

## Review of Laboratory Systems

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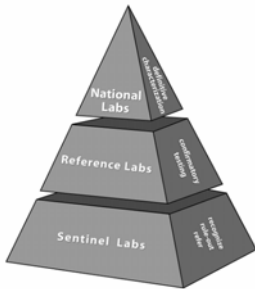
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## The Laboratory Response Network



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## Michigan Laboratory System



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## Regional Laboratories in MI



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## Regional Laboratories in MI

- Regional laboratories
  - Level B (confirmatory) lab for each region
  - Each laboratory supports a specific city, county or group of counties
  - Receive clinical specimens from Level A (sentinel) laboratories
  - Rule In and Refer to MDCH Level B-C lab in Lansing

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## Biosafety Levels

- BSL-2, designed for working with agents of moderate risk
  - Work may be done on benchtop
  - Aerosol producing procedures done in a biosafety cabinet
  - Personal protective equipment (PPE)
  - Immunizations
  - Training required
  - Access restricted

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## Biosafety Levels- BSL-2



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## Biosafety Level 2

*Safety Equipment (Primary Barriers)*

- Class II Biosafety Cabinet



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## Biosafety Levels

•BSL-3, designed for working with infectious agents which may cause serious or lethal disease as a result of exposure via inhalation

- All BSL-2 requirements plus
  - ~ Secondary barrier
  - ~ Inward directional, one pass airflow
  - ~ Sealed walls, ceiling
  - ~ Extra PPE may be required

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## Biosafety Level 3

*Safety Equipment (Primary Barriers)*



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## Biosafety Levels

- BSL-4, for work with dangerous and exotic agents that pose high-risk of inhalation transmitted laboratory acquired infections and life threatening disease
- Two types of BSL-4
  - Cabinet lab
  - Suit lab

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## Biosafety Levels

- Cabinet lab
  - All handling of agents is done in a class III biosafety cabinet
  - Dedicated non-recirculating ventilation
  - HEPA filtered supply and exhaust air
  - Daily inspections of containment parameters
  - Shower/changing anteroom

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## Biosafety Levels

- Suit lab
  - Same requirements as cabinet lab
  - Special designed suit offers same protection as a Class III biosafety cabinet

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## Biosafety Level 4

*Safety Equipment (Primary Barriers)*



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## Sentinel Laboratory

- BSL-2 for processing specimens
- BSL-3 when risk of aerosolization is present

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## Role of Sentinel Laboratories

- Key role
- Foundation of pyramid
- Prepared and trained to recognize agents
- Processing/plating of patient specimens

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## Role of Sentinel Laboratories

- Recovery and isolation of possible BT agents:
  - Bacillus anthracis*
  - Brucella* spp.
  - Burkholderia* spp.
  - Francisella tularensis*
  - Yersinia pestis*
- Emerging agents of public health concern
- Rule – out or refer agent

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## Role of Sentinel Laboratories

- Collection of referred specimens:
  - *Clostridium botulinum*
  - Suspect smallpox
  - Potential chemical exposure
- Properly package and ship specimens/isolates
- Notify public health partners

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## Turnaround Time-Sentinel Labs

- Agent specific
- 1-5 days for initial isolation
- 24-72 hours after isolation to rule-out.
- New FDA approved rapid test for anthrax – not endorsed by CDC

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## Role of Confirmatory Laboratories (Levels B-C) in a Bioterrorist Event

- Aid in rapid detection of cases
- Play a role in detection of covert attacks
- Identify and characterize isolates referred by the sentinel laboratories
- Collaborate with law enforcement
  - Preserve original specimens and cultures pursuant to a criminal investigation
  - Convey information appropriate law enforcement agency and FBI

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## Level B Confirmatory Laboratory

- BSL-3 or BSL-2 with BSL-3 practices
- Responsible for “Rule In” and Refer
  - Identify isolates received
  - Characterize isolates received
  - Serotyping
    - ~ Susceptibility testing
  - Refer to level C laboratory for further identification/characterization

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## Level C Confirmatory Laboratory

- BSL-3 facility and practices
- Responsible for “Rule In” and Refer
  - Identify isolates received
  - Further characterize isolate
    - ~ Toxin testing
    - ~ PFGE
  - Refer to level D for further characterization and archiving

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## Level D National Laboratory

- BSL-4 facility and practices
- Responsible for Confirmation, Validation and Archiving of possible bioterrorism agents
- Two Level D laboratories

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## Turnaround Time Confirmatory Labs

- Agent specific
  - 2-4 hours minimum for presumptive results
  - 1-5 days for isolation and confirmation

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## Testing Done at MDCH

•MDCH laboratory will perform procedures for isolation and identification :

- Bacillus anthracis*
- Yersinia pestis*
- Francisella tularensis*
- Brucella* spp. (genus level)
- Burkholderia* spp. (species level)
- Clostridium botulinum* and toxin testing
- Rule out and/or confirm Variola virus
- Coxiella burnetii*

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## Lab Results

• Reports on clinical specimens submitted to MDCH go to:

- Submitter
- Local Public Health Department\*
- MDCH Bureau of Epidemiology\*

\*if a reportable illness/disease

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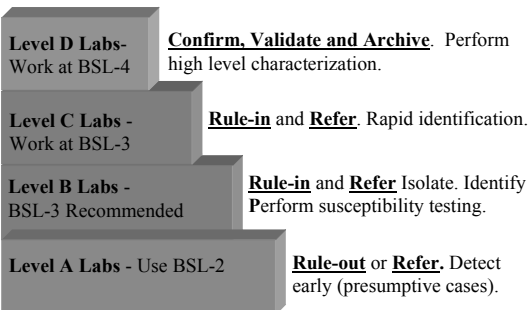
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## LRN Laboratory Levels



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Public Health Preparedness and Response to Bioterrorism

Focus Area D: Chemical Agents

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Introduction to the Chemical Terrorism Laboratory Network (CTLN)

This program is not as mature as the BT program but this will be changing rapidly. Stay tuned.

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Initially, the Chemical Terrorism Laboratory Network (CTLN) was Composed of:

- CDC – NCEH - DLS
- State of California
- State of Michigan
- State of New Mexico
- State of New York
- Commonwealth of Virginia

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## CTLN (2004) Consists of Three Laboratory Levels

- Level 1 Laboratories: Clinical Labs & other sentinel labs will be a referral center. Chemical Training to begin in 2004.
- Level 2 Laboratories: expansion to 40 states' labs planned for 2004 in collaboration with CDC & CTLN for limited testing for chemical agents.
- Level 3 Laboratories: CDC & NY, VA, CA, NM & MI to provide backup capacity. Reference methods used.
- Funding supports testing of clinical specimens.

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## Level 1 CTLN Laboratories

- Level 1 laboratories do not perform laboratory testing for chemical agents.
- Chemical Terrorism Laboratory Coordinators (CTLC) will provide technical assistance and training in the collection, handling and shipment of human specimens in response to a chemical terrorism incident to the Level 1 labs.
- Samples from a CT event are evidence.
- Training for level 1 labs is top priority for MDCH.

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## Level 2 CTLN Laboratories

- Perform level 1 laboratory activities including education & training
- Perform limited laboratory testing for chemical terrorism agents.
- Laboratory testing is limited to methods performed on the GC-MSD and the ICP-MS platforms.
- Cyanide, toxic metals in the 1st phase.
- CDC training for OH, IN,IL, WI for 2004.

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### Level 3 CTLN Laboratories

- Perform level 1 and level 2 laboratory activities including education & training
- Perform additional laboratory testing for chemical terrorism agents (metabolite of parent agent).
- Laboratory testing at level 3 laboratories includes GC-MSD, ICP-MS, GC-MS/MS and LC-MS/MS platforms.
- Cyanide, toxic metals, nerve agents, sulfur mustard-2003; nitrogen mustard, Lewisite-04&05.

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What role will CDC play in the CTLN?

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CDC – NCEH – DLS will provide to the CTLN:

- Laboratory Response Team – Available 24/7
- Establish Laboratory Instrumentation
- Develop Laboratory Procedures
- Train State Laboratories on Instrumentation and Laboratory Procedures

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## Laboratory Response Team

- Facilitate acquiring blood, serum and urine specimens as rapidly as possible
- Assist specimen shipment from emergency room, hospital or on-site facility
- The first 40 specimens will be sent to the CDC lab
- If help is needed, fly CDC staff to site of CT incident

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## Michigan Laboratory Response Network

- Approximately 180 Level 1 laboratories
- One level 3 laboratory (MDCH)
- Other resources include:
  - MSP & FBI
  - Regional Poison Centers
  - Michigan Dept of Environ. Quality
  - Michigan Dept of Agriculture
  - Michigan Dept Labor & Economic Growth
  - 51st WMD Civil Support Team (Nat'l Guard)

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## MDCH Laboratories Will

- Provide laboratory training & consultation for level 1 labs
- Provide laboratory surge capacity to the CDC laboratories in the event of a CT incident
- Assist in the analysis of human specimens from anywhere in the US
- Must be ready to perform specimen analysis within 3 hours of notification by the CDC

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## Impact of Specimen Type for Chemical Agents

- Clinical specimens
  - Compounds of interest may be metabolized. Timing of specimen is important.
  - Threat to Lab staff for chemical hazard reduced. Universal precautions adequate.
  - Documents exposure.
- Unknown specimens
  - CDC funding supports clinical specimens only
  - Parent compound is of interest & threat to lab staff is significantly increased.
  - Labs testing programs for unknown solids, liquids and gases is in development.

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## Federal Regulations & Laboratory Security

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## Federal Regulations

- “The Antiterrorism and Effective Death Penalty Act of 1996”
  - Result of inappropriate purchase of plague
  - No prior mechanism to take legal action
  - Regulated the transfer of selected agents
  - Required HHS to issue rules to implement these regulations
  - Proposed list of select agents

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## Select Agents

- Bacteria
  - BT agents
- Viruses
  - Ex: smallpox, Ebola
- Rickettsiae
  - Coxiella sp*
- Fungi
  - Coccidioides immitis*
- Toxins
  - Botulinum toxin
  - Ricin

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## Federal Regulations

- Select Agent Rule 42 CFR 72.6
  - Effective April 15, 1997
  - Designated the CDC as the enforcing agency
  - Established requirements for all facilities transferring or receiving select agents.
  - Required reporting of all transfers of the select agents
  - Tracked the acquisition and transfer of agents
  - Established an emergency notification process
  - Included list of select agents.

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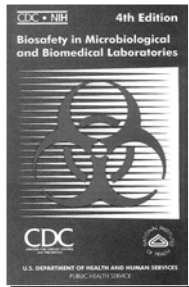
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## Federal Guidelines

- Laboratory Security and Emergency Response for Microbiological and Biomedical Laboratories

•Appendix F Biosafety in Microbiological and Biomedical Laboratories (BMBL) 4th ed. 1999



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## Federal Regulations

- The USA PATRIOT Act
  - Regulated appropriate use of select agents
  - Restricted some personnel access to agents
  - Imposed criminal and civil penalties for inappropriate use of select agents

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## Federal Guidelines

MMWR December 6, 2002

“Laboratory Security and Emergency  
Response Guidance for Laboratories Working  
with Select Agents”

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## Federal Guidelines

MMWR Guidelines

- Risk assessment
- Facility security plan
- Personnel security policies
- Restricted access to agents
- Select agent inventory and accountability
- Transfer/shipping procedures
- Emergency response plans
- Incident reporting

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## Federal Regulations

- Public Health Security and Bioterrorism Preparedness and Response Act of 2002 -(42 CFR 73)
  - Supercedes prior Select Agent Rule (42 CFR 72.6)
  - Regulates transfer, **possession and use** of select agents.
  - Requires security risk assessments
  - Expands authority to the USDA to regulate activities to protect animal and plant health and products

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## Federal Regulations

- What do they really mean?
  - PAPERWORK!!!!
  - Extensive laboratory registration process
  - Listing of every agent, who has access, where, why
  - Personnel review, screening, fingerprinting
  - Security risk assessment– facility upgrades
  - Additional safety plan
  - Agent specific training
  - Documentation, documentation, documentation
  - On-site inspection . . . . .

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## Federal Regulations

- Packaging and shipping infectious substances:
  - 49 CFR 171 Code of Federal Register
  - DOT Department of Transportation
  - DMM Domestic Mail Manual
  - IATA International Airline Transport Association

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