



# Laboratory Response Network

## Chemical Terrorism Program Packaging and Shipping of Blood and Urine Samples

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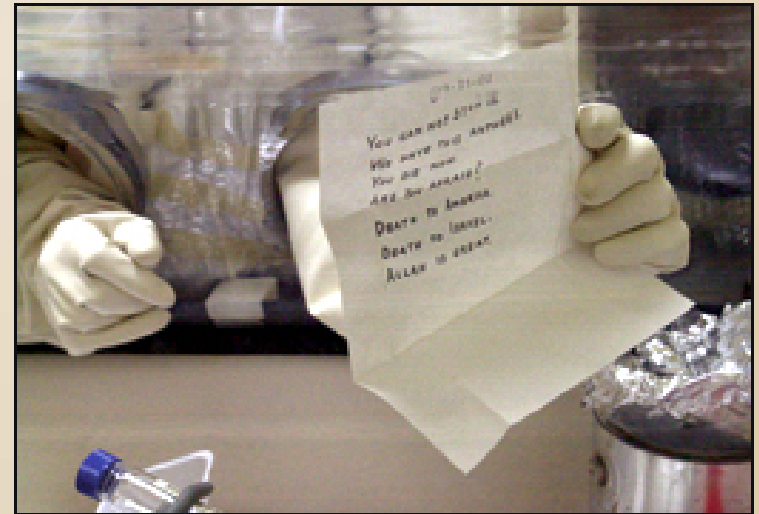
# A Wake Up Call...

## Terrorist Attacks – September 11, 2001



<http://news.yahoo.com/photos/9-11-the-25-most-powerful-photos-1315611364-slideshow/#crl=%252Fphotos%252F9-11-the-25-most-powerful-photos-slideshow%252F25-most-powerful-photos-photo-1315610974.html>

## 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/ 8/10 10:15 PM ET | [AP](#)



# Greatest Threats to Iowa

- Ricin
- Cyanide
- Chlorine
- Explosives –  
the other  
white powder



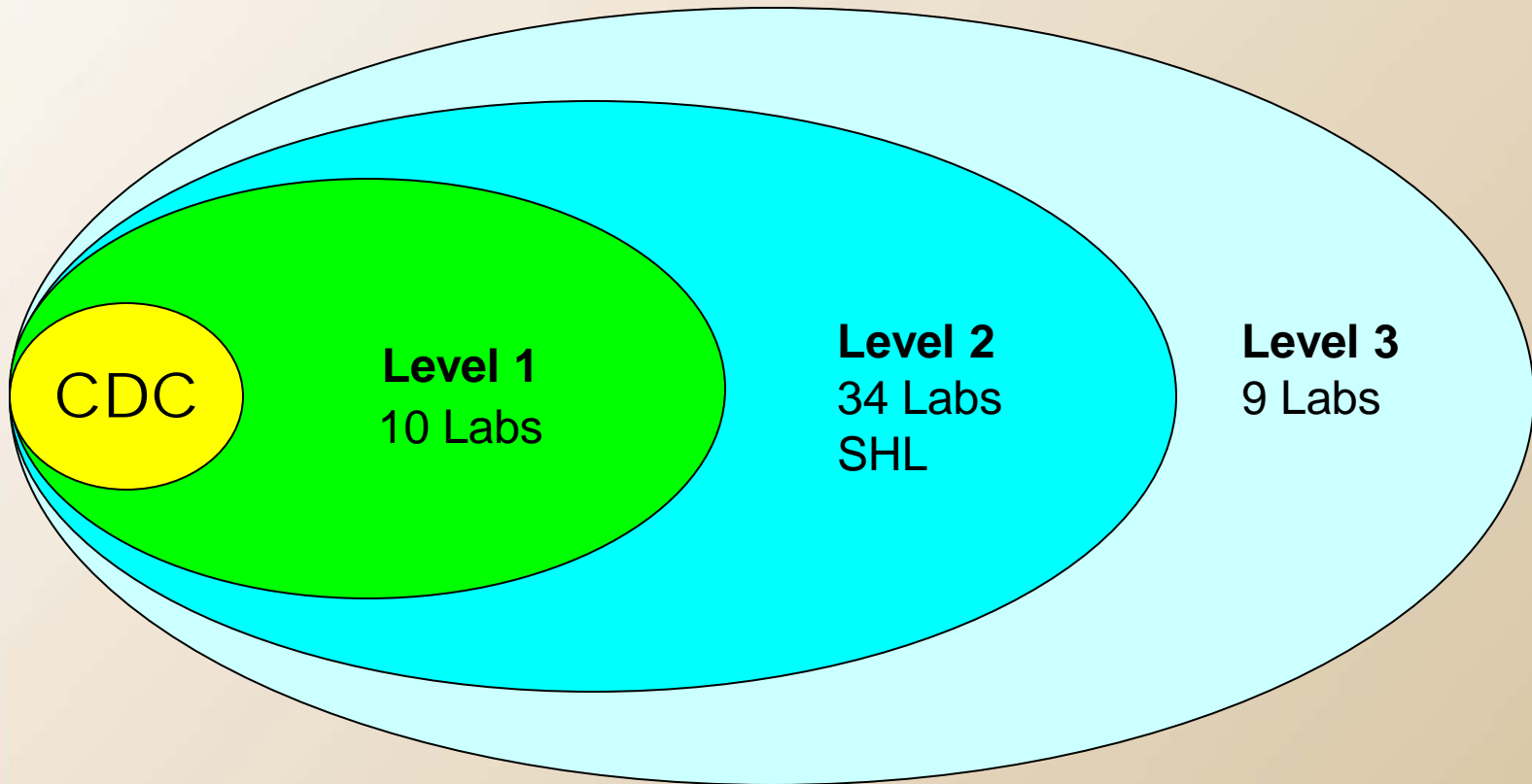
Photo of Castor Beans  
Source: [ncfpd.umn.edu](http://ncfpd.umn.edu)



Photo of TATP  
Source: [www.aiexplosives.com](http://www.aiexplosives.com)



# 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

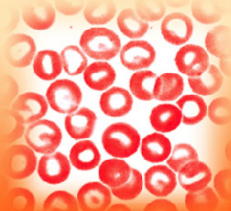
## CDC List

- 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

agents  
Hydrogen Cyanide  
Hydrogen Sulfide  
Carbon Monoxide  
Cyanogen Chloride

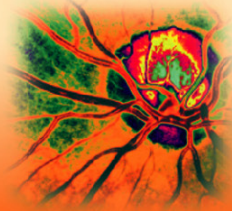
### Hydrogen Cyanide

SYMPTOMS INCLUDE

- Vertigo
- Tachycardia
- Tachypnea
- Cyanosis
- Flu-like symptoms
- Nonspecific neurological symptoms

INDICATIVE LAB TESTS

- Increased anion gap
- Metabolic acidosis
- Narrow pO<sub>2</sub> difference between arterial and venous samples



nerve

agents  
Sarin  
VX  
Tabun  
Soman

### Sarin

SYMPTOMS INCLUDE

- Diarrhea, diaphoresis
- Urination
- Miosis
- Bradycardia, bronchospasm, bronchorrhea
- Emesis
- Lacrimation
- Salivation

INDICATIVE LAB TESTS

- Decreased cholinesterase
- Increased anion gap
- Metabolic acidosis



blister

agents  
Sulfur Mustard  
Phosgene Oxime  
Nitrogen Mustard

### Sulfur Mustard

SYMPTOMS INCLUDE

- Itching
- Erythema
- Yellowish blisters
- Flu-like symptoms
- Delayed eye irritation

INDICATIVE LAB TESTS

- Thioglycol present in urine



choking

agents  
Phosgene  
Diphosgene  
Chlorine

### Phosgene

SYMPTOMS INCLUDE

- Upper respiratory tract irritation
- Rhinitis
- Coughing
- Choking
- Delayed pulmonary edema

INDICATIVE LAB TESTS

- Decreased pO<sub>2</sub>
- Decreased pCO<sub>2</sub>



metal

agents  
Dimethylmercury  
Lead • Copper  
Mercury • Arsenic  
Cadmium

### Dimethylmercury

SYMPTOMS INCLUDE

- Cough
- Metallic taste
- CNS effects
- Shortness of breath
- Flu-like symptoms
- Visual disturbances

INDICATIVE LAB TESTS

- Proteinuria
- Blood mercury
- Urine mercury

# CHEMICAL TERRORISM

PRODUCED BY THE MINNESOTA DEPARTMENT OF HEALTH 2004

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 319-530-5981.



POISON CONTROL CENTER  
www.iowapoisson.com

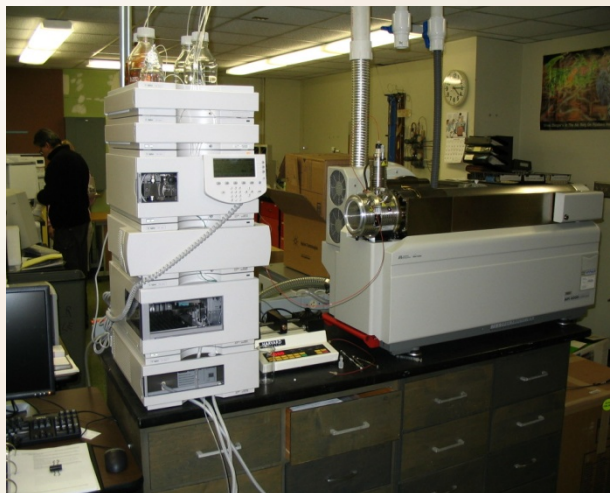


Hygienic Laboratory • The University of Iowa  
IOWA'S ENVIRONMENTAL & PUBLIC HEALTH LABORATORY  
www.uhl.uiowa.edu

2/06



# CT Instruments



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



Sciex API 4000 *Tandem* Mass  
Spectrometer /Agilent 1100 HPLC



Biotage Rapid Trace extraction system



Agilent 7890/7000 GC/Triple Quad MS



# Level 2 Laboratory Methods

Instrument	Test	Matrix
LC/MS/MS	Organophosphate Nerve Agent Metabolites (OPNA)	Urine
	Metabolic Toxins	Urine
	Hydroxynitrophenylacetic acid (HNPA)	Urine
	Abrine/Ricinine	Urine
GC/MS	Tetramethylenedisulfotetramine	Urine
	Volatile Organic Compounds (VOCs)	Serum
	Cyanide	Blood
ICP/MS	Multiple Toxic Elements	Urine
	Arsenic and Selenium	Urine
	Mercury, Lead and Cadmium	Blood



# 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...

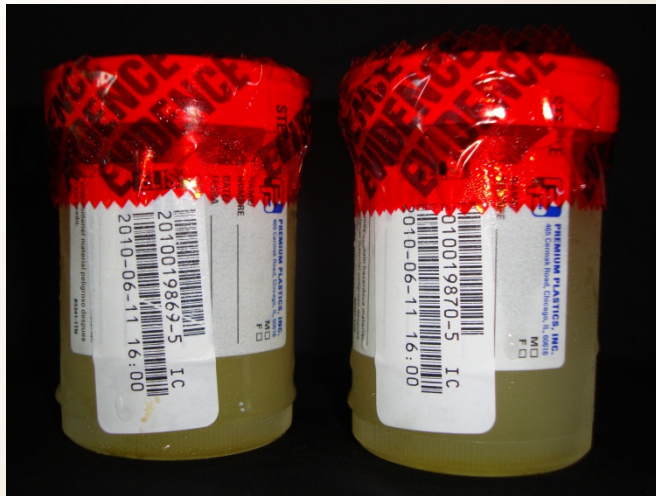
- SHL will contact involved hospital labs within 24 hours of event to determine where symptomatic patients have been sent
- SHL will work with each laboratory and local public health agencies to:
  - Get blood and urine samples collected
  - Get documentation correctly completed
  - Arrange for courier
- 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*.

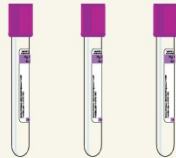
**Collect blood and urine samples for each person involved in the chemical-exposure event.**

**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: 1<sup>st</sup>: collect specimens in three (3) EDTA (purple-top) 4 mL or larger plastic or glass tubes; 2<sup>nd</sup>: 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 3 mL tubes, use four tubes.



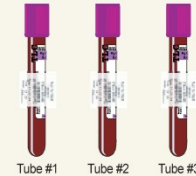
Do not use gel separators.

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



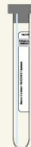
Label tubes in order of collection. #1, #2, #3

- 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.

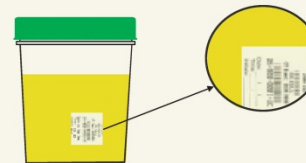
### Urine-Sample Collection

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*.



Place purple- and gray- or green- top tubes by patient number into a gridded box lined with an absorbent pad.



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.



Wrap gridded box in absorbent pad and tape to seal. Seal gridded box inside a Saf-T-Pak clear inner, leak-proof polybag (or equivalent).



Place the sealed Saf-T-Pak inner leak-proof polybag (or equivalent) inside a white Tyvek<sup>®</sup> outer envelope (or equivalent).  
*Note: If primary receptacles do not meet the internal pressure requirement of 95 kPa, use compliant secondary packaging materials.*



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.



Use polystyrene foam-insulated, corrugated fiberboard shipper to ship boxes to CDC. Place absorbent material in the bottom of the shipper.



Place refrigerator packs in a single layer on top of the absorbent material.



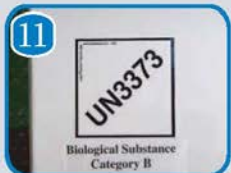
Place the packaged specimens in the shipper. Use cushioning material to minimize shifting while box is in transit. Place additional refrigerator packs on top of samples.



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.



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.



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."



Send shipment via FedEx (or equivalent) to:  
Centers for Disease Control and Prevention  
Attn: Chariety Sapp  
4770 Buford Hwy.  
Building 110 Loading Dock  
Atlanta, GA 30341  
(770) 488-0343

### 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



# Shipping Instructions - Urine

## 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*.



Place urine cups in a gridded box lined with absorbent material, or alternatively place each cup inside a leak-proof biohazard polybag (or equivalent) and then place wrapped urine cups into a box.



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.



Wrap the box with absorbent material and secure with tape. Seal the box inside a Saf-T-Pak inner leak-proof polybag (or equivalent).



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.**



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.



Use polystyrene foam-insulated, corrugated fiberboard shipper to ship boxes to CDC. Place absorbent pad in the bottom of the shipper.



Place a layer of dry ice in the bottom of the shipper on top of the absorbent material. **DO NOT** use large chunks or flakes of dry ice.



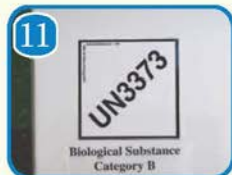
Place the packaged urine cups in the shipper. Use absorbent material or cushioning material to minimize shifting while box is in transit. Place additional dry ice on top of samples.



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.



Secure the outer container 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.



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."



Place a Class 9/UN 1845 label on the front of the shipper. This label for dry ice **MUST** indicate the weight of dry ice (in kg) in the shipper and the proper name (either dry ice or carbon dioxide, solid).



Send shipment via FedEx (or equivalent) to:  
Centers for Disease Control and Prevention  
Attn: Charley Sapp  
4770 Buford Hwy.  
Building 110 Loading Dock  
Atlanta, GA 30341  
(770) 488-0343

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



# Shipping Manifest - Urine

Page \_\_\_\_ of \_\_\_\_

CENTERS FOR DISEASE CONTROL AND PREVENTION  
CHEMICAL TERRORISM URINE 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.

Date Shipped: _____	Date Received: _____
Shipped By: _____ <small>Name</small>	Received By: _____
_____	Signature: _____
<small>Agency</small>	
Contact Telephone: _____	
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: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

CONTINUE ON NEXT PAGE

**SHIPPING ADDRESS:** Centers for Disease Control and Prevention  
Attn: Lt. Ernest McGahee  
4770 Buford Hwy.  
Building 110 Loading Dock  
Atlanta, GA 30341  
(770) 488-7579

Page \_\_\_\_ of \_\_\_\_

CENTERS FOR DISEASE CONTROL AND PREVENTION  
CHEMICAL TERRORISM URINE SPECIMEN COLLECTION AND SHIPPING MANIFEST

CONTINUED FROM PREVIOUS PAGE

PLEASE INDICATE THE AMOUNT OF URINE COLLECTED IN THE URINE CUP (UC) COLUMN.

Patient/Victim ID Label	UC (Amount)	Comments
		_____
		_____
		_____
		_____
		_____
		_____
		_____
		_____
		_____
		_____

USE ADDITIONAL COPIES OF THIS PAGE IF NECESSARY

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





# Shipping Manifest - Blood

Page \_\_\_ of \_\_\_

CENTERS 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.

Date Shipped: _____	Date Received: _____
Shipped By: _____	Received By: _____
<small>Name</small>	
<small>Agency</small>	
Contact Telephone: _____	Signature: _____
Signature: _____	

<b>BLOOD</b>	
Total Number of Specimens in this Container: _____	Total Number of <b>Blank Tubes</b> in this Container: _____
Purple Top Tubes: _____	Blank Purple Top Tubes: _____
Green- or Gray-top tubes: _____	Blank Green- or Gray-top tubes: _____
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	PT 1	PT 2	PT 3	GT 1	Comments

CONTINUE ON NEXT PAGE

**SHIPPING ADDRESS:** Centers for Disease Control and Prevention  
 Attn: Lt. Ernest McGhee  
 4770 Buford Hwy, NE  
 Building 110 Loading Dock  
 Atlanta, GA 30341  
 (770) 488-7579



Page \_\_\_ of \_\_\_

CENTERS FOR DISEASE CONTROL AND PREVENTION  
 CHEMICAL TERRORISM BLOOD SPECIMEN COLLECTION AND SHIPPING MANIFEST

CONTINUED FROM PREVIOUS PAGE

Patient/Victim ID Label	PT 1	PT 2	PT 3	GT 1	Comments

USE ADDITIONAL COPIES OF THIS PAGE IF NECESSARY



# 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??