Evaluating and Responding to Chemical Emergencies: The Role of Poison Control Centers and Public Health Labs

Clinician Outreach and Communication Activity (COCA) Conference Call

January 31, 2013

Office of Public Health Preparedness and Response
Division of Emergency Operations

Objectives

At the conclusion of this session, the participant will be able to accomplish the following:

- **Identify three services a biomedical laboratory can provide during a chemical emergency.**
- **Describe the role of poison control centers in evaluating and responding to chemical emergencies.**
- **Describe the key functions of the joint State-Federal collaborative program, CHEMPACK.**

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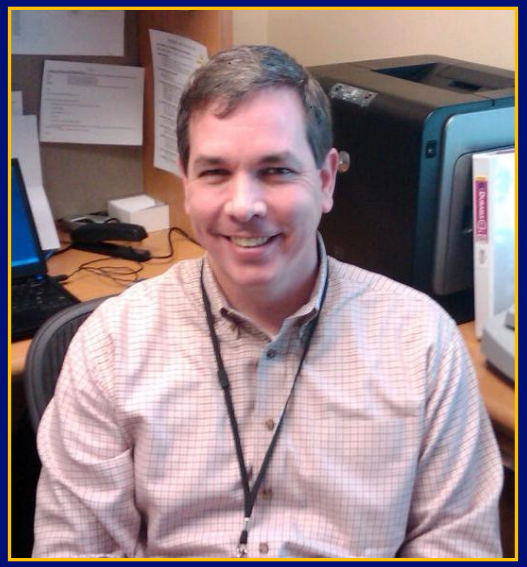
TODAY'S PRESENTER



Rudy Johnson, PhD
Laboratory Chief, Emergency Response Branch
Division of Laboratory Sciences
National Center for Environmental Health
Centers for Disease Control and Prevention

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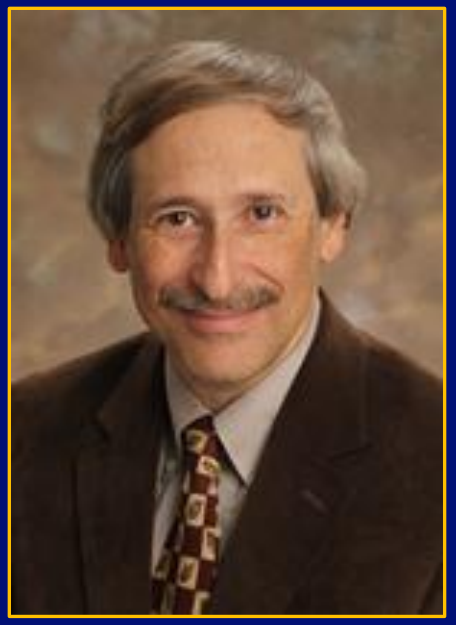

Robert J. Geller, MD
Medical Director, Georgia Poison Center
Professor of Pediatrics, Emory University

CDC Laboratory Response - Chemical Emergencies and Terrorist Events

Rudy Johnson, PhD

Division of Laboratory Sciences
National Center for Environmental Health
Centers for Disease Control and Prevention

Recent Chemical and Toxin Threats

Maine Reps Push for Disaster Relief for Shellfish Industry

02/11/2011 03:46 PM ET

Mike Michaud and Chellie Pingree says the industry needs help getting back on its feet after a massive red tide outbreak in 2009.

ike Michaud and Chellie Pingree, today urged
de disaster relief for Maine's shellfish industry,
easons in recent history.

Mustard Gas Sickens Two Massachusetts Fishermen

Null | Jun 07, 2010 | 0 comments

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February 24, 2011 2:59 PM

Report: U.S. wary of Libya's chemical weapons

Posted by CBSNews.com staff 2 comments

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As Muammar Qaddafi continues his violent crackdown on opposition protesters, U.S. officials are worried how far the embattled Libyan leader may go to neutralize the growing threat to his power.

According to a Wall Street Journal report ($), Qaddafi still possesses caches of mustard gas and other chemical weapons, as well as a stockpile of Scud B missiles and 1,000 metric tons of uranium yellowcake, leaving Washington skittish.

Vegas police find deadly ricin in motel room

Police know little of man in coma who had toxin, vials and castor beans

Goals

Produce interpretable laboratory results on a representative number of clinical samples as quickly as possible

Maintain flexible laboratory capabilities to respond to chemical emergencies and terrorism events

What information can a biomedical laboratory provide during a Chemical Emergency?

- Clear, understandable results from the analysis of a representative number of biomedical samples as quickly as possible
  - Identity of the chemical agent
  - Determine who has been exposed
  - Report actionable results, when known

Chemical Emergency Response

Chemical Emergency Response Team

24/7
Rapid deployment

Support collection, tracking and transport of samples to CDC

Response Exercises

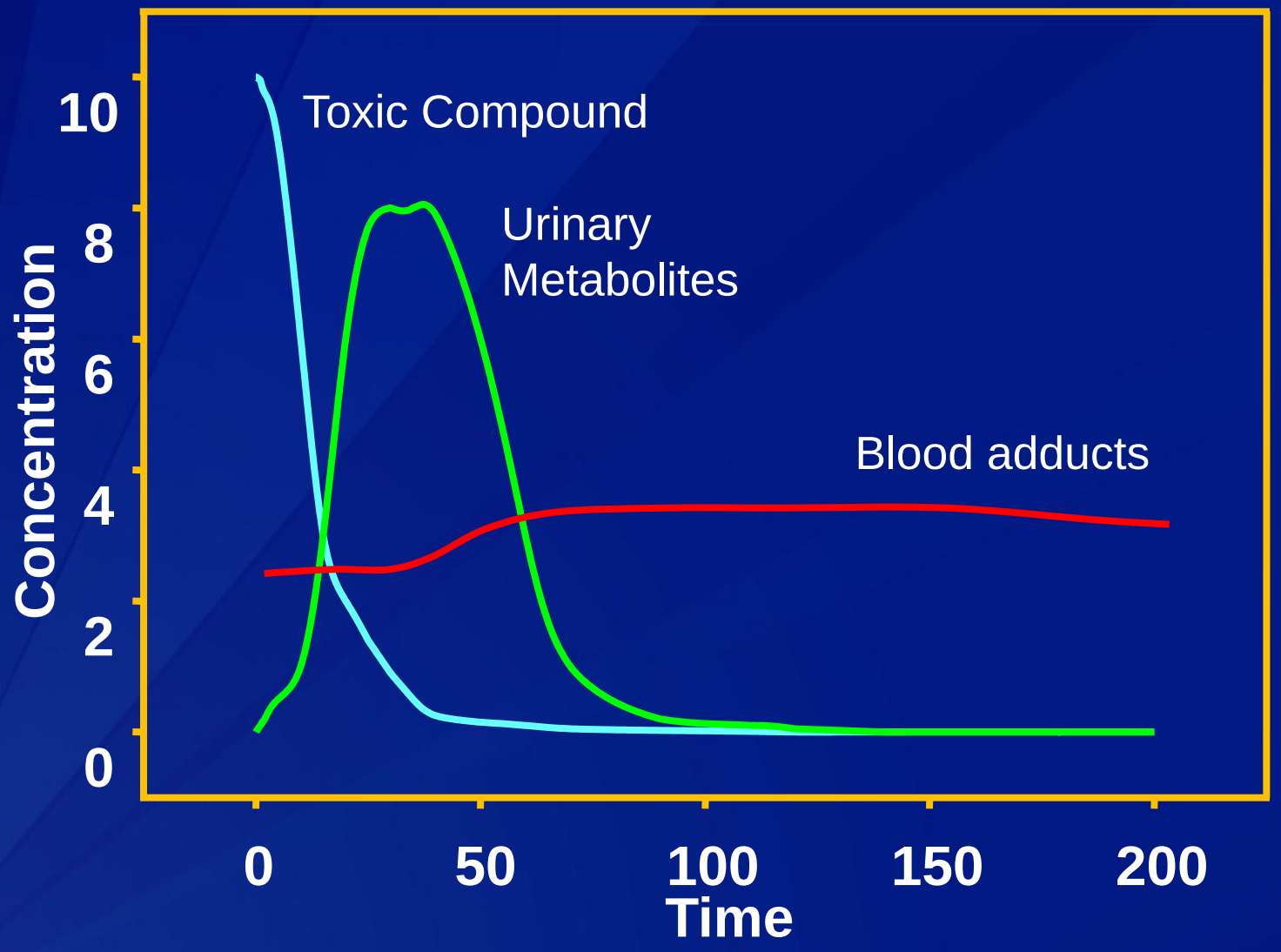
2-3 per year

- **Real-time**
  - Sample collection
  - Sample Analysis
  - Data reporting
- **Assess response capabilities**
  - Personnel
  - Sample transport
  - Sample analysis
  - Data approval & reporting

Different Biomarkers For Different Times Post Exposure

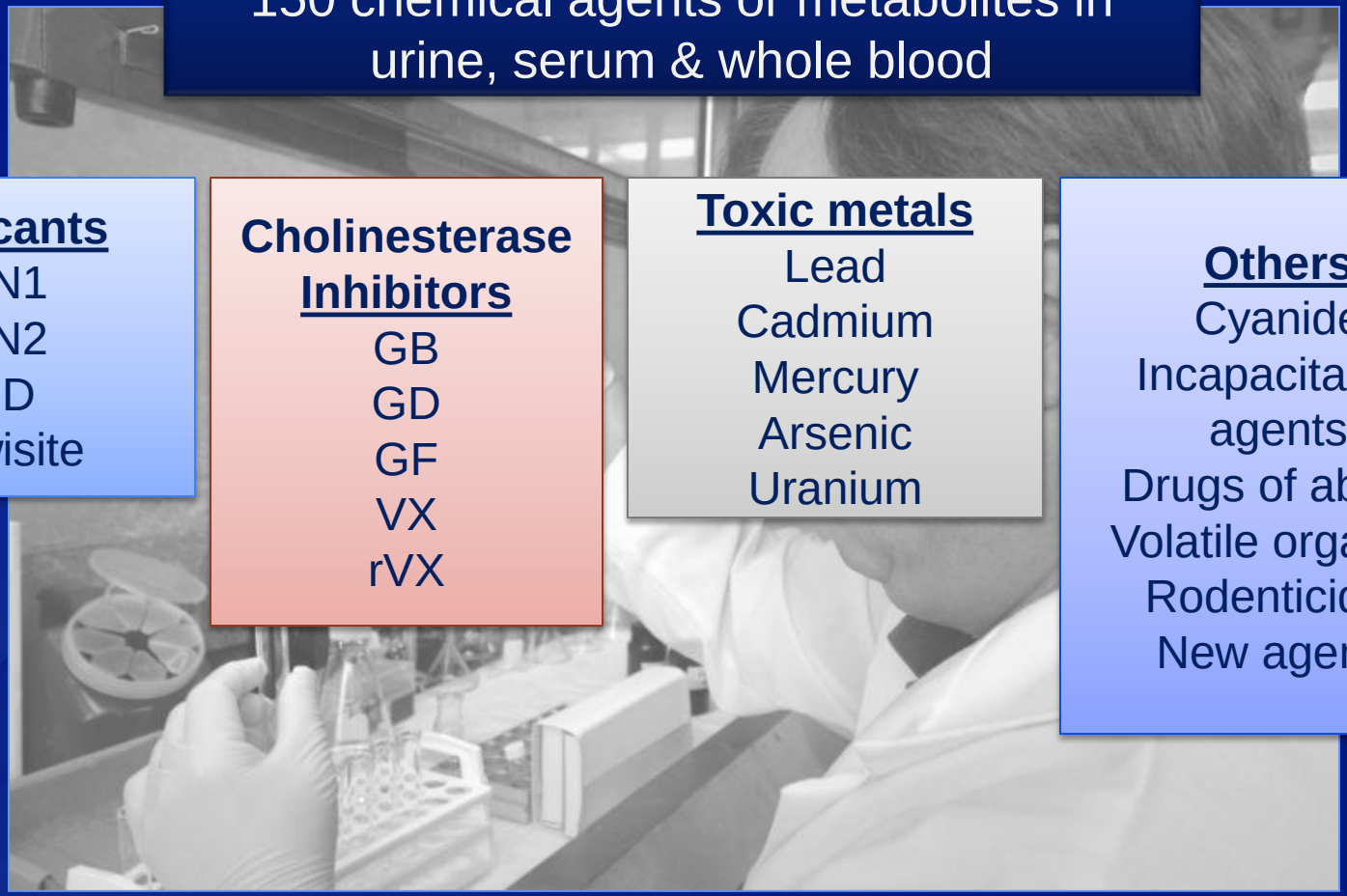
- Short-term biomarkers
- Medium-term biomarkers
- Long-term biomarkers

Non Persistent Biomarkers of Exposure



Rapid Toxic Screen

150 chemical agents or metabolites in urine, serum & whole blood



Vesicants
HN1
HN2
HD
Lewisite

Cholinesterase Inhibitors
GB
GD
GF
VX
rVX

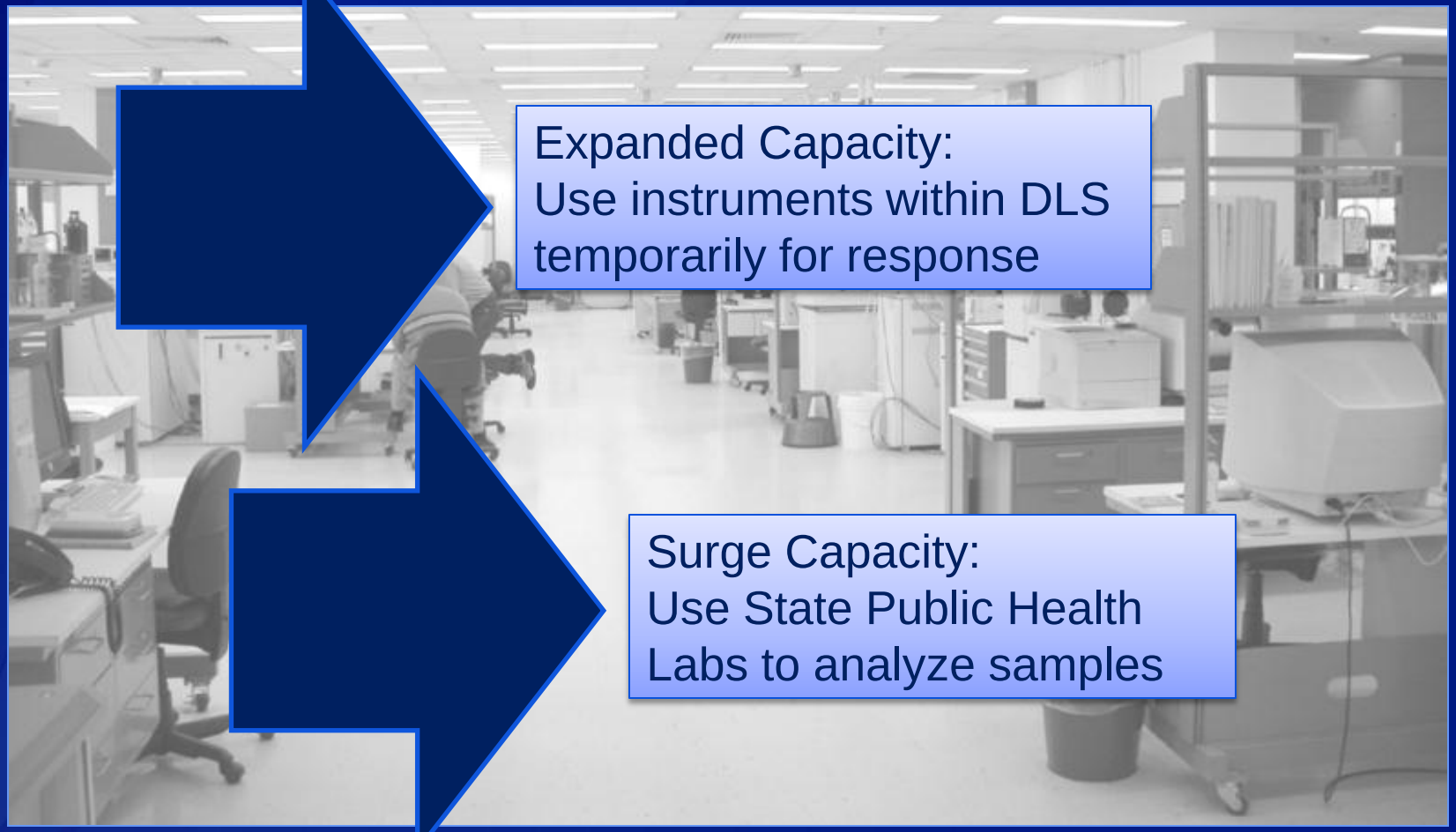
Toxic metals
Lead
Cadmium
Mercury
Arsenic
Uranium

Others
Cyanide
Incapacitating agents
Drugs of abuse
Volatile organics
Rodenticides
New agents

Overview of Diagnostic Method Criteria

- **Isotopic dilution – the best internal standard**
  - Normalizes sample preparation variations
  - Technology in synthesis
- **Sample preparation – fast and selective**
  - To obtain clinically relevant detection limits
  - To reduce interferences & suppression
- **Chromatography – builds on preparation**
  - Different selectivity from preparation
- **Tandem mass spectrometry – selective, sensitive**
  - Selectivity like a “one arm bandit”

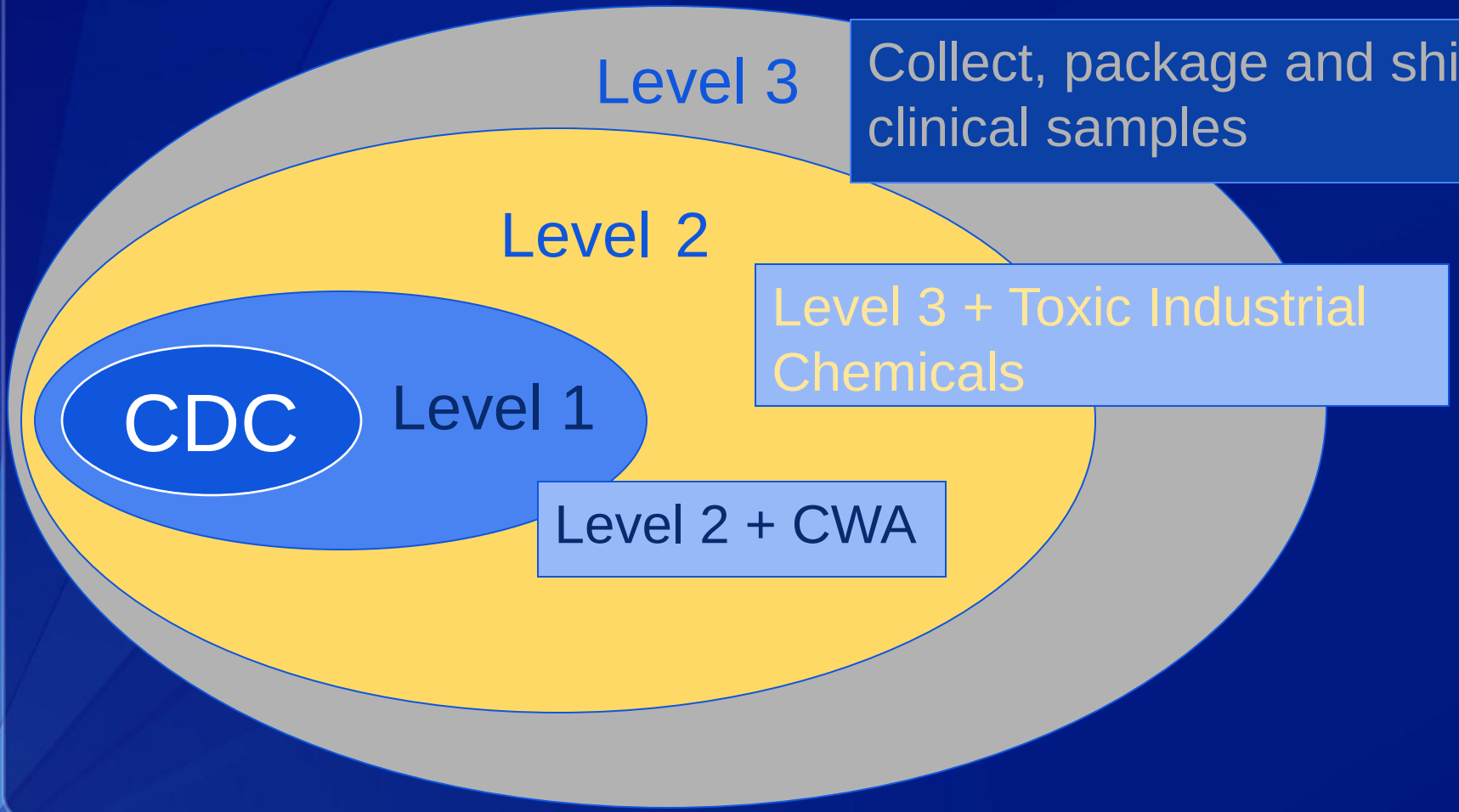
What if the sample number is really large???



Expanded Capacity:
Use instruments within DLS temporarily for response

Surge Capacity:
Use State Public Health Labs to analyze samples

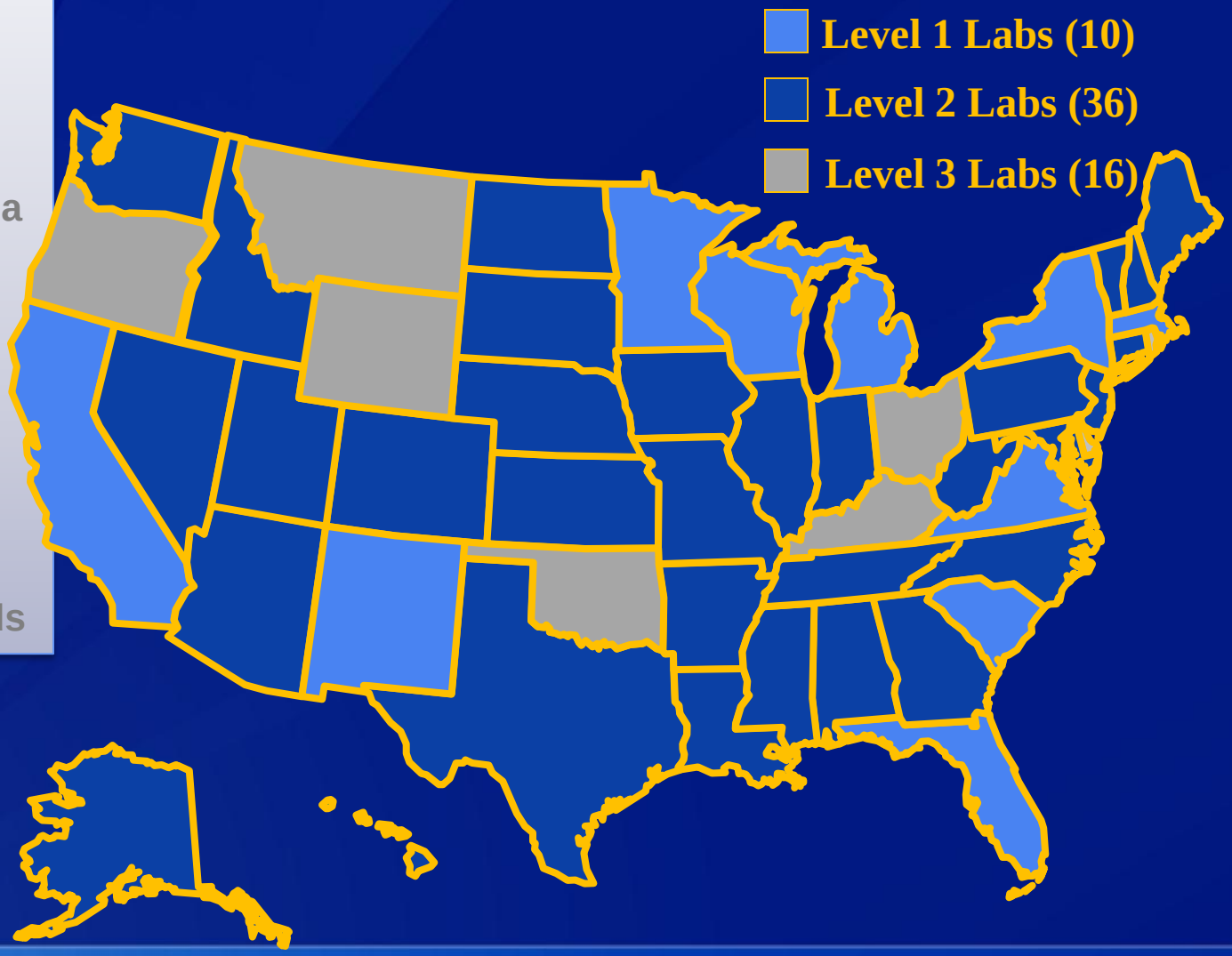
LRN-C Network Concept



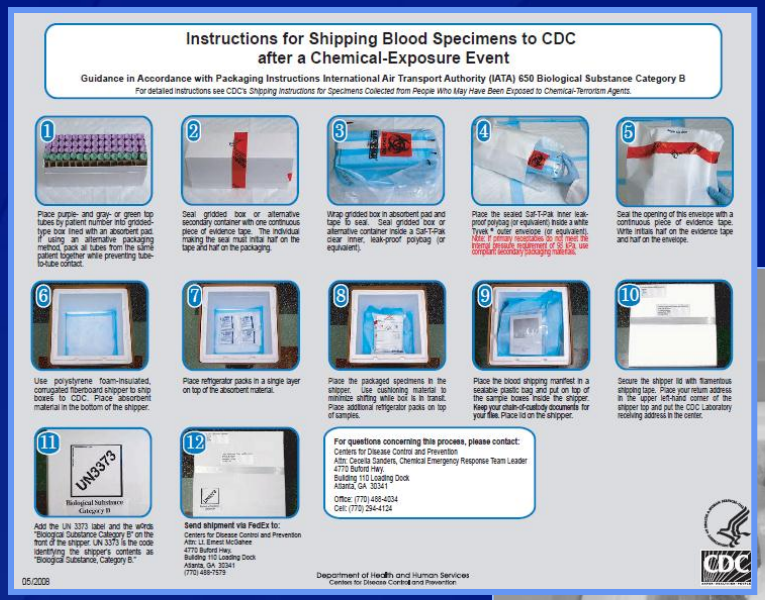
Laboratory Response Network
Chemical

District of Columbia
Los Angeles Co

American Samoa
Chicago
Guam
Micronesia
Marshall Is.
N. Mariana Is.
New York City
Palau
Puerto Rico
US Virgin Islands



Packaging and Shipping Exercises



Instructions for Shipping Blood Specimens to CDC after a Chemical-Exposure Event

Guidance in Accordance with Packaging Instructions International Air Transport Authority (IATA) 650 Biological Substance Category B

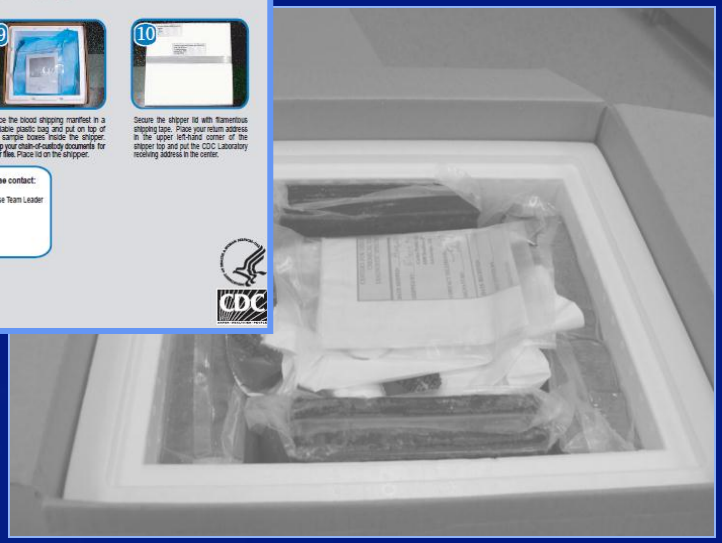
For detailed instructions see CDC's Shipping Instructions for Specimens Collected from People Who May Have Been Exposed to Chemical-Terrorism Agents.

1. Place purple- and gray- or green top tubes by patient number into gridded-type box lined with an absorbent pad. If using an alternative packaging method, pack all tubes from the same patient together while preventing tube-to-tube contact.
2. Seal gridded box or alternative secondary container with one continuous piece of evidence tape. The individual making the seal must initial half on the tape and half on the packaging.
3. Wrap gridded box in absorbent pad and tape to seal. Seal gridded box or alternative container inside a Saf-T-Pak clear inner, leak-proof polybag (or equivalent).
4. Place the sealed Saf-T-Pak inner leak-proof polybag (or equivalent) inside a white Tyvek ® outer envelope (or equivalent). Note: If primary receptacles do not meet the internal pressure requirement of 95 kPa, use compliant secondary packaging materials.
5. Seal the opening of this envelope with a continuous piece of evidence tape. Write initials half on the evidence tape and half on the envelope.
6. Use polystyrene foam-insulated, corrugated fiberboard shipper to ship boxes to CDC. Place absorbent material in the bottom of the shipper.
7. Place refrigerator packs in a single layer on top of the absorbent material.
8. Place the packaged specimens in the shipper. Use cushioning material to minimize shifting while box is in transit. Place additional refrigerator packs on top of samples.
9. Place the blood shipping manifest in a sealable plastic bag and put on top of the sample boxes inside the shipper. Keep your chain-of-custody documents for your files. Place lid on the shipper.
10. Secure the shipper lid with filamentous shipping tape. Place your return address in the upper left-hand corner of the shipper top and put the CDC Laboratory receiving address in the center.
11. Add the UN 3373 label and the words "Biological Substance Category B" on the front of the shipper. UN 3373 is the code identifying the shipper's contents as "Biological Substance, Category B."
12. **Send shipment via FedEx to:**
Centers for Disease Control and Prevention
Attn: Lt. Ernest McGahee
4770 Buford Hwy.
Building 110 Loading Dock
Atlanta, GA 30341
(770) 488-7579

For questions concerning this process, please contact:
Centers for Disease Control and Prevention
Attn: Ceceila Sanders, Chemical Emergency Response Team Leader
4770 Buford Hwy.
Building 110 Loading Dock
Atlanta, GA 30341
Office: (770) 488-4034
Cell: (770) 294-4124

05/2008

Department of Health and Human Services
Centers for Disease Control and Prevention



All States and Territories must be able to send samples

Proficiency Testing

- Quality evaluation
- Three times per year + one ‘surprise’
- Qualification status determined
- Online data reporting

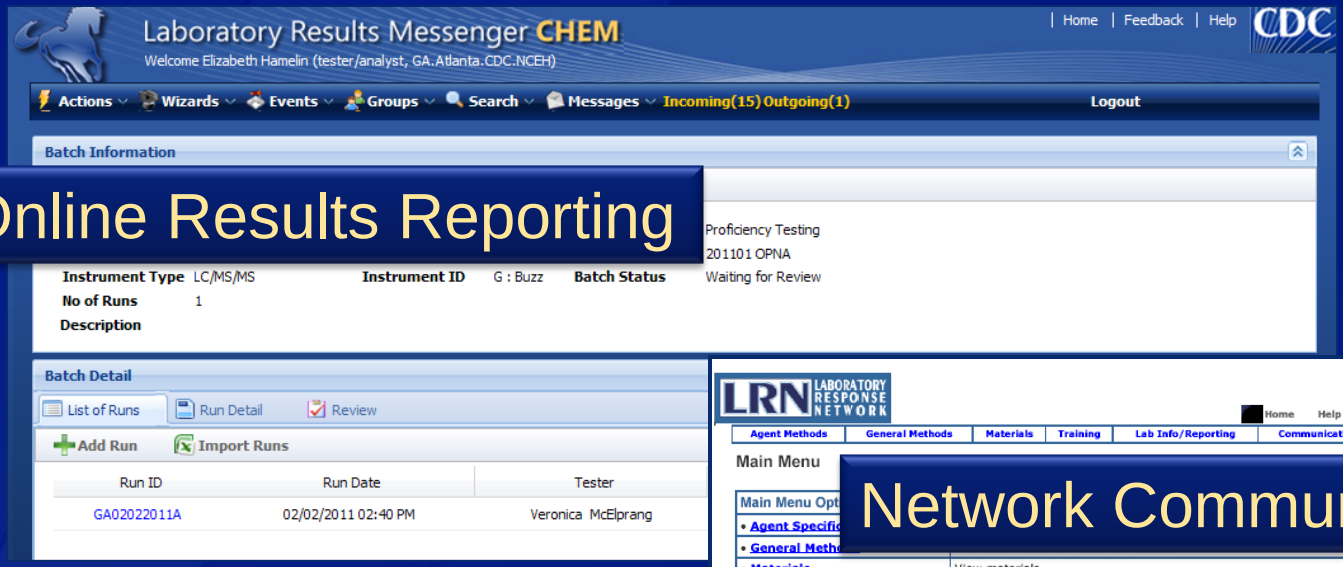
Z-Scores

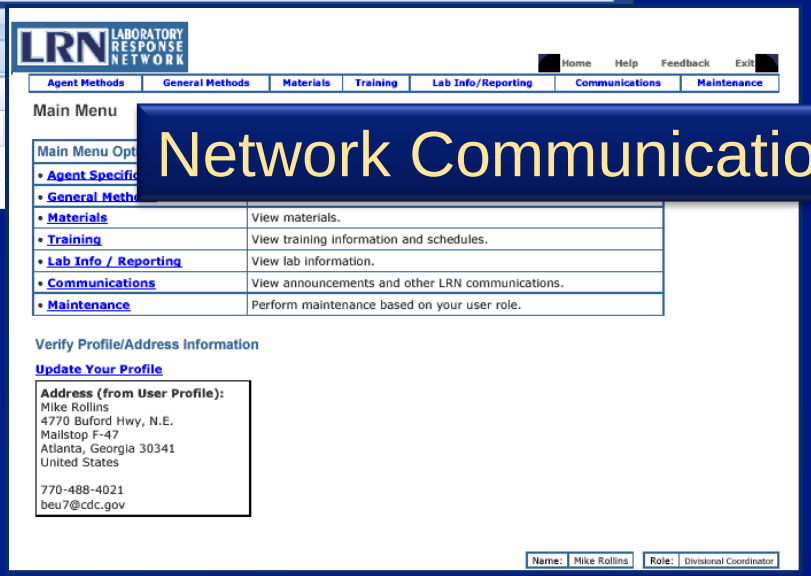
	PT Sample Identification						
Analyte	1083	1095	1412	1645	1789	Percentage	Status
GB-acid	0.28	0.02	0.27	0.06	-0.24	100%	Pass
GD-acid	-0.10	-0.22	1.28	0.01	-0.07	100%	Pass
GF-acid	-0.26	-0.44	-0.14	-0.71	-0.09	100%	Pass
rVX-acid	-0.68	-1.14	-0.42	-0.30	-0.42	100%	Pass
VX-acid	-0.66	-0.45	0.71	-0.43	0.16	100%	Pass

Materials Program

- Pre-manufactured standards and quality control samples
- Prepared for each method
- Requires custom synthesis**
- Pilot and QA testing program

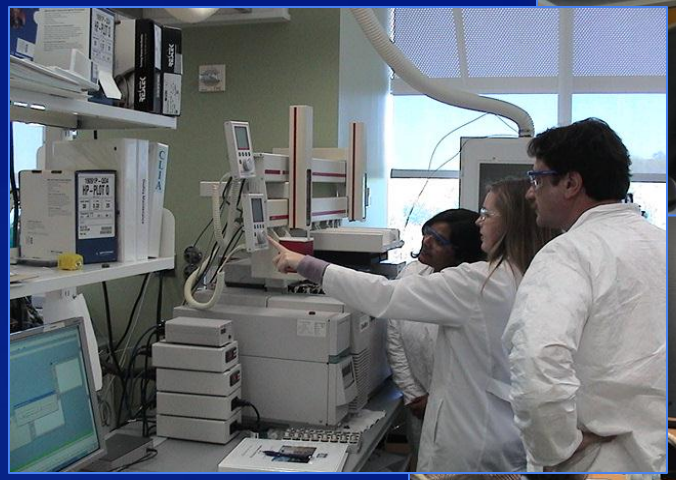
Communication & Data Transfer

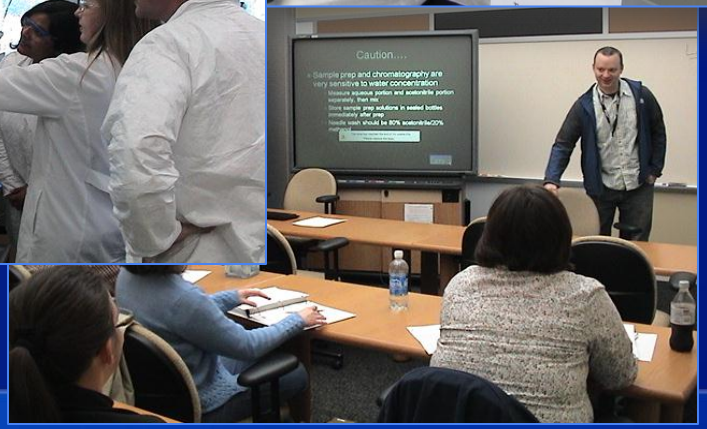




Dedicated Training & Support Staff

- **Continued training for new state personnel**
- **Maintain state qualified status**
- **Expansion of state capabilities**
  - Amanitin (Mushroom Toxin)
  - Cyanide





Coordination with other Federal Agency Laboratories

EPA

DHS

FDA

DOD

FBI

Summary

- **Chemical threats continue**
- **Emergency response preparedness**
  - Exercises & the Rapid Toxic Screen (RTS)
  - Novel methods development
- **Proficiency testing**
- **State capacity & training**
- **Domestic & international collaborations**

Thank you

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

The Georgia Poison Center's Role in Response to a Chemical Incident

CHEMPACK Program Logistics

Robert J. Geller, MD, FACMT, FAACT

Medical Director, Georgia Poison Center, and
Professor of Pediatrics, Emory University

A disaster is an unexpected event that overwhelms the capability of the existing infrastructure to respond to it in a competent and comprehensive manner.

Disaster can come as a single patient

- One patient more than we can handle can create a disaster
  - injury to other patients
  - injury to staff
  - disruption of routine care

Disaster can occur anywhere

- Warehouses
- Manufacturing facilities
- During transportation
- Public events
- Public facilities

Strategy for incident management

- Recognition
  - finding out quickly that we have a problem
- Response
  - identifying the cause and treatment
  - getting accurate info to the public
- Remediation
  - delivering prophylaxis and treatment on a large scale
  - interrupting further spread of disease

Recognition

- Do we have a problem that needs public health or public safety response?
- What are the causative agent(s)?
- Contacting the poison center reaches medical toxicologists and, if needed, public health officials

Response

- Is an antidote needed?
- Is hospital coordination needed?

Remediation at the scene

- Medical treatment
  - May require triage and prioritization of care
  - Decon at the scene prior to transport?
- Medical treatment may require use of CHEMPACK assets brought to the site

Remediation at the hospital

- Medical treatment
  - May require triage and prioritization of care
  - Is decon needed for patients who did not already receive this prior to arrival?
- Medical treatment may require use of CHEMPACK assets brought to the ED

Why CHEMPACK?

- Conventional SNS response time is 12-hrs, too long in the event of a chemical attack
- State and local governments have limited or no chemical/nerve agent antidote stocks
- Hospitals carry very limited supplies of treatments for nerve agent exposures
- Nerve agent antidotes are costly and have variable shelf lives (not an easily sustainable resource)

The CHEMPACK Role

- Supply a local cache of antidotes for treating organophosphate toxicity
- In response to:
  - Nerve agents (Sarin, soman, tabun, VX)
  - Organophosphates (Malathion, acephate)
    - Note: fertilizers are not OPs; weed-and-feed products usually don't contain OPs either
  - Carbamates and related agents (Aldicarb, carbaryl)

CHEMPACK Containers

- Self-contained units, placed in centralized locations
- Purpose: enable quicker administration of pharmaceuticals to treat OP poisoning
  - Nerve agents are potent OPs
  - Carbamates are related agents and may require atropine but not pralidoxime
- Not helpful for almost any other situation

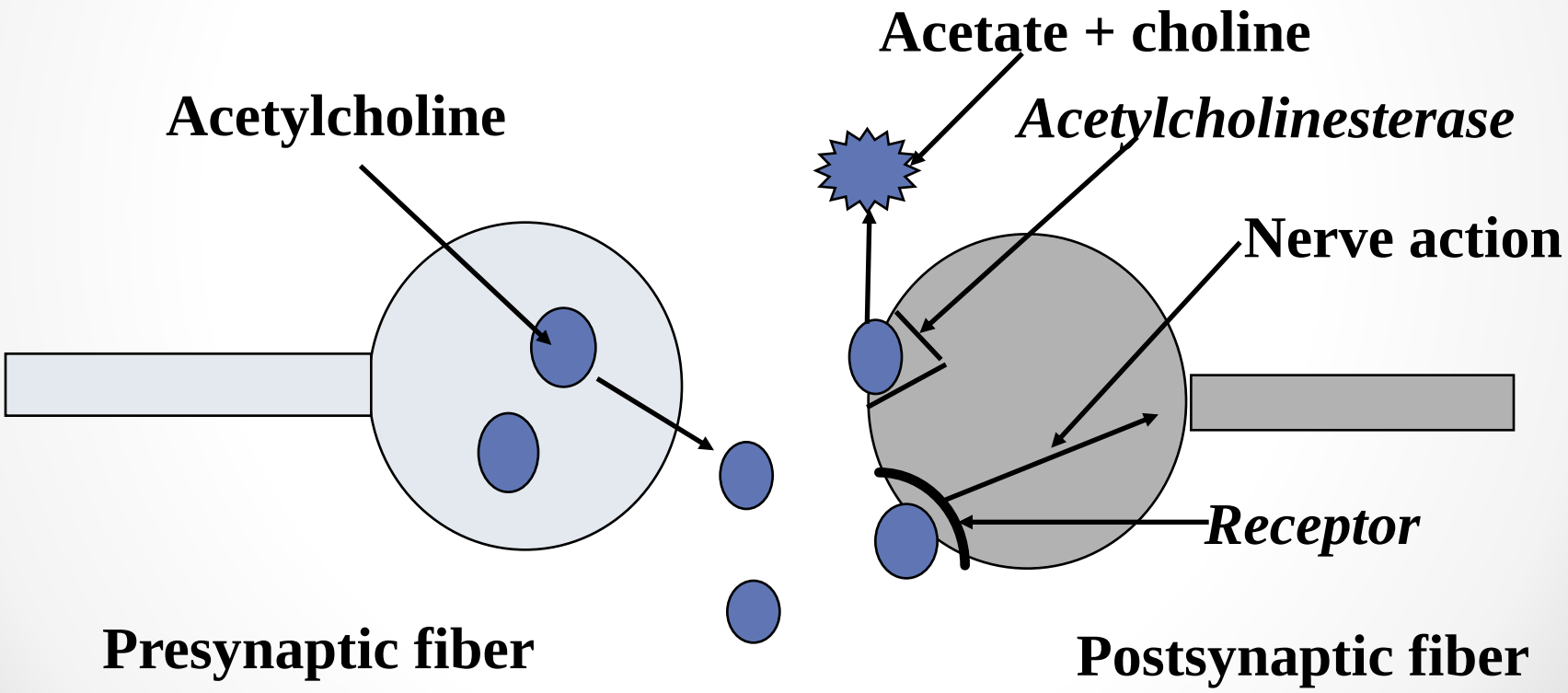
Acute Organophosphate toxicity

- Hundreds of compounds available, with 1000 fold variation in human toxicity
- Commonly used as commercial and agricultural insecticides, rare for home use
- Include:
  - Malathion, diazinon, guthion, chlorpyrifos
- Nerve agents (sarin, soman, tabun) are OPs

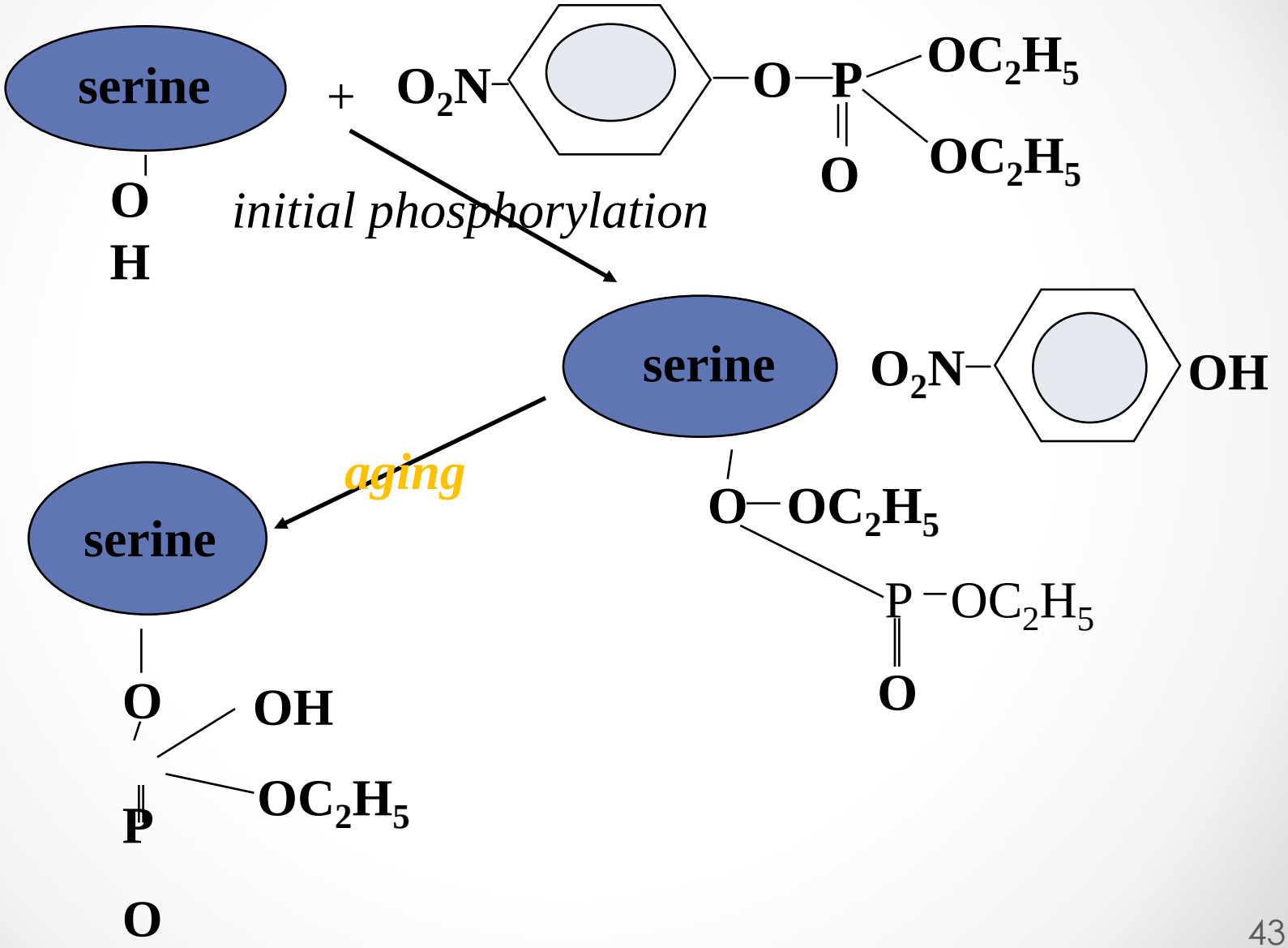
Nerve agents

- Potent organophosphates
- Sarin, soman, tabun (GA, GB, GD, VX)
- Inhibition of cholinesterases ➔⇧ acetylcholine
- Initially reversible, but "aging" occurs
  - initial weak bond becomes covalent
  - for nerve agents, aging a matter of minutes

Action of Organophosphates



Aging


serine
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initial phosphorylation
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OP's in the body

- Absorption: efficient, by inhalation, ingestion, or transdermally (even through intact skin)
- Distribution: fat soluble sites- redistributes to brain, fatty sites where it accumulates
- Metabolism: mainly by liver
- Elimination: exhaled, metabolites principally in urine

Making the Diagnosis

- Clinical symptoms, especially in the setting of compatible exposure
- Clinical lab data available at the time of the event can support the diagnosis, but doesn't absolutely confirm it
  - Cholinesterase assays
  - Body burden in fat

Nerve agents – Therapy

- Prevent further exposure
- Atropine
  - absence of atropinization = inadequate dose
- Pralidoxime (cholinesterase reactivator)
- Seizure control with diazepam
- *Remember the kinetics: nerve agents have longer half-life than atropine, diazepam*

Antidote Stock Criteria

- Cost, availability, storage all considerations
- Likelihood of immediate availability in regional disaster is poor unless available at your own facility
- Need adequate supplies until regional and Federal authorities can provide additional material

Getting Antidotes

- Expected time required to get help from Strategic National Stockpile (SNS) is 8-12 hours
- CHEMPACK program aims to fill this gap by supplying antidotes to treat OP toxicity in 1 hour

Getting Antidotes: Overview

- Call GPC for assessment
- If yes, GPC will call nearest CHEMPACK site for release of assets
- GPC will link release site and request site to coordinate transport and location
- Transport picks up and delivers
- Chain of custody must be maintained

CHEMPACK: How It Works - 1

- Local recognition of shortage
  - based on depletion of local resources in face of anticipated ongoing need
- Telephone request to central site
  - Georgia Poison Center

Georgia Poison Center Roles

- Provides clinical consultation
- Locates and contacts appropriate CHEMPACK site
- Provide consultation as needed in patient assessment and management
- Coordinate info sharing with Public Health

Who can request a CHEMPACK?

- Anyone with knowledge of the event; suggest one of the following:
  - incident commander
  - health care professional
  - EMA Director or designee
- Requester needs to represent an entity that can be responsible for the assets

More details about the request

- Requests can come from the Georgia Poison Center or directly to the stocking site
- If the request comes directly to the stocking site- if time permits, please coordinate with the Poison Center *before* opening the CHEMPACK

CHEMPACK: How It Works - 2

- Poison Center locates CHEMPACK assets near site of need
- Poison Center contacts site with assets to confirm availability
- Poison Center connects requester with site holding assets
- Site with assets arranges transport

More details about coordination

- Opening the CHEMPACK door removes the products from the shelf-life extension program
- Goal is to keep as much assets available as practical without delaying patient care
- Goal is to release adequate amounts for patient care

Coordination 2

- Poison center will coordinate release of assets needed with stocking sites
  - Not all of a CHEMPACK is likely to be needed at each incident location
- If multiple requests come in from the same area, it may be possible to supply them from the same CHEMPACK if travel distances are about the same

Coordination 3

- What happens if a stocking location cannot meet a request?
  - If the stocking site has released its cache, GPC will arrange to have other assets moved to meet requests
  - If the need appears to be large, GPC will attempt to anticipate needs and start moving assets even before an official release

More details about releasing CHEMPACK assets

- Assets will be released in sealed full-cases to simplify the process and avoid the need to count contents
  - EXCEPTION may be made for pralidoxime, since there is only 1 case of this in each CHEMPACK
- Release goal: 2 – 2.5 doses per patient expected
- GPC will coordinate amount

Logistics of transport

- Will be coordinated by releasing site
- Generally transported by “lights and sirens” vehicle
- Can be transported to a scene or to a hospital, as most clinically appropriate

More details about delivery

- Can deliver to:
  - A hospital
  - A scene
  - A secondary care site

Recipients

- At HCF, recipient should be a physician or pharmacist
- On-scene, recipients should be the incident commander or their designee

More details about transport

- Transport is under the control, and is the responsibility, of the CHEMPACK hosting site
- Need a pre-established primary and secondary transport strategy

In summary -1

- Request made
- GA Poison Center assesses needs
- GA Poison Center locates nearby assets
- GA Poison Center contacts host of assets, authorizes release
- GA Poison Center conferences host with requester, who jointly arrange transport details

In summary - 2

- GA Poison Center notifies State CHEMPACK coordinator emergently
- Transporter picks up materials at host, delivers to site in need
- GA Poison Center available for consultation, verifies ongoing status of site in need

Questions?

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Atlanta, Georgia

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Thank you for joining!
Please email us questions at coca@cdc.gov

Emergency Preparedness and Response

Emergency Preparedness & Response
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Preparedness for All Hazards
Clinician Resources
COCA Conference Calls
Conference Calls - 2013
January 31, 2013
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Emergency Preparedness & Response > Preparedness for All Hazards > Clinician Resources > COCA Conference Calls > Conference Calls - 2013

Evaluating and Responding to Chemical Emergencies: The Role of Poison Control Centers and Public Health Labs

CE = Continuing Education

Date: Thursday, January 31, 2013

Time: 2:00 - 3:00 pm (Eastern Time)

Participate By Phone:

Dial In Number: 888-790-6180

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Presenter(s):

Rudolph Johnson, PhD
Laboratory Chief, Chemical Terrorism Methods Development Laboratory
Division of Laboratory Sciences
National Center for Environmental Health
Centers for Disease Control and Prevention

Robert J. Geller, MD
Medical Director of the Georgia Poison Center
Chief of Pediatrics at Grady Memorial Hospital/Hughes Spalding
Assistant Professor, Emory University School of Medicine

Overview:

Chemical emergencies have the potential to cause widespread death and illness. Both CDC and Poison Control Centers play important roles in helping define the public health response to chemical emergencies, by providing rapid detection and accurate identification of chemical agents, toxicology information, education programs, and assistance with medical management of exposures. These unique services are critical to medical and public health personnel managing the care of people exposed during a chemical emergency. During this COCA call, subject matter experts will discuss biomedical testing for chemical agents, state level poison control center practices, and clinical resources for chemical emergencies.

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