



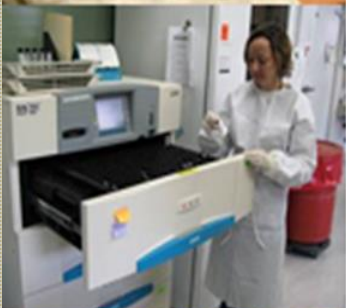
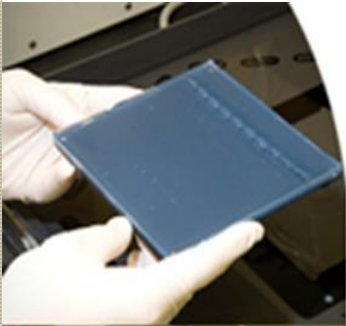
Chemical Emergency Response Activities in Wisconsin

**WCLN Webinar
May 20, 2020**

**Noel Stanton
Wisconsin State Laboratory of Hygiene
Chemical Emergency Response**

Noel: 608 224-6251

Noel.stanton@slh.wisc.edu





It Was Just a Normal Day...

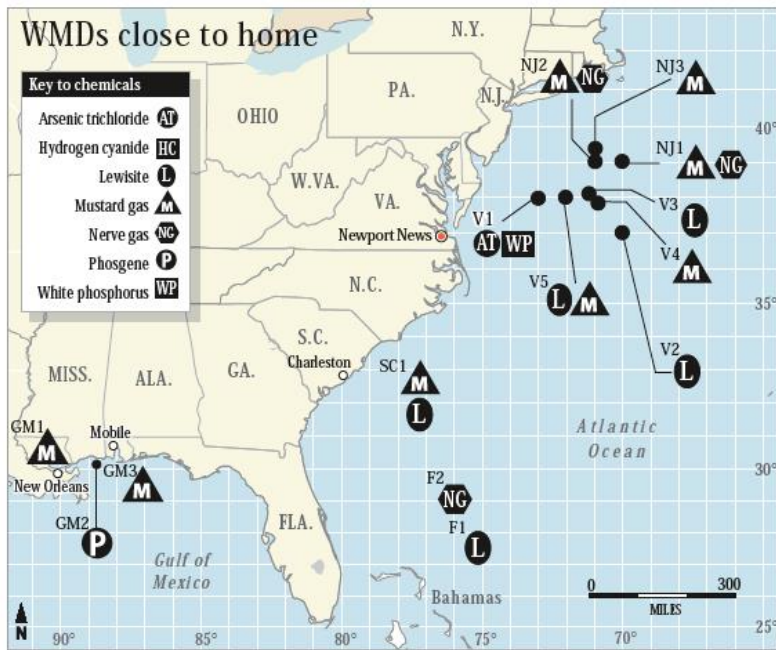
- ...off the coast of Massachusetts fishing for clams.
- They pulled in their catch...





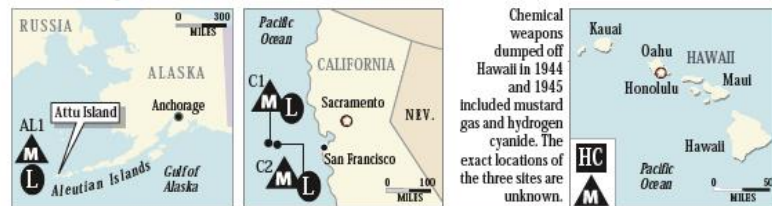
Until it Wasn't

- ...and things got interesting in a bad way.



Known dumpsites in the Pacific

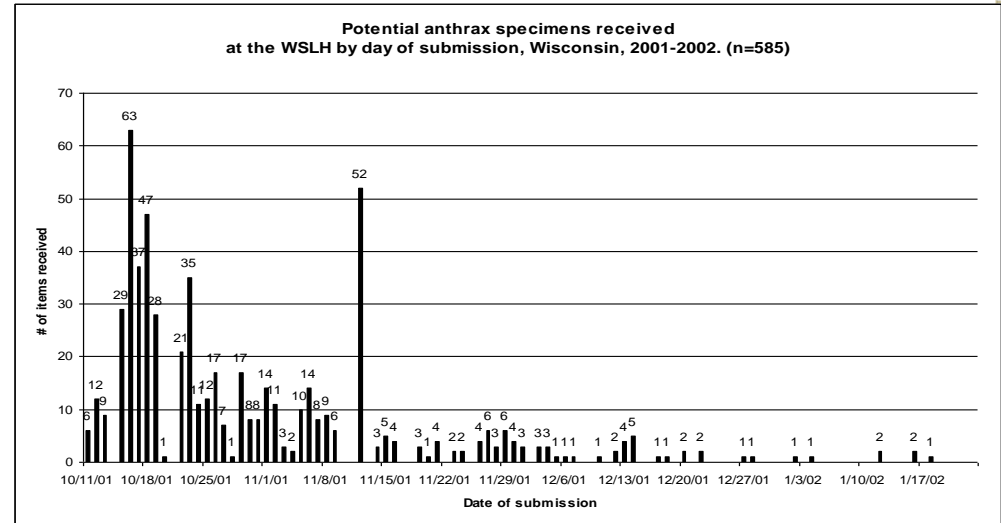
Source: U.S. Army reports





The Pre-LRNC Years

- LRN-B formation, 1990's
- Amerithrax 2001
 - Not anthrax, what is it?
 - Collect, transport, handle safely?
- What about chemical exposures?
 - Methods, materials, capacity?
 - Lab comparability assured?





LRNC History

- Tokyo Sarin attacks
 - Matsumoto & subway
- 1999 CDC initiates exposure testing, funds labs CA, MI, NY, VA
 - NM 2000
- Focus area D evolves to the LRNC, Level 1, 2, & 3
- 5 addt'l L 1 labs added 2006
- Demonstrated capability and capacity for WMD exp.
- Greatly improved resources for all PH/env. work



Normal Pupillary Response to Low Light Levels



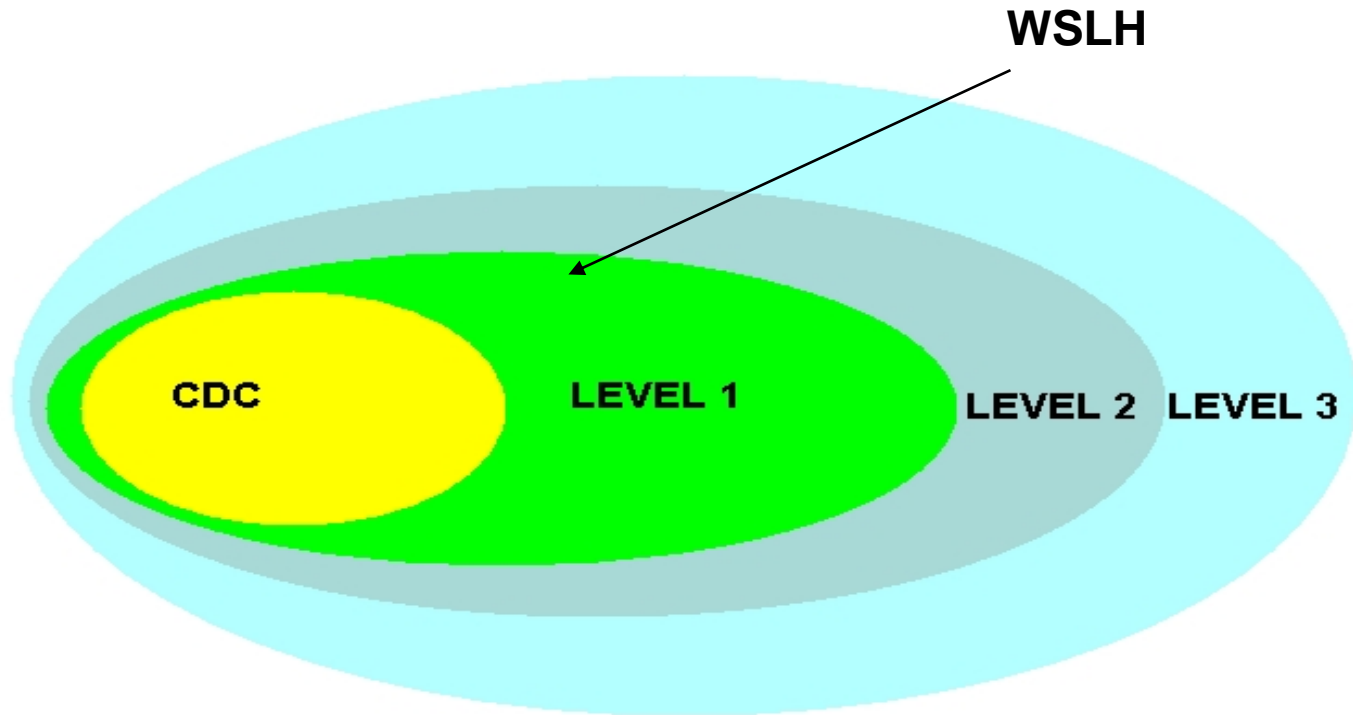
Miosis with Fixed Pinpoint Pupils After Exposure to Nerve Agent Vapors





Laboratory Response Network for Chemical Events (LRN-C)

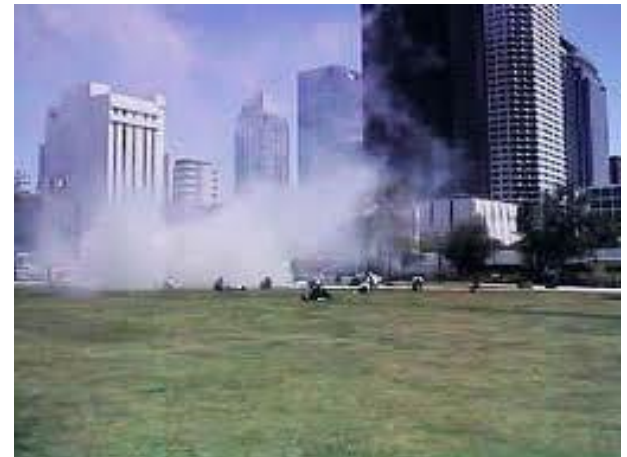
- **Limited to state & National PH labs**





Chem Laboratory Role in PHP/PHER

- Human Exposure testing
 - WMD & other identified threat agents
- Environmental sample testing
 - Frequently integrated into normal lab activities
- Analytical & technical support for WI responders
 - Hazmat, 54th CST
 - FBI, USPIS
 - State & Local health
- Food testing
 - Radiological agents





WSLH Level 1 Lab Requirements

- Model is the Tokyo subway attack.
 - 12 killed, ~1000 exposures
 - 10,000 “worried well”
- Maintain infrastructure to test 1000 specimens
 - For all LRN tests
- Initiation of testing & 24/7 operation
 - Within 24 hour notification window





MIDDLE EAST

New Report of ISIS Using Poison Gas in Syria

By KARIM SHOKHAI and CECILIAN YEGORU | AUG. 24, 2015

Email

Share

ISTANBUL — The Islamic State may have used chemical agents in an attack against civilians and rival insurgents in northern Syria late last week, according to local rebels and an international aid group.



Briefing

December 2015



ISIL/Da'esh and 'non-conventional' weapons of terror

SUMMARY

The European Union and its Member States must prepare for the possibility of a chemical or biological attack on their territory by the self-styled 'Islamic State' in Iraq and the Levant (known variously as IS, ISIS or ISIL, and by the Arabic acronym 'Da'esh'). Since the beginning of October 2015, terrorist attacks in Ankara, the Sinai Peninsula, Beirut, Paris and Tunis, for which ISIL/Da'esh has claimed responsibility, have cost the lives of 500 people. Immediately following the latest attack in Paris, the jihadist terrorist group threatened further attacks in European cities.



SIGN INVESTIGATING ISIS CHEMICAL WEAPONS REPORTS





Chemical Threat Agents

- **Classes of Agents**
 - Nerve Agents
 - Plant-derived toxins
 - Vesicants (blister & choking agents)
 - Metals & other elemental toxins
 - Volatile organics
 - Drugs
- **Compounds quickly metabolized/degraded**
 - Requires measurement of metabolites and/or biomarkers
- **Limited impact on medical treatment**
 - Results downstream of symptoms, limited tox data
 - Value in reassuring worried well, epi
 - Likelihood of attack considered



WSLH Testing Capabilities

- Organophosphorus Nerve Agent metabolite panel (urine and blood)
 - Sarin, Soman, VX, Russian VX, cyclohexylsarin
 - Organophosphorus insecticides, e.g. parathion, malathion, chlorpyrifos, diazinon
 - Cholinesterase inhibition
 - Phosphonic acid metabolites measured
- Carbamates (urine)
 - Aldicarb & metabolites



RESTRICTED USE PESTICIDE
FOR RETAIL SALE TO AND USE ONLY BY CERTIFIED APPLICATORS OR PERSONS UNDER THEIR DIRECT SUPERVISION AND ONLY FOR THOSE USES COVERED BY THE CERTIFIED APPLICATORS CERTIFICATION.

Temik® 15G

Brand Aldicarb Pesticide


PHOSPHOLINE AG COMPANY

For Control of Certain Insects, Mites and Nematodes

ACTIVE INGREDIENTS: Aldicarb
[2-methyl-2-(methylthio) propionaldehyde
O-(methylcarbamoyl)oxime]..... 15%

INERT INGREDIENTS: 85%

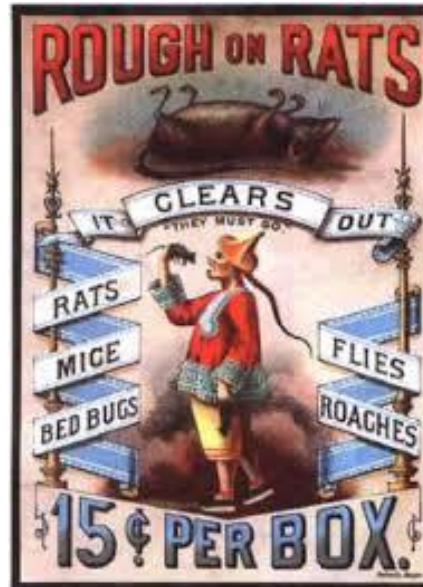
EPA Reg. No. 264-330 EPA Est. No. 10352-GA-01

 KEEP OUT OF REACH OF CHILDREN
DANGER POISON 



WSLH Level 1 Lab Capabilities

- Tetramine (tetramethylenedisulfotetramine)
 - γ aminobutyric acid receptor antagonist
 - WHO top 10 causes of death in China (age 5-29)
- Trace Elements panel of 8 in urine, 3 in blood
 - Urine Be, As, Cd, Ba, Pb, Hg, Tl, ^{238}U , blood Cd, Hg, Pb
 - WI arsenic poisoning case





WSLH Testing Capabilities

- Vesicant Nitrogen Mustard metabolite panel
 - Chemotherapy agent *and* chemical weapon
- Vesicant Sulfur Mustard metabolite
 - 1,1-sulfonylbis(2-(methylsulfonyl)ethane (SBMTE))
- Lewisite metabolite (CVAA)





WSLH Testing Capabilities

- Abrine and Ricinine
 - Plant-derived toxins, castor beans and rosary peas
 - Abrin toxicity 75X ricin
- α Amanitin
 - Similar to commercial mushrooms in appearance
 - Hepatotoxin
- Cyanotoxins
 - Water, urine planned





WSLH Testing Capabilities

- Tetranitromethane metabolite
 - 4-Hydroxy 3-Nitrophenylacetic Acid (HNPPAA)
- Cyanide
 - Firefighter research
- Volatile Organics
 - 10 quantified, ~60 determined
- Long-acting anticoagulants





Other WSLH Analytical Testing Support

- Multiple Testing Categories/configurations:
 - Routine, established tests
 - May be regulated or for research/Epi
 - New tests performed by LRN for other programs
 - Utilizing instruments & expertise
 - Limited term/single purpose research
 - Wide array of tests developed





WSLH Programs Benefitting:

- Environmental Organic & Inorganic Chemistry
 - E.g. **PFAS**, PPCP, PAHs, air pollution tracers, etc.
 - Aquatic plant nutrients, BOD, spill investigations
- OIS
 - LIMS administration
- Forensic Toxicology
 - Anesthetic panel, VOCs, CN
- Biochemical Genetics
 - Organic acids
- WSLH PT program (Lab Improvement Division)
 - Sample preparation/verification
- Occupational Health
 - E.g nitrosamines in air





Responder Support & Related Activities

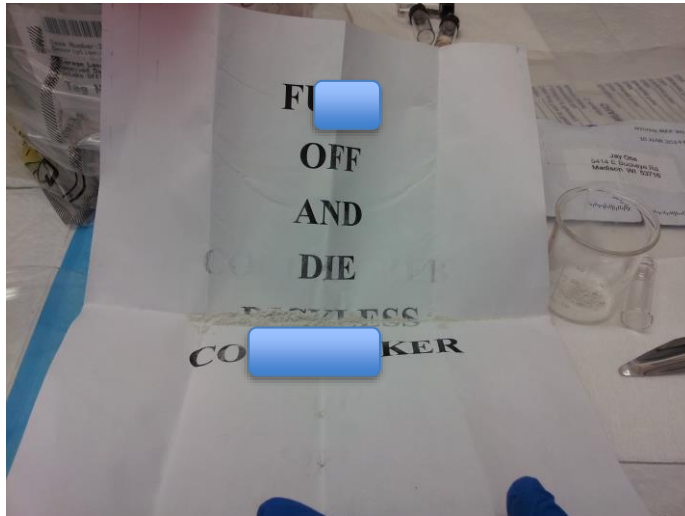
- Analytical & technical support for responders
- State-asset hazmat
 - Unknown substance characterization
 - Collection materials & protocols
 - Communication liaisons with law enforcement and health partners
 - CUEP-chem unknown eval prog.
 - Training & reachback





Unknown Substance Investigation

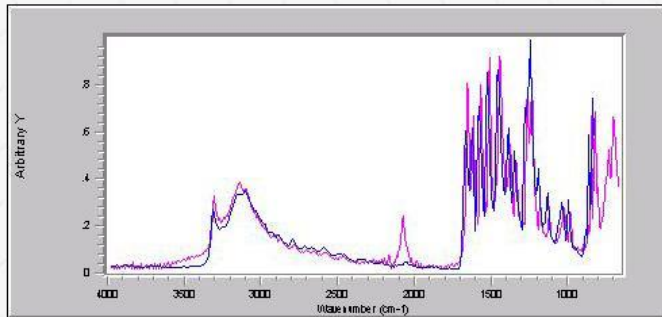
- “White Powder” investigations
 - May actually involve solids, liquids, or vapors
 - Bio and chemical threat agents
- WI Unknown substance protocol
 - Consideration of threat & health risk
- When and when not to submit to WSLH
 - Rad and explosive screening





Field Result Interpretation

Similarity: .92337 SampleID:KCN_Acetaminophene mix 08-07-2009 at 15h23m39s
Name: Acetaminophen, Sigma, NS (sensIRfo)



#	Compound Name(s)	Similarity
1	Acetaminophen, Sigma, NS	0.9233...
2	4-Acetamidophenol	0.9005...
3	Gelatine (Protein)	0.6670...
4	Peptone (Protein)	0.6549...
5	Melamine	0.6533...
6	Bovine Albumin (Protein)	0.6523

COMPARE
RAMAN

EXPORT
REPORT

ADD TO
LIBRARY

STACK

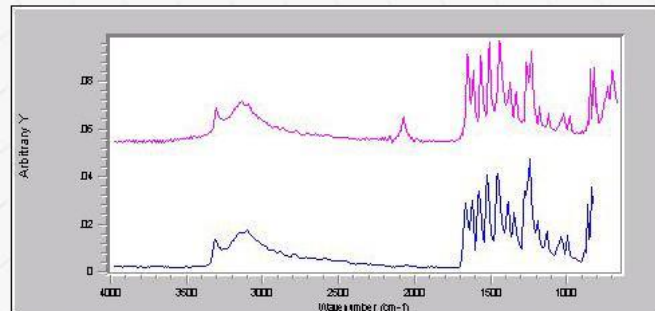
SEARCH
RESIDUAL

NIOSH
Information



DONE

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COMPARE
RAMAN

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REPORT

ADD TO
LIBRARY

OVERLAY

SEARCH
RESIDUAL

NIOSH
Information



DONE

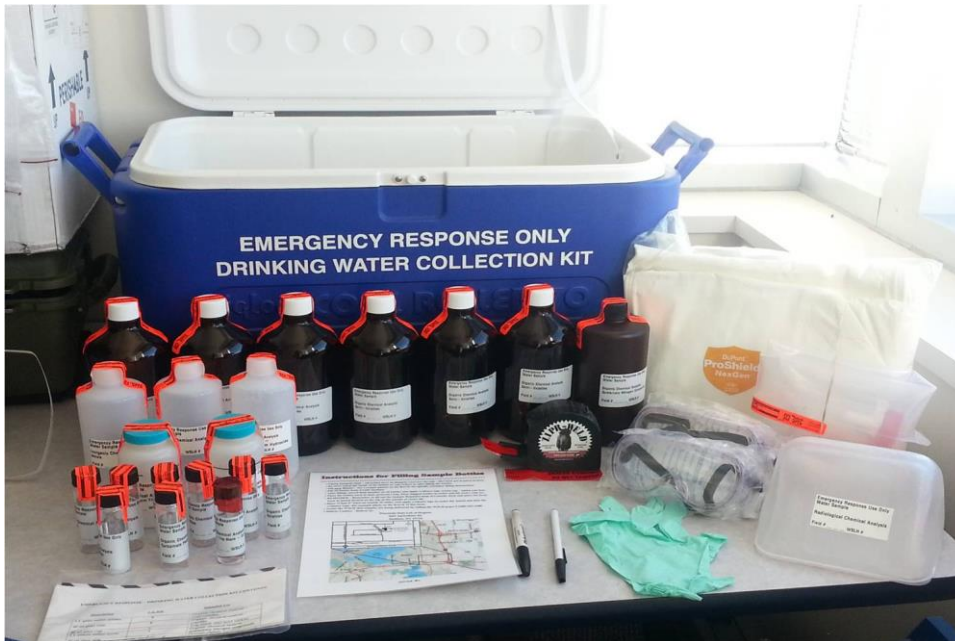
92% Acetaminophen spectral match

Extra peak = KCN

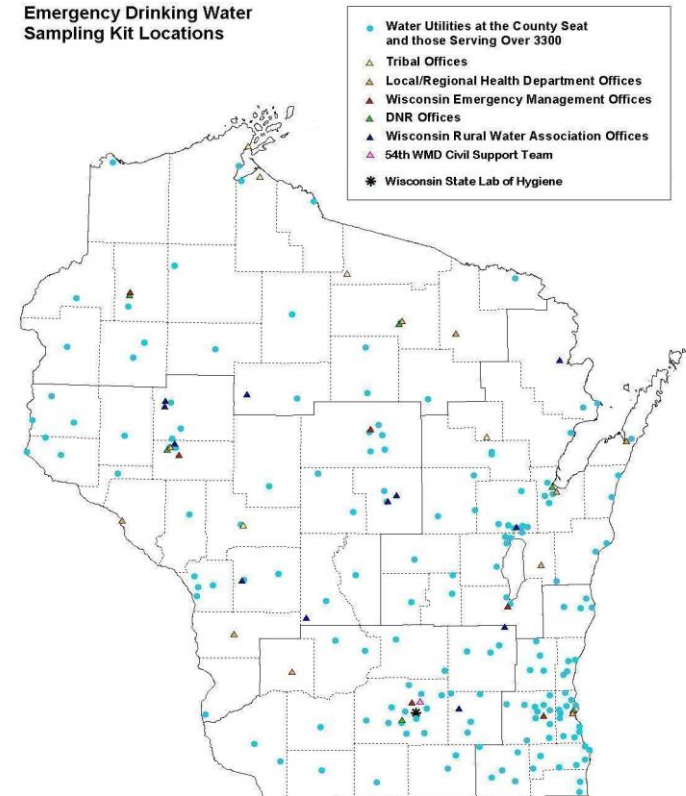


Env. Sample Collection Resources

- Emergency Response Drinking water sampling kits
 - Testing for rad, bio, chem
 - Sited all over state
 - Used October 2018



Emergency Drinking Water Sampling Kit Locations





Equipment Loan Program

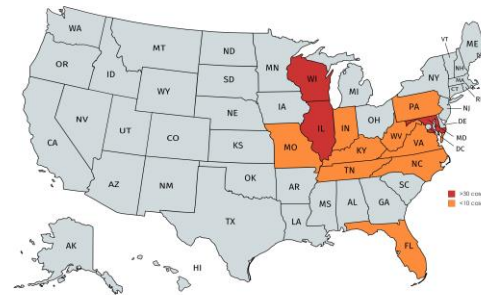
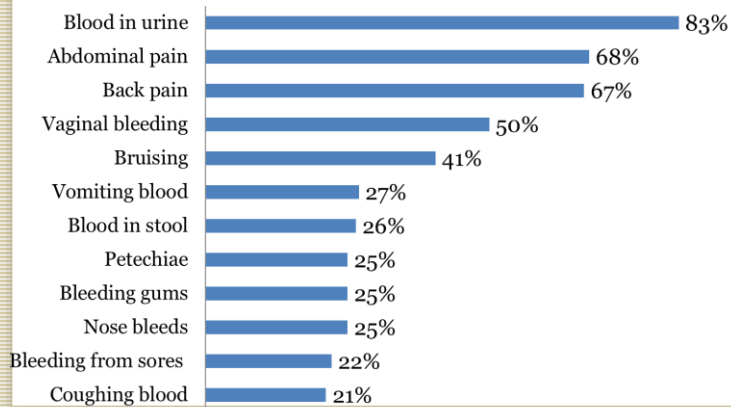
- WSLH/DHS Equipment Loan Program
 - Field monitors maintained for use by health, safety, and other investigators
 - NO_2 , H_2S , H_2CO , Hg, NH_3 , Cl_2 , VOCs, XRF, etc.
 - Instrumentation recently refreshed





Fake Dope and Rat Poison

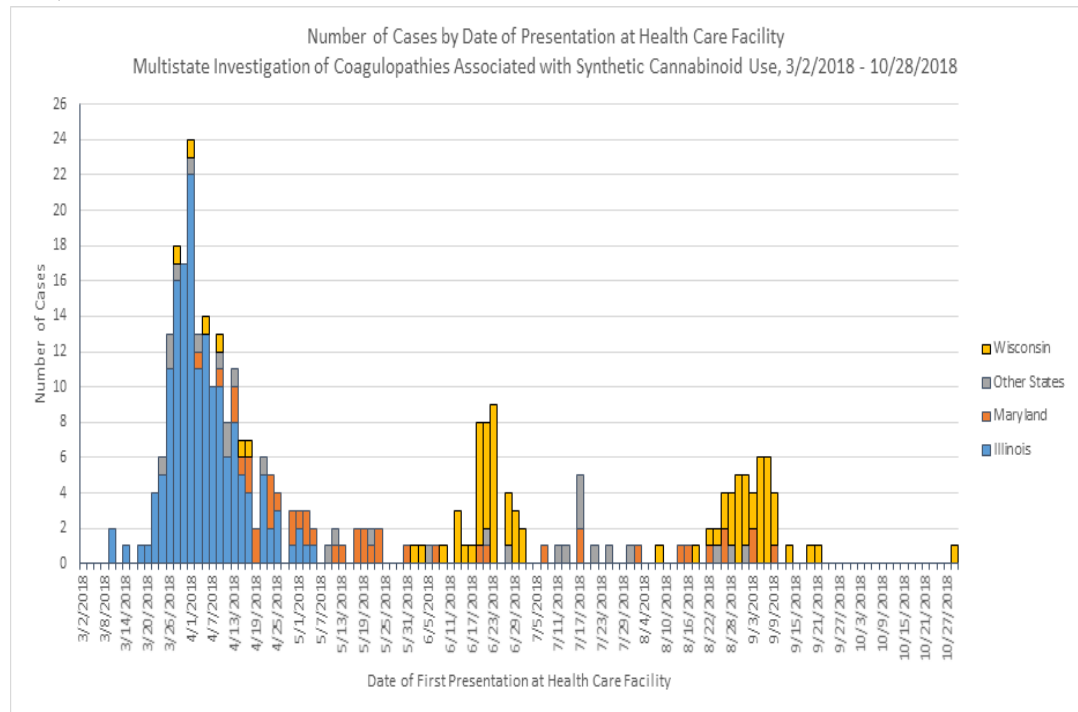
- Reports of unexplained coagulopathy in Chicago
 - Nasty constellation of symptoms
- Linked to synthetic cannabinoid use
- Brodifacoum exposure discovered
- Testing confirms brodifacoum in botanical material.
- 12 states, >320 cases, ~10 fatalities





Timeline of Cases

- Treatable w/vitamin K
- No quantitative exposure testing available
- WSLH developed test, validated per CAP
 - Employed LCMSMS, labeled ISTD obtained from CDC
- Tested ~150 patients
- 2nd lab also developed capability
- Influenced duration of treatment





EVALI

- First observed in WI, March 2019
- Peaked late summer, 50 states, >2800 hospitalized, ~70 fatalities
- WSLH role largely facilitation
 - Coordination with WDPH
 - Accepted submissions from LPH, LE, clinical labs, and pathologists
 - Developed proper collection, packaging, and shipment information
 - Directed samples to FDA, CDC (two branches)
 - Assisted with result interpretation





Vaping in WI

- WSLH received:
 - ~200 vaping pods, devices, cartridges, 12 BAL specimens & 8 FFPE blocks, 1 package edibles, 2 dabs, 2 frozen lung tissue, 1 blood, 1 plasma, 1 sputum, 1 nasal swab
- Employed 2 LIMS, a big spreadsheet, DHS Redcap database
- Developed vitamin E acetate method
 - Tested ~50 samples, confirmed association w/2019 THC products (vs. 2018) and cases





Looking Ahead

- Shift towards blood, protein adducts
- Non-targeted screening
- Radiological exposures?
- Opioids and the LRN
- PFAS capability
- New and emergent threats
 - More EVALI-related?
 - Other unregulated products





Thanks!

Any Questions?

- LRNC Staff
 - Karyn Blake
 - Meshel Lange
 - Nick Levitt
 - Erin Meinholz
 - Matt Roach
 - Brandon Shelton
 - Mason Shields
 - Noel Stanton

