LRN-C: A Chemical Emergency Asset for Local Opioid Response

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Outline

I. PHL Roles in the Opioid Crisis
II. LRN-C Framework
III. LRN-C Response Stories
IV. Summary
V. Questions/Discussion
PHL Role in the Opioid Crisis

- ID of New and Emerging Fentanyl Threats
- Supporting the classification of illicit drugs
- Ensuring the safety of first responders
- Overdose surveillance
- Informing public health and policy interventions
- Tracking the success of public health interventions
- Ante-mortem Surveillance
- Occupational Safety
THE LRN-C FRAMEWORK FOR OPIOID RESPONSE
The Laboratory Response Network for Chemical Threats (LRN-C)

**Mission:** The LRN-C and its partners will maintain an integrated national and international network of laboratories that can respond quickly to acts of chemical terrorism, emerging threats and other public health emergencies.

As the LRN-B infrastructure has been utilized for surveillance of the influenza epidemic in recent years, LRN-C could potentially be leveraged for local opioid surveillance and other activities.
LRN-C Framework: Staff and Equipment

Expert Staff

- CDC’s Public Health Emergency Preparedness Cooperative Agreement awards (PHEP) more than $12 million to 10 state public health laboratories (i.e., Level 1 Labs) annually.
- In 2017, PHEP allocated an additional $500,000 towards HAZMAT training, ISO accreditation activities, equipment vendor training for chemical threat program personnel.

Equipment

- Since 2016, PHEP has awarded more than $23 million towards updating LRN-C equipment assets, with another $12 million planned for within the next 2 years.
- Through the APHL Cooperative Agreement, LRN-C labs have received more than $250,000 in equipment training and maintenance agreements.
Comparison of two automated solid phase extractions for the detection of ten fentanyl analogs and metabolites in human urine using liquid chromatography tandem mass spectrometry

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Quantitation of fentanyl analogs in dried blood spots by flow-through desorption coupled to online solid phase extraction tandem mass spectrometry

Rebecca L. Shaner,\textsuperscript{a} Nicholas D. Schulze,\textsuperscript{b} Craig Seymour,\textsuperscript{b} Elizabeth I. Hamelin,\textsuperscript{a,\*} Jerry D. Thomas\textsuperscript{a} and Rudolph C. Johnson\textsuperscript{a}

*CDC-based Materials Program in development
LRN-C Framework: Quality Program

- Exercises
- Proficiency Testing
- In-house Validation
- Technology Transfer & Assessment
- Inter-laboratory Comparison Studies
- Materials Program
- New Methods
**LRN-C Framework: Level 3 Capabilities**

- Expertise with sample logistics and chain of custody
- LRN-C laboratory referral capabilities
- Secured messaging and laboratory to laboratory test request capabilities
- Training and outreach with local hospitals and first responders
Ready to Respond:
Public Health Laboratory Response Stories

Photo courtesy of Wisconsin State Laboratory of Hygiene
Ready to Respond: Massachusetts

Scope
The Massachusetts Chemical Threat Laboratory (LRN-C Level 1), works closely with law enforcement and first responders to prevent unintentional occupational exposures. Following field and biological testing, the lab uses LRN-C equipment and staff to perform further chemical testing on environmental samples as needed.

Capabilities
In 2016, the lab enlisted the help of the National Institute of Standards and Technology (NIST) to aid in the identification of furanyl fentanyl in a “white powder” sample. At the time, the mass spectra for this compound was not a part of the NIST 14 spectral library.

Next Steps
Massachusetts Chemical Threat Laboratory’s mass spectrum for furanyl fentanyl will be included in the next version of the NIST Mass Spectral Library. The lab will continue to support first responders with the analysis of unknown white powders collected from the field.
Ready to Respond: Washington, D.C.

Scope
Washington, D.C.’s Biomonitoring and Analytical Chemistry Unit (BACU)/Public Health Laboratory (LRN-C Level 2) leveraged their chemical threat equipment, staffing and expertise to form the District’s newly formed Forensics Chemistry Unit (FCU).

Capabilities
In 2016, FCU assisted the District’s Office of Attorney General with the identification of fentanyl analogues such as methoxy-acetyl fentanyl. At the time of identification, the synthetic fentanyl analogue was new to the Washington, D.C. area. FCU conducted molecular modeling studies to pre FCU’s work has enabled lawmakers to properly classify an ever growing list of new fentanyl analogues as illegal substances.

Next Steps
FCU now performs all of the Washington, DC’s DEA testing in environmental samples. The lab continues to expand its database for the rapid detection of synthetic opioids.
Ready to Respond: Wisconsin

Scope
In April 2018, six suspected cases of synthetic cannabinoids laced with anticoagulants were reported in Wisconsin. The Wisconsin State Laboratory of Hygiene (WSLH) (LRN-C Level 1), National Medical Services (NMS) labs, and the Illinois State Public Health Laboratory, were all engaged to do the testing. At the time, none of the labs had the testing capability.

Capabilities
With the help of internal standard provided by CDC, the WSLH was able to develop and validate a quantitative brodifacoum method in blood samples. Two of the cases were identified by quantitative analysis at WSLH, the other four by qualitative testing at NMS.

Next Steps
To date, over 200 cases of cannabinoid poisonings have shown up in at least 10 states thus far. For the next several months, WSLH will be offering brodifacoum testing at no cost for all LRN-C laboratories.
Scope
In June 2017, Arizona Department of Health Services (AZDHS) lab began supporting state epidemiologists in opioids surveillance in June 2017. Local hospitals were engaged to collect antemortem blood samples from persons presenting with overdose symptoms.

Capabilities
AZDHS PHL was able to stand up a screening method within 2 months for 22 compounds using instruments and testing approaches that are representative of most chemical threat laboratory programs (e.g., API 4000 LC/MS/MS).

Next Steps
Due to hospital HIPAA concerns, sample collection for antemortem surveillance testing has been slowed. The laboratory is currently working with Arizona county medical examiners to analyze post mortem blood for 139 opioids, fentanyl analogs, benzodiazepines, stimulants, and cannabinoids to support cause of death determinations.
Summary

**LRN-C Infrastructure**
- ✔ Staff and equipment
- ✔ Methods and materials
- ✔ Quality assurance best practices
- ✔ Sample logistics
- ✔ Response coordination
- ✔ Partnership engagement

**Potential Barriers**
- ❑ Expanding outreach capabilities
- ❑ Lack of public health policy mandate
- ❑ Costly materials
- ❑ External partnerships
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- CDC/National Center for Environmental Health (NCEH)/Division of Laboratory Science (DLS)
- Rudolph C. Johnson (CDC)
- Ryan Favors (CDC)
Thank You!!!

For more information please contact Centers for Disease Control and Prevention

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Visit: www.cdc.gov | Contact CDC at: 1-800-CDC-INFO or www.cdc.gov/info

The findings and conclusions in this study are those of the authors and do not necessarily represent the views of the U.S. Department of Health and Human Services, or the U.S. Centers for Disease Control and Prevention. Use of trade names and commercial sources is for identification only and does not constitute endorsement by the U.S. Department of Health and Human Services, or the U.S. Centers for Disease Control and Prevention.
LRN-C Response Capacity

<table>
<thead>
<tr>
<th>Level</th>
<th># of Labs</th>
<th>Sample Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>10</td>
<td>Up to 1000</td>
</tr>
<tr>
<td>Level 2</td>
<td>34</td>
<td>Up to 500</td>
</tr>
<tr>
<td>Level 3</td>
<td>10</td>
<td>---</td>
</tr>
</tbody>
</table>

Map of the United States showing the LRN-C Response Capacity by state.
LRN-C Testing Capabilities

**Level 1**
- CDC Capabilities
  - Level 2
  - Mustard Agents
  - Lewisite

**Level 2**
- Toxic Metals
- Toxic Industrial Chemicals
- Nerve Agents
- Abrine/Ricine

**Level 3**
- Biological packing and shipping capabilities
- Comprehensive response plan
CDC and LRN-C Partnership

- Chemical Threat Method Development and Technology Transfer
- Program Support
  - PHEP Interpretation
  - Secured Data Messaging Support
  - Lab Referral
- Demonstration of Analytical Proficiency
  - QA Program
  - Response Materials Program
  - Exercises

- National Surge Capacity
- Local Response
- Surveillance and Coordination
- Sample Packing and Shipping
- Hospital Outreach
<table>
<thead>
<tr>
<th>LRN-C Level</th>
<th>Function</th>
<th>Capability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 3</td>
<td>Public health surveillance, coordination</td>
<td>Packing and shipping of biological samples</td>
</tr>
<tr>
<td>Level 2</td>
<td>State response asset</td>
<td>Level 3 + lab testing</td>
</tr>
<tr>
<td>Level 1</td>
<td>National surge asset</td>
<td>Level 3 + Level 2 + Faster</td>
</tr>
</tbody>
</table>
LRN-C Method Deployment and Laboratory Qualification Scheme

Network Harmonization
- Inter-laboratory Comparison
- Materials Program Established
- Tech Transfer
- Round-Robin

Network Qualification
- 1st Proficiency Testing
Opioid Epidemic: What we can do to help???

CDC plans to:
• Work with volunteer LRN-C labs and other subject matter experts to identify a few core fentanyl methods (ie foundational methods) for detection in blood, urine and environmental samples
• Provide materials program support to volunteer LRN-C labs
• Support partnership engagement with key local stakeholders
Opioid Epidemic: What can we do to help???

At this time, CDC does NOT plan to:

- Facilitate coordinated network responses to fentanyl
- Officially introduce fentanyl testing into the LRN-C testing profile (ex. Core or Additional)
LRN Infrastructure Supports Emerging Threats

From the Response Stories Collected in 2015-2016:

- LRN-C CT staff were able to produce fast results (~36-48 hours) to assist public health officials resolve each incident

- Over 50,000 samples were analyzed by LRN-C Chemical Threat Program staff

- Nearly 500,000 people were affected by the incidents that occurred

Photo courtesy of CDC's Division of Laboratory Sciences
Incident

State Senior Health Official or FBI Requests CDC Assistance

CDC Deploys Chemical Emergency Response Team

CDC Conducts Rapid Toxic Screen (Priority Samples)

CDC returns findings to state

CDC engages LRN-C labs for additional patient testing (Surge Capacity)

Labs return results to CDC

CDC provides summary report of aggregate data

CDC returns findings to state

* A possible scenario. The actual process would be determined by the primary respondent agency for the event (e.g. FBI, state Emergency Mgr, state Epi., etc.).