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Assessment of environmental and occupational exposure while working with *Mycobacterium abscessus* in mouse models

Syadatun Ahana, MPH
Laboratory Safety Specialist

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Fellowship Disclaimer

Why Mycobacterium abscessus?

- *Mycobacterium abscessus* (Mabs) is a rapidly growing nontuberculous mycobacterium that is responsible for
  - respiratory infections
  - healthcare-associated extrapulmonary infections
- It is hard to treat because of its resistance to current antibiotic therapies

https://www.buzzrx.com/blog/copd-vs-ipf-idiopathic-pulmonary-fibrosis

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Why Assess Exposure?

Novel experimental design

- High concentrations of inoculum
- Aerosol exposure equipment

Animal research

- Risk for immunocompromised staff
- Risk of bites and aerosolization
- Risk from animal housing and handling

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Methods of Infection

1. Tail-vein Injection

- Six C3HeB/FeJ mice
- Oral dexamethasone treatment at 20 mg/L
- 6 log10 CFU injected into the tail vein
- 7H9-OADC Middlebrook broth

2. Inhalation Exposure Chamber

- Sixteen C3HeB/FeJ mice
- Oral dexamethasone treatment at 4 mg/L
- 3-3.5 log10 CFU per lung
- 7H10-OADC plates

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Tail-Vein Injection Shedding Study

- Sample sites:
  - **Mouse:** Oral, anal, urine, feces
  - **Environmental:** Settling plates in BSC during euthanasia and necropsy
- Time Point: 7 days post infection (study completion)

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Tail-Vein Injection Results

Individual	Oral	Anal	Urine	Feces
♂ #1	+		+	
♂ #2				
♀ #1			+	
♀ #2		+		
♀ #3		+	+	
♀ #4				

+= mycobacterial growth
Environmental plates were all negative

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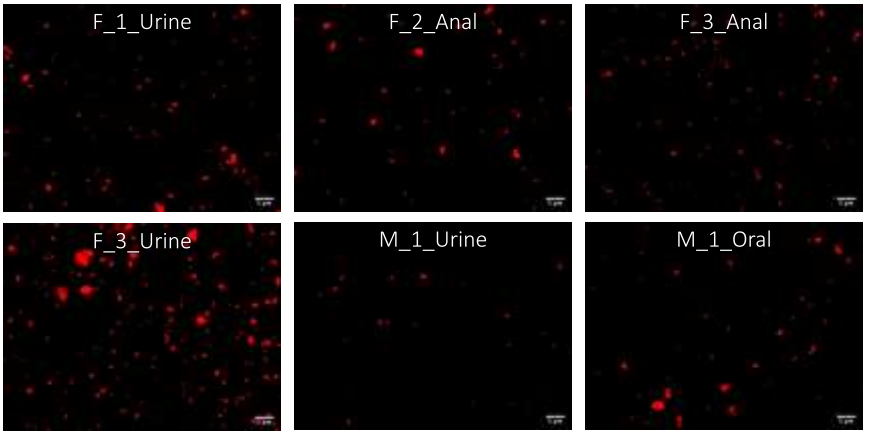
Fluorescent Microscopy of Shedding Samples



Confirmation of mCherry in all positive samples

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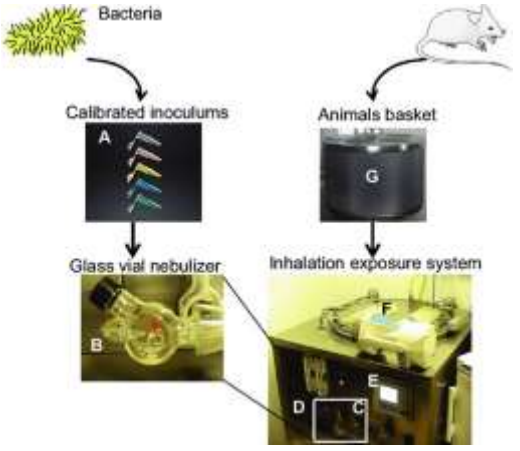
Inhalation Exposure

- Sample sites:
  - Mouse: fur, oral, anal, and urine
  - Environmental: “hot spots,” settling plates
- Time points: Baseline, Day 1, Weeks 1, 3, 5, and 7
  - Additional if symptoms present



https://www.researchgate.net/figure/whole-body-inhalation-exposure-system-Notes-The-Glas-Col-R-aerosol-exposure-chamber_fig2_280104120

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Glas-Col Inhalation Exposure System

Preheat → Nebulization → Cloud Decay → Decon. → Cool Down

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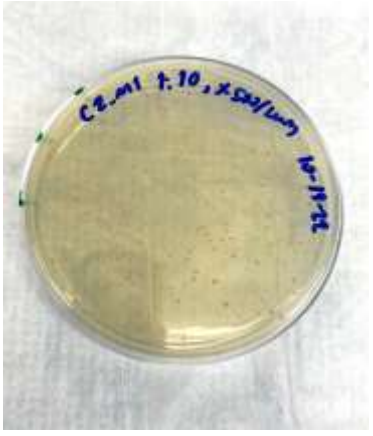
Inhalation Exposure Results

- Exposure risk from:
  - **Whole body aerosol exposure**
    - Baseline – *no growth*
    - Day 1 – *no growth*
  - **Shedding from infected mice**
    - Weeks 1, 3, 5, and 7 – *no growth*



Mouse lung infection

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Takeaways

- Exposure risks can vary according to route of administration
- Different methodologies can be used to conduct evidence-based risk assessments at other institutions
- Evaluate engineering controls prior to working with higher risk organism
- Results helped confirm our internal risk assessment

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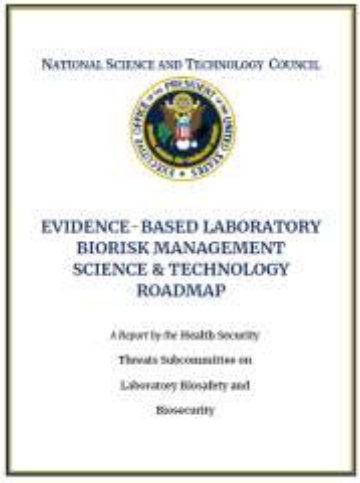
The Evidence-Based Biosafety Roadmap

- Call for evidence-based biosafety
- Opportunity for fellowship training programs like NBBTP and APHL to support these projects



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Thank you!

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