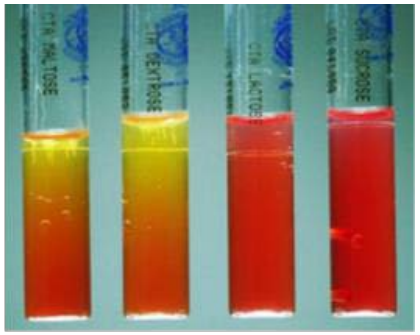
Administrative Controls

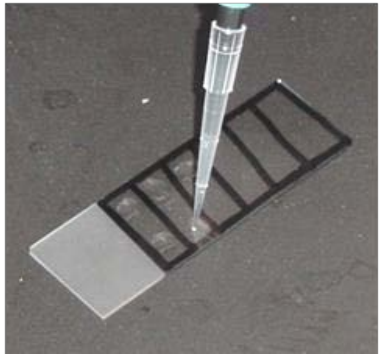
Administrative Contols

- Standard Microbiology Practices
- Standard Operating Procedures
  - Leadership
  - Biosafety Manual
- Creating a “Culture” of biosafety

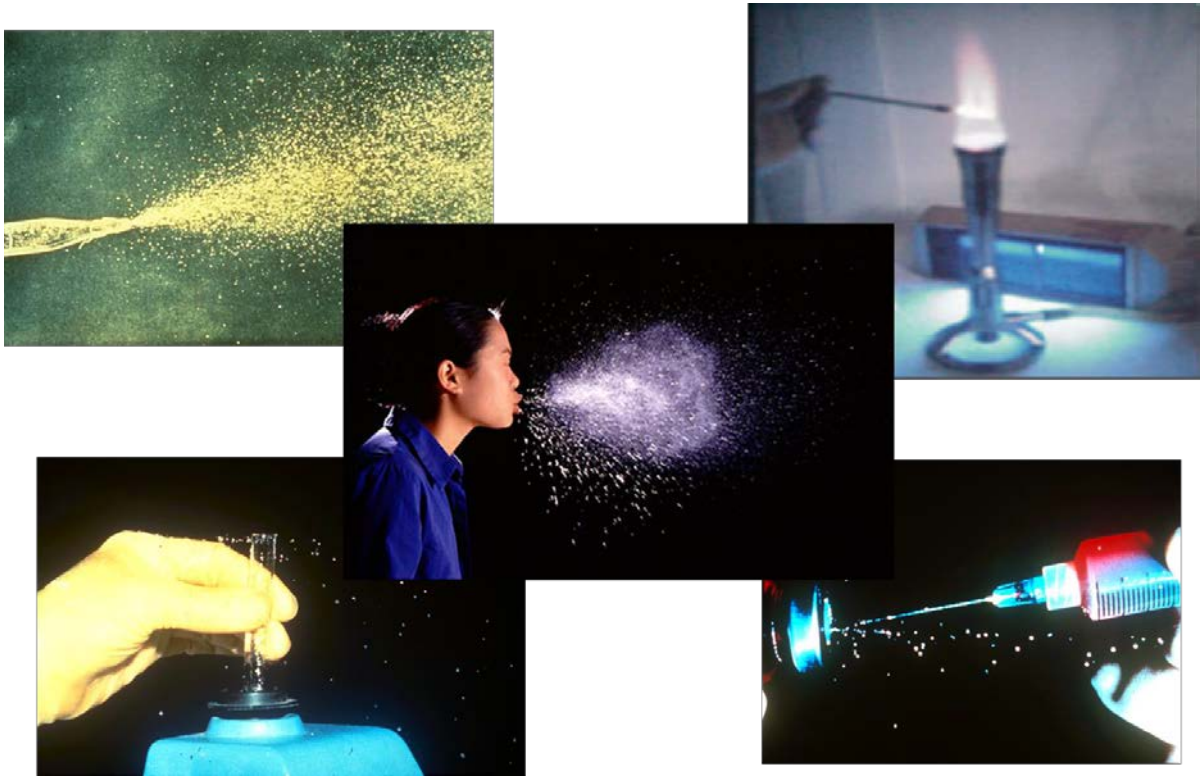
High Risk Activities Identified

- Sniffing plates
- Generating aerosols
- Centrifuging /vortexing
- Making slides
- Inoculating biochemicals
- Not using or improper use of BSC





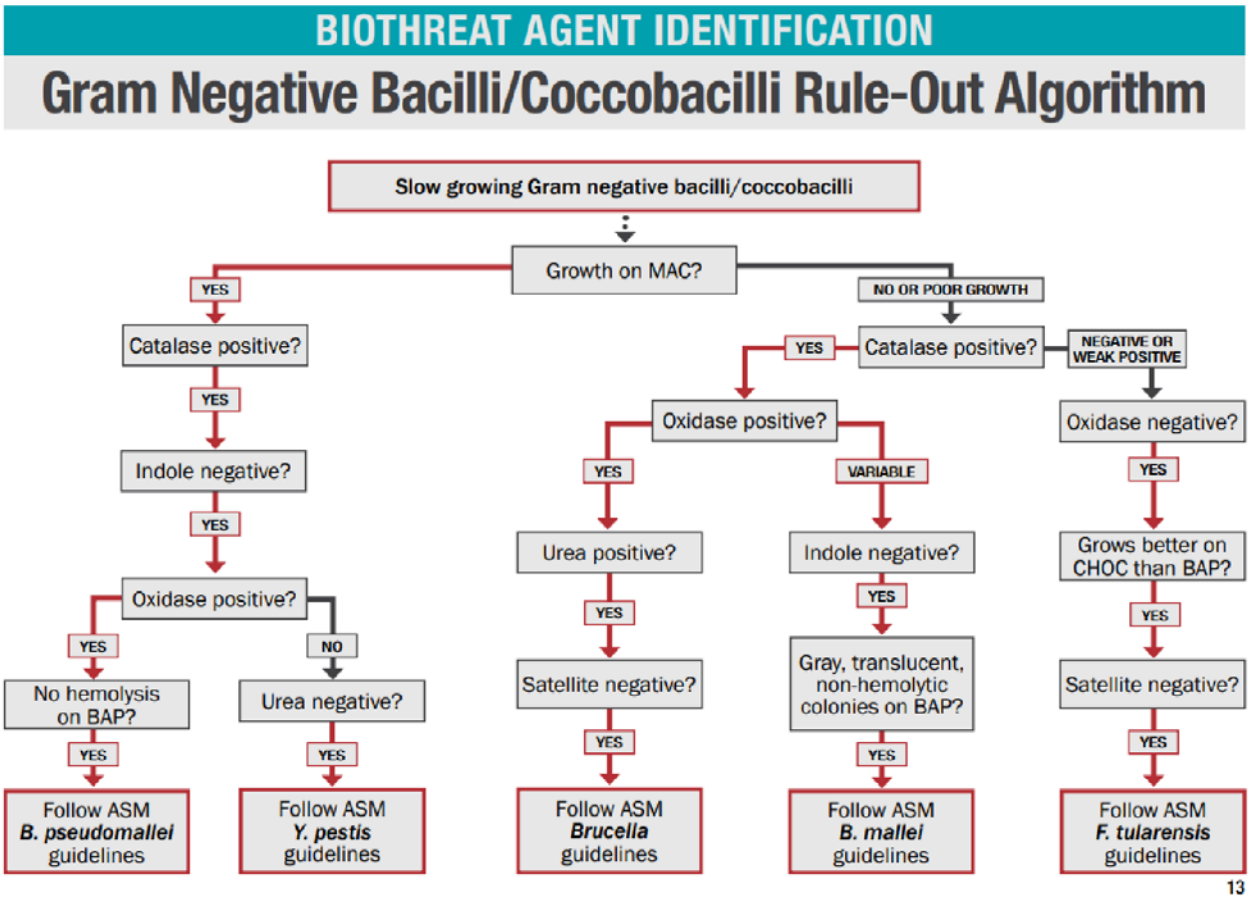
Aerosols



Procedures That May Generate Aerosols

- Performing catalase test
- Inoculating biochemicals
- Aspirating blood from blood culture bottles
- Pipetting
- Mixing
- Centrifugation
- Grinding
- Vortexing
- Pouring
- Opening lyophilized cultures
- Flaming loops
- Sonicating
- Loading syringes
- Tracheal intubation
- Non-invasive ventilation
- Wound manipulation
- Nebulizer treatment

Biothreat Agent Identification



Trigger Points

- A trigger point is a recognized combination of diagnostic findings that can be used to determine when to heighten the precautions or conditions that a sample or culture is handled under.
- For example a trigger point would be used to determine when to begin working with an organism in a biological safety cabinet.

Some Trigger Points

- Slowly growing, tiny colonies at 24–48 hours with Gram stain showing Gram-negative rods or Gram-negative coccobacilli
- Slow growth in blood culture bottles (i.e., positive at ≥48 hours), with Gram stain showing small Gram-negative rods or Gram-negative coccobacilli

MMWR / January 6, 2012 / *Vol*. *61*. 1. *Supplement*. Guidelines for Safe Work Practices in Human and Animal. Medical Diagnostic Laboratories

Some Trigger Points

- Growth only on chocolate agar
- Rapid growth of flat, nonpigmented, irregular colonies with comma projections and ground-glass appearance
- Gram stain showing boxcar-shaped, Gram-positive rods with or without spores

MMWR / January 6, 2012 / *Vol*. *61*. 1. *Supplement*. Guidelines for Safe Work Practices in Human and Animal. Medical Diagnostic Laboratories

Personal Protective Equipment

- PPE must be used properly to provide protection
- PPE can be used to build redundancy in protection
- PPE only protects the person wearing it, the hazard is still present

MALDI-TOF Risk Factors

- Many labs greatly reduce or stop doing Gram stains when relying on the MALDI-TOF
  a) Gram stain morphology is perhaps the most important trigger point
- It is difficult to use different reference software on the MALDI-TOF
  a) Most labs have CA and RUO software but they cannot be used simultaneously, and the lengthy steps are impractical under current workloads*
  b) At MDH we tested *B. thuringiensis* on the security database and it identified as *B. anthracis*, the RUO called it *B. cereus*, all with scores above 2.0
  c) MDH has also had the security database identify *B. anthracis* but the RUO identified *B. cereus* (although with a lower score)
- Open bench sample preparation
  a) Samples are prepped on an open bench before they are potentially identified as something more dangerous

* Misidentification of Risk Group 3/Security Sensitive Biological Agents by MALDI-TOF MS in Canada: November 2015-October 2017. D Pomerleau-Normandin, M Heisz, M Su