Introduction

• Methylene chloride (MC), also known as dichloromethane, is a volatile, colorless liquid found in paint strippers.
• Exposure is classically associated with central nervous system depression and elevated carboxyhemoglobin (COhb) levels.
• MC can also cause a significant defatting dermatitis and partial thickness dermal injury from prolonged dermal exposure as demonstrated in this case series.

Case Presentation

• 20-, 21-, 37-year old males with no past medical history presented to the emergency department with bilateral hand pain, swelling and erythema after cleaning a spilled container of paint and epoxy remover (60% methylene chloride, 20% methanol, <5% petroleum) with ungloved hands for 45 minutes.
• Physical exam findings were concerning for a defatting dermatitis of the bilateral palms (fig 1). Labs in the ED showed COhb percentages [reference range: 0.5 – 1.5%] for patient 1, 2 and 3 of 3.9% (daily tobacco user), 3.2% (daily tobacco user, and 2.4% (non-tobacco user), respectively. Patient 2 and 3 were transferred to a tertiary burn center for definitive care.
• The epidermis of his bilateral palms were found to be non-viable and both patients (fig 2) were taken to the operating room (OR) on hospital day 3 (HD 3) for debridement of non-viable tissue (fig 3).
• The debrided palms were dressed with a bioactive tissue allograft composed of dehydrated human amnion/chorion membrane.
• On post-operative day five (POD 5), the dressings were taken down (fig 4) and dressed with bacitracin and xeroform and the patient was discharged with follow up in the burn clinic.
• Patient 3 followed up one month after discharge with near complete resolution of dermal injury (fig 5).

Discussion

• The literature on dermal injury secondary to methylene chloride exposure is limited.
• Dermal injury from methylene chloride was first described in the 1950s. In the 1960s in volunteer studies where thumbs were immersed in a methylene chloride solution. The first case report of dermal injury secondary to MC appeared in 1984.
• Systemic toxicity does not seem to appear from dermal exposure.
• The likely etiology of dermal injury from methylene chloride is the chemical dissolving of epidermal lipids.
**Background**

- Protamine binds heparin to form a stable, neutral salt, thus neutralizing anticoagulation induced by heparin.
- Adverse reactions are rare but include bradycardia, hypotension, and anaphylaxis.

**Case Report: History of Present Illness**

- A 68 year old woman with a history of insulin-dependent diabetes mellitus (DM) type II presented to the Emergency Department in cardiac arrest from a day surgery center.
- At the surgery center, she was given protamine for heparin reversal and soon after became flushed, tachycardic, short of breath and then had a cardiac arrest.

**Case Report: Hospital Course**

- After multiple rounds of epinephrine and bicarbonate, she had return of spontaneous circulation.
- She remained hypotensive requiring both epinephrine and vasopressin infusions.
- The patient’s hypotension improved with the administration of methylprednisolone and diphenhydramine.
- She recovered and the ultimate etiology of the arrest was felt to be anaphylaxis secondary to protamine administration.

**Discussion**

- Protamine is a manufactured protein that has two uses in humans: 1) reversal of heparin anticoagulation, and 2) it is added to subcutaneously injected insulin as it allows the insulin to be released more slowly.
- Neutral protamine Hagedorn (NPH) insulin contains protamine and those treated with it chronically may form protamine antibodies predisposing them to anaphylaxis with protamine administration.

**Conclusions**

- Patients with previous protamine exposure, including NPH use, may be at increased risk of severe anaphylaxis following protamine administration.

Disclosures: None
LEVOTHYROXINE AND LIOTHYRONINE INGESTIONS REPORTED TO POISON CENTERS

Brett Roth,1 Mathias B. Forrester2
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BACKGROUND

Levothyroxine (T4) and liothyronine, a synthetic form of triiodothyronine (T3)
• Used alone or in combination to treat hypothyroidism and other thyroid problems
• Levothyroxine is the more common form of thyroid replacement therapy, but it has roughly 20% of the biological activity of T3
• Ingestion may result in adverse clinical effects similar to hypothyrotoxic – weight loss, diarrhea, vomiting, tremor, headache, nervousness, irritability, and fever
• Overdose may result in tachycardia, chest pain, trouble breathing, and confusion

This study compares levothyroxine and liothyronine ingestions reported to poison centers

METHODS

Data source: Texas Poison Center Network (statewide system of 6 poison centers that covers entire state, population >25 million)

Cases: Levothyroxine and liothyronine ingestions reported during 2000-2018
• Ingestions involving levothyroxine-liothyronine combination products and co-ingestants were excluded from the study

Analyses:
• Distribution of cases by demographic and clinical factors was determined
• Comparisons made between the two drugs

RESULTS

Total levothyroxine exposures 11,189
Total liothyronine exposures 141

Figure 1. Levothyroxine and liothyronine exposures reported to the Texas Poison Center Network during 2000-2018 by patient age

RESULTS

Figure 2. Levothyroxine and liothyronine exposures reported to the Texas Poison Center Network during 2000-2018 by patient gender

RESULTS

Figure 3. Levothyroxine and liothyronine exposures reported to the Texas Poison Center Network during 2000-2018 by exposure reason

RESULTS

Figure 4. Levothyroxine and liothyronine exposures reported to the Texas Poison Center Network during 2000-2018 by exposure site

RESULTS

Figure 5. Levothyroxine and liothyronine exposures reported to the Texas Poison Center Network during 2000-2018 by management site

RESULTS

Figure 6. Levothyroxine and liothyronine exposures reported to the Texas Poison Center Network during 2000-2018 by most common treatments

RESULTS

Figure 7. Levothyroxine and liothyronine exposures reported to the Texas Poison Center Network during 2000-2018 by most common clinical effects

CONCLUSIONS

The patterns of ingestions of levothyroxine and liothyronine used alone without co-ingestants were similar
• Most patients were young children and female
• Most ingestions were unintentional and occurred at the patient’s home
• The vast majority of levothyroxine and liothyronine ingestions did not result in serious outcomes and could be managed outside of a healthcare facility

Further study using these data will look at the variables of intentional overdoses, misuse, and dose-effect on outcome
LEVOTHYROXINE AND LIOTHYRONINE ADVERSE EVENTS REPORTED TO THE FOOD AND DRUG ADMINISTRATION

Brett Roth,1 Mathias B. Forrester2

1The University of Texas Southwestern Medical Center, Dallas, TX, USA; 2Independent Researcher, Austin, TX, USA

BACKGROUND

Levothyroxine (T4) and liothyronine (T3):
- Used alone or in combination to treat hypothyroidism and other thyroid problems
- Levothyroxine must be metabolized to liothyronine, a more active form of hormone
- Levothyroxine and liothyronine ingestion may result in adverse clinical effects similar to hyperthyroidism – weight loss, diarrhea, vomiting, tremor, headache, nervousness, irritability, and fever
- Overdose may result in tachycardia, chest pain, trouble breathing, and confusion

The objective of this study was to compare levothyroxine and liothyronine adverse events reported to the United States Food and Drug Administration (FDA).

METHODS

Data source: FDA Adverse Event Reporting System (FAERS)
- National database that contains reports of drug and other biologic product adverse events, medication errors, and product quality complaints resulting in adverse events submitted to the FDA
- Healthcare professionals (e.g., physicians, pharmacists, nurses), consumers (e.g., patients, family members, lawyers), and manufacturers submit reports to FAERS
- Reports are generally voluntary, although manufacturers are required to send reports they receive from healthcare professionals and consumers to FAERS
- Adverse events and medication errors are coded using the Medical Dictionary for Regulatory Activities (MedDRA), a validated, internationally standardized medical terminology
- Data are available through a public dashboard and through data files
- A report is classified as serious if one or more of the following outcomes were documented in the report: death, hospitalization, life-threatening, disability, congenital anomaly, and/or other serious outcome

Cases: Adverse event reports involving levothyroxine or liothyronine during 2000
- Adverse events reports involving both levothyroxine and liothyronine or other substances were excluded

Analyses:
- Distribution of levothyroxine and liothyronine adverse events was determined for various factors related to patient demographics, circumstances of the exposure, symptoms, and outcome
- Comparisons made between the two drugs

RESULTS

Figure 1. Levothyroxine and liothyronine adverse events reported to FAERS during 2000-2019 by mean patient age

Mean patient age (years)

Levothyroxine
Liothyronine
0 10 20 30 40 50

53.1
54.3

Figure 2. Levothyroxine and liothyronine adverse events reported to FAERS during 2000-2019 by patient sex

Patient sex

Percent

Male
Female

10.8
2.7

89.2
82.3

Figure 3. Levothyroxine and liothyronine adverse events reported to FAERS during 2000-2019 by most common reasons for use

Reason for use

Percent

Hypothyroidism
Thyroid stimulating hormone increased
Weight loss
Diabetes
Hair loss
Sweating
Sedative
Headache
Hair loss
Thyroid disorders
Pendred syndrome

An adverse event can have more than one reason for use

Figure 4. Levothyroxine and liothyronine adverse events reported to FAERS during 2000-2019 by most common reactions

Drug

Percent

Diabetes
Hypothyroidism
Anorexia
Weight loss
Insomnia
Confusion
Rash
Transaminase increased
Thyroid stimulating hormone increased

Figure 5. Levothyroxine and liothyronine adverse events reported to FAERS during 2000-2019 by serious outcomes

Outcome

Percent

Serious
Not serious

43.5
80.5

56.5
10.5

Figure 6. Levothyroxine and liothyronine adverse events reported to FAERS during 2000-2019 by serious outcomes

Serious outcome

Percent of total cases (not serious and serious)

An adverse event can have more than one serious outcome

CONCLUSIONS

The patterns of levothyroxine and liothyronine adverse events were similar with respect to patient demographics

The two drugs differed with respect to reason for use and reactions

A higher proportion of levothyroxine adverse events had serious outcomes, particularly those classified as unspecified other outcomes

Limitations of FAERS data
- Reporting to FAERS is often voluntary, and it is unlikely that FAERS receives reports on all adverse events for a given drug or other product
- Some reports may be duplications and some do not contain all the necessary information
- For a given report, the drug or other product may not have caused the reported adverse event
- The adverse event may have been related to an underlying condition, another drug, or other reasons
- In this study, the levothyroxine or liothyronine may not have caused the reported adverse event
- The information in the reports has not been independently verified

FAERS DATA AVAILABILITY

Public dashboard: https://fis.fda.gov/sense/app/app/d10be6bb-404e-4d22-b8c4-4156868b1537.html

Double Peak Serum Acetaminophen Concentrations Following Large Ingestion of Tylenol Combination Products
Bryan Ross, M.D., Marshall Haynick, PharmD., Kristine Nañagas, M.D.

Background
- Pharmacokinetic data for acetaminophen (APAP) is well described, however co-ingestion of APAP with opioids/anticholinergic agents can significantly alter absorption and pharmacokinetics of acetaminophen.
- We describe a large opioid/acetaminophen combination product overdose with an accompanying diphenhydramine/acetaminophen co-ingestion resulting in a “double peak” pattern of APAP absorption.

Case:
- 43-year-old female intentionally ingested 50-60 tablets of oxycodone-acetaminophen and an unknown amount of Tylenol PM.
- 24-48 hours following ingestion (unclear exact time of ingestion), APAP concentration was 287mcg/mL, and AST/ALT 589/203 Units/L.
- She was started on N-acetylcysteine. APAP initially trended down (through 60mcg/mL at 19 hours after the initial concentration drawn), AST/ALT continued to rise.
- Late in hospital day (HoD) 1, she began to display CNS depression resulting in intubation. Her APAP concentration was then noted to rise over the next several hours, peaking at 302mcg/mL.
- Patient developed AKI and was started on CVVH.
- Required levophed and vasopressin and started on intermittent hemodialysis.
- NAC continued at a dose of 12.5mg/kg/hr, instead of reducing to 6 mg/kg/hr.
- On HoD 2 labs were remarkable for pH of 7.29, lactate of 6.7mmol/L, creatinine of 1.26mg/dL, AST/ALT of 3290/1618 Units/L, ammonia of 243mcmol/L, and acetaminophen of 123mcg/mL.
- INR peaked at 3.83 on HoD 3, bilirubin peaked at 3.2mg/dL on HoD 4.
- APAP reached undetectable concentration (<10mcg/mL) on HoD 5.
- Patient was able to be extubated on HoD 8. AST and ALT fell to 18/68 Units/L on HoD 10.
- She was discharged home on HoD 31 in good condition.

Discussion
- The altered pharmacokinetics of acetaminophen when co-ingested with opioid or anticholinergic agents can induce a prolonged period of APAP absorption and a double peak of serum acetaminophen concentrations.
- This is likely due to delayed absorption secondary to slowed GI motility induced by opioid and/or anticholinergic medications.
- This second acetaminophen peak must be considered when planning treatment course as these cases have the potential for significant delayed toxicity.

CONCLUSIONS
- Large ingestions of acetaminophen combined with agents that retard GI motility may cause erratic and/or slowed APAP absorption, resulting in delayed maximal serum acetaminophen concentrations and double peak APAP concentrations.

References

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DEPARTMENT of EMERgENCY MEDICIne
False positive opiate urine drug screen in the setting of large urine dextromethorphan levels

Bryan Ross, Holly Irwin, Louise Kao, Blake Froberg

**Background**
- Literature describes dextromethorphan (DXM) inducing false positive Enzyme Linked Immunoasay Urine Drug Screen (EIA-UDS) testing for Phencyclidine (PCP).
- False positive results for opiates are not widely reported.
- Neither IBM Micromedex nor Goldfrank’s Toxicologic Emergencies 11th Ed. list DXM as a cause of false positive opiate results on UDS.

**Case 1**
- 3 yo M presents with fever and cough
- For 2 days prior received 20 mg of DXM Q4h. Prior to presentation had episode of “shaking and staring off.”
- On initial presentation: Somnolent, febrile 102°F, hypoxic 86% on room air
- CT head and ECG unremarkable, undetectable APP/ASA/ETOHS, UDS + opiates (MedTox Scan)
- Altered mental status and hypoxia resolved
- Repeat UDS again + opiates (Beckman Coulter AU5800).
- Urine drug testing by LC-MS/MS revealed no opiates, urine DXM concentration >1000 ng/mL (reporting limit 500ng/mL), dextrophan 77,000 ng/mL, (reporting limit >1000ng/mL)

**Case 2**
- 2 yo F found minimally responsive next to an open bottle of Delsym® cough medicine containing DXM
- Presented with agitation, rotary nystagmus, and tachycardia.
- UDS (Roche, Cobas 8000) positive for opiates, otherwise negative (including PCP)
- Laboratory evaluation otherwise unremarkable, repeat UDS negative (Beckman Coulter AU5800)
- Improved clinically over 24 hours
- Urine drug testing by LC/TOFMS. ELISA revealed DXM >10000 ng/mL, dextrophan >100000 ng/mL, testing was negative for opiates

<table>
<thead>
<tr>
<th></th>
<th>Case 1</th>
<th>Case 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>UDS Opioids</td>
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<tr>
<td>UDS PCP</td>
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<tr>
<td>LC/TOFMS Dextromethorphan</td>
<td>&gt;1000 ng/mL</td>
<td>&gt;10,000 ng/mL</td>
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<td>Dextrophan</td>
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<td>&gt;100,000 ng/mL</td>
</tr>
<tr>
<td>LC/TOFMS Opioids</td>
<td>Undetectable</td>
<td>Undetectable</td>
</tr>
</tbody>
</table>

**Discussion**
- Previous studies have demonstrated therapeutic doses of DXM do not induce a positive result for opiates on EIA-UDS testing.
- No study used higher doses of DXM.
- No pediatric data regarding DXM and opiate assay interference.
- These cases imply that high concentrations of DXM can precipitate false positive results for opiates on EIA urine drug testing.

**Conclusions**
- High urine concentrations of DXM can cause a false positive opiate result on certain urine EIA drug testing.

**References**
A Poison & Drug Information System Responds to a Novel Coronavirus

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In 2020 the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2; COVID-19) emerged as a global public health threat and first detected in the US in late January. The Arizona Poison & Drug Information System (APDIS) partnered with the Arizona Department of Health Services (ADHS) to develop a COVID-19 hotline as part of a state-wide response.

APDIS contacted ADHS on 1/6/2020 about setting up a COVID-19 Hotline to answer questions from the public and healthcare professionals throughout Arizona. The initial hotline went live for one county on 1/26/20. As call volume rapidly increased, an automated statewide number was implemented on 3/11/2020.

The COVID-19 Hotline provides information to the public and health care professionals regarding:

- Symptoms
- Testing
- Treatment
- Isolation Guidance
- When To Seek Treatment

An interactive voice response (IVR) system was used for callers to listen to information with the option to speak with an APDIS specialist. Poison center staff and student rotators were used to staff the hotline.

A ‘call’ was defined as any/all calls into the automated IVR COVID-19 hotline (listening to prompts and response).

A ‘case’ referred to a call managed by a hotline staff and resulted in an APDIS chart being generated.

Between 1/26/20 and 8/01/20 the COVID-19 hotline received 128,127 calls; 45,919 (35.8\%) of these were cases.

The peak 24-hour volume was 3/17/20; with 24,010 calls and 5,298 (22\%) cases for the week.

Poison Control Centers (PCCs) can play important roles in public health threats including infectious disease outbreaks.

PCCs are staffed with health care professions, available 24/7 and can provide surge capacity; all are vital components of emergency preparedness responses.

PCCs should set up partnerships with local health departments for emergency preparedness and pandemic planning.
The Arizona Poison and Drug Information System (APDIS) consists of two poison control centers (PCCs) and partners with state and local Departments of Health Services (DHS) to assist with care and communication to the public. Ongoing partnerships with DHS and other healthcare organizations allow the APDIS to assist with rapid deployment of service for pandemics and other public health risks that require health advice and referral.

PCCs are well versed in telephone triage and the prioritization of calls. These services have been used extensively during Arizona’s response to COVID-19.

The initial COVID-19 Hotline was established for the state’s largest county on January 26, 2020. A statewide Hotline was implemented on March 11, 2020, with calls routed to the two PCCs based on caller location. The Hotline used an interactive voice response (IVR) system that included many frequently asked questions (FAQs), including:

- What are the symptoms of COVID-19?
- How to prevent spread in your home?
- What to do if exposed?
- Where can I get tested?

There were four recorded options (English and Spanish), with a 5th option to speak with a PCC specialist. The IVR scripts were updated based on questions posed to DHS (Figure 1).

Since the COVID-19 Hotline’s initial implementation on January 26, 2020 and subsequent rollout for the entire state, a total of 128,127 calls were received.

Reports estimate 77,724 callers had their question(s) handled by the IVR and did not require the involvement of a PCC staff member. The IVR handled 61.5% of all calls.

The call abandoned rate averaged 3.5%.

The use of an IVR System can assist a PCC with surges in calls, including work during public health emergencies.

An IVR can reduce the workload on PCC staff.
A series of patients who inadvertently ingested Death Camas had nausea, vomiting, bradycardia, and hypotension.

The largest ingestion resulted in new ECG changes suggestive of persistent sodium channel opening.

Be aware of Death Camas ingestions in patients who forage for wild onions and present with hypotension and bradycardia.

Treatment consists of supportive care, atropine for symptomatic bradycardia, and pressors for hypotension.

Symptoms generally resolve within 48 hours.
A 2-month old Infant with Posterior Reversible Leukoencephalopathy Syndrome Secondary to Cocaine Toxicity

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BACKGROUND

- Cocaine overdose in children causes a predominance of neurological effects.
- To date, there are no reported cases of pediatric patients with posterior reversible leukoencephalopathy syndrome (PRES) secondary to cocaine intoxication.
- We report a case of a 2-month-old infant who presented with hypertension, encephalopathy, and MRI findings consistent with PRES in the setting of acute cocaine toxicity.

CASE PRESENTATION

- A 2-month-old infant female presented with altered mental status.
- T 35.6 C, HR 176 (95th percentile), BP 101/43 mmHg (95th percentile), irregular respirations at a rate of 22 breaths per minute
- Ill-appearing with poor perfusion and intermittent episodes of muscle rigidity and tongue thrusting.
- Emergently intubated for apnea and hypoxia.
- Gas chromatography-mass spectroscopy positive for cocaine and cocaine metabolites (ecgonine methyl ester and benzoylecgonine), methadone and methadone metabolite.
- Brain MRI showed an abnormal T2 hyperintensity involving the subcortical white matter of the parietal lobes.
- MRI findings in the setting of hypertension and encephalopathy felt to be consistent with PRES secondary to acute cocaine exposure.
- A full sepsis evaluation was negative.
- Extubated on hospital day 2 with full improvement in symptoms.
- Discharged to foster care on hospital day 5.

A 2-month old Infant with Posterior Reversible Leukoencephalopathy Syndrome Secondary to Cocaine Toxicity

DISCUSSION

- Cocaine acts as an indirect sympathomimetic by both stimulating the release and inhibiting the reuptake of serotonin and catecholamines at the presynaptic neuron.
- Cocaine toxicity in adults is well characterized; however, the literature on the manifestations of cocaine toxicity in children is sparse.
- In a small case series, young children with acute cocaine intoxication tended to show a greater predominance of neurologic symptoms, including seizure and obtundation, compared to adults.
- Our patient presented with a sympathomimetic toxidrome and dopaminergic features of cocaine toxicity, including muscle rigidity and tongue thrusting movements.
- The apparent diffusion coefficient (ADC) image of her brain MRI demonstrated posterior vasogenic edema in the parietal lobes, which, in the absence of other causes of vasogenic edema, are consistent with PRES.
- The predominance of vasogenic edema in the parietal lobes is uncharacteristic of PRES in adults and represents a unique finding in this young patient.

CONCLUSION

Regardless of age, cocaine toxicity should be considered in a previously well child who presents with a sympathomimetic toxidrome and acute encephalopathy.
Magnetic Resonance Imaging Features in Massive Paradichlorobenzene Poisoning

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### Background

- Paradichlorobenzene (PDCB) is a common ingredient found in mothballs and urinary deodorizer cakes. While PDCB toxicity and associated long-term neurologic sequelae has been described by previous case reports, we present a unique case of acute neurological decompensation with rapidly evolving neuroimaging.

### Case Summary

- A 31-year-old female with a past medical history significant for substance abuse (methamphetamine, opioids, alcohol) presented to the emergency department for increased lethargy over the past several weeks, bizarre behavior, and decreased oral intake.
- On presentation, she smelled strongly of toilet bowl deodorizer, had a hyperpigmented rash, and was not communicative. Per patient’s mother, she recently admitted to sniffing and ingesting toilet bowl deodorizers after an excessive amount of wrappers were found under the patient’s bed.
- Initial management centered on starting parenteral high lipid concentration nutrition as well as n-acetylcysteine for possible antioxidant benefits.
- Magnetic resonance imaging (MRI) of the brain obtained in the first 24 hours of admission exhibited hyperintensity of the corpus callosum.
- The patient became increasingly catatonic over the following 48 hours:
  - Subsequent MRI imaging revealed worsening hyperintense lesions seen in the corpus callosum.
  - The diffusion restriction in the splenium of the corpus callosum was observed to be significantly worse from the MRI just three days prior.
- Her catatonia worsened, ultimately requiring a percutaneous endoscopic jejunostomy tube for nutrition.
- Urine PDCB concentration obtained upon presentation resulted as 1,000 mg/L (ref: <25 mg/L); repeat urine concentrations one month into the patient’s hospital stay were 990 mg/L.
- The patient died on hospital day 37 from complications related to respiratory failure and aspiration pneumonitis.

### MRI images

- **DWI sequence on day of admission (left) and 48 hours later (right)**

- **Apparent diffusion coefficient (ADC) sequence on day of admission (left) and 48 hours later (right)**

- **Radiology reports:**
  - **MRI read on day of admission:** Minimal diffusion restriction and FLAIR hyper signal intensity involving the splenium of corpus callosum. This findings is non specific and likely a transient finding of a cytotoxic lesions of the corpus callosum.
  - **MRI follow-up 48 hours later:** Interval worsening of deep white matter and splenium of T2/FLAIR hyperintensity and diffusion restriction.

### Discussion

- This case is notable for an extremely elevated urinary PDCB concentration in a patient with a devastating neurological outcome.
- Previous reports have described PDCB toxicity as a rare but potentially life threatening condition, particularly when neurotoxicity occurs. The mechanism of toxicity is not well understood but is suspected to be derived from cerebral oxidative damage.
- A coasting phenomenon has been postulated, with slow release of PDCB from adipose tissue as oral nutrition decreases, contributing to the long-term adverse effects seen in PDCB toxicity.
- The management of PDCB toxicity is not well described and prognosis can vary. Our patient’s case is particularly notable for the progressive leukoencephalopathy demonstrated in the corpus callosum on serial MRIs only days apart. This indicates that rapid progression of this toxicity may occur, particularly with massive ingestion.
- Practitioners should be aware of potential for rapid neurocognitive decline in patients poisoned with PDCB. MRI imaging may be beneficial and aid with prognosis in addition to other clinical indicators.
# Intentional Diphacinone Ingestion with Severe Prolonged Coagulopathy

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## Background
- Diphacinone is a long-acting anticoagulant rodenticide acting as a vitamin K antagonist of the inanединone class.
- To our knowledge, there is only one documented case of intentional diphacinone ingestion in the literature.

## Case Presentation
- 51 y/o female with history of depression
- Endorsed a suicidal ingestion of eight vials of the rodenticide "Tomcat Liquid Concentrate" containing 0.106% diphacinone over six weeks.

## Timeline

### First Hospital Admission
Presented with hematochezia, bruising, tachycardia (118bpm), hemoglobin of 5.5 g/dl and an INR >8.

She was given 25 mg PO vitamin K, 10 mg SQ vitamin K, 2 units PRBCs and 1 unit of FFP, as TXA was not available.

She was stable for four days on oral vitamin K and transferred to a psychiatric facility with an INR of 1.1 and hemoglobin 10.7 g/dL.

### Second Hospital Admission
Six weeks later she presented again to the ED after routine labs revealed an INR of 14.3. She admitted to ingesting four more packets of diphacinone.

She was treated with FFP, intramuscular vitamin K by the initial facility and transferred to another hospital.

She remained inpatient for three days on PO vitamin K and was discharged with a plan to continue outpatient vitamin K and INR checks.

### Third Hospital Admission
Eight weeks later she went to an ED after bloodwork showed an INR of > 20.

She denied further ingestion, but reported rationing her vitamin K.

She was given 2 units FFP, IM vitamin K and transferred. She was treated inpatient with PO vitamin K for two days and discharged on vitamin K with a plan for frequent INR checks.

Qualitative serum testing by HPLC/MS tandem mass spectrometry confirmed the presence of diphacinone (NMS Labs, Horsham, PA).

## Case Discussion
- We present a case of repeated diphacinone ingestions resulting in a prolonged (> 3 months) coagulopathic state.
- The elimination half-life of diphacinone is estimated to be 15-20 days.
- As expected, her coagulopathy responded to vitamin K.
- This case also highlights the challenge in ensuring medication compliance for these patients.

## Conclusion
- Treatment of diphacinone poisoning is similar to other long-acting vitamin K antagonists.
- Prolonged coagulopathy is possible, especially with repeat exposures.
Trends in Intentional Hydroxyzine Exposures Reported to US Poison Control

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Background

- Despite being available for over 60 years, relatively little has been published regarding hydroxyzine overdoses.
- Literature is limited to a small number of older case reports, and no observational studies or reviews of hydroxyzine overdose could be found.
- Annual poison center data shows that antihistamines and psychotropic medications are among the most frequently encountered poisoning exposures.
- As both an antihistamine and anxiolytic, hydroxyzine is a medication with a high potential for overdose and better published descriptions of exposures are needed.

Methods

- Cases of intentional hydroxyzine overdose were requested from the National Poison Data System from 1/1/2000 to 12/31/2016.
- Single-substance exposures were examined for the most common clinic effects, therapies provided, management site, and outcomes.
- Cases with unknown outcomes were excluded from the analysis of single-substance exposures.

Results

- There were 62,347 intentional hydroxyzine exposures reported during the study period, including 19,885 single substance exposures with known outcomes.
- The total number of exposures increased from the previous year in 17 of the 18 years studied, and is depicted in Figure 1.
- The reason for exposure was most often suspected suicide (88%), followed by misuse (4%), unknown (4%), and abuse (3%).
- The most common clinic effects following single-substance exposures were drowsiness/lithargy (35.4%) and tachycardia (21.2%).
- Other clinic effects with >1% occurrence are listed in Table 1.

Results Continued

- No effect occurred in 33.3% of cases, minor effect in 42.1%, moderate effect in 19.2%, and major effect in 1.1%.
- Therapies performed with ≥1% frequency are listed in Table 2.
- The anticholinergic reversal agent physostigmine was used in 16 of 19,885 cases (0.8%).
- Most patients were treated in the emergency department and released to home (35.6%) or admitted to a psychiatric facility (36.7%). 13.5% of patients were admitted to non-critical care unit and 9.4% to a critical care unit. Remaining management sites included on-site (1.6%) and other (0.4%).

Conclusion

- Intentional hydroxyzine overdoses have increased substantially over the past 16 years, but major effects have been rare.
- The most common clinic effects were drowsiness and tachycardia.
- Treatments most often given were IV fluids and single-dose charcoal.
- Physostigmine, often recommended for other antihistamine overdoses, was used in less than 0.1% of intentional single-substance hydroxyzine overdoses.
- 22.9% of patients required admission to the hospital.

Table 1: Clinical effects following single substance hydroxyzine overdose

<table>
<thead>
<tr>
<th>Clinical Effect</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drowsiness/lithargy</td>
<td>35.4</td>
</tr>
<tr>
<td>Tachycardia</td>
<td>21.2</td>
</tr>
<tr>
<td>Hypertension</td>
<td>8.3</td>
</tr>
<tr>
<td>Agitation</td>
<td>6.3</td>
</tr>
<tr>
<td>Other miscellaneous</td>
<td>5.2</td>
</tr>
<tr>
<td>Vomiting</td>
<td>5.0</td>
</tr>
<tr>
<td>Nausea</td>
<td>3.7</td>
</tr>
<tr>
<td>Hypotension</td>
<td>2.9</td>
</tr>
<tr>
<td>Dizziness/vomiting</td>
<td>9.7</td>
</tr>
<tr>
<td>Confusion</td>
<td>2.4</td>
</tr>
<tr>
<td>Mydriasis</td>
<td>2.3</td>
</tr>
<tr>
<td>Electrolyte abnormality</td>
<td>2.0</td>
</tr>
<tr>
<td>Slurred speech</td>
<td>1.9</td>
</tr>
<tr>
<td>Bradycardia</td>
<td>1.7</td>
</tr>
<tr>
<td>Hallucinations/delusions</td>
<td>1.8</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>1.7</td>
</tr>
<tr>
<td>Tremor</td>
<td>1.1</td>
</tr>
<tr>
<td>Seizure (single)</td>
<td>1.1</td>
</tr>
</tbody>
</table>

Table 2: therapies perfromed following single substance hydroxyzine overdose

<table>
<thead>
<tr>
<th>Therapy</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluids, IV</td>
<td>29.3</td>
</tr>
<tr>
<td>Charcoal, single dose</td>
<td>26.5</td>
</tr>
<tr>
<td>Cathartic</td>
<td>7.5</td>
</tr>
<tr>
<td>Other</td>
<td>7.2</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>4.4</td>
</tr>
<tr>
<td>Lavago</td>
<td>2.6</td>
</tr>
<tr>
<td>Oxygen</td>
<td>2.3</td>
</tr>
<tr>
<td>Antihistamines</td>
<td>1.9</td>
</tr>
<tr>
<td>Dilute/irigate/wash</td>
<td>1.7</td>
</tr>
<tr>
<td>Sedation (other)</td>
<td>1.0</td>
</tr>
</tbody>
</table>
INTRODUCTION

- Rattlesnake envenomations are often treated with opioids during initial hospitalization due to the associated pain.
- As of 2019, two commercially available antivenoms are used to treat rattlesnake envenomations:
  - FabAV, an ovine-derived Fab antivenom
  - Fab2AV, an equine-derived F(ab')2 antivenom
- The objective of this analysis is to investigate whether opioid usage during initial hospitalization differs depending on which antivenom was used.

METHODS

- Cases were extracted from the American College of Medical Toxicology (ACMT) North American Snakebite Registry (NASBR) database.
  - Cases are contributed by a network of medical toxicologists at participating sites.
  - Data fields include demographics, bite characteristics, clinical effects, treatment details, and follow up information.
- Inclusion Criteria:
  - Rattlesnake envenomations
  - Occurred in 2019
  - Treated with antivenom
- Cases were categorized based on the type of antivenom at the first dosing event.
- Demographics, bite characteristics, and opioid use during initial hospitalization were summarized by antivenom group.
- The proportion of cases with opioid use during initial hospitalization was compared using a two-sided Fisher’s exact test.

RESULTS

- 113 Cases: 85 FabAV group, 28 Fab2AV group
  - 33 in FabAV group and 1 in Fab2AV group received both antivenom types during their course of treatment.
  - 63 (74.1%) in the FabAV group were treated with opioids during the initial hospitalization, compared to 27 (96.4%) of the Fab2AV group (p=0.0228).
  - Among >12 year olds, 76.8% of the FabAV group and 95.7% of the Fab2AV group were treated with opioids (p=0.0610).
  - Within the FabAV group, the pattern holds when comparing those eventually given both antivenom types; 90.9% of those treated with FabAV followed by Fab2AV were treated with opioids as compared to 63.5% of those that only received FabAV.

Demographics and Case Characteristics by Initial Type of Antivenom

<table>
<thead>
<tr>
<th>FabAV (N=85)</th>
<th>Fab2AV (N=28)</th>
<th>Total (N=113)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (Years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median (IQR)</td>
<td>44.0</td>
<td>33.0</td>
</tr>
<tr>
<td></td>
<td>(20.0, 59.0)</td>
<td>(17.5, 43.5)</td>
</tr>
<tr>
<td>N</td>
<td>85</td>
<td>28</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>19 (22.4%)</td>
<td>9 (32.1%)</td>
</tr>
<tr>
<td>Male</td>
<td>66 (77.6%)</td>
<td>19 (67.9%)</td>
</tr>
<tr>
<td>Bite Location</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Extremity</td>
<td>40 (47.1%)</td>
<td>19 (67.9%)</td>
</tr>
<tr>
<td>Upper Extremity</td>
<td>45 (52.9%)</td>
<td>9 (32.1%)</td>
</tr>
<tr>
<td>Time from Bite to Antivenom (Hours)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median (IQR)</td>
<td>3.0</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>(2.0, 4.0)</td>
<td>(2.0, 8.0)</td>
</tr>
<tr>
<td>N</td>
<td>83</td>
<td>28</td>
</tr>
<tr>
<td>Length of Initial Hospitalization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤24 Hours</td>
<td>10 (11.8%)</td>
<td>7 (25.0%)</td>
</tr>
<tr>
<td>25-48 Hours</td>
<td>52 (61.2%)</td>
<td>12 (42.9%)</td>
</tr>
<tr>
<td>49-72 Hours</td>
<td>16 (18.8%)</td>
<td>8 (28.6%)</td>
</tr>
<tr>
<td>≥73 Hours</td>
<td>7 (8.2%)</td>
<td>1 (3.6%)</td>
</tr>
</tbody>
</table>

CONCLUSIONS

- FabAV may be more effective at reducing the need for opioids.
- The potential relationship between antivenom treatment type and opioid use for pain warrants further investigation.

LIMITATIONS

- This is an uncontrolled observational study which does not prove causation.
- Baseline differences were not controlled for in this analysis.
- Potential confounders not assessed include the number of vials to initial control and differences in treatment practices by site.

DISCLOSURE

This study was funded by BTG Specialty Pharmaceuticals. RMPDS study authors maintained control over study design, data collection and analysis, reporting, and decisions to present and publish.
SMOKING HOOKAH, AN UNDER-RECOGNIZED SOURCE OF CARBON MONOXIDE POISONING

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SBH Health System, 1Department of Emergency Medicine, 2Division of Medical Toxicology

Introduction
Amongst many sources of carbon monoxide exposure, an often unrecognized and preventable cause of poisoning is water pipe tobacco smoke, or hookah. We aimed to identify the prevalence and outcomes of CO poisoning from smoking hookah in our urban emergency department (ED).

Methods
- Retrospective chart review of all patients presenting to the ED between January 2012 and March 2020 who had a carboxyhemoglobin (CO) level measured.
- Charts were reviewed and cases included if there was mention in the documentation of smoking hookah.
- Cases involving structural fires, gas exposures, vehicular and other non-smoking exposures were excluded.
- Patient demographics, clinical characteristics, associated symptoms, other exposures, and disposition were recorded.

Results
Ages: 16 – 70 years old
Male / Female: 43 (41%) / 61 (59%)
CO level: 0.2% - 33.7%

<table>
<thead>
<tr>
<th>Disposition</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admitted to SBH</td>
<td>4 (4%)</td>
</tr>
<tr>
<td>Elapsed time from ED</td>
<td>18 (17%)</td>
</tr>
<tr>
<td>Discharged</td>
<td>56 (54%)</td>
</tr>
<tr>
<td>Transferred for HBO</td>
<td>26 (25%)</td>
</tr>
</tbody>
</table>

Discussion
- In our series, smoking hookah led to 104 potentially preventable ED visits, 26 requiring transfer.
- More significant outcomes were associated with CO >11% and syncope.

Discussion (Continued)
- Per the CDC, there were 10,663 ED visits in New York State between 2012-2018 for unintentional CO poisoning, with 1,236 hospitalizations.
- Nationally, between 2010-2015, a total of 2,244 deaths were due to CO poisoning, mostly during the winter months.
- The majority of exposures were from fires, stoves, and vehicles.
- We identified smoking hookah as a significant source of CO exposure in our population.
- The 2018 Monitoring the Future survey found that 1 in 13 high school students in the US admitted to smoking hookah.
- Prevalence of smoking hookah varied by region, with the Northeast having the highest prevalence, with 1 in 6 young adults (19-30 years) having smoked hookah.

Conclusion
Smoking hookah is an under-recognized and significant source of CO poisoning. Recognition is the first step, and a thorough social history should be performed. Prompt identification and referral to definitive therapy can potentially preclude lasting neurologic or neuropsychiatric sequelae. Additional public health educational efforts should be directed towards broad dissemination of this consequential exposure.

References
- Lim et al. Case of carbon monoxide poisoning after smoking shisha. PMID: 20157455
- Wang LW et al. Severe carbon monoxide poisoning from waterpipe smoking: a public health concern. PMID: 25929510
- Grekin ER and Ayna D. Argileh Use Among College Students in the United States: PMID: 18432392
Pediatric Opioid Exposures Reported to the U.S. Poison Centers.

Saumitra V. Rege, Ph.D.², Jennifer A. Ross, M.D.², Christopher P. Holstege, M.D.²

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Background

- Drug overdose deaths rose from 38,329 in 2010 to 67,367 in 2018.
- Pediatric accidental exposures present a significant public health challenge and can result in serious complications, with approximately 60% calls received by poison centers (PCs) in 2017 attributed to children.
- There were 4,235 fatalities among patients aged 15-24 as a result of a drug-related overdose in 2015 with more than half of these involving opioids.
- The aim of this study was to evaluate the pediatric opioid exposures reported to the United States Poison Centers (PCs).

Methods

- A retrospective study was conducted utilizing the National Poison Data System (NPDS).
- Pediatric exposures, defined as per NPDS specifications as individuals aged ≤ 19 years, to opioids were identified using generic codes.
- Serious medical outcomes (SMO) were cases resulting in moderate or major outcomes or deaths.
- Descriptive statistics were used to analyze the characteristics of pediatric exposures. Poison regression models were used to evaluate the trends in the number and rates of exposures with the year as the independent variable.
- Important risk markers for SMO were highlighted using multivariable logistic regression models. We reported adjusted odds ratios (AOR) and the corresponding 95% confidence intervals (CI).

Results

- There were 101,201 pediatric opioid exposures reported to the PCs during the study, with 21% of the cases demonstrating SMO.
- The proportion of patients under 5 years of age was significantly lower in exposures with SMO (21.9% vs 78.1%). The proportion of SMO during the study period increased from 15.2% to 21.1%.

Predictors of Serious Medical Outcomes in Pediatric Opioid Exposures

- West (vs Northeast)
- South (vs Northeast)
- Midwest (vs Northeast)
- Acute (vs Acute on chronic)
- Multiple Substance Exposures (vs Single Substance Exposures)
- Males (vs Females)
- Misuse (vs Unintentional Exposures)
- Abuse (vs Unintentional Exposures)
- Suspected Suicides (vs Unintentional Exposures)
- 6-11 Years (vs 0 - 5 Years)

Adjusted Odds Ratio and 95% CI

Demographically, the exposures with SMO occurred more frequently in males (54.1% vs 45.3%).
- The proportion of suspected suicides (46% vs 21.6%) and intentional abuse (20.4% vs 5.8%) was higher among exposures with SMO, primarily driven by the teenage population.
- More than 80% of the cases under 5 years of age resulted from accidental exposure to the opioids. Single substance exposures were more common in exposures without SMO (53.5% vs 42.7%).
- Multiple opioids were reported in 7.5% of SMO exposures and 2.8% of exposures without SMO.
- The most common site of exposure in both groups was residence while hydrocodone and oxycodone were the most commonly reported opioids.
- Children between 6 and 19 years of age had a 35% higher risk of such outcomes (AOR: 1.35, 95% CI: 1.27 – 1.44) (Reference: 0 – 5 years).
- Similarly, males had a significantly higher risk of SMO compared to females (AOR: 1.19, 95% CI: 1.14 – 1.23).
- SMO were 4 times more likely in cases of intentional abuse (AOR: 4.78, 95% CI: 4.47 – 5.13).
- Serious outcomes were also significantly associated with the exposure to multiple substances (AOR: 2.18, 95% CI: 2.10 – 2.27).

Conclusions

- Our study noted an increase in the proportion of serious medical outcomes among pediatric opioid exposures.
- One explanation for the increased SMO in children could be the higher risk of exposure to these medications due to the substantial increases in the availability to the adult population.
- This highlights the need for greater attention to managing prescriptions and increasing patient awareness regarding the safe storage and adverse effects of these medications.
- The reasons for exposure varied among different pediatric age groups. Exposures can result from accidental contact with the drug which could result from the unsafe storage of the drug. In contrast, teenagers have a higher probability to intentionally use these drugs, often not prescribed for them, for recreational purposes to gain euphoric effects.
- Several factors independently increased the risk of serious medical outcomes in this patient population.
Results (Contd.)

- The survey included 56,313 respondents, of which 8,064 respondents (14.3%) reported using hydrocodone in the previous year. Of these 1,193 reported hydrocodone misuse.
- Past year hydrocodone misusers were more likely to be males, unmarried, and under 25 years of age.
- The proportion of past year alcohol use, low income, and major depression was greater in people misusing hydrocodone.
- Past year use and misuse of substances, including heroin (and marijuana), was significantly higher in hydrocodone misusers.
- Previous year use of marijuana (OR: 2.47, 95% CI: 2.11 – 2.90) and tranquilizers (OR: 1.17, 95% CI: 1.01 – 1.42) were significant predictors of hydrocodone misuse (ref: non-users).
- Males (vs females) were 38% and unmarried individuals (vs married) were 18% more likely to be hydrocodone misusers.
- Among clinical conditions, presence of major depressive disorder and suicidal ideation increased the risk of misuse.
- Hydrocodone misuse was significantly more likely among misusers (vs non-misusers) of other substances including sedatives, morphine, and stimulants.
- Conversely, individuals with older age (65 years and above) (ref: 12-17 years) were significantly less likely to misuse hydrocodone.

Conclusion

- The results indicate a high prevalence of hydrocodone misuse within a nationally representative sample of survey respondents.
- Several factors including the use and misuse of substances including alcohol, were important predictors of hydrocodone misuse.
- Our study further highlights the need for sustained, targeted, and multifactorial prevention responses to the ongoing opioid epidemic, including awareness of the factors that may increase the risk of misuse.
Background

- The use of benzodiazepines in ambulatory care increased substantially. According to the National Ambulatory Medical Care Survey for 2014 – 2016, benzodiazepines were prescribed in 66 million doctors’ appointments annually.
- Benzodiazepine-related overdose mortality has risen, from 0.6 per 100,000 adults in 1999 to 4.4 per 100,000 in 2016.
- According to the Centers for Disease Control and Prevention, drug overdose deaths involving benzodiazepines rose from 1,135 in 1999 to 10,724 in 2018.
- Approximately 30% of overdoses involving opioids also involve benzodiazepines.
- The objective of the study was to describe the epidemiology of benzodiazepines exposures using a near real-time national poison center (PC) database.

Methods

- We retrospectively queried the National Poison Data System (NPDS) for all benzodiazepines exposures 1/1/2013 to 12/31/2019 using generic codes.
- We descriptively assessed the exposure characteristics. Reports from acute care hospitals and emergency departments (ACHs) were analyzed as a sub-group.
- Frequencies and rates of benzodiazepines exposures (per 100,000 human exposures) were evaluated using Poisson regression methods.

Results

- There were 490,572 exposures to benzodiazepines from 2013 to 2019, with the number of calls decreasing from 75,108 to 58,377 during the study.
- Polysubstance exposures accounted for 73.5% of benzodiazepines exposures.
- The proportion of calls from acute care hospitals and hospital based EDs increased from 63.7% to 69.3% during the study period. Multiple substance exposures accounted for 70.6% of the calls from ACH.

Characteristics of Benzodiazepines Exposures

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Exposures (490,572)</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;=5 years</td>
<td>38,214</td>
<td>7.8%</td>
</tr>
<tr>
<td>6-12 years</td>
<td>6,332</td>
<td>1.3%</td>
</tr>
<tr>
<td>13-19 years</td>
<td>49,534</td>
<td>10.1%</td>
</tr>
<tr>
<td>20-39 years</td>
<td>178,120</td>
<td>36.3%</td>
</tr>
<tr>
<td>40-59 years</td>
<td>149,274</td>
<td>30.4%</td>
</tr>
<tr>
<td>&gt;60 years</td>
<td>121,399</td>
<td>24.7%</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>187,367</td>
<td>38.2%</td>
</tr>
<tr>
<td>Female</td>
<td>301,626</td>
<td>61.5%</td>
</tr>
<tr>
<td><strong>Reason</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abuse</td>
<td>35,916</td>
<td>7.3%</td>
</tr>
<tr>
<td>Misuse</td>
<td>23,850</td>
<td>4.9%</td>
</tr>
<tr>
<td>Suspected Suicide</td>
<td>297,096</td>
<td>60.6%</td>
</tr>
<tr>
<td>Unintentional</td>
<td>93,888</td>
<td>19.1%</td>
</tr>
</tbody>
</table>

Medical Outcome

<table>
<thead>
<tr>
<th>Medical Outcome</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Death</td>
<td>2,462</td>
<td>0.5%</td>
</tr>
<tr>
<td>Major effects</td>
<td>29,620</td>
<td>6.1%</td>
</tr>
<tr>
<td>Minor effects</td>
<td>158,512</td>
<td>32.3%</td>
</tr>
<tr>
<td>Moderate Effects</td>
<td>127,105</td>
<td>25.9%</td>
</tr>
<tr>
<td>Minimal/No Effects</td>
<td>159,432</td>
<td>32.5%</td>
</tr>
</tbody>
</table>

Conclusions

- Approximately 23.1% of the patients reporting benzodiazepines exposures were admitted to the critical care unit (CCU).
- Residence was the most common site of exposure (93.6%).
- Among the patients, 61.4% were females.
- Suspected suicides (60.6%) was the most commonly reported reason for exposure.
- Major effects were seen in 6% cases and the case fatality rate was 0.5%. Notably, there was an approximately 54% decrease in the number of deaths during the study period.
- The most frequently co-occurring substances were alcoholic beverages (15.9%) and antipsychotics (8.8%).
- Tachycardia (15.2%) and respiratory depression (5.5%) were commonly observed clinical effects.
- During the study period, the frequency of benzodiazepines exposures decreased by 22.3% (95% CI: -17.5%, -29.1%; p<0.01), and the rate of benzodiazepines exposures decreased by 20.8% (95% CI: -14.8%, -25.9%; p=0.03).
- Benzodiazepines exposures decreased during the study period. The increased severity of cases may be attributed to its concurrent use with opioids.
- Abuse and diversion of benzodiazepines may be a result of its perception as a low cost alternative to opioids.
- Benzodiazepines are increasingly associated with suicidal ideation, a common exposure substance in our sample.
- Increasing prescriber awareness and may be key to reduce such overdoses.
**Background**

- Drug overdoses are a leading cause of unintentional injury-associated death in the United States (U.S.) with approximately 70,980 fatalities in 2019 including 50,042 involving opioids.
- In 2018, more than 31,000 deaths involving synthetic opioids (other than methadone) occurred in the U.S., which is more deaths than from any other opioid.
- From 2013 through 2016, the number of deaths involving fentanyl approximately doubled each year.
- It is important to track fentanyl overdoses, especially those reported from the healthcare facilities (HCF) as these may greatly increase resource use.
- The objective of the current study is to use outline the epidemiology of fentanyl exposures reported to the National Poison Data System, specifically those that are reported from acute care hospitals and emergency departments (ACH).

**Methods**

- The National Poison Data System (NPDS) was queried for all human exposures to fentanyl from 2013 to 2019.
- We identified and descriptively assessed the relevant demographic and clinical characteristics.
- Fentanyl reports from acute care hospitals and Emergency Departments (ACHs) were analyzed.
- Trends in frequencies and rates (per 100,000 human exposures) were analyzed using Poisson regression.
- Percent changes from the first year of the study (2013) were reported with the corresponding 95% confidence intervals (95% CI).

**Results**

- There were 12,843 fentanyl exposures reported to the PCs, with the calls increasing from 1,544 to 2,761.
- Confirmed reports of illicit fentanyl overdoses grew from 3 reports in 2013 to 141 in 2019.
- The proportion of calls from ACH increased from 64% to 67.4% during the study.

**Results**

- Multiple substance exposures accounted for 69.9% of the overall fentanyl calls and 53.4% of the calls from ACH.
- The most frequent co-occurring substances reported were benzodiazepines (15.5%) and heroin (7.2%).
- Residence was the most common site of exposure (80.1%) and 73.1% cases were enroute to the hospital when the PC was notified.
- Tachycardia and respiratory depression were the most frequently demonstrated clinical effects.
- Naloxone was a reported therapy for 44.1% cases, with this therapy being performed prior to PC contact in most cases.
- Demographically, 55.5% of cases were males, and the most frequent age groups were 20-29 years (22.5%) and 30-39 years (21.3%).
- Intentional misuse (41.4%) and suspected suicides (16.8%) were commonly observed reasons for exposure, with the proportion of suicides being higher in cases reported by ACH (22.8%).
- Approximately 22% of the patients reporting fentanyl exposures were admitted to the critical care unit (CCU), with 11% of patients being admitted to non-CCU.
- Major effects were seen in 18.2% cases and the case fatality rate was 9.2%, with deaths increasing significantly during the study period (62 deaths in 2013 to 1,184 deaths in 2019).
- The frequency of exposures increased by 78.8% (95% CI: 68%, 90.3%; p<0.001), and the rate of exposures increased by 82.3% (95% CI: 36.3%, 143.9%; p<0.001).

**Conclusions**

- PC data demonstrated an increasing trend of fentanyl exposures, which may in part be attributed to the due to increased use of illegally or illicitly made fentanyl.
- Our study demonstrated a significant proportion of fentanyl exposures associated with intentional abuse and suspected suicide, and a significantly increasing mortality rate.
- Fentanyl exposure reports from acute care hospitals and ED's during the study increased, which may be indicative of the increased severity.
- Exposures reported to the PCs highlight the need for sustained, targeted, and multifactorial responses to the ongoing epidemic, including timely surveillance.
Patterns of Heroin Exposures with Severe Adverse Events Reported to the U.S. Poison Centers.

Saumitra V. Rege, Ph.D.; Margaret Woods, B.S.; Jennifer A. Ross, M.D.; Christopher P. Holstege, M.D.*

*Division of Medical Toxicology, Department of Emergency Medicine, University of Virginia School of Medicine, Charlottesville, Virginia, United States.

### Background
- Drug-involved overdoses are the leading cause of accidental death in the United States (U.S.) with more than 67,300 deaths resulting from drug-involved overdose in 2018. Approximately two-thirds of deaths involved an opioid.
- According to the Centers for Disease Control and Prevention (CDC), heroin-related deaths exceeded 15,000 in 2018.
- As the illicit drug market continues to evolve, morbidity and mortality due to heroin overdoses remains a significant public health challenge. As a result, timely surveillance of heroin overdoses as well as a greater understanding of the characteristics of such cases are key to developing response efforts.
- We sought to characterize the heroin exposures reported to the National Poison Data System (NPDS) which resulted in severe adverse events (SAEs).

### Methods
- The NPDS was queried for all human exposures to heroin reported to the U.S. Poison Centers (PCs) between 2008 and 2018.
- Cases that resulted in fatalities or major medical outcomes were classified as SAEs.
- We descriptively assessed the demographic and clinical characteristics.
- Trends in heroin exposures with SAEs were analyzed using Poisson regression with percent changes being reported. Independent predictors of SAEs were studied using multivariable logistic regression with adjusted odds ratios (AOR) reported.

### Results
- There were 49,839 heroin exposure calls made to the PCs from 2008 to 2018, with the number of annual exposures with SAEs increasing from 293 to 1,533 during the study.
- Single substance exposures accounted for 52.2% of heroin exposures with SAEs.

### Conclusions
- Approximately 79% of SAEs calls were reported from acute care hospitals and Emergency Departments (EDs).
- Of the patients reporting heroin exposures with SAEs, 39.4% were admitted to the critical care unit (CCU).
- Residence was the most common site of exposure (75.9%), and 85.7% of these cases were enroute to the hospital via EMS when the PC was notified.
- Among the SAE exposures, 69.5% were male, with individuals most commonly being between the ages of 20 and 29 years (42.2%).
- Intentional abuse (78.5%) and suspected suicides (10.3%) were commonly observed reasons for exposure.
- During the study period, the proportion of heroin abuse exposure cases increased (70.1% to 79.9%), while suspected suicides decreased (15.7% to 9.1%). There was a 2-fold increase in the number of annual deaths due to heroin.
- The most frequently co-occurring substance was benzodiazepines (12.9%).
- During the study period, the rate of heroin exposures with SAEs increased from 11.9 to 80.2 (per 100,000 human exposures) (p<0.001).
- Patients over 60 years of age and males were at a significantly higher risk of SAE. Other factors that increased the odds of SAEs were 3 or more exposure substances, presence of additional opioids in exposure, and intentional abuse.
Epidemiology of Severe Oxycodone Exposures Reported to the U.S. Poison Centers, 2008 – 2018.

Saumitra V. Rege, Ph.D., Tejal Pathak, Aaron Frey, D.O.*, Christopher P. Holstege, M.D.*

Division of Medical Toxicology, Department of Emergency Medicine, University of Virginia School of Medicine, Charlottesville, Virginia, United States.

<table>
<thead>
<tr>
<th>Background</th>
<th>Results</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Drug overdoses are a leading cause of unintentional injury-associated death in the United States (U.S.) with 68,577 fatalities in 2018.</td>
<td>• Results between ages 30 – 49 years were more common among the SO group (41%) as compared to the non-SO group (39%).</td>
<td>• Calls to PCs involving oxycodone decreased.</td>
</tr>
<tr>
<td>• Between 2016 and 2017, oxycodone comprised of approximately 18.8% of all prescribed opioids in the United States.</td>
<td>• Suspected suicides (55.8% vs 34.4%) and intentional abuse (19.1% vs 11.1%) were more frequent in the SO group.</td>
<td>• The proportion of oxycodone exposures from acute care hospitals and EDs increased.</td>
</tr>
<tr>
<td>• There were 182,748 visits to emergency departments (ED) related to oxycodone products in 2010. This study aims to examine the national trends in oxycodone exposures reported to U.S. poison centers (PCs).</td>
<td>• Additional co-occurring opioids were reported in 14% of the SO cases and 7% of non-SO cases.</td>
<td>• Despite the reformulation, intentional exposures to this medication remain high and result in significant adverse events.</td>
</tr>
</tbody>
</table>

**Methods**

- The National Poison Data System (NPDS) was queried for human oxycodone exposures from 2008 to 2018 using the generic code identifiers.
- Severe outcomes (SO) were defined as cases that resulted in major medical outcomes or death.
- We identified and descriptively assessed the relevant demographic and clinical characteristics.
- Trends in oxycodone frequencies and rates (per 100,000 human exposures) were analyzed using Poison regression methods. Percent changes from the first year of the study (2008) were reported with the corresponding 95% confidence intervals (95% CI).
- We developed a predictive logistic regression model to identify important predictors of severe outcomes with oxycodone exposures. Adjusted odds ratios (AOR) were reported.

**Results**

- There were 183,058 oxycodone exposures reported to the PCs from 2008 to 2018. The frequency of calls decreased from 16,644 to 12,982 during the study period.
- Among the overall oxycodone calls, the proportion of calls from acute care hospitals and EDs increased from 40% to 58.8% from 2008 to 2018.
- Multiple substance exposures accounted for 54.5% of the overall oxycodone calls.
Characterizing the Opioid-related Mortality in the United States using a National Poison Database.

Saumitra V. Rege, Ph.D.1, Sarah Ames, B.S.1, Aaron Frey, D.O.1, Christopher P. Holstege, M.D.1

1Division of Medical Toxicology, Department of Emergency Medicine, University of Virginia School of Medicine, Charlottesville, Virginia, United States.

Background

- Drug overdoses are a leading cause of unintentional injury-associated death in the United States (U.S.) with approximately 67,300 fatalities in 2018.
- Among these, approximately 47,000 deaths involved an opioid.
- The mortality and morbidity due to opioid overdoses lead to higher healthcare resource use and societal burden worldwide.
- According to the U.S. National Vital Statistics System—Mortality (NVSS-M) data, fentanyl, and heroin were the most commonly reported substances resulting in overdose deaths between 2010 and 2016.
- This study aims to examine the trends and characteristics of opioid-related mortality reported to the U.S. PCs.

Methods

- A retrospective study was conducted using The National Poison Data System (NPDS), querying it for all human exposures to opioids between 2011 and 2018.
- We descriptively assessed the demographic and clinical characteristics of exposures.
- Temporal trends in the frequency of opioid reports were evaluated by using a generalized linear mixed model with a Poisson distribution accounting for fixed and random effects.
- Independent predictors of opioid mortality were studied using logistic regression.
- Adjusted odds ratios (AOR) and the corresponding 95% confidence intervals (95% CI) were reported.

Results

- There were a total of 604,183 opioid exposure calls made to the PCs during the study period.
- The frequency of opioid exposures decreased by 28.9% (95% CI: -29.6%, -28.1%; p<0.001), and the rate of opioid exposures decreased by 21.2% (95% CI: -24.7%, -16.9%; p<0.001).
- There were 7,246 deaths in our study sample (1.2%), with 6.8% of cases demonstrating major effects.

- Among opioid-related deaths, there was a greater proportion of cases demonstrating poly substance exposures (80.7% vs 48.7%), including multiple opioids (24.9% vs 7.4%) as compared to non-fatal exposures.
- Cases between ages 30 – 39 years (19.9% vs 15.3%) and males (55.4% vs 44.5%) were more common in the exposures that resulted in deaths.
- Intentional abuse accounted for approximately half of the opioid related deaths. Hydrocodone exposures were most frequently observed and naloxone was a commonly used therapy.
- The risk of opioid-related death was the highest in cases between 50 and 59 years of age (Ref: 20 – 29 years).
- Conversely, cases under 6 years of age were 54% less likely to have a fatal opioid exposure.
- Males were 16% more likely than females to have a fatal overdose.
- Poly-substance exposures significantly increased the risk of mortality with the odds of death increasing 10-fold in cases exposed to 4 or more substances.
- Other Important predictors of an opioid-related death were intentional abuse (Ref: Unintentional exposure), parenteral route of administration (Ref: Ingestion) and exposure in the west census region of the U.S. (Ref: Northeast region).

Conclusions

- Analysis of calls to U.S. PCs indicated a decreasing trend of opioid exposures.
- The decrease observed in the opioid exposures could be attributed to the decreased opioid prescribing, tighter controls on opioids including rescheduling of specific products and the reformulation of products.
- The trends observed in PC data broadly reflect the mortality rates seen in the National Vital Statistics System (NVSS) data and, these data correlate well with each other.
- Several demographic and clinical factors increased the risk of a fatal overdose.
- Opioid-related deaths demonstrated a high risk among intentional reasons for exposures and occurred in older age groups.
- Continued surveillance of opioid-related adverse events is key to highlight changes in the patterns of such adverse events while also ensuring the implementation of timely and tailored responses.
A Case of a 22-year-old Male Presenting with Torsades de Pointes and a Type 1 Brugada Pattern in the Setting of Chronic Loperamide Misuse

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²Department of Emergency Medicine, University of Colorado, Aurora, CO, USA

Introduction

- Loperamide (Imodium®) is an over-the-counter anti-diarrheal medication that possesses mu opioid agonist properties.
- Between 2010 and 2015, loperamide exposures doubled and large doses are being misused to alleviate opiate/opioid withdrawal and/or produce euphoric effects.
- Cardiotoxicity from loperamide manifesting as QT and QRS interval prolongation is well described in the literature. The association between the type-1 Brugada pattern and supratherapeutic loperamide concentration is rarely described.
- This case report describes a 22-year-old male with a history of ongoing loperamide misuse who was found to have type-1 Brugada pattern in the setting of a supratherapeutic plasma loperamide concentration.

Case Report

- A 22-year-old male with past medical history of depression, on sertraline, was admitted to our tertiary care facility from an outside hospital after an episode of polymorphic ventricular tachycardia (pVT).
- Multiple syncopal episodes on the day of presentation prompted the patient to present to an emergency department (ED). Patient reported using 600 mg of loperamide 2-3 per week for two month to self-treat anxiety with last use one day prior to presentation.
- Telemetry monitoring revealed polymorphic ventricular tachycardia with associated loss of consciousness. The patient underwent defibrillation at 200J, intravenous (IV) administration of 4 grams of magnesium (Mg) sulfate with conversion to normal sinus rhythm and return of consciousness.
- The patient arrived to the tertiary care center with vitals notable for heart rate (HR) in the 60s and systolic blood pressure (SBP) in the 90s.
- Labs were notable for a potassium (k) of 4.7 mEq/L, Mg 3.1 mg/dl. An electrocardiogram (ECG) at this time showed a QTc interval of 667 milliseconds (ms), QRS of 136 ms, with ST elevation in V1-V3 with a “coved” appearance consistent with a type 1 Brugada pattern (fig 1).
- An isoproterenol infusion due to episodes of bradycardia (HR 40-50s) and prolonged QT interval. During 48 hours of admission, the patient was titrated off the infusion and his ECG prior to discharge returned to normal sinus rhythm (NSR) and resolution of the type 1 Brugada pattern (fig 2).
- The patient was discharged and lost to follow up.

Conclusions

- Prior to this case, the type 1 Brugada pattern with associated elevated loperamide concentrations has only been described three times in the literature.
- This case adds to the evidence that loperamide can precipitate this morphology on ECG and may possibly be related to sodium channel blockade and polymorphisms within the sodium channel.
- Limitations include the absence of prior ECG and no genetic testing.
Severe Rattlesnake Envenomation Complicated by Severe Systemic Reaction, Diffuse Myokymia, Rhabdomyolysis, and Supraventricular Tachycardia

Priya Srihari¹,², Sam Ontiveros¹,², Shaun Carstairs¹,², Alicia Minns¹,²
¹Department of Emergency Medicine, ²Division of Medical Toxicology, Univ. of California San Diego

BACKGROUND

• Rattlesnake envenomation is characterized by local swelling, tissue damage, and hematologic toxicity
• Neurotoxicity from Crotalus species is described as rippling fasciculations, or myokymia
• In general, the primary treatment for rattlesnake envenomation is administration of antivenom

CASE PRESENTATION

• A 15-year-old female presented to the Emergency Department (ED) after a rattlesnake bite to her right ankle
• En route to the ED, the patient developed worsening edema with rapid progression up to the face and neck, as well as diffuse total body myokymia
• She required intubation on arrival to the ED and was treated for anaphylaxis as well as with Anavip antivenom
• Shortly after intubation, she developed supraventricular tachycardia that required cardioversion
• In the intensive care unit (ICU), she continued to exhibit total body myokymia which was complicated by the development of rhabdomyolysis and hyperthermia, and was ultimately managed with paralysis with vecuronium
• She was extubated on day 2
• She received a total of 44 vials of Anavip antivenom
• She developed an additional episode of SVT that was terminated with adenosine
• Myokymia subsided over hospitalization and rhabdomyolysis improved
• She was discharged on nadolol with electrophysiology follow-up

RESULTS

• Vital signs on arrival to ICU:
  • Heart Rate 165 beats per minute
  • Blood Pressure 108/52 mm Hg
  • Respiratory Rate 20 per minute
  • Temperature 39 degrees Celsius
  • O2 Saturation 99%
• Peak total creatine kinase (hospital day 2): 11,651 U/L
• Rhythm strip from initial episode of SVT

CONCLUSIONS:

• This patient with no known prior exposures to rattlesnake or antivenom developed a severe envenomation that resulted in airway swelling and neurotoxicity manifested as severe myokymia
• Aggressive supportive care, including intubation and paralysis can be used in these severe cases that mimic anaphylaxis
• Here, antivenom did not improve myokymia; in cases of severe myokymia, such as this one, paralytics can be used
Acute generalized exanthematous pustulosis (AGEP) is a relatively rare condition characterized by small non-follicular pustules on a background of diffuse erythema. Majority of cases are drug-induced. Several case reports of AGEP occurring in response to a bite from spiders of the *Loxosceles* genus have been reported.

**Background**

- 19 year old woman with no known medical history presented to an emergency department (ED) in Tennessee with 3 days of fever and pustular rash with surrounding erythema on her torso, as well as a painful necrotic ulcer over her left hip.
- She had received doxycycline at another ED after the pustular rash had appeared. Otherwise no new medications.
- Temperature: 38.5 degrees Celsius. Heart rate: 109 bpm. Otherwise vitals were normal. She had pustular lesions and erythema around the torso (Figure 1), and a 5.5 by 5.9 cm necrotic lesion with surrounding blanching skin on the left hip (Figure 2).
- Labs were notable for a white blood cell count of 20,100/mcL, significant neutrophilia of 18090/mcL, and a C reactive protein of 89.7 mg/L.
- Biopsy of the pustular lesions revealed intradermal neutrophils and eosinophils, and dyskeratotic keratinocytes, consistent with AGEP. Biopsy of the necrotic lesion revealed necrosis of collagen and eccrine sweat glands with intradermal neutrophils and eosinophils, consistent with brown recluse spider envenomation.

**Case Report**

- She was admitted to the hospital and started on empiric broad spectrum antibiotics due to fever and lack of improvement on doxycycline. After biopsy results returned consistent with AGEP, antibiotics were discontinued, and she was switched to 60mg prednisone daily for 3 days and discharged with 1-week prednisone taper when afebrile and clinically improved.

**Discussion**

- This patient's clinical and histological findings were highly supportive of AGEP and *Loxosceles* envenomation.
- She was exposed to antibiotics but only after the rash already developed.
- The proposed mechanism is sphingomyelinase in *Loxosceles* venom induces increased release of interleukin-8 (IL-8) and granulocyte-macrophage colony-stimulating factor (GM-CSF), causing peripheral blood neutrophilia and dermal neutrophils.
- Recognition is important as fever and rash are common components of systemic loxoscelism. AGEP is inflammatory rather than infectious in nature. Steroids may be considered for treatment of AGEP.

**Conclusions**

We present a case of biopsy confirmed AGEP related to a *Loxosceles* envenomation.
A Kick-Off of Case Data
Silver EM¹, Oller L¹, Ruback A², Thornton SL¹

¹ Kansas Poison Control Center at the University of Kansas Health System, Kansas City, KS;
²Missouri Poison Center at SSM Health Cardinal Glennon Children’s Hospital, St. Louis, MO

Background
• Poison Control Center (PCC) case volumes fluctuate in response to various factors
• Major sporting events and their impact on workflow for healthcare professionals has been evaluated

Purpose
• Examine overall case volume trends following the kick-off times of an NFL team representing the region of two PCCs.

Methods
• Retrospective chart review at two regional PCCs
• Included: human exposure cases on Sundays between February 10, 2019 through February 2, 2020
• Cases pulled in 1-hour increments
• Sundays and case volumes were compared based off NFL games, season, and kick-off times

Results
• 10,690 human exposure cases were identified between two PCCs

Sunday PCC Cases

No Game: All Sundays, 202
No Game: Spring & Summer Months, 199
No Game: Fall & Winter months, 211
Noon Kickoff, 217
191.5 Kick Off, 210
SuperBowl 1730, 205
Playoff Games 1405, 198

Conclusion
• The seasons of fall/winter vs. spring/summer showed an impact on case volumes even without an NFL game
• Case volumes did not seem to be impacted by NFL kick-off time
• Sundays with a playoff game and the Superbowl were the only Sundays with an NFL game that showed a decrease in case volume

References
Background

• US adults fill more than 191 million opioid prescriptions annually. Opioid overdose is a leading cause of death in the US. The CIP Risk Index for Overdose or Serious Opioid-induced Respiratory Depression is a validated tool that calculates a risk class for a patient’s probability of experiencing an opioid OD within the next 6 months.
• Our objectives were to identify: (1) the proportion of adults discharged from the emergency department (ED) with a prescription opioid who were at risk for an opioid OD as measured by CIPERIOSORD, and (2) to determine their CIPERIOSORD risk class.

Methods

• This study is a secondary descriptive analysis of data collected from a prospective observational study of 389 patients ≥ 18 years of age returning to the ED within 30 days of initial index visit.
• Sociodemographic variables, comorbidities, medication history, and ED returns within 30 days after discharge were collected from patient interviews and chart reviews. This analysis only included patients reporting no opioid use at home and were discharged with an opioid prescription.

Results

• Of the 67 visits in which a prescription opioid was issued, 40 (60%) were for patients not reporting current use of opioids at home.
• Most of these visits were by females (21, 53%) and African Americans (29, 73%). The average age was 47 years (range 19-81).
• Twenty-two (55%) of these patients met at least one CIPERIOSORD predictive factor for OD.
• The most common predictive factor was antidepressant use (17%), followed by history of bipolar disorder or schizophrenia (11%), substance use (11%), and benzodiazepine use (11%).
• The distribution of risk classes during these visits included 18 (45%) patients in class 1, 1 (2%) class 2, 6 (15%) class 3, 4 (10%) class 4, 5 (13%) class 5, 4 (10%) class 6, and 2 (5%) in class 7.
• Fifteen (37%) patients had a 15.1% to 83.4% average predicted probability of experiencing an OD (CIP-RIOSORD risk class 4 to 7).

Conclusions

• Our findings illustrate a considerable proportion of ED patients were discharged with a new opioid prescription despite having a high-predicted probability for an OD within 6 months.
• CIPERIOSORD should be further studied as a potential tool for EDs to utilize prior to prescribing opioids to reduce risk of opioid overdose.
Changes in Prescription Opioid Exposures Reported to Poison Centers Following the Emergence of the COVID-19 Pandemic
Authors: Stevan Geoffrey Severtson, Marie Gurrola, Tanner Gardiner, Richard C. Dart, Janetta L. Iwanicki

INTRODUCTION

- Poison centers provide geographically-specific and timely data on the misuse of substances such prescription opioids
- Concern regarding poison centers’ capacity to provide standard care arose with the emergence of the COVID-19 pandemic
- We examined changes in exposures reported to poison centers in the first 17 weeks of 2020 (December 29, 2019 through April 25, 2020) to assess the impact of COVID-19 pandemic on collection of data on prescription opioid exposures

METHODS

- The Researched Abuse, Diversion and Addiction-Related Surveillance (RADARS) System receives weekly prescription opioid exposure data from poison centers
- Trends in exposures across all ages involving ten prescription opioids (oxycodeone, fentanyl, hydrocodone, morphine, hydromorphone, oxymorphone, methadone, buprenorphine, tramadol, and tapentadol) from 48 participating centers were evaluated
- Spline regression models assuming a Poisson distribution were used to identify time points where trends in exposure case counts significantly changed in 2020

RESULTS

- In 2020, two points were identified where trends in exposures significantly changed
  - Week 1 through week 10 (12/29/19 through 3/7/20)
    - Exposures showed a nonsignificant increase
  - Week 11 through week 14 (3/8/20 through 4/4/20)
    - Exposures decreased 6.0% each week on average
  - Week 15 through week 17 (4/5/20 through 4/25/20)
    - Exposures increased by 3.4% each week on average.

Table 1: Difference in Average Weekly Exposures Cases in 2020 relative to 2019

<table>
<thead>
<tr>
<th>Exposure category</th>
<th>Weeks*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 through10</td>
</tr>
<tr>
<td>All exposures</td>
<td>6.9% (3.5 to 10.4)</td>
</tr>
<tr>
<td>Caller site</td>
<td></td>
</tr>
<tr>
<td>Residence</td>
<td>11.0% (4.6 to 17.8)</td>
</tr>
<tr>
<td>Health care facility</td>
<td>1.4% (-2.7 to 5.6)</td>
</tr>
<tr>
<td>Other</td>
<td>42.9% (26.7 to 61.2)</td>
</tr>
<tr>
<td>Exposure reasonb</td>
<td></td>
</tr>
<tr>
<td>Intentional abuse</td>
<td>41.9% (28.6 to 56.5)</td>
</tr>
<tr>
<td>Intentional misuse</td>
<td>2.0% (-9.8 to 15.2)</td>
</tr>
<tr>
<td>Suspected suicidal</td>
<td>-1.6% (-6.7 to 3.7)</td>
</tr>
<tr>
<td>Unintentional general</td>
<td>15.8% (4.6 to 28.2)</td>
</tr>
<tr>
<td>Unintentional therapeutic error</td>
<td>0.2% (-6.9 to 7.8)</td>
</tr>
<tr>
<td>Medical outcome</td>
<td></td>
</tr>
<tr>
<td>No effect + minor effect</td>
<td>-0.3% (-5.5 to 5.2)</td>
</tr>
<tr>
<td>Moderate + major + death</td>
<td>4.8% (-0.8 to 10.8)</td>
</tr>
<tr>
<td>Not followed</td>
<td>11.4% (2.8 to 20.8)</td>
</tr>
<tr>
<td>Unable to follow</td>
<td>39.5% (24.7 to 56.2)</td>
</tr>
<tr>
<td>Unrelated</td>
<td>-6.7% (-22.7 to 12.6)</td>
</tr>
</tbody>
</table>

aWeeks represent Sunday through Saturday with the first week including days from the previous year
bFive most common exposure reasons evaluated

CONCLUSIONS

- Beginning in early March, exposure calls involving prescription opioids decreased each week through the beginning of April
- In early April, calls increased each week. The most significant reductions relative to 2019 were in suspected suicidal exposures and calls originating from health care facilities
- Unintentional general exposures and intentional abuse exposures in 2020 were greater than 2019 and remained relatively stable
- Further evaluation is needed to determine the extent to which these observations are due to changes among the general population or exposures not captured due to taxed resources at poison centers and health care facilities

LIMITATIONS

- Poison center data is based on spontaneous self-reported information which presents a potential bias of ambiguous answers, inaccurate product identification, or incomplete data
- Not all exposures are reported to poison centers therefore cases may underestimate the true number of exposures in the population
- Exposure information is specific to the exposure, not necessarily the substance involved in the exposure

DISCLOSURE

The RADARS System is supported by subscriptions from pharmaceutical manufacturers, government and non-government agencies for surveillance, research and reporting services. RADARS System is the property of Denver Health and Hospital Authority, a political subdivision of the State of Colorado. Denver Health retains exclusive ownership of all data, databases and systems. Subscribers do not participate in data collection nor do they have access to the raw data.
Dietary Supplements: A New Year’s Resolution Gone Bad
Salinger Lori\textsuperscript{1}, Hart Katherine\textsuperscript{1}, Tomassoni AJ\textsuperscript{2}
UConn Health, Connecticut Poison Center\textsuperscript{1} Yale School of Medicine, Department of Emergency Medicine\textsuperscript{2}

\textbf{Background}

\textbf{Dietary/herbal supplementation & Anabolic Steroids:}
- Use has been reported to cause acute interstitial nephritis (AIN)
- Rhabdomyolysis and multi-organ system failure can also be seen
- This case is unique in that only brief use of dietary/herbal supplements as well as anabolic steroids led to massive hypertension, catastrophic renal failure and pulmonary hemorrhage.

\textbf{Agents used by this patient (each one per manufacturer recommendation)}:
- Slimming agent with Garcinia cambogia/caffeine/black pepper, 2 capsules bid
- Creatine powder: 4 grams (1 scoop), bid
- Lean CLA or Conjugated Linoleic Acid, 2 capsules bid
- L-carnitine 100 mg, 1 capsule bid
- Advanced muscle performance including whey, cellulose Testosterone with caffeine, stinging nettle: 1-2 capsules daily
- Performance supplement containing yohimbine and caffeine

\textbf{Timeline}

<table>
<thead>
<tr>
<th>Time</th>
<th>Admission</th>
<th>Day 2</th>
<th>Day 4</th>
<th>Day 5</th>
<th>Day 7</th>
<th>Day 8</th>
<th>Day 9</th>
<th>Day 11</th>
<th>Day 15</th>
<th>Day 21</th>
<th>Day 25</th>
<th>Day 29</th>
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<tbody>
<tr>
<td>Creatinine (mg/dL)</td>
<td>10.3</td>
<td>10.4</td>
<td>10.5</td>
<td>11.0</td>
<td>9.84</td>
<td>9.89</td>
<td>5.38</td>
<td>7.2</td>
<td>8.63</td>
<td>8.9</td>
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<tr>
<td>BUN (mg/dL)</td>
<td>86</td>
<td>83</td>
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<tr>
<td>Urine output</td>
<td>&quot;trace&quot;</td>
<td>&quot;good&quot;</td>
<td>EDD HHH</td>
<td>&quot;OK&quot;</td>
<td>oliguric</td>
<td>oliguric</td>
<td>450 mL (+1)</td>
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<td>CK (u/l)</td>
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<tr>
<td>Media/treatments added</td>
<td>Leaks, output, and hypertension</td>
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<tr>
<td>Significant findings</td>
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</tbody>
</table>
| \textbf{Conclusions: The “Perfect Storm”} | Though the patient reported taking only the \textit{recommended} amount of each supplement, his regimens created the “perfect storm”. Brief use of a combination of dietary/herbal/steroid supplements caused TMA and AIN leading to dialysis and possible kidney transplantation months later. Public and professional education regarding the dangers of taking multiple weight loss and bodybuilding supplements is paramount.

\textbf{Case Presentation}

A normally healthy 29-year-old male presented to a clinic 4 weeks after making a New Year’s resolution to rapidly lose 20 pounds. His regimen included daily exercise, a 1000 kcal diet and use of supplements listed. He had gastroenteritis the first week and noted nausea the second week. He developed dyspnea, malaise and headache 10 days prior to presentation on day 27. He had been coughing rusty brown sputum; his RN fine-cause recognized hemoptysis. On ED presentation, his BMI was 28 with a blood pressure of 247/170 and HR 150; tachypnea was also noted. CXR revealed mild pulmonary edema and echocardiogram showed normal wall motion, an ejection fraction of 65%, elevated pulmonary artery systolic pressure and mildly enlarged left atrium. His troponin was 0.158 mg/ml and BNP > 32,000 pg/ml. Renal ultrasound was unremarkable. See timeline for labs. Admitted to an ICU, he was transferred to a tertiary level setting on hospital day 3. Pulmonary edema improved but hypertension persisted with BPS 160-186/94-114. Renal failure persisted with creatinine > 10 mg/dl, BUN > 90 mg/dl and anemia (hemoglobin 8.6 g/dl, hematocrit 27.7%); CK normalized. WBC and granular casts were present on urine microscopy. Urine catecholamines were normal. Hemodialysis was initiated on day 5 and was scheduled thrice-weekly on day 8 due to oliguria. He was administered amiodipine, carvedilol, labetalol and bumetanide; hydralazine was subsequently added. Renal biopsy revealed thrombotic microangiopathy (TMA) with AIN and scarring in 5 of 6 glomeruli. Extensive workup revealed no other etiologies for his renal disease. He was discharged on hospital day 27 dialysis-dependent with non-oliguric renal failure. Four months later, renal function has not improved and he has been referred for evaluation for kidney transplant.

\textbf{Case Discussion}

Nephrologists attributed this patient’s renal injury to malignant hypertension caused by his use of dietary and performance enhancing supplements. Literature review reveals that in the majority of cases, patients suffering renal injury had ingested supplements and/or anabolic steroids for considerably longer periods of time before AKI (acute kidney injury) development.

\textbf{References}

Parenteral Qiazo® Lysis Reagent Exposure
Salinger Lori¹, Hart Katherine¹, Tomassoni AJ²
UConn Health, Connecticut Poison Center¹ Yale School of Medicine, Department of Emergency Medicine²

Background

Qiazo lysis Reagent:
- Structure: A general protein denaturant used in the extraction of DNA and RNA. Qiazo® is composed of two active ingredients, guanidine thiocyanate 10–25% and phenol 25–50%. Guanidine thiocyanate is a chaotropic agent. Both compounds interfere with water molecules associated with protein molecules causing protein denaturation due to conformational changes. The guanidine thiocyanate-phenol reagent and the combination of extraction and chaotropic disruption yields higher amounts of RNA and DNA.
- Exposures: Parenteral exposure to Qiazo® has not been previously reported. A single case report of guanidine thiocyanate ingestion resulted in neurological impairment. A review of the manufacturer’s documentation raised concern for potential tissue necrosis.

Case Presentation

A 28 year old male presented to an acute care facility after an accidental injection of Qiazo® to his fingertip in a research lab. The patient inadvertently punctured the volar surface of the fourth finger of his non-dominant hand through his glove. He stated that the majority of the reagent had already been used and estimated the amount remaining in the syringe to a few microliters. He also stated that a drop splashed into his mouth and another onto his face. He immediately began irrigation at the work site. On ED arrival, a 1 x 1 cm ecchymosis was noted on his finger, four small areas of erythema were evident on his face and he was complaining of "facial burning". He had no evidence of oral irritation (erythema, drooling, etc.). Additional irrigation was performed, digital photographs of the exposure sites were obtained and a medical toxicologist was consulted. A search of the medical literature and the manufacturer’s related publications revealed no case reports of parenteral exposure to this product; however, the mechanisms of action of the product’s components suggested potential for severe tissue necrosis. The patient was contacted and stated no parenteral exposures worldwide had been reported to them. The patient was discharged from the ED and ultimately did well with minimal discomfort and full use of his hand.

Case Discussion

This is the first documented case of parenteral exposure to guanidine thiocyanate and phenol. Minimal symptoms occurred and there was no loss of mobility, likely due to the small amount of reagent injected. With the advent of Covid-19, the use of lysis reagents is likely to increase.

Toxicology Consult

A medical toxicologist was consulted shortly after the exposure due to limited data regarding treatment recommendations for dermal and/or parenteral exposures. The Safety Data Sheet stated, for dermal exposures: “Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required”. Copious irrigation was recommended and serial digital photos of the exposure sites were reviewed throughout the patient’s ED and post-discharge course.

Conclusions

Parenteral exposure to guanidine thiocyanate and phenol is a rare event. Poison center staff and healthcare practitioners may be unfamiliar with it’s possible risks. All such exposures should raise concern for tissue destruction. A limited amount of material injected and swift decontamination may have protected this patient from significant injury.

References

INTRODUCTION

- Methamphetamine has traditionally been of domestic origin; private makeshift labs confined to barns and trailers in sparsely populated locations. Due to increasing law enforcement focus on shutting down these labs, domestic methamphetamine manufacturing has been declining.

- Sourced high quality methamphetamine smuggled from Mexico is now the predominant source into the United States (US) drug black market; this explains the high use prevalence in the western US because of established drug trafficking routes.

- However, methamphetamine use is expanding across the country and its presence in rural midwestern states has been recognized by poison centers and state health departments.

- Michigan has demonstrated a marked rise in methamphetamine use, consistent with national trends and an increase in prevalence across the country. Classically in this state, cocaine predominated in urban areas while methamphetamine was more likely found in rural, less population dense regions.

- Anecdotal reports describe an increasingly urban presence of methamphetamine use.

- We aim to identify changes in geographical trends of methamphetamine use by evaluating Michigan Poison Center cases across state counties over time.

METHODS

- Retrospective review of state poison center reported cases of methamphetamine use stratified by state counties from 2012 to 2019.

- ToxSentry® database was queried for “methamphetamine” exposures, with county information documented.

- Counties with less than eight cases over the study timeframe were excluded since this was equivalent to less than 1 case per year.

- Individual counties were evaluated based on population density and reported methamphetamine case frequencies. Case frequencies based on population density were stratified (> 1 million; 500,000 to 1 million; 100,000 to 500,000; 50,000 to 100,000; and <50,000 persons).

- Population density information was based on 2016 estimated census information with a total state population of 9,653,345 and population of the three largest counties (in descending order) being 1,749,366, 1,243,970, and 867,730.

RESULTS

- Methamphetamine exposures reported to the Michigan Poison Center from 2012 to 2019 totaled 738 cases.

- There were 632 total case exposures from 69 counties with identified and documented county information (106 unknown); 476 cases from 24 counties were evaluated based on study inclusion criteria (Figure 1).

- Nine counties reported more than 20 cases.

- Normalizing for population density revealed increased case exposures rates per 100,000 among more sparsely populated rural counties (Figure 2).

- Among the highest exposure rates (> 20 per 100,000), 42.9% were among rural communities with a population density < 50,000.

- Furthermore, the highest case exposure rate (59.3 per 100,000) occurred in the most sparsely populated county.

FIGURES

Figure 1. Michigan Poison Center Methamphetamine Cases Reported by County, 2012 to 2019

Figure 2. Michigan Poison Center Methamphetamine Case Exposure Rates per 100,000 by County, 2012 to 2019

DISCUSSION

- Historically, methamphetamine use has been highly prevalent in rural regions of the US, with even higher preponderance in the western US, however we note an increase in Michigan.

- After controlling for population density, a significant urban shift in methamphetamine use was not demonstrated.

- Total case frequency was prevalent among urbanized counties, however owing to increased population density.

- Limitations include reporting inaccuracies, incomplete coding, and potential discrepancies in actual exposure location versus location of call to the poison center.

CONCLUSION

- Despite anecdotal reports of methamphetamine use increasing among more urban counties, case exposures reported to the Michigan Poison Center support high rates of use in rural communities from 2012 to 2019.
INTRODUCTION

- Methamphetamine use has increased across the United States, signaling an emerging public health concern.
- Combination use of methamphetamine and heroin, (a.k.a. ‘goofball’), is rising.
- Increased availability, higher purity, and low-cost have all contributed to methamphetamine’s rising popularity.
- Efforts to curb the opioid epidemic, including limiting supplies of prescription opioids, may have the unintended effect of increasing use of illicit opioids and other drugs of abuse, including methamphetamine.
- ‘Goofball’ produces a desirable synergistic high and physiological balance in drug effects, despite placing users at increased risk.
- Our poison center has noted increases in reported methamphetamine exposures.
- Our objective was to describe the relationship between reported cases of methamphetamine with opioid co-exposures and outcome severities over time.

METHODS

- Retrospective review of methamphetamine exposures reported to the Michigan Poison Center from 2012-2019.
- ToxSentry® database was queried for all “methamphetamine” exposures.
- Case co-exposures and medical outcomes were recorded.
- Outcome severities were derived from American Association of Poison Control Centers’ National Poison Data System coding definitions.

RESULTS

- Total of 738 methamphetamine exposure cases with a notable increase from 50 in 2012 to 165 in 2019.
- Cumulative methamphetamine/opioid co-exposures totaled 40.2% (297 cases) of all methamphetamine exposures and methamphetamine/opioid co-exposures increased from 14 in 2012 to 74 in 2019.
- Co-exposures increased annually from 2015-2019 (Figure 1).
- Outcome severities were recorded for 114 cases: moderate severity comprised the majority of documented outcomes from co-exposure cases, increasing from 1 in 2012 to 16 in 2018. Cases with major outcome severity increased from 3 in 2012 to its peak of 10 in 2017 (Figure 2).
- The opioids most frequently involved in co-exposures were heroin, hydrocodone, and methadone.
- Heroin co-exposures were the most frequent: cumulative heroin co-exposure cases outnumbered all other opioids nearly 2 to 1 and cases generally increased over study period.

DISCUSSION

- Mixtures involving methamphetamine and opioids have become more prevalent, signaling a critical intersection between an established drug epidemic and emerging public health threat approaching epidemic status.
- Methamphetamine and opioid co-exposure cases reported to Michigan Poison Center increased from 2012 to 2019.
- Heroin co-exposures (‘goofballs’) exceeded all other opioids and parallels national trends.
- Although no conclusive trend was observed, moderate severity outcomes increased from 2016 to 2018, and deaths involving psychostimulants such as methamphetamine are increasing statewide.
- Discordance between reported clinical severity and mortality trends may be due to inherent poison center data limitations including reporting inaccuracies, incomplete coding, cases lost to follow-up, and lack of inclusion of coroner’s/medical examiner cases.

CONCLUSION

- This study supports the utility of real-time poison center toxicosurveillance data to help identify, track, and coordinate mitigative responses to emerging public health threats.
- Not only is methamphetamine use surging statewide, concerning methamphetamine/opioid co-exposures are becoming more common.
- No definitive outcome severity trend was observed among poison center cases.
INTRODUCTION

• Prescription stimulants are Schedule II controlled substances, commonly prescribed for ADHD or narcolepsy.

• Transitioning from prescription drugs to lower-cost, higher-potency, and readily-available illicit drugs is a well-described phenomenon for opioids; the same may be true for stimulants (i.e. transition from methylphenidate to methamphetamine).

• Reports of stimulants being used to augment and/or supplant opioid effects – or to allow an opioid user to be more “functional” - are common.

• Recent legislative efforts to curb the opioid epidemic, including limiting supplies of prescription opioids, may contribute to the increase in popularity of abuse and misuse of prescription and illicit stimulants.

• We evaluated state prescription trends of prescription stimulants and opioids with prescription and illicit amphetamine-based exposures reported to the Michigan Poison Center over time.

METHODS

• Michigan Automated Prescription System (MAPS) was queried for amphetamine-based and opioid (opioid agonists or partial agonists) medications prescribed in Michigan from 2012-2019.

• Total prescriptions and units dispensed were recorded.

• MAPS data was juxtaposed to ToxSentry® database queries for total exposures involving all amphetamine-based substances and abuse and misuse of illicit amphetamines reported to our poison center from 2012-2019.

• Illicit amphetamines queried included methamphetamine, hallucinogenic amphetamines, and synthetic phenylethylamines, analogs, and precursors.

RESULTS

• Total amphetamine-based prescriptions dispensed increased from 2.6 million in 2012 to 3.1 million in 2019 (19% increase), while opioid prescriptions decreased from 10.2 million to 7.3 million during this timeframe (32.4% decrease) (Figure 1).

• Dosage unit analysis paralleled this trend increasing from 115.5 million in 2012 to 135.8 million in 2019 (17.6% increase). Prominent increases in amphetamine prescriptions occurred from 2012 to 2016, however stabilized thereafter.

• Michigan Poison Center data demonstrated increases in abuse and misuse of illicit amphetamines from 2017-2019.

• An overall increase in total amphetamine-based exposures was also evident from 888 to 987 from 2012 to 2019 (Figure 3). Consistent increases in poison center reported methamphetamine exposures occurred from 2012-2019, representing a 3.2-fold increase (Figure 2).

DISCUSSION

• Amphetamine-based prescriptions have increased coinciding with a decline in opioid prescriptions statewide between 2012 to 2019.

• Meanwhile, Michigan Poison Center amphetamine-based exposures increased, with illicit amphetamine use and misuse climbing since 2017 despite stabilizing amphetamine prescription trends.

• Michigan Poison Center data further supports an overall increase in illicit amphetamine exposures from 2012 to 2019.

• While national and statewide efforts have been directed towards mitigating the opioid burden, similar initiatives may be warranted for amphetamine-based prescriptions.

• Legislative efforts to limit supplies of prescription opioids is a plausible contributing factor in diverting users to prescription or illicit amphetamine-based substances.

• This rise indicates an evolving public health concern and potentially significant intersection between an established epidemic and an emerging threat.

CONCLUSION

• Michigan and the Michigan Poison Center have experienced a rise in amphetamine-based prescriptions and reported amphetamine exposures, respectively, coinciding with declining opioid prescriptions from 2012 to 2019.

• Amphetamine-based prescription trends and increases in illicit amphetamine use indicates a public health challenge warranting further scrutiny.
INTRODUCTION

- Psychostimulant use across the United States (US) has increased markedly in the past decade.
- Methamphetamine use in particular has exhibited a stark rise, with higher prevalence in the western US.
- Methamphetamine exposures reported to the Michigan Poison Center have surged; this is consistent with national trends, indicating an emerging public health threat extending across the country.
- Myriad factors have contributed to methamphetamine's popularity, including increased accessibility and higher potency while remaining low cost.
- Our objective was to review the prevalence and characteristics of amphetamine-based exposures and subset of methamphetamine exposures reported to the Michigan Poison Center between 2012 and 2019.

METHODS

- Retrospective review of amphetamine-based and methamphetamine-based case exposures reported to the state poison center from 2012-2019.
- ToxSentry® database was queried for substances “amphetamine-ALL” and “methamphetamine”; age, reason of exposure (intentional versus unintentional), route of exposure, and reported co-exposures were recorded.

RESULTS

- 7818 amphetamine-based exposures were reported from 2012-2019, peaking in 2015-2017 (Figure 1), remaining stable thereafter. In adults (age >18), 3318 were reported accounting for 42% of total amphetamine exposures. An increase in exposures of 41.3% (346 to 489) occurred in the adult population, with progressive increases in annual reported numbers.
- Cumulative methamphetamine reported exposures totaled 738. Methamphetamine exposures rose from 50 in 2012 to 165 in 2019, representing a 3.3-fold increase; consistent with a rate increase from 0.51 to 1.65 per 100,000 residents.
- Methamphetamine exposures predominantly occurred in the 25-34-year-old age group. Ingestion and inhalation were the most common routes of exposure; cumulative ingestion exposures outnumbered all other routes of exposure.
- Co-exposures were reported in 40.9% of cases, with the most commonly occurring substances being (in descending order) THC, heroin, amphetamines, and cocaine.
- Intentional exposures to methamphetamine outnumbered unintentional or unknown exposures 2 to 1. Exposure cases primarily involved males (461 vs. 277 females).

DISCUSSION

- The prevalence of psychostimulant use has increased across the US, with methamphetamine use representing the largest increase among the drug class.
- Although all amphetamine-based exposures reported to our poison center have risen during the study time period, exposure increases have been relatively stable since 2016.
- Conversely, methamphetamine exposures have surged during this timeframe, supporting national reports of a potential emerging methamphetamine epidemic.
- This supports the utility of data and real-time toxicosurveillance provided by poison centers in helping to detect and track new or growing public health threats.
- Furthermore, we hope poison center data can help inform local and national health agencies of drug use trends requiring close scrutiny and public health action.
- Methamphetamine reported exposures to the Michigan Poison Center have progressively increased despite stable reports of amphetamine exposures.
- This study strengthens the case for utility of poison center data in supporting the detection of emerging public health threats, informing public health action, and development of mitigation efforts.
Comparison of opioid exposures managed at military and Veterans Affairs hospitals

Shawn M. Varney, MD1, Mathias B. Forrester2

1South Texas Poison Center, UT Health San Antonio, TX; 2Independent Researcher, Austin, TX

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Background

• Little information exists on opioid exposures managed at military and Veterans Affairs (VA) hospitals.
• Opioid use and abuse affects all members of society and can result in serious injury and death.
• Our objective was to describe opioid exposures reported to the Texas Poison Center Network (TPCN) that were managed at military and VA hospitals.

Methods

• Cases were opioid exposures among patients aged 18 years or older reported to the TPCN during 2000-2018 where management occurred at a military or VA hospital.
• Exposure distribution for various demographic and clinical factors was determined for military and VA hospitals.
• Comparisons were made between the two groups.
• Rate ratios and 95% confidence intervals were calculated. (bold and * = statistically significant)

Results

• Of 836 opioid exposures, 584 (69.9%) were managed at military hospitals and 252 (30.1%) at VA hospitals.

Demographics

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Military</th>
<th>VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>45.0%</td>
<td>80.2%*</td>
</tr>
<tr>
<td>Mean Age (yr)</td>
<td>31.8</td>
<td>48.1</td>
</tr>
</tbody>
</table>

Bold and * = statistically significant

Most Common Opioids

<table>
<thead>
<tr>
<th>Opioid</th>
<th>Military</th>
<th>VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrocodone</td>
<td>34.6%</td>
<td>43.7%*</td>
</tr>
<tr>
<td>Tramadol</td>
<td>24.8%</td>
<td>27.4%</td>
</tr>
<tr>
<td>Oxycodone</td>
<td>24.1%</td>
<td>6.3%*</td>
</tr>
<tr>
<td>Codeine</td>
<td>12.5%</td>
<td>8.3%</td>
</tr>
</tbody>
</table>

Exposure Reason

<table>
<thead>
<tr>
<th>Reason</th>
<th>Military</th>
<th>VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTENTIONAL</td>
<td>88.7%</td>
<td>86.1%</td>
</tr>
<tr>
<td>-Attempted Suicide</td>
<td>71.6%</td>
<td>59.5%*</td>
</tr>
<tr>
<td>-Misuse</td>
<td>7.4%</td>
<td>11.5%</td>
</tr>
<tr>
<td>-Abuse</td>
<td>4.5%</td>
<td>9.5%*</td>
</tr>
<tr>
<td>-Unknown</td>
<td>5.2%</td>
<td>5.6%</td>
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</table>

UNINTENTIONAL

<table>
<thead>
<tr>
<th>Reason</th>
<th>Military</th>
<th>VA</th>
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</thead>
<tbody>
<tr>
<td>5.3%</td>
<td>10.3%*</td>
<td></td>
</tr>
</tbody>
</table>

Clinical Effects

<table>
<thead>
<tr>
<th>Effect</th>
<th>Military</th>
<th>VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drowsiness/ Lethargy</td>
<td>46.4%</td>
<td>48.0%</td>
</tr>
<tr>
<td>Tachycardia</td>
<td>24.7%</td>
<td>16.7%*</td>
</tr>
<tr>
<td>Hypertension</td>
<td>10.4%</td>
<td>11.5%</td>
</tr>
<tr>
<td>Vomiting</td>
<td>8.9%</td>
<td>4.8%*</td>
</tr>
<tr>
<td>Confusion</td>
<td>6.2%</td>
<td>9.9%</td>
</tr>
<tr>
<td>Agitation/ Irritability</td>
<td>5.7%</td>
<td>10.7%*</td>
</tr>
</tbody>
</table>

Medical Outcome

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Military</th>
<th>VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious</td>
<td>40.9%</td>
<td>38.1%</td>
</tr>
<tr>
<td>Deaths</td>
<td>3 (0.5%)</td>
<td>2 (0.8%)</td>
</tr>
</tbody>
</table>

Conclusion

• Differing patterns of opioid exposures may need to be considered in the education, prevention, and treatment of opioid exposures at military and VA hospitals.
Substantial improvement in plaque psoriasis symptoms after inadvertent secukinumab subcutaneous overdose without adverse effect

Alexandru Ulici, PharmD | Ann M Arens, MD | Travis D Olives, MD MPH
Minnesota Poison Control System    Hennepin Healthcare    Minneapolis, Minnesota

Background

- Secukinumab (Cosentyx®) is a monoclonal antibody with selective binding to IL-17A cytokine preventing interaction with IL-17 receptor
- Typical FDA approved dosing for secukinumab is 150mg subcutaneously weekly for 4 weeks then 150-300mg every 4 weeks for plaque psoriasis, psoriatic arthritis and ankylosing spondylitis
- Peak plasma level is reached 6 days post-dose with 77% bioavailability and an elimination half-life of 31 days
- Chronic therapy can lead to development of Behçet Disease, systemic lupus erythematosus, infections and palmoplantar pustulosis
- Little is known regarding acute secukinumab overdose

Conclusions

- We report the longest known duration of secukinumab overdose
- Delayed peak plasma level and prolonged elimination half-life likely explain our patient’s persistent beneficial result without doses after the first week
- We recommend consideration of secukinumab dosages used in trials for other disease-states to assess potential adverse effects from inadvertent dosing errors

Case Report

- A 40-year-old, 1.83m tall, 150kg male injected subcutaneously 150mg of secukinumab daily for 7 days instead of 300mg weekly
- Facial/forehead redness and scalp/post-auricular scabbing completely resolved on day 7
- No laboratory tests were completed and plan to restart weekly injection 6 weeks after the last dose

Previously studied doses

<table>
<thead>
<tr>
<th>Proof-of-concept studies</th>
<th>Adverse events</th>
</tr>
</thead>
<tbody>
<tr>
<td>One 3mg/kg IV dose (for psoriasis)</td>
<td>No increase in adverse effects compared to placebo</td>
</tr>
<tr>
<td>One 10mg/kg IV dose (for rheumatoid arthritis, uveitis)</td>
<td></td>
</tr>
</tbody>
</table>

MEASURE-1 Trial

- 10mg/kg IV every 2 weeks for 3 doses then 75 or 150mg subcutaneously every 4 weeks
- Similar adverse event profiles

MEASURE-2 Trial

- 75 or 150mg subcutaneous doses weekly for 3 weeks then every 4 weeks
- No documented adverse events

Phase-2 clinical trials

- Two 30mg/kg IV doses separated by 29 days

Current case report

- Cumulative 7mg/kg dose over 7 days (comparable to 5.4mg/kg intravenous dose)
- No adverse effects or signs/symptoms of infection noted at 13 and 38 days via telephonic follow-up

Intended dose

Actual Administered dose

0---------------------1---------------------2---------------------3---------------------4 Weeks

Disclosures: None
Psychiatric Evaluation of Patients with Ecstasy Use from the Poison Control Perspective

Tweet, Marit¹; Kennedy, Joseph¹; Nelson, Michael²; Wahl, Michael³; Aks, Steven¹

¹. Toxikon Consortium, Chicago IL. 2. Illinois Poison Center, 3. NorthShore University Health System

Background

Ecstasy, molly, and MDMA are widely used terms for 3,4 methylenedioxy-methamphetamine (MDMA) which is used recreationally for its euphoric and hallucinogenic effects. There are many substances that can be substituted for MDMA including amphetamines, methamphetamines, hallucinogenic tryptophans, and cathinones. All of these substances have prominent neuropsychiatric effects. Management of the acute, short-term psychiatric effects is well described, but information on longer-term effects with need for psychiatric consultation is not well described.

Methods

163 cases exposure coded as “ecstasy,” “molly,” or “MDMA” were obtained from the RPC database for the 2019 calendar year. Cases were excluded if the patient was lost to follow up, did not present to the hospital, was less than 12 years old, pregnant, or was intubated at any point during their stay (i.e. unable to self-report their symptoms). 125 cases remained. Charts were reviewed for neuropsychiatric symptoms such as agitation or hallucinations, co-ingestants, history of prior psychiatric illness, and whether the presentation was associated with a self-harm attempt. For the purposes of evaluating the frequency of urgent psychiatric consultation and psychiatric admission, an additional 18 cases were excluded where it was unclear if any psychiatric consultation was obtained.

Results

• The average age of the patients was 25.1 years with an age range of 14 to 53 years.
• 77 of the 125 cases (62%) were male patients.
• 54 of 125 cases (43%) had no co-ingestants involved.
• 36% of all cases were admitted for medical reasons.
• For patients admitted to a medical service during their stay, a psychiatry consult was obtained in 24% of cases, with 13% of all medically admitted patients ultimately being admitted to psychiatry.
• For patients only managed in the emergency department, a psychiatry consult was obtained in 23% of cases with 12% of all ED patients being admitted to psychiatry.
• 60% of the patients who received a psychiatric consultation had presented to the hospital after a self-harm attempt.
• Patients with a history of psychiatric illness were more likely to have a psychiatry consult (44%) compared to those patients without a history of psychiatric illness (22%) ($\chi^2$ p=0.03).
• It was not noted by Poison Center Staff if any patients discharged had follow up with a mental health professional.

Conclusions

Many cases of reported MDMA use present with neuropsychiatric effects. Patients with a history of psychiatric disorder appear more likely to get a psychiatric consultation, although it is unclear if this is due to the acute neuropsychiatric effects of their ingestion as opposed to their underlying condition. A large number of these cases require mental health evaluation, but the long-term handoff to psychiatric care, and rate of continued neuropsychiatric effects needs better definition from the Poison Center perspective.
Background
- Haff disease is a syndrome resulting from consuming certain types of fish contaminated with an as-of-yet unidentified toxin.
- Often develops 6-21 hours after ingestion
- Characterized by myalgias, rhabdomyolysis, and dark urine, but can also cause gastrointestinal distress, chest discomfort, and other symptoms.
- Toxin appears heat stable but not much else is known.
- Buffalo fish, salmon, or crayfish are most commonly implicated.
- Clinicians in the emergency department (ED) are uniquely positioned to identify toxic outbreaks such as these, and can help prevent further spread through taking early action.

Case Details
- Three patients from one family with similar presentations were reported to the regional poison center after eating buffalo fish purchased from a local grocery store.
- The parents had fried their portions in oil whereas the daughter used an air fryer without oil, but all ate approximately similar sized portions.
- Within a few hours, they developed nausea, vomiting, shortness of breath, and myalgias.
- Initially, the 75-year-old father presented to the ED where he was treated symptomatically, after which he felt better and was discharged home.
- His wife, 69 years old, and his adult daughter, 36 years old, then presented to the same ED.
- Due to their complaints of muscle aches and generalized weakness, a CPK was checked and found to be elevated. The poison center reported the cases to the department of public health.
- The father was instructed to return and all patients were all admitted, treated with IV fluids, and monitored for worsening rhabdomyolysis.
- All were discharged within a few days after symptom resolution and no change in renal function.

Case Discussion
The department of public health’s response involved going to the grocery store and having the buffalo fish pulled from the stock. A public health alert was released to spread awareness within medical care settings. No further cases were reported to the poison center or the department of public health. Due to the prompt recognition by the ED physician of a cluster of cases consistent with Haff disease, local authorities were notified and involved early. Much remains unknown regarding Haff disease and it is unclear how the method of meal preparation or how patient medications may relate to the severity of rhabdomyolysis or symptoms that develop.

<table>
<thead>
<tr>
<th>Patient</th>
<th>Past Medical History</th>
<th>Initial CPK (U/L)</th>
<th>Peak CPK (U/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>75 yr old male</td>
<td>Hypertension, Hyperlipidemia</td>
<td>1,916</td>
<td>30,253</td>
</tr>
<tr>
<td>69 yr old female</td>
<td>Hypertension, Hyperlipidemia</td>
<td>2,767</td>
<td>19,946</td>
</tr>
<tr>
<td>36 yr old female</td>
<td>None</td>
<td>1,186</td>
<td>56,768</td>
</tr>
</tbody>
</table>

Conclusions
The astute clinician plays an important role in early recognition of outbreaks of toxic exposures. Additionally, the roles of the regional poison center and local departments of public health in taking swift action are integral to preventing further widespread toxic exposure during outbreaks.
Speech Disturbance in Adult Chronic Lead Poisoning—Resolution with Chelation

Background

Speech impediments (including stuttering) have been described in children who have developed lead encephalopathy. However, stuttering and speech fluency impairment due to chronic lead exposure in an adult with resolution due to chelation has not been described. We describe such a case, treated with standard course of oral succimer.

Case Report

- The patient is a 48-year-old male with a past medical history of asthma and sciatica, not taking any prescription medication.
- He presented with a five-year history of exposure to lead at the indoor gun range where he worked.
- Over the last five months of exposure, he developed headaches, short-term memory deficits, and paranoid ideation. His physical examination was remarkable for flat affect, slow speech pattern, and slow gait.
- Venous blood lead level (BLL) was 45 mcg/dl, zinc protoporphyrin level (ZPP) of 74 mcmol/mol heme, and urine aminolevulinic (ALA) acid level of 21 nmol/ml (normal < 15). His blood ALA, complete blood count (CBC), and urine analysis were all within normal limits.
- A complete neurological workup performed by a Neurologist, including two MRIs, was unremarkable.

Case Discussion

Stuttering is thought to be related to impairments in the frontal lobe, particularly Broca's area. It appears that chronic lead exposure may have widespread effects in these areas. Our patient did not have other speech deficits such as aphasia, or anomia. Stuttering due to lead poisoning in an adult was only described once, this was due to acute occupational exposure from sandblasting (over a 45-day period) with a BLL of 111 ug/dl. The outcome of treatment was not documented in those cases.

- The patient (70kg) was initially started on 700mg of succimer TID, but he was unable to tolerate this due to persistent vomiting. He then was started on succimer 500 mg TID for five days, followed by 500 mg bid for 14 days, which he was able to tolerate.
- After treatment, all symptoms resolved and he had significant improvement of BLL (6.7 mcg/dl) and ZPP (45 mcmol ZPP/mol heme) within forty days.
- Four months later, his symptoms recurred with marked stuttering to the point that the patient was unable to articulate any words at all. His BLL had rebounded to 26 mcg/dl despite being off work since his initial presentation.
- Succimer was restarted at the same dose as his initial course, and by the time of his next follow-up appointment, all his symptoms had resolved with a virtually clear speech pattern. His repeat BLL at that time was 5.4 mcg/dl, with a ZPP of 31 mcmol ZPP/mol heme.

Conclusions

Speech disturbance in an adult patient with chronic lead exposure is not a well described clinical manifestation of toxicity. The disturbance may be responsive to chelation with succimer therapy.
Results

- A total of 1,912 medication adverse events met the study criteria.

Methods

- Data were obtained from the FDA Adverse Event Reporting System (FAERS), a national database reporting adverse events from drugs and other biologic products, and medication errors.
- Reports are coded using the Medical Dictionary for Regulatory Activities (MedDRA), a validated, internationally standardized medical terminology.
- The FAERS public dashboard was searched for all records added through 2019 that reported “priapism” in the reactions text field, and the raw data for the records were downloaded.
- Cases initially received by the FDA during 2000-2019 and involving only a single suspect product were included in the study.
- Records where the patient sex was listed as “female” were excluded.

Background

- Priapism is a persistent, often painful, penile erection not associated with sexual stimulation that lasts more than 4 hours.
- The condition requires immediate medical attention to prevent long-term complications.
- Certain medications may increase the risk of priapism, including antipsychotics, antidepressants, vasoactive erectile agents, alpha-adrenergic receptor antagonists, antihypertensives, anticoagulants, hormones, phosphodiesterase type 5 inhibitors, and attention deficit hyperactivity disorder medications.
- The objective of this study was to characterize medication adverse events involving priapism reported to the United States Food and Drug Administration (FDA).

Conclusions

- The most commonly reported medications implicated in adverse events involving priapism had been previously associated with the condition.
- It should be noted that these drugs or other products may not have caused the reported adverse event.
- The adverse event may have been related to an underlying condition, another drug, or other reasons.

Reported outcomes

<table>
<thead>
<tr>
<th>Category</th>
<th>Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not serious</td>
<td>270 (14.1%)</td>
</tr>
<tr>
<td>Hospitalized</td>
<td>668 (34.9%)</td>
</tr>
<tr>
<td>Intervention</td>
<td>246 (12.9%)</td>
</tr>
<tr>
<td>Disabled</td>
<td>124 (6.5%)</td>
</tr>
<tr>
<td>Life threatening</td>
<td>18 (0.9%)</td>
</tr>
<tr>
<td>Died</td>
<td>8 (0.4%)</td>
</tr>
<tr>
<td>Unspecified other outcomes</td>
<td>964 (50.4%)</td>
</tr>
</tbody>
</table>

Reported Age of Priapism Cases

Most frequently reported reasons

<table>
<thead>
<tr>
<th>Reason</th>
<th>Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>152 (11.7%)</td>
</tr>
<tr>
<td>Erectile Dysfunction</td>
<td>149 (11.4%)</td>
</tr>
<tr>
<td>Schizophrenia</td>
<td>142 (10.9%)</td>
</tr>
<tr>
<td>Insomnia</td>
<td>108 (8.3%)</td>
</tr>
<tr>
<td>Bipolar Disorder</td>
<td>81 (6.2%)</td>
</tr>
</tbody>
</table>

Reported Age (Years)

- There were 1,375 cases with a reported age. The mean age was 39.4 years (range 0-95 years).
Background

- The Wisconsin Poison Center (WPC) provides 24-hour, free poison information for all individuals in Wisconsin.
- ~75% of cases are managed outside of healthcare facilities by Specialists in Poison Information (SPIs), including calls from the general public seeking guidance on potentially toxic exposures.
- Currently, follow-up protocols exist for hydrocarbon and mushroom exposures, but it is unclear if these follow-up calls result in any change in management.

Methods

- All home-managed hydrocarbon and mushroom exposures from 2019 were abstracted. These exposures were chosen based on observations from SPIs and medical toxicologists that follow-up calls infrequently changed management.
- Variables such as time of exposure, time of follow-up call, substance, co-ingestants, and symptoms were extracted.
- Descriptive statistics were performed.

Hydrocarbon and mushroom exposures do not require follow-up calls. Using data to reduce the number of unnecessary calls for Specialists in Poison Information is good practice.

<table>
<thead>
<tr>
<th>Table 1: Mushroom Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Mushroom Cases</td>
</tr>
<tr>
<td>Cases Meeting Exclusion Criteria</td>
</tr>
<tr>
<td>Total Cases Analyzed</td>
</tr>
<tr>
<td>Number of Symptomatic Patients* (n=3, 10%)</td>
</tr>
<tr>
<td>Cases in which follow up calls changed management</td>
</tr>
<tr>
<td>*All symptomatic patients only reported nausea/vomiting and/or diarrhea</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2: Hydrocarbon Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Hydrocarbon Cases</td>
</tr>
<tr>
<td>Cases Meeting Exclusion Criteria</td>
</tr>
<tr>
<td>Total Cases Analyzed</td>
</tr>
<tr>
<td>Number of Symptomatic Patients (n=38, 53.5%)</td>
</tr>
<tr>
<td>Cases in which follow up calls changed management* (n=1, 1.4%)</td>
</tr>
<tr>
<td>*Persistent cough sent to ED with negative work-up and discharged from ED</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chart 1: Hydrocarbon Symptom Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>No symptoms (n=33, 46.5%)</td>
</tr>
<tr>
<td>GI Upset (n=13, 18.3%)</td>
</tr>
<tr>
<td>Cough (n=10, 14.1%)</td>
</tr>
<tr>
<td>Throat Irritation (n=7, 9.9%)</td>
</tr>
<tr>
<td>Other (n=8, 11.3%)</td>
</tr>
</tbody>
</table>

Discussion

- No follow up calls made for home managed hydrocarbon or mushroom exposures led to clinically significant changes in management.
- Seeking feedback from SPIs on anecdotal observations is a reasonable approach for targeted evaluation of poison center guidelines to reduce the number of unnecessary calls made by SPIs.
Tongue Trouble? Atypical Epinephrine Auto-Injection Tolerated by Toddler
Jill M Topeff, PharmD1,2 | Kirk A Hughes, RN1,2 | Nathan Kunzler, MD1,2 | Jon B Cole, MD1,2
1Minnesota Poison Control System  2Hennepin Healthcare
Minneapolis, Minnesota

Background
• Epinephrine auto-injectors (e.g. Epi-Pens®) are commonly prescribed to treat anaphylaxis.
• 1.6 million US prescriptions for epinephrine auto-injectors dispensed in 2017
• Almost 1500 accidental exposures to epinephrine auto-injectors in children < 6 y.o. reported to US Poison Centers in 2019
• Accidental injections to the tongue are rare

Case Report
• A 3-year-old boy placed his mother’s Epi-Pen® auto-injector 0.3mg/3ml in his mouth; it punctured his tongue and deployed.

Pre-hospital:
• Mother reported immediate tongue bleeding, emesis, and immediate respiratory changes described as “wheezing”
• Patient was transported via EMS to local emergency department

ED Course:
• Initial VS: BP 119/88, HR 146, RR 19
• Initial PE:
  Child was A&Ox4
  Bleeding stopped
  No notable swelling, pallor or edema
  Lung sounds clear

ED Staff verified Epi-Pen® had fully discharged its 0.3 mg contents.
• Successfully diluted with food and drink
• Discharged after 2 hour of observation

Discussion
• Epinephrine is a potent fast acting vasoconstrictor commonly used to counteract anaphylaxis. The half life is less than 5 minutes
• Local effects (though rare) are local tissue ischemia
• Systemic effects include hypertension, tachycardia, nausea, vomiting, diaphoresis, pallor, headache, anxiety and difficulty breathing
• Blood supply to the human tongue is ample, making ischemic vasoconstriction unlikely.
• Ultimately in this case the local injection was well tolerated both from an ischemic and systemic absorption perspective

Conclusions
• We present an accidental injection of a 0.3 mg Epi-Pen® auto-injector into the tongue of a toddler that resulted in no significant injury.
• More data are needed to determine if accidental tongue injections from epinephrine auto-injectors are routinely benign.
Robocough Killer: Death from Ingestion of 10 Grams of Dextromethorphan

Jill Topeff, PharmD\(^1\) | Kelsey Stokkeland, PharmD\(^1\) | Kirk Hughes, RN\(^1\) | Jon Cole, MD\(^2\) | Travis Olives, MD\(^2\)

\(^1\)Minnesota Poison Control System  \(^2\)Hennepin Healthcare

Minneapolis, Minnesota

**Background**

- Dextromethorphan is a common over the counter cough suppressant.
- It is structurally similar to opioids, but high doses produce effects similar to ketamine and PCP, including hallucinations and euphoria.
- It is commonly misused, but death is rare.

**Case Report**

- A 25 year old man walked himself into the ED reporting he drank 24 bottles of Robocough\(^\circledast\) (10.8g dextromethorphan hydrobromide)
- Initial vitals: HR 120s, BP 90s/50s mm/Hg
- Within an hour he suffered cardiac arrest, with failed resuscitation efforts
- Medical examiner documented death as suicide by dextromethorphan intoxication, but a full autopsy was not completed.

**Images from www.robocough.com**

- **Dextromethorphan:**
  - Therapeutic dose: 30mg every 6-8 hours
  - >200mg causes euphoria and hallucinations
  - >500mg causes dissociative sedation

- **Robocough\(^\circledast\):**
  - Contains 10mg/ml dextromethorphan hydrobromide
  - Recommended dose is 30mg/3mL
  - Comes with a 30mL dosing cup (300mg/30mL)
  - Full bottle contains 450mg/45mL
  - Sold in packs of 5, 12, 24, 48 or 96 bottles.
  - 96 bottles provides 43.2grams, 1,440 30mg doses, or a minimum 360 day supply.

**Conclusion**

- Robocough\(^\circledast\) is a dangerously concentrated dextromethorphan product to be aware of, especially in suicidal patients and those with dextromethorphan use disorders.
The Power of Engagement - Tweetchats Increase Altmetric-Scored Dissemination of Promoted Journal Manuscripts

Toomey D(1), Mycyk MB(2), Spyres MB(3), Greller HA(4), Ruha M(5), Chai PR(1,6,7,8)

1) Brigham and Women’s Hospital, Harvard Medical School 2) Cook County Health, Department of Emergency Medicine 3) Department of Emergency Medicine, University of Southern California, Keck School of Medicine 4) Department of Emergency Medicine, Division of Medical Toxicology, SBH Health System, Bronx, NY 5) Department of Medical Toxicology, Banner – University Medical Center Phoenix. Arizona 6) Department of Psychosocial Oncology and Palliative Care, DFCI 7) The Fenway Institute 8) The Koch Institute for Integrated Cancer Research, MIT

**Question**

Does discussion of Journal of Medical Toxicology publications in tweetchats increase overall online attention for a given manuscript? How does this affect how often these articles are discussed/accessed at large?

**Background**

In 2017 the American College of Medical Toxicology (ACMT) initiated a recurring interactive chat on Twitter, aggregated using the hashtag #firesidetox. It is unclear to what degree social media attention to manuscripts increases their dissemination. In this investigation, we sought to determine the impact of #firesidetox on Altmetric score. We additionally sought to measure the frequency at which featured manuscripts were accessed.

**Methods**

We examined papers discussed in the #firesidetox tweetchat from January 1, 2017 to February 29, 2020. Altmetric scores and number of times manuscripts were accessed (downloaded from publisher) were compared with manuscripts in the same volume and issue. Access information was gathered through the Springer Nature’s JMT website.

**Results**

We analyzed #firesidetox tweetchats during the study period. Tweetchat featured manuscripts had a higher mean Altmetric score on the date of review and had more accesses than other manuscripts published in the same issue of JMT and not discussed in a Tweetchat.

<table>
<thead>
<tr>
<th>Discussed on #firesidetox?</th>
<th>Mean Altmetric Score</th>
<th>Download Number (Springer)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes (n11)</td>
<td>65</td>
<td>1201</td>
</tr>
<tr>
<td>No (n77)</td>
<td>18</td>
<td>630</td>
</tr>
</tbody>
</table>

**Conclusion**

Manuscripts published in JMT discussed during the #firesidetox tweetchats had higher Altmetric scores and higher mean number of accesses compared to other manuscripts published within the same issue. Whether that significant finding reflects importance of topic, expertise of authors, or popularity of discussants deserves further examination. Tweetchats provide a promising method for increasing dissemination of manuscripts in the future.
Pressure Necrosis from Kratom Overdose Requiring Fasciotomy

Natasha Tobarran DO¹; John Downs MD¹; Carl Wolf PhD²; Brandon Wills DO¹; Kirk Cumpston DO¹
¹Department of Emergency Medicine, Virginia Commonwealth University Health System
²FIRM Specialty Testing Laboratory and Forensic Toxicology Laboratory, VCU Health, Richmond, VA

Background

• Kratom from the (Mitragyna speciosa) plant is used for the treatment of pain, opioid addiction, and recreational use
• Clinical effects can include seizures², opioid toxidrome, hepatotoxicity, and infectious complications from bacterial contamination.
• Reports of morbidity and mortality associated with kratom are often confounded by co-ingestions.
• We report a case of severe rhabdomyolysis from pressure necrosis leading to fasciotomy

Case Presentation

HPI
• 31 year old male presented to the ED after being unconscious for 6 hours
• He admitted to smoking kratom prior to the event
• Complained of severe left leg pain and edema
• Denied any known falls or trauma

PMH
• Cocaine, heroin, and prescription opioid usage
• Ethanol use

Hospital Course
• Taken to OR immediately--4 compartment leg fasciotomy + thigh fasciotomy
• Required CRRT for severe rhabdomyolysis and AKI for 48 hours
• Discharged on hospital day 18

Discussion

• Rhabdomyolysis is not generally associated with kratom use, but there are numerous reports of opioids and sedative-hypnotics resulting in prolonged periods of immobilization and crush injuries resulting in rhabdomyolysis.¹
• Like opioids, kratom is known to have a high affinity for the mu-opioid receptor at high doses.

Table

<table>
<thead>
<tr>
<th>Initial Laboratory Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPK &gt; 18,000 IU/L</td>
</tr>
<tr>
<td>Creatinine 2.9 mg/dL</td>
</tr>
<tr>
<td>Potassium 5.7 mEq/L</td>
</tr>
<tr>
<td>AST 1,144 IU/L</td>
</tr>
<tr>
<td>ALT 239 IU/L</td>
</tr>
<tr>
<td>Calcium 5.5 mEq/L</td>
</tr>
<tr>
<td>Ethanol Not detected</td>
</tr>
<tr>
<td>Urine drug screen Nothing detected</td>
</tr>
</tbody>
</table>

Laboratory Analysis

• Urine was positive for mitragynine and 7 hydroxymitragynine using UPLC-MSMS
• Serum mitragynine was 5 ng/mL and urine mitragynine was 6 ng/mL
• Immunoassay was used to screen for a library of 300 prescribed and OTC substances. If positive, were confirmed by GCMS.
  - The only substances detected were caffeine and venlafaxine

References


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Emergencymedicine.vcu.edu
VCUEMResidency @VCUEM
Synthetic cannabinoid receptor agonists (SCRA) are a diverse group of chemicals with variable potency. Literature on unintentional exposures is limited. Methyl N-[[1-(5-fluoropentyl)-1H-indol-3-yl]crecentlyarbonyl]-3-methylvalinate (5F-MDMB-PICA) is a SCRA with limited human toxicity data.

We present an analytically confirmed case of a 12-month-old girl exposed to 5F-MDMB-PICA

**Background**

- Synthetic cannabinoid receptor agonists (SCRA) are a diverse group of chemicals with variable potency.
- Literature on unintentional exposures is limited.
- Methyl N-[[1-(5-fluoropentyl)-1H-indol-3-yl]crecentlyarbonyl]-3-methylvalinate (5F-MDMB-PICA) is a SCRA with limited human toxicity data.
- We present an analytically confirmed case of a 12-month-old girl exposed to 5F-MDMB-PICA

**Case Report**

- A previously healthy 12-month-old, 12 kilogram girl was brought to the ED by her mother for altered mental status.
- 1 hour prior, the mother found the child with “glassy eyes” and inability to stand.
- Vital signs: HR 121 bpm, BP 115/57 mmHg, RR of 36 bpm, 99% O2 saturation on room air and temp 36.7°C.
- In ED she had several episodes of emesis and then became “limp.”
- Ingestion of a “bead of K2” was suspected.
- She was drowsy but would temporarily wake to painful stimuli.
- She had “constricted pupils”, no nystagmus and would not stand.
- Lab testing was significant only for an elevated glucose of 119 mg/dL and a pH of 7.28 with a PCO2 of 54 mmHg pCO2.
- A targeted rapid GC/MS urine drug screen was negative.
- She received 250 ml of normal saline IV and was admitted.
- Her BP (132/77 mmHg) and HR (194 bpm) peaked approximately 4 hours after arrival and slowly returned to normal.
- She remained altered with periods of agitation and somnolence which resolved approximately 20 hours after presentation.
- She was discharged with child protective services after a 32-hour hospital stay.
- Serum from presentation was tested by LC-QTOF/MS (LC 1260-QTOF 6550, Agilent Technologies, Santa Clara, CA).
- 5F-MDMB-PICA (Figure 1) was detected at concentration of 4.6 ng/mL.
- No other substances were detected

**Case Discussion**

- 5F-MDMB-PICA is structurally similar to 5F-MDMB-PINACA but the indazole has been replaced by an indole group.
- First identified in 2017 and listed as DEA Schedule I in 2018.
- Literature on human toxicity is limited but is believed to be a potent agonist at the cannabinoid-1 receptor.
- This is the first analytically confirmed pediatric exposure.
- The low concentrations and volatility may make detection by commonly used GC/MS and LC/MS/MS methods a challenge.

**Conclusion**

- This unintentional pediatric exposure to 5F-MDMB-PICA resulted in self-limited but prolonged altered mental status.
- Health care providers should be aware of the potential threat 5F-MDMB-PICA and other SCRAs pose to children.
Use of antivenom therapy for North American crotalid envenomations can be variable.

We compared characteristics and trends of pediatric crotalid bites reported to the National Poison Data System (NPDS) that did or did not receive antivenom therapy.

Antivenom for the Kids?
Comparison Of Pediatric Crotalid Bites Reported to NPDS That Did Or Did Not Receive Antivenom Therapy.
Thornton SL¹, Darracq M²
¹ University of Kansas Health Care System Poison Control Center, Kansas City, KS, ² Department of Emergency Medicine University of California-San Francisco-Fresno, Department of Emergency Medicine, Fresno, CA

Background

• The NPDS was queried for all crotalid bites reported between 1/1/2006 and 12/31/2018 involving patients < 19 yo.
• Clinical characteristics of those receiving antivenom were compared to those that did not.

Methods

• 10118 case were identified.
• Table 1 compares key characteristics between these that did receive antivenom and those that did not.
• Cases receiving antivenom increased over the study period from 333 in 2006 to 412 in 2018.
• There was only 1 year when less than 50% of cases received antivenom (2017).

Conclusion

• Use of antivenom in pediatric crotalid bites reported to the NPDS increased over the study period and more than half received antivenom therapy.
• Cases that did receive antivenom therapy were associated with higher rates of moderate and major outcomes.
• Further studies are warranted to determine clinical factors associated with receiving or not receiving antivenom therapy.

Table 1: Characteristics of Antivenom and No Antivenom Cases

<table>
<thead>
<tr>
<th></th>
<th>Antivenom</th>
<th>No Antivenom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number of Cases</td>
<td>5368</td>
<td>4750</td>
</tr>
<tr>
<td>Age years (SD)</td>
<td>10.55 (5.21)</td>
<td>11.87 (5.26)</td>
</tr>
<tr>
<td>% Male</td>
<td>63.50%</td>
<td>64.30%</td>
</tr>
<tr>
<td>Copperhead (n)</td>
<td>47% (2149)</td>
<td>53% (2389)</td>
</tr>
<tr>
<td>Rattlesnake (n)</td>
<td>66% (1717)</td>
<td>34% (865)</td>
</tr>
<tr>
<td>Cottonmouth (n)</td>
<td>48% (282)</td>
<td>52% (309)</td>
</tr>
<tr>
<td>Other Crotalid (n)</td>
<td>51% (1220)</td>
<td>49% (1187)</td>
</tr>
<tr>
<td>Minor outcome</td>
<td>791</td>
<td>1966</td>
</tr>
<tr>
<td>Moderate outcome</td>
<td>4088</td>
<td>1817</td>
</tr>
<tr>
<td>Major outcome</td>
<td>369</td>
<td>41</td>
</tr>
<tr>
<td>Admitted to critical care</td>
<td>2493</td>
<td>349</td>
</tr>
<tr>
<td>Deaths</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Received vasopressors</td>
<td>31</td>
<td>0</td>
</tr>
<tr>
<td>Received antibiotics</td>
<td>489</td>
<td>381</td>
</tr>
</tbody>
</table>
Antivenom or Not?
Comparison Of Adult Crotalid Bites Reported to NPDS That Did Or Did Not Receive Antivenom Therapy.
Thornton SL¹, Darraoq M²
¹ University of Kansas Health Care System Poison Control Center, Kansas City, KS. ² Department of Emergency Medicine-University of California-San Francisco-Fresno, Department of Emergency Medicine, Fresno, CA

<table>
<thead>
<tr>
<th>Background</th>
<th>Results</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Use of antivenom therapy for North American crotalid envenomations can be variable.</td>
<td>• 36835 case were identified.</td>
<td>• Use of antivenom in adult crotalid bites reported to the NPDS increased over the study period but overall less than half received antivenom therapy.</td>
</tr>
<tr>
<td>• We compared characteristics and trends of adult crotalid bites reported to the National Poison Data System (NPDS) that did or did not receive antivenom therapy.</td>
<td>• Table 1 compares key characteristics between those that did receive antivenom and those that did not.</td>
<td>• Cases that did receive antivenom therapy were associated with higher rates of moderate and major outcomes.</td>
</tr>
<tr>
<td></td>
<td>• Cases receiving antivenom increased over the study period from 1052 in 2006 to 1557 in 2018.</td>
<td>Further studies are warranted to determine clinical factors associated with receiving or not receiving antivenom therapy.</td>
</tr>
<tr>
<td></td>
<td>• Antivenom was given in &gt;50% of case in 2009, 2012 and 2016.</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Characteristics of Antivenom and No Antivenom Cases

<table>
<thead>
<tr>
<th></th>
<th>Antivenom</th>
<th>No Antivenom</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Number of Cases</strong></td>
<td>17969</td>
<td>18866</td>
</tr>
<tr>
<td><strong>Age years (SD)</strong></td>
<td>46.05(16.71)</td>
<td>43.05(18.24)</td>
</tr>
<tr>
<td><strong>% Male</strong></td>
<td>69.40%</td>
<td>69.50%</td>
</tr>
<tr>
<td><strong>Copperhead (n)</strong></td>
<td>41% (6755)</td>
<td>59% (9753)</td>
</tr>
<tr>
<td><strong>Rattlesnake (n)</strong></td>
<td>61% (7009)</td>
<td>49% (4391)</td>
</tr>
<tr>
<td><strong>Cottonmouth (n)</strong></td>
<td>42% (999)</td>
<td>58% (1397)</td>
</tr>
<tr>
<td><strong>Other Crotalid (n)</strong></td>
<td>49% (3206)</td>
<td>51% (3325)</td>
</tr>
<tr>
<td><strong>Minor outcome</strong></td>
<td>2778</td>
<td>7300</td>
</tr>
<tr>
<td><strong>Moderate outcome</strong></td>
<td>12829</td>
<td>6325</td>
</tr>
<tr>
<td><strong>Major outcome</strong></td>
<td>1530</td>
<td>180</td>
</tr>
<tr>
<td><strong>Admitted to critical care</strong></td>
<td>9204</td>
<td>1117</td>
</tr>
<tr>
<td><strong>Deaths</strong></td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td><strong>Received vasopressors</strong></td>
<td>247</td>
<td>15</td>
</tr>
<tr>
<td><strong>Received antibiotics</strong></td>
<td>2068</td>
<td>1795</td>
</tr>
</tbody>
</table>
Use of antivenom therapy for North American crotalid envenomations can be variable. We compared characteristics and trends of adult crotalid bites reported to the National Poison Data System (NPDS) that did or did not receive antivenom therapy.

**Methods**

- The NPDS was queried for all crotalid bites reported between 1/1/2006 and 12/31/2018 involving patients > 19 yo.
- Clinical characteristics of those receiving antivenom were compared to those that did not.

**Results**

- 36835 case were identified.
- Table 1 compares key characteristics between these that did receive antivenom and those that did not.
- Cases receiving antivenom increased over the study period from 1052 in 2006 to 1557 in 2018.
- Antivenom was given in >50% of case in 2009, 2012 and 2016.

**Conclusion**

- Use of antivenom in adult crotalid bites reported to the NPDS increased over the study period but overall less than half received antivenom therapy.
- Cases that did receive antivenom therapy were associated with higher rates of moderate and major outcomes.
- Further studies are warranted to determine clinical factors associated with receiving or not receiving antivenom therapy.

**Table 1: Characteristics of Antivenom and No Antivenom Cases**

<table>
<thead>
<tr>
<th></th>
<th>Antivenom</th>
<th>No Antivenom</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Number of Cases</strong></td>
<td>17969</td>
<td>18866</td>
</tr>
<tr>
<td><strong>Age years (SD)</strong></td>
<td>46.05(16.71)</td>
<td>43.05(18.24)</td>
</tr>
<tr>
<td><strong>% Male</strong></td>
<td>69.40%</td>
<td>69.50%</td>
</tr>
<tr>
<td><strong>Copperhead (n)</strong></td>
<td>41% (6755)</td>
<td>59% (9753)</td>
</tr>
<tr>
<td><strong>Rattlesnake (n)</strong></td>
<td>61% (7009)</td>
<td>49% (4391)</td>
</tr>
<tr>
<td><strong>Cottonmouth (n)</strong></td>
<td>42% (999)</td>
<td>58% (1397)</td>
</tr>
<tr>
<td><strong>Other Crotalid (n)</strong></td>
<td>49% (3206)</td>
<td>51% (3325)</td>
</tr>
<tr>
<td><strong>Minor outcome</strong></td>
<td>2778</td>
<td>7300</td>
</tr>
<tr>
<td><strong>Moderate outcome</strong></td>
<td>12829</td>
<td>6325</td>
</tr>
<tr>
<td><strong>Major outcome</strong></td>
<td>1530</td>
<td>180</td>
</tr>
<tr>
<td><strong>Admitted to critical care</strong></td>
<td>9204</td>
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</table>
North American crotalid bites can cause significant morbidity and occasional mortality. They remain low incidence events with unique geographical distributions. We examined the geographical trends and clinical characteristics of adult crotalid bites reported to the NPDS from 2006 to 2018.

Methods

• NPDS was queried for all copperheads, rattlesnakes, cottonmouths or unknown crotalids snake bites reported between 1/1/2006 and 12/31/2018 involving patients < 19 years of age.
• All data in the NPDS data set was analyzed using IBM SPSS Statistics for Mac, Version 25.0 (Armonk, NY)

Results

• Table 1 lists pertinent clinical characteristics and trends.
• Figure 1 shows the yearly trends.
• Figure 2 shows the geographical distribution.
• Virginia (9.8%) and North Carolina (6%) had the largest % increase over the study period.

Figure 1: Yearly Trends

Table 1: Clinical characteristics and trends.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>% change/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases</td>
<td>10118</td>
</tr>
<tr>
<td>Age [SD]</td>
<td>11 years [5.4]</td>
</tr>
<tr>
<td>Sex</td>
<td>64% male (n=6463)</td>
</tr>
<tr>
<td>Copperhead (n)</td>
<td>45% (4538)</td>
</tr>
<tr>
<td>Rattlesnake (n)</td>
<td>26% (2582)</td>
</tr>
<tr>
<td>Moderate Outcomes (n)</td>
<td>58% (5905)</td>
</tr>
<tr>
<td>Major Outcomes (n)</td>
<td>4% (405)</td>
</tr>
<tr>
<td>ICU Care (n)</td>
<td>57% (5745)</td>
</tr>
<tr>
<td>% Antivenom Use (n)</td>
<td>53% (5368)</td>
</tr>
<tr>
<td>% Deaths (n)</td>
<td>0.02% (2)</td>
</tr>
</tbody>
</table>

Figure 2: Geographical distribution of cases.

Conclusion

• Pediatric crotalid bites increased over the last 13 years driven largely by increases in reported copperhead bites.
• Antivenom used also increased over the study period.
• Major medical outcomes and deaths remained stable and rare.
North American crotalid bites can cause significant morbidity and occasional mortality. They remain low incidence events with unique geographical distributions. We examined the geographical trends and clinical characteristics of adult crotalid bites reported to the NPDS from 2006 to 2018.

Methods

NPDS was queried for copperheads, rattlesnakes, cottonmouths or unknown crotalids bites reported between 1/1/2006 and 12/31/2018 involving patients ≥ 19 years of age. This data set was analyzed using IBM SPSS Statistics for Mac, Version 25.0 (Armonk, NY).

Results

- Table 1 list pertinent clinical characteristics and trends.
- Figure 1 shows yearly trends.
- Figure 2 shows geographic distribution of cases.
- North Carolina (8.2%) and Oklahoma (7.9%) saw the greatest percent increase over the study period.

Conclusion

- Adult crotalid snake bites reported to NPDS have increased over the last 13 years driven largely by increases in reported copperhead bites.
- Antivenom used also increased over the time period driven largely by its use in copperhead cases.
- Major outcomes and deaths remained stable and rare

Table 1: Clinical characteristics and Trends

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Number of Bites</td>
<td>36835</td>
</tr>
<tr>
<td>Age [SD]</td>
<td>45.4</td>
</tr>
<tr>
<td>Sex</td>
<td>69% male (n=25588)</td>
</tr>
<tr>
<td>% Copperhead</td>
<td>44.8% (n=16508)</td>
</tr>
<tr>
<td>% Rattlesnake</td>
<td>30.9% (n=11400)</td>
</tr>
<tr>
<td>Moderate Outcomes</td>
<td>52% (n=19154)</td>
</tr>
<tr>
<td>Major Outcomes</td>
<td>4.7% (n=1710)</td>
</tr>
<tr>
<td>ICU Care</td>
<td>49% (n=17963)</td>
</tr>
<tr>
<td>% Antivenom Use (n)</td>
<td>49% (n=17969)</td>
</tr>
<tr>
<td>% Deaths (n)</td>
<td>0.09% (n=32)</td>
</tr>
</tbody>
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North American crotalid bites can cause significant morbidity and occasional mortality. They remain low incidence events with unique geographical distributions. We examined the geographical trends and clinical characteristics of adult crotalid bites reported to the NPDS from 2006 to 2018.

Methods

• NPDS was queried for copperheads, rattlesnakes, cottonmouths or unknown crotalids bites reported between 1/1/2006 and 12/31/2018 involving patients ≥ 19 years of age.
• This data set was analyzed using IBM SPSS Statistics for Mac, Version 25.0 (Armonk, NY).

Results

• Table 1 list pertinent clinical characteristics and trends.
• Figure 1 shows yearly trends.
• Figure 2 shows geographic distribution of cases.
• North Carolina (8.2%) and Oklahoma (7.9%) saw the greatest percent increase over the study period.

Figure 1: Yearly Trends of Crotalid Bites

Figure 2: Geographic Distribution of Crotalid Bites

Table 1: Clinical characteristics and Trends

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</tr>
</tbody>
</table>

Conclusion

• Adult crotalid snake bites reported to NPDS have increased over the last 13 years driven largely by increases in reported copperhead bites.
• Antivenom used also increased over the time period driven largely by its use in copperhead cases.
• Major outcomes and deaths remained stable and rare.
There are approximately 1350 critical access hospitals (CAH) in the United States.

CAH play important roles in the care of poisoned patients in these rural areas.

Prior studies have demonstrated that smaller hospital size is associated with stocking deficiencies of certain antidotes.

We sought to evaluate the antidote stocking levels of a midwestern state’s critical access hospitals.

133 hospitals completed the survey for a 100% respondent rate. 83 were designated as CAHs.

CAHs had a mean of 16.8 (SD 4.8) of the 45 antidotes in stock. The highest number of antidotes stocked was 30 by 2 CAH facilities. There was no single antidote which was stocked by all CAHs.

Specific Antidotes and Percent Stocked by CAHs

<table>
<thead>
<tr>
<th>Antidote</th>
<th>% CAHs</th>
<th>Antidote</th>
<th>% CAHs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naloxone</td>
<td>98.8</td>
<td>DFO</td>
<td>15.7</td>
</tr>
<tr>
<td>Glucagon</td>
<td>97.6</td>
<td>Ethanol</td>
<td>13.3</td>
</tr>
<tr>
<td>Sodium bicarb</td>
<td>97.6</td>
<td>PCC</td>
<td>13.3</td>
</tr>
<tr>
<td>Vitamin K</td>
<td>97.6</td>
<td>Sodium Thiosulfate</td>
<td>12.0</td>
</tr>
<tr>
<td>Diazepam/Lorazepam</td>
<td>96.4</td>
<td>Cyanide Antidote Kit</td>
<td>10.8</td>
</tr>
<tr>
<td>Atropine</td>
<td>95.2</td>
<td>2-PAM</td>
<td>10.8</td>
</tr>
<tr>
<td>Flumazenil</td>
<td>92.8</td>
<td>Hydroxocobalamin</td>
<td>9.6</td>
</tr>
<tr>
<td>NAC (any form)</td>
<td>90.4</td>
<td>Sodium Nitrite</td>
<td>8.4</td>
</tr>
<tr>
<td>Calcium Gluconate</td>
<td>85.5</td>
<td>Fomepizole</td>
<td>7.2</td>
</tr>
<tr>
<td>Folic Acid</td>
<td>85.5</td>
<td>Dimercaprol (BAL)</td>
<td>4.8</td>
</tr>
<tr>
<td>Calcium Chloride</td>
<td>81.9</td>
<td>Potassium Iodide</td>
<td>4.8</td>
</tr>
<tr>
<td>AC WITH sorbitol</td>
<td>76.3</td>
<td>Folinic Acid</td>
<td>3.6</td>
</tr>
<tr>
<td>Dantrolene</td>
<td>77.1</td>
<td>Sodium acetate</td>
<td>3.6</td>
</tr>
<tr>
<td>AC w/o sorbitol</td>
<td>75.9</td>
<td>Anavip</td>
<td>2.4</td>
</tr>
<tr>
<td>Protamine</td>
<td>61.4</td>
<td>L-Carnitine</td>
<td>2.4</td>
</tr>
<tr>
<td>Crofab</td>
<td>48.2</td>
<td>Anexanet Alfa</td>
<td>1.2</td>
</tr>
<tr>
<td>Physostigmine</td>
<td>34.9</td>
<td>Black Widow Antivenom</td>
<td>1.2</td>
</tr>
<tr>
<td>Pyridoxine</td>
<td>34.9</td>
<td>CaNaEDTA</td>
<td>1.2</td>
</tr>
<tr>
<td>Methylene blue</td>
<td>30.1</td>
<td>Succimer</td>
<td>0</td>
</tr>
<tr>
<td>Octreotide</td>
<td>28.9</td>
<td>Glucarpidase</td>
<td>0</td>
</tr>
<tr>
<td>Digibind</td>
<td>27.7</td>
<td>Prussian Blue</td>
<td>0</td>
</tr>
<tr>
<td>Idarucizumab</td>
<td>16.9</td>
<td>Uridine Triacetate</td>
<td>0</td>
</tr>
<tr>
<td>Cyproheptadine</td>
<td>16.9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Time sensitive antidotes were found to be rarely stocked, such as fomepizole (n=6), hydroxocobalamin (n=8), digoxin immune fab (n=23), and methylene blue (n=25).

Chelators were rarely stocked. Only 4 CAH (5%) reported stocking either CaNaEDTA, succimer, dimercaprol or Prussian blue.

No correlation was found between antidotes stocked and number of inpatient beds (correlation coefficient 0.1) or emergency department beds (correlation coefficient 0.22).

Conclusion

Critical access hospitals reported low overall levels of antidote stocking.

In particular, several time sensitive antidotes and chelators were rarely, if ever, reported as being stocked.

Further studies are warranted to investigate the reasons behind the low antidote stocking rates and develop contingency plans for poisoned patients who may present to these hospitals.
Hydroxocobalamin is indicated for known or suspected cyanide poisoning.

Prompt administration is crucial when cyanide poisoning is suspected.

The objective of this study was to evaluate the time to administration and clinical data involved with hydroxocobalamin usage at an academic medical center with an American College of Surgeons level one trauma and burn center.

Background

- Table 1 describes clinical and laboratory characteristics stratified by all cases, cases that survived, and deaths.
- 56 cases were identified, with 93% of all cases (n=52) being adults ≥ 19.
- Average adult age was 52 years (SD 14.6), and the average child age was 3.5 years (SD 3.9).
- 70% of cases were male (n=39).
- 46% of cases were transfers (n=26).
- The average hospital LOS was 282 hours (SD 423), with 89% of cases admitted to a critical care unit (n=50).

Results

- Average time from hospital arrival to hydroxocobalamin administration was 289 minutes (SD 407), after exclusion of a case where hydroxocobalamin was administered 29,955 minutes after admission for suspected cyanide toxicity from nitroprusside.
- 21% of cases (n=12) had hydroxocobalamin administered within 60 minutes of hospital arrival.
- 20% of cases (n=11) died, with significant delays in time to hydroxocobalamin administration (538 minutes, SD 769) than those that survived to discharge (227 minutes, SD 226).

Table 1: Clinical and Laboratory Characteristics

<table>
<thead>
<tr>
<th>Clinical or Lab Characteristic (mean)</th>
<th>All Cases (n=56)</th>
<th>Survived (n=45)</th>
<th>Death (n=11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial COHgb % [SD]</td>
<td>7.9% [9.1]</td>
<td>8.1 [9.5]</td>
<td>7.0 [6.6]</td>
</tr>
<tr>
<td>Initial pH [SD]</td>
<td>7.31 [0.125]</td>
<td>7.35 [0.1]</td>
<td>7.18 [0.13]</td>
</tr>
<tr>
<td>Lowest pH [SD]</td>
<td>7.24 [0.15]</td>
<td>7.28 [0.1]</td>
<td>7.06 [0.19]</td>
</tr>
<tr>
<td>Initial Serum Lactate (mg/dL) [SD]</td>
<td>4.3 [3.8]</td>
<td>3.6 [3.5]</td>
<td>6.7 [4.0]</td>
</tr>
<tr>
<td>Max Serum Lactate (mg/dL) [SD]</td>
<td>6.1 [6.3]</td>
<td>4.0 [3.4]</td>
<td>13.1 [8.7]</td>
</tr>
<tr>
<td>Min Serum Bicarbonate (mEq/L) [SD]</td>
<td>17.7 [4.6]</td>
<td>18.8 [4.2]</td>
<td>13 [3.5]</td>
</tr>
<tr>
<td>Initial MetHgb % [SD]</td>
<td>2.7 [3.5]</td>
<td>0.56 [0.32]</td>
<td>5.3 [4]</td>
</tr>
<tr>
<td>Maximum MetHgb % [SD]</td>
<td>3.2 [4.2]</td>
<td>0.56 [0.32]</td>
<td>6.6 [4.6]</td>
</tr>
<tr>
<td>Initial SBP (mmHg) [SD]</td>
<td>140 [32]</td>
<td>139 [32]</td>
<td>144 [34]</td>
</tr>
<tr>
<td>Lowest SBP (mmHg) [SD]</td>
<td>87 [20]</td>
<td>89 [18]</td>
<td>77 [25]</td>
</tr>
</tbody>
</table>

Methods

- The electronic medical record was queried for hydroxocobalamin administrations from 1/1/07 to 12/31/18 with ensuing chart review and data extraction after two rounds of training to ensure inter-rater reliability.

- Multiple data points were extracted and analyzed using Microsoft Excel (Redmond, WA). They included those data points noted in Table 1 as well as age, sex, time of hospital arrival, admitting diagnosis, hospital length of stay (LOS), time of hydroxocobalamin administration, hydroxocobalamin dose, use of amyl nitrate or sodium thiosulfate, and use of hyperbaric oxygen therapy.

- Burn (n=16), inhalation injury (n=15), and smoke inhalation (n=7) accounted for 68% of the admitting diagnoses.
- Cyanide levels were obtained for 17 cases, measurable in 9 cases including 3 deaths, but not considered to be toxic (average 0.084 mcg/mL, SD 0.051).
- Amyl nitrate and sodium thiosulfate were never administered.
- Hyperbaric oxygen therapy was administered 4 times.

Conclusion

- There was a significant delay in the administration of hydroxocobalamin after hospital arrival.
- Cases that resulted in death had significantly longer times to hydroxocobalamin administration.
- Further studies are warranted to validate this single center study and identify reasons for delays in hydroxocobalamin administration.
Background

Amid the global pandemic caused by the novel coronavirus (SARS-CoV-2), sources have speculated on the potential benefits of medications for the treatment of SARS-CoV-2. Chloroquine, an antimalarial and antirheumatic medication, garnered attention, and its purported benefits were widely publicized. We report two cases of chloroquine toxicity following ingestion of an aquarium disinfectant containing 98% weight by weight chloroquine phosphate in a misguided attempt to prevent infection by SARS-CoV-2.

Case Report

• A husband and wife each consumed a teaspoonful of aquarium disinfectant containing chloroquine phosphate dissolved in liquid (Figure 1) with the intention of preventing infection by SARS-CoV-2.

• Within 20 minutes of ingestion, the wife developed nausea, vomiting and diarrhea, while the husband experienced only diarrhea.

• The wife called emergency medical services 90 minutes after the ingestion when the husband developed dyspnea.

• On arrival to the emergency department (ED), he was unresponsive, seized and vomiting.

• Cardiopulmonary resuscitation was performed, and sodium bicarbonate, atropine, epinephrine, magnesium sulfate, calcium chloride, diazepam and dextrose were administered (doses unknown).

• Despite initial return of spontaneous circulation, recurrent cardiac arrest resulted in death approximately 3.5 hours after the ingestion.

• Continuous cardiac monitoring during resuscitation revealed a wide QRS >160ms with multiple rhythms, including bidirectional ventricular tachycardia, idioventricular tachycardia, sinus tachycardia and sinus arrest (Figures 2 and 3).

• On arrival to the same ED, the wife was awake and alert but with protracted nausea and vomiting.

• Her initial electrocardiogram (ECG) showed sinus tachycardia with QRS 440ms. She received magnesium sulfate 2g and sodium bicarbonate 50mEq bolus followed by an infusion (150mEq in 1 L dextrose 5% water at 175mL/h).

• She was transferred to the Medical Toxicology service at a tertiary referral hospital where ECG revealed QRS 109ms and QTc 534ms (Figure 4).

• Potassium chloride 60mEq and magnesium sulfate 2g were administered, and sodium bicarbonate infusion was continued.

• Although the wife did not experience hemodynamic instability, she had more severe and protracted gastrointestinal toxicity than her husband.

• Her symptoms gradually resolved over 48 hours.

• ECG at the time of discharge revealed QRS 99ms and QTc 433ms.

• Antemortem serum chloroquine concentration in the husband obtained 3 hours after ingestion was 6.2mg/L concentration in the wife obtained 3 hours and 16 hours after ingestion were 1.1mg/L and 0.4mg/L, respectively.

Case Discussion

Chloroquine toxicity is potentially fatal and characterized by nausea, vomiting, diarrhea, and abrupt decompensation due to cardiovascular collapse. The peak concentration of chloroquine occurs within 1-2 hours of ingestion, volume of distribution is 200L/kg, and elimination half-life is 20-60 days. Chloroquine is metabolized by various cytochrome P450 isoforms, CYP2C8, CYP2D6 and CYP3A4/5 being the major catalysts of deethylation. The active metabolite, desethylchloroquine, can be detected in plasma within 30 minutes of an oral dose of chloroquine. Risk of fatal outcome is associated with ingestions greater than 5g, systolic blood pressure less than 80mmHg and QRS duration greater than 120ms. Whole blood chloroquine concentrations greater than 7mg/L and serum chloroquine concentrations greater than 5mg/L are associated with fatality. The exact amounts of chloroquine ingested by the patients presented above are unknown. The differences in their presentations could be attributed to variances in bioavailability and absorption, as the wife demonstrated more severe gastrointestinal toxicity than the husband. Pharmacogenomic testing of the wife revealed normal metabolism though CYP2D6 and CYP3A4 but poor metabolism through CYP2D6 and CYP3A4 but intermediate metabolism through CYP2D6. The significance of these polymorphisms is not fully understood in the context of chloroquine’s narrow therapeutic index.

Conclusions

During this time of heightened public fear, it is important to effectively communicate the dangers of using unproven therapies in a self-directed manner to prevent or treat infection by SARS-CoV-2. Use of self-administered substances, whether prescribed medications or household products, can result in morbidity and mortality. Accurate guidance is crucial for public safety during these challenging times. Clinicians should be able to recognize the toxic effects of chloroquine and anticipate the potential for precipitous hemodynamic instability and cardiac arrest in exposed patients.

References

Background

Since the introduction of Fab antivenom (FabAV) for treatment of North American rattlesnake envenomation, serum sickness reactions are uncommon. A clinical trial comparing FabAV with the newer F(ab'){2} antivenom (Fab2AV) showed a similarly low rate of serum sickness. The first year of commercial use of Fab2AV in the United States (US) was in 2019, and serum sickness has not been reported outside the clinical trial. We describe a pediatric case of serum sickness following administration of Fab2AV.

Case Presentation

- A healthy 7-year-old boy was bitten on the right posterior calf by a native rattlesnake while hiking in Arizona.
- EMS applied a tourniquet to the leg, which was removed upon arrival in the ED 2 hours after the bite.
- Initial physical examination revealed puncture wounds on the posterior calf, proximal swelling to 20 cm from the punctures, and right inguinal tenderness.
- Labs showed a leukocyte count of 18.2 K/μL, hemoglobin 12.0 g/dL, platelet count 22 K/μL and fibrinogen 179 mg/dL [200-400 mg/dL].
- The leg was placed in a posterior non-compressive splint, and 10 vials of Fab2AV were administered.
- Over the subsequent three days, an additional 28 vials of antivenom were administered for swelling, pain, hypofibrinogenemia, and thrombocytopenia.
- He was discharged home on hospital day 5 with residual ecchymosis of his leg (Figure 1).
- On follow-up two days later, his mother noted decreased activity and appetite, irritability. A pruritic erythematous maculopapular rash was noted around the envenomation site and progressed proximally onto his abdomen over the next several hours (Figures 2 and 3).
- Retrospective review of labs revealed eosinophil count 0.40 K/μL [0.0-0.8 K/μL] on admission, which increased to 0.82 K/μL at hospital discharge, and 0.89 K/μL the following day (Figure 4).
- The patient was diagnosed with serum sickness and prescribed prednisolone 0.5 mg/kg twice daily and diphenhydramine 12.5 mg every 6 hours for five days. Acetaminophen 320 mg every 6 hours was continued.
- Labs drawn three days into therapy showed eosinophil count had normalized to 0.01 K/μL.
- The rash had nearly receded on the final day of therapy.
- No rebound of symptoms occurred after completion of the 5-day course of therapy.

Discussion

Serum sickness is a type III hypersensitivity reaction due to immune complex deposition and an anticipated delayed reaction after administration of heterologous serum proteins. It is characterized by fever, lymphadenopathy, cutaneous eruptions, and arthralgias. Eosinophilia may be present. Prior to 2000, whole IgG antivenom (IgGAV) used to treat North American rattlesnake envenomation was highly associated with the development of serum sickness. A retrospective review found 56% of patients treated with IgGAV suffered serum sickness. Currently available FabAV and Fab2AV therapies have a lower risk of serum sickness. In preclinical trials, 2.4% and 2.3% of patients experienced serum sickness following treatment with FabAV and Fab2AV, respectively. Serum sickness as a result of IgGAV exposure was often treated with 1-3 weeks of corticosteroids.

In this patient, symptoms of serum sickness may have been blunted due to the use of scheduled acetaminophen. Eosinophilia was present and helpful in making the diagnosis of serum sickness. A shorter course of corticosteroids, 5 days in comparison to 1-3 weeks, was effective in treating symptoms of fatigue, malaise, and rash.

Conclusions

Assessment for serum sickness should continue to be part of post-discharge care for all patients with rattlesnake envenomation who have received any type of antivenom. Providers should continue to counsel patients to monitor for signs of serum sickness after discharge. The eosinophil count may be a useful indicator of such a reaction.

References

Methotrexate is a chemotherapeutic and immunomodulating drug with an uncommon dosing schedule. Its once weekly dosing can result in errors as most medications are taken daily. This dosing error can prove clinically significant and sometimes fatal. We sought to describe methotrexate ingestions reported to a poison center from 2009-2019.

Background:

- Methotrexate is a chemotherapeutic and immunomodulating drug with an uncommon dosing schedule.
- Its once weekly dosing can result in errors as most medications are taken daily.
- This dosing error can prove clinically significant and sometimes fatal.
- We sought to describe methotrexate ingestions reported to a poison center from 2009-2019.

Methods:

- non-human cases, information calls, and non-ingestions excluded
- any uncertainty regarding case classification was discussed amongst authors until classification was determined.
- this study was approved by the local IRB.

Results:

- 146 calls, 35 excluded
- 111 ingestions
  - 23 intentional
  - 88 unintentional

Discussion:

- We identified 86 cases of unintentional mis-dosing associated with methotrexate.
- The majority of these patients were treated for rheumatoid arthritis.
- Over one-third (37%) of unintentional mis-dosing were admitted to the hospital and treated with leucovorin.

Limitations:

- Poison center calls are not a complete account of cases in the catchment area.
- A number of cases that were deemed low risk were closed after the initial call.
- If medication error is not discovered, patients may present with sequelae of methotrexate toxicity. Thus, methotrexate toxicity may be missed or underreported.

Consequences of inappropriately taking methotrexate can result in death. Clinicians should be aware of methotrexate’s potential dangers and should thoroughly educate patients and providers administering medications on methotrexate’s dosing frequency. Future efforts towards a safer medication packaging system may be beneficial.
Ricin manifests toxicity through disruption of protein synthesis.

Castor beans contain 1-5% ricin and ingestion results in varied degrees of toxicity depending on preparation and dose.

We report a case of sequential ricin and amygdalin ingestion after brewing castor beans and cherry pits with coffee in a self-harm attempt.

**Background:**
- Ricin manifests toxicity through disruption of protein synthesis.
- Castor beans contain 1-5% ricin and ingestion results in varied degrees of toxicity depending on preparation and dose.
- We report a case of sequential ricin and amygdalin ingestion after brewing castor beans and cherry pits with coffee in a self-harm attempt.

**Case Presentation:**
- A 36-year-old male ground 50 castor beans, mixed the product with coffee grounds, brewed two large cups of ricin-coffee mixture, and drank them.
- He woke up the following day without ill effects so he repeated the procedure with 80 cherry pits in attempt at a cyanide ingestion.
- Hazmat field testing was positive for ricin in coffee grounds.
- Prehospital interventions: 50g Activated charcoal, hazmat decontamination

**Physical exam/labs:**
- HR: 87 RR 16 B/P 126/94  96% SpO2 on RA
- Pertinent labs:
  - WBC 12.84 k
  - lactate 3.8 mmol/L

**Case continued:**
- The patients lactate decreased with intravenous fluids.
- Hospital day 2: his WBC peaked at 18.43 K and his lactate rose again to 2.7 and responded to fluids again.
- Urine at 37.5 hours and 64 hours post ingestion showed ricinine concentrations of 219 ug/L and 144 ug/L, respectively.
- Blood was tested for cyanides on samples from hospital days 1, 2, and 3. all samples had detectable cyanide that was below the level of quantification for that assay (<25 ug/L).

**Discussion:**
Case reports of castor bean and cherry pit ingestion indicate that mastication is necessary for release and absorption of ricin and amygdalin, respectively. Ricin can be inactivated via heating at 80 degrees Celsius for 10 minutes. Amygdalin is degraded via isomerization when boiled for 3 minutes. Most coffee makers reach temperatures higher than 80 degrees Celsius for brewing purposes, but brewing usually lasts less than 10 minutes. We hypothesize that the patient’s preparation process of grinding, heating, brewing, and pouring castor beans and cherry pits through a coffee filter may have decreased the total amount of metabolically active ricin and amygdalin in the ingested products, thus attenuating a potentially toxic exposure.

**Conclusion:**
We report a case of attempted ricin and amygdalin ingestion via extraction through a coffee brewer. This was a non-fatal ingestion.
Background and objectives

- Fentanyl and fentanyl analogues are potent synthetic opioids that have been used to fortify heroin product in the United States and Canada and have been identified analytically in samples from a high proportion of patients with severe or fatal apparent heroin toxicity in those countries.  
- The United Kingdom (UK) Identification Of Novel psychoActive substances (IONA) study has been recording clinical features and analytic findings for patients presenting with severe toxicity after suspected use of non-pharmaceutical opioids.  
- This report describes the frequency of detection of fentanyl and its analogues in samples from British patients presenting with suspected heroin toxicity.

Methods

- With ethical approval, patients (≥16y) presenting to 29 participating hospitals (England, Wales, Scotland) with severe acute toxicity (according to specific definitions) after suspected heroin exposure were recruited with informed consent.  
- Those lacking capacity were included with the agreement of an appropriate representative. They were able to confirm/refuse their own consent on recovery.  
- Clinical features were recorded using a structured data collection sheet.  
- Blood and/or urine samples were collected and analysed by liquid chromatography-tandem mass spectrometry using a methodology with very high sensitivity for detecting fentanyl analogues.

Results

- Clinical and analytical data were available for 77 patients (median age 38 years, range 18-62, 71% male) presenting between January 2017 and March 2020.  
  - 61 (79.2%) participants died  
  - 19 (24.7%) were admitted to an intensive care unit  
  - 10 (13.0%) were intubated and ventilated  
  - 2 (2.6%) died

- One or more conventional opioids were detected in samples from 61 (79.2%) patients (Figure 1).

- Fentanyl (or its metabolite norfentanyl) was detected in samples from 3 (3.9%) participants, one in each year 2017, 2018 and 2019. None gave a history of fentanyl use, including diversion of patches.

- Alfentanil was detected in samples from 1 patient after administration in hospital for intubation. No other fentanyl analogues were detected in this cohort.

- Multiple drug exposures were common, with other non-opioid substances found including benzodiazepines, cocaine, gabapentinoids, levamisole and new psychoactive substances (15.6%), especially synthetic cannabinoids receptor agonists (Figure 2).

Discussion and conclusions

- Fentanyl (3.9%) and its analogues (no illicit exposures) have been infrequently involved in episodes of suspected severe heroin toxicity in the UK over the period 2017-2020.

- There is an ongoing risk that fentanyl or its analogues may appear in the local heroin supply and continuing vigilance remains essential.

References


Pepper spray exposures treated at emergency departments
Cristina Thomas\textsuperscript{a}, Mathias B. Forrester\textsuperscript{b}
\textsuperscript{a}North Texas Poison Center, Dallas, TX, USA, \textsuperscript{b}Independent Researcher, Austin, TX, USA

**Background**

- Pepper sprays are used as a nonlethal method to disable individuals and repel animals by causing intense irritation of mucous membranes of the eyes, nose, throat, and skin.
- The products can also be inhaled or ingested.
- Pepper sprays contain oleoresin capsicum extracted from pepper plants of the genus Capsicum.
- Pepper spray exposure causes almost immediate onset of symptoms, although most resolve 30-60 minutes after exposure.
- Dermal effects include burning pain, tingling, erythema, edema, and pruritus. Ocular exposure may result in redness, swelling, severe burning pain, tingling, and lacrimation.
- Inhalation of pepper spray may lead to cough, choking, burning pain, sneezing, and nasal discharge.
- In a portion of pepper spray exposures, serious medical outcomes that require medical evaluation may occur.
- The objective of this study was to describe pepper spray exposures managed at United States (US) emergency departments (EDs).

**Methods**

- Data were obtained from the National Electronic Injury Surveillance System (NEISS), a database of consumer product-related injuries collected from the EDs of approximately 100 US hospitals.
- National estimates are calculated from the database records based on the sample weight assigned to each case based on the inverse probability of the hospital being selected for the NEISS sample.
- Pepper spray exposures reported during 2001-2018 were defined as those records assigned product code 1619 (Personal Protection Devices) where the record narrative also mentioned “pepper spray.”
- The distribution of estimated pepper spray exposures was determined for various factors related to patient demographics, injury circumstances, diagnosis, and disposition.

**Results**

- A total of 876 pepper spray exposures were identified, resulting in a national estimate of 26,191 exposures or a mean of 1,455 exposures per year.
- 14,991 (57.2%) of the patients were male and 11,200 (42.8%) female.
- Of the 19,794 patients with a reported race, 9,904 (50.0%) were white, 6,141 (31.0%) were African-American, 113 (0.6%) were Asian, & 3,636 (18.4%) other.

**Results cont.**

- The diagnoses were dermatitis or conjunctivitis (n=6,112, 23.3%), poisoning (n=5,791, 22.1%), chemical burns (n=5,375, 20.5%), and other/not stated (n=8,913, 34.0%).
- The disposition was 24,218 (92.5%) treated or examined and released, 171 (0.7%) treated and transferred to another hospital, 278 (1.1%) treated and admitted for hospitalization, 1,517 (5.8%) left without being seen, and 6 (0.0%) not recorded.

**Conclusion**

- Pepper spray exposures treated in EDs most often involved patients who were children and male.
- The exposures most often occurred at home followed by public property and school.
- The majority of the exposures affected the head and neck, particularly the eye and face.
- Most patients were treated or evaluated and released from the ED.
Ingestion of Melia azedarach by dogs
Cristina Thomas\textsuperscript{a}, Mathias B. Forrester\textsuperscript{b}
\textsuperscript{a}North Texas Poison Center, Dallas, TX, USA, \textsuperscript{b}Independent Researcher, Austin, TX, USA

Background

- \textit{Melia azedarach} (commonly known as chinaberry, pride of India, white cedar, umbrella tree) is a deciduous tree in the Meliaceae (Mahogany) family.
- The tree can reach 15 m (50 feet). Its leaves are 0.3-0.6 m (one-two feet) in length and dark green (turning yellow-gold in autumn).
- \textit{M. azedarach} produces purple, five-petaled flowers in spring. The fruit of \textit{M. azedarach} are hard, yellow to yellow-green, 1-2 cm (0.4-0.8 inches) in diameter berries or drupes on stalks.
- Native to Southeast Asia and northern Australia, \textit{M. azedarach} was introduced to the United States in the mid-1800s as an ornamental tree.
- \textit{M. azedarach} contains multiple limonoid tetranotriterpenes such as meliatoxins A1, A2, and A3. These chemicals are found in highest concentrations in the fruit but also can be found in the bark, leaves, and flowers.
- Signs observed after \textit{M. azedarach} ingestion by dogs include vomiting, hypersalivation, diarrhea, abdominal pain, ataxia, seizures, tachycardia, bradycardia, cyanosis, and dyspnea. Death may occur. Symptoms may occur within 1-8 hours after ingestion.
- The objective of this study was to describe \textit{M. azedarach} ingestions by dogs reported to poison centers.

Methods

- Cases were \textit{M. azedarach} ingestions by dogs reported to the Texas Poison Center Network during 2000-2018.
- The distribution of cases was determined for various factors.

Results

- A total of 49 ingestions of \textit{M. azedarach} by dogs during 2000-2018 were reported.
- The part of the plant involved in these ingestions was reported to be the berry in 34 (69%) of the cases and unknown in the rest.
- Initial signs were reported in 22 (45%) of the cases.

<table>
<thead>
<tr>
<th>Initial Sign</th>
<th>Number of Dogs</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastrointestinal</td>
<td>13</td>
<td>27%</td>
</tr>
<tr>
<td>Vomiting</td>
<td>9</td>
<td>18%</td>
</tr>
<tr>
<td>Neurological</td>
<td>11</td>
<td>22%</td>
</tr>
<tr>
<td>Drowsiness or Lethargy</td>
<td>5</td>
<td>10%</td>
</tr>
<tr>
<td>Seizures</td>
<td>4</td>
<td>8%</td>
</tr>
</tbody>
</table>

- Other signs reported in <3 cases were hypotension, abdominal pain, weight loss, blood in rectum, diarrhea, nausea, ataxia, confusion, muscle weakness, paralysis, nystagmus, and renal failure.
- No deaths were reported, but the poison center network generally does not follow animal exposures to determine final outcome.
- Nine (18%) of the dogs were already at a veterinary facility when the poison center was contacted, 25 (51%) were referred to a veterinary facility by the poison center, and 15 (31%) had an unknown management site.

Conclusion

- These cases add to the published information on canine ingestion of \textit{M. azedarach} and demonstrate that ingestion of \textit{M. azedarach} by dogs might result in gastrointestinal and neurological signs and have serious outcomes.
- Thus, pet owners and caregivers should take care when dogs are in environments where \textit{M. azedarach} can be found.
Background

- Rabies is a zoonotic disease caused by a virus.
- All mammals, including humans, are susceptible to rabies infection, commonly transmitted through a bite or wound contact with saliva from an infected animal.
- Once clinical signs develop, the disease is almost inevitably fatal.
- Rabies can be prevented through the administration of a rabies vaccine prior to exposure or prior to the onset of clinical signs.
- However, the rabies vaccine itself can cause adverse events.
- The objective of this study was to describe human rabies vaccine adverse events reported to the United States (US) Food and Drug Administration (FDA).

Methods

- Data were obtained from the Vaccine Adverse Reporting System (VAERS), a national database that contains reports of adverse events following vaccination.
- Reports are coded using the Medical Dictionary for Regulatory Activities (MedDRA), a validated, internationally standardized medical terminology.
- VAERS public data for the years 1991-2018 were downloaded and searched for all records that included a rabies vaccine.
- The distribution of rabies vaccine adverse events was determined for various factors related to patient demographics, circumstances of the exposure, symptoms, and outcome.

Results

- Of the 3,167 patients with a known sex, 2,050 (64.7%) were female and 1,117 (35.3%) male.
- The adverse event resulted in an emergency department or doctor visit in 1,061 (32.7%) cases.
- The adverse event was classified as serious in 217 (6.7%) cases: 167 (5.1%) hospitalized, 9 (0.3%) prolonged hospitalization, 40 (1.2%) life threatening illness, 40 (1.2%) disability, and 8 (0.2%) death.

Conclusion

- The annual number of rabies adverse events declined over the study period.
- The highest proportion of adverse events were reported during the summer.
- Most of the patients were female and age 20-39 years.
- Although almost one-third of the adverse events resulted in an emergency department or doctor visit there were few serious adverse events.
Introduction

- The use of tear gas as a crowd control agent has raised concern about its proper use and perceived safety.
- Health effects have ranged from mucus membrane irritation to pulmonary edema and death.
- Commonly used agents include:
  - Chloroacetophenone (CN)
  - O-Chlorobenzylidene Malonitrile (CS)
  - Oleoresin Capsicum (OC)
- We report characteristics of exposures to chemical lacrimators for a 20-year period reported to the National Poison Data System (NPDS).
- NPDS is a national epidemiology surveillance system which contains de-identified data on chemical exposure and management from all calls received by 55 US poison centers.

Methods

- We reviewed retrospective exposure call data from NPDS for “lacrimators” from January 1, 2000 – December 31, 2019 including:
  - Descriptive analyses by year, age, chemical, intentionality, medical outcome, and exposure scenario
  - Excluded
    - Animal Exposures
    - Information Calls
    - Non-confirmed Exposures

Results

<table>
<thead>
<tr>
<th>Lacrimator Exposures Reported to U.S. Poison Centers by Age per Year N=70,455</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
</tr>
<tr>
<td>2000</td>
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<td>2001</td>
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<th>Exposure Type</th>
<th>OC</th>
<th>CN</th>
<th>CS</th>
<th>Other/Unknown</th>
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<tbody>
<tr>
<td>Intentional</td>
<td>77,121 (75.3%)</td>
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<tr>
<th>Medical Outcomes</th>
<th>Minor Effects</th>
<th>Moderate Effects</th>
<th>Major Effects</th>
<th>No Effects</th>
<th>Unrelated or Unable to Follow</th>
</tr>
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<tr>
<td>OC</td>
<td>46,867 (45.9%)</td>
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<td>CN</td>
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<tr>
<td>CS</td>
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<thead>
<tr>
<th>Exposure per Age</th>
<th>Infants (Age &lt;5)</th>
<th>Children (Age 6-12)</th>
<th>Adolescents (Age 13-19)</th>
<th>Adults (Age 20-59)</th>
<th>Elderly (Age 60 and up)</th>
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<tr>
<td>OC</td>
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<tr>
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<td>42,807 (41.8%)</td>
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<tr>
<td>Intentional</td>
<td>4,220 (4.1%)</td>
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Conclusion

From January 1, 2000 to December 31, 2019, there were >100,000 reported exposures to lacrimators called to poison centers, with a large proportion of exposures in children (age 6-12) and adolescents (age 13-19). We could not find information on whether these exposures were related to their use as crowd control measures in NPDS; however the majority were reported as unintentional and likely accidental. While overall number of exposures have decreased over the past 20 years, the proportion of exposures to children have increased. Of the calls reporting exposure scenarios, a large number involved exposures in poorly ventilated areas and exposures among children, suggesting that education is needed regarding appropriate use and storage of these chemicals to avoid dangerous exposures.
The number of calls to this poison center referred to or from a HCF have significantly increased from 2012 to 2019
- Calls to one or more toxicologists have decreased during the study period
- Several possible explanations for this paradoxical finding include:
  - Increase in cases referred to a HCF by SPIs to seek consultation with a medical toxicologist but without a change in underlying complexity of cases
  - Increasing number of low acuity calls from HCFs
  - Increased comfort amongst providers in managing the poisoned patient
  - Increase in hospital-based protocols requiring contact with a poison center for poisoned patients
- Further data extrapolation and analyses are required to explore these hypotheses
Traffic fatalities increased following the opening of adult-use cannabis dispensaries in Washington, Colorado, and Oregon

Results
Monthly traffic fatalities showed a statistically significant increase following dispensary opening in:
WASHINGTON +5.813 (p=.0035; 1.963-9.662)  
COLORADO +9.000 (p=.0002; 4.364-13.64)  
OREGON +7.556 (p=.0001; 3.830-11.28)

The change in monthly traffic fatalities was not statistically significant in:
ALASKA +0.5417 (p=.4245; -0.8115-1.895)

Conclusion
We demonstrated a statistically significant increase in monthly traffic fatalities following the opening of cannabis dispensaries for adult use in three of four states examined.

This may be associated with more drivers operating motor vehicles under the influence of cannabis.

Limitations:
The FARS dataset:
- does not currently contain traffic fatality data after December 2018
- does not allow the determination of whether crashes were known/suspected to involve substance use
- excludes non-fatal crashes

Our study design did not include a comparison to nationwide traffic fatality trends and, being retrospective, cannot be used to infer causality.

Future directions
Examine both fatal and non-fatal crash data
Analyze crash reports for involvement of cannabis, ethanol, or other psychoactive substances
Compare with overall traffic fatality trends and states where cannabis for adult use remains illegal.

<table>
<thead>
<tr>
<th>State</th>
<th>Opening Date</th>
<th>Data range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington</td>
<td>07/2014</td>
<td>48 months</td>
</tr>
<tr>
<td>Colorado</td>
<td>01/2014</td>
<td>48 months</td>
</tr>
<tr>
<td>Oregon</td>
<td>10/2015</td>
<td>36 months</td>
</tr>
<tr>
<td>Alaska</td>
<td>10/2016</td>
<td>24 months</td>
</tr>
</tbody>
</table>
Background

- Utah's opioid epidemic increased need for naloxone training to law enforcement and general public
- Developed 20 minute "Naloxone for Opioid Overdose 101" e-learning training
- Target audience: Public safety/first responders, general public
- Purpose: To decrease opioid overdose deaths by training laypersons how to use naloxone

Methods

- UPC CCTV team created initial storyboard
- Diverse community advisory board assisted in development and provided feedback
  - Police
  - Fire/EMS
  - Clinical pharmacy
  - Public health

- Training objectives
  - Describe what opioids are and how they work
  - Recognize the signs of an opioid overdose
  - Describe what naloxone is and how it works
  - Recognize when and how to use naloxone

- Bonus section: Describe Utah laws related to naloxone
- Included key content in plain language

Methods Continued

- Created and embedded 4 naloxone administration demonstration videos via YouTube
  - Narcan® nasal spray
  - Intramuscular injectable
  - Nasal atomizer
  - EV70® auto injector
- Target audience/subject matter experts pilot test
- Learners receive certificate of completion
- Optional short assessment survey
- Final training live June 10, 2019
- Training available:
  - Utah Department of Health website NALOXONE.UTAH.GOV/N-TRAINING
  - Public Health Foundation learning network TRAIN.ORG/MAIN/COURSE/1055643/
  - Utah Department of Public Safety, Peace Officer Standards & Training (POST) training management system (TMS) for Utah law enforcement personnel

Results

- 373 public safety officers have completed training through POST LMS March 12 - April 30, 2020 (portion are included in the 859 surveys responses)

<table>
<thead>
<tr>
<th></th>
<th>Utah</th>
<th>%</th>
<th>Outside Utah</th>
<th>%</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Law enforcement</td>
<td>169</td>
<td>38.24%</td>
<td>36</td>
<td>8.63%</td>
<td>205</td>
<td>23.86%</td>
</tr>
<tr>
<td>Health care professional (pharmacist, nurse, doctor, etc.)</td>
<td>22</td>
<td>4.98%</td>
<td>146</td>
<td>33.01%</td>
<td>168</td>
<td>19.56%</td>
</tr>
<tr>
<td>General public/responder</td>
<td>58</td>
<td>12.71%</td>
<td>57</td>
<td>12.87%</td>
<td>95</td>
<td>11.08%</td>
</tr>
<tr>
<td>Public health worker</td>
<td>23</td>
<td>5.20%</td>
<td>50</td>
<td>11.99%</td>
<td>73</td>
<td>8.52%</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td>36</td>
<td>8.60%</td>
<td>34</td>
<td>8.15%</td>
<td>70</td>
<td>8.28%</td>
</tr>
<tr>
<td>Substance use or mental health services provider</td>
<td>51</td>
<td>11.54%</td>
<td>15</td>
<td>3.60%</td>
<td>66</td>
<td>7.68%</td>
</tr>
<tr>
<td>Total</td>
<td>442</td>
<td>100.00%</td>
<td>417</td>
<td>100.00%</td>
<td>859</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

Table 1. Survey Question: What group best describes your role with opioid overdose response?

- "Naloxone for Opioid Overdose 101" training is broadly accessible to the public and public safety/first responders
- Free 24/7 internet-based training
- Survey has only been completed by a portion of individuals who have taken the training
- Majority of learners feel more prepared to administer naloxone after completing the online training
We present a case of *H. horridum* envenomation notable for syncope, hypotension, and bradycardia.

There is minimal literature on envenomation by *H. horridum* and bradycardia is rarely reported in envenomation by other *Heloderma spp.*

**CLINICAL PRESENTATION**

- A healthy 68 y/o man envenomed by a 21 y/o captive Mexican Beaded Lizard weighing 1817 grams
- Three syncopal episodes ~ 30 minutes after envenomation prior to EMS arrival with brief apneic period
- Upon EMS arrival was found awake, diaphoretic, hypotensive (80s/50s), and bradycardic (40s)
- Upon arrival to ED symptoms and vital signs had improved
- Reported sharp, burning, non-radiating pain (9/10) at bite site which subsided within 3 hours
- CBC, CMP, troponin, PT, CK, and EKG without acute change
- Discharged after overnight observation with a course of prophylactic antibiotics: complete resolution of symptoms by 1 week

**TREATMENT**

- Removal of lizard
- Supportive care for pain, hypotension, angioedema, and anaphylaxis
- Evaluation for retained foreign body
- Wound care

**DISCUSSION**

- There is minimal literature on envenomation by *H. horridum* and bradycardia is rarely reported in envenomation by other *Heloderma spp.*
- A previous case series of 70 bites contained only 1 documented case of bradycardia
- The patient’s hypotension and syncope can be explained by the vasodilatory effects of VIP agonists, GLP-1 agonists, and bradykinin
- VIP and GLP-1 agonists are typically considered to have positive chronotropic effects through increased cAMP
- Inhibition of Ca\(^{2+}\) channels in cardiac pacemaker cells by helothermine may be an explanation for the patient’s bradycardia

**REFERENCES**


The authors have no conflicts of interest to declare.
An Increase in Foraging Misadventures Associated with the COVID-19 Pandemic

Christine M. Stork, PharmD, DABAT, FAACT; Vincent Calleo, MD; Jeanna M. Marraffa, PharmD, MPH, DABAT, FAACT
Upstate New York Poison Center, Department of Emergency Medicine, Upstate Medical University, Syracuse, NY

Background

Each year, misadventures from foraging result in calls to poison centers and hospitalizations. During the spring months, Veratrum species are often mistaken for Allium tricoccum, commonly referred to as ramps or leeks. Veratrum alkaloids, commonly referred to as false hellebore, are thought to cause toxic effects by opening sodium channels resulting in cardio toxic effects. In the spring of 2020, during the height of the COVID-19 pandemic, our poison center appreciated an anecdotal increase in calls prompting this review.

Results

There were 30 plant exposure calls in 2020 compared to an average of 14 in the previous 5 years. See Figure 1 for exposures and coded outcomes. Of the 30 calls in 2020, 18 calls were Veratrum exposure calls, and 14 reported symptoms. In the previous 5 years, an average of 2.2 calls regarding Veratrum occurred. (Figure 1) In all Veratrum calls from 2015-2020, 24 calls reported clinical effects. The most common clinical effects coded were; gastrointestinal, 25%; bradycardia, 12%; hypotension, 9%; oral irritation, 9%. Others occurring in 7-8% of cases included hypoglycemia, mydriasis, and dizziness and vertigo.

Methods

Calls coded as plant exposure were abstracted from our data collection system from 3/14/2020 through 5/15/2020 and compared to the same time period from 2015 through 2019. From this dataset, Veratrum coded calls were analyzed separately with inclusion of clinical effects coded in symptomatic calls.

Discussion

Plant foraging exposures, and specifically Veratrum species exposures increased calls to our poison center in 2020 during the COVID-19 pandemic. We hypothesize this increase is due to more people staying home and subsequently foraging as a hobby.

Conclusions

Poison prevention messaging should include messages for foragers to prevent exposures during these times. After exposure, patients should be evaluated for common effects including gastrointestinal, bradycardia, hypotension, oral irritation, hypoglycemia, mydriasis, and dizziness and vertigo.
Background

AHLS courses throughout the world are conducted using a series of 4 tabletop simulations in order to further provide a case-based and more real-life experience within the basic course materials. We sought to determine if a FIT component would lead to greater participant satisfaction and subjective determination of how much knowledge was retained six months later.

Methods

During two administrations of the national AHLS course, a FIT simulation occurred substituting the noxious gas tabletop simulation. The remainder of the AHLS materials and tabletop exercises were unchanged from previous AHLS courses. Using an alternative location, a simulated live event took place, with all protective gear, decontamination materials, simulated and live moulage patients and simulated treatment materials. A 30 minute debrief session occurred after the FIT session.

Results

- 35 subjects participated in the FIT events. Each participant voluntarily agreed to be surveyed regarding the FIT session. Six months after each class, the students were contacted to determine how they perceived their knowledge and retention of the material and if the exercise benefited their retention.
- Prior to the class 33%-55% of the students perceived they were able to manage single or multiple HazMat patients.
- At the end of each class 89-100 percent of the students reported that they are better able to manage a HazMat patient, and they believed that the FIT was instrumental in their knowledge retention. This was as much as a 150% improvement.

Survey Results

<table>
<thead>
<tr>
<th>Question</th>
<th>Session 1 (Agree and Strongly Agree)</th>
<th>Session 2 (Agree and Strongly Agree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have had previous HazMat training?</td>
<td>66%</td>
<td>50%</td>
</tr>
<tr>
<td>Did that previous training have a hands-on component?</td>
<td>100%</td>
<td>66%</td>
</tr>
<tr>
<td>Prior to this class did you feel prepared to manage a HazMat patient?</td>
<td>55%</td>
<td>33%</td>
</tr>
<tr>
<td>Prior to this class, I thought I could provide patient care and protect myself when managing a HazMat Patient.</td>
<td>55%</td>
<td>33%</td>
</tr>
<tr>
<td>I feel prepared to handle a HazMat Patient at my work.</td>
<td>88%</td>
<td>83%</td>
</tr>
<tr>
<td>I think I can provide patient care and protect myself when managing a HazMat patient.</td>
<td>66%</td>
<td>100%</td>
</tr>
<tr>
<td>I believe the fully immersive simulation (FTX) can prepare me to manage a HazMat Incident.</td>
<td>89%</td>
<td>100%</td>
</tr>
<tr>
<td>I believe the FTX enhanced my learning of the didactic material.</td>
<td>78%</td>
<td>83%</td>
</tr>
<tr>
<td>I retained more of the didactic material than I expected.</td>
<td>89%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Conclusions

FIT training, when possible, should be incorporated into HAZMAT training programs.
RESULTS OF A TARGETED MEDIA OUTREACH TO LOW-UTILIZATION COUNTIES

Steverson, AC | North Carolina Poison Control

BACKGROUND
A regional poison control center (RPCC) observed a significant drop in calls among six counties in its coverage area. The decline in the six-county area was observed over a multi-year period with calls decreasing 23% on average from the previous year. The decrease in the six-county area was non-proportional to the RPCC's overall decline in calls, and the RPCC’s outreach and primarily allocates outreach funds to the largest markets of its territory. To reach sharp areas of decline, the RPCC launched a targeted year-long media outreach to the six low-utilization counties.

METHODS
Counties chosen for inclusion in the low-utilization outreach had greater than 100 calls per county annually and had experienced at least a 20% drop in contact volume from the previous year. Animated poison center awareness videos were created for two identical online media campaigns on Facebook. The campaigns were implemented in the six low-utilization counties as well as major designated market areas to provide a benchmark for analysis. Residents with a household income of less than $100,000 were targeted in both campaigns, and RPCC budgets for each campaign were the same ($1,100 per month). The campaigns ran online simultaneously for 12 months, and they were measured by video views, link clicks, post engagements, and shares. Monthly call volume to the RPCC was also assessed in the low utilization and major market areas both pre and post campaigns.

RESULTS
Low utilization and major market areas demonstrated a similar level of campaign activity and engagement. Residents in lower-utilization counties were as likely to view the animated videos as were residents of major designated market areas (139,161 lower-utilization video views/140,083 major market video views). In six months out of 12, video views in the low-utilization counties exceeded those in the major markets. Residents of lower-utilization counties were also nearly as likely (80%) to share campaign content as the major market group and were 66% as likely to click through an advertisement to the poison center website. During the calendar year of outreach, poison center contact volume in lower-utilization areas increased in five of the six counties from a range of 6-31% from the previous year when no media outreach was conducted.

CONCLUSIONS
The degree to which the campaigns influenced behaviors and poison center contact volume is unknown. However, this study demonstrated comparable interaction rates between residents in lower-utilization counties and residents in major market areas. Residents in lower-utilization areas were as likely or nearly as likely to act on a campaign advertisement as residents in the major market areas. Lower-utilization counties in this study were also rural counties, suggesting that rural residents can benefit from an online outreach. Targeting lower-utilization areas of a poison control center territory can be an effective outreach strategy. More research is needed to determine the long-term effects of a lower-utilization county outreach.
DEVELOPING TAGLINES AND MESSAGING TO PROMOTE THE POISON CONTROL BRAND

Steverson, AC¹ | Stephan, WB²

¹North Carolina Poison Control | ²Florida Poison Information Center–Miami

BACKGROUND

Poison control centers nationwide face public awareness challenges. While promotion is often handled on an individual center basis, there is little research to guide poison centers in their branding and messaging efforts. A study was undertaken to solicit qualitative input from the public that could shape priority messages and help establish a tagline for poison control. The tagline would reflect the service characteristics most valued by participants and promote a call-to-action for the public that encourages poison control utilization.

METHODS

Participants were recruited throughout the territory of two regional poison control centers, and they were asked to evaluate various taglines relating to poison control. Fifty-nine people participated in four online focus groups, and respondents were segmented by age: 47% were aged 19-34, 53% were aged 35-74.

Participants were English-speaking residents of urban counties, two-thirds (66%) of which were female. Participants’ self-reported race/ethnicity was 58% white, 25% black, and 17% Hispanic. Just over half of respondents (53%) reported having a college or post-college degree. Eight taglines (five primary and three secondary) were tested across the four groups to determine the importance level of various poison control service characteristics including convenience, speed of response, expertise, cost-effectiveness, and overall value.

RESULTS

Speed of response was the characteristic most highly rated by participants. The tagline “When seconds count” was chosen as the leading tagline by nearly half of respondents (45%). Three primary reasons were given for participants’ preference: the tagline plainly communicated that poison control was the place to contact for suspected poison emergencies, it elicited a strong emotional appeal, and it embodied a concise, clear, and memorable message. Particularly, “When seconds count” had a notably stronger appeal with the older cohort. Otherwise, responses were remarkably similar across geographic areas. Overall, about 40% of participants demonstrated an unclear or inaccurate understanding of what poison control centers do or how they benefit the public. Participants suggested improving awareness through mass media campaigns. After a brief overview of poison center services at the conclusion of the study, participants reported a high likelihood to utilize poison control, with an overall rating of 4.2 out of 5.

CONCLUSIONS

Beyond identifying a preferred tagline, qualitative insight from participants indicated barriers that prohibit poison control utilization including:

1. a lack of understanding about how poison control responds to poison emergencies;
2. a lack of familiarity with the 1-800-222-1222 number;
3. the belief that 911 is the best choice in a suspected poisoning.

Participants clearly regarded suspected poisonings as emergencies. They recommended easier access to poison control services either by integrating poison control with 911 or establishing a memorable 3-digit number. Participants in this study reported a likelihood to utilize poison control services after being introduced to an appropriate tagline and receiving education about poison control. However, a tagline alone is unlikely to overcome many pre-existing barriers that prevent people from contacting poison control. Further public education and greater awareness of poison control centers are suggested to complement a tagline for poison control.

AGE GROUP | GENDER | RACE/ETHNICITY | EDUCATION
--- | --- | --- | ---
19-34 yrs | 34% | 46% | 24% | 58% | 53% | 47% | 46% | 44% | 54% | 53% | 51% |
35-74 yrs | Female | Male | White | Black | Hispanic | College or post-college degree | Some college or less

PRIMARY TAGLINES TESTED

| POISON CONTROL BRAND | PRIMARY TAGLINES |
--- | ---
Steverson, AC¹ | The experts doctors trust |
Stephan, WB² | Help at your fingertips |

POST-TAGLINE STUDY: How likely would you be to call the poison control 800 number if you thought someone might be poisoned?

“I am more likely after this study, but still not sure if calling 911 would be more direct and faster acting in an immediately pressing medical situation where those seconds do matter.” Nicole B, 34

“[If I knew that the poison control number provides emergency services I would call for sure. If I did not know that, I would not call].” Melissa E, 47

“[If I knew that they are quicker than 911, I would use them].” Norva C, 40

“I would call the number if I had access to the number, 911 is just so quick and it’s in my brain.” Denise C, 45

“It would be helpful if the number would be easy such as 911.” Lisa P, 44

“Poisonings can be very stressful and scary and I might revert back to what I know which is 911.” Anais T, 20

“[After this study] I have been very informed on the benefits of calling the poison hotline. I do believe that if someone knows or myself has been poisoned I would be very likely to call this number because I am now aware that there are experts waiting to help with your specific poisoning g.” Yasmine D, 83

“[If I knew the number or had it easily accessible, then I would definitely call it].” Otherwise, I would contact 911.” Jennifer F, 20

“Otherwise, I would contact 911 first.” Jennifer F, 20

“It would take a bit of advertising and proven results to let me know that 911 isn’t my best option.” David V, 46

Poster design and printing by Blazon Productions, LLC
Counties with High Hispanic Concentration Show Elevated Risk for Death and Hospitalization from Poisoning

Wendy Stephan, PhD MPH CHES & Matthew Gribble, PhD

Objectives: To assess the associations between county-level % Hispanic population and poisoning death rates and hospitalization rates, after adjusting for potential confounding factors including poverty, age, urban/rural status and opioid sales.

Methods: Data on poisoning deaths and hospitalizations were collected by the Florida Department of Health and demographic data were pulled from the American Community Survey for the 67 counties of Florida over the period 2010-2015. Counties were dichotomized into high vs. low % Hispanic population based on the statewide mean of 11.9% Hispanic. Opioid sales data were drawn from the Florida Prescription Drug Monitoring Program and were categorized by quartile. We modeled incidence rate ratios (IRR) using a mixed-effects Poisson regression with county-level random intercepts and random slopes on year. The model for death outcomes included fixed-effect adjustment for year, year^2, median age, % poverty, urban/rural status, and opioid sales. The model for hospitalization included fixed-effect adjustment for year, year^2, median age, calls to poison centers, urban/rural status and opioid sales. For the hospitalization study, a separate sub-analysis was conducted using counties with greater than 10,000 residents (N=40) that included the % uninsured, in addition to the covariates already listed.

Results: Conditional on the random effects and after adjusting for the factors noted, high % Hispanic counties were found to have higher incidence rates of poisoning death (IRR 1.50, 95% confidence interval [1.18, 1.92]) and hospitalization (IRR 1.26, 95% confidence interval [1.06, 1.50]) compared to low % Hispanic counties. The sub-analysis which included % uninsured generated a lower incidence rate ratio of 1.20 (95% confidence interval [1.04, 1.38]), conditional on the random effects and after also adjusting for year, year^2, median age, calls to poison centers, urban/rural status and opioid sales.

Conclusions: These county-level results are in the opposite direction of unadjusted incidence data that describe lower death and hospitalization rates among Hispanic individuals in Florida and the U.S. One possible explanation for this discrepancy is that the poisoning events in high % Hispanic counties, after accounting for county-level attributes and random effects, could be occurring more often in non-Hispanic individuals residing in these counties. This is consistent with other research on “despair deaths” among older white populations in communities with changing demographics. These results may indicate that areas with larger minority populations warrant extra poison and drug abuse prevention attention from poison control centers and other public health agencies. These results must be interpreted with caution since ecological data cannot be used to definitively assess individual-level behavior, which was not measured in this study.
The gold standard for detecting ethanol is blood testing. Breath testing is faster, less expensive, and less invasive than blood testing. Accuracy of breath testing has been debated. It is unknown if perceived breath effort during a breath test impacts accuracy.

**Research Question**

Does perceived "poor" effort during breath ethanol testing result in worse correlation with blood testing on the same patient compared with "normal" effort breath testing?

**Methods**

- Retrospective, single ED, 3 year period
- Subjects identified with the following done within a single hospital encounter: blood ethanol test, breath ethanol test, and breath test effort documented as either "poor" or "normal"
- 2 groups: breath test and blood draw within 120 minutes of one another, breath and blood within 30 min of one another
- Analysis done comparing breath with blood tests within each group, and comparing difference of breath and blood variance between "poor" and "normal" effort within each group
- Breath tests done using Alco-Sensor FST and blood tests done using Architect c8000

**Results**

- 1704 subjects, 593 (under 120 minutes between breath and blood) and 108 (under 30 minutes)
- 120 minute group:
  - 593 subjects (327 normal effort, 266 poor)
  - No time spread difference between groups
  - Median difference between breath and blood was 0.046 gm/dL (IQR 0.075, p<0.0001)
  - Median difference between breath and blood in normal effort group (0.033) and poor effort (0.067) was significant (p<0.0001)
- 30 minute group:
  - 108 subjects (66 normal effort, 42 poor)
  - No time spread difference between groups
  - Median difference between breath and blood was 0.045 gm/dL (IQR 0.079, p<0.0001)
  - Median difference between breath and blood in normal effort group (0.033) and poor effort (0.074) was significant (p<0.0006)

**Discussion**

Investigators wanted to capture the clinical scenario of someone approaching the ordering provider and saying “they blew a 0.09...but it was really poor effort” to see if that comment is meaningful.

According to these data, the insinuation in that comment is meaningful to the accuracy of the test. Additionally, even in the normal effort group the breath ethanol differed from the blood ethanol.

The time difference between breath and blood testing was skewed equally on both sides and accounted for during the analysis.

**Conclusion**

- Retrospective study looking at breath ethanol testing accuracy and whether perceived breath effort impacts that accuracy
- There was a significant difference between breath and blood ethanol levels
- There was a greater difference between breath and blood ethanol levels with poor breath effort as opposed to normal
Phenibut Withdrawal Requiring Escalating Doses of Baclofen and Phenobarbital
Priya Srihari¹,², Binh Ly¹,²

¹Department of Emergency Medicine, ²Division of Medical Toxicology, Univ. of California San Diego

BACKGROUND
• β-phenyl-γ-aminobutyric acid, or Phenibut, is a γ-aminobutyric acid subtype B (GABA-B) agonist
• It is easily purchased online as a supplement, marketed as a treatment for anxiety or for nootropic effects
• Withdrawal is similar to withdrawal from GABA-A agonists however is often resistant to traditionally used medications such as benzodiazepines
• Baclofen, a GABA-B agonist that is structurally similar to phenibut, has been anecdotally used to treat phenibut withdrawal, however regimens reported vary widely

CASE REPORT
• A 24-year-old male presented to the Emergency Department (ED) with palpitations, shortness of breath, and anxiety
• He was tachycardic, diaphoretic, and extremely anxious on examination
• He had previously been on zopiclone to treat insomnia and had purchased phenibut online to prevent withdrawal from this
• He was using 2-3 grams of phenibut per day for 1 week
• His last use was 48 hours prior to arrival, and he had not experienced withdrawal symptoms prior to his presentation to the ED
• He initially required 2 mg of lorazepam, 130 mg of baclofen, and 780 mg of phenobarbital over 6 hours to control symptoms
• He continued to require doses of baclofen (40 mg at a time) and additional doses of phenobarbital while in the hospital to manage his symptoms
• He was ultimately discharged on a 15 day taper of baclofen

DISCUSSION
• Phenibut dependence can occur after a short period of use
• Withdrawal is clinically similar to GABA-A agonist withdrawal
• Baclofen can be used to treat GABA-B agonist withdrawal, however reported regimens are from case reports and vary widely
• In highly resistant cases, such as this one, a combination of GABA-A agonists and GABA-B agonists can be useful

CONCLUSIONS
• Phenibut withdrawal can be challenging to manage as it is often resistant to traditional medicines such as benzodiazepines
• A combination of GABA-A agonists and GABA-B agonists can be used in resistant cases, however careful monitoring and reassessment is needed
Hydroxychloroquine Overdose: Correlating a Serum Level to Clinical Manifestation

Nguyen Vu, PharmD, Bryan Wilson, MD, Jaiva Larsen, MD

Hydroxychloroquine (HCQ) is used to treat malaria and other autoimmune disorders. Documented HCQ overdose is rare but still carries a severe prognosis and mortality. The association between HCQ levels and clinical toxicity in overdoses is not well established. Through this case report, we aim to:

- Further characterize clinical manifestation of HCQ poisoning
- Evaluate the utility of obtaining HCQ levels

HALLMARK OF HCQ OVERDOSE
Rapid deterioration followed by ventricular dysrhythmias and cardiovascular collapse

TOXIC PLASMA LEVELS
- Severe HCQ poisonings have been described with \[\text{[HCQ]}_{\text{plasma}}\] between 0.64 and 9.87 mg/L.1
- Interestingly, therapeutic blood level is 0.5 – 2 mg/L.
- De Olano et al.:2
  - \[\text{[HCQ]}_{\text{plasma}}\] = 28 mg/L (about 2x[HCQ]_{\text{plasma}})3
  - Following overdoses: \(C_{\text{max}} = 3 \text{ – 12 hrs, }T_{1/2} = 11.6 \text{ – 31 hrs}
- Even though the lethal [HCQ] are not well established, decreased in drug concentration over time correlates with clinical improvement.

\[\text{[HCQ]}_{\text{plasma}} = 0.64 \text{ mg/L – 14 mg/L}\]

CASE REPORT
A 16-year-old girl presented with stupor and hypotension after ingestion of unknown amount of prednisone, ibuprofen, melatonin, and HCQ

<table>
<thead>
<tr>
<th>Time from TOI – location</th>
<th>Presentation</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 hours – EMS/ED</td>
<td>GCS 11</td>
<td>IVF boluses</td>
</tr>
<tr>
<td>116.9 kg</td>
<td>HR 87 bpm, BP 68/48 mmHg, RR 20 br/min, O₂ Sat 87%, Temp 35.4°C</td>
<td>Intubation</td>
</tr>
<tr>
<td>5 hours – ED/PICU</td>
<td>BP 68/40</td>
<td>Norepinephrine 15 mcg/min</td>
</tr>
<tr>
<td></td>
<td>ECG: HR 85 bpm, QTc 430 ms, QRS 106 ms; borderline intraventricular conduction delay, borderline T-wave abnormality</td>
<td>Diazepam IV bolus 1 mg/kg per IBW followed by infusion of 1 mg/kg over 24 hours</td>
</tr>
<tr>
<td></td>
<td>VBG: pH 7.37, PCO₂ 38, CO₂ 22</td>
<td>Magnesium sulfate 2 g IV</td>
</tr>
<tr>
<td></td>
<td>K 3.6</td>
<td>50 mEq sodium bicarbonate</td>
</tr>
<tr>
<td></td>
<td>Serum [HCQ] 2.7 mg/L (High Performance Liquid Chromatography/Tandem Mass Spectrometry, 17-day turnaround time)</td>
<td></td>
</tr>
</tbody>
</table>

12 hours – PICU
- ECG: HR 85 bpm, QTc 514 ms, QRS 114 ms; unspecified intraventricular conduction delay
- Mg 1.9, K 3.5
- Serum [HCQ] 2.7 mg/L

12 hours – PICU
- ECG: HR 85 bpm, QTc 514 ms, QRS 114 ms; unspecified intraventricular conduction delay
- Mg 1.9, K 3.5
- Potassium chloride 30 mEq IV

22 hours – PICU
- BP 114/53, MAP 68
- ECG: HR 91 bpm, QTc 474 ms, QRS 98 ms; sinus rhythm
- Norepinephrine 3 mcg/min

32 hours – PICU
- BP 129/64, MAP 80
- Norepinephrine discontinued
- Extubated

48 hours – floor status
- GCS 15
- HR 78 bpm, BP 116/71, RR 20 br/min, O₂ Sat 87% on 0.5 L/min
- Psychiatry consultation pending

REFERENCES

CONCLUSION
- HCQ poisoning was successfully treated with supportive care and high dose diazepam.
- The patient had moderate to severe toxicity at [HCQ]_{plasma} = 2.7 mg/L.
- Obtaining [HCQ] at many institutions has limited utility in clinical practice.
- We added to the current pool of evidence in the effort to correlate specific level to clinical presentation.
- As HCQ has been popularized as a potential therapy for COVID-19, albeit without confirmatory clinical evidence, this case emphasizes the importance of early recognition and treatment of this detrimental toxicity.

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TREATMENT EMPHASIS
Early intubation
High dose diazepam
Pressor support

Successful Use of Buprenorphine/Naloxone in the Treatment of Tianeptine Withdrawal

Edgar JW1, Rivera JV, Rushton W1,2,3
1. Department of Emergency Medicine, University of Alabama at Birmingham
2. Office of Medical Toxicology, University of Alabama at Birmingham
3. Alabama Poison Information Center, Children’s of Alabama

Background

- Tianeptine is also known as “Tianna,” “Red Dawn,” or “Za-Za,” and is an atypical synthetic antidepressant.
- Tianeptine is readily available in local gas stations and convenience stores across the country but is not currently regulated by the Food and Drug Administration (FDA).
- Tianeptine abuse poses an increasing public health risk in the United States [1,2].
- Withdrawal from tianeptine can be severe given its strong activity at the mu opioid receptor.
- Buprenorphine/naloxone can be used successfully in the treatment of tianeptine withdrawal.

Previous Studies on Therapies Used In Tianeptine Toxicity

- Fluids 35.1%
- Benzodiazepines 27.2%
- Oxygen 10.5%
- Naloxone 9.7%
- Sedation 9.7%
- Antiemetics 4.1%
- Ventilator support 4.1%
- Antihistamine 2.6%

Case Summary

- A 35-year-old female with past medical history of depression and opioid use disorder presented with severe anxiety.
- She reported having obtained tianeptine from a local gas station and consuming 30 pills a day in order to wean off opioids.
- She further reported an abrupt cessation of tianeptine and clonazepam use approximately 36 hours prior to arrival.
- Vital signs on arrival were remarkable for BP 138/57 mmHg and sinus tachycardia to 105 beats/min.
- Arrival EKG showed QTc 425 msec and QRS 102 msec.
- Physical exam was notable for vomiting, mydriasis, facial flushing and tachypnea.
- Due to severe symptoms, she was admitted for further management.

Discussion

- Tianeptine withdrawal is characterized by agitation, tachycardia, hypertension, anxiety, diaphoresis, and tremors.
- As depicted above, benzodiazepines have classically been the predominant agent of choice for treating withdrawal symptoms.
- Until now, treatment of withdrawal with opioid agonists had been primarily anecdotal as few cases of successful use were previously found in the literature [3].
- This case highlights a patient who demonstrated temporal improvement in symptoms after initiation of buprenorphine/naloxone for the treatment of tianeptine and benzodiazepine withdrawal and adds to the limited body of literature of temporal improvement of tianeptine withdrawal symptoms when using buprenorphine/naloxone.
- Further research is needed on use of buprenorphine/naloxone in the treatment of tianeptine withdrawal but health care providers could consider initiating treatment in patients who are not responding to benzodiazepines.

References

Emergency Provider Practices and Attitudes Around Naloxone Prescribing

D. Li, A. Zosel1,2, J. Hernandez-Meier1

Medical College of Wisconsin Department of Emergency Medicine1, Wisconsin Poison Center2

Background

• Opioid-related mortality has risen nationally in the past 2 decades and Emergency Department (ED) visits related to opioid abuse and overdose have become more frequent.
• Naloxone reverses opioid overdose, but only 1.5% of patients at high risk of opioid overdose are prescribed naloxone in a recent study.
• ED providers are in a unique position to identify and treat patients with opioid overdoses, opioid use disorders and opioid-related injuries.

Objective

• Characterize ED providers naloxone-prescribing behaviors and identify perceived barriers to naloxone-prescribing.

Methods

• A survey consisting of multiple choice, free response, and Likert scale questions was created using Qualtrics and administered via email to physicians and advanced care providers in one urban academic ED.
• Descriptive statistics were performed.

Results

- I HAVE PRESCRIBEDNALOXONE FROM THE EMERGENCY DEPARTMENT IN THE PAST
  - Yes 58%
  - No 42%

- Patients would benefit from greater access to naloxone
  - Agree 92%
  - Disagree 8%

- I am open to prescribing naloxone
  - Agree 94%
  - Disagree 6%

- Response rate was 29% (36/124)
  - 25 males (69%) and 11 females
  - 27 attending physicians, 7 residents, and 2 physician assistants.
  - All agreed that naloxone is effective in reversing opioid overdose.
  - The majority (58%) had prescribed naloxone from the ED in the past.

Discussion

- Increased naloxone availability has been shown to be associated with decreased opioid-related mortality. Yet, a range of experience and beliefs exist among ED providers regarding the practice of prescribing naloxone.
- Although most ED providers indicated willingness to prescribe naloxone and agree that patients would benefit from greater access, many have not prescribed from the ED and there exists concerns among providers that increased naloxone prescription may increase risky opioid-use behavior and morbidity/mortality.
- Logistical barriers to prescribing naloxone: Participants acknowledged the lack of time that is necessary to educate patients about proper naloxone use during a clinical encounter.
- Sample population limited to one urban academic medical center.
- More information is needed to gauge the impact of individual barriers to prescribing naloxone, but our findings may inform education efforts for about the impact and benefits of greater naloxone availability.

Conclusion

- Although most ED providers that responded to our survey are open to naloxone prescribing for patients with high-risk opioid use, logistical barriers and variability in provider beliefs and prescribing practices exist.

Acknowledgements

Funding was provided by Dr. Richard Dart through the WMS Foundation Summer Fellowship Program.
Role of Respiratory Symptoms in Assessing Risk for Serious Outcome Among Children Who Accidentally Ingest Liquid Laundry Detergent Packs

Jonathan Colvin, Saundra Minge, Alysha Behrman, Shan Yin; Cincinnati Children’s Drug & Poison Information Center, USA
Kersi Vasunia, Kazue Takeuchi; The Procter & Gamble Company, USA

Background

• Following the introduction of Single Use Liquid Laundry Detergent Packs (LLDPs) in the U.S., a prospective observational study was initiated among 12 US poison centers (PCs) serving 24% of the total US population

• Although a significant proportion of exposure cases are managed in a healthcare facility (HCF), accidental ingestions involving young children rarely result in serious injury

• We seek to further investigate the role of respiratory symptoms in accessing risk for serious injury among young children who unintentionally ingest an LLDP

Methods

Case Selection

• LLDP exposure cases involving young children (aged < 6 years) who ingested the product were extracted from the ongoing prospective study database

• Case selection was limited to years 2016-2019. During this period, the proportion of accidental LLDP ingestion cases associated with a moderate or major outcome was consistent across the entire product category and did not reflect product/brand-specific variation

• Multi-route exposures involving clinical effects that were limited to an ocular or dermal route of exposure were excluded from analysis

Data Management & Analysis

• The exposure narrative was reviewed to verify the accuracy of coded data (clinical effects, therapies, medical outcome, management site) as well as information pertinent to the clinical course of the patient (i.e. labs, diagnostic procedures, duration and severity of clinical effects)

• Coding discrepancies involving a moderate or major medical outcome were reconciled with the contributing poison center

• Cases involving a moderate or major outcome were classified as “Serious” for purposes of this analysis

• Descriptive analysis was performed on absolute case counts and relative proportions

Results

Table 1

<table>
<thead>
<tr>
<th>Management Site</th>
<th>Age (Years)</th>
<th>Non-HCF</th>
<th>HCF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site</td>
<td>&lt;1</td>
<td>389 (7.0)</td>
<td>287 (3.3)</td>
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<tr>
<td></td>
<td>1</td>
<td>1604 (31.2)</td>
<td>669 (8.1)</td>
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<td></td>
<td>2</td>
<td>1688 (32.9)</td>
<td>666 (8.0)</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>1188 (23.0)</td>
<td>333 (4.3)</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>456 (7.2)</td>
<td>151 (1.2)</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>181 (2.7)</td>
<td>41 (0.4)</td>
</tr>
<tr>
<td>Total (N=4)</td>
<td></td>
<td>17 (0.3)</td>
<td>6 (0.1)</td>
</tr>
</tbody>
</table>

Serious Cases Lacking Respiratory Symptoms

- Among the 15 patients who did not experience respiratory symptoms, roughly half (n=8) were escalated due to concern for persistent vomiting and dehydration and 9 received endoscopy with findings described as ‘mild’ (n=4) or ‘normal’ (n=5)

- One (1) patient was described as ‘listless’, however recovered within 8 hours of receiving IV fluids and food

Clinical Effects & Diagnostic Findings

Most Commonly Reported Symptoms

- Vomiting (67.1%), Cough/choke (18.2%), Drowsiness/lethargy (9.2%), Excess secretions (5.8%), Diaphoresis (5.7%)

- Oral irritation (3.3%), Nausea (3.3%), Other Respiratory (3.0%), Abdominal Pain (2.2%), Rash (2.2%), Rhynothema/lushid (1.3%), Fever/notremperature (1.6%), Agitated/irritable (1.4%), Ocular - Irritation/pain (1.0%)

- The majority of serious cases involving a moderate or major outcome were attributed to respiratory symptoms (n=2463, 69%)

- Among the patients who were managed in an HCF (n=236), most (69%) did not consult the regional poison center prior to arrival

Conclusions

• Young children who lacked respiratory symptoms after ingesting an LLDP product were unlikely to experience serious injury

• Given the relative high proportion of children who are managed in an HCF, additional efforts to ensure the regional poison center is consulted by the caregiver prior to seeking emergency medical assistance are needed

Acknowledgements

Poison Center Study Sites
• Arizona Poison and Drug Information Center
• Central Ohio Poison Center
• Children’s Hospital of Philadelphia Poison Center
• Georgia Poison Center
• Hennepin Regional Poison Center
• Michigan Regional Poison Control Center
• Northern New England Poison Center
• Rocky Mountain Poison and Drug Center
• Utah Poison Control Center
• Washington Poison Center

Study is funded by the Procter & Gamble Company.
# Implications of Nicotine’s Postmortem Redistribution Post Fatal E-Liquid Ingestion

Masha Yemets, PharmD; Howell Foster, PharmD, DABAT; Pam Hill, PharmD

Arkansas Poison and Drug Information Center, University of Arkansas for Medical Sciences College of Pharmacy

## Introduction

Postmortem redistribution (PMR)
- alteration of drug concentration that occurs after death
- may occur in many substances
- is not an exact science
- higher central to peripheral blood concentrations have been used to predict the occurrence
- mechanisms postulated to affect this phenomenon include passive diffusion, cell lyses, acidification, and putrefaction
- factors that may also contribute are physiochemical properties of a substance, temperature, body position, route of exposure and when the samples were collected
- blood concentrations of drugs that have been collected after death may be misleading

## Case Summary

- A 17-month-old male was found to be unresponsive, cyanotic and in asystole.
- CPR was performed in route to the hospital, and multiple doses of epinephrine were administered upon arrival to the ED.
- The child had e-liquid around his mouth and covering his hands, as well as spilled on the floor.
- The near empty bottle of e-liquid contained 18 mg/mL of nicotine and was 16.5 mL in volume.
- The time of exposure and amount ingested were both unknown.
- The toxicology analysis used LC-MS and showed that the child had nicotine and caffeine blood levels of 0.3 mg/L and 0.222 mg/L, respectively.
- The sample source was whole blood via the subclavian artery approximately 14 hours after the pronounced time of death.

## Discussion

- Although lethal concentrations of nicotine can vary greatly, the low peripheral blood concentration of this patient raised questions concerning the cause of death.
- Since transdermal absorption is possible with e-liquids, it is plausible to assume that there was some dermal absorption from the child’s hands that could have elevated the blood concentration.
- One liquid nicotine overdose showed that the heart, kidneys, and lungs may be sites of redistribution. These had higher nicotine concentrations than the peripheral blood postmortem.
- Nicotine levels post fatal intoxications have shown that the cardiac concentrations have been about 3 times greater than that of femoral concentrations, aside from one report.
- The central nicotine concentration for this patient was not obtained, making it difficult to extrapolate the amount of PMR that could have occurred. This phenomenon would help to explain the discrepancy between the nicotine level and the proposed cause of death.
- PMR of nicotine is not very well documented. Further quantitative analysis needs to be gathered to provide evidence of the extent of PMR.

## Various Literature Reported C/P Postmortem Nicotine Concentrations Following Nicotine Overdoses

<table>
<thead>
<tr>
<th></th>
<th>Femoral</th>
<th>Cardiac</th>
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<tbody>
<tr>
<td>5.5 mg/L</td>
<td>136 mg/L</td>
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<tr>
<td>0.46 mg/L</td>
<td>1.4 mg/L</td>
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</tr>
<tr>
<td>0.71 mg/L</td>
<td>1.9 mg/L</td>
<td></td>
</tr>
<tr>
<td>0.31 mg/L</td>
<td>0.19 mg/L</td>
<td></td>
</tr>
</tbody>
</table>

## References

Trends in Intentional Substance Abuse by Adolescents Aged 11-18 Reported to US Poison Centers from 2013-2018

Sawyer J Wylie, Amberly R Johnson
Utah Poison Control Center, College of Pharmacy, University of Utah, Salt Lake City, Utah

Results

Background
- Intentional substance abuse by adolescents is common, can have serious consequences, and includes a wide variety of substances
- Previous literature published in 2013 focused on Rx and OTC intentional abuse exposures reported to US Poison Control Centers (PCCs)
- This study describes the trends in demographics, substance(s), and medical outcomes of intentional substance abuse exposures by adolescents aged 11-18 reported to PCCs

Methods
- Study period: 2013-2018
- Data analyzed: Retrospective review of intentional substance abuse exposures by adolescents aged 11-18 years old reported to PCC’s
- Exclusion criteria: Medical outcomes “Confirmed non-exposure” and “unrelated effect”

Results
- Total exposures: 64,131
- Average number of substances per exposure: 1.3 (SD 0.73)
- Patient age in years (mean ± SD; median ± IQR): 15.8 ± 1.6; 16 ± 15-17
- Female patients: 36.4%
- Benzodiazepines were the most common substances abused during the study period (Table 1)
- The most common substances used for intentional abuse were relatively consistent across years (Table 1)
- Benzodiazepines were the most common substances abused during the study period (Table 1)

Results Continued
- Fatalities reported: 141 (direct and indirect)
- Most common single substance exposures resulting in death:
  - fentanyl [prescription] (n=14, 0.02%)
  - hallucinogenic amphetamines (n=9, 0.01%)
  - miscellaneous unknown drugs (n=6, 0.009%)
  - ethanol [beverages] (n=5, 0.008%), and heroin (n=5, 0.008%)

Graph 1: Top Ten Substances per Year

Table 1: Most Common Substances

<table>
<thead>
<tr>
<th>Generic Code Name</th>
<th>Quantity</th>
<th>Percent</th>
</tr>
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<tbody>
<tr>
<td>Benzodiazepines</td>
<td>5594</td>
<td>8.7</td>
</tr>
<tr>
<td>Ethanol (Beverages)</td>
<td>5163</td>
<td>8.0</td>
</tr>
<tr>
<td>Dextromethorphan Preparations [Not Otherwise Classified]</td>
<td>4725</td>
<td>7.4</td>
</tr>
<tr>
<td>Marijuana: Dried Plant</td>
<td>4346</td>
<td>6.8</td>
</tr>
<tr>
<td>Synthetic Cannabinoids, Analogs and Precursors</td>
<td>3735</td>
<td>5.9</td>
</tr>
<tr>
<td>Obsolete: Antihistamine and/or Decongestant with Dextromethorphan without Phenylpropanolamine</td>
<td>3136</td>
<td>4.9</td>
</tr>
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</table>

Table 2: Most Common Non-Drug Substances

<table>
<thead>
<tr>
<th>Generic Code Name</th>
<th>Quantity</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freon and Other Propellants</td>
<td>794</td>
<td>1.2</td>
</tr>
<tr>
<td>Atypical Antipsychotics</td>
<td>689</td>
<td>1.1</td>
</tr>
<tr>
<td>Methamphetamine</td>
<td>683</td>
<td>1.1</td>
</tr>
<tr>
<td>Acetaminophen with Hydrocodone</td>
<td>675</td>
<td>1.1</td>
</tr>
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</table>

Conclusion
- The most common substances involved in adolescent intentional abuse exposures reported to US PCCs included benzodiazepines, dextromethorphan preparations [not otherwise classified], and ethanol [beverages]
- As patient age increased, exposures to non-drug substances decreased and exposures to pharmaceuticals increased
- As patient age increased, medical outcomes increased in severity
- Fatalities reported: 141 (direct and indirect)
  - Most common single substance exposures resulting in death:
    - fentanyl [prescription] (n=14, 0.02%)
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<td>794</td>
<td>1.2</td>
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<td>Hand Sanitizer: Ethanol Based</td>
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<td>Plants: Hallucinogenic</td>
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<td>Mouthwashes: Ethanol Containing</td>
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<td>0.34</td>
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<td>Rubbing Alcohols: Isopropanol without Methyl Salicylate</td>
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<td>0.23</td>
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<tr>
<td>Simple Asphyxiants</td>
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<td>0.22</td>
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<tr>
<td>Plants: Anticholinergic</td>
<td>122</td>
<td>0.19</td>
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<tr>
<td>Other Non-Drug Substances</td>
<td>112</td>
<td>0.17</td>
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- Female patients: 36.4%

- Benzodiazepines were the most common substances abused during the study period (Table 1)
- The most common substances used for intentional abuse were relatively consistent across years (Graph 1)
- Exposures that included a non-drug substance: 5,217 (8.1%)

- Of the top 30 substances, non-drug substances were involved in more than 20% of exposures in patients 11 and 12 years old (28%, 20% respectively) compared to less than 10% in patients 14 years and older

- “Moderate effect” was the most common medical outcome
- Most common outcome for ages 11-13 years old was minor effect (range 28.1-33.8%)  
  Most common outcome for ages 16-18 years old was moderate effect (range 34.3-36.5%)

- Fatalities reported: 141 (direct and indirect)
  - Most common single substance exposures resulting in death:
    - Fentanyl (prescription) (n=14, 0.02%)
    - Hallucinogenic amphetamines (n=9, 0.01%)
    - Miscellaneous unknown drugs (n=6, 0.009%)
    - Ethanol (beverages) (n=5, 0.008%), and heroin (n=5, 0.008%)

Conclusion

- The most common substances involved in adolescent intentional abuse exposures reported to US PCCs included benzodiazepines, dextromethorphan preparations (not otherwise classified), and ethanol (beverages)
- As patient age increased, exposures to non-drug substances decreased and exposures to pharmaceuticals increased
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Graph 1: Top Ten Substances per Year

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<tbody>
<tr>
<td>Benzodiazepines</td>
<td>5,594</td>
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<td>Ethanol (beverages)</td>
<td>5,163</td>
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<tr>
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<td>4,725</td>
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<tr>
<td>Marijuana: Dried Plant</td>
<td>4,346</td>
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<td>Synthetic Cannabinoids, Analogs and Precursors</td>
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<tr>
<th>Table 2: Most Common Non-Drug Substances</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>Alcohol</td>
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<td>Caffeine</td>
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<td>Tea</td>
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<td>Mouthwash: Ethanol Containing</td>
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<td>Rubbing Alcohol: Isopropylalcohol with Methyl Salicylate</td>
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<td>Simple Aspirinsects</td>
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<td>710</td>
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</table>
MANAGEMENT OF SEVERE CHILDHOOD LEAD POISONING: USEFULNESS OF MONITORING ZINC PROTOPORPHYRIN (ZPP) DURING CHELATION THERAPY

Marissa Hauptman1,2, Bryan Stierman1,2, Benjamin Yarsky3, Hema Pingali1,2, Maritha Du2,5, Al Ozonoff1,4, Alan D. Woolf1,2,3

1Harvard Medical School, Boston MA; 2Pediatric Environmental Health Center 3Dept of Medical Education 4Division of Infectious Diseases, all at Boston Children’s Hospital; 5Boston College Boston, MA

METHODS: EMR reviewed for children hospitalized with vBLL > 45 mcg/dL between 2005-2017. Relationship between lead biomarkers and days from initial vBLL or ZPP to outcome of vBLL < 20 ug/dL (DTO) and ZPP < 70 umol assessed. CHELATION: - dimercaprol (BAL), calcium disodium edetate (CaNa2EDTA), dimercaptosuccinic acid (DMSA), d-penicillamine (dPEN). To count as course of oral chelation, patient completed > 1 wk

STATISTICS: MATLAB (Mathworks, Inc., Natick, MA). Summary stats compared using z-score or Wilcoxon rank sum; Kaplan-Meier (K-M) Analysis (STATA); alpha set at 0.05

IRB: approved by BCH.

RESULTS: DTO on K-M correlated: initial BLL, # chelation courses, autism

CONCLUSION: Chelation lowered BLL. DTO correlated with severity/ ZPP

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<tr>
<th>Peak vBLL</th>
<th>45-54ug/dL (N=18)</th>
<th>55-69ug/dL (N=10)</th>
<th>70 ug/dL (N=8)</th>
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<tbody>
<tr>
<td>Mean Chelant Cycles (range)*</td>
<td>4.5 (1-13)</td>
<td>5.3 (2-17)</td>
<td>11.25 (2-23)</td>
</tr>
<tr>
<td>Mean Days to BLL &lt; 20ug/dL (p=0.06)</td>
<td>347.47</td>
<td>442.14</td>
<td>1259.4</td>
</tr>
<tr>
<td>Mean Days to ZPP &lt; 70 umol (p=0.36)</td>
<td>349.4</td>
<td>435.7</td>
<td>556.3</td>
</tr>
<tr>
<td>Mean Hospital Days (range)**</td>
<td>6.27 (0-11)</td>
<td>8.6 (6-16)</td>
<td>11.25 (8-41)</td>
</tr>
</tbody>
</table>

ACKNOWLEDGEMENT: This publication was supported by the cooperative agreement award number 1 NU61TS000296-01-00 from ATSDR. Its contents are the responsibility of the authors and do not necessarily represent the official views of ATSDR. The U.S. EPA supports the Pediatric Environmental Health Specialty Unit (PEHSU) by providing partial funding to ATSDR under Inter-Agency Agreement number DW-75-95877701. Neither EPA nor ATSDR endorse the purchase of any commercial products or services mentioned in PEHSU publications.
Successful Use of Anavip for Treatment of an Agkistrodon Envenomation

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BACKGROUND

- Anavip is a F(ab′)2 immunoglobulin fragment derived from horses immunized with venom from Bothrops asper and Crotalus durissus. CroFab is a Fab immunoglobulin fragment derived from sheep immunized with venom from Crotalus adamanteus, Crotalus atrox, Crotalus scutulatus, and Agkistrodon piscivorus.
- Anavip was approved by the FDA in 2015 for treatment of North American rattlesnake envenomation but notably not approved for treatment of Agkistrodon spp. envenomation. CroFab was approved in 2000 and is currently approved for the treatment of all North American crotalid envenomations.
- Published data regarding the efficacy and safety of Anavip in treating Agkistrodon spp. envenomations is limited.
- We present a case of a patient successfully treated with Anavip after confirmed Agkistrodon contortrix contortrix envenomation.

HIGHLIGHTS

We present a case of confirmed Agkistrodon contortrix contortrix envenomation successfully treated with the off-label use of Anavip antivenom.

CASE DETAILS

- Patient was a late-70’s aged man with coronary artery disease, diabetes, and a history of snake envenomation on two previous occasions (treated with Wyeth Antivenin) who was bitten on his non-dominant fifth finger by a captive Agkistrodon contortrix contortrix.
- Rapidly developed severe pain, swelling, diaphoresis, nausea, and vomiting.
- Arrived at a local emergency department 3 hours post-envenomation.
  - Exam at that time was notable for 2 puncture wounds to the dorsum of the 5th finger and erythematous swelling circumferentially around the finger progressing to the ulnar styloid process.
  - Treated with 10 vials of Anavip as well as opioids, ondansetron, IV fluids, tetanus booster, and extremity elevation. Transferred.
- He arrived at the receiving facility 5 hours after envenomation.
  - His pain had improved and his erythematous swelling had not progressed past the boundaries marked at the initial healthcare facility.
  - His troponin was noted to be elevated and he was diagnosed with a non-ST elevation myocardial infarction which was treated with medical management.
  - Over the next 36 hours, his platelets demonstrated a slow downward trend to a nadir of 132,000/μL for which he received an additional 4 vials of Anavip. The remainder of his hospital course was unremarkable, discharge platelets 149,000/μL.
  - Symptoms improved by 2 week follow-up with complete resolution by 3 month follow-up. No late coagulopathy developed, platelets up 256,000/μL.

DISCUSSION

- There was no progression of swelling or pain following the initial loading dose of 10 vials of Anavip. He received an additional 4 vials for developing thrombocytopenia though the need for this is debatable.
- Published data and clinical experience outside of the United States suggests Anavip should be efficacious in the treatment of Agkistrodon spp. envenomation.
- This case report adds published data to the literature supporting its efficacy.
- The etiology of the patients elevated troponin is unclear but may represent demand ischemia or direct venom effect.

REFERENCES

Background

In factitious disorder imposed on self (Munchausen’s Syndrome), patients feign illness through elaborate lies in order to gain attention and sympathy, often traveling between hospitals and using fake aliases to avoid recognition. These practices increase patient morbidity and mortality and place undue strain on hospitals. There are no known mechanisms to track patient aliases and care across hospitals, making the disorder difficult to identify. Additionally, there are few guidelines for management within the ED.

Case report

A 49yo woman with a history of pulmonary emboli on warfarin and gastric ulcers presented to the ED at Hospital A complaining of abdominal pain. She reported being forced at gunpoint to drink sixty blended tablets of warfarin with subsequent hematemesis. The regional poison center received the case from Hospital A and identified it as very similar to a report about a woman of a different name who presented to nearby Hospital B days prior. While at Hospital B the patient’s INR had increased despite being off of warfarin, elevating suspicion for surreptitious warfarin ingestion. Following confrontation, she had left Hospital B AMA one day before presenting to Hospital A. Through tracking similar cases, the RPC determined that within a two-month period, at least six hospitalizations including multiple procedures were linked to known aliases for the same patient.

Discussion

By recognizing patterns amongst ingestion cases, RPCs can help to diagnose factitious disorder. This early diagnosis can both minimize self-induced and iatrogenic harm to patients and guide provider reaction to patient dishonesty. In response to this case, our toxicology service developed a secure living dossier which tracks aliases and lab values across hospitals. With this tool, our service is able to share collateral information with the patient’s care teams. Future management recommendations include avoiding direct confrontation, assuring constant patient observation, and avoiding risky diagnostic procedures.

Conclusions

Early discovery of factitious disorder via pattern recognition by centralized resources like the regional poison center may help to guide hospital practices and optimize patient care and safety.
An opioid-associated amnestic syndrome (OAS) characterized by acute onset memory loss and bilateral hippocampal signal abnormalities on brain imaging in the setting of a history of opioid use, particularly fentanyl, has been elucidated. As of yet, there is no case definition to assist emergency physicians and toxicologists in diagnosing this syndrome.

**METHODS**

- Cases identified by direct discussion with public health authorities and PubMed search.
- Publications and presentations through November 2019 considered.
- Cases of transient global amnesia <24 hours or those attributable to alternative etiology, e.g. encephalitis, were excluded.
- OAS cases met “confirmed”, “probable”, or “possible” criteria

**RESULTS**

- 23 case reports/series accounting for 40 unique cases identified.
- Average age 38 years old.
- 65% male, 22.5% female, 12.5% without gender reported.
- All 40 cases with bilateral hippocampal injury on MRI.
- 33 cases with analytical toxicology performed and reported.
- 30 cases with opioid detected or history of opioid use.
- In cases with no opioid detected or reported, most common alternate exposures were cocaine (6 cases) and cannabinoids (3 cases).

**CONCLUSIONS**

We have validated a proposed formal case definition for OAS that can assist emergency physicians and toxicologists in evaluating patients with amnesia and a history of opioid or substance use. Increased access to analytical toxicology testing could aid in classification of confirmed cases.
Background

- Sodium azide ingestion is uncommon but often fatal.
- There are no known antidotes or recommended treatment modalities in sodium azide toxicity.
- Additionally, the question is raised of risk to healthcare providers in treating these patients.
- We aim to describe a case of sodium azide toxicity to add to the limited data available for this toxic ingestion.

Case Study

- A 19-year-old male presented to the emergency department after a reported intentional ingestion of 40 mL 5% sodium azide solution.
- Initial vital signs notable for the following: HR 160 bpm, BP 148/123 mm/Hg, RR 25 rpm.
- Intravenous hydration was initiated with subsequent addition of norepinephrine infusion for hypotension.
- Patient was intubated for worsening tachypnea and encephalopathy.
- Initial laboratory studies notable for the following: pH 7.41, PaCO2 14 mmHg, HCO3a 9 mEq/L, methemoglobin 3.5%, anion gap 27 mMol/L, lactate 12.8 mMol/L.

Case Study (continued)

- He was admitted to the ICU and placed on a bicarbonate infusion.
- Plasma exchange was performed after a multi-disciplinary discussion and evaluation by nephrology.
- Hemodynamics, metabolic derangements, and vasopressor requirements improved throughout the day.
- Fifteen hours after arrival, the patient acutely decompensated and required titration of multiple vasopressors for refractory hypotension.
- Bedside echocardiogram revealed biventricular failure.
- He was evaluated for ECMO but determined not to be a candidate after two episodes of PEA arrest.
- Patient expired despite resuscitation.

Discussion

- Sodium azide is rapidly metabolized to hydrazoic acid, which then dissipates to all tissues.
- The patient presented 2 hours after ingestion and did not have emesis or dermal contamination, making exposure risk to healthcare providers minimal.
- As a mitochondrial poison, significant metabolic acidosis and multi-organ failure ensue, often resulting in death.
- Despite initial stabilization after plasma exchange, the patient rapidly decompensated and died, so the exact benefit of plasma exchange remains unclear.
- Hemodialysis was unlikely to be beneficial in this patient for two reasons: sodium azide’s rapid metabolism and distribution and the stabilization of his metabolic derangements.
- ECMO was considered, although there is no evidence this intervention would mitigate the toxic effect of this chemical.

Conclusions

- Sodium azide ingestion, if presenting late, poses low risk to healthcare providers.
- Supportive care remains the mainstay of treatment, though most cases remain uniformly fatal.
Neurotoxicity with Resultant Respiratory Failure Secondary to South African Coral Snake Envenomation

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**Background**

- A previous case report demonstrated systemic toxicity and respiratory failure requiring intubation with resolution of paralysis after 12 hours.
- We present an additional case of systemic toxicity with respiratory failure after envenomation by the same snake.

**Case Study**

- A 14-year-old male presented to a community hospital after being bit by a captive South African coral snake (reported by owner to be subspecies *cowlesi*).
- He developed immediate tongue swelling, dyspnea, diplopia, and dysarthria and ultimately required intubation for respiratory failure.
- On arrival to our tertiary care center, he was sedated but flaccid in the extremities with puncture wounds to his right index finger.
- Twelve hours after intubation, his paralysis resolved, and he was extubated to room air.
- The patient was discharged home the following day without persistent neurologic deficits.
- Local reaction was limited to mild edema and erythema.
- His father was envenomed by the same snake a year prior and required intubation for respiratory failure with a similar clinical course.

**Discussion**

- Two subspecies of *Aspidelaps lubricus* are reported, which may produce variable effects after envenomation depending on venom composition.
- The venom from this snake species is reported to contain alpha-neurotoxins that competitively inhibit post-synaptic nicotinic acetylcholine receptors, resulting in muscle paralysis, bulbar paresis, and respiratory failure.
- Potential for neurotoxicity may depend on the venom composition, which can vary based on diet.
- Alternatively, predatory circumstances surrounding the envenomation and the snake’s propensity to deliver venom may determine venom composition.
- This specific snake has caused neurotoxicity with resultant respiratory failure in two individuals.

**Conclusions**

- This specific South African coral snake contains neurotoxic venom.
- Clinical effects may vary between subspecies or be secondary to differences in diet or predatory circumstances.
OBJECTIVES:
On 23-Jan-2020, the National Poison Data System (NPDS) Rapid Coding Committee activated the 99th IBM-Micromedex Emergent Code: Novel Coronavirus: Product Code: 7325206. The code name was revised 11-Mar-2020 to COVID-19 CONFIRMED and Emergent Code #100 added, COVID-19 Not Confirmed: Product Code 7324190. We examined the time course and components of NPDS cases relating to COVID-19 cases.

METHODS
We examined all COVID-19 and Non-COVID-19 NPDS cases via the NPDS Special Projects Enterprise Report “COVID-19 Case Count” for Open or Closed Exposure and Information cases 26-Dec-2019 through 20-May-2020 (Figure 1). We examined the contributions of Information and Exposure cases, doubling time of the initial increase in the cases, the half-time of the decrease in cases, and the day of the week contribution. Descriptive statistics and change over time via linear and logarithmic and multivariate regression were via SAS JMP (12.0.1).

RESULTS:
For the 147 days (26-Dec-2019 through 20-May-2020) poison centers (PCs) reported 360,026 COVID-19 Exposure and Information cases (COVID Cases), of which 99.69% were closed, and 7,068 were COVID-19 Exposures. Most COVID Cases, 352,958 (98.04%), were Information cases (see Table 1).

Table 1. Special Project Enterprise Report “COVID-19 Case Count” for Exposure & Information Cases for 1-Jan-2019 through 13-Apr-2020. Mean and maximum calls/day and sum for the 469 days

<table>
<thead>
<tr>
<th>Description</th>
<th>Mean</th>
<th>Mean</th>
<th>Maximum</th>
<th>Sum</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>COVID -- TOTAL</td>
<td>2,449</td>
<td>17,144</td>
<td>12,142</td>
<td>360,026</td>
<td>100%</td>
</tr>
<tr>
<td>COVID, Exposures</td>
<td>48</td>
<td>337</td>
<td>232</td>
<td>7,068</td>
<td>1.96%</td>
</tr>
<tr>
<td>COVID, Information+</td>
<td>2,401</td>
<td>16,808</td>
<td>11,977</td>
<td>352,958</td>
<td>98.04%</td>
</tr>
<tr>
<td>Non-COVID - TOTAL</td>
<td>6,905</td>
<td>48,334</td>
<td>7,491</td>
<td>1,015,009</td>
<td>100%</td>
</tr>
<tr>
<td>Non-COVID, Exposures</td>
<td>5,953</td>
<td>41,671</td>
<td>6,487</td>
<td>875,092</td>
<td>86.22%</td>
</tr>
<tr>
<td>Non-COVID, Information+</td>
<td>952</td>
<td>6,663</td>
<td>1,454</td>
<td>139,917</td>
<td>13.78%</td>
</tr>
</tbody>
</table>

The maximum (peak) of 12,142 COVID Cases occurred on 16-Mar-2020, Week 12 (12-Mar-2020 – 18-Mar-2020) (Figure 2). During the upswing (20-Feb-2020 through 16-Mar-2020) COVID Cases increased with a doubling time [95% CI] of 3.01 [2.76, 3.32] days. During the early decline (16-Mar-2020 through 20-Apr-2020), COVID Cases declined with a half-time of 16.5 [14.1, 20] days and during the later decline (20-Apr-2020 through 20-May-2020) with a half-time of 39.8 [22.2, 195] days. During the early decline, the day of the week effect was highly statistically significant (LogWorth = 13.0, p< 0.00001) with Sunday < Saturday << Friday< Tuesday< Thursday< Wednesday < Monday. (Figure 3)

CONCLUSIONS:
- The COVID-19 outbreak is an ongoing national surveillance challenge requiring a multidisciplinary approach.
- NPDS data findings reinforce the substantial utility of using poison center signals to meet this need.
- PCs do not currently have the capability to case verify or contact trace. Therefore, NPDS cases are not thought of as cases in the traditional public health framework.
- Adding resources to enhance the national poison center network with this capacity is an achievable and realistic path forward to create an additional surveillance signal.
- System design such as enhancing case verification should be developed to build on the near real-time infrastructure of PC data collection.
- This pandemic serves as a stimulus to public health agencies to collaborate with AAPCC and PCs, especially in the data collection phases.

Figure 2. COVID-19 Cases (Exposure +Information Cases) by week (12/26/2019 through 5/20/2020). The peak (68,494 cases) occurs on Week 12 (3/12/2020 – 3/18/2020)
INTRODUCTION

- Tizanidine is a skeletal muscle relaxant in the class of imidazoline derivatives
  - Alpha-2 adrenergic receptor agonist
  - Structurally similar to clonidine
- Adverse effects include drowsiness, hypotension, and bradycardia
  - In overdose, may resemble the opioid toxidrome
- High dose naloxone has been used to reverse clonidine toxicity
- Given the similarities in chemical structure it is postulated that naloxone may also be effective in cases of tizanidine toxicity

CASE PRESENTATION

- 43-year-old female intentionally took an unknown amount of tizanidine
- On arrival to the ED, the patient’s GCS was 15, BP 154/94, and HR 116
- 1.5 hours after presentation, she became lethargic with miotic pupils, BP 86/59, and had inappropriately normal HR 70
- UDS was negative for opiates
- Patient received atropine, 4.5 liters of IVF, and a total of 6.4 mg naloxone in separate boluses with subsequent hemodynamic improvement
- Since naloxone boluses improved vital signs, a naloxone infusion was started in the ED
- However, it was discontinued at the request of the admitting intensivist and patient quickly became hypotensive and bradycardic
- The naloxone infusion was restarted and the patient’s hemodynamics again improved. The patient was admitted to ICU and despite her improvement with naloxone, she was switched to dopamine
- She subsequently made a full recovery

DISCUSSION

There is no evidence that naloxone interacts with alpha-adrenergic receptors or that tizanidine interacts with opioid receptors; however, it is postulated that naloxone may be successful in treating sympatholytic toxicity due to its ability to antagonize the effects of the endogenous opioids released as a result of central alpha-2 agonism.

CONCLUSION

This case demonstrates that high-dose naloxone may improve the sympatholytic effects of tizanidine toxicity.
Impact of Marijuana Legalization on Healthcare Utilization for Psychosis and Schizophrenia in Colorado

George S. Wang, MD1; Christine Buttorff, PhD2; Asa Wilks3; Dan Schwam2 and Rosalie L. Pacula, PhD4.

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BACKGROUND/OBJECTIVE

The public health impact of the availability of high potency cannabis products has yet to be fully understood. Available evidence has demonstrated an association of chronic cannabis use with an increase in acute psychosis and schizophrenia-type symptoms that is strengthened with exposure to higher doses of THC. Recreational market has provided a venue for the sale of higher concentrated products.

Colorado (CO) is one of the first states to allow both medical (2000) and recreational (2012) marijuana and has been on the forefront on the public health impact of legalization. The objective was To evaluate the impact of recreational cannabis legalization on psychosis and schizophrenia related healthcare encounters in CO.

METHODS

Data
Colorado Hospital Association (CHA) Claims: 2013-2018
- Collects hospital discharge data from hospitals and health systems throughout the state
- Data includes patients with variety of insurance (private, public) and uninsured.

We focus on ED visits here since psychiatric ED visits are more common than inpatient admissions.

Outcomes
- ICD 9 and 10 codes to identify claims for psychosis or schizophrenia, with or without cannabis-related claims.
- Colorado Department of Revenue: Data on the location of all dispensaries, total sales per county
- Exposures: Total number of dispensaries per county, total number of Analysis
- GIS and descriptive methods to examine trends in outcomes
- Regression models to assess association between exposures and outcomes at the county level

RESULTS

- There were few claims co-coded with cannabis, though over 70% of claims for both diagnoses were male (Table 1).
- The number of psychosis claims has declined while the number of schizophrenia claims has increased overall statewide (Figure 1).
- Most counties decrease in schizophrenia claims, though some increase (Figure 2).
- Initial regression analysis demonstrated association between increase in Psychosis ED visits per Capita with recreational dispensaries (p=0.02), sales from recreational dispensaries (p=0.001), and sales from medical and recreational Sales (p=0.032).
- An increase in schizophrenia ED visits were not associated with similar exposure variables (p=0.86, 0.95, 0.86, respectively).

<table>
<thead>
<tr>
<th>Table 1: Descriptive statistics, statewide, 2013-2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychedisis with Cannabis</td>
</tr>
<tr>
<td>Total ED Visits</td>
</tr>
<tr>
<td>% Age 0-18</td>
</tr>
<tr>
<td>% Age 19-25</td>
</tr>
<tr>
<td>% Age 26-64</td>
</tr>
<tr>
<td>% Male</td>
</tr>
<tr>
<td>% Commercial</td>
</tr>
<tr>
<td>% Government</td>
</tr>
<tr>
<td>% Other Insurance</td>
</tr>
</tbody>
</table>

CONCLUSIONS

- Recreational dispensaries variable measures increased overall psychosis ED visits per capita.
- There was no impact on schizophrenia ED visits.
- However, co-coded diagnosis with cannabis remained low and relatively unchanged.
- Disproportionately effected adult males with government insurance.
- Less population dense counties were also effected.

FUTURE DIRECTIONS

- Further evaluation of accuracy of coding for cannabis with and without mental health diagnosis.
- Evaluate the health economic impact, and compare to nonlegal states.
- Further analysis on impact of medical vs recreational exposure variables.
- Evaluate other harm outcomes: pregnancy, vomiting, poisoning.
Clinical Characteristics in Cardiotoxic Agent Overdose Necessitating Venoarterial Extracorporeal Membrane Oxygenation: a Case Series

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2. Program in Trauma, R. Adams Cowley Shock Trauma Center, University of Maryland School of Medicine
3. Department of Internal Medicine, University of Maryland School of Medicine, Baltimore, MD
4. Division of Cardiac Surgery, Department of Surgery, University of Maryland School of Medicine, Baltimore, MD

Background

- Venoarterial extracorporeal membrane oxygenation (VA-ECMO) is increasingly utilized in drug-induced refractory cardiogenic shock.
- We present a case series to describe the clinical characteristics of patients who received VA-ECMO due to severe cardiotoxicity.

Methods

Case identification

- Medical toxicology consult log was reviewed from January 1, 2015 to February 1, 2020 to identify VA-ECMO cases.

Inclusion criteria

- Ingestion of cardiotoxic agents (i.e. beta blockers [BBs], calcium channel blockers [CCBs] & membrane stabilizing agents)
- Received VA-ECMO for refractory cardiogenic shock (mean arterial pressure <65 mmHg or systolic blood pressure < 90 mmHg)
- Evaluated by a medical toxicologist

Data collection

- Vital signs
- Laboratory results
- Antidotal/medical therapy
- Length of stay: ICU and hospital
- Acute Physiology and Chronic Health Evaluation (APACHE IV)

Analysis

- Descriptive analysis was performed

Results

- Median age was 36 years and 5 out of 6 cases were male.
- Four cases involved BBs and CCBs while 2 cases involved membrane stabilizing agent (MSA) exposure.
- Table 1 summarizes the antidotal therapy (e.g. high-dose insulin, glucagon, etc.) and medical intervention performed.
- Median MAP improved from 57 to 75 mmHg with lower vasopressor requirement after VA-ECMO initiation (Table 1).
- Acid/base abnormalities – acidemia and lactic acidosis – also improved with VA-ECMO (Table 2).
- Median ICU length of stay was 5 days (range: 4-23) while median hospital length of stay was 20 days (range: 9-68)
- All patients were discharged without disability

Discussion:

- BBs, CCBs or MSA exposures can result in refractory cardiogenic shock from cardiotoxicity.
- VA-ECMO can provide circulatory support when no or limited alternative medical therapy is available.
- VA-ECMO should be considered in patients with drug-induced cardiogenic shock if:
  - Infusion of >2 vasopressors
  - Acute Physiology and Chronic Health Evaluation (APACHE IV) score exceeds 75
  - End-organ injury involving >2 organ systems
  - Maximized/optimized antidotal therapy (e.g. high-dose insulin, bicarbonate infusion, lipid emulsion, etc.)

Conclusions

- VA-ECMO support should be considered in hemodynamically unstable patients from cardiotoxicity despite optimization of antidotal/medical therapy.
Physician Attitudes on Buprenorphine Induction in the Emergency Department: Results from a Multistate Survey

Matthew Zuckerman, MD1; Ty Kelly1, Kennon Heard, MD1; Amy Zosel, MD2; Michael Marlin, MD3; Jason Hoppe, DO1

1 University of Colorado School of Medicine 2 Medical College of Wisconsin 3 University of Mississippi Medical Center

EDs are important location for ED buprenorphine (EDBUP)
There is a treatment gap between need and provider services
Unclear if gap is due to perceived barriers, attitudes, or resources
The objective of this study is to assess physician attitudes to EDBUP and barriers

Background

- Subjects: Emergency Medicine Physicians
- An anonymous survey utilizing RedCap was distributed via American College of Emergency Physicians state chapters and Facebook EM provider groups.
- Questionnaire assessed physician attitudes of EDBUP and perceived barriers

Methods

- EDs are important location for ED buprenorphine (EDBUP)
- There is a treatment gap between need and provider services
- Unclear if gap is due to perceived barriers, attitudes, or resources
- The objective of this study is to assess physician attitudes to EDBUP and barriers

Results

- 162 EM physicians completed the survey
- 96% of X-waivered physicians, 73% of academic physicians, 49% of non-academic physicians, and 34% of non-X-waivered physicians felt comfortable initiating EDBUP
- Most frequently cited barrier to EDBUP was lack of access to outpatient MOUD referral

Conclusions

- Providers within a various practice environment endorsed support for EDBUP
- Barriers were similar
- Future initiatives should focus on supporting workflow, follow up, and training

Barriers

- There is no reimbursement for me
- No dept financial incentive
- It takes too much of my time
- I don't have training
- I don't have social work resources
- No buprenorphine in my ED
- Acess to follow up in my area

<table>
<thead>
<tr>
<th>Barriers</th>
<th>No barrier</th>
<th>Moderate barrier</th>
<th>Significant barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>No dept financial incentive</td>
<td>0%</td>
<td>80%</td>
<td>20%</td>
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<td>It takes too much of my time</td>
<td>20%</td>
<td>80%</td>
<td>0%</td>
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<td>I don't have training</td>
<td>40%</td>
<td>60%</td>
<td>0%</td>
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<tr>
<td>I don't have social work resources</td>
<td>10%</td>
<td>90%</td>
<td>0%</td>
</tr>
<tr>
<td>No buprenorphine in my ED</td>
<td>50%</td>
<td>50%</td>
<td>0%</td>
</tr>
<tr>
<td>Acess to follow up in my area</td>
<td>30%</td>
<td>70%</td>
<td>0%</td>
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</table>