# IT'S NEVER TOO EARLY TO PREPARE: SIX UPDATES SINCE THE LAST TIME YOU THOUGHT OF CHEMICAL EMERGENCIES

Southern Regional Disaster Response System HHS Region 4

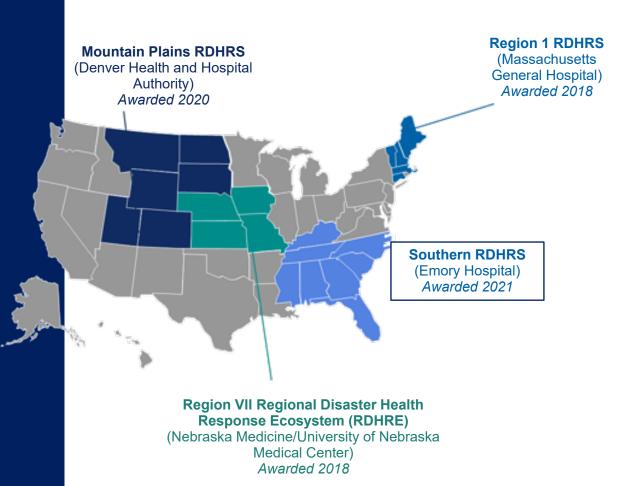
Alexander Isakov, MD, MPH – Emory University – SRDRS Principal Investigator Curtis Harris, PhD – University of Georgia Institute for Disaster Management – SRDRS Executive Director Richard Schwartz, MD – Augusta University Health System – SRDRS Medical Director Ziad Kazzi, MD – Emory University – SRDRS Associate Medical Director Kelly Nadeau, RN, MN, EMHP – Georgia DPH- Healthcare Preparedness Program Director David Newton, DrPH(c), MPH, NRP – Georgia DPH – Director, Division of Health Protection

#### **INTRODUCTION TO SRDRS**

#### 4<sup>th</sup> region funded by HHS/ASPR

Complement existing preparedness and response frameworks

Integrating 1) clinical subject matter expertise and 2) health systems' operational expertise into existing preparedness and response structures at the local regional and state level





#### **SRDRS AIMS**

Augment	Improve	Facilitate
Augment horizontal and vertical integration of key stakeholders	Improve bidirectional communication and situational awareness	Facilitate greater access to highly specialized clinical expertise and capabilities to
<ul> <li>champion public-private partnerships</li> <li>align preparedness and response plans, policies, and procedures</li> </ul>	<ul> <li>CBRNE response</li> <li>health care organizations and government partners</li> </ul>	improve medical surge capacity











# ZIAD KAZZI, MD, FACMT, FAACT, FAAEM, FACEP



- Associate Medical Director, Southern Regional Disaster Response System
- Professor and Director, International Medical Toxicology Fellowship, Emory University
- Assistant Medical Director, Georgia Poison Center
- Director, Grady Occupational and Environmental Toxicology Outpatient Clinic
- Immediate Past-President, MENATOX
- Vice President, ACMT
- Member, National Council on Radiation Protection and Measurements
- Executive Committee Member, Radiation Injury Treatment Network



#### CONFLICT OF INTEREST DISCLOSURE

• No relevant conflicts of interest to disclose

#### OBJECTIVES

- After participating in this session, you will be able to:
  - List 6 novel chemical hazards, lessons learned and response tools or strategies
  - Draft or update their chemical emergency preparedness and response annex with more ease



#### WHAT IS CBRNE?

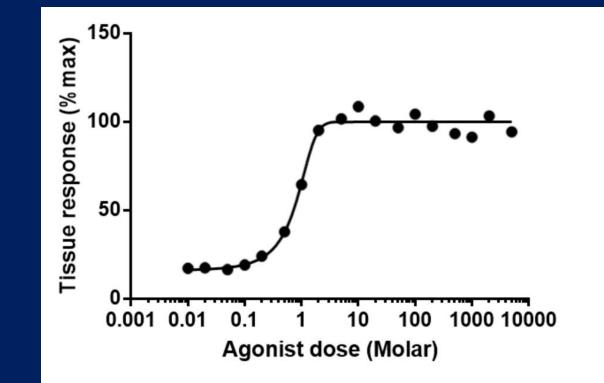
#### CBRNE

- Military agents that are either of dual or single use
- Non-military agents: Chemical and Radioactive Materials. These can also be termed Toxic Industrial Chemicals (TICs) and Toxic Industrial Materials (TIMs)

#### THE DOSE MAKES THE POISON "DOSIS SOLA FACIT VENENUM"



Paracelsus



Source Creative Commons

#### TOXIC INDUSTRIAL CHEMICALS

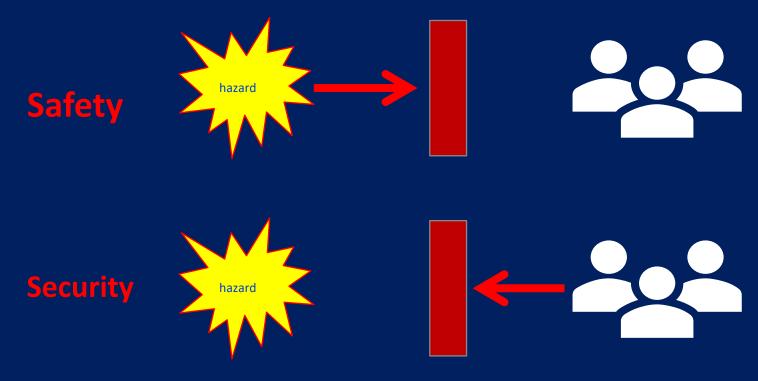
- Very large number of agents
- Easily available
- Variable security
- Variable clinical toxicity

#### SCHEDULED CHEMICALS

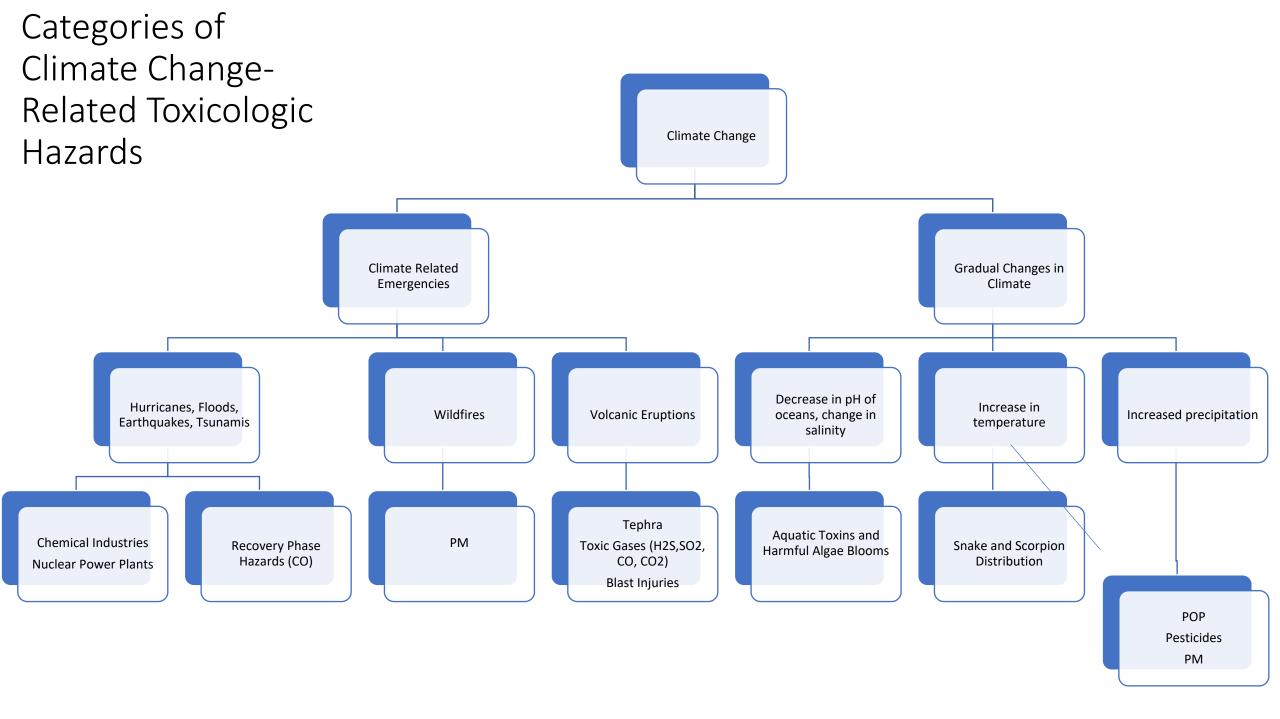
- **1.** Schedule 1 chemicals have few, or no uses outside chemical weapons. These may be produced or used for research, medical, pharmaceutical or chemical weapon defense testing purposes but production at sites producing more than 100 grams per year must be declared to the OPCW.
  - 1. A country is limited to possessing a maximum of 1 tonne of these materials. Examples are sulfur mustard and nerve agents, and substances which are solely used as precursor chemicals in their manufacture.
- 2. Schedule 2 chemicals have legitimate small-scale applications. Manufacture must be declared and there are restrictions on export to countries that are not CWC signatories. An example is thiodiglycol which can be used in the manufacture of mustard agents, but is also used as a solvent in inks.
- **3.** Schedule 3 chemicals have large-scale uses apart from chemical weapons. Plants which manufacture more than 30 tonnes per year must be declared and can be inspected, and there are restrictions on export to countries which are not CWC signatories.
  - 1. Examples of these substances are phosgene which is also a precursor in the manufacture of many legitimate organic compounds (e.g. pharmaceutical agents and many common pesticides), and triethanolamine, used in the manufacture of nitrogen mustard but also commonly used in toiletries and detergents.

### WHAT IS CHEMICAL SECURITY?

•Protecting Chemicals from people with ill intent or limited knowledge of chemistry.



Source: Dr. Andrew Nelson





#### Natural Disasters and Severe Weather

Natural Disasters and Severe Weather 3: Health and Safety Concerns for All Disasters

A Natural Disasters and Severe		Natural Disasters, Severe Weather, and COVID-19
Weather		Know how the COVID-19 pandemic can affect disaster preparedness and recovery, and what you can do to keep yourself
Natural Disasters, Severe Weather, and COVID-19		and others safe.
Earthquakes	+	Carbon Monoxide Poisoning After a Disaster
Extreme Heat	+	Essenaily (Specially ) from
Roads	+	
Hurricanes		
Landslides & Mudslides		FLORIDA'S
Lightening	+	POISON CONTROL CONTROL
Tornadoes		Search
Tsuramis		ABOUT THE NETWORK POISONING IN PLORIDA POISONING DATA PREVENTION EDUCATIONAL MATERIALS NEWS CONTACT
Volcanoes	+	Carbon monoxide (CO) is an odorless, colorless gas that can cause sudden illness/ outages occur during natural disasters and other emergencies, the use of altern/
Wildfres	+	heating or cooking can cause CO to build up in a home, garage, or camper and HOME SAFETY HUTTICADOS
Winter Weather		HOME SAFETY Hurricanes
		For Adults & Sentors       Preventing Poisonings After a Hurricane         For Adults & Sentors       After a hurricane or other natural disaster, poison         For Adults & Sentors       After a hurricane or other natural disaster, poison         COVID-19       control centers traditionally experience an increase         Marricanes       in poisoning calls. Below are some of the most         INTENTIONAL POISONING       common poisonings after a hurricane and tips to help

9

Suicide

Domestic Abuse Hotline

Remember, Florida's Poison Control Centers are available 24 hours a day, even during a storm, at 1-800-222-1222.

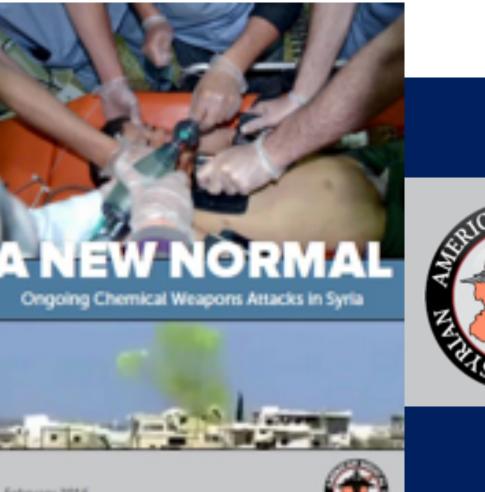
Click on a link below to see more information

keep your family safe.



#### WATER SOLUBILITY

Water Solubility	High	Intermediate	Low
Example	Chloramine	Chlorine	Phosgene
Signs and Symptoms	Upper Airway	Upper Airway>Lower Airway	Lower Airway



February 2016



chemical attacks in Syria

77%

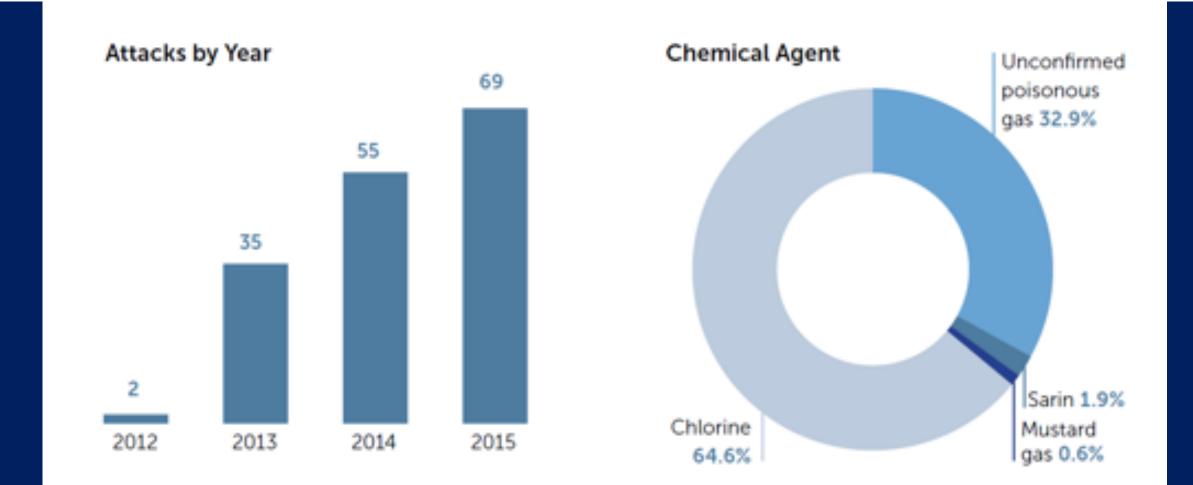
of chemical attacks occurred after UNSC Resolution 2118

# 14,581

victims of chemical attacks

1,491 deaths from chemical attacks

#### ACCORDING TO THE SYRIAN ARAB MEDICAL SOCIETY



#### **DISINFORMATION CAMPAIGN TARGET**

Social Network Analysis and Mining (2022) 12:80 https://doi.org/10.1007/s13278-022-00908-6

ORIGINAL ARTICLE



#### How disinformation operations against Russian opposition leader Alexei Navalny influence the international audience on Twitter

Iuliia Alieva<sup>1</sup><sup>(i)</sup> - J. D. Moffitt<sup>1</sup><sup>(i)</sup> - Kathleen M. Carley<sup>1</sup><sup>(i)</sup>

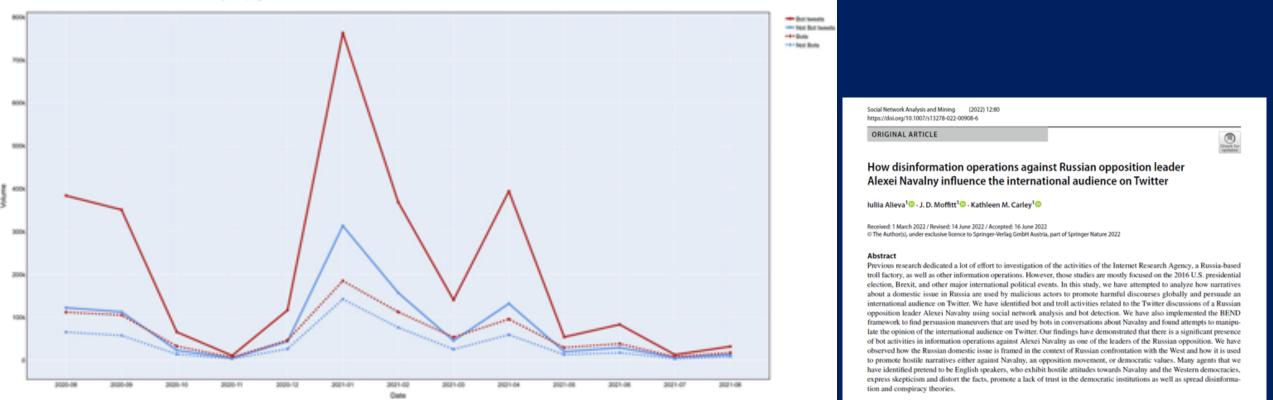
Received: 1 March 2022 / Revised: 14 June 2022 / Accepted: 16 June 2022 © The Author(s), under exclusive licence to Springer-Verlag GmbH Austria, part of Springer Nature 2022

#### Abstract

Previous research dedicated a lot of effort to investigation of the activities of the Internet Research Agency, a Russia-based troll factory, as well as other information operations. However, those studies are mostly focused on the 2016 U.S. presidential election, Brexit, and other major international political events. In this study, we have attempted to analyze how narratives about a domestic issue in Russia are used by malicious actors to promote harmful discourses globally and persuade an international audience on Twitter. We have identified bot and troll activities related to the Twitter discussions of a Russian opposition leader Alexei Navalny using social network analysis and bot detection. We have also implemented the BEND framework to find persuasion maneuvers that are used by bots in conversations about Navalny and found attempts to manipulate the opinion of the international audience on Twitter. Our findings have demonstrated that there is a significant presence of bot activities in information operations against Alexei Navalny as one of the leaders of the Russian opposition. We have identified pretend how the Russian domestic issue is framed in the context of Russian confrontation with the West and how it is used to promote hostile narratives either against Navalny, an opposition movement, or democratic values. Many agents that we have identified pretend to be English speakers, who exhibit hostile attitudes towards Navalny and the Western democracies, express skepticism and distort the facts, promote a lack of trust in the democratic institutions as well as spread disinformation and conspiracy theories.

#### DISINFORMATION AUGUST 2020-AUGUST 2021 SURROUNDING THE NAVALNY INCIDENT

Volume of Tweets and Bots Over Time in Navality Campaign



50% of 717K users were found to be predicted bots producing around 3 million tweets

#### **CURRENT EVENTS IN UKRAINE**

- Brutal war that has targeted civilians and witnessed genocide has raged for over a year
- Concern for effect of war on chemical industries
- Concern for effect of war on nuclear power plants
- Concern for use of chemical weapons or radiological/nuclear devices and weapons



Sláva Ukrayíni!

## CLINICAL DIAGNOSIS VERSUS LABORATORY DIAGNOSIS

- Many agents cause non-specific and overlapping clinical presentations
- Clinicians lack knowledge/experience about certain chemical and radiological injuries
- Some chemical agents and all radiological exposures have delayed presentations
- Resources may not be available for testing
- Laboratory testing may not be available for specific agent

Some Examples of Toxidromes

Irritant (highly and moderately water soluble)

Collection of clinical signs and symptoms that point to one or more toxic agents Asphyxiant Gastrointestinal Gastrointestinal with Nervous System Anticholinergic Sedative Opioid Stimulant **Corrosive or Caustic** Hydrocarbons and Substituted Hydrocarbons **Skin Lesions Acute Radiation Exposure** 

#### **BLISTER AGENTS**

TABLE 7-2 CLINICAL DIFFERENCES AMONG VESICANTS							
	Onset						
Chemical Agent	Pain	Tissue Damage	Blister				
Mustard	Hours later	Immediate; onset of clinical effects is hours later	Fluid filled				
Lewisite	Immediate	Seconds to minutes	Fluid filled				
Phosgene Oxime	Immediate	Seconds	Solid wheal				

#### GASTROINTESTINAL SYNDROME LONDON, ENGLAND NOVEMBER 1, 2006

- Mr. Alexander Litvinenko fell ill at night
- His wife had prepared a special dinner to celebrate their one-year anniversary in London
- During that day he had meetings in London



Mr. Alexander Litvinenko

# BY NOVEMBER 3, 2006

- Mr. Litvinenko had been suffering from abdominal pain, profuse diarrhea and vomiting for two days when he was taken to hospital
- Initial diagnosis: gastroenteritis with mild dehydration
  - Wide range of tests over the following days to try to identify the cause of his symptoms
- Initial blood tests showed that although the platelet count was normal, both hemoglobin and the white blood cell count were high
- Abnormally high levels of creatinine and urea, indicating that he was dehydrated from the vomiting and diarrhea

## NOVEMBER 4, 2006

- Started on a course of Ciprofloxacin
- Over the next few days
  - Platelet count fell to an abnormal level and the red and white blood cell counts fell further.
  - The continuing decline in blood cell count caused increasing levels of concern

# NOVEMBER 9, 2006

- Marina Litvinenko asked the consultant, Dr. Dean Creer whether Mr. Litvinenko's infection could have been the result of poisoning
- She explained that her husband was usually extremely fit and healthy, but, "he knew of dangerous people and a friend of theirs had been poisoned and killed by these people", hence her anxiety
- Dr. Creer told her that the symptoms were common, and that intentional infection/poisoning was not likely

# NOVEMBER 13, 2006

- Dr. Virchis took over Mr. Litvinenko's care and was aware of Mrs. Litvinenko's previously expressed concerns about possible poisoning
- He observed that Mr. Litvinenko's condition did not fit with the previous evolving diagnosis of gastroenteritis or of Ciprofloxacin toxicity
- Further attempts were made by medical staff to identify a cause for Mr. Litvinenko's declining condition and various investigations were carried out involving Medical Toxicology colleagues at Guy's Hospital poisons unit

### TRANSFERRED TO A HIGHER LEVEL OF CARE

- Dr. Nathwani: although the level of thallium in Mr. Litvinenko's blood had been abnormal before his transfer to UCH, it was not elevated enough.
  - Mr. Litvinenko did not have any significant damage to his nerve endings and had relatively low thallium levels.

•A fatal case of thallium toxicity: challenges in management

<u>R Riyaz<sup>1</sup>, S L Pandalai</u>, <u>M Schwartz</u>, <u>Z N Kazzi</u> 2013 Mar;9(1):75-8.

# NOVEMBER 13, 2006

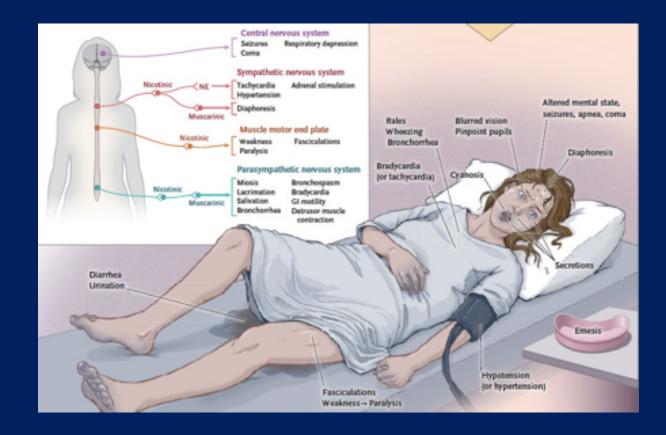
- It struck Dr Virchis that his presentation was similar to that of a patient suffering from acute leukemia who had been treated with intensive chemotherapy and total body irradiation prior to a bone marrow transplant
- The clinical notes reveal that radiology was to be asked to, "check radioactive sources of poisoning"

# NOVEMBER 23, 2006

- Mr. Litvinenko death after three cardiac arrests between November 21 and 23, 2006
- Radioactive Polonium-210 identified in urine right before his death

#### Diagnosis and treatment of polonium poisoning Robert D. Jefferson <sup>a</sup>; Ronald E. Goans <sup>b</sup>; Peter G. Blain <sup>a</sup>; Simon H. L. Thomas <sup>a</sup>

#### ORGANIC PHOSPHORUS COMPOUNDS AND NERVE AGENTS: GASTROINTESTINAL AND NERVOUS SYSTEM



#### Source: NEJM April 2019

#### SALISBURY, ENGLAND, SUNDAY MARCH 4, 2018

- Report to dispatch by a member of the public of an unconscious young woman on a bench, slumped over an older man who is starting into space and mumbling (16:15).
- Location frequented by drug users
- Patient 1: decreased responsiveness, mioisis, sweating, incomprehensible words, flaccid
- Patient 2: unresponsive, hypopneic, sweating, miosis, minimal oral secretions, rigidity



# THE FOLLOWING DAYS (MONDAY AND TUESDAY MARCH 5-6, 2018)

- No response to naloxone
- Lactic acidosis
- Shock
- Googling Sergei Skripal led to suspicion of poisoning and other potential toxins or toxicants
- Patient 3 with plausible exposure
  - Miosis, fatigue, feeling sweaty
  - Progressed the next day to hallucinations/vivid dreams, one episode of vomiting, diaphoresis, blurry vision



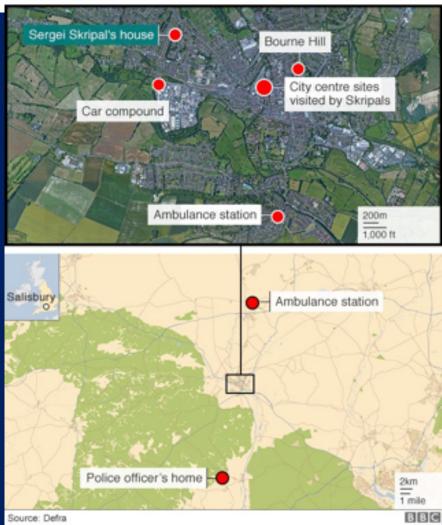
**Officer Nick Bailey** 

# CONFIRMING THE DIAGNOSIS AND OTHER ISSUES

- Very low cholinesterase levels
- Specialized testing confirms Novichok
- Skin and hair depot and decontamination
- Environmental assessment and management

#### $4^{TH}$ GENERATION AGENTS – NOVICHOK – A-**SERIES NERVE AGENTS**

Salisbury sites requiring possible decontamination







## DAWN STURGESS AND CHARLIE ROWLEY JUNE 30-2018



Source: https://www.cele bratingthislife.ca/ 2015/06/chaneln05-diyvase.html

Source: http://lipstipsbeyond.com/ quick-tip-tuesday-dontrub-wrists-together/

Source: BBC

# NOVICHOKS OR 4<sup>TH</sup> GENERATION NERVE AGENTS

- Potentially tens of chemicals
- Potential for binary agents
- Various chemical structures with Fluoride, Nitrogen, Phosphate and Carbons
  - Phosphoramidates?
- Reported to be five to eight times more toxic than VX
- Liquids with low volatility but higher persistence than VX
  - Attention to decontamination of surfaces to avoid additional exposures
- Delayed onset of toxicity with dermal exposures (? Days)
  - Delayed decontamination still effective

#### DISTINGUISHING FEATURES OF FOURTH GENERATION AGENTS (FGA) VERSUS NERVE AGENTS

- Decontamination of skin and hair is crucial
- Bronchoconstriction and seizure have been a prominent features of FGA toxicity in animal studies
- Can cause severe metabolic acidosis with markedly elevated serum lactate
- Longer duration of illness

## SPECIFIC THERAPIES – NERVE AGENTS AND NOVICHOK

- Reactive Skin
   Decontamination
   Lotion (RSDL)
- Atropine
- Oxime (Pralidoxime)Benzodiazepine



Figure 1 - Reactive Skin Decontamination Lotion (RSDL) presentation



Military MARK I Kit containing atropine and 2-PAM autoinjectors Source: U.S. Army Soldier and Biological Chemical Command (SBCCOM).

#### **OXIMES**

- Reactivate acetylcholinesterase
- Pralidoxime (widely used)
  - 1-2g (25–50 mg/kg) loading over 30 min followed by 500mg/h
  - Boluses can cause vomiting, tachycardia, and elevated blood pressure



Credit: Dr. Alfarsi, Oman

## **OPIOID TOXIDROME**



Source: N Engl J Med 2012; 367:146-155 DOI: 10.1056/NEJMra1202561

- Miosis
- Coma or stupor
- Depressed breathing
- Low blood pressure and or heart rate
- Low body temperature

## FENTANYL AND ITS ANALOGUES

- Alfentanil
- Remifentanil
- Carfentanil
- Newer fentalogs



Source DEA





Photo: New Hampshire State Police Forensic Lab

## **DIAGNOSTIC STUDIES**

- Basic urine drug screens will not detect fentanyl and its analogues
- Some newer urine drug screens detect fentanyl but not the analogues
- Tertiary labs can detect a battery of these opioids

### FENTALOG STUDY

- Xylazine
- Other adulterants and contaminants
  - Diphenhydramine
  - Quinine

#### PUBLIC ALERT

Adverse Effects Linked to Next Generation Opioids Reported in Patients Presenting to Emergency Departments After Suspected Opioid Overdose

Papare: The objects of the measurement is is well paths holds and odds, dominent is colonomized, the supporter, and and examines and consumers, formation and classed theoremy presentil, and all other colonal acting after separate quick models and provides to encounter well-being quick to chand acting after separate quick models and provident to encounter provides quick to chand acting after separate quick models and provident to encounter provides a colong anti-separate separate quick models and provident to encounter provides a colong anti-separate separate separate path and the separate path of the separate provides to actualize an encounter the separate path of the separate set of the separate provides and the set of the set of the separate set of the separate provides and the set of the set



December 2021

Burnism: Fing and out in all the direct result and resultance contrasts (there and indicated parents in resultance) approximate for character and on resultance. The collect cas for produced strapting, herein, bulker), evaluate, indicategorization of excidencial endograms (PDE) foreigns.

proper allog maning webselelogen man for septement standisance and departments. Next intel desp projections we controls webseled or sensored advances, such as time adultment or 10%, effect on provider efforts or learning advances. Understanding merging allogs on help device are sensored approaches in initial measures and here colonies efforts.

Objective: A particular between both Associate Collage of Weinlast Decoding: (2020) and the Coulous Decodes In Process: Decodes and Edu prior (2020)) we contributed in responsible particular proceedings of the Decodes and Prior and P

Advanced agreements The sport rate prepared by Alex Marias MD, Har A (Lincold), MD, Yan H, Yan MD, MD, Yan MD,

110,000

#### Metonitazene •

Networksone: two interaction is consisting unspire ordered lines me pattern relativing upper and propriate of suggestion option relativing the pattern propriate or overgoing y dependence is two different ments. Budy present were forware to the applicate propriet in the two-file array of interaction 20 and 16 years. The first applicate propriet is two-file array of suggestioner closed finiting not need with other and proprieting processing budgest closed finiting not need with other and proprieting rescale array of high-file array of address while for second rescale control of any finition. One pattern trace of any of address while for second rescale areas

Competencies servicings tasking on extent developments of fermionistic services, and the service service service service service service service services and services to other through the despective service service service services.

The second second second

#### Isotonitazene •

and a second sec

N-Piperidinyl Etonitazene

Ppendiced Transmiss Are investig a second growth without from a prices within a gap and program of second speed second of Man process provide to an its fram. The process

man and aid and man ten female tells same a gap factors if aid if your <u>Discontent</u> for an of contents of factor and an an actual method for an of factor and demaining Pointen method for an of factor point demaining Pointen method if I does of Marting Hill and pointen method if I does of Marting Hill and pointen method.

> Construction of the state of the state of the state state of the state party of the state of the state state of the state



south relation has been been been

the local property of the second with a particular through the second se

Southers with the state of the second state of the operation of the second state of th



a ministerio

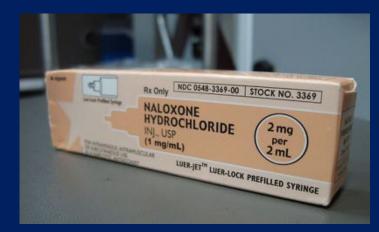
#### **RESPONDER SAFETY**



**Emergency Responders** 

#### MANAGEMENT

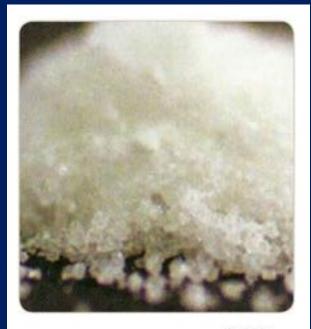
& Airway & Ventilation & Oxygenation & Naloxone May need higher doses compared to heroin ecommended doses (o.4 mg IV) naloxone as initial dose to reverse apnea, if needed increase to 2 mg, up to 10 mg)



Soure: Creative Commons License

## NOVEL PSYCHOACTIVE SUBSTANCES IMAGES FROM DEA

#### Synthetic cathinones



Bath salts

#### Synthetic cannabinoids







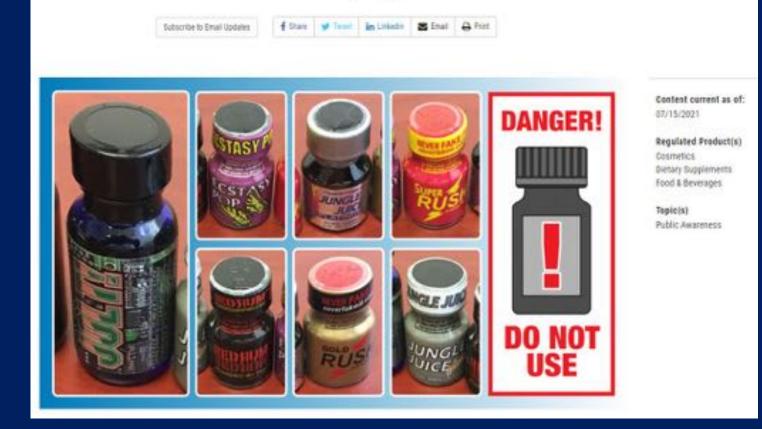
#### ADDITIONAL SUBSTANCES SOURCE DEA



### INHALANTS IMAGES DEA & FDA



#### Ingesting or Inhaling Nitrite "Poppers" Can Cause Severe Injury or Death



## ANTICHOLINERGIC TOXIDROME

- Dry as a Bone
- Mad as a Hatter
- Blind as a Bat
- Full as a Flask
- Hot as a Hare
- Examples:
  - Datura Starmomium or Jimson Weed
  - Diphendydramine
  - Atropine
  - BZ



Datura Stramomium

## TREATMENT PROTOCOLS

- Life-saving interventions and decontamination
- PPE at hospitals and prehospital
- Medical assessment materials and resources
- Medical management materials and resources



## SURVEILLANCE AND LONG-TERM POPULATION MONITORING/CONSIDERATIONS

- After event monitoring pitfalls
- Medical monitoring of those who exhibited clinical symptoms
- Public health monitoring of those affected
- Access to health care for those affected
- Research on health effects from chemical exposure
- Financial compensation for victims
- Social recognition of the tragedy
- Outreach to those affected such as updates on new scientific and medical developments or new programs or policies relevant to the incident



### THANKYOU FORYOUR ATTENTION

- Happy to discuss any additional questions by email
- Follow me on Twitter @*ZiadKazzi*
- Check out our website and register to attend our upcoming webinar series
- Chemical Emergency Medical Management (CHEMM) <u>https://chemm.nlm.nih.gov/</u>



#### THANK YOU

#### HOW CAN WE WORK TOGETHER TO STRENGTHEN REGION 4 ?



Southern Regional Disaster Response System HHS Region IV