Laboratory Response Network

Chemical Terrorism Program
Packaging and Shipping of Blood and Urine Samples

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A Wake Up Call...

Terrorist Attacks – September 11, 2001


Amerithrax Investigation – October 2001

http://www.fbi.gov/about-us/history/famous-cases/anthrax-amerithrax/the-envelopes
But Even Before 2001...

- Sarin Gas Attack – Tokyo Subway in March 1995
- Aum Shinrikyo Cult ("Supreme Truth")
- Twelve People Were Killed and 5000 People Were Treated

Recent Toxin and Chemical Threats

White House: Syria crosses 'red line' with use of chemical weapons on its people
By Barbara Starr, Jessica Yellin and Chelsea J. Carter, CNN
updated 8:42 AM EDT, Fri June 14, 2013

Toxic substance ricin is found in LV hotel room

New poison letters put ricin under microscope
By Mariano Castillo, CNN
updated 7:36 AM EDT, Mon June 3, 2013

Clam Boat Canisters: Fisherman Blistered, Sickened After Crew Pulls Aboard Canisters Of Mustard Agent Off Long Island
JAY LINDSAY | 06/10 10:15 PM ET | AP
Greatest Threats to Iowa

- Ricin
- Cyanide
- Chlorine
- Explosives – the other white powder
Chemical Laboratory Response Network

SHL is a Level 2 Laboratory in the LRN-C
Description of LRN-C Laboratories

• 53 Laboratories participate in the LRN-C program
• Level 1 Labs
  - Function as surge capacity labs for the CDC
  - Can detect mustard agents, nerve agents, etc.
• Level 2 Labs
  - Analysis of clinical specimens for exposure to chemical agents
• Level 3 Labs
  - Sample collection, packaging, and shipping
Chemical Agents

CDC List

- Biotoxins
- Blister Agents/Vesicants
- Blood Agents
- Caustics (Acids)
- Choking/Lung
- Pulmonary Agents
- Incapacitating Agents
- Metals
- Nerve Agents
- Organic Solvents
- Riot Control Agents/Tear Gas
- Toxic Alcohols
- Vomiting Agents
- Metabolites in human tissue
Chemical Terrorism Poster

- **Blood**: Hydrogen Cyanide, Hydrogen Sulfide, Carbon Monoxide, Cyanogen Chloride
  - Symptoms Include: Vertigo, Tachycardia, Tachypnea, Cyanosis, Flu-like symptoms, Non-specific neurological symptoms
  - Indicative Lab Tests: Increased anion gap, Metabolic acidosis, Narrowed pO2 difference between arterial and venous samples

- **Nerve**: Sarin, VX, Tabun, Soman
  - Symptoms Include: Diarrhea, diaphoresis, Urination, Miosis, Bradycardia, bronchospasm, bronchchorea, Laxation, Lacrimation, Salivation

- **Blister**: Sulfur Mustard, Phosgene, Oxime, Nitrogen Mustard
  - Symptoms Include: Itching, Edema, Yellowish blisters, Flu-like symptoms, Delayed eye irritation
  - Indicative Lab Tests: Decreased cholinesterase, Increased anion gap, Metabolic acidosis

- **Choking**: Phosgene, Diphosgene, Chlorine
  - Symptoms Include: Upper respiratory tract irritation, Rhinitis, Coughing, Choking, Delayed pulmonary edema
  - Indicative Lab Tests: Decreased pO2, Decreased pCO2

- **Metal**: Dimethylmercury, Lead, Copper, Mercury, Arsenic, Cadmium
  - Symptoms Include: Gough, Metallic taste, CNS effects, Shortness of breath, Flu-like symptoms, Visual disturbances
  - Indicative Lab Tests: Proteinuria, Blood mercury, Urine mercury

Call the Iowa Department of Public Health for technical assistance/consultation at our Emergency Notification Number (24/7) 1-866-834-9671

Call the University Hygienic Laboratory for appropriate specimen collection, packaging and shipping information at (319)-335-4861 OR refer to Iowa’s Biological/Chemical Threat Agent (BCTA) Protocol Model. AFTER REGULAR HOURS CALL THE DUTY OFFICER AT 319-330-5981.
CT Instruments

Sciex API 4000 Tandem Mass Spectrometer /Agilent 1100 HPLC

Biotage Rapid Trace extraction system

Agilent 7890/5973 GC/MS with Gerstel MPS2 Prepstation Autosampler

Agilent 7890/7000 GC/Triple Quad MS
# Level 2 Laboratory Methods

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<th>Test</th>
<th>Matrix</th>
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<tr>
<td>LC/MS/MS</td>
<td>Organophosphate Nerve Agent Metabolites (OPNA)</td>
<td>Urine</td>
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<tr>
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<td>Metabolic Toxins</td>
<td>Urine</td>
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<td></td>
<td>Hydroxynitrophenylacetic acid (HNPAA)</td>
<td>Urine</td>
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<td></td>
<td>Abrine/Ricinine</td>
<td>Urine</td>
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<tr>
<td>GC/MS</td>
<td>Tetramethylenedisulfotetramine</td>
<td>Urine</td>
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<td></td>
<td>Volatile Organic Compounds (VOCs)</td>
<td>Serum</td>
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<tr>
<td></td>
<td>Cyanide</td>
<td>Blood</td>
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<tr>
<td>ICP/MS</td>
<td>Multiple Toxic Elements</td>
<td>Urine</td>
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<tr>
<td></td>
<td>Arsenic and Selenium</td>
<td>Urine</td>
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<tr>
<td></td>
<td>Mercury, Lead and Cadmium</td>
<td>Blood</td>
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</tbody>
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CDC’s Plan
Large Chemical Event

1. Blood and urine samples from the first 40 symptomatic patients are collected and sent to CDC
2. CDC analyzes samples
3. Results and clinical treatment recommendations sent back to submitting labs within 36 hours
4. SHL can then analyze any additional samples
Modification...

- SHL will contact involved hospital labs within 24 hours of event to determine where symptomatic patients have been sent
- SHL will work with each laboratory and local public health agencies to:
  - Get blood and urine samples collected
  - Get documentation correctly completed
  - Arrange for courier
- Samples sent to SHL (Ankeny or Coralville) - whichever is closer
- SHL assures all documentation and packaging is correct and will then send to CDC
- Results will be returned to SHL and forwarded to submitting lab, LPH, and IDPH
Reasons for Sample Analysis

• Identify the agent(s)
  – Confirm a preliminary field agent identification

• Differentiate exposed from worried well

• Determine the extent of exposure
  – Number, geographical, temporal

• Relate internal dose levels to symptoms

• Provide evidentiary information to the law enforcement officials
Packaging and Shipping Instructions

Blood and Urine Specimens
Specimen Collection Protocol Chart

CDC Specimen-Collection Protocol for a Chemical-Exposure Event

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

Collect blood and urine samples for each person involved in the chemical-exposure event.

Note: For children, collect only urine samples unless otherwise directed by CDC.

Blood-Sample Collection

For each person, collect blood in glass or plastic tubes in the following order: 1st—collect specimens in three (3) EDTA (purple-top) 4 mL or larger plastic or glass tubes; 2nd—collect another specimen in one (1) gray- or green-top tube. Collect the specimens by following the steps below:

1. Collect a minimum of 12 mL of blood in three (3) 4 mL or larger glass or plastic tubes. If using 2 mL tubes, use four tubes.

   - Do not use gel separators.

2. Mix contents of tubes by inverting them 5 or 6 times.

   - Label tubes in order of collection. #1, #2, #3

3. Place bar-coded labels on each tube, so that when the tubes are upright, the barcode looks like a ladder.

   - Store samples at 1°C to 10°C.
   - Do not freeze.

4. After collecting samples in the purple-top tubes, collect one (1) sample in a gray- or green-top tube (gray-top tube shown). Allow the tube to fill to its stated capacity.

   - Do not use gel separators.

5. Mix contents of the tube by inverting it 5 or 6 times.

6. Place bar-coded labels on the tube, so that when the tube is upright, the barcode looks like a ladder.

   - Store samples at 1°C to 10°C.
   - Do not freeze.

Urine-Sample Collection

For each person, collect 40 mL-60 mL of urine in a screw-cap urine cup.

- Label the urine cup with the appropriate bar-coded label as shown. Indicate on the cup how the sample was collected if the method was other than “clean catch” (i.e., catheterization).
- Freeze samples (optimally at -70°C).
- Place bar-coded labels on all cups so that when the cup is upright, the barcode looks like a ladder.
Shipping Instructions - Blood

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 a gridded box lined with absorbent pad.

2. Seal gridded box 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 inside a self-T-Fak clear inner, leak-proof polybag (or equivalent).

4. Place the sealed self-T-Fak inner leak-proof polybag (or equivalent) inside a white Tyvek® outer envelope (or equivalent). Note: 1 primary mollusk do not meet the internal transport requirement of 95% pop.

5. Seal the opening of this envelope with a continuous piece of evidence tape. We initial half on the envelope 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 insulating material to maximize shipping white 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 tamperproof 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.

For questions concerning this process, please contact:
- Centers for Disease Control and Prevention
  - Attn: Chemical Emergency Response Team
  - 4770 Buford Hwy.
  - Building 110 Loading Dock
  - Atlanta, GA 30341
  - (770) 488-4600

Send shipment via FedEx (or equivalent) to:
- Centers for Disease Control and Prevention
  - Attn: Charity Sapp
  - 4770 Buford Hwy.
  - Building 110 Loading Dock
  - Atlanta, GA 30341
  - (770) 488-3433
Instructions for Shipping Urine 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 urine cups in a gridded box lined with absorbent material, or alternatively place each cup inside a leak-proof biobag (or equivalent) and then place wrapped urine cups into a box.
2. Use one continuous piece of evidence tape to seal the gridded box or the box containing wrapped urine cups. Write initials half on the evidence tape and half on the box.
3. Wash the box with absorbent material and secure with tape. Seal the box inside a self-seal polybag or equivalent.
4. Place the sealed self-seal polybag (or equivalent) inside a white Tyvek® outer envelope (or equivalent).
   - Note: If primary envelopes do not meet the internal pressure requirement of 55 psi, 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 pad in the bottom of the shipper.
7. Place a layer of dry ice in the bottom of the shipper. Use absorbent material or cushioning material to minimize settling when box is in transit. Place additional dry ice on top of samples.
8. Place the packaged urine cups in the shipper. Use absorbent material or cushioning material to minimize settling when box is in transit. Place additional dry ice on top of samples.
9. Place the urine 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 outer container lid with pennantless 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.

UN3373

Biological Substance Category B

For questions concerning this process, please contact:
Centers for Disease Control and Prevention
Altn: Chemical Emergency Response Team
4770 Buford Hwy
Building 110, Loading Dock
Atlanta, GA 30341
(770) 488-6840

Centers for Disease Control and Prevention

Department of Health and Human Services
Shipping Manifest - Urine

Note: Blood tubes and urine cups cannot be shipped together in the same package. Prepare a separate shipping manifest for each. Place each shipping manifest (with specimen identification numbers) in a plastic zippered bag on top of the specimens before closing the lid of the polyethylene foam-insulated, corrugated fiberboard shipper.

Date Shipped: ___________________________  Date Received: ___________________________

Shipped By:  ___________________________  Received By:  ___________________________

_________________________  ___________________________
Contact Telephone:  Signature:

Signature: ___________________________

Urine
Total Number of Specimens in this Container:  __  Total Number of Blank Urine Cups this Container:  __

Please include two (2) empty, unopened urine cups from each lot number collected for background contamination measurement.

COMMENTS:

_________________________  ___________________________  ___________________________

_________________________  ___________________________  ___________________________

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Shipping Address:  Centers for Disease Control and Prevention
Attn: J.L. Ernest McGhee
4770 Buford Hwy.
Building 110 Loading Dock
Atlanta, GA 30341
(770) 488-7579

CONTINUE ON NEXT PAGE
Shipping Manifest - Blood

**CONTENTS FOR DISEASE CONTROL AND PREVENTION**

**CHEMICAL TERRORISM BLOOD SPECIMEN COLLECTION AND SHIPPING MANIFEST**

Note: Blood tubes and urine cups cannot be shipped together in the same package, prepare a separate shipping manifest for each. Place each shipping manifest (with specimen identification numbers) in a plastic zippered bag on top of the specimens before closing the lid of the polystyrene foam-insulated, corrugated fiberboard shipper.

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<thead>
<tr>
<th>Date Shipped:</th>
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<th>Shipped By:</th>
<th>Received By:</th>
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Contact Telephone: ________________________________________
Signature: ________________________________________________

**BLOOD**

<table>
<thead>
<tr>
<th>Total Number of Specimens in this Container:</th>
<th>Total Number of Blank Tubes in this Container:</th>
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<table>
<thead>
<tr>
<th>Green- or Gray-top tubes:</th>
<th>Blank Green- or Gray-top tubes:</th>
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Please include two (2) empty, unopened purple-top tubes and two (2) empty, unopened green- or gray-top tubes from each lot number collected for background contamination measurement.

Place a ✓ in each box for samples shipped. Place an X in each box for samples not shipped. Please indicate the size of the tube collected in the comments field. Collect a minimum of 12 mL of blood. Use three 4-mL or larger vacuum fill (unopened), non-gel, purple-top (EDTA) tubes; use four tubes if using 3-mL tubes.

PT – Purple-top tube
GT – Green- or Gray-top tube

**PATIENT/VICTIM ID Label**

<table>
<thead>
<tr>
<th>Patient/Victim ID Label</th>
<th>PT 1</th>
<th>PT 2</th>
<th>PT 3</th>
<th>GT 1</th>
<th>Comments</th>
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**SHIPPING ADDRESS:** Centers for Disease Control and Prevention

Atlanta, GA 30341

(770) 488-7579

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Annual Packaging and Shipping Exercise

• The State Hygienic Laboratory is required to participate in and pass the annual packaging and shipping exercise for the LRN-C program

• Required performance measure
Changes to the LRN-C Packaging and Shipping Exercise

• Name Change: SCPaS (Sample Collection, Packaging, and Shipping) to SPaSE (Specimen Packaging and Shipping Exercise)

• 40 complete sets of specimens are now required (instead of 10 sets)
Laboratory Information for Chemical Emergencies

http://emergency.cdc.gov/chemical/lab.asp
Thank You for Your Time and Attention!

Questions??