Biorisk Management Considerations for Non-Traditional Laboratories

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Challenging Problems.
Smart Solutions.

Background

- Ongoing shift in pathogen detection and diagnostic methods
- Infrastructure and resource challenges in low resource environments
- Endogenous capabilities supplemented by non-traditional laboratory spaces provided and often staffed by international partners

Non-Traditional Laboratories

- Designed for varying degrees of portability
- Typically rely on molecular and/or serological technologies; some may include clinical chemistries and other blood analyses, microscopy capability
- Non-permanent infrastructure impacts available engineering controls, increases reliance on administrative controls and personal protective equipment (PPE) selection and use

Containerized Laboratories

- Closest to traditional laboratories
- Workflows defined by arrangement of intermodal shipping containers or equivalent
- Can support larger equipment
- Generally installed next to medical facility

MRIGlobal containerized molecular diagnostics laboratory, Moyamba, Sierra Leone

Mobile Laboratories

- Workflows dependent on existing room configuration or tent setup
- Equipment largely modular– fit into hard sided boxes for transport
- Generally installed adjacent to medical facilities

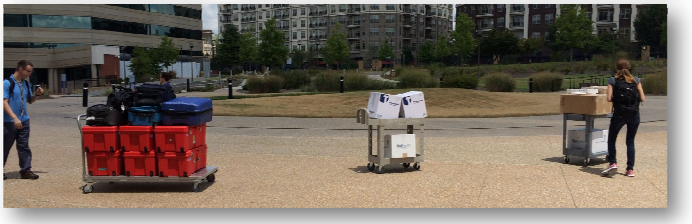

Photo courtesy of L. Presser

Laboratory-in-a-Box

- Smallest footprint; single table workflow
- Most focused testing capability
- Designed for immediate sample processing and analysis
- Transportable by single passenger vehicle, to facilitate access to testing sites

https://nanoporetech.com/

https://biomeme.com/

MRIGlobal's Mercury Lab, patent pending. Images courtesy of J. Russell

High Risk Areas of Focus

Sample transport	Sample security	Personnel protection	Decon	Waste disposal
• Local capabilities limited • In transit loss or release • Quality challenges	• Local capacity limited • Need for short and long term storage	• Engineer-ing control availability • Chemical inactivation not always a viable option	• Decon reagent importation • Local reagent quality • Equipment decon	• Limited municipal waste, liquid waste handling • Solid waste repurposing

Sample Transport

Containerized laboratories

- Pros: Establish in key locations
- Cons: Location determines impact on collection, packaging, quality management

Mobile laboratories

- Pros: Establish in key locations
- Cons: Location determines impact on collection, packaging, quality management

Laboratory-in-a-box

- Pros: Establish where needed. Can oversee collection, packaging, quality management
- Cons: Sample throughput lower

Sample Security

Containerized laboratories

- Laboratory access designed to be secured (padlock or cipher lock)
- Cold storage devices may be lockable

Mobile laboratories

- Laboratory access dependent on local infrastructure
- Cold storage, if purchased locally, not lockable

Laboratory-in-a-box

- Designed for immediate sample processing
- No long term sample storage
- Challenging if host nation expects preservation of positives

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Personnel Protection

Containerized laboratories

- Can include biosafety cabinets and/or glove boxes for primary containment
- Directional, filtered airflow possible

Mobile laboratories

- Portable glove boxes and/or open benches
- Administrative controls, PPE, workflow used to reduce risk

Laboratory-in-a-box

- Administrative controls and choice of PPE are critical
- Work conducted on open bench; may incorporate portable glove box enclosing work surface

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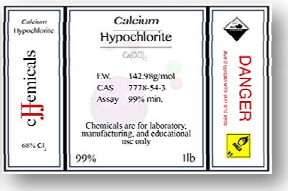
Decontamination



Containerized laboratories

- Surface decontamination
- Decontamination of floors, walls, ceilings possible

Mobile laboratories

- Surface decontamination
- Decontamination of floors, walls, and/or ceilings may be possible depending on infrastructure

Laboratory-in-a-box

- Work surface/equipment surface decontamination
- Use of glove box complicates decontamination

Biohazardous Waste Disposal

Containerized laboratories

- Small to medium scale incinerator
- Ash pit
- Decontaminated liquids disposed of in leach field

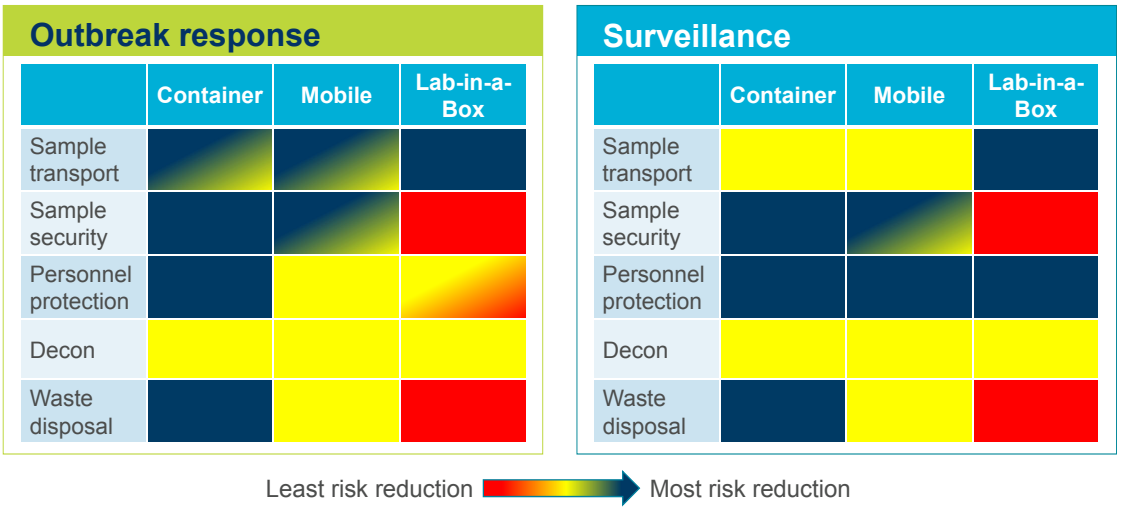
Mobile laboratories

- Open burn pit
- Site buried when no longer in use
- Decontaminated liquids disposed of in leach fields or collected for later disposal

Laboratory-in-a-box

- Open burn pit or “pack out” of solid wastes
- Decontaminated liquids poured out in burn pit or collected and buried

Risk Reduction for Outbreak *vs.* Surveillance Activities



Critical Areas for Improvement

- Decontamination strategies/technologies for equipment
- Disposal of solid biohazardous waste
- Disposal of liquid biohazardous waste

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THANK YOU

for your attention!

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