



Welcome to the 2025 ACMT Annual Scientific Meeting

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Abstract

These are the selected abstracts for the 2025 American College of Medical Toxicology (ACMT) Annual Scientific Meeting, which will take place from April 4–6, 2025, in Vancouver, Canada. This year's accepted abstracts include original research studies, including contributions from the Toxicology Investigators Consortium (Toxic), and clinically significant case reports highlighting unique toxicologic phenomena. These presentations reflect the continued growth and impact of toxicology research, providing attendees with valuable insights into emerging trends, novel treatment strategies, and evolving best practices in the field.

Keywords Abstracts · Annual scientific meeting · Toxicology investigators consortium · Medical toxicology foundation

Introduction

The American College of Medical Toxicology (ACMT) received 236 eligible abstracts for consideration at the 2025 Annual Scientific Meeting (#ACMT2025) in Vancouver, Canada. This year's submissions included 114 original research studies and 122 case reports, showcasing the diverse and impactful work being conducted across the field. The accepted abstracts continue the tradition of delivering high-quality toxicology research to attendees.

The topics presented at this year's annual meeting highlight the breadth and evolution of medical toxicology. The first day will feature studies ranging from the safety and tolerability

of novel pharmacologic treatments for alcohol use disorder to advances in the management of envenomations, including comparisons of emerging antivenoms and investigations into adaptive immune responses. The second day will introduce cutting-edge diagnostic tools and biomarkers, including the use of wearable biosensors to detect ethanol intoxication and inflammatory profiles in patients with cannabinoid hyperemesis syndrome. The meeting will conclude with lightning platform presentations on the final day, offering a rapid-fire exploration of timely research. Topics include trends in nitazene-related overdose deaths, clinical outcomes for substance use disorder patients supported by peer coaches, and the feasibility of using biosensors to assess alcohol withdrawal. Other presentations will address toxicological phenomena including xylazine concentrations in opioid overdoses and the toxicokinetics of salicylate poisoning.

As in previous years, the annual meeting will feature a variety of engaging sessions, including concurrent tracks tailored to attendees' interests such as environmental and public health, research, addiction toxicology, professional development, and new insights in toxicology. These tracks, combined with symposia, case-based discussions, and competitions such as the Open Mic Competition and MTF Shark Tank Research Forum, promise to make #ACMT2025 a dynamic and enriching experience. Additionally, the conference location of Vancouver, Canada will offer a unique opportunity to engage with leading local experts in a vibrant city known for its natural beauty, making it a great backdrop

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for fostering learning, collaboration, and connecting the medical toxicology community.

This exceptional work would not be possible without the dedication and expertise of our Abstract Review Committee: Gillian Beauchamp, Adam Blumberg, Keith Burkhart, Vincent Calleo, Stephanie Carreiro, Peter Chai, Richard Chen, James Chenoweth, Jon Cole, Nicholas Connors, Colleen Cowdery, John DelBianco, Matthew Dernbach, Erik Fisher, Riley Hartmann, Hannah Hays, Rob Hendrickson, Michelle Hieger, Diane Hindman, Damilola Idowu-Ellsworth, Louise Kao, Kenneth Katz, Joseph Kennedy, Michael Khoury, Andrew King, Andrew Koons, JoAn Laes, Eric Lavonas, Jacob Lebin, Michael Levine, Dave Liss, Jennifer Love, Alex Manini, Christopher Meaden, Andrew Monte, Elissa Moore, Babak Mostafazadeh, Mark Mycyk, Anthony Pizon, Patricia Rosen, Jonathan Schimmel, Evan Schwarz, Daniel Sessions, Manoj Tyagi, Steven Walsh, Richard Wang, James Watson, Ben Weigel, Sage Wiener, and Luke Yip.

Additionally, we would like to thank Shana Kusin, the chair of the Abstract Review Mentorship Program, as well as the mentors who generously dedicated their time to guiding the fellows: Gillian Beauchamp, Peter Chai, Joseph Carpenter, Stephanie Carreiro, Rob Hendrickson, Louise Kao, JoAn Laes, David Liss, Christopher Meaden, and Evan

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Lastly, we would like to acknowledge the contributions of the ACMT staff, including Adrienne Dunavin, Alyssa Falise, and Stephanie Abston, who led this process.

#ACMT2025 promises to celebrate the growing impact of toxicology research and its role in advancing patient care and public health. We look forward to the innovative studies and stimulating discussions that will undoubtedly make this year's meeting a success.

Congratulations to all the contributors whose work will be presented at the 2025 ACMT Annual Scientific Meeting in Vancouver, Canada.

We look forward to a great meeting,

Charlotte Goldfine, Abstract Review Chair

Joseph Carpenter, Abstract Review Co-Chair

Maryann Amirshahi, ACMT Research Committee Chair

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DAY 1: PLATFORMS, ABSTRACTS 001–004

001. Safety and Tolerability of the Novel Ghrelin-O-Acyltransferase (GOAT) Inhibitor GLWL-01 in Patients with Alcohol Use Disorder

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Background: The peptide hormone acyl-ghrelin stimulates food intake via binding to the growth hormone secretagogue receptor (GHSR). Ghrelin activation to acyl-ghrelin is catalyzed by the enzyme ghrelin-O-acyltransferase (GOAT). Pre-clinical and human laboratory studies suggest that increasing acyl-ghrelin increases alcohol intake, while GHSR blockade decreases alcohol consumption. GOAT inhibition reduces endogenous acyl-ghrelin formation but has not been well-studied as a pharmacotherapeutic approach for alcohol use disorder (AUD). We present safety data from a randomized controlled trial evaluating the investigational GOAT inhibitor GLWL-01 in patients with AUD.

Hypothesis: There is no difference in the quantity, frequency, or severity of adverse events (AEs) in the GLWL-01 condition versus placebo, individually and by organ system.

Methods: This was a Phase 1b/2a randomized, double-blind, placebo-controlled, crossover trial evaluating GLWL-01 safety in patients with AUD. Patients were admitted to an inpatient research unit and evaluated for AEs daily while receiving GLWL-01 (450 mg BID x 3.5 days) or placebo (3.5 days) with a minimum two-day washout period between the two stages. AEs were classified according to the National Cancer Institute's Common Terminology Criteria for Adverse Events (CTCAE) Version 5. The number of unique AEs and proportion of participants experiencing an AE in the GLWL-01 versus placebo conditions were compared using chi-square tests and Fisher's exact tests, respectively. Generalized linear mixed effects modeling was used to evaluate the effect of GLWL-01 on severity of cardiac and hepatic AEs.

Results: Study participants (N = 21) were six female (28.6%), 13 black (61.9%), five white (23.8%), median age 41.6 (IQR 33.1–53.2), 10 (47.6%) with severe AUD, and median BMI 26.6 (IQR 22.4–28.3). Of these, 18 (85.7%) completed at least one study stage, and 13 (61.9%) completed both stages. There was no difference in the number of unique AEs between the GLWL-01 versus placebo conditions [$\chi^2(1, N = 64) = 2.25, NS$]. The proportion of individuals experiencing specific symptoms or CTCAE categories was also not significantly different when comparing the GLWL-01 condition to placebo. Models estimating QTcF, AST, and ALT revealed no significant association between GLWL-01 and any outcome (NS for all three). These outcomes also did not differ significantly by proportion of participants experiencing the AE (NS for all three).

Conclusion: Our results suggest that GLWL-01 is tolerable and safe in people with AUD. However, caution is warranted given this study's small sample size and short duration of drug dosing. Additional studies of the interactions between GLWL-01 and alcohol are also warranted.

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002. Comparison of Crotalidae Immune F(ab')₂ (Equine) and Crotalidae-polyvalent Immune Fab (Ovine) at Establishing Control in Louisiana Non-Rattlesnake Crotalid Envenomations

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Background: Copperheads (*Agkistrodon contortrix*) and cottonmouths (*Agkistrodon piscivorus*) are responsible for the majority (82.4%) of identified snake envenomations in Louisiana. While the Food and Drug Administration has approved both Crotalidae immune F(ab')₂ (Anavip[®]) and Crotalidae polyvalent immune Fab (CroFab[®]) for *Agkistrodon* envenomations, there is limited data comparing their efficacies.

Research Question: How does Anavip[®] compare to CroFab[®] for initial control of non-rattlesnake envenomations?

Methods: This is a retrospective, IRB-approved study of patients receiving either CroFab[®] or Anavip[®] in a Louisiana hospital system between 2017 and 2023. Demographics, snake types, envenomation conditions, clinical effects, medication administrations, treatment responses, and adverse effects were collected by chart review. Cases were excluded if the snake was identified as a rattlesnake, the patient was treated with both Anavip[®] and CroFab[®], antivenom was administered at an outside facility, or records were otherwise unavailable.

Results: Eighty patients received CroFab[®] between July 2017 and October 2020, with 53 meeting inclusion criteria. The system formulary switched to Anavip[®] in July 2020. Forty-seven patients received Anavip[®] from then to October 2023, with 30 meeting inclusion criteria. Seven total cases were excluded due to rattlesnake envenomation. Of the 83 included cases, the snake was identified as either copperhead (n = 41) or cottonmouth species (n = 15), or was an unidentified crotalid (n = 27). All cases had objective signs of envenomation. Sixty-seven were mild in severity, 12 were moderate, and four were severe. In the CroFab[®] cohort, the initial number of vials ranged from four to six. Thirteen CroFab[®] cases (24.5%) required additional vials for the purpose of establishing control of local tissue toxicity. The mean number of control vials for patients who received CroFab[®] was 5.17 (95% CI 4.68, 5.66) with a median of

four. In the Anavip[®] cohort, all patients received 10 control vials initially, with 19 cases (63.3%) requiring additional vials for control of local tissue toxicity. The mean number of control vials for patients who received Anavip[®] was 17 (95% CI 14.32 to 19.68) with a median of 19. The difference in the percentage of patients requiring additional control vials was significantly different between CroFab[®] and Anavip[®] (Chi square = 10.59, p = 0.001).

Conclusion: In this set of Louisiana non-rattlesnake envenomations, control of local tissue toxicity with initial dosing was more often achieved in cases treated with CroFab[®] compared to Anavip[®] (75.5% vs 36.7%). A randomized, blinded trial is needed to compare efficacy between CroFab[®] and Anavip[®] for *Agkistrodon* envenomations.

003. Human Adaptive Immune Response to Envenomation by North American Crotalids

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Background: Snake venom is a complex mixture of multiple proteins and other components. The human immune response to snake venom has not been well-characterized, particularly in North American crotalids. We therefore sought to characterize the immune response to crotalid envenomation.

Research Question: Does envenomation by North American crotalids produce a measurable human adaptive immune response, and can human monoclonal antibodies against snake venom components be isolated?

Methods: We report preliminary results from a study of the human immune response to the venom of North American crotalids. We enrolled adult patients presenting with symptomatic envenomation by a native North American crotalid. Blood samples were obtained at enrollment and at return visits one, two, four, eight, and 12 weeks post-envenomation. Blood samples were analyzed for IgG response to snake venom and, if feasible, plasmablast response, followed by identification of monoclonal antibodies against snake venom. Reacting antibodies were tested against commercially obtained snake venoms using immunoprecipitation and their targets were identified using mass spectrometry.

Results: We enrolled ten subjects from July 2021-June 2023, eight of whom completed at least one follow-up blood draw visit. Eight subjects were envenomated by copperheads (*Agkistrodon contortrix*), one by a timber rattlesnake (*Crotalus horridus*), and one by a Western diamondback (*Crotalus atrox*); notably, this patient had been envenomated by *C. atrox* on multiple previous occasions. Analysis of samples from a subject envenomated by *A. contortrix* demonstrated

a detectable increase in IgG response to *A. contortrix* venom between day zero and day 60, which cross-reacted to *Agkistrodon piscivorus* venom but cross-reacted only minimally to rattlesnake venom. Analysis of samples from the subject with repeated envenomations by *C. atrox* demonstrated a circulating plasmablast B cell response to snake venom components one-week post-envenomation. We single cell sorted plasmablasts from this time point, cloned immunoglobulin genes from each cell, and expressed 30 clonally distinct human monoclonal antibodies directed against components of *C. atrox* venom. Preliminary assays suggest that identified human monoclonal antibodies directed against phospholipase A2 and snake venom metalloproteinase inhibit the activity of these venom components *in vitro*.

Conclusion: Preliminary work with patients envenomated by native North American crotalids confirms that the human immune system mounts a specific antibody response to snake venom components from the envenomating species and other closely related snake species. Monoclonal antibodies against specific important protein components of snake venom can be identified and cloned from human blood samples and may inhibit the activity of venom components.

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004. Efficacy of Alpha-Chymotrypsin in Reducing Toxicity of Bungarus Multicinctus Venom in an Experimental Rabbit Model

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Background: *Bungarus multicinctus*' bite is a frequent, severe and often fatal accident in Vietnam. Although antivenom is considered the gold standard for treating venomous snakebite, it is not widely available, and both difficult and expensive to manufacture. There is a need to find an alternative method for treating toxins from venomous snakes in general and *Bungarus multicinctus* in particular.

Alphachymotrypsin, which is a proteolytic enzyme, could be another method for neutralizing venom in snakebite patients.

Research Question: (1) Does alpha-chymotrypsin local injection for rabbits poisoned by krait venom reduce paralysis and mortality? (2) What are the side effects of alpha-chymotrypsin when injected in experimental rabbits?

Methods: Thirty purebred white rabbits were injected with an LD50 dose of 0.1 mg/kg of *Bungarus multicinctus*' venom at their thigh, randomized divided into six groups of five rabbits: one control group injected locally with physiological saline; four groups with increasing levels of alpha-chymotrypsin of 1000 UI, 2000 UI, 5000 UI, 10000 UI; and one group receiving a mixture of 5000 UI alpha-chymotrypsin and venom. Mortality rate, muscle strength and inflammation of the local injection site were monitored for 72 hours. Fatalities of group 1, 2, 3, 4, 5, 6 were 4/5, 1/5, 3/5, 0/5, 0/5, 0/5; muscle strength were 0.2 (0–1); 2.6 (0–4); 1.8 (0–5); 4.6 (3–5); 5; 5; local tissue damage were 0/5, 2/5, 3/5, 3/5 and 3/5 in turn. Fisher's exact test indicated p1-4, p1-5, p1-6 <0,05 when comparing fatalities between group 1 and 4, 5, 6 showed effectiveness of higher doses of alpha-chymotrypsin injection in the treatment of intoxicated rabbits. There was no paralysis when a solution of mixing alpha-chymotrypsin with venom was injected to the rabbits.

Conclusion: Alpha-chymotrypsin appeared to be an effective method to reduce the toxicity of *Bungarus multicinctus*'s venom in experimental rabbits. High doses of alpha-chymotrypsin injected could help local inflammation and necrosis injuries.

DAY 1: MODERATED POSTERS, ABSTRACTS 005–011

005. Blood Transfusion Affecting Phosphatidylethanol Concentration Background

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Background: Phosphatidylethanol (PEth) is a whole blood biomarker used to assess for ethanol consumption within the past four weeks. PEth is stable in stored units of packed red blood cells (pRBCs) which has raised concerns for creating “false positive” elevated PEth levels in organ transplant candidates receiving blood transfusion. Greater than 20 ng/mL is the commonly used cutoff for alcohol consumption.

Hypothesis: Transfusion of a single unit of pRBC can cause an increase in PEth from a “negative” (< 20 ng/mL) to a “positive” (> 20 ng/mL) level.

Methods: This is a prospective observational study of 50 subjects transfused with one unit of pRBC whose pre- and post-transfusion whole blood PEth levels were measured. Subjects were inpatients at a single urban hospital enrolled over a two-year period. Waste from pre- and post-transfusion lavender-top blood specimens were assessed for PEth levels.

Results: Four of 50 (8%) of subjects crossed from a “negative” PEth concentration to “positive” concentration after the transfusion of one unit of pRBC. Eight (16%) of subjects had an increase in their PEth concentrations after transfusion but did not cross the threshold of “negative” to “positive”.

Conclusion: Transfusion of a single pRBC unit can cause an iatrogenic or “false positive” elevated PEth concentration. PEth concentrations therefore must be interpreted with caution after blood transfusion. Based on these results, we hypothesize transfusion of more than one pRBC unit may cause even greater or higher incidence of increase in PEth.

006. Single Substance Exposures Associated with Anemia

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Background: There are many xenobiotics that may result in anemia, however this is often overlooked in patients presenting for a toxicologic cause. Hematologic abnormality related codes were first added to the National Poison Data System (NPDS) in 2019. We aimed to identify the xenobiotics or exposures reported to United States poison centers most commonly associated with anemia.

Methods: We conducted a retrospective analysis using NPDS between January 1, 2019 and December 31, 2023. We queried NPDS for all single substance ingestions with a documented related clinical effect of low hemoglobin/hematocrit. We analyzed adult (≥ 20 years) and pediatric (age ≤ 19 years) exposures separately. We described cases by demographics, level of care, clinical effects, and medical outcome.

Results: There was a total of 334 pediatric cases and 1,432 adult cases during the study period. The most common pediatric exposures were lead (27.8%), brown recluse envenomation (14.7%), rattlesnake envenomation (11.4%), acetaminophen (5.1%), and ibuprofen (3.0%). The most common adult exposures were rattlesnake envenomation (12.4%), acetaminophen (12.2%), antineoplastic drugs (8.8%), and ethanol (8.5%). The majority of adults (66%) were admitted to critical care units, 23% were admitted to noncritical care units, and 7.1% were treated and released. Roughly half of the pediatric patients (51.2%) were admitted to critical care units, 29.9% to noncritical care units, and 14.7% were treated and released. Death was reported in 14.7% of adult cases, and 41.5% of the exposures resulted in a major effect. Death

was reported in 3.3% of pediatric cases, and 33.2% of the exposures resulted in a major effect. The most frequently reported therapies in adults were intravenous fluids (47.6%), oxygen (45%), blood products (35%), antibiotics (34%), and intubation (30.8%). Forty nine percent of pediatric patients received intravenous fluids, 23.4% were treated with oxygen, 28.7% received blood products, 24.3% received antibiotics, and 16.5% were intubated. Additional relevant treatment in adults included vasopressors (29.1%), thiamine (14.2%), folate (9.6%), and colony stimulating factors (2.2%).

Conclusion: While hemoglobin and hematocrit levels are often overlooked in patients presenting for toxicologic causes, patients with low levels required high levels of care and carried significant mortality. Significant treatment such as blood products and intubation may be required for these patients. There are limitations to this study, including the wide range of xenobiotics or exposures making direct correlations difficult, however, related anemia may suggest a higher likelihood of patients requiring a high level of care or having significant medical outcomes.

007. Plasma Non-Steroidal Anti-Inflammatory Drug Concentrations in Dogs During Carbon Hemoperfusion

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Background: Carbon hemoperfusion (cHP) is gaining popularity as a treatment for various intoxications in veterinary medicine. However, plasma Non-Steroidal Anti-Inflammatory Drug (NSAID) concentrations during cHP have not been reported. This study aimed to describe the plasma NSAID concentrations during cHP in dogs with severe NSAID intoxications.

Methods: This is a prospective observational study. Heparinized plasma samples were collected from dogs during cHP at two veterinary teaching institutions between April 2023 and February 2024. Plasma NSAID concentrations were measured using liquid chromatography–mass spectrometry.

Results: A total of 18 dogs ingested ibuprofen (n = 10, median 1,000 mg/kg, interquartile range (IQR) 400–1,800 mg/kg), carprofen (n = 5, 200 mg/kg, 125–222 mg/kg), naproxen (n = 2, 59 and 486 mg/kg), and meloxicam (n = 1, 1.4 mg/kg). The median time from suspected ingestion to the cHP was 7 hours (IQR 5–9). cHP was performed using an intermittent hemodialysis platform (n = 8/18), a

continuous renal replacement therapy platform ($n = 6/18$), or a standalone hemoperfusion platform ($n = 4/18$). The median duration of cHP was 2 hours (IQR 1.4–2.9), and the median total blood volume processed was 1.1 L/kg (IQR 1.0–1.3), equating to 13 times (IQR 11–15) the estimated blood volume of 80 ml/kg in dogs. Median (IQR) plasma NSAID concentrations were reduced by 58% (46–72%): 54% (32–61%) for ibuprofen, 72% (47–95%) for carprofen, 46% and 58% for naproxen, and 91% for meloxicam. The calculated half-lives (h) during cHP were 1.45 (IQR 1.2–2.9) for ibuprofen, 1.5 (IQR 0.3–3.1) for carprofen, 1.9–2.5 for naproxen, and 1 for meloxicam.

Conclusion: This is the first published report on the description of plasma NSAIDs concentrations during cHP in dogs. Carbon hemoperfusion significantly reduced plasma NSAID concentrations. The half-lives of NSAIDs during cHP were markedly shortened compared to previously reported half-lives of therapeutic dosages in dogs, suggesting the efficacy of cHP. Standardized sampling protocols involving a larger number of dogs are recommended for future prospective studies to further investigate NSAID pharmacokinetics.

008. Frequency of Lead Testing in Pediatric Gunshot Wound Patients with or without Retained Foreign Bodies

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Background: Firearm injury is the leading cause of death for children in the United States. Most firearm projectiles contain lead, and retained foreign bodies (FBs) present a source of firearm injury morbidity, especially in children. There are currently no medical society guidelines for lead level monitoring after firearm injuries with retained FBs in the pediatric population.

Research Question: Do pediatric patients with retained firearm ballistic fragments receive post-injury blood lead testing?

Methods: This is an observational cohort study of pediatric patients (< 18 years old) presenting to our trauma center after sustaining nonfatal penetrating firearm injuries. Patients were identified from the Saint Louis Children's Hospital Trauma Registry for the period of January 1, 2022 to December 31, 2022 allowing for at least 18 months of follow up data post injury. Patients were analyzed in two groups: those with one or more retained FBs (FB group) and those without a retained FB (non-FB group). The trauma registry was queried for patient demographics (age [median, IQR], biologic sex [male, female], race [Black, White, Other], and ethnicity [Hispanic or non-Hispanic]). Patient medical records were manually reviewed for the presence or absence of retained FBs, the number of fragments present, their

location, the occurrence of FB removal procedures, pre-injury blood lead levels (BLLs) (mcg/dL), and post-injury BLLs (mcg/dL). A BLL was considered clinically significant if it was above 3.5 mcg/dL. Due to the low number of BLLs observed, no comparative statistics were performed.

Results: Of the 148 children with non-fatal firearm injuries during the study period, the median age was 15 years (12–16 IQR range), 79.7% were male, 81.8% were Black/Non-Hispanic. Eighty-six patients had retained FBs. In the FB group, the number of retained fragments ranged from one to innumerable, nine had intra-articular FBs, and 29 (including 4/9 intra-articular FBs) underwent a procedure to remove the fragments. Pre-injury, nine patients (six in the FB group; three in the non-FB group) had BLLs; one was clinically significant (4.9 mcg/dL). Of the entire cohort, four patients (2.7%) received a post-injury BLL, three (3.5%) in the FB group (1.0, 1.2, and 1.8 mcg/dL), and one (1.6%) in the non-FB group (1.0 mcg/dL).

Conclusion: Children with retained ballistic fragments from a firearm injury do not routinely get blood lead testing. Prospective research is needed to ascertain whether children with retained firearm ballistic fragments are at increased risk of elevated BLLs.

009. Crotalidae Polyvalent Immune Fab Dosing in Agkistrodon Contortrix Envenomation: Preliminary Results of a Single-Center Retrospective Cohort Study

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Background: Crotalidae polyvalent immune F_{ab} (FabAV) is commonly administered to treat *Agkistrodon contortrix* snakebite (ACSB). Some data suggest that clinicians administer FabAV at lower doses than suggested by the package insert when treating ACSB.

Research Question: What are the patterns of dosing and administration of FabAV for ACSB in patients evaluated by a medical toxicology service?

Methods: This is a retrospective cohort study of patients evaluated in-person by our medical toxicology service at our primary hospital sites (quaternary academic pediatric and adult hospitals in the Midwest) from January 2001 – June 2023. We queried an internal database to identify patients with ACSB. We included patients with known or suspected ACSB, regardless of whether they received initial care (including FabAV) at an outside facility, and excluded patients with dry bites, administration of other antivenoms, or administration of FabAV without reliable documentation of dosing. Trained abstractors obtained data from the

electronic medical record using an electronic form. We used descriptive statistics to summarize the primary outcome (FabAV dosing) and multiple regression to adjust age and sex in our exploratory analysis of clinical outcomes.

Results: We identified 187 cases meeting inclusion criteria; 121 (64.7%) were male, and 33 (17.6%) were six years of age or younger. One hundred forty-four patients (77%) received *any* FabAV. The median initial dose of FabAV was 4 vials (IQR 2–4) and the median total dose of FabAV was 4 (IQR 2–4). Only 21 patients (11.2%) received five or more vials of FabAV. Exploratory logistic regression analysis demonstrated no significant association between initial FabAV dose and incidence of FabAV redosing. The median total weight-based milligram morphine equivalent administered was 0.3 mg/kg (IQR 0.1–0.8). Exploratory linear regression analysis found that patients receiving an initial dose of five or more vials of FabAV received *more* total opioids than patients receiving an initial dose of 1–2 vials FabAV. One hundred thirty-five patients (72%) were admitted, with a median hospital length of stay (LOS) of 16.5 hours (IQR 11.3–30.8) and no significant difference in LOS by FabAV dosing. Analysis of envenomation severity, laboratory results, and extent of soft tissue injury is ongoing.

Conclusion: In this single-center retrospective cohort study of ACSB, FabAV use was common, and doses used were frequently below those recommended in the package insert. Preliminary analysis suggests that higher FabAV doses were not associated with reductions in FabAV redosing incidence, opioid consumption, or hospital LOS.

010. Medical Toxicology: A Safety Net for Snakebite Victims

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Background: An estimated 5,000–10,000 snakebites are evaluated annually in US hospitals. Because of this relative infrequency, most physicians lack expertise in their management. Medical toxicologists, however, have specific envenomation training. The purpose of this study was to determine if bedside evaluation by a medical toxicologist during a subsequent hospital visit changed management in snakebite cases that were initially treated elsewhere by non-toxicologists.

Methods: This was a review of prospectively collected de-identified patient information reported to the North American Snakebite Registry (NASBR) by medical toxicologists providing bedside care for snakebite patients between

January 1, 2018 and December 31, 2023. Patients who were discharged from a facility without a medical toxicologist and then represented to a facility with a medical toxicologist, whether directly or via transfer, were included. Data regarding patient demographics, clinical features, antivenom utilization, other interventions, and outcomes were reviewed.

Results: There were 1270 cases entered into NASBR during the study period. We identified 84 (6.6%) patients who met the inclusion criteria. Clinical information from the initial hospitalization was available in 35 (42%) cases. Medical toxicologists administered antivenom to 30 (86%) patients. No patients received antivenom during their initial hospital stay, which ranged from two to 264 hours with a median of six hours. Eight (23%) patients who returned to the original hospital or who presented to a different hospital lacking a medical toxicologist received antivenom prior to being transferred to a hospital with a medical toxicologist. One patient received antivenom at the referring hospital for a bite from a snake that was subsequently identified as a nonvenomous garter snake.

Several interventions that are not recommended for snake bites were performed at the hospitals without a medical toxicologist, including prolonged application of ice, antivenom administration following a bite from a nonvenomous snake, placing the affected limb below heart level, and prophylactic antibiotics. In the 49 cases for which data from the initial hospitalization were unavailable, the medical toxicologist treated 33 (67%) patients with antivenom, including five (10%) who received a dose from a transferring hospital.

Conclusion: In this study, most snakebite patients who had already been evaluated and discharged from another hospital were treated with antivenom by the medical toxicologist. This suggests that other physicians may have too high a threshold to treat with antivenom or are not monitoring patients for a sufficient length of time. Early consultation with a medical toxicologist may lead to quicker antivenom administration and recovery.

ToxIC: This research was performed by the ACMT Toxicology Investigators Consortium

011. Clinical Features of Paralytic Shellfish Poisoning Cases from the 2024 Oregon Outbreak

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Background: Paralytic shellfish poisoning (PSP) occurs after consuming bivalves (e.g. mussels) that accumulate saxitoxin, a voltage-gated sodium channel antagonist that causes paresthesia and paralysis. Toxicology resources state that consuming a greater number of affected shellfish results

in more severe symptoms and that symptoms occur within 30 minutes.

Research Question: Do all PSP symptoms begin within 30 minutes of exposure? Do the number of shellfish that are consumed correlate with symptom severity?

Methods: This retrospective chart review of Poison Center cases was approved by the Oregon Health and Science University IRB. We included cases with the substance code “paralytic shellfish poisoning” and excluded cases if data was insufficient.

Results: Eighteen cases were identified; one was excluded. Time to symptom onset was variable; 13/17 (76.5%) < 30 minutes, 4/17 (23.5%) > 30 minutes, including one with onset at 4.5 hours. Clinical symptoms included: 9/17 (52.9%) hand/feet numbness, 14/17 (82.4%) oral/perioral numbness, 3/17 (17.7%) ataxia, 2/17 (11.8%) proximal extremity numbness, and 1/17 (5.9%) paralysis with respiratory failure. No patient died. Nine cases had progression of symptoms after presentation. All severe symptom progression (e.g. intubation, new-onset ataxia) occurred within six hours of ingestion and all minor progression (e.g. increase in area of paresthesia) occurred within nine hours. The most severe manifestations occurred in a patient with orofacial numbness within one hour after ingesting 20 mussels who presented with bilateral lower extremity weakness three-four hours after ingestion and progressed to respiratory failure and intubation six-seven hours after ingestion. The number of mussels ingested was documented in 13 cases. Four patients ingested >10 mussels; symptom onset ranged from “immediate” to 4.5 hours, the latest progression of symptoms was 8.5 hours after ingestion, all were admitted, and two were admitted to the ICU. Seven patients ate < 5 mussels; all had symptom onset within minutes, symptom progression as late as seven hours after ingestion, symptom resolution within 13 hours, and three were admitted.

Conclusion: In this population, symptom onset following ingestion of shellfish containing saxitoxin was variable with one-quarter developing symptoms beyond 30 minutes of ingestion and one as late as 4.5 hours after ingestion. All symptom progression occurred within nine hours. The number of mussels ingested did not correlate with time-to-symptom-onset but did correlate with severity. Limitations include small sample size, few severe cases, and potential recall bias.

DAY 1: POSTERS, ABSTRACTS 012–069

012. Evaluating Interest & Engagement in ACMT Webinars: Insights from 2023 Registration Data

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Background: The American College of Medical Toxicology (ACMT) aims to advance patient care among its members and promote medical toxicology through education for the general public. As part of this strategy, ACMT hosts three to four webinars per month throughout the year. These webinar offerings include the Addiction Toxicology Case Conference (ATCC) and various ad hoc sessions that are typically available to both members and non-members, and the member-exclusive webinar series: National Case Conference (NCC), National Journal Club (NJC), and National Grand Rounds (NGR). These webinars require substantial organizational resources. ACMT allocates more than 0.50 FTE of staff time to manage, market, and produce the series.

Hypothesis: ACMT’s investment in its webinar series is justified by significant interest and engagement by members and non-members.

Methods: This study analyzes webinar metrics from January 2023 to January 2024, using registration as a primary indicator of interest and engagement. While actual attendance numbers tend to be higher, they are less precise due to factors like group viewing or “shadow participation,” where additional unregistered individuals watch alongside the registered attendee. Consequently, the registration data offers a more reliable measure. A registrant-to-attendee ratio was calculated by dividing the total number of registrants by those who did not attend, providing an understanding of engagement based on expressed interest versus follow-through.

Results: In 2023, ACMT hosted 40 webinars, attracting a total of 3426 registrations. The case-based series, NCC (1265) and ATCC (1237), saw the highest levels of registrations. Average monthly registration was 282, peaking in January (379 registrants) and dipping in June (197 registrants). Publicly accessible webinars like ATCC and ad hoc sessions drew notable interest from non-members, with 276 non-member registrants attending the ATCC and 52 joining various ad hoc webinars. The overall registrant-to-attendee ratio, a key performance indicator for virtual activities, averaged 49%, exceeding the industry standard of 40%.

Conclusion: The registration data demonstrate strong interest in and engagement across ACMT’s webinar series, with case-based webinars like NCC being especially popular. Additionally, ATCC and special topic ad hoc sessions successfully reached a broader audience, emphasizing their value to both members and the wider medical community. These findings confirm that ACMT’s investment in staff time and resources for the webinar series is well-justified, reflecting the significant educational value and support of the organization’s mission.

013. Member Engagement in the ACMT National Case Conference (NCC) Webinar Series: 2023 Attendance Trends

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Background: The National Case Conference (NCC) is the most widely attended webinar series offered by ACMT, featuring monthly case-based discussions designed to enhance clinical knowledge and foster professional development. Registration for these webinars is exclusive to ACMT members. Understanding participation patterns, including group viewing behaviors, is essential for evaluating the series' impact and its value to the membership.

Hypothesis: We suspect that ACMT members are utilizing these webinars not only for professional development, but also as an educational tool for learners and peers.

Methods: Registration and attendance records for the 2023 NCC were analyzed across 12 monthly sessions. Members were categorized by registration frequency: one-time registrants, occasional registrants (2–5), regular registrants (6–11), and full-year registrants (all 12). Attendance totals for each webinar were determined by those who registered and attended plus the number of people watching with them in the room, as collected by a survey. Additionally, membership category data and “shadow participation” (group viewing) were collected via a survey asking, “How many are watching in the room with you?”

Results: In 2023, 330 of 887 (38%) individual ACMT members registered for a NCC webinar, including four medical students, 20 residents, 12 international members, six emeritus members, 80 fellows-in-training, 28 associate members, 29 affiliate members, and 151 full members. Participation trends revealed that of the 330 who registered, 30% (98) registered for only one session, 45% (146) registered occasionally (2–5 webinars), 21% (69) registered regularly (6–11 webinars), and 3% (9) registered for all 12 sessions. On average, the webinars attracted 141 total attendees per session, with January having the highest attendance (245 attendees) and May the lowest (87 attendees). On average, 56% of attendees were identified as “shadow participants” watching in the room with registered members. Additionally, shadow participants accounted for a substantial portion of engagement, making up over 60% of the total attendance for March and April.

Conclusion: Although limited by the low granularity of attendance demographics (i.e. it is difficult to identify shadow participants) registration metrics for the 2023 NCC shows that the webinar series engaged a diverse ACMT

audience, with strong interest from both regular and occasional registrants. High group-viewing rates, particularly sessions where over 60% were shadow participants, highlight the webinars' value for both individual and collaborative learning, presenting further opportunities for knowledge-sharing in medical toxicology.

014. Medical Specialty Matches of Medical Students who Participate in an Elective Medical Toxicology Rotation

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Background: Most medical toxicologists have a primary medical specialty of emergency medicine. The medical toxicology community recognizes the value of having a diversity of primary medical specialties, but it is difficult to know from which specialties medical toxicology fellowships should recruit. A previous study of recent medical toxicology graduates identified that participating in a medical toxicology clinical rotation influenced their decision to become a medical toxicologist. Thus, early exposure to medical toxicology rotation may influence career decisions, but many medical students may have already chosen their primary specialty prior to their rotation experience. This study's objective is to determine which medical specialties may be likely to produce medical toxicologists by analyzing the medical specialties of medical students who participated in an elective medical toxicology rotation.

Methods: This is an IRB exempt, multi-center, retrospective, descriptive survey-based study. A survey was provided to the medical toxicology rotation directors of three academic centers about the 2023–2024 academic year. The primary outcome was medical specialty match. Secondary outcomes included level of training of the medical students, average number of students per rotation, rotation clinical experiences offered, description of rotation lecturers, and additional non-clinical requirements of the rotation. Data was analyzed using descriptive statistics.

Results: The 2024 medical specialty match of 30 students who rotated through a medical toxicology rotation from three different sites were analyzed. The most popular medical specialty matches were emergency medicine (8; 26.7%), internal medicine (7; 23.3%) and psychiatry (6; 20.0%). All medical toxicology rotations only accepted fourth year medical students, provided a bedside consult clinical experience, had didactic lectures provided by a medical toxicology attending, and had a non-clinical requirement of a presentation on an evidence-based medical toxicology topic. The average number of medical students per rotation was 0.6.

Conclusion: Emergency medicine, internal medicine, and psychiatry were the most common medical specialty match for students who took an elective medical toxicology rotation. All medical toxicology rotations surveyed only accepted fourth year medical students, provided bedside consultation experience, had lectures provided by a medical toxicology attending, and required students to explore an evidenced based topic. Future studies will include additional academic centers, a medical student survey regarding their medical toxicology rotation, and follow up at the end of their primary specialty training about their pursuit of a medical toxicology career. This pilot study indicates that medical toxicology fellowships may find success by expanding recruitment efforts to include internal medicine and psychiatry.

015. The Presence of Medical Toxicologists in Emergency Medicine Residency Programs

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Background: Poisoning is the leading cause of death and injury in the US, with many cases initially presenting to the emergency department (ED). The scope and integration of medical toxicology education and training in emergency medicine (EM) residency programs is not well-characterized.

Research Question: What is the proportion of emergency medicine residency programs with at least one medical toxicologist (MT) on their faculty?

Methods: We compiled a list of EM residency programs using public information from the Accreditation Council for Graduate Medical Education (ACGME). Each EM program website was reviewed for the presence of medical toxicologists on faculty at the program's primary affiliated hospitals. This was then cross-referenced with the American Board of Medical Specialties (ABMS) list of board-certified medical toxicologists and/or the American College of Medical Toxicology (ACMT) member directory.

Results: As of 2024, there are 289 ACGME-approved emergency medicine residency programs in the United States, of which 32 (11%) have medical toxicology fellowships. Of these 289 programs, 141 (48.8%) had at least one medical toxicologist on faculty. Thirty-two of 141 (22.7%) programs with a medical toxicologist have an affiliated medical toxicology fellowship. Of all 236 three-year programs, 111 (47%) have at least one medical toxicologist. Of the 53 four-year programs, 30 (56.6%) have at least one medical

toxicologist. The proportionate number of residencies with at least one medical toxicologist per state varied widely. Of the states with the most EM residencies, Florida has 7/22 (31.8%), New York 23/32 (71.9%), Michigan 5/26 (19.2%), CA 12/26 (46.2%), and Texas 10/19 (52.6%) programs that have at least one medical toxicologist.

Conclusion: About half of emergency medicine residency programs have a medical toxicologist on faculty, and about half do not. Only a tenth of these programs have an affiliated medical toxicology fellowship. Understanding the medical toxicology education at EM residencies with and without medical toxicologists, including whether residents have a mandatory or optional medical toxicology rotation, is currently being investigated. The lack of medical toxicologists at half of the EM residencies may provide additional job opportunities for medical toxicologists in the future.

016. Intravenous Elemental Mercury Injection Leading to Mercurial Pulmonary Emboli

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Background: Mercury has been used for centuries in various applications, including medicine, industry, and alchemy. However, mercury's toxic properties, particularly in its elemental form, have long been a concern. It can lead to neurological, renal, and respiratory damage. This report summarizes an uncommon case of elemental mercury poisoning by intravenous injection.

Results: The patient was a 35-year-old male who presented after injecting himself with 88 mL of elemental mercury procured from a thermometer in a suicide attempt two weeks prior. His initial complete blood count test showed a platelet count of 406,000/mm³, with a normal white blood cell count, hemoglobin, and hematocrit. Complete metabolic profile demonstrated mildly elevated transaminase activities, AST 55 IU/L, ALT 121 IU/L, but electrolytes and glucose were within reference ranges. A radiograph of the chest demonstrated diffuse radiopaque particles throughout the lungs, predominantly within the lung bases. Radiographs of bilateral elbows did not demonstrate radiopaque foreign bodies. A transthoracic echocardiogram did not detect any intracardiac foreign bodies. He did not complain of pain, paresthesia, dyspnea, or diaphoresis. His vital signs were blood pressure 118/70 mmHg, heart rate 69 beats per minute, and temperature 36.6°C. His respirations were non-labored (17 breaths per minute with 99% saturation on room air). A serum mercury concentration resulted three days later at 78 ng/mL and a 24-hour urine mercury concentration was 165 mcg/24 hours, both above reference ranges. The patient

received oral succimer (dimercaptosuccinic acid), 700 mg orally thrice daily for five days, followed by 700 mg orally twice daily for 14 days. He was discharged 11 days after admission and was lost to follow up. It is unclear whether he completed the remainder of his oral succimer regimen.

Conclusion: Clinical symptoms most frequently reported after intravenous mercury injection include fever, chills, exanthem, paresthesia, and arthralgia. Aplastic anemia, renal dysfunction, and rarely, death, have occurred. Most patients develop tissue depositions of mercury within the lungs, which can also occur in subcutaneous tissues, the liver, kidneys, or blood vessels. Described treatment regimens vary, with some patients receiving no chelation despite elevated concentrations of serum and urine mercury. Urine and blood concentrations are not predictive of symptom development. In this case, the patient did not have any new or worsening symptoms of mercury toxicity and tolerated oral chelation therapy.

017. Long-Term Clinical Course in Chronic Elemental Mercury Exposure Without Source Control

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Background: Chronic elemental mercury exposure is a rare condition, typically seen in occupational settings. A mainstay of treating poisoning is cessation of exposure. However, source control can be impossible for patients with a large tissue burden of mercury not amenable to surgical removal. Long-term management of their exposure is challenging.

Hypothesis: The clinical course of chronic elemental mercury exposure in patients with a known body burden can be variable and is not always correlated with mercury levels.

Methods: This is a single patient case report. Data was obtained via electronic medical record review. A 60-year-old male presented to the toxicology clinic after hospitalization for elemental mercury exposure. Whole blood and 24-hour urine mercury levels, symptoms reported, and physical exam findings were recorded during clinic visits over the following 30 months.

Results: During index hospitalization the patient's 24-hour urine mercury level was 858 mcg/L. He had tremor and confusion. Imaging demonstrated radiopaque foreign bodies in his pelvis, pulmonary vasculature, gastrointestinal tract, and heart, compatible with elemental mercury injection and ingestion. Chelation was performed with dimercaprol 5 mg/kg IM x1 and succimer 500 mg TID for five days followed by BID for 14 days. His confusion improved but he endorsed ongoing dizziness and peripheral neuropathy. His mercury level had improved to 235 mcg/L two months later. A second course of succimer 500 mg TID for five days, BID

for 14 days was performed with subsequent urine mercury level of 323 mcg/L and no changes to his symptoms. Five months after initial presentation a third round of succimer was performed, with subsequent 24-hour urine mercury level of 77 mcg/L. Two years later, he endorsed waxing and waning nausea, vomiting, dizziness, and fatigue. Urine mercury levels at 27 and 31 months were 315 mcg/L and then 518 mcg/L without clear progression of symptoms reported via telehealth visit. Further chelation was deferred given a lack of clinical symptoms and questionable benefit.

Conclusion: This case report highlights the patient's variable clinical course of chronic elemental mercury exposure with a large body burden of mercury. Despite chelation, he continued to experience symptoms without clear correlation to his urine mercury levels. The variability of presentation without new exposures suggests that long-term management of chronic elemental mercury exposure without source control poses challenges to conventional management.

018. Poppin' Tags at the Thrift Shop: A Thrift Shop Thermometer Leading to Mercury Poisoning

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Background: Subcutaneous injection of elemental mercury is uncommon and reported to cause significant local inflammation; however, the potential for systemic toxicity is unclear. The case below describes a patient with significantly high blood and urine mercury levels after subcutaneous injection compared to prior case reports.

Methods: This is a case report of a 21-year-old man who presented to the hospital for left forearm redness and swelling. He had injected, subcutaneously, 50–150 ml of liquid mercury into his left forearm six days prior in a self-harm attempt. He obtained the mercury from thermometers purchased at thrift shops. He also reported fevers, shortness of breath, dysphonia, chest pain, and nausea. He denied any vomiting, abdominal pain, or diarrhea. Vital signs were within normal limits. His physical exam was significant for prominent, poorly demarcated erythema of the left forearm with induration and tenderness to palpation.

Results: Day of admission labs showed whole blood mercury 388 mcg/L (normal: < 10 mcg/L) and 24-hour urine mercury 685 mcg/L (normal: < 20 mcg/L). Cardiopulmonary symptoms resolved and were not considered related to mercury poisoning. Chest X-ray was negative. Left forearm X-ray showed extensive globular radiopaque foreign material in the soft tissue extending 10 cm distal to the elbow all the way to the distal radius. The patient was

taken to the operating room for mercury removal. Nearly 300 cm² of affected skin and fat tissue were debrided down to deep muscle fascia with skin graft placement. Toxicology recommended precautions to avoid intraoperative vaporization of the mercury including avoidance of heat from electrocautery and aerosolization due to suction. Repeat imaging showed successful removal. He was discharged to inpatient psychiatry on cephalexin. The patient was lost to follow up, and unfortunately repeat levels were not obtained.

Conclusion: Subcutaneous mercury exposures are uncommon. Local findings predominate and acute systemic toxicity is rare despite high mercury levels. The patient above had significantly elevated levels in the blood and urine on admission compared with prior case reports and did not have specific symptoms of mercury toxicity.

019. Ayurvedic Remedy *Rasa Karpuram* Causing Pediatric Mercury Toxicity

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Background: *Rasa Karpuram* is an ayurvedic remedy, commonly used as a natural cure for a variety of ailments in India but not regulated by the Food and Drug Administration, and contains multiple compounds, including camphor, mercury sulfide, *Myristica fragrans*, *Cyperus scariosus*, and *Papaver somniferum*. Toxicity associated with *rasa karpuram* exposure has not been previously described.

Methods: We present a case of a five-month-old female who arrived at the emergency department after being given *Rasa Karpuram* by her parents for constipation. The parents had previously used the same remedy for their own symptoms. The patient arrived at the EC in acute distress, with tachycardia, tachypnea, altered mental status, and vomiting. She required intubation for airway protection and was subsequently admitted to the pediatric intensive care unit (PICU) following initial resuscitation. Initial labs revealed acute kidney and acute liver injury, for which continuous renal replacement therapy (CRRT) and N-acetylcysteine were initiated. A continuous EEG was performed. The regional poison center was called and recommended heavy metal testing.

Results: Serum mercury concentration from the patient's initial presentation returned on day three of hospitalization at 3534 ug/L (≤ 10 ug/L). Urine heavy metal testing was not initially performed due to anuria. Chelation therapy with succimer was started. The patient was continued on CRRT and started on molecular absorbent recirculation system (MARS) with chelation therapy per the hepatology team's recommendation. The patient's acetaminophen, salicylate

and alcohol concentrations were undetectable. Serum lead and arsenic concentrations were undetectable. The cEEG was negative for epileptiform activity. During chelation therapy, the patient's serum mercury concentrations decreased. On hospital days four, seven, and 12 concentrations of mercury were down trending with values of 1561 ug/L, 513 ug/L and 302 ug/L, respectively. Her most recent serum mercury concentration was 33.4 ug/L. The patient had a prolonged stay in the hospital developing hypertension and bacterial infection. She was extubated on hospital day 12 and transferred out of the PICU on hospital day 24. She was discharged after 37 days when her acute kidney injury had resolved. She continues to receive succimer chelation as outpatient.

Conclusion: Our case describes the effects and management of mercury toxicity in a pediatric patient due to *Rasa Karpuram*, previously never reported. Pediatric exposures to ayurvedic remedies may lead to severe toxicity from its multiple xenobiotics. Additional parental education on non-FDA regulated remedies such as ayurvedic medicines is needed.

020. A Story That Changed Quick(silver): Self-Inflicted Mercurialism

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Background: Subacute inorganic mercurialism is well described after exposures to elemental mercury (Hg₀) vapor but seldom after parenteral injection. Subcutaneous deposits of Hg₀ can be absorbed and cause systemic toxicity. Vascular embolization may also occur and can be detected with imaging

Hypothesis: Radiography with intracardiac and/or extrathoracic Hg₀ emboli should prompt consideration of a subcutaneous/intravenous exposure

Methods: This is a single patient case report.

Results: A 40-year-old male had presented to the ED with erythema and pain in his left forearm. A foreign body on radiography was noted, "chronic" per the patient. He was discharged home with antibiotics. He returned three days later with no improvement prompting PICC placement for IV antibiotics. Incidentally, chest radiography revealed innumerable small radiodense opacities scattered bilaterally, presumed to be related to an inhalational exposure during welding. He again returned four days later to the ED for abdominal pain prompting abdominal plain films which

showed massive increase in opacities within the thorax but now scattered throughout the abdomen and pelvis. Patient was noted to be emotionally labile with bizarre behavior and was placed on a hold pending psychiatric evaluation. Toxicology recommended chelation with a five day course of 2,3-dimercapto-1-propanesulfonic acid (DMPS); succimer was utilized during the two-day delay in acquisition. The initial 24-hour urine mercury concentration was 2230 mcg/L. Whole blood mercury was > 160 mcg/dL. On day four of DMPS a repeat 24 hour urine mercury concentration was unmeasurably high (> 10,000 mcg/L). Whole blood mercury remained elevated (> 160 mcg/dL) throughout the course of chelation. Surgery was consulted who recommended outpatient followup. After clearance from psychiatry the patient left against medical advice. Over the next twelve years the patient was chelated multiple times for symptomatic recrudescence. Clinical features included ataxia, dysarthria, neuropsychiatric abnormalities, tremor and decreased visual acuity.

Conclusions: Inhalation of Hg⁰ vapor can result in a flu-like syndrome followed by pneumonitis, neurotoxicity, and renal injury. This particular patient had imaging studies inconsistent with his exposure history. Subcutaneous Hg⁰ can gain access to the vascular space with embolization primarily to the pulmonary vasculature. Systemic embolization, which can occur in the absence of an anatomical shunt, is unique to this route of exposure.

021. When Plumbism Becomes Painful, Pyretic and Pruritic: A Case Describing Rare Adverse Effects During Chelation and the Utility of N-acetylcysteine

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Background: The chelating agents succimer (DMSA) and calcium disodium edetate (CaNa₂EDTA) are typically well tolerated. We present a unique case of a patient who developed an intolerance to both DMSA and CaNa₂EDTA during a single course of chelation, necessitating an alternative therapeutic approach.

Methods: This is a single case report.

Results: A 17-year-old male was admitted with an asymptomatic blood lead level (BLL) of 66.1 mcg/dL. The patient had a history of pica and had presented eight months earlier with a BLL of 79.8 mcg/dL, for which he completed three courses of chelation with DMSA and/or CaNa₂EDTA. He was diagnosed with iron deficiency anemia and was treated for a *Helicobacter pylori* infection. On this admission, his labs showed an elevated zinc

protoporphyrin/heme ratio (>600). For his fifth course of chelation, medical toxicology recommended oral DMSA (500 mg) in combination with intravenous CaNa₂EDTA (1.55 mg/kg/hr). One hour after his initial dose of DMSA, he developed diffuse pruritus, followed by nausea and dysphagia. His exam revealed small oral ulcerations and a macular rash on his anterior neck, chest, and arms. DMSA was discontinued and all lesions resolved over the following two days. On hospital day (HD) three, the patient developed progressive pain and confluent erythema at the right antecubital IV site, followed by fever (38.5°C), chills, myalgias, and nausea. CaNa₂EDTA was discontinued and replaced with an N-acetylcysteine (NAC) infusion. Upper extremity ultrasound revealed confluent hyperchoic thickening, subcutaneous edema, and superficial venous thrombosis. By HD five, bloodwork showed an 18% reduction in the BLL (52.9 mcg/dL), and the patient was discharged.

Conclusion: Clinically significant adverse effects are uncommon during lead chelation. Succimer is infrequently associated with severe mucocutaneous eruptions of an unclear etiology, which typically resolve upon discontinuation of the drug. Known toxicities of CaNa₂EDTA include nephrotoxicity, febrile systemic reactions, and localized cutaneous hydroxyapatite deposition. Alternate etiologies of iron deficiency anemia should be simultaneously considered. When both standard chelators are intolerable, NAC serves as a reasonable alternative, with clinical evidence supporting its ability to enhance urinary lead elimination.

022. Trends in Exposures and Chelation of Arsenic, Lead, and Mercury as reported to the National Poison Data System

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Background: Arsenic, lead, and mercury are all nonessential metals in humans and it is important to monitor trends of exposures for public safety. Many chelation therapies are rarely used and can often be difficult to find a pharmacy with them in stock. We aimed to describe the characteristics of single substance exposures of arsenic, lead, and mercury and the use of chelator treatments as reported to United States Poison Centers.

Methods: We conducted a retrospective review of the National Poison Data System over a 23 year period from 1/1/2000 through 12/31/2023. We queried single substance exposures with the generic code for arsenic, lead, and mercury. We described the trends of exposures over the study period and the frequency and trends of chelation therapies for each respective metal. Chelators reported and included in analysis were dimercaprol, CaNa₂EDTA, succimer, penicillamine, and dimercaptopropanesulfonic acid.

Results: During the study period, lead (N = 43,819) had the most exposures reported followed by mercury (N = 35,398) then arsenic (N = 18,348). Chelator treatment was reported most often in lead exposure (7.92%) followed by arsenic (2.01%) and then mercury (0.96%). The most common chelator for all three metals was succimer. There was no definite trend in the rate (treatments reported per total exposures) of chelation therapy over the study period for lead or mercury, but the rate of chelation therapy of arsenic showed a steady decrease from a peak of 5.97% in 2003 to a nadir of 0.32% in 2018.

Conclusions: Exposures to lead are more frequently treated with chelation than mercury or arsenic as reported to the NPDS. The rate of chelation for arsenic decreased steadily over the study period. This data suggests it would be most prudent to ensure access to succimer compared to other chelating agents.

023. A Comparison of Pediatric Capillary and Venous Lead Levels and Their Related Management

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Background: Lead toxicity in children can have lasting detrimental effects necessitating early screening. Capillary lead levels are frequently used but can be falsely elevated, potentially leading to excessive resource utilization.

Hypothesis: In evaluating lead toxicity, significant discrepancies between capillary and venous lead levels occur leading to high resource utilization.

Methods: This is a retrospective descriptive study of elevated capillary and venous lead levels that were evaluated by medical toxicology from May 2015 through October 2024. Data collected from qualifying cases included length of stay, chelation therapy, whole bowel irrigation, intensive care admission, and capillary and venous lead levels. Data was analyzed using descriptive statistics. Capillary and venous lead means were compared using a paired t-test.

Results: Fifty-seven patients were included in analysis, the average age was 3.42 years with an average hospital stay of 2.63 days. Of these, 45.6% received whole bowel irrigation, 54.5% oral chelation, 5.3% parenteral chelation, 98.2% were admitted, and 3.5% required ICU admission. Approximately 43.9% of patients had a capillary lead level with average of 61.9 µg/dL and standard deviation (SD) 34.5 µg/dL. All patients had a venous lead level with an average of 37.5 µg/dL (SD 22.2 µg/dL). The average venous lead of patients with corresponding capillary levels was 35.8 µg/dL (SD 23.4 µg/dL). The average time between capillary and venous collection was 4.6 (SD 3.9) days. There were six cases with large discrepancies between capillary and venous levels, including a capillary level of 157.2 µg/dL and venous of 2.9 µg/dL and

another with capillary 121.6 µg/dL and 12.6 µg/dL venous. There was a statistically significant difference between means of capillary and venous levels with $p < 0.005$. Of patients with capillary lead levels above chelation threshold, 47% had venous levels below treatment threshold.

Conclusion: This review demonstrated potential intervention altering differences between capillary and venous lead levels. Patients sent to a tertiary care center for elevated capillary lead levels frequently required admission, often due to limitations in acquiring definitive venous lead levels only available certain weekdays and time to set up remediation plans for safe discharge. Several capillary lead elevations showed significantly lower venous levels once obtained. The test is highly sensitive, but specificity suffers from potential external contamination and false positives. Relying on capillary lead levels may lead to initial overtreatment and unnecessary resource utilization as interventions may be started before definitive testing can be obtained.

024. A Rare Case of Dermatologic Eruption in Lithium Overdose

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Background: Lithium is a well-established and widely used mood stabilizer in the treatment of bipolar disorder. A variety of adverse effects have been reported with therapeutic use, including those affecting the endocrine, renal, central nervous systems, and, uncommonly, causing dermatologic eruptions. In overdose, its primary site of toxicity is the central nervous system and dermatologic manifestations have not been reported.

Hypothesis: Maculopapular rash is an uncommon adverse effect of therapeutic lithium use and has not yet been reported in overdose.

Methods: This is a single patient chart review. A 77-year-old female with a history of bipolar disorder presented to the emergency department after ingesting 100 pills of 300 mg extended-release lithium 45 minutes prior to arrival. Upon initial evaluation, the patient was hemodynamically stable, but confused and slow to verbally respond. Gut decontamination with whole bowel irrigation was performed. After four hours, her lithium level was 1.7 mmol/L and she developed a nonpruritic maculopapular skin eruption on her face. The patient's husband noted that this rash had occurred previously when the patient was first prescribed lithium several years prior. The patient was treated with intravenous diphenhydramine 25 mg, which did not resolve the rash. As she continued treatment for her lithium overdose, her rash was monitored closely.

Results: The patient's lithium level peaked at 4.1 mmol/L twelve hours after arrival to the hospital. It remained elevated at 3.5 mmol/L over the next 30 hours and hemodialysis was

performed until it eventually normalized to 1.0 mmol/L 36 hours post-arrival. The patient's rash progressed from her face to her neck, back, and extremities over 48 hours. At 72 hours after presentation, the medical team noted significant improvement of the rash and by 96 hours, it had completely resolved. The patient remained confused for several days, but she eventually returned to her neurologic baseline and was discharged on hospital day 12 to an inpatient psychiatric facility.

Conclusion: Dermatologic eruptions are an underreported adverse effect with therapeutic use of lithium, with acneiform and maculopapular eruptions being the most commonly described. Here, we report a maculopapular rash in acute overdose, in which no case reports exist. The patient's sudden skin eruption several hours after a large acute ingestion, as well as the persistence of the rash over the next few days, may be correlated with the patient's elevated serum lithium levels.

025. Systemic Toxicity from Subcutaneous Injection of Elemental Mercury

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Background: Subcutaneous injection of elemental mercury is a rare presentation of heavy metal exposure. Most previously reported cases have resulted in localized soft tissue effects with minimal systemic toxicity.

Hypothesis: Prolonged retention of subcutaneous elemental mercury can result in systemic toxicity.

Methods: This is a single patient chart review.

Results: A 24-year-old male with a history of autism inserted elemental mercury he obtained from a large thermometer into his left antecubital fossa in a suicide attempt, after experiencing social isolation during the COVID-19 pandemic. The mercury injection went unreported and unrecognized for the next 3 years. During that time, he developed hypertension and proteinuria with membranous nephropathy diagnosed on renal biopsy, as well as neuropsychiatric symptoms, including a tremor and increased irritability. The history of injected elemental mercury was discovered after a dermatologist attempted excision of the foreign material, which was initially thought to be pencil graphite. An initial 24-hour urinary mercury concentration was 150 mcg/L with a blood level of 57 mcg/L. He subsequently underwent surgical excision with debridement of the foreign material in his antecubital fossa alongside chelation therapy with oral succimer, followed by free flap reconstruction of his forearm. Three weeks after the surgical excision, his 24-hour urinary mercury concentration was 116 mcg/L with a blood level of 5 mcg/L. He reported improvement in his neuropsychiatric symptoms. A second

course of oral succimer was ordered with plans to trend serial 24-hour urinary mercury concentrations to confirm effective systemic elimination of mercury.

Conclusion: Subcutaneous injection with prolonged retention of elemental mercury can result in significant systemic absorption with associated toxicity.

026. Intentional Lidocaine Powder Ingestion Presenting in Cardiac Arrest

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Background: Local anesthetic toxicity usually occurs in the setting of iatrogenic overdose via dermal, subcutaneous, or epidural injection of anesthetics. Toxicity secondary to intentional ingestion of local anesthetic is a rare presentation.

Hypothesis: Intentional ingestion of local anesthetic as a suicide attempt can result in severe cardiac toxicity.

Methods: This is a single patient chart review.

Results: A 19-year-old male presented in cardiac arrest after arguing with his girlfriend. He was found in a neighbor's yard an hour after last being seen normal with seizure-like activity. Prehospital personnel found him to be in pulseless ventricular tachycardia, began chest compressions, administered IV epinephrine, and defibrillated him twice. Return of spontaneous circulation was achieved before ED arrival. In the ED, he was found to have a pH of 6.89 and QRS of 122 ms on initial ECG. Collateral information was obtained by examining his smartphone, wherein a ChatGPT thread was found in which he ascertained the lethal dose of lidocaine. An empty container of 99% lidocaine hydrochloride powder was later found in his house. At this point, he was given a 1.5 mL/kg bolus of lipid emulsion followed by a 15 mL/kg infusion over twenty minutes. A bolus of 50 mEq of 8.4% sodium bicarbonate was given. His QRS narrowed to 98 ms on repeat ECG. He was endotracheally intubated and admitted to the ICU, where post-cardiac arrest targeted temperature management was initiated. Initial lactic acid was 18.1 mmol/L. His serum lidocaine concentration obtained five hours after the likely time of cardiac arrest was 3.7 mg/L. A repeat concentration of 1.7 mg/L was obtained six hours and twenty minutes later with a calculated serum half-life of 5.64 hours. Upon rewarming and holding sedation one day later, the patient had a neurologic exam consistent with brain death. Repeat CT imaging of the brain showed complete effacement of basal cisterns, diffuse cerebral edema, and early uncal herniation. Other ingestions were excluded through GC/MS testing and quantitative bupropion and hydroxybupropion concentrations, which were undetectable.

Conclusion: A rare presentation of local anesthetic systemic toxicity, intentional ingestion of lidocaine powder as a suicide attempt can result in significant systemic toxicity and cardiac arrest.

027. Lidocaine for Treatment of Refractory QRS Widening Secondary to Doxepin Ingestion

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Background: Doxepin, a tricyclic antidepressant (TCA), exhibits cardiac toxicity via sodium channel blockade demonstrated as QRS widening. Sodium bicarbonate therapy provides increased sodium load to reduce the effects of sodium channel blockade, as well as increase the pH leading to more freely diffusible non-ionized agent, and less blockade. While lidocaine has been advocated for use in ventricular dysrhythmias refractory to sodium bicarbonate, it has not demonstrated benefit in aberrant sinus rhythms solely. Lidocaine can decrease the QRS by competitively antagonizing the sodium channels from TCA. QRS prolongation is directly correlated to negative outcomes in TCA toxicity.

Hypothesis: Lidocaine can be used to shorten a wide QRS secondary to sodium channel blockade from tricyclic antidepressant overdose resistant to sodium bicarbonate therapy.

Methods: This is a single-patient case report. A 29-year-old man with history of eczema and depression presented after ingesting an unknown amount of doxepin for pruritus secondary to his eczema. Prehospital ECG demonstrated a QRS of 185 milliseconds (ms) and noted to be 175 ms on arrival. He was administered 200 mEq of sodium bicarbonate with only temporary changes in QRS that were not sustained, requiring repeat administrations.

Results: Within the first two days of hospitalization, the patient had had a refractory wide QRS to a total of 400 mEq of sodium bicarbonate intermittently pushed, 4 mEq/kg of hypertonic saline boluses, and continuous sodium bicarbonate infusion. His pH was 7.49, and he was noted to have a QRS of 172 ms. At that time, a 100 mg lidocaine IV push was administered, and a continuous lidocaine infusion was started resulting in a narrowing of the QRS to 141 ms. The patient remained on a lidocaine infusion for 20 hours without a QRS increase of more than 10 ms and was then discontinued with a return to normal QRS of 90 ms nine days after presentation.

Conclusion: We report the successful use of lidocaine for a TCA overdose with refractory QRS widening. Further study should define the appropriate timing and indications for this therapy.

028. Prolonged Flecainide Elimination from Serum Alkalinization in Chronic Toxicity

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Background: Flecainide is an antiarrhythmic medication that in supratherapeutic concentrations may result in cardiac dysrhythmias through its action on cardiac voltage-gated sodium channels (VGSCs). Although treatment with hypertonic sodium bicarbonate may correct the resulting wide QRS arrhythmias, elimination of flecainide may be impaired with serum alkalinization in acute toxicity. This case demonstrates a similar effect in chronic flecainide toxicity.

Methods: This is a single patient chart review. A 69-year-old female patient with a history of atrial fibrillation developed recurrent episodes of wide complex tachycardia (WCT) refractory to treatment with hypertonic sodium bicarbonate during a hospital admission for orthopnea. She began taking flecainide (50 mg initially, increased to 100 mg twice daily) one month prior. Home medications included alendronate, atorvastatin, apixaban, and metoprolol. Serial serum flecainide concentrations and blood gases were obtained.

Results: Laboratory workup upon presentation was significant for hypokalemia (2.7 meq/L) and alkalosis (pH 7.64). Renal (Cr 1.04 mg/dL) and hepatic function were at the patient's baseline. A flecainide concentration obtained 12 hours after presentation was 1.78 mcg/ml (therapeutic 0.2 to 1.0 mcg/ml). Subsequent flecainide levels were 1.38 mcg/ml (66 hours), 1.58 mcg/ml (95 hours), and 0.58 mcg/ml (189 hours). Blood gases showed alkalosis (pH > 7.45) until hour 89 of hospitalization. CYP2D6 pharmacogenomic testing showed normal expression of the related genes and predicted normal metabolism activity. Her hospital course was significant for recurrent WCT, which were treated with epinephrine, defibrillations, and a temporary transvenous pacemaker. Acetazolamide, 8.4% sodium bicarbonate, amiodarone infusion, and 3% sodium chloride were unsuccessful in preventing further dysrhythmias. Dysrhythmias stopped after treatment with 1 mg/kg lidocaine bolus. She was discharged on day 15 to acute rehabilitation.

Conclusion: This patient had no evidence of decreased renal function, hepatic function, medication interaction, or genetic metabolic function to account for her prolonged flecainide elimination. An apparent increase in serum flecainide concentrations occurred following serum alkalinization, with a corresponding decrease following resolution of alkalosis. This suggests a similar effect on elimination of flecainide in this case of chronic toxicity as previously reported in acute toxicity. While our case should not discourage the use of key therapies such as hypertonic sodium bicarbonate, it does have implications for patient care. Impaired elimination may increase intensive care unit and hospital length of stay. It also raises the need for adjunctive therapies.

029. A Massive, Asymptomatic Mavacamten Overdose

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Background: Mavacamten is a small-molecule allosteric and cardiac myosin inhibitor used in the treatment of obstructive hypertrophic cardiomyopathy (HOCM) and was FDA-approved in 2022. There are only two reports of mavacamten overdose, both occurring during phase III clinical trials. We present the largest reported mavacamten overdose in published literature.

Methods: Data for this single patient case was obtained from medical records and a patient interview. A 47-year-old male with history of HOCM status post septal ablation, heart failure with preserved ejection fraction, intermittent heart block status post permanent pacemaker (ventricular-sensed ventricular-paced inhibiting), hypertension, and daily alcohol use presented to the emergency department (ED) 16 hours after overdose of 225 mg of mavacamten (1.5-month supply), in addition to 40 mg of hydrocodone and one liter of vodka. He had several episodes of emesis before presentation and in the ED. His initial examination was notable for mild drowsiness. Vital signs were within normal range, and laboratory testing was remarkable for WBC 18.1 K/uL, anion gap 21, lactate 4.4 mmol/L, acute kidney injury with creatinine 1.53 mg/dL, troponin 22 ng/L, ethanol 63 mg/dL, positive urine drug screen for opiates, and negative acetaminophen and salicylate levels. Electrocardiogram was similar to baseline with sinus rhythm, rate of 73, QRS of 151 ms and QTc 484 ms.

Results: The patient was admitted to an ICU for monitoring, and his drowsiness was resolved the next morning. Echocardiogram on hospital day (HD) one demonstrated normal systolic function. There were no occurrences of hypotension or arrhythmia. He remained asymptomatic and was discharged on HD four to inpatient psychiatry. In contrast to other overdose reports, which resulted in death of a child two hours after ingestion of 45mg of mavacamten and asystole in an adult at an unspecified duration of time after ingestion of 144mg of mavacamten, this patient remained asymptomatic despite reported ingestion of a far greater dose. Blood mavacamten levels are not available; however, the patient's report was consistent and corroborated by family and empty pill bottles.

Conclusion: Despite the largest reported ingestion of mavacamten, this patient did not develop symptoms. This is the third reported overdose of mavacamten, and is the sole report since FDA approval. While this patient did not develop symptoms, mavacamten is notable for a half-life of six to nine days, and 23 days in CYP 2C19 poor metabolizers, raising concern for the potential of long duration of effect in symptomatic overdose.

030. Not So Quiet: Quetiapine Poisoning Causing Refractory Shock and Status Epilepticus

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Background: Massive ingestions of antipsychotics causing refractory shock are exceedingly rare. At least one case describes a severe quetiapine overdose that resulted in QRS widening, recurrent arrhythmias, and circulatory collapse that was managed with vasopressors, continuous renal replacement therapy, and extracorporeal membrane oxygenation (ECMO). We present a case of another massive quetiapine ingestion which was successfully managed with ECMO and considerable amounts of vasopressors.

Results: A 21-year-old male was transported to the ED due to declining mental status after a reported ingestion of up to 230 tablets of 400 mg quetiapine. In the ED, the patient was intubated, fluid resuscitated and started on norepinephrine for hypotension. In the ICU, he developed status epilepticus for which 4 g of levetiracetam, 15 mg/kg of phenobarbital, 12 mg of lorazepam and a 10 mg/hr midazolam infusion were given. Mean arterial pressure (MAP) on norepinephrine and vasopressin was 40 mmHg. Within a few hours, the patient progressed to pulseless electrical activity. He was cannulated for venoarterial ECMO and placed on maximum pressor support with a 2 mg/kg bolus dose of methylene blue, in addition to norepinephrine at 2 mcg/kg/min, vasopressin at 0.06 u/min, epinephrine at 0.3 mcg/kg/min, and phenylephrine at 9 mcg/kg/min. The QRS was 170 ms and potassium was 1.4 mEq/L, which was replenished rapidly directly through the ECMO circuit. With aggressive support, his MAP improved above 70, and within eight hours of presenting to the hospital, vasopressor requirements were decreasing. The patient was slowly weaned off vasopressors, decannulated within three days, and discharged within one week with no known sequelae. An expanded urine drug screen revealed only quetiapine and norquetiapine.

Conclusion: Quetiapine poisoning can result in coma, hypotension, tachycardia and respiratory depression. Several case reports have described more concerning toxic manifestations such as seizures, ventricular arrhythmias, and refractory shock. Only one other case report detailed a patient with a massive near-fatal ingestion that had similar manifestations including QRS widening and circulatory collapse requiring ECMO. While seizures have been noted to occur from quetiapine, refractory seizures or status epilepticus have only been reported in one other case. Massive quetiapine

ingestions may cause refractory shock and status epilepticus. Treatment considerations include ECMO, multiple high dose pressors, and antiepileptic medications.

031. Chest Pain Beware: A Case of 5-Fluorouracil Induced Vasospasm Resulting in Acute Coronary Syndrome

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Background: 5-fluorouracil (5-FU) is an antimetabolite used in the management of malignant neoplasms. Common toxicities include gastroenteritis and bone marrow suppression. Its cardiotoxic effects, though less frequently reported, can be significant. Notably, coronary vasospasm is a recognized complication, which may manifest as acute coronary syndrome, often accompanied by ECG changes and elevated troponin levels. Vasospasm most commonly occurs during the first cycle of treatment, and infusion regimens carry a greater risk compared to bolus regimens. Individual risk factors are not well-established, but may include younger age, pre-existing renal disease, and the *absence* of pre-existing cardiovascular disease. Additionally, deficiency of the enzyme dihydropyrimidine dehydrogenase is associated with toxicity.

Methods: This is a case report of a 70-year-old female presenting to the emergency department (ED) with one day of anxiety, throat tightness, and dull left sided chest pain. She had recently been diagnosed with anal squamous cell carcinoma and started an infusion of 5-FU three days prior to her ED visit. Initial ECG demonstrated normal sinus rhythm without ischemic changes. While in the ED, she experienced recurrent acute onset of severe chest pain and diaphoresis. Repeat ECG revealed interval changes including a new left bundle branch block with hyperacute T waves. A troponin delta of 2271 ng/L indicated clinically significant elevation (delta >5 ng/L). In response to these findings, a STEMI alert was activated, the patient was administered aspirin and nitroglycerin and underwent immediate cardiac catheterization.

Results: In the catheterization lab, the patient reported notable improvement in her chest pain prior to intervention. Repeat ECG demonstrated resolution of ST and T wave changes. Cardiac catheterization demonstrated moderate obstructive coronary artery disease but no evidence of vessel thrombus or dissection, and a diagnosis of 5-FU induced coronary vasospasm was established. The patient was discharged two days later without complication after discontinuation of 5-FU.

Conclusion: 5-FU is the third most used chemotherapy agent for solid tumors and the second most associated with cardiotoxicity. It is imperative for emergency providers to recognize these cardiotoxic effects and collaborate with cardiologists and oncologists to mitigate morbidity

and mortality associated with this condition. Pre-treatment with calcium channel blockers and nitrates may decrease the risk of mortality and recurrence of chest pain. Management includes discontinuation of 5-FU, with consideration of uridine triacetate. Reinitiating therapy is generally not recommended due to a high risk of recurrence, and in our case, the patient's oncologist chose not to restart 5-FU.

032. Caffeine Clearance Data Utilizing In-Line AAVV Hemodialysis Attached to VA ECMO Outflow Cannula

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Background: Severe methylxanthine toxicity causes recurrent seizures and ventricular dysrhythmias. We present a pediatric caffeine overdose with multiple cardiac arrests treated with ACLS, intravenous lipid emulsion, VA ECMO, and hemodialysis. Caffeine extraction and clearance data are reported.

Hypothesis: Is hemodialysis performed in-line through an ECMO cannula an effective strategy to decrease serum caffeine concentrations?

Methods: This is a single patient chart review. A 13-year-old ingested approximately 6g of caffeine (115mg/kg) and developed recurrent seizures and ventricular dysrhythmias. Multiple cardiac arrests were treated with ACLS, intravenous lipid emulsion, and VA ECMO (18Fr R CFA arterial catheter; 19Fr R CFV drainage catheter; 5Fr R SFA distal perfusion catheter) with blood flow rate 3 L/min (BSA 1.54 m²). A hemodialysis circuit was attached to the VA ECMO circuit in AAVV arrangement pre/post oxygenator. Two 4-hour sessions of hemodialysis were performed with blood flow rate of 300 mL/min and dialysate flow rate of 600 mL/min. Serial serum caffeine concentrations were measured with LC/MS.

Results: Based on the patient's weight (52.2 kg), a volume of distribution (V_d) of 0.7 L/kg for caffeine, and a pre-hemodialysis serum caffeine concentration of 52.6 mg/L, the estimated drug burden immediately pre-hemodialysis was 1.92 g. Following hemodialysis session one, plasma caffeine concentration decreased 77% down to 12 mg/L. Following hemodialysis session two, it lowered an additional 70% to 3.6 mg/L. The caffeine plasma extraction ratio during hemodialysis session one was 0.5. The hemodialysis caffeine clearance rate was 99.6 mL/min.

Conclusion: Hemodialysis effectively decreased caffeine concentrations. The hemodialysis clearance rate of 99.6 mL/min represents a 147% increase from previously published endogenous caffeine clearance rates of 67.9 mL/min (0.078 L/h/kg). Dialysis clearance rates improve with increasing blood flow, increasing dialysate flow, or

increasing ultrafiltration rate. For this patient, connecting the hemodialysis circuit directly to the VA ECMO circuit allowed for higher blood flow rates in this hemodynamically unstable patient and reduced the crowding of cannulas in her extremities. A limitation of this single case report is the absence of urine caffeine concentrations, making direct comparison of simultaneous endogenous vs extracorporeal removal not possible. Hemodialysis is an effective method of caffeine removal. Attaching hemodialysis circuits directly to ECMO circuits may allow for higher blood flow rates in critically ill patients, allowing for higher clearance rates of dialyzable substances.

033. Effect of VA ECMO on Vasopressor Requirement and Organ Perfusion in Verapamil Overdose

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Background: Calcium channel blocker overdose may cause bradycardia and hypotension refractory to maximal therapy. A prior multicenter retrospective review of verapamil overdoses found that verapamil concentration > 2.27 mg/L upon ICU admission had a mortality odds ratio of 2.76. Mortality from verapamil ingestion has been reported with blood concentrations as low as 0.9 mg/L. We present a verapamil overdose case treated successfully with VA ECMO.

Hypothesis: Is initiation of VA ECMO associated with improvement in organ perfusion and decreased vasopressor requirement in the setting of high serum verapamil concentrations?

Methods: This is a single patient chart review. A 56-year-old female with bipolar disorder ingested 7.2 g of immediate release verapamil and presented 30 minutes later with somnolence, bradycardia, and hypotension. Upon arrival, her mean arterial pressure was 46 mmHg and her heart rate <40. Hypotension was refractory to intravenous fluids, high dose pressors, and intravenous pacing. Six hours post-ingestion, she was cannulated for VA ECMO (21Fr R CFA arterial cannula, 25Fr L CFV drainage cannula, 7Fr R SFA distal perfusion cannula) with a blood flow rate of 4.8 L/min (BSA: 2.47 m²). Organ perfusion was indirectly measured with urine output and lactic acid. Total vasopressor use was calculated using the Norepinephrine Equivalence (NEE) scale. Serial verapamil concentrations were measured by LC/MS.

Results: Initial verapamil concentration prior to cannulation was 3.5 mg/L (reference 0.12–0.40 mg/L); over the first 24 hours it decreased but remained >1.0 mg/L. In the three hours preceding cannulation, vasopressor use increased 270% from 0.45 to 1.22 µg/kg/min, urine output was 0.45 mL/kg/hr, and lactate was 12.1 mmol/L. Following cannulation, her vasopressor requirements decreased by 37% by three hours, 67% by six hours, and 96% by 12 hours down

to 0.04 µg/kg/min. Urine output increased to 9.5 mL/kg/hr in the two hours post-cannulation, then stabilized at 2–2.5 mL/kg/hr. Lactate began to downtrend at four hours post-cannulation. These results are limited by this being a single case report.

Conclusion: Our patient's initial verapamil concentration of 3.5 mg/L, rising lactic acid, and refractory hypotension were prognostic of a poor outcome. Following cannulation, organ perfusion rapidly improved and her vasopressor requirements significantly decreased despite continued elevated verapamil concentrations. VA ECMO cannulation was beneficial for the stabilization of this critically ill patient.

034. A Case of Prolonged Cardiotoxicity from Combined Guanfacine and Fluoxetine Overdose

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Background: Guanfacine is a central alpha-2 agonist used in the treatment of attention deficit hyperactivity disorder known to produce bradycardia and hypotension in toxicity. Most documented cases describe hospitalization for several days before returning to baseline. Fluoxetine is a known CYP2D6 inhibitor but is felt to affect CYP3A4 activity to a lesser extent. This is a case of persistent bradycardia and prolonged QTc interval lasting for seven days after intentional overdose of combined guanfacine and fluoxetine in an adolescent patient.

Hypothesis: The cardiotoxic effects of guanfacine can be prolonged by CYP3A4 inhibition in the setting of fluoxetine overdose.

Methods: This is a single patient chart review at a tertiary care center. Serial electrocardiograms (EKGs) were obtained to monitor for interval changes. A urine comprehensive drug panel performed by liquid chromatography-mass spectrometry and urine concentrations of guanfacine and fluoxetine were obtained for drug confirmation.

Results: A 16-year-old male presented to an emergency department with lethargy and dizziness four days after intentional ingestion of his 4 mg Guanfacine Extended Release and Fluoxetine 20 mg. He admitted to ingesting a total bottle of each, described as one-month supply. He reported episodes of vomiting but was amnesic to further events. On presentation, he was bradycardic with a heart rate (HR) of 38 bpm for which he was transferred to a pediatric intensive care unit. He remained normotensive with HR ranging 30–40 bpm. Initial EKG showed QTc 524 ms. A urine drug comprehensive panel showed carboxy-delta-9 tetrahydrocannabinol glucuronide. Urine guanfacine concentration six days from ingestion was 710 ng/mL. Same day urine fluoxetine and norfluoxetine

concentrations were 270 ng/mL and 130 ng/mL, respectively. He was transferred to the floor on hospital day (HD) two and remained on cardiac monitoring until HR normalized to 70 bpm by HD four. His QTc downtrended to 518 ms, 499 ms, and finally 401 ms by day of discharge, seven days post-ingestion.

Conclusion: Guanfacine metabolism is dependent on CYP3A4 activity which is susceptible to inhibition by multiple medications including fluoxetine. Such drug-drug interactions may cause prolonged cardiotoxic effects including bradycardia and QTc prolongation. While serum guanfacine concentrations were not available, urine concentration was still elevated six days from ingestion. Further studies regarding the clinical outcomes and significance of such findings are needed to risk stratify patients and determine an appropriate length of observation or hospitalization.

035. Iatrogenic Hyponatremia After High-Dose Insulin Euglycemic Therapy

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Background: High-dose insulin euglycemic therapy (HDIET) serves as an adjunctive treatment for patients with xenobiotic-induced cardiogenic shock. Although hypoglycemia is a known adverse effect of HDIET upon initiation, fluid and electrolyte status must also be considered. We present a case in which HDIET was used as an adjunct to multiple vasopressors that resulted in fluid overload and profound hyponatremia.

Methods: This is a case report of a 55-year-old male who presented to a community emergency department after intentional ingestion of amlodipine, atenolol, lisinopril, and hydrochlorothiazide. Arrival vital signs were BP 96/58, HR 99, T 36.4C, RR 32, and O2 saturation at 94% on room air. He became progressively hypotensive despite fluid resuscitation and was started on an epinephrine infusion. Poison control was consulted who recommended using vasopressors, calcium, methylene blue, and HDIET if point of care (POC) ultrasound demonstrated poor cardiac function. The patient was intubated for worsening respiratory status. Initial labs were notable for a sodium of 131 and creatinine of 2.71 (no prior labs were available to refer to baseline). Due to increasing vasopressor requirements, he was started on HDIET with no POC ultrasound performed. An initial bolus of 99 units of insulin was given with subsequent infusion at 5 units/kg/hr. He received over 34 liters (L) of fluid including 2L from the insulin infusion, 8.5L from dextrose-containing fluids, and 18.2L of free water over 23 hours. Repeat labs showed

decreasing sodium with nadir of 114 at 22 hours and creatinine that increased to 3.01 with associated oliguria and a physical exam notable for anasarca. He was transferred to a tertiary care facility where he was cannulated for ECMO. Nephrology was consulted, and CRRT was initiated in series with ECMO. The patient was ultimately on ECMO for 5 days, and he suffered no neurological sequelae despite rapid fluctuations in serum sodium concentrations.

Results: HDIET serves as an adjunct therapy in xenobiotic-induced cardiogenic shock. Although it is an effective therapy in correct patients, it is not without adverse effects.

Conclusion: HDIET may serve as an effective adjunct to manage overdose of cardiac medications. However, fluid volume administration, urinary output, and electrolytes must be closely monitored, as excessive free fluid can lead to hyponatremia.

036. QTc Interval Prolongation in Patients Administered Sodium Bicarbonate for Tricyclic Antidepressant Poisoning

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Background: IV sodium bicarbonate (NaHCO₃) effectively reduces the QRS interval and prevents seizures and ventricular dysrhythmias in tricyclic antidepressant (TCA) poisoning. However, repeated doses or continuous infusion of NaHCO₃ can lower serum potassium, potentially causing QTc prolongation, which increases the risk of cardiac arrhythmias. The primary concern of giving this antidote is that treating one type of cardiotoxicity (QRS prolongation) may cause another type of cardiotoxicity (QTc prolongation) as an adverse effect. While this is a widely held concern, no data exists on the relationship between NaHCO₃ administration and prolongation or other changes to the QTc interval in patients with TCA poisoning.

Methods: We conducted a retrospective analysis of a consecutive patient sample admitted to a single hospital. Patients with a diagnosis of TCA poisoning between 1/1/2012 and 12/31/2021 were identified and data was abstracted by chart review. Patients were excluded from analysis if they did not have documented medication administration times, medications administered or NaHCO₃ administered, one or fewer EKGs, or a discharge date listed prior to admission date. Descriptive statistics were used to describe the QTc intervals.

Results: Ninety-six patients were identified during the study period with 21 meeting inclusion criteria, with 22 unique encounters (one patient presented twice). Mean age was 38.5 years (range, 21 – 62 years); 11 (52%) patients were female. Only two patients did not have a prolonged

QTc during their encounter, defined as QTcB > 440 ms for men and > 460 ms for women. Of patients who had prolonged QTc (mean, 468 ms men; mean, 500 ms, women), 85% (17/20) had a prolonged QTc at presentation. Six women had QTc > 500 ms (two had QTc > 600 ms); four men had QTc > 500 ms (one with QTc > 550 ms, zero with QTc > 600 ms). No patient developed Torsades de Pointes. Ten patients had K⁺ < 3.5 mEq/L (range, 2.8 - 3.4 mEq/L).

Conclusions: Though it is effective for shortening the QRS interval, there is no clear data regarding sodium bicarbonate's effects on QTc interval changes. Patients who were admitted for TCA poisoning frequently had QTc prolongation. In this limited sample, no patients with QTc prolongation experienced Torsades de Pointes. Further analysis is needed to identify if sodium bicarbonate is responsible for these changes.

037. The Use of Post-Pyloric Multi-Dose Activated Charcoal in Colchicine Toxicity

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Background: Colchicine has a narrow therapeutic index and a severe clinical presentation in large overdose. There is no standard treatment other than supportive care. Once these patients reach a certain point in their colchicine toxicity, further resuscitative efforts may become futile.

Hypothesis: Colchicine is mainly absorbed in the ileum and jejunum and undergoes significant enterohepatic recirculation, contributing to its prolonged toxicity. Administration of post-pyloric activated charcoal may help neutralize colchicine's toxic effects in overdose.

Methods: This is a case report of a 51-year-old male (93.2 kg) who presented after ingesting numerous tablets of 0.6 mg colchicine in a suicide attempt an hour and a half prior to arrival. Family reports ingestion of 80 tablets. He also ingested 40 clonazepam tablets, and one oxycodone-acetaminophen tablet. He was sleepy but otherwise asymptomatic initially. His presenting vital signs: HR 84, BP 132/80, RR 16, O₂ saturation 97% (room air). On arrival in the Emergency Department, he was given 25 g of activated charcoal (AC) via nasogastric tube. Acetaminophen and aspirin levels were undetectable. Approximately nine hours later, he developed vomiting refractory to antiemetics. He was intubated for airway protection. At this time, we recommended a post-pyloric nasoenteric tube with 25 g AC every four hours.

Results: Ingestions above 0.5 mg/kg are associated with a high fatality rate, and his ingestion was approximately 0.52 mg/kg. He was admitted to the intensive care unit. Intravenous NAC was started preemptively by the primary team for liver protection. He was given normal saline at 30 mL/hr, but

he remained hypotensive and was started on five micrograms of norepinephrine. Prior to receiving AC, his creatinine was 1.1 mg/dL, BUN 14 mg/dL, platelets 113 x 10³/mm³, white blood cell count 3.9 x 10³/μL, AST/ALT 46/86 units/L. The multidose AC every four hours was given for two days. He improved and was extubated on day four. Post-AC laboratory studies showed: creatinine 0.8 mg/dL, BUN 10 mg/dL, platelets 241 x 10³/mm³, white blood cell count 8.0 x 10³/μL, AST/ALT 86/74 units/L. He remained stable and was discharged on day five.

Conclusion: Activated charcoal in colchicine toxicity is useful within the first two hours of overdose, however due to enterohepatic recirculation, colchicine's toxic effects continue past the stomach. Multi-dose activated charcoal administered past the pylorus may be useful in continuing to neutralize the colchicine in the ileum and jejunum, where it is primarily absorbed.

038. Antidote Worse Than the Toxin? Emergent Therapeutic Plasma Exchange to Manage Lipemia Secondary to Treatment of Local Anesthetic Systemic Toxicity

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Background: Local anesthetic systemic toxicity (LAST), a rare and potentially life-threatening complication of regional anesthesia, requires prompt treatment with intravenous lipid emulsion (ILE). ILE, when administered at high doses, carries a known risk of lipemic phenomena.

Research Question: Can therapeutic plasma exchange be used to treat clinically apparent hyperviscosity syndrome from intravenous lipid emulsion toxicity occurring in the setting of local anesthetic systemic toxicity?

Methods: This is a single patient case report. An 18-year-old, 53.5 kg female received 137.5 mg (2.57 mg/kg) bupivacaine administered perineurally as 0.25% and 0.5% solutions. Immediately thereafter, she developed seizure-like activity prompting administration of 500 mL (9.3 mL/kg) 20% ILE. Following her scheduled procedure, she had recurrence of seizure-like activity and received additional ILE. Due to her ongoing symptoms, she required transfer from the free-standing surgery clinic to the intensive care unit. Prior to transfer, EMS was instructed to give additional ILE and by the time of transfer to the intensive care unit, the patient had received 1,500 mL total of ILE (28.0 mL/kg) but had returned to neurological baseline without additional seizure activity. Within one hour of arrival to the intensive care unit, she rapidly developed severe headache, blurry vision and photophobia. Her blood was noted to be turbid, with visible precipitation of lipoproteins, and was difficult to aspirate

from peripheral IV access. Therapeutic plasma exchange (TPE) was performed and an insulin drip was initiated due to concern for hyperviscosity syndrome and potential for sequelae of severe hypertriglyceridemia. Triglyceride concentrations were obtained both before and after initiation of plasmapheresis and an insulin drip.

Results: Prior to the initiation of TPE, the patient's triglyceride concentration was 10,350 mg/dL. After one single-volume session of therapeutic plasma exchange and 12 hours of an insulin drip she had brisk improvement in clinical symptoms and hyperviscosity, with triglyceride concentration dropping to 690 mg/dL. The patient was ultimately discharged on hospital day two with a normal triglyceride concentration of 90 mg/dL and full resolution of symptoms. She did have sporadic recurrence of residual headaches without neurological deficits following discharge prompting non-contrast CT scan of the head, which was nonrevealing.

Conclusion: Excessive administration of intravenous lipid emulsion, particularly in individuals with lower body mass, predisposes patients to lipemia. TPE, in conjunction with an insulin infusion, may be used to treat severe cases and mitigate the clinical risks of severe hypertriglyceridemia.

039. The Use of Physostigmine and Rivastigmine in the Treatment of Cyclobenzaprine Induced Delirium

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Background: Cyclobenzaprine is a commonly used centrally acting muscle relaxant structurally related to amitriptyline. Cyclobenzaprine acts on various receptors, including antagonism of the acetylcholine muscarinic receptor, which can cause delirium. While the adverse effects of cyclobenzaprine are well known, there is limited guidance on the treatment of antimuscarinic delirium caused by cyclobenzaprine.

Hypothesis: Given the mechanism of action and muscarinic receptor antagonism, rivastigmine can serve as an effective adjunct in the treatment of cyclobenzaprine induced delirium induced by acetylcholine muscarinic receptor antagonism.

Methods: We report the case of a 49-year-old male with a history of chronic obstructive pulmonary disease and chronic back pain who presented with altered mentation, tachycardia, and hypertension. The patient had recently filled a prescription for cyclobenzaprine and was found unresponsive after presumed ingestion of 290 mg of cyclobenzaprine. Initial vital signs were notable for a heart rate of 140 bpm, blood pressure

of 206/184, and temperature of 38.2°C. The patient was given 4 mg total of intravenous midazolam with no improvement in delirium. Initial electrocardiogram was notable for a QRS interval of 119 msec for which one ampule of sodium bicarbonate was given. Due to continued agitation, two doses of 0.5 mg of physostigmine were given 25 minutes apart, with no improvement. A third dose of 1 mg of physostigmine was given 20 minutes later with significant improvement in mental status and heart rate (110 bpm). One hour after the third dose of physostigmine, the patient became more tachycardic and had a recurrence of delirium. Due to limited physostigmine supply, a 9.6 mg rivastigmine patch was applied to the patient's back, and the patient was admitted to the intensive care unit (ICU). The urine drug screen detected benzodiazepines and tetrahydrocannabinol, and the patient had a cyclobenzaprine serum concentration of 120 ng/ml (4–40 ng/ml).

Results: In the ICU, the patient continued to have mild agitation and tachycardia, and a dexmedetomidine infusion was started and ran for a short period before being discontinued. The patient had complete resolution of delirium 16 hours into their hospital stay. The rivastigmine patch was removed approximately 24 hours after it was placed.

Conclusion: While there is some data supporting the use of physostigmine for cyclobenzaprine-induced delirium, there is little guidance on the use of rivastigmine. This case highlights the use of rivastigmine in the treatment of cyclobenzaprine-induced delirium.

040. Efficacy of Alpha-Chymotrypsin and Hemoperfusion in Reducing Toxicity of Bungarus Multicinctus Venom: A Case Report

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Background: *Bungarus multicinctus* venom is highly poisonous, and potentially fatal if not treated. Due to the restrictions on specific antivenom in Vietnam, several new treatments are being studied. Alphachymotrypsin is a digestive protease enzyme that has been shown to be effective against several proteinaceous venoms. Hemoperfusion is capable of removing and protecting against snake toxins. We present a case of successful use of alphachymotrypsin in combination with hemoperfusion in the treatment of patients with quadruple paralysis and respiratory failure caused by *Bungarus multicinctus*.

Results: A 67-year-old man was bitten in his right hand by *B. multicinctus*. At the point of two bites 1 cm apart, around slight swelling; quarterly muscle power 1/5, II degree eyelids

collapse, two pupils stretched 4 mm. After 11 hours, the patient developed respiratory disorders: slow rapid breathing, frequency 26 times per minute, SpO₂ 90%. Due to restrictions in antivenom, the patient was given an injection of alphachymotrypsin at a total dose of 40,000 IU at the sixth hour after the bite and hemoperfusion at the 17,5th - 23rd - 28,5th - 40,5th hour after the bite. At the 110th hour after the bite, the patient's paralysis recovered at muscle power 5/5, with no more respiratory paralysis, and an intravenous tube was removed.

Conclusion: The combination of alphachymotrypsin and hemoperfusion can help shorten respiratory and hospitalization time in patients bitten by *Bungarus multicinctus*.

041. Anaphylactoid Reaction to Crotalidae Polyvalent Immune Fab in a 37-Year-Old Female with Cottonmouth (*Agkistrodon piscivorus*) Envenomation

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Background: Envenomation from venomous snakes such as the Cottonmouth (*Agkistrodon piscivorus*) can lead to significant local and systemic effects, often necessitating antivenom therapy. Polyvalent Immune Fab is commonly used to neutralize venom from crotalids in North America.

Hypothesis: A second exposure to Polyvalent Immune Fab resulted in an anaphylactoid reaction not observed with the initial dose in a 37-year-old female.

Methods: This is a case report of a 37-year-old female with a history of ADHD and asthma who presented to the emergency department after a Cottonmouth snakebite to her left index finger. Initial treatment at an outside hospital included four vials of Polyvalent Immune Fab, which alleviated pain and localized swelling. However, upon transfer to our facility on Day 2, the patient exhibited worsening symptoms, including progressive pain and swelling extending beyond the elbow. Due to continued symptom progression, an additional four vials of Polyvalent Immune Fab were administered. Within minutes of administration, the patient developed an anaphylactoid reaction, presenting with acute dyspnea and wheezing. The infusion rate was reduced, and the patient was treated with albuterol, epinephrine, methylprednisolone, and diphenhydramine, resulting in resolution of the hypersensitivity reaction.

Results: IgE-mediated anaphylaxis involves an immediate allergic reaction triggered by IgE antibodies recognizing antivenom proteins, leading to mast cell degranulation. In contrast, non-IgE-mediated reactions, such as delayed or anaphylactoid reactions, occur through immune complex formation or direct mast cell activation. The initial exposure to Polyvalent Immune Fab may have primed the immune system, increasing susceptibility to a reaction on subsequent doses.

Conclusion: Adverse reactions to Polyvalent Immune Fab can be life-threatening and require immediate intervention. Patients with pre-existing respiratory conditions such as asthma may be at increased risk for severe reactions, underscoring the importance of close monitoring and prompt management of hypersensitivity in these cases.

042. Evaluation of Anti-Venom Therapy for Middle East Scorpion Envenomations

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Background: Scorpion envenomation is a leading cause of envenomation in our region. Anti-venom has been used successfully to treat the systemic manifestations of envenomations inflicted by toxic scorpions. Toxic scorpions common in our area include *Leiurus quinquestriatus*, *Androctonus australis* and *Buthus occitanus*. This study describes the outcomes of children envenomated by these scorpions, and treated with a polyvalent scorpion anti-venom F(ab')₂ (equine), used since 2016 at our institution.

Methods: A retrospective chart review of all children admitted with symptoms and signs of scorpion envenomation to Soroka University Medical Center between September 1, 2019 and December 1, 2020 who received antivenom was conducted. Our center has a protocol mandating anti-venom therapy for all patients manifesting autonomic excitation, agitation, and anxiety, or more pronounced symptoms, following suspected scorpion envenomation.

Results: Three hundred patients were seen in the pediatric emergency department for scorpion envenomation during the study period, and 49 required anti-venom as per departmental policy. Four of 49 developed allergic reactions during anti-venom treatment: two manifested minor skin rashes treated with antihistamines only, and a further two required intramuscular adrenaline. There were no deaths in the study cohort and all patients recovered fully, with complete resolution of symptoms, signs and laboratory features.

Conclusion: Patients treated with anti-venom exhibited rapid resolution of symptoms without severe hypersensitivity. We recommend broadened availability of anti-venom at sites where it is needed.

043. Treatment of Subacute Methotrexate Neurotoxicity With Dextromethorphan

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Background: Methotrexate is associated with neurotoxicity. Three forms of methotrexate neurotoxicity have been

described: acute, subacute, and chronic. Acute toxicity occurs during or shortly after administration and is associated with headache, confusion, seizures, and chemical arachnoiditis. Subacute occurs within days to weeks of administration and is associated with encephalopathy, hemiparesis, paraplegia, ataxia, speech disorders, seizures, myelopathy, and sensory changes. Chronic occurs months to years following administration and is associated with learning disabilities, irritability, seizures, ataxia, dysphagia, quadriparesis, and coma. This case describes a patient with subacute methotrexate neurotoxicity. The pathophysiology is incompletely understood but NMDA receptor agonism by sulfur-containing excitatory amino acids has been suggested.

Hypothesis: Does dextromethorphan improve symptoms of subacute methotrexate neurotoxicity?

Methods: This is a single patient chart review. A 15-year old male with history of acute lymphoblastic lymphoma (ALL) treated with thioguanine, cytarabine, erwinia-asparaginase, cyclophosphamide, dexamethasone, and methotrexate presented to the emergency department four days after receiving 15 mg intrathecal methotrexate. His symptoms included dysarthria, right-sided hemiplegia, and agitation which developed over the preceding two hours. Emergency department workup notable for euglycemia and unremarkable non-contrast CT of head. After discussion with the pediatric neurology team, an MRI was obtained revealing bilateral hyperintense diffusion-weighted signal consistent with methotrexate neurotoxicity. Patient was subsequently admitted to the hospital for further monitoring. Several hours after admission, the patient developed seizure-like activity and was started on levetiracetam. EEG monitoring noted findings consistent with nonspecific encephalopathy. While in the PICU, the patient developed worsening agitation requiring lorazepam for sedation. Although subacute methotrexate toxicity typically resolves spontaneously, dextromethorphan 1 mg/kg BID was started on hospital day two given persistent encephalopathy and right-sided weakness at the recommendation of pediatric oncology

Results: Prior to initiation of dextromethorphan, the patient's examination was notable for dysarthria, disorientation to day of week, decreased sensation to light touch of right upper and lower extremities, right-sided hyporeflexia, and right facial, arm and leg weakness. One day after dextromethorphan initiation, examination was notable for orientation to day of week, marked improvement of right-sided weakness, and normal reflexes. Patient was discharged on hospital day 11 with only mild right-sided weakness remaining. All symptoms resolved one month post-discharge.

Conclusion: Dextromethorphan initiation was temporally associated with improvement of neurotoxic symptoms. Limitations include lack of repeat imaging, difficulty in differentiating natural disease course from the effects of

dextromethorphan administration, confounding factors of ICU hospitalization, and other medications administered during hospitalization.

044. Trends in the Use of Leucovorin for Methotrexate Exposures Reported to the California Poison Control System, 2009–2019

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Background: Leucovorin (folinic acid) can limit the bone marrow and gastrointestinal toxicity of methotrexate. Efficacy depends on early administration; therefore, treatment should not be postponed to obtain serum methotrexate levels. Because of the relative safety of leucovorin compared with the potential toxicity of methotrexate overdose, leucovorin should be administered whenever there is concern for potential toxicity.

Research Question: We aimed to characterize trends in leucovorin use for methotrexate exposures reported to the California Poison Control System (CPCS) over an 11-year period.

Methods: We conducted a retrospective analysis using the California Poison Control System database. We queried the CPCS database for cases coded as antineoplastic agents between January 1, 2009 to December 31, 2019 and selected cases which reported exposure to methotrexate. We analyzed characteristics, therapies and outcomes of methotrexate exposures and described trends in the use of leucovorin after methotrexate exposure. Acute ingestions were defined as ingestions occurring over a period less than 24 hours.

Results: One hundred and forty cases of methotrexate exposure were reported. Ages ranged from 10 months to 91 years old (median 35 years). The median methotrexate dose reported for acute ingestions was 20 mg (IQR: 12.5–62.5 mg, n = 55). Chronic ingestions occurred over a median of seven days (IQR: 5–11 days, n = 34) with a median daily dose of 15 mg (IQR: 10–17.5 mg, n = 34).

Leucovorin was administered in 47% (n = 66) of cases. Eighty-one patients (58%) reported at least one symptom after methotrexate exposure; of these symptomatic patients, 45% (n = 37) received leucovorin and 50% (n = 41) did not receive leucovorin. Leucovorin was administered to 75% (n = 12) of patients that experienced major effects, 53% (n = 17) of patients with moderate effects, 30% (n = 12) of patients with minor effects, 47% (n = 21) of patients with no effect and in 33% (n = 1) of cases reporting fatality.

Methotrexate levels were available in 49 cases (median 0.15 umol/L, IQR: 0.05–0.52 umol/L). All three patients with levels >1.0 umol/L received leucovorin. Levels were not available in 65% (n = 91) of cases. In 67% (n = 61) of cases where methotrexate levels were not known, leucovorin was not administered, including 36 cases in which patients reported symptoms.

Conclusion: Despite recommendations to administer leucovorin early in cases of potential methotrexate toxicity, there exists heterogeneity in the use of leucovorin for methotrexate exposure. Variability may be related to doses reported, timing of ingestion, presenting symptoms, indication for therapeutic use of methotrexate or concurrent therapeutic use of leucovorin.

045. Age-Related Survival Outcomes of Extracorporeal Membrane Oxygenation in Acutely Poisoned Patients: A Decade-Long Analysis

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Background: Nearly 100,000 people died from acute poisonings in 2021, marking a 30% increase from the previous year. Managing critical poisonings often requires specialized therapies, such as extracorporeal membrane oxygenation (ECMO). Preliminary data suggests that venoarterial (VA) and venovenous (VV) ECMO may improve survival in patients with refractory shock, cardiac arrest, or respiratory failure due to poisoning. Survival rates across age groups have not been elucidated.

Hypothesis: In patients presenting with presumed poisoning who received ECMO treatment, do survival rates differ among age groups?

Methods: This was a secondary analysis of cases reported to the Toxicology Investigators Consortium (Toxic) database, between January 2013 and November 2023. IRB approval was obtained. Inclusion criteria were patients of all ages presenting with signs and symptoms of poisoning who received ECMO. Cases without mortality data were excluded. The primary outcome was survival to discharge by age group.

Results: Over the 10-year study period, 133 patients with signs and symptoms of poisoning received ECMO. Thirteen patients were excluded because it was uncertain whether their signs and symptoms were attributable to poisoning. An additional thirteen patients were excluded in our final analysis due to a lack of mortality data, resulting in a cohort of 107 patients. Patient ages ranged from 1 to 68 with a median age of 23. Fifty patients (46.7%) were female and 57 patients (53.3%) were male. Cardiovascular xenobiotics

were the most common exposure, present in 41% of cases, followed by opioids. All cause mortality was 30%. Patients were grouped by age into 10-year intervals. The 20–29 age group had the highest survival rate (82.1%), while the 40–49 age group had the lowest survival (37.5%). The largest age group, 10–19, had a survival rate of 70.7%, while the 30–39, 50–59, and 60–69 age groups showed survival rates of 61.5%, 66.7% and 50%, respectively.

Conclusion: This analysis suggests that survival rates in ECMO-treated patients due to presumed poisoning tend to be lower in older age groups, with notable reductions in the 40–49 and 60–69 age brackets. Future studies are needed to explore the underlying reasons for decreased survival in these age groups, such as potential comorbidities or variations in response to ECMO therapy. Limitations include unclear criteria for ECMO selection, diverse xenobiotic exposures, and lack of information on VA or VV ECMO use, which may affect outcome interpretation.

Toxic: This research was performed by the ACMT Toxicology Investigators Consortium

046. National Trends in Fomepizole Use for Acetaminophen Poisoning; 2012–2024

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Background: Fomepizole (4-methylpyrazole) has been suggested as adjunctive therapy for severe acetaminophen toxicity though clinical data on its effectiveness is lacking. Given the equipoise surrounding its use, we sought to determine national trends in the use of fomepizole for acetaminophen poisoning.

Hypothesis: Fomepizole is being used with increasing frequency to treat acetaminophen poisoning and is employed most often in cases of severe toxicity.

Methods: This is a cross-sectional analysis of hospitalized patients with acetaminophen poisoning from January 2012 to June 30, 2024, using Epic Cosmos, a research database of 259 million patients nationally from participating institutions. We queried for cases of acetaminophen poisoning, defined as those containing ICD-10-CM code T39.1 Data extracted included receipt of N-acetylcysteine (NAC), receipt of fomepizole, demographic data, and outcomes including death and liver transplantation. Data were analyzed using descriptive statistics to determine trends in fomepizole use and multivariable logistic regression

accounting for demographic variables to determine associations with death or liver transplant.

Results: There were 103,335 cases of acetaminophen poisoning identified during the study period: 59,138 (57.2%) received NAC, and 1229 (1.2%) received fomepizole. In 2012, 0.6% of NAC-treated acetaminophen poisoning cases also received fomepizole. That rose to 6.2% in the first half of 2024. From 2012 to 2019, the proportion of NAC-treated acetaminophen poisoning cases receiving fomepizole slightly decreased (−7.3%), but from 2019–2024, there was a 1006.4% increase in fomepizole use among NAC-treated cases. In regression modeling, the odds for death (OR = 6.25, aOR = 5.59, $p < 0.001$) and liver transplantation (OR = 6.26, aOR = 6.15, $p < 0.001$) were higher among those who received both NAC and fomepizole when compared to those who received NAC alone. We suspect this is due to increased fomepizole use in patients with more severe toxicity, rather than direct harm from the medication. These findings suggest that fomepizole is being used to treat acetaminophen toxicity much more frequently in recent years and is being employed in the sickest subset of patients. The study is limited by its retrospective nature and lack of clinical data available to determine the type of exposure, degree of exposure, and existence of liver damage at the time of treatment.

Conclusion: The use of fomepizole in the treatment of patients with acetaminophen poisoning has risen dramatically since 2019, especially among patients at highest risk for death and liver transplantation. It is of critical importance that future research answers the question: is there a therapeutic benefit of fomepizole in acetaminophen poisoning?

047. High Quality, High Dose: A Quality Improvement Project Regarding High Dose N-Acetylcysteine for “Massive” Acetaminophen Overdose

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Background: High dose N-acetylcysteine (HDNAC) has been proposed for “massive” ingestions of acetaminophen. Our regional poison center instituted a HDNAC protocol in June 2021 based on Hendrickson’s proposed increase in dosing based on acetaminophen level. Prior to recommending HDNAC, a specialist in poison information consults a toxicologist for their recommendation. Our primary objective was to determine how often consultants were recommending HDNAC, and secondarily to determine how often pertinent clinical information was gathered prior to the consult, and to characterize these exposures for quality improvement.

Methods: This is a retrospective review of cases reported to our regional poison center that received HDNAC for “massive” acetaminophen overdoses from June 2021– April 2024.

Our center consulted with seven toxicologists and four toxicology fellows during the study period. There were 969 cases reported that received NAC. Fifty-six cases were identified that received HDNAC for “massive” acetaminophen overdose, defined as a level above the 300 mcg/mL line. Cases were excluded if they received NAC for non-acetaminophen overdose or if NAC was increased to account for removal during extracorporeal therapies. Data were abstracted into a standard collection form by trained research assistants. Simple descriptive statistics and acetaminophen ratio, the quotient of acetaminophen concentration and level at the 150 mcg/mL treatment line at the same time, were performed in Microsoft Excel.

Results: Toxicologists at our regional poison center recommended HDNAC nine times between June 2021 through December 2021, eight times in 2022, 24 times in 2023, and 16 times from January 2024 through April 2024. There were 48 acute, seven chronic, and one acute-on-chronic ingestions. Among included cases, 95% of ingestions were intentional, and 62.5% were for self-harm. The reported dose taken was known in 50% of acute ingestions, with a median of 40 g (range 2–195 g). The median acetaminophen ratio was 3.4 (range 1.3–23.3). Among included cases, 95% had transaminases, 52% had INR, 27% had SCr, 16% had pH, and 5% had lactate documented prior to HDNAC recommendations. The presence or absence of nausea/vomiting was documented in 70% of cases, encephalopathy in 45%, and abdominal pain in 41% prior to consultation.

Conclusion: This study may provide helpful information for institutions in our service area regarding our practice. It may help to inform those making order sets or protocols as to what information toxicologists are looking to assess prior to recommending HDNAC, and to improve our center’s data collection.

048. Dabigatran-Associated Major Bleedings and The Benefit of Idarucizumab: Real-World Data

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Background: International guidelines recommend the use of a specific reversal agent as first-line therapy for dabigatran-associated major bleeding. Limited real-world evidence is available from countries with limited availability of this agent. There is a need to verify the benefit of idarucizumab to justify its stockpiling despite the cost and availability challenges.

Hypothesis: Idarucizumab improves survival in dabigatran-associated major bleedings.

Methods: This is a single center retrospective chart review study. Medical records of dabigatran-associated bleeding

from January 1, 2020 to June 30, 2024 were retrieved using a digital query that crossed ICD diagnoses of bleedings with community prescriptions and dispensing of dabigatran. Retrieved records were manually surveyed. Dabigatran use prior to admission was verified. Only major bleedings were included. Demographic and clinical data from the eligible case records were collected and analyzed. The primary outcome was in-hospital mortality. A comparison was made between cases in which idarucizumab was used and those without this treatment.

Results: Fifteen cases were included in the analysis. Average age was 76.3 years (range 66–91). Nine patients (60%) were male. Ten (66.6%) cases were gastrointestinal bleedings, three more (20%) involved intracranial hemorrhage. None of the cases was an acute overdose. The average hemoglobin level on admission for the non-CNS bleeding cases was 7.7 gr%, with an average decline of 4.3 gr% from baseline (based on prior community testing). Levels of dabigatran serum levels were measured upon admission in 10 patients. The average level was 785 ng/ml (therapeutic peak concentrations, 10th–90th percentile, are 74.3–383 ng/mL and 52–275 ng/mL for the 150- and 110-mg BD doses, per RE-LY trial). The main cause for the elevated levels was deteriorated renal function in elderly patients. Overall, in-hospital mortality was 40% (6/15). All patients received blood transfusions; two packed cells units in average. In eight cases idarucizumab 5 gr was administered. There was no difference between the groups (idarucizumab-treated and not treated) regarding average age, levels of hemoglobin, rates of its decrease from baseline, dabigatran levels upon admission and blood transfusions ($p = \text{NS}$). There were more females in the treatment group (5/8 vs. 1/7). Mortality was significantly lower in the idarucizumab-treated group, 12.5% (1/8) vs. 71.4% (5/7), ($p = 0.013$).

Conclusions: Idarucizumab significantly improved survival of patients with acute major bleeding secondary to dabigatran. It is recommended to stockpile this antidote for immediate treatment of dabigatran-associated major bleedings.

049. Chronic Symptomatic Carbon Monoxide Poisoning Due to Passive Exposure to Hookah Smoke

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Background: Hookah is a single- or multi-stemmed instrument for heating or vaporizing and then smoking either tobacco, flavored tobacco, or substances of abuse. Intensive hookah smoking can induce high levels of carboxyhemoglobin.

Hypothesis: Passive exposure to hookah smoke can result in carbon monoxide (CO) poisoning.

Methods: This is a single case chart review of a 61-year-old woman with no prior chronic comorbidities that was diagnosed with polycythemia (HB range 17–18 gr%) and was followed up for several years at a hematology clinic. She suffered from weakness and occasional dizziness and reported intermittent paresthesia. Erythropoietin level was at the lower limit of the normal range. Bone marrow aspiration and biopsy were unremarkable. Malignancy was ruled out. The patient denied smoking. She underwent several phlebotomies. Nine years after the initial diagnosis of polycythemia, blood gases test was performed.

Results: A high level of carboxyhemoglobin (COHB) was found (27.7%, venous blood), and the patient was referred to the emergency department for toxicological evaluation. According to the patient, there was no use of combustion products in her house. She again denied active smoking. After a thorough medical history, it was revealed that family members are smoking hookah consistently and frequently in the house. Upon evaluation, her vital signs were in normal range: pulse 69/min, BP 108/69, temperature 36.8°C, Oxygen saturation 99%. Laboratory tests confirmed the elevated COHB (19.6%, arterial blood) and elevated HB (17.7 gr%). The patient was treated with 100% oxygen through a reservoir mask for two hours. The COHB level decreased to 6.4%. The patient was recommended to avoid proximity to smoke sources. CO monitoring was performed at the patient's house; no other CO sources besides the hookah were detected. Upon a follow up visit, the patient reported that her symptoms were improved.

Conclusion: Passive exposure to hookah smoke can increase the level of carboxyhemoglobin and induce CO poisoning. Chronic CO exposure should be suspected and evaluated in secondary polycythemia, even in non-smokers.

050. Perinatal Carbon Monoxide Poisoning with Atypical Presentation of Hypoxic Ischemic Encephalopathy in the Neonate

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Background: Perinatal carbon monoxide (CO) poisoning is rarely reported, and treatment considerations are controversial. We report a case of perinatal CO poisoning with rapid delivery and treatment of the full-term neonate complicated by atypical presentation of hypoxic ischemic encephalopathy (HIE).

Hypothesis: Perinatal CO poisoning contributed to significant HIE in a neonate.

Methods: Chart review of mother and infant.

Results: A 22-year-old female G2P1 at 38+1 weeks gestation presented with seizure activity an hour after exposure to a gas-powered generator. Patient was awake and alert on ED arrival. Initial vital signs: T 36.7 HR 130 bpm BP 112/45 O₂ saturation 97% on 100% oxygen which was continued for six hours. Initial labwork revealed pH 7.16 and carboxyhemoglobin of 37.3%. Initial fetal monitoring was reassuring until about two hours therefore emergent delivery performed. Neonate was delivered at 3 h 46 minutes post maternal arrival to hospital, approximately five hours after reported onset of maternal CO exposure. Infant was floppy with heart rate < 100 and poor respiratory effort. Apgar scores were one, six, six at one, five, and ten minutes. Neonate labwork showed bicarbonate 27 mmol/L, pH 7.28 and carboxyhemoglobin 6.3% which declined to 1.4% at 4.5 hours of life. Infant was treated with 100% oxygen for six hours. No local option was available for urgent hyperbaric oxygen therapy (HBOT) and the next nearest chambers were unable to accommodate an intubated neonate; also, family declined being transferred out of state. At six hours, infant was extubated and appeared active. On day of life (DOL) one patient developed multiple episodes of apnea, desaturations and rhythmic jerking of extremities and was re-intubated for respiratory failure. Video EEG showed seizure activity. MRI obtained on DOL four revealed extensive diffuse brain injury with associated diffusion restriction and cytotoxic edema. Patient was extubated on DOL four and discharged on DOL 16 with nasogastric tube feedings, on room air, and with prescribed diazepam and gabapentin. At 18 months patient is being treated for spastic cerebral palsy, epilepsy, and dysphagia with gastrostomy tube feeding.

Conclusion: We present a rare case of perinatal CO exposure. The full-term infant was rapidly delivered and treated within hours of the exposure and had initially reassuring lab work and clinical picture, however suffered severe HIE. HBOT was not locally available. This case adds to the sparse literature on perinatal CO poisoning and highlights continued questions surrounding the care of this vulnerable population.

051. Carbon Monoxide Toxicity Complicated by Carbon Dioxide Retention and Heart Failure: The Potential Role for Non-invasive Positive Pressure Ventilation

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Background: Carbon monoxide (CO) toxicity management emphasizes enhancing carboxyhemoglobin (COHb) elimination by increasing the partial pressure of oxygen (PO₂)

via supplemental oxygen. In patients with chronic carbon dioxide (CO₂) retention, hyperoxia may cause hypoventilation and progressive respiratory acidosis. CO₂ retention has been described as a challenge when managing CO toxicity in patients with chronic obstructive pulmonary disease (COPD). Pulmonary edema provides additional management challenges as it may both exacerbate COPD and impair gas exchange leading to delayed COHb elimination.

Hypothesis: Bilevel non-invasive positive pressure ventilation (BiPAP) helped to treat hypercapnia and improved oxygenation in a COPD patient, thereby enhancing CO elimination.

Methods: This is a single patient case report. A 78-year-old female with ischemic heart disease and moderate COPD presented to hospital with several days of weakness, dyspnea, and pedal edema. She was found to have pulmonary edema, new atrial flutter, and CO toxicity with an initial COHb of 21.9%. The CO source was identified as a household furnace. When started on oxygen via nasal cannula at 6 L/min, she developed progressive somnolence with increasing PCO₂. Due to her hypercapnia, BiPAP was started in addition to diuretics and inhaled bronchodilators. Adherence to BiPAP was impaired by patient tolerance. BiPAP was used intermittently for 7 hours until the hypercapnia improved, followed by high-flow nasal cannula for the duration of treatment.

Results: The patient was admitted to the intensive care unit. Hyperbaric oxygen therapy was deemed contraindicated due to the patient's instability and pulmonary disease. The patient's PCO₂ peaked at 93 mmHg while on nasal cannula. With BiPAP the PCO₂ decreased to 80 mmHg and somnolence improved. The PO₂ increased from 61 mmHg to 284 mmHg while on BiPAP. Despite continuous use of supplemental oxygen, it took 32.5 hours for the COHb to decrease from 21.9% to 4.9%, which corresponds to an average half-life of 15.06 hours. Half-life was reduced to 10.47 hours while the patient was on BiPAP with 100% oxygen. The patient survived and was functionally independent at time of hospital discharge.

Conclusion: The elimination of COHb was severely prolonged in a patient with pulmonary edema and CO₂ retention. BiPAP may improve respiratory acidosis and help to optimize oxygenation for patients with CO toxicity who are at risk for CO₂ retention. The improved oxygenation with BiPAP may also contribute to enhanced elimination of COHb.

052. Inadvertent Occupational Argon Exposure with Seizure-like Activity Resulting in Full Neurologic Recovery

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Background: Argon is an inert gas used in occupational environments to enhance stability and displace oxygen. If inhaled, displacement of oxygen will occur, causing asphyxiation. We present a case of a patient who inhaled continuous argon gas instead of compressed air through a positive pressure suit for several minutes and had signs of anoxic brain injury. Subsequently, the patient made a full neurologic recovery.

Results: A young adult male without known prior medical history presented to an emergency department following accidental inhalation of argon gas. While at a worksite, the patient's positive pressure suit was connected to an argon gas line instead of oxygen for a length one to four minutes. The patient experienced seizure-like activity, and was brought to the emergency department where he was given benzodiazepines, intubated and placed on a propofol infusion. Transfer to a higher level of care with neurocritical care and medical toxicology services was initiated. He continued to display large amplitude involuntary movements without electrographic correlate on continuous electroencephalogram (cEEG) and there was initial concern for anoxic brain injury. By hospital day five, the patient had been successfully extubated, weaned off oxygen support, ambulated, and exhibited no residual neurologic deficit.

Conclusion: As a simple asphyxiant, argon gas and the mechanism by which it displaces oxygen if inhaled is not unusual. However, the duration of argon exposure with associated signs of anoxic brain injury would presumably lead to some neurologic impairment. This case highlights full neurologic recovery following a significant argon exposure treated with aggressive supportive and neuroprotective medical care.

053. Lemon Car or Rotten Egg? Hydrogen Sulfide Poisoning From a Personal Vehicle With Analytic Confirmation

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Background: Hydrogen sulfide (H_2S) poisoning is rare. The most common cause of exposure to H_2S is occupational, followed by "chemical suicides" in which sulfur- and acid-containing products are intentionally combined. Although less common, exposures from environmental sources such as thermal springs and domestic sources such as faulty plumbing have been described. We describe a case of H_2S poisoning from a personal vehicle and summarize the patient's clinical course, which included significant neurologic injury and the development of myopericarditis.

Methods: This is a single patient chart review. A 67-year-old man presented to the emergency department via EMS after he became unresponsive while driving his vehicle. Available

prehospital vital signs were: heart rate, 50 beats per minute; oxygen saturation, 50% on room air. On arrival, he was obtunded, apneic, and smelled of rotten eggs; this odor was noted by both EMS and ED providers. The vital signs following intubation were blood pressure, 117/60 mmHg; heart rate, 110 beats per minute; oxygen saturation, 100%; temperature, 35°C.

Results: Additional collateral regarding the suspected exposure, a blood thiosulfate concentration, and neuroimaging were obtained. The patient's family reported that the battery of his vehicle died four days prior and was charged. Since then, the car smelled of rotten eggs when it was driven. Initial labs were pH 7.09; pCO_2 , 68 mmHg; lactate, 5.8 mmol/L; bicarbonate 15 mEq/L. A blood thiosulfate concentration drawn with the initial labs resulted on hospital day 11 at 10 mcg/mL (reference range: 0–2 mcg/mL). MRI on hospital day two showed restricted diffusion in both cerebellar hemispheres and hippocampi, and subtle increased T2 signal in the caudate and putamen bilaterally, findings consistent with anoxic brain injury. His neurologic exam was remarkable for intact brainstem reflexes and non-purposeful eye opening. Pericarditis developed on day three, followed by myocarditis (peak troponin, day 10: 7.27 ng/mL; left ventricular ejection fraction 35%). He underwent tracheostomy and percutaneous endoscopic gastrostomy tube placement, and had a prolonged hospital course complicated by deep vein thromboses and heparin induced thrombocytopenia. As of hospital day 125, his neurologic status remained unchanged, and he awaits placement to a long-term acute care facility.

Conclusion: We describe a patient who developed significant neurologic injury and myopericarditis after a suspected hydrogen sulfide exposure while driving a personal vehicle, corroborated by analytic testing.

054. Chlorine Gas Induced Acute Respiratory Distress Syndrome due to Pool Shock

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Background: Chlorine gas is a known pulmonary irritant with potential to cause severe pneumonitis and edema, and while exposure is common with chlorinated household cleaners, most life-threatening cases stem from industrial accidents or chemical warfare. We present the case of a 75-year-old male who developed acute respiratory distress syndrome (ARDS) following an accidental chlorine exposure while attempting to clean a residential pool.

Research Question: What is the expected timeline and outcome for ARDS following chlorine gas exposure?

Methods: This is a single patient chart review. A 75-year-old male with a history of hypertension and sleep apnea suffered a large exposure to chlorine gas after mixing calcium hypochlorite (pool shock) with water in his sink, triggering an explosion with gas release. He rapidly developed bronchospasm, pulmonary edema and respiratory failure refractory to bronchodilators and bilevel positive pressure ventilation, and was subsequently intubated. Given concerns for ocular exposure, his eyes were irrigated with saline. He progressed to ARDS, with chest imaging revealing pulmonary edema and diffuse alveolar damage, and a pO_2/FiO_2 ratio of 121. The patient was deeply sedated, paralyzed, and placed in prone positioning within 12 hours of exposure. He received intravenous dexamethasone and inhaled epoprostenol. On hospital day two, he was supinated with gradual improvement in his oxygenation. He additionally suffered severe chemical conjunctivitis with epithelial loss and corneal abrasion, managed with polyvinyl alcohol and neomycin-polymyxin B-dexamethasone ointment. The patient was extubated on hospital-day seven, and discharged to transitional care six days later without additional oxygen needs and a return of vision to baseline.

Results: Chlorine gas induced lung injury is thought to be caused by the generation of free radicals, hypochlorous and hydrochloric acid on contact with water within the pulmonary epithelium. Nebulized sodium bicarbonate has been postulated to reduce the local production of acid, but data is limited to case series and a prospective trial showing transient improvement in FEV1, with no long-term benefit. Steroid use may attenuate the inflammatory response, though there are no focused clinical trials evaluating outcomes. Care is otherwise supportive with supplemental oxygen, bronchodilators to counteract irritant-induced bronchoconstriction, and escalation of respiratory support as needed. In the case of our patient, aggressive management of his lung injury with albuterol, ARDS-dose-steroids, lung-protective ventilation, pulmonary vasodilators, paralysis and proning proved to be effective.

Conclusion: Although patients exposed to chlorine gas may experience severe pulmonary injury and subsequent respiratory failure, recovery is possible with excellent supportive care.

055. Chlorine Exposure Leading to Delayed ARDS Requiring Positive Pressure Respiratory Support

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Background: Chlorine gas is an intermediate solubility pulmonary irritant. Severe toxicity as a result of exposure

to pool chemicals is rare. Here we present a case of chlorine exposure from pool chemicals which led to severe pulmonary edema and required treatment with bilevel positive airway pressure and intensive care unit admission.

Methods: This is a case report based on a single patient who was treated in our institution. The patient was a 28-year-old man with a history of childhood asthma who was lifting a box of 90% trichloro-s-triazentrione tablets which had gotten wet about one hour prior to arrival. His symptoms included shortness of breath, chest and throat pain. His vitals were normal and he was treated with an albuterol inhaler and prednisone and was discharged about four hours after exposure. Ten hours after the exposure he presented again, this time hypoxic and in respiratory distress with diffuse rales. A CT showed diffuse ground glass opacities consistent with ARDS. He was treated with nebulized bronchodilators and IV methylprednisolone and required bi-level positive airway pressure for respiratory support and was admitted to the ICU. The next day he was able to be titrated down to high-flow nasal cannula and on hospital day four was able to be discharged home with no supplemental oxygen.

Results: Chlorine is one of the most common pulmonary irritant exposures in the US. However, presentation is rarely this severe, and diffuse ground glass opacities are a rare finding. Additionally, need for ICU admission and positive pressure airway support occur in a very small fraction of cases. Many severe exposures in the setting of pool chemicals are related to malfunction of larger chlorinating systems, however our patient was exposed to fumes from chlorinating tablets, making his route of exposure unusual for such a severe course. The biphasic nature of his symptoms led to an ED discharge on the first visit and a potential delay in supportive care.

Conclusion: Our patient exposed to chlorine gas had a uniquely severe clinical course and radiographic findings for his route of exposure. In addition, he had delayed development of severe symptoms leading to a premature hospital discharge. It is important for clinicians to be aware of the potential severe outcomes of chlorine gas exposure and the potential for delayed toxicity given its intermediate solubility.

056. 1,1-Difluoroethane Use Associated With Recurrent Polymorphic Ventricular Tachycardia and Myocarditis on Cardiac Magnetic Resonance Imaging

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Background: Inhaled halogenated hydrocarbon use is associated with cardiotoxicity including lethal ventricular dysrhythmias, often called “sudden sniffing death syndrome,” electrocardiogram (ECG) changes, and cardiomyopathy. Cardiac

magnetic resonance (cMR) imaging has rarely been reported in the literature as a diagnostic modality for this pathology.

Research Question: Is there a role for cMR in evaluating inhaled hydrocarbon-related cardiotoxicity?

Methods: This is a single-patient case report. A 37-year-old man with past medical history of depression, anxiety, hypertension, and substance use (inhalants, alcohol, cannabis) presented to a local hospital with chief complaint of bilateral lower extremity pain and request for “detox” from inhalant use. He endorsed regular inhaled use of keyboard cleaner (Surf Onn, Walmart Brand) containing 1,1-difluoroethane (DFE) as well as recently discontinued alcohol consumption and inhaled nitrous oxide use. He subsequently had multiple episodes of cardiac arrest with polymorphic ventricular tachycardia. The medical toxicology service was consulted for assistance.

Results: Patient arrived in the ED with normal mental status and over the ensuing five hours had six episodes of pulseless ventricular tachycardia, four being Torsades de Pointes. All were successfully defibrillated. Serial ECGs throughout admission showed maximum QRS of 74 ms and QTc of 492 ms without ischemic changes. Initial labs were notable for magnesium of 1.4 mg/dL, normal potassium and total calcium, ionized calcium of 1.17 mMol/L, and high sensitivity troponin of 162 ng/L that peaked at 1,867 ng/dL. C-reactive protein and erythrocyte sedimentation rate were elevated at 9.1 mg/dL and 62 mm/hr respectively. LC-QTOF-MS urine drug testing on HD 2 detected amiodarone (iatrogenic), caffeine, hydroxyzine, and citalopram/escitalopram. An echocardiogram showed mildly reduced biventricular function but no regional wall motion abnormalities. Coronary artery CTA showed no coronary calcifications. On HD 5, cMR with regadenoson stress protocol showed mildly reduced biventricular EF (44–46%), flattened myocardial time-signal intensity curves, and abnormal T1/T2 values in the septum consistent with myocardial edema, attributed to direct cardiotoxicity/myocarditis vs. post-arrest changes. He was started on metoprolol, valsartan, acamprosate, and discharged to an inpatient psychiatric facility with a wearable vest defibrillator in place.

Conclusion: Inhaled difluoroethane use has been associated with ventricular dysrhythmias, cardiomyopathy, and myocardial changes on autopsy. We observed a case of recurrent polymorphic ventricular tachycardia in the setting of 1,1-difluoroethane use with work-up including cardiac MR and serum inflammatory markers suggestive of toxic myocarditis. Cardiac MR may be a helpful diagnostic study to assess for inhalant-related cardiotoxicity.

057. Results From a Pilot Period of a Drug Identification Program as a Harm Reduction Initiative

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Background: Adulteration within the illicit drug supply poses significant health risks, with individuals affected by substance use disorders unknowingly exposed to concealed substances that may produce unintended pharmacologic effects. In 2023, Hamilton County Public Health (HCPH) partnered with the Centers for Disease Control and Prevention, the University of North Carolina Street Drug Analysis Lab (UNC), and community-based organizations to pilot a drug checking program. The primary purpose of this study was to characterize the drugs identified in samples submitted by participants.

Methods: Participants could voluntarily submit samples of drugs at three different community sites. This study included samples collected from 1/24 - 9/24. Samples included drug residues, powder, or used paraphernalia. All samples were submitted anonymously but included a questionnaire. Participants identified what they thought the substance was. The samples were then sent to the UNC Drug Analysis lab that performed gas chromatography/mass spectrometry. Participants could then access their results directly from the UNC website.

Results: Forty-nine samples were submitted for identification. In addition to fentanyl, heroin, cocaine, and methamphetamine, 42 other substances were identified. Sixteen of these were substances with potential psychoactive activity but were not a known metabolite (e.g., 6-monoacetylmorphine). The most common were xylazine (26), p-fluorofentanyl (9), medetomidine (7), and N-desethyl etonitazene (5). Five distinct benzimidazole opioids were identified. Fourteen substances were likely cutting agents, five were likely metabolites of other illicit agents, and seven were likely precursors or byproducts in the manufacture of other illicit agents. Three samples had no substances of any kind identified. All potentially psychoactive adulterants were found only in samples submitted that were believed to contain an opioid. Two samples believed to be an opioid contained only the opioid (e.g., fentanyl and/or heroin or fentanyl precursors such as 4-anilino-N-phenethylpiperidine). Five samples were submitted believed to contain methamphetamine. Four contained only methamphetamine and one contained methamphetamine and dimethyl sulfone (likely a cutting agent). Three samples were submitted believed to contain cocaine and all three only had cocaine identified.

Conclusion: In this sample of drug samples submitted in Hamilton County, OH, the majority of samples believed to be an opioid were adulterated with other substances. Alpha-2 agonists, fentanyl analogs, and benzimidazole opioids were common. Information given to participants

provided community awareness on novel substances and may aid in harm reduction efforts.

058. Regional Trends for Drugs and Novel Psychoactive Substances (NPS) from Emergency Department Patients in the United States

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Background: Traditional misused drugs and novel psychoactive substances (NPS) are commonly encountered in post-mortem toxicology testing; however, these drugs are often not monitored or reported in non-fatal overdoses. Therefore, we investigated the geographical patterns of detected drugs involved in non-fatal overdoses.

Research Question: What are the geographical patterns of drug detection among patients with non-fatal polydrug overdoses?

Methods: In collaboration with the Toxicology Investigators Consortium (ToxIC) Drug-Overdose Toxicology-Surveillance (DOTS) Reporting Program, blood specimens were collected from patients who presented to emergency departments after a suspected stimulant or opioid overdose across 17 hospitals in the United States (US). Blood specimens were collected and sent to the Center for Forensic Science Research and Education (CFSRE) for comprehensive toxicology testing. The testing workflow included blood alcohol testing, comprehensive drug screening, and quantitation of select drugs and NPS. Blood specimens were prepared by basic and acidic liquid-liquid extractions prior to analysis via liquid chromatography quadrupole time-of-flight mass spectrometry (LC-QTOF-MS). Analysis was completed using a Sciex X500R QTOF-MS coupled to a Sciex Exion LC. Data were processed against an in-house database containing more than 1,200 targets. Regions were defined as Eastern, Central, and Western US. Central and site institutional review boards approved this study with informed consent.

Results: To date, 564 DOTS specimens have been analyzed via LC-QTOF-MS. Overall, fentanyl (93%) was the most prevalent drug across the entire US; however, stimulant positivity varied by region. Methamphetamine was more commonly detected in the West (West: 77%, Central: 38%, East: 12%), whereas cocaine was more commonly detected in the East (West: 16%, Central: 28%, East: 50%). Adulterants were more commonly identified in the

East with low prevalence in the West. Xylazine (36%) and quinine (23%) were the most prevalent adulterants identified (xylazine co-positivity with fentanyl: 99%). Other commonly detected drugs included methadone (East: 16%), hallucinogens (e.g., PCP 5.7% and ketamine 6.8% primarily in the Eastern US), THC (Central: 17%) and diazepam (East: 11%). NPS were most often detected in the Eastern US (31%), and least often identified in the Western US (6%). *para*-Fluorofentanyl, bromazolam, *N,N*-dimethylpentylone, and MDMB-4en-PINACA were the most prevalent NPS detected, primarily alongside fentanyl. **Conclusion:** Comprehensive toxicology testing after a non-fatal overdose can provide important insights into the recreational drug market. While adulterants and NPS were more common in the Eastern U.S., the most prevalent types of NPS did not vary across geographical regions.

ToxIC: This research was performed by the ACMT Toxicology Investigators Consortium

059. Medetomidine: An Emerging Toxic Adulterant in the Illicit Drug Supply

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Background: The latest adulterant identified in the illicit drug supply is medetomidine, an alpha-2 agonist like xylazine and clonidine, which can be found in both human and veterinary medicine. Medetomidine exists in two enantiomeric forms: the potent and active dexmedetomidine and the largely inactive levomedetomidine. Concerningly, animal studies have shown medetomidine to be a more potent, selective, and specific agonist than xylazine in the peripheral and central nervous systems, and with a longer duration of action.

Methods: Antemortem and postmortem whole blood samples, collected from individuals suspected of consuming medetomidine-containing drug products, were analyzed. Qualitative drug screening was performed by liquid chromatography time-of-flight mass spectrometry (LC-TOF-MS). When permitted, samples screening positive for medetomidine were forwarded for confirmatory testing. Quantitative confirmation for total medetomidine was performed by liquid chromatography tandem quadrupole mass spectrometry (LC-QQQ-MS). A separate LC-QQQ-MS confirmatory method was later developed to differentiate the dex- and levo- enantiomeric forms.

Results: As of November 2024, use of medetomidine as an adulterant has been identified in more than 10 US states and 2 Canadian provinces. It was most frequently observed in samples containing fentanyl and xylazine, though medetomidine has also been identified with cocaine, heroin, and

fentanyl analogs. For this study, 30 whole blood samples underwent both quantitation and differentiation testing for medetomidine (average 3.5 ng/mL; range <0.10–16 ng/mL). Dexmedetomidine was found in all 30 blood specimens; levomedetomidine was detected in 26. In addition to these results, concurrent findings included fentanyl (n = 30), xylazine (n = 17), cocaine/metabolites (n = 14), methamphetamine (n = 7), and PCP (n = 2). The absence of levomedetomidine in 4 of the samples along with review of case history suggests likely medical administration of dexmedetomidine in these instances. However, in most cases, dex- and levo- medetomidine were both identified, showing likely illicit or veterinary diversion.

Conclusion: Medetomidine is the latest adulterant to appear in the recreational drug supply. Though typically seen as a minor component of illicit drug samples, it remains of toxicological concern with the significantly increased potency over xylazine. Currently, information on medetomidine's effects in humans, particularly in combination with other drugs, is limited. In cases where medetomidine ingestion is suspected, severe adverse effects have been noted, including heightened sedation, hypotension, and profound bradycardia. Clinicians and toxicologists should be aware of medetomidine and be prepared to evaluate and interpret cases involving this emerging substance.

060. Alpha-2 Agonist in Opioid Overdose Is Not Associated with Prolonged Emergency Department Sedation

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Background: Alpha-2 agonists (A2A), including xylazine, medetomidine, and clonidine, have been increasingly detected in the illicit opioid supply and are anecdotally associated with prolonged sedation. Qualitative data from people who use opioids with xylazine notes subjective experiences of prolonged sedation. However, prolonged sedation associated with novel A2A among patients with a confirmed opioid overdose (OD) has not been measured.

Hypothesis: Among emergency department (ED) opioid OD, those with A2A and illicit opioids detected will have a higher odds of hospital admission, longer hospital length of

stay and higher total naloxone dose compared to those with illicit opioids without A2A.

Methods: The Toxicology Investigators Consortium (ToxIC) Fentanyl Study is conducted at ten medical centers. Patients age 18+ years presenting with suspected opioid OD and waste blood are included. Serum was analyzed by the Center for Forensic Science Research and Education using quadrupole time-of-flight mass spectrometry for over 1200 substances. Primary outcomes included hospital length of stay (hours), hospital admission and total naloxone dose (mg) because these outcomes may be associated with prolonged sedation. Patients with A2A and an illicit opioid were compared to patients with only illicit opioids. Unadjusted and adjusted multivariable logistic and log-linear regression models were estimated using R 4.3.3.

Results: Between September 21, 2020, and August 22, 2024, 1527 (83.5%) patients with completed toxicological testing had an illicit opioid detected and 23.2% (n = 354) had at least one A2A. The following A2As were detected with an illicit opioid: xylazine (n = 336) 22.0%, clonidine (n = 19) 1.2%, and medetomidine (n = 6) 0.4%. There were significant differences in hospital disposition between the two groups ($p = 0.03$). More patients with A2A were not admitted to the hospital (64.7% vs. 57.1%) and had a lower incidence of ICU admissions (11.9% vs. 17.9%). In unadjusted models, A2A were associated with lower odds of hospital admission (OR 0.72; 95% CI 0.56, 0.93) but this was not statistically significant in adjusted models (aOR 0.79; 95% CI 0.57, 1.09). A2A were not associated with total naloxone dose received (aOR -0.01; 95% CI -0.16, 0.14) or hospital length of stay (aOR 0.08; 95% CI -0.02, 0.36).

Conclusions: In this large national multicenter cohort, A2A were not associated with prolonged sedation in ED patients with confirmed opioid OD. Future work using quantitative serum concentrations and assessing clinical differences during the immediate pre-hospital, post-OD period may better elucidate effects of A2A in opioid OD patients.

ToxIC: This research was performed by the ACMT Toxicology Investigators Consortium

061. A Case of Mistaken Identity: Beta-hydroxybutyrate Identified As Gamma-Hydroxybutyrate With LC/MS-MS

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Background: Liquid chromatography with tandem mass spectrometry (LC/MS-MS) is often used for identification of xenobiotics. LC/MS-MS is highly specific and sensitive.

When compared to immunoassay drug screens, LC/MS-MS is far less likely to produce a false positive result.

Methods: This is a single patient case report. We describe a case of misidentification of beta-hydroxybutyrate (BHB) for gamma-hydroxybutyrate (GHB) in a pediatric patient.

Results: A 15-year-old female presented to the emergency department of a pediatric hospital in status epilepticus unresponsive to oral clonazepam and intranasal midazolam at home, plus 4 mg IV midazolam by EMS. Her history included a BRAF mutation, cardiofaciocutaneous syndrome, and epilepsy managed with clobazam, levetiracetam, zonisamide, and ketogenic diet. In the ED, her seizures persisted despite 4 mg IV lorazepam before loading with IV fosphenytoin. Her electrolytes were normal except for a bicarbonate of 18 mmol/L. Drugs of abuse screening with LC/MS-MS was positive for benzodiazepine (7-aminoclonazepam) and GHB. The latter was unexpected since there was no plausible source of exposure. No family member had a prescription for sodium oxybate, which is the sodium salt of GHB. Discussion with the laboratory medical director clarified that beta-hydroxybutyrate and gamma-hydroxybutyrate are indistinguishable by LC/MS-MS. BHB and GHB are isomers sharing the same molecular weight (104.1 Da). Although LC/MS-MS can differentiate compounds of similar mass if they are large enough to fragment and generate a unique mass-charge fingerprint, GHB and BHB produce similar fingerprints due to their small mass and similar bonding. Urinalysis from the same specimen showed 4+ ketones (acetoacetate and acetone). The laboratory protocol for reporting a positive urine GHB required checking the urine ketones. If the urine ketones are positive, then the final report of the LC/MS-MS should be negative for GHB. An inexperienced laboratory technician omitted this step, which led to the erroneous laboratory report. Serum BHB concentration was 3.5 mmol/L and reflected ketosis associated with her ketogenic diet.

Conclusion: While LC/MS-MS has excellent test characteristics for most xenobiotics, it cannot distinguish between beta-hydroxybutyrate and gamma-hydroxybutyrate. Interpretation of LC/MS-MS results require exclusion of ketosis.

062. Massive Bupropion Overdose With Large Intestinal Burden and Postmortem Continued Absorption and Redistribution

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Background: Bupropion hydrochloride is a monocyclic aminoketone that has been FDA approved for the treatment of depression since the 1990s. Intentional overdose with bupropion is not uncommon, based on large reviews of

United States' poison center data. Death, however, is rare, corresponding to less than 0.5% of all reported cases. Major clinical effects of bupropion, including central nervous system and cardiovascular toxicity, are due to the parent compound and its active metabolite, 4-hydroxybupropion. There are few reports of fatalities with postmortem bupropion and 4-hydroxybupropion levels in the peer reviewed literature.

Methods: This is a single patient chart review. A 24-year-old male with a history of depression was found unresponsive. On first responder arrival, the patient had three generalized tonic-clonic seizures. On arrival to the emergency department, his temperature was 38.8°C, blood pressure was 100/52 mmHg and heart rate was 155 beats/min. His physical exam was notable for unresponsiveness, diaphoresis, mydriasis, tachycardia, sonorous respirations, and a Glasgow coma scale of 3. Within minutes, he had additional seizures and was intubated for airway protection. Subsequent to intubation, he became hypotensive with minimal response to vasopressor support. A trauma assessment with CT scans of head, cervical spine and chest were unremarkable. A CT angiogram of the abdomen and pelvis showed innumerable intraluminal hyperdensities within the small bowel. Immediately after the CT imaging suggested toxic ingestion, the Medical Toxicology team was consulted, and bupropion toxicity was suspected. An electrocardiogram was notable for sinus tachycardia at 110 beats per minute with QRS and QTc interval prolongation. The patient was treated with activated charcoal, sodium bicarbonate IV boluses, and IV fat emulsion therapy. Extracorporeal membrane oxygenation was not available. The patient developed cardiac arrest and died after three hours.

Results: Results performed by gas chromatography-mass spectrometry from the patient's antemortem blood, on arrival to the ED, were notable for a bupropion level of 13,000 ng/mL (therapeutic range: 10–100 ng/mL) and 4-hydroxybupropion level of 2,600 ng/mL (therapeutic range: 850–1500 ng/mL). Post-mortem analysis was performed 12 hours after ED presentation (nine hours after death) was notable for bupropion level of 53,000 ng/mL and 4-hydroxybupropion 4,300 ng/mL. Post-mortem urine bupropion was 71,000 nL/mL and 4-hydroxybupropion 11,000 ng/mL.

Conclusion: Reports of post-mortem analysis after death related to bupropion is uncommon. We report an unusual case of post-mortem continued absorption and redistribution due to massive overdose.

063. Evaluation of Hydroxocobalamin Interference on Determination of Carboxyhemoglobin Percentage by Co-Oximetry

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Background: Hydroxocobalamin is a red chromophore with absorption peaks at 274, 351, 500, and 526 nm, raising concerns that it could interfere with spectrophotometric tests. In particular, co-oximetry uses similar absorption spectra to determine carboxyhemoglobin percentage (CO-Hgb%). Case reports of patients treated for presumed carbon monoxide and cyanide exposure suggest hydroxocobalamin caused falsely decreased CO-Hgb%. Animal and spiked blood experiments, however, demonstrate both CO-Hgb% elevations and reductions. These models might not accurately reflect clinically relevant serum concentrations or account for changes with metabolism. This study investigated the effect of hydroxocobalamin administration on CO-Hgb% in human subjects.

Methods: Patients who received hydroxocobalamin for hypotension were screened for inclusion. Patients with a blood gas on which a CO-Hgb% could be determined before and within 12 hours after administration of hydroxocobalamin were included. Patients were excluded if they did not have a CO-Hgb% drawn before and after hydroxocobalamin administration, received methylene blue before hydroxocobalamin administration or before collection of the subsequent blood gas, received >6 L of IV fluids over 4 hours during or after hydroxocobalamin infusion, or received >1.5 L of blood products between administration of hydroxocobalamin and collection of the subsequent blood gas. Cases were reviewed retrospectively. No blood testing or interventions were dictated by the IRB-approved study protocol. Samples were measured on one of two Radiometer ABL800 co-oximeters (measuring in the 478–673 nm range). Assignment to a particular instrument was random. Imprecision for each instrument for CO-Hgb% <5% was $\pm 0.3\%$. CO-Hgb% before and after hydroxocobalamin administration was compared using two-tailed t-test.

Results: In total, 21 subjects were screened; 14 were analyzed. CO-Hgb% generally increased after administration of hydroxocobalamin (mean: +0.81% (95%CI 0.22–1.39; $p < 0.05$)) with a range of -1.7 to $+2\%$. Subsequent blood gas was obtained, on average, 4.1 hours (range: 0.6–10.5 hours) after hydroxocobalamin administration.

Conclusion: Hydroxocobalamin might interfere with CO-Hgb% detection but does not demonstrate a clinically relevant deviation in results when using the Radiometer ABL800. Possible causes might include short distribution half-life of hydroxocobalamin (1–2 hours), metabolism to cyanocobalamin which has a different absorption spectrum (278, 361, and 550 nm), instrument-specific variations, or interference unrelated to wavelength absorption. Limitations include the availability of only one model of co-oximeter, low CO-Hgb%, heterogeneous population, possible contribution of critical illness, and the retrospective nature of the study. Future investigations of laboratory interference by hydroxocobalamin in human subjects on different instruments might help determine the true incidence, cause, and significance of this effect.

064. A Severe Case of Alcoholic Ketoacidosis with Shock and Markedly Elevated Lactate

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Background: Alcoholic ketoacidosis (AKA) occurs in some patients with chronic alcohol use, resulting from a starvation state with hepatic glycogen depletion and high cellular redox potential due to metabolism of ethanol. The ratio of NADH:NAD⁺ is increased, promoting the preferential formation of beta-hydroxybutyrate over acetoacetate.

Methods: This is a single patient chart review. The patient is a 31-year-old male with a medical history notable for alcohol use disorder (pint of vodka per day) who presented to the emergency department after being found down at home. He had been experiencing abdominal pain, vomiting, and nausea for the prior week with continued alcohol use with little else by mouth. Upon arrival the patient was altered, hypotensive, and with a severe metabolic acidosis. Initial blood gas notable for pH 6.98, PCO₂ 26, PO₂ 62, HCO₃ 4, glucose 83, and lactate > 24 mmol/L (upper threshold of detection). Initial ethanol and beta-hydroxybutyric acid levels were 166 mg/dL and 3.67 mmol/L, respectively. Labs also notable for acute kidney injury (Creatinine of 2.31) and rhabdomyolysis (CK of 5,386). The patient remained hypotensive despite fluids and was started on a norepinephrine infusion, as well as sodium bicarbonate infusion with high-dose thiamine. Broad-spectrum antibiotics were initiated given concern for possible component of septic shock.

Results: During aggressive ED/inpatient work-up and management, further consideration was given to the possibility of alcoholic ketoacidosis. Patient initially admitted to MICU where his acidosis corrected to 7.54 in a 24 hour period following fluid resuscitation, thiamine and dextrose administration, and sodium bicarbonate infusion. Lactate decreased to 7.7 and 2.9 on days two and three, respectively. The hospitalization was complicated by circulatory overload with acute hypoxic respiratory failure that was responsive to diuretics, and the patient was ultimately discharged on hospital day seven. No infectious source was found. There were no detectable toxic alcohols and the patient was not prescribed metformin nor nucleoside reverse transcriptase inhibitors. There was no history to suggest exposure to complex IV inhibitors. The patient had no history of diabetes and euglycemic diabetic ketoacidosis was thought to be unlikely. No other clear etiology for his presentation was identified, raising suspicion for AKA as the causative pathophysiology.

Conclusion: We present a severe case of suspected AKA, which highlights one of the more extreme presentations of AKA described in the medical literature.

065. Ethylene Glycol Poisoning Complicated by Cerebral Edema - Is Hemodialysis Safe?

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Background: Hemodialysis (HD) is crucial treatment for severe ethylene glycol (EG) poisoning. EG toxicity is also associated with cerebral edema. We present a patient with severe EG toxicity who had evidence of cerebral edema and received HD, with a poor outcome.

Hypothesis: The initiation of HD in a patient with severe EG toxicity and cerebral edema may have contributed to worsening cerebral edema.

Methods: This is a single patient chart review. A 17-year-old male presented unresponsive, last seen well 19 hours prior. Initial labs showed pH 6.90, HCO₃ < 10 mEq/L, pCO₂ 18 mmHg, K 6.6 mEq/L, Cr 1.81 mg/dL, and osmolar gap 42 mOsm/kg. A lactate gap was noted: VBG lactate > 16 mmol/L, serum lactate 3.3 mmol/L. CT head was unremarkable. He was intubated, given calcium gluconate, insulin/dextrose, started on bicarbonate infusion, and transferred to a tertiary care facility ~24 hours after last seen well.

Results: Patient's clinical and laboratory picture suggested EG toxicity. Therapy was initiated with fomepizole, thiamine, and pyridoxine; nephrology was consulted for urgent HD. Repeat head CT ~38 hours after last seen well showed global effacement of cerebral sulci and basal cisterns, concerning for cerebral edema. Hypertonic saline was added to bicarbonate infusion and HD was initiated ~41 hours after last seen well. Approximately 20–30 minutes after initiation of HD, patient became hypertensive to 200s/100s and HR dropped from 110s to 70s. Polymorphic ventricular tachycardia was observed on the monitor, and pupils were dilated and non-reactive, prompting concern for herniation. Patient became pulseless with asystole. ROSC was achieved after 10 minutes, and he received epinephrine, lidocaine, calcium, and mannitol. Repeat head CT showed worsened cerebral edema without herniation. Post-arrest, patient had no cough or gag; pupils remained fixed and dilated. Family ultimately decided to withdraw care and patient passed away. After a five-day turnaround, EG level resulted 59.1 mg/dL, drawn ~27 hours after last seen well.

Conclusion: HD can exacerbate cerebral edema through dialysis disequilibrium syndrome caused by rapid removal of urea. Additionally, a rapid rise in serum pH with HD can cause a paradoxical increase in intracellular acidosis, worsening cerebral edema. However, HD is the treatment of choice for severe EG toxicity and can be lifesaving. In this case, the patient's decompensation may have been related to worsening cerebral edema. Further investigation is needed regarding the use of HD in poisoned patients with cerebral edema.

066. Lack of Association of the Start of Daylight Savings Time With All Calls and Suicide-Related Calls to Ohio Poison Centers

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Background: The transition to daylight savings time (DST) in the spring leads to one hour of sleep loss and an accompanying reduction in sleep efficiency and disruption of circadian rhythm. This reduction in sleep is associated with an increased risk of motor vehicle collisions, stroke, and suicidal ideation.

Hypothesis: We hypothesized a positive association between the total number of exposure calls and suicidal ingestion calls to the local poison control center in the days immediately following the start of DST, a period associated with increased sleep deprivation.

Methods: We performed a retrospective analysis of Ohio poison center data of exposure calls from 2003–2023, including the 28 days before and after the start of DST. Total call counts and suicide-related calls for three-day intervals and the total and median call volumes across all years were compared with the baseline call rate using a Poisson Test. All analyses were performed using R.

Results: The 28 days immediately preceding DST for 2003–2023 had a median call volume of 2,823 for all exposure calls and 319 for suicide-related calls. No statistically significant change was observed in any three-day interval after the start of DST for the total or median call volumes across all the years.

Conclusion: In this retrospective analysis, the days following the start of daylight saving time (DST) were not associated with an increase in call volume to local poison centers, nor did we find any association with suicide-related calls.

067. Urinary Paraben Concentrations by Demographics and Cancer Diagnosis Among US Adults

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Background: Parabens are endocrine disrupting compounds (EDCs) that are commonly used as antimicrobial agents in food, pharmaceuticals, household products, and personal care products (PCPs) such as cosmetics, moisturizers, hair products, and sunscreen. Due to daily exposure to these chemicals, there has been increasing concern about environmental exposure to parabens and cancer risk.

Research Question: This study aims to assess whether urinary paraben concentrations differ relating to demographics and cancer diagnosis in the general adult population.

Methods: This is a cross-sectional study using a representative sample of 8631 adult participants aged 20–85 years from the 2005–2016 National Health and Nutrition Examination Survey (NHANES) cycles. We examined urinary concentrations of parabens, including butylparaben (BP), ethylparaben (EP), methylparaben (MP), and propylparaben (PP) in our study population. To control for urine dilutions in spot urine samples, creatinine-adjusted urinary concentrations of parabens were determined for each individual. Cancer diagnosis including all types of cancers was self-reported and collected from the medical condition questionnaire data. The statistical analysis in this study was performed using SAS version 9.4. Weighted geometric means of urinary paraben concentrations were analyzed in the study participants.

Results: Of the 8631 participants, 816 (9.45%, weighted prevalence) reported a cancer diagnosis. MP was the most abundant paraben in urine with a weighted geometric mean of 52.65 µg/g creatinine, followed by PP (6.92 µg/g creatinine), EP (2.60 µg/g creatinine), and BP (0.30 µg/g creatinine). Individuals with cancers showed a statistically significant increase in the geometric mean of urinary MP concentrations (67.51 µg/g creatinine) compared to non-cancer individuals (51.22 µg/g creatinine) ($p = 0.0054$). None of the other parabens showed statistically significant increase in urine concentrations among cancer individuals. In addition, urinary paraben concentrations varied among different demographics, with sex showing the largest variations for all types of parabens examined. For instance, females were found to have an almost five-fold increase in the geometric mean of urinary MP concentrations (111.37 µg/g creatinine) compared to males (24.00 µg/g creatinine) ($p < 0.0001$).

Conclusion: This study demonstrates a significantly increased urinary concentration of MP among individuals with cancer. Further studies are warranted to examine the association between paraben exposures and cancer risk, especially among women, and to evaluate PCP usage in relation to paraben exposure to provide more insights into the potential role of parabens in cancer etiology.

068. Takostubo Cardiomyopathy in Severe Scorpion Envenomation in a 72-Year-Old Woman. A Case Report.

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Background: Scorpion stings are a medical emergency, with effects ranging from localized pain to life-threatening systemic manifestations. While neurotoxic effects are commonly recognized, cardiovascular complications, including Takotsubo cardiomyopathy (TTC), are rare but potentially severe consequences of envenomation.

Hypothesis: Severe Scorpion stings can lead to Takotsubo Cardiomyopathy.

Methods: We describe a case of severe scorpion envenomation resulting in Takotsubo cardiomyopathy.

Results: A 72-year-old female presented to a primary health care facility after being stung by an unknown scorpion with severe localized pain, chest pain, and shortness of breath. She was treated symptomatically. Her initial electrocardiogram (ECG) was normal, and her symptoms improved, so she was discharged. Twenty-four hours later, she presented to the Emergency Department with worsening chest pain and shortness of breath. Her vitals showed a blood pressure of 137/64 mmHg, a heart rate of 86 beats per minute, and an oxygen saturation of 98% at room air. Her systemic exam was normal except for a mild swelling at the distal phalanx of the right ring finger. A repeated ECG showed sinus rhythm with T-wave inversion in leads V3-V6, II, III, and aVF, and her Troponin was elevated at 750 pg/mL (0–22 pg/mL). She was treated with one vial (5 mL) of Equine Saudi Polyvalent anti-scorpion antivenom. An echocardiogram was done on the same day of admission, which showed mild apical ballooning of the left ventricle, regional wall motion abnormalities, and a reduced ejection fraction of 40%, consistent with Takotsubo cardiomyopathy. After receiving the antivenom, her symptoms improved, and troponin levels declined. The patient refused to undergo a Coronary Angiography procedure, and she was treated symptomatically.

Conclusion: Takotsubo cardiomyopathy (TTC), known as stress-induced cardiomyopathy, has been associated with various stressors, including physical and emotional stimuli. Scorpion envenomation is a rare but notable trigger. Documented cases have shown cardiac complications are due to the catecholamine surge induced by the venom. The patient's description of the scorpion might be close to the known vicious family of scorpions in Oman, the Buthidae family, specifically *Lurius quinquestriatus*, also known as the deathstalker. This case highlights a rare but significant cardiac complication: Takotsubo cardiomyopathy, which manifests following a scorpion envenomation. Early recognition, prompt intervention, and comprehensive cardiac care are crucial for enhancing patient outcomes in such cases.

069. Harmful Algal Blooms (HABs) in Sea Turtles as a Surrogate Marker for Human Exposure

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Background: With warming climates, exposures to harmful algal blooms (HABs) are expected to rise in locations outside of known endemic areas. This creates a growing need within the medical toxicology community to define disease burden and prepare for this growing public health threat. This project represents a novel approach to surveillance with a goal to foster cross-disciplinary collaboration within the toxicology and veterinary science communities and further characterize HABs exposure.

Hypothesis: Stranded sea turtle liver specimens can serve as a surveillance source for potential human HAB exposure.

Methods: This observational pilot study analyzed post-mortem liver samples from sea turtles via liquid chromatography-quadrupole time-of-flight (LC-QToF) analysis for presence of 14 regionally significant HABs: Neosaxitoxin, Saxitoxin, Cylindrospermopsin, Anatoxin A, Domoic acid, Microcystins (RR, YR, LR, and LA), Nodularin, Okadaic acid, Brevetoxins-2 and -3, and Teleocidin. Post-mortem samples collected by New England Aquarium (NEAq) from local sea turtle strandings between November 2023 and January 2024 underwent LC-QToF analysis at University of Connecticut Institute of Environment. Descriptive statistics were calculated for incidence of detection in the sample for each HAB (frequencies/percentages) and for HAB concentration (means/standard deviations(SD)).

Results: Thirty-six liver samples were analyzed from sea turtles representing three species (N=24 *Lepidochelys kempii*, N=6 *Caretta caretta*, and N=6 *Chelonia mydas*). Forty-one percent of samples tested positive for at least one HAB and 6% of samples were positive for two separate HABs. Six of the 14 HABs tested were found in at least one sample: Domoic acid (in 11.1% of samples); brevetoxins-2 and -3 (in 5.6%, 16.7% of samples, respectively); neosaxitoxin (in 2.8% of samples); microcystin LR (in 2.8% of samples); and okadaic acid (in 2.8% of samples). Brevetoxin-3 had the highest mean concentration in positive samples (197.1 ng/g, SD 54.0), followed by neosaxitoxin (164.9ng/g, SD 27.5).

Conclusion: Presence of multiple HABs in liver samples from stranded sea turtles indicates a possible surrogate source of detection for current and future HAB trends. Preparedness for future HAB trends will allow medical toxicologists to educate medical providers and the public. Future work should include evaluation of HAB concentrations over time, comparison of HAB concentration across

various climate conditions, and correlation with incidence of human HAB poisonings.

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DAY 2: PLATFORMS, ABSTRACTS 070–073

070. Inflammatory Biomarker Profiles of Emergency Department Patients with Cannabinoid Hyperemesis Syndrome and Acute Cannabis Intoxication

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Background: Cannabis Hyperemesis Syndrome (CHS) is a clinical entity involving periods of cyclic vomiting and abdominal pain in patients with heavy, chronic cannabis use. The underlying pathophysiology of CHS is poorly understood. Variable expression and agonism of the CB2 receptor is implicated in a number of inflammatory disease states, and there is a paucity of literature investigating a potential inflammatory mechanism in CHS.

Research Question: Do CHS patients presenting to an Emergency Department demonstrate a distinct profile of inflammatory biomarkers as compared to patients presenting with acute cannabis intoxication (CI)?

Methods: This was a prospective cohort study of adult and pediatric patients presenting to an Emergency Department at a single academic medical center with either CHS or CI. Subjects were identified by rolling review of disposition diagnoses associated with either CHS or CI. Charts were reviewed to ensure accuracy of diagnosis. Subjects with remnant biological samples collected as part of their routine clinical care met inclusion criteria. Remnant biological samples were identified in the clinical pathology laboratory and stored for analysis. Retrospective chart review and data extraction was performed for all subjects meeting inclusion criteria. Data extracted included duration of stay, disposition, laboratory and imaging results, interventions, etc. Serum samples were then batch-analyzed with a 27-plex Luminex kit following the manufacturer's protocol. Inflammatory markers screened for included IL-6, IL-13, VEGF, TNF-a, and IL-8, among others. The protocol was IRB approved. Differences between groups were determined by using the Mann-Whitney test (p-value < 0.05 were considered significant).

Results: A total of 50 subjects met inclusion criteria, 43 of whom had a serum sample with sufficient volume for analysis. Of the 43 subjects, 32 (74%) presented with CHS, which included 50% males with a mean age of 27 years. The remaining 11 (26%) presented with cannabis intoxication, and included 72% males with a mean age of 24 years. Of the 27 inflammatory

markers measured, significant differences were observed for MCP-1 ($p = 0.03$) and IL-13 ($p = 0.03$). In patients with CHS, IL-13 yielded higher values than patients with CI. In patients with CI, MCP-1 yielded higher values than patients with CHS. No other inflammatory biomarkers demonstrated statistically significant differences between study groups.

Conclusion: These data suggest that the bioinflammatory profiles in patients with CHS and CI are similar. However, further investigation into the possible role of the specific inflammatory markers MCP-1 and IL-13 in the pathogenesis of CHS may be warranted.

071. Detecting Ethanol Intoxication and Impairment Using Wearable Biosensors

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Background: Ethanol is the most commonly abused drug worldwide. Identifying alcohol impairment requires trained personnel who may have interpersonal variability and are not always readily available. Detecting intoxication using wearable biosensors may facilitate the identification of impairment and allow for the deployment of smartphone-based harm reduction interventions.

Hypothesis: Wearable biosensors are a feasible and acceptable method of assessing ethanol intoxication in healthy subjects.

Methods: We performed an observational study with a local Police Academy's alcohol intoxication lab, designed to train law enforcement officers to detect intoxication. Consenting otherwise healthy participants wore a wrist biosensor (Empatica EmbracePlus) for over six hours. We collected heart rate, skin temperature, electrodermal activity, and accelerometry continuously throughout the study period. Participants consumed alcoholic beverages ad hoc over five hours. Breath alcohol content (BrAC) was recorded using a breathalyzer (Intoximeters Inc – Alco-Sensor FST) every one-two hours. Afterwards, officers performed standard field sobriety testing to measure impairment. The primary outcome was feasibility defined by our ability to collect usable data. As a secondary outcome, we sought to define potential associations and correlations between biometrics and BrAc. Biometrics were analyzed using descriptive statistics, RMANOVA, and Pearson product moment correlation calculations. Acceptability was measured with a two-question survey.

Results: Over the study period, we screened 29 participants. Of these, all 29 were eligible and all were enrolled in the study. Sixteen were males, mean age was 30.2 (IQR 23,32) years. At the final BrAC measurement, subjects achieved an average BrAC of 0.11% (IQR 0.09%–0.14%). We demonstrated a statistically significant increase in heart rate ($p = 0.0033$), change in EDA ($p = 0.0232$), and accelerometry ($p = 0.0033$) features from baseline to the final BrAC assessment. There was a weak, but statistically significant correlation ($r^2 = 0.36$, $P = 0.003$) between increasing BrAC and change in heart rate from baseline. We found no correlation between BrAC and EDA, accelerometry, and skin. Subjects described willingness and interest in using wearable biosensors/smart phone technology to detect their own impairment from alcohol.

Conclusions: Assessment of alcohol intoxication is feasible using a wearable biosensor to collect heart rate, EDA, skin temperature and accelerometry. Heart rate increase was the most consistent feature associated with an increase in BrAC. Participants found the assessment strategy acceptable. The study was limited by a lack of standardization in activities while drinking which may account for weak correlations in biometrics and BrAC. Future work should advance machine learning algorithms to detect ethanol induced intoxication and impairment.

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072. Xylazine Blood Concentrations Are Not Associated With Clinical Severity After an Opioid Overdose

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Background: Xylazine is a common adulterant detected in the illicit drug supply. Its clinical effects after overdose are still not clear.

Hypothesis: Patients with any detectable blood xylazine (compared to no xylazine) and patients with higher xylazine blood concentrations (compared to those with lower xylazine concentrations) will have more severe clinical outcomes following an overdose.

Methods: The Toxicology Investigator's Consortium (Toxic) Drug Overdose Toxicology-Surveillance (DOTS) reporting program was a two-year multicenter observational study that prospectively enrolled patients presenting to one of 17 participating medical centers with a severe/life-threatening opioid and/or stimulant overdose. Data obtained included detailed patient interviews, clinical information from the medical record, and comprehensive toxicological testing of blood samples. For this subgroup analysis, patients with blood testing positive for xylazine were compared to those negative or below the limit of quantification (LOQ) of 1 ng/ml for xylazine. Blood fentanyl concentrations were also examined. Analyses were restricted to those who had blood obtained within four hours of emergency department (ED) presentation and those who presented following a clinically suspected opioid overdose. Clinical outcomes included intubation, any admission, intensive care unit (ICU) admission, and bradycardia. Wilcoxon rank sum tests were used for continuous variables and chi-square or Fisher's Exact tests for categorical variables.

Results: Among the 494 patients with completed laboratory results to date, 300 had blood obtained within 4 hours and 197 patients presented to the ED following a suspected opioid overdose. Xylazine was detected in 39/197 patients (19.8%). The majority of patients with detected xylazine ($n = 25$; 64.1%) had blood concentrations above the LOQ. The median xylazine concentration in these cases was 7.6 ng/mL (IQR 2.3, 12.0). There were no statistically significant relationships between xylazine concentrations and the clinical outcomes of intubation, any admission, ICU admission, or bradycardia. However, median fentanyl concentrations were higher for those admitted (6.6 ng/mL; IQR 4.3–11.0) compared to those not admitted (4.5 ng/mL; IQR 2.9–8.6) ($p = 0.03$). Limitations included that undetected substances and not xylazine may have affected the results.

Conclusions: In patients where xylazine was detected, blood concentrations did not predict more severe outcomes including bradycardia, intubation, and hospital/ICU admission. However, higher fentanyl concentrations were associated with hospital admission. The sample size did not allow for multivariable modeling, but as the number of cases with laboratory analyses grows, multivariable modeling may help assess the impact of concomitant drugs and other confounding factors.

Toxic: This research was performed by the ACMT Toxicology Investigators Consortium

073. Veverimer as an Orphan Drug: A Potential Role in Salicylate Toxicity

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Background: Veverimer is an orally administered, non-absorbed drug that binds chloride anions with high selectivity in the gastrointestinal lumen. This increases plasma and urine bicarbonate with resultant alkalinization. Previous *in vitro* binding studies confirmed Veverimer's ability to bind negatively charged small drugs, specifically acetylsalicylic acid (ASA). This prompted an *in vivo* victim drug study, to characterize this drug-drug interaction (DDI).

Hypothesis: Coadministration of Veverimer with ASA will reduce the area under the concentration-time curve (AUC) and maximum plasma concentration (C_{max}).

Methods: A Phase 1, open-label, randomized, three-way crossover study evaluating the effect of veverimer (9 gm) on the PK profile of single-dose ASA (81 mg) in 51 healthy adult volunteers was performed. The primary endpoints were the AUC, time zero to the last observed non-zero concentration (AUC_{0-t}) and extrapolated to infinity (AUC_{0-inf}), and C_{max} for the treatment groups. Treatment groups were *A reference* ASA at Hour zero; *B test* ASA at Hour zero and veverimer within 10 min; *C test* veverimer at Hour -21 + ASA Hour zero + veverimer Hour three. The lower limit of quantification (LLOQ) for ASA was 2 ng/ml (0.00002 mg/dl). Per industry standard, if the 90% CIs of the geometric least squares mean ratio (GLSMR) of test to reference for the ln-transformed PK parameters AUC_{0-t} , AUC_{0-inf} , and C_{max} falls within 80.00% to 125.00%, no DDI exists.

Results: The AUC_{0-t} was 999, 850, and 981 and AUC_{0-inf} 1000, 852, and 983 hour \times ng/ml for treatment groups A, B, and C respectively. C_{max} for A, B, and C was 668, 631, and 630 ng/ml, respectively. Based on the accepted definition it was determined no DDI existed. Analysis of the PK linear and log-linear mean plasma ASA concentration over time showed blunting of C_{max} and faster time to LLOQ (six vs eight hours) in treatment group B (ASA and concomitant veverimer) vs. ASA alone.

Conclusion: No DDI at the rapidly absorbed, low dose ASA and high dose veverimer was found. *In vitro* binding studies at clinically relevant concentrations typical of those following ASA overdose (10,000 X greater), are needed to further investigate veverimer's impact on AUC_{0-t} and C_{max} . The impact of concomitant administration of veverimer on ASA's PK profile at these exceedingly low plasma concentrations, coupled with its known capacity to directly bind ASA and alkalinize plasma and urine, may foretell an adjunctive role for veverimer in the management of salicylate toxicity.

DAY 2: MODERATED POSTERS, ABSTRACTS 074–080

074. Increased Psilocybin-related Exposures Reported to a Regional Poison Center after Legalization

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Background: On October 20, 2020, Oregon voters approved the Oregon Psilocybin Services Act, which legalized the “manufacture, delivery, administration of psilocybin at supervised, licensed facilities”. After a two-year rules-development process, Oregon began accepting applications for licensure on January 2, 2023.

Research question: Did the legalization of the manufacture, delivery, and administration of psilocybin change the rate or severity of psilocybin-related adverse effects reported to the Oregon Poison Center?

Methods: We searched the Oregon Poison Center database for human, exposure, ingestions, within Oregon, with Generic codes for psilocybin (0058000, 0310161), from 2015–2024. We divided the time-periods into pre-legalization (2015–2020), pre-licensure (2020–2022), and post-licensure (2023–2024). For 2024, annual case counts were predicted by expanding the daily rate prior to 11/12/24, to 365 days. Counts of psilocybin-related cases were compared using Student t-test. Clinical outcomes were compared using Chi-square.

Results: A total of 366 cases were identified over the 10-year period. Cases increased from 15 in 2015 to 68 cases in 2023 and 70 predicted cases in 2024. Patients were largely young adults: age 13–19y (125; 34%), age 20–29y (84, 23%), age 30–39y (56, 15%), with few children (< 13y, 7%) or adults > 40y (16%). The majority had moderate (43%) or minor (20%) outcomes, with 5% major outcomes and one death (0.3%). Most exposures occurred in the patient’s own (68%) or another (5%) residence, and only one was reported from a healthcare facility (0.3%). Most cases were intentional abuse (233, 64%). Adverse drug reactions (6, 2%) and unintentional therapeutic errors (1, 0.3%) were rare. Cases significantly increased from 24/year in the pre-legislation period to 40/year in the pre-licensure period ($p = 0.047$) and to 64/year in the post-licensure period ($p = 0.046$). The proportion of cases that were severe (moderate or major toxicity or death) was not different in the three periods (58% vs. 73% vs. 60%, $p = \text{NS}$).

Conclusion: We found a significant increase in cases of psilocybin toxicity after the legalization vote and then after the licensure period. We did not find an increase in clinical severity. Most cases were intentional abuse that occurred in residences. We found no cases associated with licensed facilities. Our data suggests that acceptance of psilocybin and adverse events from psilocybin increased once the law was passed and

further increased after licensure, but that cases are unrelated to licensed facilities. Limitations include a lack of generalizability due to the specifics of this one state’s laws.

075. Opiate Content in Poppy Seed Tea Brewed Using Real-World Quantities and Methods

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Background: People have attempted to extract opiates from the surface of unwashed *Papaver somniferum* seeds by brewing poppy seed tea for recreational consumption. Various extraction methods and reports of the intoxicating effects after consuming these teas are available online. However, the quantities of opiates extracted is unclear. Previously published laboratory-based, small-quantity extractions have demonstrated variable quantities of morphine (0.0024–3.81 mg in 18 mL) and codeine (0.041–0.58 mg in 18 mL), but this used small volumes and laboratory-grade equipment and techniques. We sought to quantify the opiates extracted using commonly recommended proportions of ingredients and commonly available equipment when brewing poppy seed tea.

Methods: Using data from a prior study (unpublished data from a prior ACMT abstract), we selected the brewing technique that demonstrated the greatest extraction of morphine and codeine. To best replicate real-world practices, we searched online forums for commonly referenced equipment and quantities or ratios of ingredients. We then chose three poppy seed brands found on common online marketplaces whose labeling indicated the seeds were unwashed or had minimal processing. Three samples (A–C) of each brand (#1–3) were made. Liquid chromatography/mass spectrometry was performed on each sample to determine the concentrations of codeine and morphine in each. Testing for other opiates, such as thebaine or noscapine, was not available.

Results: Morphine content ranged from 1837.0 ng/mL to 19482.5 ng/mL. Codeine content ranged from 295.5 ng/mL to 20124.9 ng/mL. Brand #2 consistently demonstrated a greater opiate content than the other brands with an average of 18389.5 ng/mL morphine and 18576.0 ng/mL codeine (or 18.4 mg and 18.6 mg per liter, respectively).

Conclusion: Our study was designed to replicate real-world extractions of morphine and codeine when brewing poppy seed teas using commonly referenced proportions, techniques, and tools. The morphine and codeine content vary widely and could result in clinically relevant oral doses. Limitations of this study include the small sample size and lack of quantification of other opiates. Despite these limitations, our data suggests that even individuals using widely

available equipment to brew their own poppy seed tea may be at risk for opioid toxicity depending on their tolerance, amount of tea consumed, and amount of opiates extracted.

076. Opioid Overdose Among People Who Intend to Only Use Illicit Stimulants

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Background: Patients who develop opioid toxicity despite intending to use only stimulants are a poorly described group that may have unique clinical characteristics.

Research Question: Are there differences in blood fentanyl concentrations and clinical outcomes for patients presenting to an emergency department (ED) with an acute opioid overdose who intended to use only stimulants versus those intending to use only opioids?

Methods: The Toxicology Investigators Consortium (ToxIC) Drug Overdose Toxicology-Surveillance (DOTS) Reporting Program was a prospective study of patients \geq 13 years presenting to 17 US EDs for an opioid or stimulant overdose over 17 months (4/18/2023–9/30/2024). Obtained blood was analyzed by the Center for Forensic Science Research and Education using quadrupole time-of-flight mass spectrometry for over 1200 illicit substances. Patient interviews and chart reviews were conducted. Inclusion for this sub-analysis were patients with an opioid overdose who self-reported using only a stimulant or only an opioid. Chi-Square, Fisher's Exact, and Wilcoxon Rank Sum Tests were used to compare clinical data between the two groups. Central and site IRBs approved this study with written informed consent.

Results: Of the 332 patients who presented with a suspected opioid overdose, 182 met inclusion criteria. Of these, 51 (28%) self-reported their intention to use only stimulants, and 131 (72%) intended to use only opioids. Fentanyl was detected in 90.2% and 93.9% of those who intended to use only stimulants or opioids, respectively. The median serum fentanyl concentration was lower in those who intended to use stimulants (3.8 ng/mL, IQR: 1.5, 6.2 vs. 5.0 ng/mL, IQR 2.9, 11.0; $p = 0.02$). Subjects who intended to use stimulants received lower total doses of naloxone (2.0 mg vs 4.0 mg, $p = 0.04$). Compared to those who intended to use only opioids, subjects who intended to use stimulants did not have a

significantly higher incidence of admission (33% vs. 31%, $p = NS$), naloxone infusion (7.8% vs. 5.0%, $p = NS$), intubation (2.0% vs. 3.1%, $p = NS$), or the first dose of naloxone administered by EMS (80% vs. 64%, $p = NS$).

Conclusions: Patients who intended to use stimulants were a notable proportion of opioid overdoses presenting to EDs in our study. This group had lower serum fentanyl concentrations and were administered lower doses of naloxone which may reflect a lower tolerance in opioid naïve stimulant users. Novel approaches to decrease harm amongst this group are warranted, including distributing naloxone to people who use stimulants.

ToxIC: This research was performed by the ACMT Toxicology Investigators Consortium

077. EMS-Initiated Buprenorphine for Opioid Use Disorder

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Background: The treatment gap for individuals with opioid use disorder remains wide. Emergency Medical Services (EMS) is often the first encounter a person with OUD has with the healthcare system. Patients may refuse transport or leave against medical advice once they arrive in the emergency department (ED), thus EMS provides another critical access touchpoint to offer treatment and potentially save lives.

Hypothesis: Offering buprenorphine in the prehospital setting is feasible and safe.

Methods: A retrospective observational cohort of patients seen and treated by EMS personnel for overdose or withdrawal in two EMS systems offering buprenorphine from 8/1/2020 to 5/1/2024 in Camden, New Jersey and 10/9/2020 to 10–11/2023 in Contra Costa, California.

Results: A total of 274 patients were administered buprenorphine at both sites, 174 in Camden and 100 in Contra Costa. All patients in Camden were treated after an overdose event, with Contra Costa reporting 33 (33%) after an overdose and 67(67%) for treatment of withdrawal. The mean age (range) in the two samples were 44.3 (21–72) and 36.4 (17–82) respectively. Camden had more males (76%) versus Contra Costa (65%) with demographics reported as 46% White, 44.3% Black and 28% Hispanic versus Contra Costa with 51% White, 25% Black

and 89% Hispanic. The mean (range) of Clinical Opiate Withdrawal Scale (COWS) scores were 10.2 (2–20) and 16.1 (3–45) respectively. Both sites dispensed the initial dose of 16 mg of buprenorphine similarly, 182 (99%) and 87 (87%). The total dose of buprenorphine was 16mg in 144 (83%) in Camden and for 69 (69%) in Contra Costa. The mean reduction in COWS scores was –7.1 and –6.9 respectively. Both EMS systems reported a 1% rate of precipitated withdrawal. Transport to the ED varied with Camden transporting 82 (47%) and Contra Costa transporting 99 (99%). Engagement in treatment at 30 days was 41 (23.6%) at Camden and 33 (33%) for Contra Costa.

Conclusion: These two retrospective observation cohorts, provide evidence that EMS-initiated buprenorphine is feasible and safe in the prehospital setting. However, more data to assess effectiveness of this intervention is needed from prospective studies.

078. 20-Year Review Pediatric Methamphetamine Exposure

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Background: Methamphetamine is the predominant stimulant in the western United States and has been associated with pediatric exploratory ingestions. We sought to describe the exposure locations, clinical presentations, interventions, and outcomes of pediatric exploratory exposures in the United States over the last 20 years.

Methods: We searched the National Poison Data System (NPDS) over a 20-year period (1/1/2004–12/31/2023). Cases were included if they were a hospitalized child (<6 years) after an exposure to methamphetamine (substance code 0201127) by ingestion or unknown route. We extracted age, level of healthcare, clinical effect, therapies, exposure sites, and medical outcomes.

Results: We included 1,359 subjects. Cases increased by 333% over the 20-year period. The majority of children were less than two years old (988/1359; 73%). There was a near even split between patients admitted to an ICU (662, 49%) and the pediatric floor (697, 51.3%). Most of these exposures occurred at home (1,100, 81%) or another residence (132, 10%). Agitation (1,075, 79%), Tachycardia (872, 64%) and hypertension (249, 18%) were the predominate clinical effects reported. Less commonly reported clinical effects included rhabdomyolysis (129, 9%), hyperthermia (151, 11%), and CNS depression (106, 8%). Medical outcomes included 291 (21%) mild, 831 (61%) moderate, 216 (16%) major, and 3 (0.2%) children died. Treatments included benzodiazepines (943, 69%), intravenous fluids (829, 61%), and intubation (75, 6%).

Conclusion: Exposures of young children to methamphetamine continue to increase in the United States and the majority of exposures occur in the child's home. About half of children admitted for methamphetamine ingestions were admitted to the intensive care unit and the majority had moderate to severe outcomes. Further research should be performed to further characterize this group and prevent future exposures.

079. A Single Center's Experience With Full Agonist Therapy for Severe Opioid Withdrawal

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Background: Anecdotally, we have seen an increase in complex opioid withdrawal cases in our community, especially amongst heavy fentanyl users. Traditionally, buprenorphine is used to treat precipitated withdrawal by administering escalating doses until symptoms are controlled. However, symptom control may not be reached and ultimately patients may require aggressive measures like intubation. We present early data of an alternative to this approach by using full agonist therapy (hydromorphone) in select cases with the hope of avoiding such outcomes.

Methods: This is a retrospective chart review at a single academic center with both an addiction medicine and medical toxicology service performed between May 1, 2023 and May 31, 2024. Inclusion criteria included patients who were treated with hydromorphone in the emergency department for precipitated withdrawal. Patients were identified using an internal database of patients seen by the medical toxicology service. Two reviewers (both non-blinded authors) independently examined 13 cases. Cohen's Kappa was applied to assess inter-rater reliability. Outcomes were analyzed with descriptive statistics, where appropriate. Narrative summaries of each case were developed to provide in-depth insight.

Results: Agreement between reviewers was high (kappa = 0.91). After applying inclusion and exclusion criteria, 13 patients were included (9 male; 4 female). Precipitants of withdrawal were buprenorphine (10), and naloxone (3). Nine patients received non-full agonists before hydromorphone. Twelve of 13 patients demonstrated improvement after hydromorphone; intubation was considered for two patients and one of those two patients was intubated. All patients were admitted; 10 to a general medical bed, and three to the intensive care unit. Length of stay (LOS) mean was 86.5 hours, median was 59.1 hours. Adjunctive medications were common and included: buprenorphine, benzodiazepines, antipsychotics, antiemetics, clonidine, ketamine, gabapentin, hydroxyzine, acetaminophen, melatonin.

Conclusion: Management options for opioid use disorder have progressed both acutely and chronically to manage this disease, however, a severe phenotype of withdrawal in the setting of heavy fentanyl usage has emerged. Traditional management strategies for precipitated withdrawal are not always effective. We present early data using an alternative approach in severe precipitated withdrawal, which is to use hydromorphone in patients who are refractory to the traditional strategies. Further research is ongoing to assess whether this approach affects LOS, time to buprenorphine induction, as well as whether it may circumvent aggressive and potentially traumatizing events like intubation in this often vulnerable, marginalized population.

080. Fentanyl Toxicity in Children Under Six: A Retrospective Analysis of Clinical Presentation and Outcomes

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Background: The widespread presence of illicit fentanyl in the United States has led to a concerning increase in unintentional exposures among young children. There is currently limited data describing the characteristics of these exposures.

Research Question: What are the clinical characteristics, interventions, and outcomes in young children following unintentional illicit fentanyl exposure?

Methods: This is a retrospective analysis of illicit fentanyl exposures in children under six years reported to the National Poison Center Database (NPDS) from 2013–2023 (substance codes 3185166/8057336). Cases of adverse drug reactions, withdrawal, multiple drug ingestions (>2 substances), non-exposures and those with substance/product codes with pharmaceutical product names were omitted.

Results: A total of 1,466 cases were identified. Most exposures occurred in children aged 1–2 years ($n = 757$, 55.9%) or ≤ 1 year ($n = 481$, 35.5%). The gender distribution was balanced, with 48.9% female ($n = 663$) and 51.1% male ($n = 788$). Major symptoms included CNS depression and respiratory compromise, with severe CNS depression (unresponsive to stimuli) in 32% of cases ($n = 469$), moderate depression in 24% ($n = 346$), and mild depression in 10% ($n = 151$). A total of 694 cases (47%) involved either respiratory depression or arrest; 573 cases of respiratory depression (39%) and 170 cases of respiratory arrest (12%). A minority of patients developed acidosis (113, 7.7%), bradycardia (61, 4.2%), or hypoxic brain injury (24, 1.6%). Naloxone was administered in 62% of cases ($n = 916$), 9.7% ($n = 142$) had cardiopulmonary resuscitation, 9.4% ($n = 139$) were intubated, and 3.0% ($n = 44$) required vasopressors. About half (45%, $n = 653$) were admitted to an ICU, 20% ($n = 300$) had non-ICU admission, and 27% ($n = 393$) were managed in the emergency department. In those with known duration of symptoms ($n = 1047$), symptoms resolved after \leq

8 hours in 247 (24%), 8– \leq 24 hours in 500 (48%), and 1–7 days in 277 (26%). Outcomes were significant, with 43% ($n = 624$) experiencing major effects, 28% ($n = 413$) moderate effects, and a 3.5% ($n = 51$) mortality rate. The majority of fentanyl exposures occurred in the child's own residence (82%, $n = 1,202$). Other locations included other residences (6.1%, $n = 89$), public places (3.5%, $n = 52$), schools (0.1%, $n = 2$), and unspecified locations (2.2%, $n = 32$).

Conclusion: Illicit fentanyl exposures in children frequently result in severe CNS and respiratory depression, high rates of ICU admission, and substantial morbidity and mortality. These data highlight the critical need for targeted public health outreach, including education on safe storage practices and fentanyl exposure prevention.

DAY 2: POSTERS, ABSTRACTS 081–138

081. Rhabdomyolysis and Acute Kidney Injury After Use of 3-Methyl-PCP

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Background: 3-methyl phencyclidine (3-methyl-PCP) is a novel synthetic dissociative anesthetic structurally like other arylcyclohexylamines and has affinity for NMDA receptors. This case represents the first confirmed case of 3-methyl-PCP intoxication.

Hypothesis: Novel synthetic dissociative anesthetics have increasing use demonstrated by the Center for Forensic Science Research and Education's (CSFRE) Novel Psychoactive Substance Discovery program drug early warning system.

Methods: Data for this single patient case report was obtained from medical records and patient interview. A 29-year-old man with history of substance use presented to an emergency department after a drug overdose. He was encephalopathic with GCS of 12, HR 144 bpm, BP 160/86 mmHg and temperature 98.9°F. Urine was cola-colored, and exam demonstrated facial bruising, nystagmus, right arm swelling with tenderness and decreased strength without clinical compartment syndrome.

Results: Laboratory testing demonstrated: WBC 24.2 K/uL, creatinine 5.1 mg/dL, potassium 5.7 mmol/L, bicarbonate 18 mmol/L, AST 576 IU/L, ALT 218 IU/L, troponin 296 ng/mL, lactate 2.7 mmol/L, and CPK 66,800 IU/L. Urinalysis revealed large blood. Urine drug screen detected PCP and cannabinoids. Acetaminophen, salicylate, and ethanol levels were undetectable. ECG showed sinus tachycardia. N-acetylcysteine, intravenous fluids, calcium gluconate, and

benzodiazepines were administered. He was diagnosed with rhabdomyolysis and non-oliguric acute kidney injury and admitted to ICU. His mental status improved hospital day (HD) two, and he disclosed use of 3-Methyl-PCP obtained online. He estimated consuming 750 mg continuously over three days. He recalled perceptual disturbances, excessive exercise, laying on the floor, and minimal fluid ingestion. Further diagnostics included a normal echocardiogram, negative right upper extremity duplex, and extremity x-ray demonstrating soft tissue swelling. Laboratory abnormalities, arm swelling and pain improved, and he was discharged on HD five. At primary care follow up five days later, mild residual swelling and pain persisted, and he was referred to physical therapy. One month after discharge, all clinical findings were resolved. CSFRE confirmed 3-methyl-PCP. Packaging residue provided by the patient contained 3-methyl-PCP via Gas Chromatography Mass Spectrometry (GC-MS) and Liquid Chromatography Quadrupole Time-of-Flight Mass Spectrometry (LC-QTOF-MS). Concurrently, both patient blood and urine samples confirmed presence of 3-methyl-PCP via LC-QTOF-MS and Liquid Chromatography Tandem Quadrupole Mass Spectrometry (LC-QQQ-MS): 32–140 ng/mL (blood) and 4,500–5,000 ng/mL (urine), respectively.

Conclusion: This case highlights the first confirmed 3-methyl-PCP poisoning and underscores the growing clinical relevance of such novel substances. Online accessibility of these potent substances raises public health concerns.

082. Withdrawn

083. Phenibut Intoxication and Withdrawal Causing Severe Refractory Agitation

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Background: Phenibut (β -phenyl-aminobutyric acid) is a (GABA)_B agonist that has made inroads in the United States as a non-FDA approved anxiety treatment. Withdrawal from this agent, while rare, is often refractory to GABA_A agonists such as benzodiazepines.

Methods: This is a single patient case report. A 30-year-old woman presented to the emergency department (ED) from the airport after she was denied access to a flight due to “acting strangely”. When EMS was called she quickly became severely agitated. Upon initial presentation to the ED the patient’s vital signs were BP: 122/85, HR 91, Temp: 37.2°C RR 18, SPO2 100% on room air. Despite 10 mg of midazolam, 4 mg of lorazepam, 20 mg of ziprasidone, and 140 mg of ketamine, the patient required physical restraints and

was screaming incoherently with noted mydriasis. Her labs were notable for a positive pregnancy test and a urine drug screen that was positive for methamphetamines, benzodiazepines, fentanyl, and cannabinoids. She was intubated and required multiple sedating medications in the ICU including propofol (80 mcg/kg/min), midazolam (5mg/hr), and dexmedetomidine(0.6 mcg/kg/hr). Additional history was obtained.

Results: The patient’s mother stated that her daughter had a history of severe anxiety, and for several months had been using a supplement purchased online which she believed to be phenibut. On hospital day two the patient was found to be yawning repeatedly and remained difficult to sedate. Fentanyl and baclofen were added due to concern for opioid and phenibut withdrawal respectively. She was started on baclofen 10 mg three times per day and uptitrated to 20 mg three times per day the next day, without significant change to her sedation requirements. She was difficult to wean from the ventilator secondary to continued agitation. After 10 days the patient was extubated and confirmed that she took an unknown amount of phenibut prior to arrival, as well as daily fentanyl. Baclofen was weaned over the next 10 days; she was also started on buprenorphine for opioid use disorder. The patient was discharged home with outpatient obstetric and addiction follow up.

Conclusion: Phenibut intoxication and withdrawal can present with severe agitation, delirium and seizures. Symptoms are often refractory to standard sedating medications such as benzodiazepines, antipsychotics or ketamine as they do not directly act on the GABA_B receptor primarily. Management consists of supportive care and may include baclofen in the setting of withdrawal, although its efficacy is uncertain, and clear guidelines are lacking.

084. BTMPS Contamination in Illicit Fentanyl: A San Francisco Surveillance Study from June to October 2024

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Background: Since June 2024, bis(2,2,6,6-tetramethyl-4-piperidyl) sebacate (BTMPS), a hindered amine light stabilizer commonly used in plastics, has been detected as a contaminant in illicit fentanyl across the United States. BTMPS is a potent L-type calcium channel blocker and a noncompetitive antagonist at nicotinic acetylcholine receptors, but its clinical effects in opioid users remain unclear.

Research Question: Is BTMPS present in the illicit drug supply used by patients presenting to an outpatient opiate treatment program in San Francisco, CA?

Methods: This ongoing observational study examines the prevalence of BTMPS-positive urine samples from intake

patients at Ward 93, an outpatient opiate treatment program in San Francisco, CA. Urine samples are aliquoted, de-identified, and analyzed for chemical composition using high-resolution mass spectrometry. The data is then analyzed using software that compares it to a library of approximately 5,000 compounds. Providers at Ward 93 remain blinded to individual sample identities, and results are shared weekly in aggregate. These findings are communicated to patients via informational postings that provide overdose prevention tips, guidance for informed consumption, and links to support services.

Results: A total of 352 urine samples were collected from June to October 2024, with 24 samples (6.8%) testing positive for BTMPS. In June, one sample (1.4%) contained BTMPS, while in July, the number rose to 14 samples (15.4%). The proportion of BTMPS-positive samples declined in August and September to 4.5% and 5.0%, respectively. In October, one of the 68 samples (1.5%) tested contained BTMPS. All BTMPS-positive samples were also positive for fentanyl, norfentanyl, and 4-ANPP, with 83% additionally positive for xylazine, compared to 18% of the overall sample pool. BTMPS concentrations in positive samples ranged from <10 to 318 ng/mL, with a median concentration of 61 ng/mL.

Conclusion: BTMPS has been detected in urine samples in San Francisco since June 2024. This is the first known report including specific BTMPS concentrations in urine samples, indicating that BTMPS can be detected in the urine unchanged. Further research is needed to better understand the clinical effects of BTMPS in individuals using illicit opioids.

085. Are There Demographic Differences in Patients with a Suspected Opioid Overdose Based on Co-Exposure to Novel Psychoactive Substances?

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Background: Alongside fentanyl and its analogs, other compounds have emerged known as “novel psychoactive substances” (NPS), which include synthetic cannabinoids, cathinone derivatives, non-fentanyl synthetic opioids, and others. Previous studies identified individuals ages 18–25 who frequent metropolitan night clubs as a high-risk group for NPS exposure. We aim to analyze prevalence rates and demographics of individuals who presented to the ED after an opioid overdose who also had exposure to NPS.

Hypothesis: We hypothesize that patients that have both confirmed opioid and NPS exposures will be younger and predominantly male compared to patients who had opioid exposures without NPS.

Methods: The Toxicology Investigators Consortium (ToxIC) Fentanyl Study is a prospectively collected observational study conducted across 10 US medical centers in nine states. Patients 18 years and older presenting to the emergency department with a suspected opioid overdose with available waste serum samples are included. Imprisoned patients or those with non-toxicological diagnoses were excluded. Patients’ sociodemographic characteristics were collected via chart review, and serum was analyzed via liquid chromatography quadrupole time-of-flight mass spectrometry at the Center for Forensic Science Research and Education (CSFRE). Data analyses consisted of descriptive statistics (mean(sd)) and comparative statistical methods (chi-square). Central and site IRBs approved this study with a waiver of consent.

Results: Among 1289 patients with suspected opioid overdose who were enrolled between September 2020 to December 2023, NPS were detected in 259 subjects (20%). NPS (+) patients had a mean age of 41.18 (14.32) years vs. 42.41 (14.55) years for NPS (-) (p = NS). The gender distribution for NPS (+) cases was 68.73% male vs. 72.27% male for non-NPS (p = NS). Reported racial distribution for NPS (+) was 51.07% white, 28.13% black, and 20.80% “other”, versus 54.05% white, 25.48% black, and 20.46% “other” for NPS (-) cases (p = NS). The average number of analytes detected in NPS (+) cases was 9.54, while the average number of analytes for NPS (-) cases was 5.96 (p = .0001). Geographical distributions between NPS (+) and NPS (-) cases were also significantly different (p = .007).

Conclusions: We did not detect demographic differences when stratifying by NPS detection, perhaps because patients of varying demographics were equally unaware of NPS exposures. NPS (+) patients had significantly more drugs detected in their serum when compared to those who were NPS (-), suggesting NPS use may be more strongly associated with polysubstance use and this, potentially, puts them at higher risk for exposure to NPS.

ToxIC: This research was performed by the ACMT Toxicology Investigators Consortium

086. A Medical Humanities-Based Substance Use Disorder Curriculum: A Pilot Study

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Background: Medical schools have historically devoted little time to teaching substance use disorders (SUD). There are calls for increased SUD content in medical training, with an emphasis on creative coursework that incorporates education

on the attitudes and skills involved in treating patients with SUD. Medical humanities-driven teaching is an engaging and efficacious means to improve clinical knowledge, skill and empathy; however, there is limited research on the use of this method to teach SUD content.

Research Question: Can a medical humanities-based curriculum effectively deliver SUD-related undergraduate medical education?

Methods: We developed a novel curriculum that included SUD-related literary materials. The course consisted of four 2-hour seminars, with discussion facilitated by three physicians. Learning objectives included increased: [1] comfort in engaging a patient in a conversation about their substance use, [2] comfort in assessing a patient's readiness to change their substance-use related behavior, and [3] awareness of the ASAM resource "Top Ten Things Every Physician Should Know About Addiction". Undergraduate medical students volunteered for the pilot course, with some receiving elective credit for participation. All course participants completed pre-, immediate post-, and 5-week post-course surveys to gauge knowledge growth and retention.

Results: There were eight course participants, all of whom were female, with medical school years ranging from M2-M3. Learners gauged attainment of learning objective [1] from 1–10 (1 = "not at all comfortable", 10 = "completely comfortable"), and mean (SD) results for pre-, immediate-post, and 5-week post course were: 5.0 (2.2), 7.9 (0.9), and 7.8 (1.6), respectively. Results for attainment of learning objective [2] were: 5.3 (1.8), 7.6 (1.2), 8.0 (1.3), respectively. Learners gauged attainment of learning objective [3] from 1–5 (1 = "not at all aware", 5 = "fully aware"), and results were: 4.5 (0.4), 5.0 (0.0), 5.0 (0.0). Learners also gauged comfort navigating 25 different SUD-related clinical scenarios from 1–5 (1 = "not at all comfortable", 5 = "completely comfortable"), and results were: 2.4 (0.6), 3.9 (0.3), and 3.7 (0.4), respectively. Immediately post-course, learners gauged how essential the literary material was to the learning objectives from 1–10 (1 = "not at all essential" and 10 = "completely essential"), and results were: 8.4 (1.0).

Conclusion: Medical student knowledge of SUD content was improved by a medical humanities-driven SUD course, and knowledge was retained over time. As this course was conducted at a single institution and with a small sample size, further study is needed to confirm these pilot findings.

087. Opioid Use Disorder and Maternal Mortality in Louisiana

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Background: Opioid use disorder (OUD) in pregnancy increased nationally more than four-fold from 1999–2014.

It is known that OUD is associated with adverse perinatal outcomes. We hypothesize that OUD is likewise associated with perinatal death.

Hypothesis: Opioid use disorder is associated with increased risk for pregnancy-associated death.

Methods: We performed a retrospective cohort study of delivery admissions at a large regional health system from May 2018 to December 2023. Patient data was matched to death certificate data during the same period from state Vital Records. Those without delivery outcome information and prenatal care in the system were excluded. OUD was defined by ICD-10 code documentation in the electronic medical record or documented prescription for buprenorphine or methadone. The primary outcome was pregnancy-associated mortality, defined as occurring during pregnancy or up to one year post-delivery. Secondary outcomes included all-cause mortality, as well as substance-use related death and overdose. Baseline characteristics and outcomes were compared via chi-square test or t-test. Outcomes are presented as odds ratio (OR) with 95% confidence intervals (95% CI).

Results: Among 98,039 deliveries, OUD was diagnosed in 691 (0.70%) patients compared to 97,348 without the diagnosis. In total, 145 patients with pregnancies were matched to death records during the study, including 83 occurring within 12 months of pregnancy. Pregnancy-associated death was more common among those with OUD compared to those without (8.7 vs. 0.8 per 1,000 births, OR 11.1, 95% CI 4.8, 25.5). All-cause mortality was nearly 20-fold more common in patients with OUD (N = 17) compared to those without OUD (N = 128, 24.6 vs. 1.3 per 1,000 births, OR 19.6, 95% CI 11.8, 32.5). Death by overdose occurred among 10 patients with OUD (14.5 per 1,000 births) compared to 14 (0.1 per 1,000 births) among patients without OUD (OR 102.1, 95% CI 45.2, 230.6). While substance-use related deaths were more common in patients with OUD compared to those without OUD (5.8 vs. 0.1 per 1,000 births, OR 43.6, 95% CI 14.2, 134.0), 13 patients without the diagnosis had opioid-related deaths, suggesting the possibility of under-diagnosis of OUD.

Conclusion: OUD in pregnancy confers an increase in pregnancy-associated death, both by all-cause mortality and substance use. We identified a possibility of under-diagnosis of OUD with the discovery of a number of opioid-related deaths in the absence of OUD. Prospective investigations regarding opioid use prevalence among a subset of the pregnant population in the region will be studied.

088. Perceptions on a Digital Health Tool for Supporting Recovery from Opioid Use Disorder: A Qualitative Study

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Background: Wearable devices have numerous applications across the spectrum of opioid use disorder (OUD), including the potential to monitor opioid withdrawal and buprenorphine ingestion. To create a user-centered tool, designers must first understand the perspectives of key stakeholders, including clients who take buprenorphine and healthcare providers who support them

Research Question: What features, form factor(s), and functionalities of a wearable device that detects opioid withdrawal and buprenorphine intake are feasible and acceptable to end users

Methods: This was a qualitative research study of key stakeholders, including clinicians (prescribing providers), supportive providers (peer recovery coaches, nurses, and addiction counselors), and clients (people with lived/living experience taking buprenorphine for OUD) from across the United States. Semi-structured interviews were conducted virtually via video conference until thematic saturation was reached. Interviews explored the purpose and function of the technology being developed, reviewed several mock-ups of ways the device could be designed for the body, which included an arm band, arm sleeve, shoulder sleeve, and halter, and queried stakeholders' perspectives on challenges and barriers to its implementation. Interviews were transcribed verbatim, iteratively coded, and thematic analysis was applied

Results: We conducted interviews with 22 key stakeholders (four clinicians, 11 supportive providers, and seven clients). The most favorable form factor was an upper arm band. Participants cited its discretion as compared to other designs and noted that it looked similar to a fitness device or other kind of medical device. Participants expressed concerns about patient privacy, use (or misuse) of data for punitive purposes, and stigma associated with identification of the end user as a person with OUD. Another concern was applicability of the device for people lacking housing or experiencing other socioeconomic instability, which is prevalent in the patient population with OUD.

Conclusion: Our qualitative data results highlight the importance of designing with patient privacy in mind to limit added stigma and of allowing end-users to maintain control of their data. Furthermore, the results highlight that the device would need to be introduced in an environment or program where users have the appropriate social stability and support for successful use of the system.

089. Implementation and Evaluation of an Emergency Department Medications for Opioid Use Disorder (ED MOUD) Program in a Regional Health System

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Background: The opioid epidemic remains a leading cause of overdose deaths. Treatment with medications for opioid use disorder (MOUD) decreases mortality, overdose rates, and ED visits. ED initiation of buprenorphine can safely be administered in the ED or prescribed from the ED for a home start of treatment. Despite the obvious benefits, ED prescribing of buprenorphine has not yet become the standard of care.

Hypothesis: Initiation of an ED MOUD program will increase the rate of buprenorphine prescriptions, and engagement in treatment at 30 days for ED patients with OUD.

Methods: This is a non-randomized observational cohort study evaluating the impact of an ED MOUD program on buprenorphine prescriptions for patients with an opioid related ED visit presenting over nine months at four EDs in a regional health system in southwest Michigan (150,000 visits per year). All sites are without an addiction medicine consult service. Monthly, abstracted data was pulled from the EHR if coded with any of 127 opioid related diagnostic codes and retrospectively reviewed to identify patients appropriate for MOUD initiation. Patients still in treatment at 30 days out were identified using the Michigan Automated Prescription System (MAPS) to identify patients with an active buprenorphine prescription.

Results: In 2022, the year preceding program initiation, two prescriptions for buprenorphine/naloxone were written by providers from the four EDs. During the nine month program, 207 unique patients were identified as having opioid related visits. Of these, 95 were diagnosed with OUD and received an outpatient prescription for buprenorphine, and 93 received a first dose in the ED and a prescription. All patients were scheduled for a follow up appointment within seven days with a community prescriber. Forty-two patients were identified as having an active buprenorphine prescription 30 days out from their ED encounter, suggesting continued treatment.

Conclusion: The initiation of an ED MOUD program increased buprenorphine dosing and prescribing within our health system EDs from almost nonexistent, to prescriptions being written for almost half of all patients who visited an ED in our health system for opioid related complaints. This study demonstrates the feasibility and success of such a program in a regional, chiefly community ED system, and strongly supports the potential for far more widespread adoption of ED MOUD initiation.

090. First Intranasal Naloxone Dose Among Patients With Confirmed Opioid-Related Overdoses Doesn't Predict Naloxone Response

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Background: In 2023, three in four of more than 100,000 fatal overdoses that occurred in the US were opioid-related. Early identification and naloxone administration are associated with increased survival rates for people experiencing overdose. However, naloxone responses are complicated by polysubstance use, particularly for people who use opioids and stimulants concurrently.

Research Question: In patients with opioid-confirmed overdose, does the first dose of intranasally administered naloxone predict naloxone response after controlling for confirmed stimulant and/or benzodiazepine detection?

Methods: The Toxicology Investigators Consortium (ToxIC) Drug Overdose Toxicology-Surveillance (DOTS) Reporting Program enrolled patients who experienced suspected opioid and/or stimulant overdose who presented to one of 17 emergency departments in the US. This analysis included patients with confirmed opioid exposure who received naloxone intranasally for their first dose. Patients participated in one-on-one structured interviews, and data were extracted from their medical records. The Center for Forensic Research and Education (CSFRE) performed toxicological testing for substance detection. Data were collected on naloxone administration in prehospital/hospital settings, and included doses, routes used, who administered it, and patients' responses (e.g. improved, precipitated withdrawal, no response). A multivariate logistic regression assessed whether the first dose of naloxone (mg, continuous) predicted naloxone non-response after controlling for stimulant exposure (yes/no), and benzodiazepine exposure (yes/no).

Results: Between April 2023 and July 2024, 401 patients who were opioid positive on toxicological testing were enrolled in the DOTS Reporting Program, with 320 (79.8%) receiving naloxone and 192 (60.0%) of those with naloxone receiving their first dose intranasally. Of those receiving intranasal naloxone, the median dose was 4.0 mg (IQR: 2.0 – 4.0 mg). Most were administered by EMS/medical professionals (n = 119, 62.0%). Naloxone non-response was reported for 45 (23.4%) patients. Approximately 38 (19.8%) patients and 128 (66.7%) had confirmed benzodiazepine and stimulant exposure, respectively. Naloxone dose

(AOR: 0.87, 95% CI: 0.72, 1.01), confirmed stimulant exposure (AOR: 0.69, 95% CI: 0.33, 1.47), and confirmed benzodiazepine exposure (AOR: 1.68, 95% CI: 0.69, 3.94) were not significant predictors of naloxone non-response.

Conclusions: Approximately one in four opioid-exposed patients receiving their first dose of naloxone intranasally may experience non-response. However, this study found that the dose was not a significant predictor of naloxone non-response, even after controlling for confirmed stimulant and/or benzodiazepine exposure – although further investigations should be conducted on larger samples. Future research should consider other possible contributors to naloxone non-response to improve survival rates among patients experiencing opioid-related overdose.

ToxIC: This research was performed by the ACMT Toxicology Investigators Consortium

091. Management of Patients Placed on Continuous Naloxone Infusion vs Intermittent Bolus Dosing of Naloxone: A Case-Control Study

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Background: Continuous naloxone infusion (CNI) may be used in patients with prolonged or recurrent respiratory depression following an opioid overdose; alternatively, patients may be managed with intermittent boluses of naloxone (IBN). Our objective was to compare characteristics and outcomes of patients for whom a CNI was started compared to patients managed with IBN.

Methods: This is a retrospective review of adult patients who received naloxone between November 2022 and November 2023 at a single academic hospital. Cases included all patients for whom CNI was initiated. Controls included patients in whom three or more IBN, but no CNI, was administered during their hospital visit. We excluded patients receiving less than three IBN. Charts were reviewed by three reviewers and a standardized data extraction sheet was used.

Results: Of 41 patients identified as having CNI ordered, 27 met inclusion criteria. Fifty-six control cases were randomly selected of which 26 met inclusion criteria. Sixteen (59%) of the SNI group had a history of OUD, compared to 5 (19%) of the IBN group. Nine (33%) of the CNI group received pre-hospital naloxone, compared to 13 (50%) of the IBN group. The median respiratory rate for both groups prior to naloxone initiation was 7 breaths/min. In the CNI group, a median of 5 boluses (range 2–12, average 0.16 mg) of naloxone were given prior to infusion. In the IBN group, a median of 4 boluses (range 3–8, average 0.09 mg) were

administered. The median starting dose of CNI was 0.21 mg/hr, and the median cumulative naloxone dose by infusion was 2.29 mg (range 0.1 mg - 7.7 mg). Patients remained on CNI for a median time of 8.4 hours (range 0.5–30 hours). In the CNI group, average time from initiation of infusion to discharge was 24.6 hours. In the IBN group, patients were discharged an average of 7.3 hours after their last bolus. Four patients (15%) of patients in the IBN group had an adverse event, compared to 13 (48%) of patients in the CNI group.

Conclusions: Patients managed with CNI had higher rates of documented OUD and less exposure to pre-hospital naloxone compared to patients managed with IBN. Patients in both groups received variable numbers of bolus doses of naloxone. Patients treated with CNI had longer lengths of stay and more adverse events than patients managed with IBN. More research is needed to determine which patients should be managed with CNI versus IBN.

092. Reverse Takotsubo Cardiomyopathy as a Unique Presentation of Opioid Withdrawal

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Background: Takotsubo cardiomyopathy is a known complication of opioid withdrawal; reverse takotsubo cardiomyopathy is uncommonly reported. Data on its clinical features in this context is limited.

Research Question: This case characterizes a unique presentation of opioid withdrawal in the form of reverse takotsubo cardiomyopathy.

Methods: This is a single case report of a 32-year-old woman with opioid use disorder (30 bags/day by injection route, with last use just prior to arrival) presenting for a COVID-19 test before rehabilitation placement. Initial evaluation was remarkable for an anxious female with normal vitals and a Clinical Opiate Withdrawal Scale (COWS) score of 4. After a negative COVID-19 test and unremarkable screening labs, she was incidentally noted to be pregnant. Patient was evaluated by medical toxicology 12 hours after presentation due to concern for worsening withdrawal. Her COWS had increased to 24. Patient was not a candidate for buprenorphine given her recent use of fentanyl. Administration of full opioid agonist with 100 mcg fentanyl IV as well as 2 mg droperidol IV resolved her agitation, tachycardia, and nausea. Three hours later, she developed respiratory distress requiring 15 L non-rebreather, tachypnea, and tachycardia.

Results: Chest X-ray showed pulmonary edema; ECG revealed sinus tachycardia, PVCs in a bigeminy pattern, a QTc of 585 ms, and anteroinferior ST depressions. Troponin-I rose from 0.01 ng/mL to 13.28 ng/mL. The patient was intubated due to

somnolence in the setting of hypoxemic respiratory failure. Left heart catheterization displayed angiographically normal coronary arteries. Transthoracic echocardiogram (TTE) revealed a left ventricular ejection fraction (LVEF) of 10–15%, with apical hyperkinesis and basal hypokinesis, suggestive of reverse takotsubo cardiomyopathy. She required inotropic support with milrinone and norepinephrine, which were weaned after self-extubation on hospital day (HOD) two. Methadone 60 mg was initiated, maintaining a COWS score less than 10 throughout admission. Follow-up TTE on HOD four showed resolution of wall motion abnormalities and improved LVEF to 35%.

Conclusion: This case of reverse takotsubo cardiomyopathy shared clinical features with takotsubo cardiomyopathy related to opioid withdrawal, including sudden respiratory distress, pulmonary edema on chest X-ray, and ECG changes suggestive of ischemia. Continued research is needed to further elucidate the characteristics and optimal management of reverse takotsubo cardiomyopathy in this population. Limitations include the generalizability of this isolated case, limited available prior medical history, and potential for confounding physiologic and psychosocial stressors.

093. The Effect of Dispensaries on the Incidence of THC-Related Poison Center Calls in the State of Ohio

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Background: In the US there is a trend for states to decriminalize and legalize the use of cannabis products. Prior research has found a positive association between these policies and an increase in the number of calls to poison centers (PC) for toxicity associated with cannabis exposure. To date, no studies have evaluated the effect the number of dispensaries has on these calls.

Methods: We performed a retrospective study from January 1, 2023 through December 31, 2023, evaluating the number of marijuana exposure calls associated with the number of active dispensaries within a county in Ohio. A multivariable Poisson regression was used to evaluate this association's effect size and significance. We controlled for total PC calls, gender, age, route of exposure, level of care provided, outcome, the total time exposure for each number of active dispensaries within a county, and the time-weighted population of each county. This study was exempt from approval by the institutional review board of the authors' institution.

Results: There were 1,746 calls for marijuana exposures and 140,065 total PC calls during this time, and a range of

zero to 13 active dispensaries per county statewide. Univariate analysis showed a positive significant effect with a coefficient of 0.34 (S.E.: 0.006, $p < 2e-16$). Multivariate analysis confirmed this association, with significant covariates of route, age, level of care, medical outcome, time exposure, time-weighted population, and total PC calls. Gender was found to be insignificant. The effect on age was most pronounced for zero to five years and was negative for patients 60 years and older.

Conclusion: There is a positive association between the number of marijuana dispensaries in a county and the number of marijuana-related exposure calls to a PC. Patients zero to five years demonstrated the largest effect, while there was a negative association for patients 60 years and older.

094. Adolescent Tetrahydrocannabinol Isomers and “Royal Honey” Intoxication Leading to Prolonged Encephalopathy and Abnormal Ocular Movements: A Case Report

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Background: Pediatric toxicity from tetrahydrocannabinol (THC) isomers, including delta-8-THC and delta-9-THC, has led to encephalopathy reported, typically lasting less than two days. Toxicity of delta-6-THC has not been widely reported. We describe a case of prolonged encephalopathy in an adolescent patient after a single ingestion of two THC-containing gummies and “Royal Honey.”

Hypothesis: Exposure to THC isomers in the pediatric population can cause prolonged encephalopathy.

Methods: This is a single patient chart review of an adolescent treated at a tertiary care pediatric hospital. A urine drug profile was performed at the hospital laboratory. Plasma drug analysis was performed at the Drug Enforcement Agency Toxicology (DEA Tox) Testing Program laboratory. Both analyses used Liquid Chromatography Time-of-Flight Mass Spectrometer. Neither laboratory libraries contain delta-6-THC nor its metabolites. The hospital laboratory library only has delta-9-THC and metabolites.

Results: A previously healthy 16-year-old male presented with palpitations and vomiting after ingesting two 125 mg gummies advertised as containing delta-6-THC, “THC-A,” and “liquid diamonds,” a concentrated version of delta-8-THC and other THC isomers. He ingested a packet of “Royal Honey,” which may be marketed as a sexual enhancement supplement. Per Food

and Drug Administration notification, some “Royal Honey” products contain illicit sildenafil and tadalafil. After receiving intravenous fluids, the patient was discharged. Throughout the day, he became nonverbal, tremulous, ataxic, and intermittently turned his head to the side. He presented to an emergency department less than 24 hours after ingestion, found to be nonverbal with head twitching and disconjugate eye movements. His mental status improved to almost baseline by four days from ingestion, though he complained of lower extremity weakness. He was discharged five days after ingestion. A comprehensive urine drug profile returned positive for “carboxy-delta-9-THC” and caffeine; sildenafil and tadalafil were not detected. DEA Tox plasma analysis returned positive for 11-nor-9-carboxy-delta-8-THC, a metabolite of delta-8-THC.

Conclusion: This case illustrates pediatric prolonged neurologic effects lasting four days after a single ingestion of THC-containing gummies. The patient tested positive for delta-8-THC metabolites. The initial “delta-9-THC” result was likely false positive from the delta-8-THC. Due to the inability to detect delta-6-THC or its metabolites, it is unclear if effects were related to this variant. The source of caffeine in his urine is unclear but may have contaminated the “Royal Honey” leading to vomiting and palpitations. When caring for a pediatric patient exposed to newer THC products, the clinician will have to consider a prolonged duration of encephalopathy.

095. Trends in Synthetic Cannabinoid Use Among Opioid Overdose Cases in the United States

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Background: Synthetic cannabinoids (SCs) are potent psychoactive substances with high abuse potential due to their strong affinity for endocannabinoid receptors and ability to evade drug screens. Although popular for their anxiolytic and hallucinogenic effects, SCs often cause adverse reactions like agitation, confusion, and seizures. A notable knowledge gap exists regarding SC co-use with other illicit

drugs, particularly opioids like fentanyl, complicating overdose diagnosis and treatment.

Research Questions: 1. What synthetic cannabinoids most commonly co-occur with opioids in patients who overdose? 2. What are the demographic characteristics of patients exposed to synthetic cannabinoids in the context of opioid overdose?

Methods: The Toxicology Investigators Consortium's (Toxic) Fentanyl study is a multicenter observational study involving ten hospitals across nine US states (Sept 2020-ongoing). Adult patients 18 and older presenting with a suspected opioid overdose and confirmed synthetic cannabinoid exposure were included in this analysis. Data collected encompassed demographics, self-reported substance use disorders (SUDs), co-occurring substances identified via blood analysis, and psychiatric history. Descriptive statistics were utilized due to the nonparametric nature of the data.

Results: Among 1289 cases with completed analyte results, 29 cases had SC, and MDMB-4en-PINACA was detected in 15 patients (51.7%), making it the most prevalent SC identified. Among those with SC positivity, the average age was 48.9 years (range 20–70), with a male predominance (66.7%). Racial distribution included 40% White, 33.3% Black, and 20% Mixed. Previously diagnosed depression (26.7%) and anxiety (20.0%) were common among those with psychiatric conditions. Chart reviews showed 66.7% currently used opioids, mainly illicit opioids (41.7%). Approximately 60% of patients had a noted history of tobacco use, and 26.7% used alcohol, cannabis, and or psychostimulants at the time of the overdose. Blood analyses of patients who were SC-positive showed co-occurring opioids (80%), adulterants (93.3%), stimulants (86.7%), and benzodiazepines (73.3%). Importantly, no fatalities were recorded among the 29 SC cases.

Conclusion: MDMB-4en-PINACA was the predominant SC among patients presenting with suspected opioid overdose across diverse U.S. regions, similar to trends in other data sources. We found patients with SC were most often middle-aged males with complex polysubstance use histories. The findings highlight the need for enhanced screening protocols and comprehensive intervention strategies to address synthetic cannabinoid use in the context of opioid overdose.

Toxic: This research was performed by the ACMT Toxicology Investigators Consortium

096. Evaluation of Sociodemographic Differences in Xylazine Versus Non-Xylazine Exposures

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Background: Xylazine has become increasingly prevalent in illicit drug exposures across the country. Socioeconomic characteristics of people exposed to xylazine has not been explored, and little research has been conducted comparing patient demographics of those exposed to xylazine and other illicit drugs.

Hypothesis: There are differences in socioeconomic characteristics between people exposed to xylazine (intentional and unintentional) and those exposed to all other illicit drugs.

Methods: This is a prospective observational study from the Toxicology Investigators Consortium (Toxic) Drug Overdose Toxicology Surveillance (DOTS) Reporting Program which consisted of patient interviews, chart reviews, and toxicological blood analysis from patients presenting to emergency departments after overdose at 17 sites nationwide. Cases positive for xylazine were compared to cases negative for xylazine (all illicit drugs excluding xylazine). Statistical analysis was conducted using Fisher's Exact Test and Chi-Squared Test to compare cohorts.

Results: From April 2023 to September 2024, a total of 95 patients had positive blood testing for xylazine and 399 had other illicit drugs but were negative for xylazine. Sixty-nine percent of patients positive for xylazine were Black and 27% were White, while only 49% of patients negative for xylazine were Black and 38% were White ($p = 0.007$). Patients testing positive for xylazine tended to have lower incomes, with 91% reporting an annual income below \$40,000 compared to only 80% of patients who were xylazine negative ($p = 0.04$). Of patients who tested positive for xylazine, 79% did not progress past a high school education, compared to 64% of those without xylazine ($p = 0.015$). Patients positive for xylazine had a 70% unemployment rate while only 56% of non-xylazine cases reported unemployment ($p = 0.01$). Patients with xylazine were less likely to have a stable housing situation (48%) compared to those without xylazine (55% with stable housing; $p = 0.002$). There were also statistically significant differences in xylazine usage across sites ($p < 0.001$). There were no significant differences between age, sex, marital status, military service, cohabitation status, spending time in a homeless shelter within a year, and family history of drug use.

Conclusion: Patients exposed to xylazine were more likely to be Black, have lower income, lower educational attainment, higher unemployment, and less secure housing. Many

of these statistically significant differences may be driven by geographical variabilities. Once blood analyses are finalized, multivariable modeling is needed to understand if differences in sociodemographic characteristics are driven by geography alone. Interventions are needed to mitigate and prevent discrimination for those receiving treatment after overdose.

Toxic: *This research was performed by the ACMT Toxicology Investigators Consortium*

097. Withdrawn

098. Phenobarbital Monotherapy for Alcohol Withdrawal – A Comparison of Hospital Protocols

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Background: The management of alcohol withdrawal syndrome (AWS) lacks standardization. While benzodiazepines (BZD) are mainstays of treatment, phenobarbital (PHB) is considered a plausible alternative. There are limited high-quality studies comparing the safety and efficacy of BZD and PHB, however, many hospitals have institutional PHB monotherapy guidelines, some which are publicly available.

Research Question: What hospital-based PHB monotherapy guidelines for AWS are publicly available and what clinical risk assessment methods, dosing strategies, and level of monitoring are recommended?

Methods: Six hospital protocols were identified through a Google web search using the terms “phenobarbital protocols for alcohol withdrawal,” “phenobarbital alcohol withdrawal emergency department,” “phenobarbital alcohol withdrawal inpatient,” “phenobarbital alcohol guideline,” and “phenobarbital alcohol management.” Protocols were reviewed for: assessment criteria for patient’s risk of withdrawal, recommended level of care or monitoring, dosing strategy, and recommendations for co-administration of BZDs.

Results: All six of the hospital protocols recommended PHB as a monotherapy. To assess for risk of AWS, two protocols used CIWA-Ar scores, and one protocol classified patients as low-risk for AWS based on the number of alcoholic drinks per week, while two protocols utilized AUDIT-C to assess for risk of alcohol use disorder (AUD) in patients. In three protocols, any patients with prior history of withdrawal seizures, or development of delirium tremens, were categorized as high risk for AWS. Initial PHB dosing varied between protocols, with two recommending weight-based loading doses (6–15 mg/kg and 12–15 mg/kg). In the remaining protocols, initial dosing

varied from 60 mg for low-risk patients, to 260 mg for high-risk patients. Across the protocols, there were no recommendations for concurrent BZD use, nor the use of propofol for severe AWS. Adjuncts recommended included haloperidol for agitation, and dexmedetomidine for refractory AWS. There was a level of care recommendation that was outlined in three of the hospital protocols; two recommending management only in an intensive care unit (ICU), and one recommending monitoring in the Emergency Department (ED), Step-Down unit, or ICU.

Conclusion: In six publicly available PHB monotherapy for AWS guidelines, there was wide variability in dosing strategies. These protocols were consistent in their recommendations for higher levels of monitoring (ED or ICU) and no co-administration of BZDs. Further research is necessary to determine efficacy, appropriate patient selection, severity assessment, and dosing regimens for PHB monotherapy.

099. AUDIT-C Screening in Patients Presenting to VA Emergency Departments With Alcohol Intoxication: Does It Tell Us Anything We Don’t Already Know?

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Background: The Alcohol Use Disorders Identification Test-Concise (AUDIT-C) is a validated alcohol misuse screen consisting of three questions. In a prior study of Veterans Administration (VA) patients screened via mailed AUDIT-C surveys, the rate of a positive screen for alcohol misuse (≥ 5 points out of 12) was 11%.

Research Question: Our objective was to evaluate the utility of AUDIT-C as a screening tool in patients who present to emergency departments intoxicated.

Methods: This is a retrospective study of patients presenting to any VA Emergency Department (ED) over a 10-year period (2010–2019). Patients were identified via automated Microsoft SQL query of the VA Corporate Data Warehouse. Inclusion criteria were any ED visit with an alcohol intoxication ICD9/10 code (but not ICD codes indicating only alcohol abuse without intoxication) and/or measured serum ethanol concentration greater than 50 mg/dl. Demographic data and AUDIT-C scores obtained from any setting within six months of the ED visit were obtained and descriptive statistics were performed. If there were multiple AUDIT-C scores performed within six months of the ED visit, the higher score was used.

Results: Out of a total of 251,300 VA ED patient encounters with a clinical and/or laboratory diagnosis of alcohol intoxication, 222,839 had an AUDIT-C assessment performed

within six months of their ED visit. There were 83,612 unique patients. In terms of the 222,839 ED visits with associated AUDIT-C screens, the median score was 11 (IQR 6–12), and 176,722 (79%) were positive for alcohol misuse (≥ 5 points out of 12). In a subgroup analysis of 29,635 encounters associated with ethanol concentrations below the 100 mg/dL threshold for intoxication, the AUDIT-C screen remained positive in 19,013 cases (64%).

Conclusion: Emergency Department patients with any degree of alcohol present are likely to screen positive for alcohol misuse on AUDIT-C, and screen positive at rates far higher than the VA population in general. These patients should be targeted for intervention accordingly. Universal screening of emergency department patients should be considered; if such screening is not feasible, patients with emergency department visits for alcohol related complaints should be considered at high risk for underlying alcohol use disorder. Further work should investigate whether this finding is generalizable to other patient populations.

100. Management of Acute Pain in the Emergency Department With Intravenous Buprenorphine

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Background: Intravenous (IV) buprenorphine, a partial opioid agonist, is an underutilized alternative to full opioid agonists for analgesia in the Emergency Department (ED) and offers lower risks of addiction and respiratory depression.

Research Question: Is IV buprenorphine a suitable alternative to full opioid agonists for the management of acute pain in the ED?

Method: This case-series study included patients from an urban, tertiary care ED who received IV buprenorphine for analgesia. A 29-item survey on opioid misuse and ED visit utilization (COMM), pain intensity/pain interference (PEG), biopsychosocial impact on pain (DoD/VA Pain), and substance use (ADCS) was administered. A pain score (1–10 DoD/VA scale) was measured pre/post administration of IV buprenorphine, and a paired sample t-test was used to evaluate the data.

Results: In total, 25 patients received IV buprenorphine in the ED and were surveyed; nine (36%) had a substance use disorder (SUD), including eight (32%) with opioid use disorder (OUD). Twenty (80%) completed the 29-item pain surveys, of these 19 (95%) responded to COMM, 19 (95%) PEG, 20 (100%) DoD/VA Pain, and 20 (100%) to the ADCS survey. Twenty-four patients (96%) received non-opioid pain medications before treatment with IV buprenorphine. Six patients (24%) received full opioid agonists during their ED visit. Five patients (20%) were treated with an initial dose of 0.15 mg; 16 patients (64%) with an initial dose of 0.3 mg; and four patients (16%) with an initial dose of 0.6 mg. The average cumulative dose administered was 0.5 mg. 15

patients (60%) received cumulative doses of 0.3 mg or less, and 10 patients (40%) received cumulative doses over 0.5 mg, including two patients who received cumulative doses greater than 1 mg. Of the patients with OUD, their average cumulative dose was 0.79 mg, while opioid-naïve patients had an average cumulative dose of 0.36 mg. Patients receiving total doses greater than 0.5 mg saw a 50% reduction in pain scores; while patients receiving total doses less than or equal to 0.3 mg had a 67.2% reduction in pain scores. Overall, the average pain score before treatment was 8.52 (SD=1.85), which decreased to 3.48 (SD=3.12) after IV buprenorphine ($p < 0.05$).

Conclusion: IV buprenorphine significantly reduced acute pain. Patients who are opioid-naïve achieved similar pain relief with lower doses as compared to patients who have OUD. IV buprenorphine is a promising alternative to full opioid agonists, offering effective and safe pain relief.

101. Identifying Patterns of Polydrug Combinations in Emergency Department Patients With Confirmed Opioid Overdose Using Latent Class Analysis

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Background: Polydrug overdoses frequently involve opioids, stimulants, and other novel psychoactive substances. Understanding the complex polydrug combinations in the evolving opioid crisis is critical for informing clinical and public health interventions. Latent class analysis is an advanced statistical technique that can help distinguish heterogeneity among groups based on similar characteristics and posterior class probabilities, and research is limited on the use of this statistical technique to understand polydrug overdoses through blood toxicology analyses.

Research Question: What are the latent classes of polydrug use among patients presenting to the ED after a non-fatal confirmed opioid overdose?

Methods: This study utilized data from the Toxicology Investigators Consortium (ToxIC) Fentalog Study, an ongoing observational study of prospectively enrolled patients presenting to one of ten participating medical centers with

a suspected opioid overdose. Residual serum samples were analyzed using liquid chromatography quadrupole time-of-flight mass spectrometry for the presence of over 1,200 drugs and metabolites. Chart reviews were conducted to assess demographics and clinical characteristics. The analytic sample for this study included participants who also had at least one opioid present in their serum. Demographics included sex and age (continuous). This study was approved by central and site IRBs with a waiver of informed consent.

Results: Among patients with confirmed opioid overdose ($n=1426$), the most commonly detected drug classes were fentanyl and/or fentanyl analogs (89%), adulterants (73%), and stimulants (56%), including methamphetamine (32%) and cocaine (29%). Nearly three in four (73%) were male, and the average age was 43 (range 18–89). Three unique classes were identified, including 1) Prescription opioids and prescription benzodiazepines ($n = 155$; 11%), 2) Fentanyl and methamphetamine ($n = 618$; 43%), and 3) Fentanyl, cocaine, and xylazine ($n = 637$; 45%). Females were more likely than males to be classified in the prescription opioid and benzodiazepine class compared to the fentanyl and cocaine class (AOR: 2.36; 95% CI: 1.97, 2.76). Younger ages were more likely to be in the fentanyl and cocaine class (AOR: 0.96; 95% CI: 0.94, 0.97) compared to the fentanyl and methamphetamine class.

Conclusions: Concomitant use of stimulants was detected in two of three distinct drug combination patterns from latent class analysis (one with methamphetamine and one with cocaine). This finding has significant public health implications, including potentiation of effects, overdose severity, hospital resource use, and likely cognitive / behavioral impacts. Future studies should incorporate regional variations and validate demographic associations in females and young adults.

Toxic: This research was performed by the ACMT Toxicology Investigators Consortium

102. Buprenorphine Administration and Addiction Treatment after Non-Fatal Opioid Overdoses: A Multicenter Study

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Background: Medications for opioid use disorder (MOUD) include buprenorphine, methadone, and naltrexone. Patients who present to the emergency department (ED) after a non-fatal opioid overdose may be candidates for (MOUD) initiation. The goal of this analysis is to examine treatment trends with buprenorphine among patients enrolled in the Toxicology Investigators Consortium (ToxIC) Drug Overdose Toxicology Surveillance (DOTS) reporting program.

Methods: The ToxIC DOTS Reporting Program (Food and Drug Administration (FDA) Contract #75F40122D00028/75F40123F19002) enrolled patients ages ≥ 13 years following a severe/life-threatening opioid or stimulant overdose presenting to one of 17 U.S. EDs from 2022–2024. DOTS includes data collection from chart reviews, patient interviews, and comprehensive qualitative and quantitative toxicology testing conducted by the Center for Forensic Science Research and Education using quadrupole time-of-flight mass spectrometry. Primary outcomes of this analysis include hospital/ED buprenorphine administration and buprenorphine prescriptions on discharge. Other variables included self-reported drug use and prior treatment history. Central/site IRBs approved this project, and patients provided informed consent.

Results: Of 494 patients with completed laboratory analyses, 332 (67.2%) had findings consistent with an opioid overdose at presentation. Of these, 7.2% ($n = 24$) were administered buprenorphine in the hospital and 9.0% ($n = 30$) were prescribed buprenorphine on discharge. 6.6% ($n = 22$) received both buprenorphine in the hospital and a prescription at discharge. A total of 32 unique patients (32/332; 9.6%) received buprenorphine either in the hospital or as a prescription at discharge. Fentanyl was detected in 87.5% (28/32) of these cases with a mean concentration of 18.97 ng/mL (Range: 1.10, 100.0); buprenorphine was detected in 12.5% (4/32). Approximately 34.1% of patients who were administered and/or prescribed buprenorphine had taken buprenorphine in the past 3 months. There were no statistically significant differences for age, race and ethnicity, and gender between those who received buprenorphine and those who did not. However, there were statistically significant differences in the prevalence of buprenorphine administration (in ED and/or prescription at discharge) by region. Buprenorphine was administered and/or prescribed for 16.3% of patients in the East, 11.4% of patients in the West, and 3.9% of patients in the Midwest ($p = 0.004$).

Conclusions: In this study less than 10% of patients with symptomatic opioid overdose were treated with buprenorphine in the hospital or with a prescription at discharge. Future studies should examine both patient and clinician barriers to buprenorphine initiation after an opioid overdose.

Toxic: This research was performed by the ACMT Toxicology Investigators Consortium

103. Rate of Dissolution of Different Drug Packing Materials in a Simulated Stomach Environment

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Background: Body stuffing of packaged drugs is common and there are many differences in how the drugs are packaged. Most data around this is outdated and as such there is little data on how long to observe these patients in the Emergency Department.

Hypothesis: Drug packets made of different materials will dissolve and release their contents in a simulated stomach environment at different rates.

Methods: This is a basic science experiment. Equal amounts of blue dye powder (100mg) were packaged into different packaging materials. This included a small plastic baggie, a bundle of 10 glassine packets, and two separate single glassine packets. These were then placed into separate USP dissolution tester type 1 baskets at a pH of 1.2 to simulate the gastric environment. Fluid samples were taken at specific time intervals from each of the different baskets over two hours. Each sample of fluid was visually compared to a control set of serial dilutions of the dye to determine the time at which each packaging material released their contents and how much was released at each time point. The control dilutions used for comparison were as followed, 1:1, 1:2, 1:4, 1:8, and 1:16.

Results: Neither of the two individual plastic baggies released any of their contents over two hours. Glassine packet number one was found to first release its contents at 60 minutes. Glassine packet number two was found to first release its contents at 75 minutes. The bundle of glassine packets first released its contents at the 45 minute mark. The vial at the two hour mark for glassine packet number one was most comparable to the 1:1 control dilution. The vial for glassine packet number two was most comparable to the 1:4 control dilution. The vial for the bundle of glassine packets was most comparable to the 1:1 control dilution.

Conclusion: Ingested drug packets made of glassine may release their contents in the stomach earlier than ones made of plastic.

104. Unintentional Pediatric Exposures to Household Cleaning Products: A Cross-Sectional Analysis of the National Poison Data System (2016–2023)

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Background: Household cleaning products are the second most common exposure among children aged five and under, accounting for 11.3% of all pediatric calls to America's Poison Centers (APC) in 2020. No studies have yet compared the volume of calls related to unintentional cleaning product exposures in pediatric patients before and after the onset of the COVID-19 pandemic.

Hypothesis: The incidence of pediatric exposures to household cleaning products increased during the COVID-19 pandemic.

Methods: This cross-sectional analysis utilized data from the National Poison Data System (NPDS) on pediatric household cleaning product exposures from January 1, 2016, to December 31, 2023. Data was obtained through a formal request to APC, querying 83 unique generic product codes under the category "CLEANING SUBSTANCES (HOUSEHOLD)." Pediatric subjects aged zero to five with exposures to specified product codes were included. Exposure cases with missing data on "Age," "Gender," "Generic Code Number," "Management Site," or "Medical Outcome" were excluded. Exposures were classified into 14 categories based on product use, major toxic ingredients, and modes of action. All data was de-identified and confirmed by self-certification through the University of California, San Francisco Institutional Review Board.

Results: A total of 669,576 pediatric exposures were analyzed during the study period, with children under three years old accounting for 84% of all calls. Among exposures with known product information, "Soaps" and "Bleach" were the most frequently reported, accounting for 15.6% and 15.5% of cases, respectively. Both categories demonstrated a significant increase in reported exposures in 2020 compared to 2019, with 'Soaps' rising by 0.9% (95% CI: 0.48%, 1.2%; $p < 0.001$) and 'Bleach' increasing by 1.5% (95% CI: 1.16%, 1.89%; $p < 0.001$). While the total number of calls to APC increased from 77,092 in 2019 to 78,844 in 2020, there was an overall downward trend in total number of calls from 2016 to 2023.

Conclusion: An increase in unintentional exposures to "Soaps" and "Bleach" between 2019 and 2020 among pediatric patients was observed in this cross-sectional analysis. This suggests that the COVID-19 pandemic, which likely led to increased use of cleaning products, may have contributed to the observed increase in these types of exposures in pediatric patients.

105. Characteristics and Outcomes of Pediatric Nicotine Exposures Described in the Toxicology Investigators Consortium (Toxic) Core Registry

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Background: For the last eight years of NPDS reports, nicotine-containing products have consistently ranked

among the top 25% of pediatric exposures with the most recent report coding 11,674 nicotine exposures in children less than five. However, poison center calls are voluntary and therefore may not accurately capture true exposures or extent of toxicity.

Research Question: Are the trends viewed in NPDS data for pediatric nicotine exposures representative of those pediatric patients with nicotine exposure evaluated at bedside by a medical toxicologist?

Methods: This is a secondary analysis of the Toxicology Investigators Consortium (ToxIC) Core Registry. Cases include patients seen by a medical toxicology physician during a formal consultation that are aged 6 years or under and entered into the ToxIC Core Registry between 2012–2023. The primary outcome was mortality; secondary outcomes were morbidity as further classified by need for therapeutic intervention or need for hospital admission, including level of care, co-exposures and route of exposure.

Results: Forty-two patients met inclusion criteria. Of the forty-two patients there were no deaths. The most frequent manifestations of presumed toxicity were central nervous system depression or coma (23.8%) and tachycardia (19%). Only fourteen patients required intervention (33.3%) with the most common intervention being IV fluids (64.3%), followed by benzodiazepines (28.6%) and intubation (28.6%). Twenty-five patients (59.5%) were admitted to the hospital with seventeen (68%) of those admitted to an ICU. Most of these cases were single exposure to nicotine (71.4%). The most common route of exposure was oral (81%) although cases with nicotine only exposures by dermal (4.8%) or inhalation (2.4%) all required ICU admission. Of those with co-exposures, the most common were opioids (41.7%) and cannabinoids (25%). While not a required field, for two cases an estimated dose of nicotine ingested was provided but no formulation or ingestion amount could be determined.

Conclusion: Over half of the pediatric nicotine exposures evaluated at the bedside by a medical toxicologist displayed evidence of toxicity necessitating hospital admission. Central nervous system depression and tachycardia were the most common clinical manifestations with approximately 40% of these exposures requiring ICU admission. Parental education regarding pediatric nicotine exposures in children under the age of six may reduce the number of hospitalizations and ICU admissions for this reason. Limitations include small sample size, unknown exposure dose and lack of confirmatory laboratory testing.

ToxIC: This research was performed by the ACMT Toxicology Investigators Consortium

106. Nicotine Ingestions Among Children Younger than Six Years Old Reported to United States Poison Centers, 2010–2023

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Background: Nicotine is a highly toxic substance contained in a wide variety of products that can resemble food or candy to young children.

Research Question: The objective of this study is to investigate the characteristics and trends of nicotine ingestions among children <6 years old reported to US poison centers.

Methods: We analyzed unintentional-general, single-substance nicotine ingestions among children <6 years old reported to the National Poison Data System from 2010–2023.

Results: There were 134,663 unintentional-general, single-substance nicotine ingestions among children < 6 years old reported to US poison centers. Most ingestions were among children < 2 years old (76.2%), boys (55.5%), or occurred at a residence (98.5%). The rate of nicotine ingestions increased significantly by 59.4% from 2010–2015 ($P < 0.001$) before significantly decreasing by 34.1% from 2015–2023 ($P < 0.001$). This rate trend was primarily determined by the ingestion rate for nicotine liquids, which increased by 450.0% from 2010–2015 ($P < 0.001$) and then decreased by 45.2% from 2015–2023 ($P < 0.05$). Most nicotine ingestions were associated with no effect (36.8%) or minor effect (19.6%), and 81.3% did not receive treatment at a healthcare facility. Moderate effects were observed among 1.2% of ingestions, and there were 39 ingestions with major effects and two fatalities. A minority of ingestions (15.9%) were treated/evaluated and released, and 0.5% were medically admitted. Nicotine pouch ingestions among children <6 years old were not reported to the NPDS prior to 2020, but the rate of ingestion involving pouches increased rapidly by 763.1% from 2020–2023. Nicotine pouches were more likely to be associated with a serious medical outcome (OR: 1.53, 95% CI: 1.10–2.13) or medical admission (OR: 2.03, 95% CI: 1.31–3.15) than other product formulations.

Conclusions: Although most nicotine ingestions among children <6 years old were associated with no or clinically insignificant effects, some children did experience serious outcomes, including two fatalities. The abrupt change in the rate of liquid nicotine ingestions corresponded temporally with passage of state legislation and the federal Child

Nicotine Poisoning Prevention Act of 2015 requiring child-resistant packaging of liquid nicotine containers, which may support the importance of public policy in prevention of these ingestions. The emergence and comparative severity of nicotine pouch ingestions is a reminder of the public health challenges of the evolving oral nicotine product market. The findings of this study support the need for ongoing surveillance and increased efforts to prevent nicotine ingestions among young children.

107. Withdrawn

108. A Case of Serotonin Syndrome Induced by Iatrogenic Fentanyl Infusion in Chronic Lithium Toxicity

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Background: Lithium is hypothesized to modulate neurotransmission of monoamines including serotonin and has been implicated in cases of serotonergic toxicity when combined with selective serotonin reuptake inhibitors (SSRIs). Fentanyl has also been associated with pro-serotonergic effects through unclear mechanisms. The incidence of fentanyl related serotonin syndrome (SS) is thought to be low and primarily described in case reports with concomitant use of SSRIs. This is a unique case of serotonin syndrome induced by iatrogenic fentanyl infusion in the setting of chronic lithium toxicity.

Hypothesis: The use of therapeutic intravenous (IV) fentanyl infusion can precipitate SS in patients with chronic lithium toxicity.

Methods: This is a single patient chart review at a tertiary care center. Serial serum lithium concentrations were obtained, and a comprehensive drug panel was performed by liquid chromatography-mass spectrometry.

Results: A 15-year-old female with developmental delay, anxiety, and reactive attachment disorder on long-term lithium therapy of 1200 mg daily presented with abrupt neurologic changes precipitated by recent initiation of lisinopril. Symptoms included central nervous system depression, myoclonus, tremor, and hyper-reflexia, consistent with chronic lithium toxicity. The patient's lithium concentration on presentation was 3.76 mmol/L. Although concentrations downtrended on hospital day two with normal saline infusion, her mental status and neuromuscular findings worsened, and she developed hypernatremia concerning for nephrogenic diabetes insipidus. The decision was made to intubate the patient for airway protection and transfer her to our facility's intensive care unit for hemodialysis (HD). Continuous renal replacement therapy started after a session of HD, and serum lithium concentrations remained subtherapeutic. Her symptoms suddenly worsened on hospital

day three after a fentanyl infusion was added to her post-intubation sedation regimen. Following the initiation of the fentanyl infusion she developed worsened neuromuscular rigidity, clonus, hypertension, tachycardia, and hyperthermia concerning for SS. We suspect that SS was precipitated by the IV fentanyl as no other changes to her medication regimen had been made and a comprehensive urine drug panel was unrevealing. Symptoms improved by hospital day four with cessation of fentanyl, external cooling measures, and transient use of vecuronium.

Conclusion: Subtherapeutic lithium concentrations do not exclude the risk or development of SS in patients with chronic lithium toxicity. The avoidance of commonly used therapeutic agents with pro-serotonergic effects, such as fentanyl, should be emphasized in patients at risk for SS, especially if there is already clinical evidence of moderate neuromuscular or autonomic hyperactivity as in this patient.

109. An Unintentional Intravenous Administration of the Seasonal Influenza Vaccine in a Pediatric Patient

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Background: Adverse effects stemming from intramuscular influenza vaccination administration are typically mild, self-limiting, and well documented. However, a dearth of literature exists related to intravenous (IV) administration, having only previously been described once. We report the case of a two-year-old who was inadvertently administered an IV dose of the seasonal influenza vaccination.

Hypothesis: IV administration of the influenza vaccine may result in a more dramatic immune response that would improve with symptomatic care.

Methods: This is a single patient chart review. A two-year-old with a past medical history of IgA deficiency, was inadvertently administered an otherwise routine polyvalent influenza vaccine intravenously. The patient did not have a history of egg allergy. Nine hours later, the patient presented to the local emergency department crying with a severe headache and reported fever with a single episode of emesis at home. Vitals: tachycardia at 156 bpm, afebrile, and normotensive. Physical exam did not reveal any respiratory difficulty or rash.

Results: The poison center recommended symptomatic care. The patient was treated with 15 mg/kg of acetaminophen and 0.5 mg of ondansetron, discharged five hours later with improvement.

Conclusion: To our knowledge, this appears to be the first documented incidence of unintentional IV administration of a seasonal influenza vaccine in a pediatric patient. There is a single prior case series from 1979. A trivalent influenza vaccine was administered after being misidentified as a heparin flush. A patient developed myalgias and a fever of 39.1°C within 18 hours. Antibody titers later confirmed exposure. Beyond the IV penicillin the patient had already been receiving prior to this exposure, no additional therapeutic interventions were administered and no further symptoms developed. Injection of the influenza-specific antigens induces an inflammatory innate immune system-mediated response that subsequently primes the adaptive immune system. As IV administration of an influenza vaccine results in more rapid uptake of the viral antigen, it is plausible this route of administration may result in a more exaggerated immune response and subsequent symptomatology. Our patient had full symptom resolution and was discharged home without incident. Our case supports minimal toxicity with intravenous polyvalent influenza vaccine administration.

110. Methemoglobinemia from a Pediatric Exploratory Phenazopyridine Ingestion

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Background: Phenazopyridine can cause methemoglobinemia in both acute and chronic ingestions. One previous case report describes a small-dose pediatric exploratory phenazopyridine ingestion that caused methemoglobinemia requiring methylene blue treatment.

Research Question: Can an exploratory pediatric ingestion of three pills of phenazopyridine produce clinically significant signs or symptoms of methemoglobinemia in an otherwise-healthy child?

Methods: This is a single patient chart review. A thirteen-kilogram seventeen-month-old male ingested three 200 mg phenazopyridine tablets after finding an open bottle near the couch. Though some phenazopyridine formulations come in blister packs, in this case, the patient's mother had been prescribed six pills in a twist-top pill bottle. The child was seen in an outside hospital and his methemoglobin (MetHgb) level at 0.75 h post ingestion was 1.4%. During transfer, his urine became orange. Activated charcoal (AC) administration was attempted (by concealing AC in food), but it was unclear how much AC actually was ingested.

Results: The patient's hemoglobin (Hgb) concentration was 13.6 mg/dL (10.5 – 13.5 mg/dL normal range), and there was no known family history of hemoglobinopathy or G6PD deficiency. Peak (measured) MetHgb (10.3%)

occurred 6.5 h from ingestion with a nadir SpO₂ measurement approximately 90% with appropriate waveform from about 7.1 – 11.0 h post-ingestion while the patient was awake. No overt cyanosis was noted, and the patient was active. His SpO₂ did not fall below 97% in the 10 h he slept and played following a MetHgb measurement of 2.6%. Acetaminophen level remained below detection. MetHgb returned to 1.4% at 21 h post ingestion without intervention. The patient was discharged home.

Conclusion: Phenazopyridine often is lemon-flavored and can be mistaken for candy by children. In this case, a 600 mg ingestion of phenazopyridine induced methemoglobinemia and vital sign abnormalities in an otherwise-healthy child.

111. Safe Reversal of Antimuscarinic Toxidrome With Transdermal Rivastigmine Monotherapy in a Pediatric Diphenhydramine Overdose: A TikTok Tale

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Background: For the treatment of antimuscarinic delirium, rare cases of physostigmine induced seizures and bradycardia have led to cautious utilization usually in conjunction with benzodiazepines. While rivastigmine is not FDA approved for the treatment of antimuscarinic delirium, case studies demonstrating its efficacy as an adjunctive treatment exist. These cases describe the use of rivastigmine (oral or transdermal) in addition to benzodiazepines and do not discuss the safety or efficacy of transdermal rivastigmine alone.

Research Question: Can transdermal rivastigmine monotherapy treat antimuscarinic delirium without iatrogenic toxicity?

Methods: This is a single-patient case report of a 14-year-old previously healthy male who presented to a Children's Hospital Emergency Department for encephalopathy after ingestion of twenty diphenhydramine 25 mg tablets in the context of a TikTok Challenge.

Results: The patient presented to the Emergency Department with tachycardia, hypertension, agitation, mydriatic pupils, and dry mucous membranes consistent with antimuscarinic toxidrome. Parents found open blister packs of diphenhydramine with twenty tablets missing totaling 500 mg and video evidence of the "Benadryl TikTok Challenge." Electrocardiogram showed sinus tachycardia with normal intervals, and he received a bolus of intravenous fluids in the Emergency Department. Laboratory evaluation was unremarkable and co-ingestion labs, including ethanol, were negative. Urine drug screen was negative and comprehensive urine drug testing was positive for diphenhydramine and caffeine. He was admitted for observation and transdermal

rivastigmine 9.5 mcg was placed within three hours of arrival. He was noted to be at his mental baseline eight hours after arrival. Transdermal rivastigmine was then removed with subsequent development of carphologia and encephalopathy approximately two hours after patch removal. When reapplied, he again had improvement of his toxidrome and was oriented and conversational. Rivastigmine was removed once more approximately eight hours later when his heart rate was noted to be consistently down-trending, but not bradycardic. Mental status remained at baseline thereafter and he was discharged home on hospital day two.

Conclusion: Rivastigmine is a long-acting carbamate ester available in oral and transdermal formulations that has shown promise in treating antimuscarinic toxicity in conjunction with as needed benzodiazepines or physostigmine. Here, we described a case of pediatric antimuscarinic toxidrome successfully treated with transdermal rivastigmine without adverse events or additional therapies.

112. Status Epilepticus After Exploratory Fipronil Ingestion

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Background: Fipronil is a phenylpyrazole insecticide that blocks GABA-A chloride channels. Fipronil is thought to be less toxic to mammals than insects due to much higher affinity for insect chloride channels than mammals. However, in rare reports, children have been affected by even exploratory ingestions of fipronil. We present a case of pediatric status epilepticus due to fipronil ingestion.

Methods: Data for this single patient case was obtained from medical records and patient interview. A two-year-old 13 kg female was found outside next to a bottle of Termidor HE (8.73% fipronil), shaking and vomiting. The patient had a history of hyponatremia-induced seizures in infancy due feeding issues, but no epilepsy or antiepileptic use. Three seizures were witnessed by EMS and a total of 3 mg of IV midazolam were administered prehospital.

Results: Upon presentation to an outside emergency department, dilated pupils and tonic-clonic seizure activity were noted. IM midazolam resulted in transient resolution of seizure before status epilepticus prompted intubation. The patient experienced a brief hypotension after intubation that improved with IV crystalloid bolus. She received multiple additional doses of IV lorazepam (5.5 mg total) for treatment of recurrent seizure, and midazolam infusion was initiated. Despite titration of midazolam infusion, seizure persisted, and the patient also received 20 PE/kg fosphenytoin. Initial labs were remarkable for leukocytosis 21.3

K/uL, hypokalemia 3.2 mmol/L, bicarbonate 22 mmol/L, and glucose 169 mg/dL. EKG demonstrated sinus rhythm rate 109, QRS 66 ms, QTc 404 ms. Chest radiograph was unremarkable. Tonic-clonic seizure activity had ceased upon transfer to a tertiary care pediatric intensive care unit. Sedation was maintained with midazolam and dexmedetomidine infusions. No further tonic-clonic seizure activity was witnessed. EEG was monitored as midazolam was titrated down from 0.5 mg/kg/hr over the course of 10 hours. No ongoing epileptiform activity was identified, and she was extubated HD two. After extubation, psychomotor agitation, ataxia and slurred speech were present. She received two additional doses of benzodiazepines for agitation. She was discharged in usual state of health on HD three.

Conclusion: This case demonstrates that even exploratory ingestions of fipronil can result in severe morbidity, including very rapid onset of refractory status epilepticus, likely due to inhibition of GABA chloride channels. Unusually, while GABA-agonists are first-line for treatment of toxicant-induced seizures, this patient did not have resolution of status epilepticus until both multiple doses of benzodiazepines and fosphenytoin were administered.

113. Dichlorvos Exposure in a Pediatric Patient with Cholinesterase Concentrations

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Background: Dichlorvos is an organophosphate compound that is banned in the United States. Information regarding skin manifestation of dichlorvos and pediatric exposure are extremely limited.

Methods: This is a case report of a single patient.

Results: A nonverbal 15-year-old male with a past medical history of autism, congenital CMV, and intellectual disability was brought to the emergency department by their parent for vomiting. Vitals on arrival were BP 115/75, HR 90, RR 20, Temp 37°C, Spo2 98%. Patient developed rhinorrhea, blistering skin lesions (on bilateral inner thighs), tachypnea, decreasing mental status, and an oxygen requirement (O2 sat was as low as 78% on room air). He was started on empiric antibiotics, oxygen (titrated up to 6 L nasal cannula), and admitted to the hospital. Approximately 48 hours into the patient's hospital stay, a family member discovered a bottle of "Sniper" insecticide (containing dichlorvos) on a shelf at home with the cap removed and half the product missing. The patient's mother reported this was a product given to her by a friend to kill cockroaches, but that she had not opened it before and kept it stored below her sink. Gastroenterology was consulted and did not want to perform a scope given

possible time of ingestion >48 hours and the risk of perforation, in addition to the fact that the patient was able to tolerate oral intake. Dermatology was consulted for the thigh skin findings and said they appeared suggestive of a chemical/thermal burn and, based off frozen preparation, were inconsistent with staphylococcal scalded skin syndrome. Toxicology was consulted and reported that the symptoms could be consistent with dichlorvos exposure and recommended supportive care and skin decontamination. The patient continued to recover to their baseline state of health with healing skin wounds and was discharged on hospital day five. Cholinesterase concentrations sent on hospital day four returned after patient's discharge with the following values: plasma cholinesterase 0.8 U/mL (ref 2.9 – 7.1) and RBC cholinesterase 2.7 U/mL (ref 7.9 - 17.1). Three days after discharge, the patient's mother reported (via phone) that the patient was doing well. The patient is currently scheduled to follow up in toxicology clinic.

Conclusion: Although banned in the United States, dichlorvos remains a potential source of morbidity. Symptoms of dichlorvos exposure can include rhinorrhea, tachypnea with oxygen requirement, and decreased mental status. Skin exposure with dichlorvos or dichlorvos-containing products may lead to chemical burns.

114. Ensuring School Safety in the Age of Fentanyl: Physician-Led Opioid Overdose Response Training for Non-Medical School Staff

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Background: With the rise in adolescent opioid overdose deaths, there is a pressing need to ensure schools not only have access to the opioid antagonist naloxone but that school staff are trained in effective overdose response. The Prevention Education Partnership (PEP) Program of the Ronald O. Perelman Department of Emergency Medicine at NYU Grossman School of Medicine is a New York State-sponsored Opioid Overdose Prevention Program dedicated to ensuring overdose preparedness for schools. Through a public-academic partnership between NYC Public Schools and PEP, opioid overdose response training was provided to non-medical school staff, including drug counselors, educators, and administrators.

Research Question: Does physician-led opioid overdose response training for non-medical school staff increase learners' knowledge, confidence, and willingness to respond to a student overdose?

Methods: This study employed a pre- and post-test design. Interested school staff registered to participate in a 90-minute training led by medical experts (e.g., physicians and medical students) held onsite at the affiliated academic medical center. The training didactic included an overview of fentanyl, including its mechanism of action, toxicity, and proliferation in the illicit drug market, and a review of adolescent substance use prevalence, motivations for use, and overdose trends. In small groups, instructors distributed free naloxone kits, defined naloxone's mechanism of action and pharmacokinetics, and modeled on a manikin how to recognize an opioid overdose and respond with or without intranasal naloxone. Learners were certified after completion of a skills check. All participants (n = 242) were invited to take part in pre- and post-training surveys.

Results: A total of 151 participants completed both pre- and post-training surveys. The majority of respondents had never received training on how to identify an opioid overdose (70.7%) or how to administer naloxone (75.5%). Post-training, participants overdose knowledge, response actions, and confidence in their ability to respond improved significantly ($p < 0.001$) compared to pre-training. Participants' perceived likelihood of administering naloxone if indicated increased significantly ($p < 0.001$). Additionally, substance use stigmatization decreased significantly post-training (pre-survey $\bar{x} = 14.62$ to post-survey $\bar{x} = 13.23$; $p < 0.001$). Over 95% of study participants agreed the training was relevant to their role and 98% agreed it was beneficial to be trained by a healthcare professional.

Conclusion: In-person, expert-led opioid overdose response training for non-medical school staff is feasible, effective, and acceptable as a means of enhancing school safety to confront the rise in fentanyl-related overdose risk for US adolescents.

115. Pediatric Patients with Confirmed Fentanyl Exposures Presenting to a Children's Hospital Emergency Department

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Background: As fentanyl has become the primary illicit opioid in the US drug supply, it is expected that accidental pediatric exposures to fentanyl will rise. The purpose of this study was to describe children with fentanyl exposures seen in a single tertiary care children's hospital.

Methods: This is a retrospective chart review on all patients less than six years old who tested positive for urine fentanyl and/or norfentanyl in a pediatric emergency department

(ED) between August 2015 to August 2023. Patients with a reported intentional ingestion prior to presentation or those on whom drug testing was completed after therapeutic administration of opioids were excluded. Data on each patient's presentation and ED course was collected with subsequent descriptive analysis.

Results: A total of 43 individual patient encounters were included with 56% male ($n = 24$) and 44% female ($n = 19$). The average patient age was 2.3 years. Forty-nine percent of the encounters occurred during the final three years of the study. The most common chief complaints at the time of ED presentation were ingestion ($n = 14$), unresponsiveness ($n = 11$), altered mental status ($n = 6$), and difficulty breathing ($n = 4$). Therapeutic interventions provided in the ED included naloxone administration (67%), supplemental oxygen (53%) and fluid boluses (37%). Six patients required positive-pressure ventilation and one patient required intubation. Fifty-one percent of patients ($n = 22$) had a negative urine drug screen and then subsequently tested positive for either fentanyl or norfentanyl using mass spectrometry. There were a total of twenty-two mass spectrometry tests that resulted in a quantitative urine fentanyl level, with a mean level of 59 ng/mL (range 0 - 793 ng/mL). Those with a quantitative fentanyl level of 0 ng/mL ($n = 4$) tested positive for norfentanyl. Seventeen tests resulted with a semi-quantitative urine fentanyl level of > 50 ng/mL, and four tests resulted as "present" with no quantification of fentanyl. The most common disposition status from the ED was admission to the intensive-care unit at 53% ($n = 23$), followed by admission to the floor at 40% ($n = 17$), and discharge to home at 7% ($n = 3$).

Conclusion: Confirmed fentanyl exposures in children seen at a single children's hospital have risen in recent years. Unresponsiveness and altered mental status should prompt consideration of a fentanyl exposure. While urine levels cannot be correlated with serum levels or dose, urine levels in these symptomatic children were similar to levels seen in adults.

116. LC-MS of Patients Taking Diphenoxylate/Atropine May Reveal the Presence of Normeperidine

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Background: Diphenoxylate hydrochloride/atropine sulfate is an antidiarrheal medication

Hypothesis: Liquid chromatography-tandem mass spectrometry (LC-MS) performed on urine from a who ingested

diphenoxylate hydrochloride/atropine sulfate may reveal the presence of normeperidine, as normeperidine is used to manufacture diphenoxylate.

Methods: This is a single-patient chart review. A six-month-old boy with a history of plagiocephaly, hyperbilirubinemia requiring phototherapy, torticollis, and seborrheic dermatitis presented as a transfer from an outside hospital after possible exposure to two white, round tablets with an "M" imprint, which contained 2.5 mg diphenoxylate hydrochloride and 0.025 mg atropine sulfate each. The patient's father mistook these for teething tablets and mixed them into the patient's formula. Upon realizing the mistake, the patient's mother brought him to an outside facility. Upon arrival, the patient was noted to be "fussy," with flushing and "dilated pupils." After transfer for evaluation by our toxicology team, the patient's exam noted flushed skin, pupils two to three mm, and agitation. He was admitted for monitoring and underwent urine testing to confirm his exposure. By hospital day two, the patient's exam had improved, and his vital signs were all within normal limits. Urine assayed by LC-MS detected normeperidine, a meperidine metabolite. Providers became concerned that the patient may have been exposed to meperidine instead of diphenoxylate hydrochloride/atropine sulfate, as some meperidine tablets are white, with an "M" imprinted on them. To the family's knowledge, no one in the household had received a prescription for or used meperidine. The Department of Child Protective Services (DCS) had cleared the patient for discharge, but he was re-consulted for potential exposure to meperidine. Subsequent testing of a volunteer's urine after ingesting a diphenoxylate-atropine tablet and testing of a tablet directly revealed the presence of normeperidine.

Results: Literature review revealed that normeperidine may be used to synthesize diphenoxylate, and that use of diphenoxylate-atropine tablets may lead to the detection of normeperidine on LC-MS. The patient was subsequently cleared for discharge. To our knowledge, this is the second existing case report of such a result.

Conclusion: Urine LC-MS may detect normeperidine in a patient exposed to diphenoxylate hydrochloride/atropine sulfate, as normeperidine is used to produce diphenoxylate. Providers should be aware of this potential contaminant to ensure accuracy in interpreting LC-MS results, especially when managing pediatric patients.

117. Acute Ethanol Intoxication in Adolescents: A Retrospective Analysis

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Background: Excessive ethanol consumption in adolescents is a global health problem that leads to morbidity so we aimed to analyze the clinical characteristics of acute ethanol intoxication in adolescents attended in a Poison Control Center in Mexico State.

Methods: This is a retrospective, descriptive review of a Poison Control Center database in a Hospital in Mexico State from February 2012 to September 2024. Data analysis was performed using Microsoft Excel software.

Results: Our database included one thousand six hundred seventy-six patients, of which 114 were adolescents with acute ethanol intoxication, aged 13 to 17 years. Age distribution was: 13 years 5.3% (n = 6); 14 years 16.7% (n = 19); 15 years 27.2% (n = 31); 16 years 22.8% (n = 26) and 17 years 28.1% (n = 32). Gender distribution showed 61.4% female (n = 70) and 38.6% male (n = 44). Co-ingestions were present in 7% of cases (n = 8), with analgesics, antihistamines, acetylsalicylic acid and benzodiazepines being the most common. Blood ethanol concentrations ranged from 10 to 485 mg/dl, with the highest frequency (49.6%, n = 56) in the 201–300 mg/dl range, with a mean of 220.05 mg/dl. The highest concentration (485 mg/dl) was found in a 14 year old girl who presented with somnolence. The main reasons they sought medical attention were sedation 81.5% (n = 93), vomiting 31.5% (n = 36), nausea 22.8% (n = 26), agitation 6.1% (n = 7), headache 2.6% (n = 3) and hypothermia 1.75% (n = 2). Severity varied: 16.7% mild (n = 19), 70.2% moderate (n = 80) and 13.2% severe (n = 15). Outcomes: 6.1% (n = 7) required hospitalization in the pediatric unit, 1.8% (n = 2) needed intermediate care, and 0.9% (n = 1) admitted to the pediatric intensive care unit.

Conclusions: In this study, we identified that ethanol consumption in adolescence predominates in females between 15 and 17 years old and that adolescents are brought to the emergency department mainly due to somnolence, vomiting and nausea. Blood ethanol concentrations were found to be in a high range, however, in terms of symptoms, most cases were classified as moderate ethanol intoxication, which allowed early discharge in most patients.

118. Youngest Recorded N-Acetylcysteine Treatment With Survival in 24 Week and 3 Day Old Neonate

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Background: Acetaminophen is known to cross the placenta and cause acute liver injury in the fetus. The treatment of a neonate suffering from acetaminophen-induced liver injury during the peripartum period is poorly characterized in the literature and dose adjustments are not well described.

Hypothesis: N-acetylcysteine (NAC) is hepatoprotective and safe for treatment of toxicity in neonates following in utero exposure to acetaminophen.

Methods: This is a single patient case study performed via chart review. A neonate was born at 24 weeks and three days gestational age by emergent Cesarean section to a mother who presented with acute hepatic failure. Mother was transferred to an academic ICU with obstetrics as she was thought to have acute fatty liver of pregnancy. The patient's mother was found to have a serum acetaminophen concentration of 77 mcg/mL from taking acetaminophen for pain. Mother's laboratory results upon arrival to the ICU included: INR 4.7, AST/ALT 4293/4343 IU/L, bicarbonate 14 mMol/L, lactate of 3.3 mMol/L, and creatinine 0.6 mg/dL. She was also hypoglycemic at the outside hospital requiring a dextrose infusion. Due to the discovered acetaminophen toxicity, the mother was initiated on NAC and the neonate was immediately assessed at birth for acetaminophen toxicity.

Results: At birth, the patient's serum acetaminophen concentration was 34 mcg/mL. Laboratory values showed INR 1.7, AST 54 IU/L, pH 7.17, HCO₃ 16 mMol/L, PaCO₂ 43 mmHg. NAC therapy was initiated at seven hours of life with an initial intravenous bolus of 150 mg/kg and followed by an infusion with a rate of 15 mg/kg/hr. Due to a concern for osmotic load and need for neuroprotection, the initial bolus was administered over two hours. At the completion of the 21-hour NAC protocol, the patient's acetaminophen level returned undetectable and AST, INR, and pH normalized and treatment was discontinued. The patient's early life was complicated by retinopathy of prematurity, necrotizing enterocolitis requiring surgery, respiratory distress syndrome requiring mechanical ventilation, bacteremia and patent ductus arteriosus. After a prolonged 110 day hospital stay, he was able to be discharged to a children's home on minimal nasal cannula oxygen with subsequent transition to family's home one week later.

Conclusion: NAC administration remains the cornerstone of treatment for patients of all ages. In the extremely premature neonate, dosing adjustment to avoid osmotic load may be beneficial.

119. Outcomes of Pediatric Methyl Salicylate Ingestions

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Background: Methyl salicylate is common in over-the-counter (OTC) products. Oil of Wintergreen, which contains methyl salicylate is widely considered a "one swallow can kill" substance, though the dangers of other OTC methyl salicylate products are less well-defined. Our aim was to determine outcomes of pediatric ingestions of methyl salicylate-containing products.

Methods: We conducted a retrospective analysis using the National Poison Data System (NPDS) between January 1, 2000 and December 31, 2023. We queried NPDS for all single substance ingestions involving methyl salicylate in pediatric patients aged five years or younger. We described cases by demographics, level of care, clinical effects, and medical outcome.

Results: There was a total of 152,508 cases during the study period. The exposures were roughly equally distributed between female (48%) and male (51%) patients. The most common clinical effects were oral irritation (10.5%), vomiting (2.6%), ocular irritation/pain (2.3%), dermal irritation/pain (1.8%), and erythema/flushing (1.5%). The majority of cases were managed on site (88.7%). Of those who received medical attention 78.8% were treated and released, while only 1.7% and 1.3% were admitted to noncritical care and critical care units respectively. The majority of cases (55.6%) were not followed because of non-to-minimal possible toxicity. Approximately 28.9% were reported as no effect and 11.3% as minor effect. Death was reported in one case, and less than 0.5% of cases resulted in moderate (0.2%) or major (0.01%) effects. The most frequently reported therapies were dilution (80.9%), food/snack (16.2%), single dose activated charcoal (1.5%), other emetic (0.5%), and cathartic (0.4%). Alkalinization was performed in 89 cases (0.06%) and hemodialysis or hemoperfusion were performed in six cases (<0.01%), and ECMO was reported in one case.

Conclusion: The large majority of pediatric methyl salicylate ingestions resulted in minimal or no effect, with less than 1% of cases resulting in significant effects. Given the limitations of data extraction from NPDS, we were unable to differentiate cases of oil of wintergreen from other methyl salicylate-containing products, such as topical analgesics. We were not able to assess the dose ingested. Our suspicion is that cases with significant outcomes were due to oil of wintergreen ingestions, and that pediatric patients with unintentional ingestions of other methyl salicylate-containing products could be safely observed at home in most cases. However, further research with differentiation between these products is warranted.

120. Neonatal Digoxin Toxicity and Treatment with Digoxin Immune Fab

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Background: Neonatal cardiac glycoside toxicity is infrequently reported in the literature, and management can be challenging due to unpredictable pharmacokinetics. Neonatal cases describing treatment with digoxin immune fab are limited, with various dosing strategies described. We report

a case of neonatal digoxin toxicity successfully managed with conservative antidotal therapy.

Methods: A five-week-old male born at 38 weeks with hypoplastic left heart syndrome presented to the emergency department with a two-day history of emesis and heart rates oscillating between 90–125 bpm per home heart monitor. Nine days prior, the patient was discharged following a Norwood procedure with multiple prescriptions: digoxin 12.5 mcg BID, aspirin, cholecalciferol, enalapril, furosemide, and omeprazole. Vital signs upon arrival were: HR 128 bpm, BP 84/53 mmHg, RR 30/minute, temp 35.8°C, and SpO₂ 84%. Labs were significant for point-of-care glucose of 52 mg/dL, K⁺ of 5.2 mEq/L, and digoxin concentration of 8.5 ng/mL; BUN/Cr were normal. The last dose of digoxin was administered the day prior to arrival; patient's mom was having difficulty reconstituting the digoxin appropriately, leading to a supratherapeutic level. Digoxin immune fab was given for bradycardia at home, hypotension, and hyperkalemia. Due to the concerns for rapid potassium shifts, a conservative dosing strategy was utilized. The patient received digoxin immune fab 5 mg (1/8 of 40 mg vial). Two hours after antidote administration, serum potassium decreased to 3.1 mEq/L. The patient remained hemodynamically stable for the remainder of his hospitalization without re-experiencing bradycardia. Patient also had concern for necrotizing enterocolitis (NEC) for which antibiotics were administered. The patient was discharged after hospitalization day 10, after completing NEC treatment.

Results: This patient exhibited gastrointestinal distress, bradycardia, and hyperkalemia in the setting of a supratherapeutic digoxin concentration with underlying cardiac pathology, NEC, and concomitant use of furosemide and enalapril, which may have contributed to overall symptomatology. Traditional dosing utilizing the patient's weight and digoxin concentration suggests a 10 mg dose. A conservative dose of digoxin immune fab was provided with resolution of symptoms and with no recurrence. The serum potassium decreased rapidly but required no further intervention.

Conclusion: Dosing of digoxin immune fab in neonates is sparse and heterogenous in the medical literature. Standard aliquot dosing by digoxin immune fab vials may not be appropriate given risk for rapid electrolyte changes at higher doses. A tailored approach considering serum concentration, overall symptomatology, and underlying pathology while calculating a dose is optimal.

121. A Case of Surreptitious Lithium Poisoning in a 7-Month-Old

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Background: Lithium is a cornerstone in the management of bipolar disorder and other mood disorders but has a

narrow therapeutic index. Lithium toxicity can result from overdose, dehydration, or impaired renal function, manifesting in neurological, gastrointestinal, and cardiac symptoms. We present an unusual case of lithium toxicity due to intentional surreptitious administration in a 7-month-old.

Results: A 7-month-old female with prior hospitalization for klebsiella bacteremia and meningitis was admitted for supportive management of bronchiolitis. Initial neurologic exam was “alert, symmetric face, tracks physician during evaluation, EOMI, move all extremities, normal tone”. On day four, the patient had an episode of synchronous bilateral upper extremity jerking with associated lip smacking, associated oxygen desaturation to the 50% range on pulse oximetry. The patient underwent bag-valve-mask ventilation with improvement in oxygenation. She received 5 mg rectal diazepam, two doses of 0.6 mg lorazepam IV, and 60 mg/kg levetiracetam IV load. Her seizure activity continued for 27 minutes and ultimately resolved when 12 mg ketamine and 6.2 mg rocuronium was administered for intubation. She was sedated with dexmedetomidine at 0.7 mcg/kg/hr and fentanyl at 2 mcg/kg/hr and admitted to the pediatric intensive care unit (PICU). Laboratory evaluation was notable for WBC 32.8 K/cumm, Sodium 136 mmol/L, Creatinine 0.35 mg/dL, Glucose 195 mg/dL, Calcium 9.2 mg/dL. Acetaminophen < 5 mcg/mL, Salicylates < 0.5 mg/dL, Ammonia 34 mcumol/L, Urine Drug Screen (LC-MS) positive for ketamine (given for intubation). Non-contrast CT head study demonstrated possible trace extra-axial blood products along left frontal convexity. Lithium concentration was 3.7 mmol/L. Physical exam demonstrated “miotic pupils, EEG leads glued to head...[and] inducible and sustained lower extremity clonus”. She underwent one dialysis session with subsequent improvement of lithium concentration to 0.8 mmol/L without subsequent rebound. She underwent hyperhydration for 24 hours until lithium concentration was undetectable. Evidently, the department of children and family services had notified the team that patient may be receiving her parent’s medications, which prompted the serum lithium test. She was discharged to foster care as mother had confessed to giving patient lithium through feeds during the first few days of admission.

Conclusion: This was a case of acute toxicity that resulted in status epilepticus and subsequent improvement with supportive care and hemodialysis. It highlights the importance of keeping a broad differential in undifferentiated causes of altered mentation and seizures in a pediatric patient.

122. Investigating the Effect of Fomepizole on the Clearance of Acetaminophen in Acute Toxicity: A Retrospective Cohort Study

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Background: Acetaminophen is a frequent cause of liver failure following intentional pharmaceutical overdose. N-acetylcysteine (NAC) has been used as the gold standard for treatment of acetaminophen toxicity since the 1970s. Acute acetaminophen poisoning produces hepatotoxic metabolites via oxidative metabolism by cytochrome P450 2E1 (CYP2E1). Fomepizole fully blocks CYP2E1, preventing oxidative metabolism of acetaminophen. The addition of fomepizole to standard therapy for patients with acute acetaminophen poisoning may prolong the apparent half-life of acetaminophen without clear indicators of worse toxicity.

Hypothesis: Does fomepizole prolong serum half-life in patients with acute acetaminophen poisoning?

Methods: This is a retrospective cohort study of patients evaluated in-person by our medical toxicology service at our primary hospital sites (quaternary academic pediatric and adult hospitals) from July 2018 – September 2024. We queried an internal database to identify patients with acute acetaminophen poisoning who received NAC or NAC + Fomepizole, regardless of where they received their initial care at an outside facility. We excluded patients younger than 10 years old, patients with unknown or prolonged ingestion time, and patients with co-ingestions. A sole abstractor obtained data from the electronic medical record using Microsoft excel. Using R, we used linear regression on log-transformed data to deduce the average elimination half-life of acetaminophen in each group.

Results: We identified 36 cases meeting inclusion criteria; 6 (16.7%) were male patients, and 10 (27.8%) received fomepizole and NAC. In patients receiving only IV NAC, the mean time to NAC administration was 11.9 hours (95% CI: 9.5 to 14.4 hours) with mean duration of NAC infusion being 33.5 hours (95% CI: 23.0 to 44.1 hours). Patients who received IV NAC and fomepizole on average waited 17.3 hours (95% CI: 6.4 to 22.9 hours) before receiving IV NAC over a mean duration of 60.0 hours (95% CI: 35.9 to 72.3 hours). First dose of fomepizole was administered on average 22.9 hours (95% CI: 10.1 to 29.5 hours) post-ingestion. Exploratory linear regression modeling resulted in a half-life of 2.3 hours (95% CI: 1.8 to 3.0 hours) for the group receiving only IV NAC and 17.4 hours (95% CI: 9.4 to 115.3 hours) for patients receiving fomepizole.

Conclusion: In this single-center retrospective cohort, preliminary data abstraction and analysis suggests that fomepizole does not prolong the serum half-life of acetaminophen. Markedly wide variability in the acetaminophen half-life in the fomepizole group may be due to small sample size or other confounding factors, but further investigation is warranted.

123. Acetaminophen Toxicity with Bactrian Hump Pharmacokinetics Treated Without Need For Repeat N-Acetylcysteine Bolus

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Background: Large acetaminophen (APAP) overdoses, or those with coingestants associated with slowing of GI transit, can rarely exhibit Bactrian (“double hump”) pharmacokinetics. We present a case in which APAP overdose showed Bactrian pharmacokinetics and was successfully treated with N-acetylcysteine (NAC) without repeat boluses at peak concentrations.

Methods: This is a case report of a 73-year-old female with a history of prior suicide attempts who was found altered by her family 12 hours from last known well. Per EMS, she had agonal respirations and received 2 mg naloxone without improvement. She was taken to an emergency department where vital signs were notable for BP 86/51, HR 115, T 35.7C, O₂ saturation of 88% on room air, and was subsequently intubated for airway protection. She was started on vasopressors as well as midazolam and fentanyl infusions for sedation. Initial APAP resulted at 173 mcg/ml with AST 855, ALT 582, and INR 1.2. The patient was started on standard dosing of IV NAC per Oregon Poison Center (OPC) recommendations, and serial APAP levels were obtained. Her APAP level decreased to 57 mcg/ml at 24 hours from arrival but then increased to 256 mcg/ml at 45 hours. The OPC recommended a repeat loading dose of NAC followed by increasing the infusion rate to 12.5 mg/kg/hr; however, this was not performed by the treating physician, and her dosing remained unchanged. Her APAP level decreased to 18 mcg/ml at 85 hours; rose to 70 mcg/ml at 101 hours with AST 45 and ALT 281; again decreased to 28 mcg/ml at 112 hours; it increased again to 102 mcg/ml at 117 hours with AST 38, ALT 252, and INR 1.2. For the remainder of her course, the serum APAP downtrended consistently and became undetectable 143 hours from the initial time of arrival. A urine drug screen had resulted positive for benzodiazepines and opiates, with negative urine fentanyl confirmatory testing. Salicylate and ethanol levels were negative.

Results: Despite the treating physician’s deviation from OPC recommendations to adjust the NAC dosing in response to unusual “double hump” pharmacokinetics, the patient successfully recovered.

Conclusion: APAP bactrian hump pharmacokinetics may not require repeat NAC bolus for successful treatment. In this instance, opioid toxicity may have contributed to delayed sporadic absorption. Limitations include lack of confirmation of the amount of APAP ingested or any coingestants

124. Survey of Poison Center Recommendations on High-Dose Acetylcysteine and Fomepizole in High-Risk Acetaminophen Overdose

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Background: Patients with massive acetaminophen (paracetamol) ingestion are at increased risk of hepatotoxicity despite treatment with acetylcysteine, and recent literature is divided on whether higher dose acetylcysteine impacts their outcome. Fomepizole may provide further benefit, but controlled studies are lacking.

Research Question: At what threshold and to what degree are U.S. poison centers recommending more intense acetylcysteine treatment or fomepizole for high-risk acetaminophen patients?

Methods: A Research Electronic Data Capture survey was distributed to 200 directors and associate directors from 55 US poison centers, aiming to assess current practices regarding high-dose acetylcysteine and fomepizole in high-risk acetaminophen cases. The survey included questions on standard acetylcysteine protocols, criteria for high-dose acetylcysteine administration, and indications for fomepizole use.

Results: Of those contacted, 47 (23.5%) responded, providing insights into diverse clinical practices and decision-making criteria. Among respondents, 38.3% reported using the standard U.S. FDA-approved “three-bag” intravenous acetylcysteine regimen (300 mg/kg over 21 hours). Others reported using a “two-bag” or “one-bag” protocol or supporting a variety of protocols based on order sets at health-care facilities served by their centers. High-dose acetylcysteine is recommended by 72.3% of respondents when acetaminophen concentrations are greater than or equal to 300 mcg/mL (1,985 μmol/L) at four hours post-ingestion, consistent with Hendrickson’s 2019 recommendations published in *Clinical Toxicology*. For cases treated with high-dose acetylcysteine, 59.1% of respondents double the maintenance infusion rate to 12.5 mg/kg/hour. Others tailor the infusion rate to the patient’s acetaminophen concentration as per the Hendrickson nomogram or consider other factors such as ALT/AST trends. Regarding fomepizole, 58.7% of respondents consider its use in cases with elevated acetaminophen concentrations, although usage patterns vary substantially. Some centers apply a 300 mcg/mL threshold, while others limit fomepizole use to cases presenting with concurrent hepatotoxicity. Fomepizole administration is also influenced by clinical markers such as anion gap metabolic acidosis (50.0%), elevated lactate (43.5%), or fulminant hepatic failure (50.0%). Despite varying protocols, most respondents agreed that fomepizole, when combined with high-dose acetylcysteine, may improve outcomes in critically ill acetaminophen patients.

Conclusion: This survey reveals considerable variability among U.S. poison centers in managing high-risk acetaminophen overdose, highlighting the need for standardized guidelines on high-dose acetylcysteine and fomepizole.

The findings underscore the necessity for further clinical trials to establish specific, evidence-based protocols, aiming to reduce practice variability and enhance patient outcomes in severe acetaminophen toxicity.

125. Serum Baclofen Concentrations in Dogs With Baclofen Toxicosis Treated With In-Series Carbon Hemoperfusion and Hemodialysis

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Background: Carbon hemoperfusion (cHP) is gaining popularity as a treatment for various intoxications in veterinary medicine. This study aimed to evaluate serum baclofen concentrations before, during and after in-series cHP and hemodialysis (HD) in dogs with baclofen toxicosis.

Methods: This prospective observational study involved four dogs, with heparinized serum samples collected before, during, and after in-series cHP/HD. Serum baclofen concentrations were measured using liquid chromatography–mass spectrometry. The extraction ratio (ER, %) of cHP and HD, half-life during cHP/HD, and total dialytic elimination constant were calculated. Post-treatment samples were collected to determine endogenous half-life and intrinsic elimination constant.

Results: Two dogs received both cHP/HD and mechanical ventilation, while the other two received cHP/HD alone. The median (range) of ingested dosages was 12 mg/kg (4–24). The median time from suspected ingestion to cHP/HD initiation was seven hours (IQR 5–9). cHP/HD was performed using an intermittent hemodialysis platform in two cases and a continuous renal replacement therapy platform in two cases. The median duration of cHP/HD was three hours (range, 2.2–4.2), with a median total blood volume processed of 1.2 L/kg (range, 0.7–1.4), equating to 15 times (8.8–18) the estimated blood volume (80 ml/kg) in dogs. cHP/HD reduced serum baclofen concentration by median 66% (45–72%). Median ER (%) for cHP and HD was 59 (45–73) and 10 (8–13), respectively. The calculated half-life (h) during cHP/HD was 1.5 (1.1–2.3), compared to 5.8 (3.1–13.6) after cHP/HD. The median dialytic elimination constant was 0.34 (range, 0.08–0.34), which was 28 times faster than the intrinsic elimination constant of 0.12 (0.05–0.23).

Conclusion: cHP significantly reduced serum baclofen concentrations. The half-life of baclofen during cHP/HD was notably shorter than after treatment, and the median dialytic elimination constant was 28 times faster than intrinsic

elimination based on post-cHP samples, underscoring the efficacy of cHP. Standardized sampling protocols and larger sample sizes are recommended for future prospective studies to further investigate baclofen pharmacokinetics in dogs and compare the efficacy of cHP and HD in extracorporeal baclofen removal.

126. Female Poisoning: More Common but Less Severe

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Background: Intentional self-harm differs between females and males, but there is limited data on deliberate self-poisoning (DSP). We aimed to investigate the characteristics and severity of DSP in adult females compared to males.

Methods: Deliberate self-poisoning admissions to the Clinical Toxicology Unit at Calvary Mater Newcastle Hospital were reviewed from January 1990 to June 2024, and adult female patients (aged 18 to 64 y) were compared to males. Data were extracted from the prospective database including drug ingested, length of stay (LOS), intensive care unit (ICU) admission, death, clinical effects (hypotension, arrhythmia, coma, seizure, and hepatotoxicity), and treatment (intubation, charcoal, naloxone).

Results: There were 21,984 adult deliberate self-poisoning overdose admissions between January 1990 to June 2024, 13,859 (63.0%) female, 8,781 (36.6%) male and 74 (0.3%) other gender. The median age for females was 33 y (interquartile range [IQR]: 24–45 y), which only slightly differed to males (median 34 y, IQR: 25–44 y). Females presented to hospital slightly earlier than males (median 2.9 h; IQR: 1.6–6.8 h vs. 3.4 h; IQR: 1.7–8.8 h). The LOS for female patients was median 15.8 h (IQR: 8.5–25 h) compared to males, median 15.5 h (IQR: 8.1–25 h). The proportion of females (1,258; 9.1%) admitted to ICU was significantly less than males (902; 11.2%); absolute difference of 2.1% (95% confidence interval [CI]: 1.3–3.0%; $p < 0.001$). A smaller proportion of females died (30, 0.22%) compared to males (25, 0.31%); absolute difference: 0.09%; 95% CI: –0.04–0.26%). Female patients more commonly took paracetamol, selective serotonin reuptake inhibitors, quetiapine, ibuprofen, serotonin–norepinephrine reuptake inhibitors and valproate, compared to males who more commonly ingested opioids. Female overdose patients were less likely to have hepatotoxicity, seizures, coma and delirium, compared to males. Females developed hypotension more often (5.0% vs. 3.7%), but a similar proportion received inotropes (0.8% vs. 0.9%). A smaller proportion of females were intubated compared males (779; 5.6% compared to 540; 6.7%, absolute difference 1.1%; 95% CI: 0.4–1.7%; $p = 0.001$). Females were less likely to get naloxone (3.4%

vs. 5.5%) and chemical sedation (2.0% vs. 3.6%), but similar proportions were given activated charcoal (18.0% vs. 17.4%).
Conclusion: We found that adult female overdoses were more common, but they were less severe than male overdoses, with less complications, intubations and ICU.

127. Loperamide Toxicity: Concentration Dependent Toxicodynamics?

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Background: Loperamide in large doses or combined with a p-glycoprotein inhibitor (e.g. cimetidine, quinine) acts as a central mu-opiate receptor agonist and has been used by opioid-dependent patients to prevent opioid withdrawal symptoms. The toxicity profile has been well established to include primarily repolarization abnormalities with profound QTc prolongation resulting in Torsades de Pointes, however depolarization abnormalities have also been reported.

Hypothesis: The manifestation of depolarization versus repolarization abnormalities may be a consequence of serum drug concentration.

Methods: This is a single patient chart review. A 36-year-old male presented to the ED after an episode of convulsive syncope secondary to chronic loperamide ingestion. He provided history of taking 150–300 2 mg loperamide tablets daily, with another 15–30 2 mg tablets occasionally at night for three years prior to presentation. His initial EKG demonstrated a corrected QT interval (QTc) of 654 msec and a QRSD of 261 msec. In the emergency department he received 200 meq sodium bicarbonate, 40 mg potassium chloride, and a 1 mg/kg lidocaine bolus followed by an infusion at 1 mg/min with minimal change. During the hospital course, in addition to the prolonged QTc, the patient demonstrated a wide QRS as well as bradycardia with a first-degree AV block. He developed two episodes of polymorphic ventricular tachycardia as well short runs of non-sustained ventricular tachycardia (up to 6 beats) that self-resolved. He was primarily treated with magnesium infusion. Oral naloxone 1 mg TID was administered to enhance gastrointestinal motility and prevent ongoing absorption.

Results: Serum drug concentrations obtained on presentation revealed a loperamide concentration of 280 ng/mL and desmethylloperamide of 480 ng/mL with a ratio of 0.58. The range of loperamide concentrations reported in live patients with active toxicity is from 19–190 ng/mL, and desmethylloperamide ranges from 32–560 ng/mL. The ratios range from 0.064 to 0.37. This patient demonstrated both depolarization and repolarization abnormalities which complicates clinical management. The patient was safely discharged

home after seven days after demonstrating stable EKG's and initiation of buprenorphine/naloxone via micro-induction.

Conclusion: To our knowledge, this case represents the highest loperamide level observed in a living patient as well as the highest loperamide/desmethylloperamide ratio reported in the existing literature. Additionally, previous case reports have shown only mild depolarization abnormalities as quantified by QRS prolongation (typically < 200 msec). The presence of marked depolarization abnormalities in this case may suggest that this finding is concentration dependent.

128. Potassium Thiocyanate Toxicity – an Uncommon Ingestion Causing Caustic Injury

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Background: Historically potassium thiocyanate was used as an antihypertensive, however there are limited modern reports and clinical descriptions of isolated oral potassium thiocyanate ingestion to help guide management. We describe a patient with severe potassium thiocyanate toxicity after an ingestion in a self-harm attempt.

Methods: A 48-year-old woman presented to the emergency department (ED) approximately two hours after ingesting an unknown amount of potassium thiocyanate in a self-harm attempt. The patient reported purchasing it online and denied other ingestions. On ED arrival, the patient had bloody rectal discharge, bright red vomit, and hyperactive bowel sounds. Her initial vital signs were: heart rate 81 beats per minute, blood pressure 131/69 mmHg, respiratory rate 18 breaths per minute, and oxygen saturation 98% on room air. The patient was admitted to the intensive care unit (ICU) where the patient became obtunded and was subsequently intubated for airway protection. An endoscopy and exploratory laparotomy were performed to evaluate for gastrointestinal injury. The patient was started on continuous veno-venous hemodialysis due to poor urine output. She had a prolonged hospital course complicated by secondary bacterial infection and multipressor shock. The patient was extubated 13 days after their initial presentation and was discharged to an outpatient acute partial hospitalization program on hospital day 23.

Results: After admission to the ICU, she had a CT scan which showed thickened bowel wall with edema. On endoscopy she was found to have Zargar caustic injury grade 1 and 2a of the esophagus and Zargar caustic injury grade 3a of the stomach characterized by diffuse severe mucosal changes and areas of black discoloration and ulceration. Surgery performed an exploratory laparotomy

and she was found to have dusky bowel. Labs that were drawn three hours after initial presentation resulted with a cyanide concentration of 1.13 mg/L and a thiocyanate concentration of 33 mg/dL.

Conclusion: Oral ingestion of potassium thiocyanate is an uncommon self-harm attempt presentation. Toxicity from thiocyanate is not well described but has been reported to cause neurologic and renal toxicity. Caustic injury has also been reported with potassium thiocyanate toxicity. Testing is often of limited clinical utility but can confirm a suspected ingestion. Although this patient did not develop renal injury, they did develop altered mental status and significant gastrointestinal caustic injury, adding to the limited existing literature on potassium thiocyanate toxicity.

129. Potassium Permanganate – Can Standard Caustic Ingestion Screening Guidelines Direct Endoscopy?

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Background: Potassium permanganate (KMnO₄) is a highly corrosive oxidizing agent which can result in severe gastrointestinal and hepatic injury after oral exposure. While a wide variety of intentional cases have been published, few report on the outcomes of unintentional or exploratory exposures. As such it remains unclear whether traditional screening tools to evaluate caustic exposures can be extrapolated to Potassium Permanganate exposures. We report a case of unintentional exploratory potassium permanganate exposure in a pediatric patient with no clinical deterioration with confirmation endoscopy.

Results: This is a single patient chart review. A 15-month-old previously healthy female presented to the emergency department nearly 1.5 hours after unwitnessed ingestion of an unknown amount of potassium permanganate cleaning solution. Patient initially noted to have purple stained mouth; however, otherwise remained asymptomatic, tolerating breastfeeding prior to arrival. On presentation, vital signs and exam were unremarkable. Initial comprehensive metabolic panel notable for a bicarbonate 19 mmol/L and AST 41 U/L with lipase and amylase within normal limits. Serum manganese was 1.5 mcg/L and methemoglobin 0.8% (total hemoglobin 11.1 g/dL) nearly 10 hours post-ingestion. Esophagogastroduodenoscopy (EGD) performed within 24 hours post-ingestion, demonstrating one small red spot at fundus with mild linear erythema in the stomach body; otherwise, normal mucosa in the esophagus, remaining stomach, duodenal bulb and second part of duodenum.

The patient's vitals and exam remained unremarkable with appropriate oral intake post-endoscopy.

Conclusion: Potassium permanganate is a highly toxic oxidizing agent frequently used as an abortifacient, irritant, and antiseptic. Exploratory exposure to traditional caustics may be cleared with a trial of clear liquids and food in the absence of vomiting, drooling, oral food tolerance, or stridor. However, few cases report asymptomatic or minimally symptomatic potassium permanganate exposures. Our patient represents a case of asymptomatic potassium permanganate with confirmed endoscopic evaluation which may have been effectively cleared by traditional caustic exposure screening criteria. Unintentional and exploratory potassium permanganate exposures may follow traditional caustic screening guidelines. Further research is required to assess this patient population in a larger cohort.

130. Hepatotoxicity Associated with Chinese Herbal Supplement Du Huo Ji Sheng Wan

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Background: As the use of traditional Chinese medicine becomes more popular in the United States, the number of reports of toxicities from these xenobiotics is increasing. Here we present the first case report of hepatotoxicity from the supplement Du Huo Ji Sheng Wan with liver biopsy results available, with likely offending agent Du Huo (*Radix angelicae Pubescentis*).

Methods: This is a case report of a single patient treated in our institution. The patient is a 70 year old male who presented to the Emergency Department for right upper quadrant abdominal pain and nausea that developed over five days. On further questioning, he had been taking an herbal supplement for joint pain that an acquaintance had bought in China, Du Huo Ji Sheng Wan, for the last month. On presentation his vitals were within normal limits, with an exam pertinent for jaundice and scleral icterus. Laboratory results were remarkable for aspartate aminotransferase (AST) of 1633 U/L, alanine aminotransferase (ALT) of 2074 U/L, total bilirubin of 8.8 mg/dL, direct bilirubin of 6.5 mg/dL, indirect bilirubin of 2.3 mg/dL, and alkaline phosphatase of 135 U/L. Workup for alternate causes of his hepatic injury were ultimately unremarkable. N-acetylcysteine was initiated upon arrival with AST and ALT peaking on hospital day seven at 3132 U/L and 3118 U/L, with peak serum bilirubin of 16.3mg/dL. Liver biopsy demonstrated moderate to severe mixed inflammation consistent with moderate to severe toxin-induced liver injury. He was discharged on hospital day nine with resolved symptoms.

Results: The herbal supplement Du Huo Ji Sheng Wan is a mix of multiple different herbal ingredients, including Du Huo. While there is one previous case report of hepatotoxicity associated with Du Huo, the case involved a cholestatic injury pattern, a relatively mild clinical course, no liver biopsy, and no treatment with N-acetylcysteine. Our case demonstrates the potential severity of hepatotoxicity from this agent, and presents the first case with biopsy results.

Conclusion: Du Huo Ji Sheng Wan, while used for joint pain and analgesia, may result in hepatotoxicity. Clinicians should consider Du Huo as a potential cause of Chinese herbal supplement associated hepatotoxicity.

131. Household Bleach Ingestion Associated with Severe Gastric Caustic Injury without Esophageal or Oral Injury

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Background: Historically, household bleach products have contained dilute sodium hypochlorite while industrial products are much more concentrated, making intentional ingestions somewhat less dangerous. Recently, we have seen an increase in the availability of concentrated household bleach to the general public. Injuries associated with intentional bleach ingestion are primarily reported in the esophagus, but severe gastric injuries have rarely been described in isolation.

Research Question: Should we rethink our pre-test clinical suspicion for isolated gastric injury in household bleach ingestion without signs and symptoms of oral or esophageal injury?

Methods: This is a case report with data obtained by electronic medical record review of a 37-year-old male patient who presented to our tertiary referral center after ingesting 2.39 L of over-the-counter bleach containing 7.5% sodium hypochlorite. The patient reported this to be his second suicide attempt by bleach ingestion, the first one having occurred a month prior, although no record of a hospital visit was found. The emergency department and inpatient phases of care were reviewed. An esophagogastroduodenoscopy (EGD) studies was obtained within four hours of ingestion given his high risk of perforation and esophageal strictures, and on day 25 during his hospitalization.

Results: During his emergency department phase of care, the patient was initially agitated but with unlabored breathing with normal breath sounds, a tender abdomen, excoriation of the lips but a normal oropharynx. He had one episode of hematemesis. He underwent a computerized tomography (CT) scan notable for esophagitis and gastritis without signs

of necrosis or perforation. The EGD study performed on the day of presentation showed extensive gastric necrotic and hemorrhagic injury without evidence of esophageal mucosal irritation. A repeat EGD was performed on day 25 of hospitalization due to persistent abdominal pain which demonstrated persistent isolated gastric irritation with no evidence of perforation or stricture formation. He was ultimately discharged after subsequent psychiatric admission.

Conclusion: In this patient with intentional ingestion of 2.39 L of 7.5% sodium hypochlorite household bleach, severe gastric caustic injuries including necrosis, hemorrhage, and ulcerations occurred despite a normal appearing oral cavity and esophagus on EGD evaluation.

132. Large Volume Household Bleach Ingestion Without Caustic Injury on Endoscopic Evaluation

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Background: Household bleach, containing sodium hypochlorite (typically <10%), is less concentrated than industrial cleaners and ingestions frequently result in minimal toxicity. However, large volume intentional ingestions of caustics increase the risk for clinically significant injury. We present a case of large volume ingestion of standard household bleach without caustic injury.

Research Question: Does large volume ingestion of low concentration household bleach lead to significant mucosal injury?

Methods: This is a single-patient case presentation of a previously healthy 31-year-old male who presented to a level one trauma center emergency department following large volume ingestion of household bleach in a suicide attempt.

Results: The patient presented via ambulance shortly after reported ingestion of approximately 30 ounces (887.2 ml) of household bleach. The patient's mother found him vomiting at home, with an empty bottle of household bleach nearby. On arrival to the emergency department, he was encephalopathic and in respiratory distress. A portable chest x-ray did not show any free air concerning for esophageal perforation. Initially, he was trialed on BiPAP but ultimately required rapid sequence intubation for work of breathing. Laboratory evaluation was notable for respiratory alkalosis with pH 7.52 without metabolic acidosis, electrolyte abnormality, or liver dysfunction. Co-ingestion labs were negative for acetaminophen, salicylate, and ethanol. The urine drug screen was positive for benzodiazepines. Comprehensive drug testing was positive for caffeine metabolites and iatrogenic medications

including midazolam, ketamine, and propofol. Computed Tomography imaging of the chest, abdomen, and pelvis demonstrated mild proximal to mid-gastric fold prominence concerning for caustic injury and he was admitted to the medical intensive care unit. His respiratory status improved following intubation, and he remained on minimal ventilator settings until completion of endoscopy twenty-two hours after initial presentation. Endoscopic evaluation was without evidence of mucosal injury. He was extubated successfully on hospital day two and his diet was progressively advanced. There was no evidence of significant acidemia or primary pulmonary pathology or aspiration. His initial respiratory compromise was thought to be due to pain and anxiety following his suicide attempt. He subsequently underwent psychiatric evaluation and was discharged on hospital day four.

Conclusion: Previous reports of household bleach exposure note severe outcomes are rare but more likely in intentional ingestion. This case demonstrates a dramatic exposure in terms of quantity without endoscopically demonstrated injury. This case adds to assertions that even large volume ingestion of low concentration of household bleach does not lead to aerodigestive injury.

133. Delayed Electrolyte Derangement and Death Following Phosphoric Acid Ingestion

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Background: Phosphoric acid is a strong acid that is corrosive at high concentrations or large volumes. This is a case of delayed acidemia with severe hyperphosphatemia and hypocalcemia.

Hypothesis: Phosphoric acid in gel matrix may lead to delayed electrolyte derangements.

Methods: This is a single patient chart review. A 66-year-old male with a history of type 2 diabetes, hyperlipidemia, hypertension, hypothyroidism, who presented to the Medical Center via EMS 35 minutes after intentional ingestion of rust dissolver (Loctite Naval Jelly, 10–30% phosphoric acid) and latex paint additive (Floetrol, vinyl acrylic latex) on the day of admission. He was initially admitted to the hospitalist service and at that time required 2 L of supplemental oxygen by nasal cannula. He began having coarse lung sounds and became increasingly hypoxic, ultimately requiring high flow nasal cannula. Patient was transitioned to the ICU for close monitoring of his airway and GI consultation to coordinate EGD to evaluate degree of injury. On the day of admission (hospital day zero) patient also underwent CT chest abdomen pelvis which revealed diffuse wall thickening of the

esophagus suggesting esophagitis. On HOD one the patient had an EGD by GI, which demonstrated grade 2A esophageal injuries. The patient was kept NPO and maintained on high-dose PPI.

Results: On HOD one he developed an acute kidney injury that degenerated into acute renal failure. His phosphorous was critically high (rising from 3.5 mg/dL to 15.6 mg/dL, normal 2.5–4.5 mg/dL) and his calcium was critically low (falling from 9.8 mg/dL to 4.7 mg/dL, normal 8.8–10.2 mg/dL). Attempts to correct his electrolyte derangements were made but ultimately his metabolic acidosis (pH 7.15) persisted despite administration of sodium bicarbonate, and therefore emergent CRRT was initiated. Unfortunately, despite the medical team's best efforts he continued to decline clinically. The decision was made by the family to pursue comfort focused care. He passed away 51 hours after reported ingestion.

Conclusion: Delayed hyperphosphatemia, hypocalcemia, and acidemia may occur in addition to corrosive esophageal injury after ingestion of phosphoric acid. Patients should be monitored closely for changes in phosphorous and calcium concentration, which may occur 12–24 hours after ingestion of certain products.

134. Treatment of Dapsone-Induced Methemoglobinemia in the Setting of Acute Myasthenic Crisis

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Background: Dapsone, a known inducer of methemoglobinemia, is an alternative antibiotic for *Pneumocystis jirovecii* pneumonia (PJP) prophylaxis in patients with an allergy to sulfonamide antibiotics. In this case, a patient with newly diagnosed myasthenia gravis presented with acute respiratory failure in the setting of methemoglobinemia and myasthenic crisis.

Methods: This is a single-patient chart review. A 62-year-old woman, started on dapsone five days previously for PJP prophylaxis, presented to the hospital with dyspnea and lethargy. She was cyanotic, with abnormal pulse oximetry. Laboratory evaluation confirmed methemoglobinemia of 14.4%, and she was also found to have a negative inspiratory force of negative 20 cm H₂O raising concern for concomitant exacerbation of her myasthenia gravis. She received respiratory support with high-flow oxygen and was treated with methylene blue. Her acute myasthenia gravis flare was subsequently managed with intravenous immunoglobulin (IVIG).

Results: The patient's methemoglobin level decreased to 1.5% following treatment with 1 mg/kg of methylene blue. A repeat methemoglobin level approximately twelve hours later was 2.2%. Dapsone was discontinued and alternative

PJP prophylaxis was initiated. Toxicology considered whether the color of methylene blue could cause an interference with a blood leak detector on plasmapheresis equipment. The patient received IVIG as this was preferred by the primary team, regardless of this concern. The patient's clinical status gradually improved over 24 hours and her oxygen support was weaned.

Conclusion: This case underscores the unique challenge of managing methemoglobinemia in a patient with myasthenia gravis, as impaired oxygen delivery from methemoglobinemia can further exacerbate the severity of myasthenic crisis. Additionally, this case raised the question of whether the color of methylene blue could potentially interfere with the blood leak detector on plasmapheresis equipment. No data was found to support an interference, however limited data exists to support its safety.

135. Laxative-Induced Hypermagnesemia Successfully Treated With Hemodialysis and GI Decontamination

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Background: Hypermagnesemia is a rare but potentially fatal condition typically seen in patients with renal impairment or pregnant patients being treated for preeclampsia. Severe hypermagnesemia (serum Mg > 8–9 mg/dL) can cause paralysis, respiratory failure, ileus, bradycardias and cardiac arrest.

Research Question: Is a single session of hemodialysis sufficient to treat acute hypermagnesemia?

Methods: This is a single-patient case report. A 76-year-old female with past medical history of stage three chronic kidney disease, hyponatremia, coronary artery disease, and pulmonary hypertension presented to an emergency department with chief complaint of abdominal pain and constipation she had attempted to self-treat by ingesting two bottles of magnesium citrate over the preceding 36 hours. Her serum magnesium level was initially found to be 7.6 mg/dL. Our poison control center was consulted for management recommendations.

Results: In the ED, labs were notable for a creatinine at its baseline of 1.36 mg/dL and an upward trending serum magnesium level to 8.3 mg/dL from initial value of 7.6 despite receiving a liter of crystalloid fluid. Her ECG showed atrial fibrillation with a right bundle branch block, QRS of 146 ms and QTc interval of 424 ms (both unchanged from prior). CT abdomen/pelvis showed moderate colonic dilatation with liquid stool consistent with enterocolitis and rectal stool impaction. She was treated with a mineral oil enema and one three

hour session of hemodialysis (HD). Post-HD magnesium level on hospital day two was 4.0 mg/dL, which subsequently trended down to 2.8 mg/dL by hospital day four with ongoing fluid resuscitation. On hospital day seven, patient was found unresponsive and pulseless and was successfully resuscitated. However, she ultimately was transitioned to comfort care and died within several days from complications thought to be unrelated to her hypermagnesemia. Her serum magnesium level was 1.7 mg/dL in the peri-arrest period.

Conclusion: We present a case of laxative-induced acute hypermagnesemia in an elderly patient with chronic renal impairment. We observed this patient had no evidence of ECG abnormalities, dysrhythmia, or respiratory failure, and was successfully treated with a single three hour session of HD and magnesium-free laxative therapy.

136. A Case of Hydrogen Peroxide Ingestion

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Background: Hydrogen peroxide (H₂O₂) is a common chemical found in homes and is used for many purposes including disinfecting and cleaning. Most household concentrations are 3% H₂O₂, but there are commercially available concentrations as high as 35% or more. When applied to cells, the H₂O₂ rapidly oxidizes with formation of free radicals and results in cellular protein and DNA damage. When ingested, it can cause caustic injury to mucosal linings of the gastrointestinal tract. Upon exposure to body tissues, degradation of H₂O₂ by the enzyme catalase can liberate significant amounts of oxygen gas. The resultant gas is not only released into the GI tract, but can enter the bloodstream causing both systemic venous and/or arterial gas embolization.

Methods: This is a single patient chart review. A 29-year-old female presented following intentional ingestion of household (3%) hydrogen peroxide, rubbing alcohol, and natural ingredient household cleaner about one hour prior to arrival to the emergency department. She arrived vomiting and with epigastric tenderness, though hemodynamically stable. CT scans were obtained and revealed gas within the portal venous system as well as pneumatosis of the walls of the stomach and distal esophagus. Labs were notable for isopropanol level of 70 mg/dL, acetone level of 12 mg/dL, ethanol level of 20 mg/dL and an initial lactate of 5.3 mmol/L.

Results: The patient was treated symptomatically with intravenous pantoprazole, famotidine, and ondansetron and was admitted to the medicine service. Given the findings of extraluminal gas after hydrogen peroxide ingestion, the patient underwent hyperbaric oxygen therapy with one treatment and repeat imaging demonstrated complete resolution

of pneumatosis and portal venous gas. Gastroenterology was consulted for consideration of upper endoscopy, which was ultimately deferred with intention to perform six weeks post-ingestion. Patient's symptoms improved and she was medically cleared for the behavioral health unit on hospital day two.

Conclusion: We present a case of an intentional overdose of household hydrogen peroxide among other ingestants with resulting portal venous gas and pneumatosis. This was promptly treated with hyperbaric oxygen therapy with complete resolution of extraluminal gas on repeat CT imaging. This case report provides additional support for use of hyperbaric oxygen therapy in symptomatic hydrogen peroxide ingestions. Furthermore, the patient in this case report developed systemic gas embolization following ingestion of a 3% hydrogen peroxide solution, a phenomenon that is more commonly associated with ingestions of more highly concentrated hydrogen peroxide solutions.

137. Diazinon Pesticide Exposure With Recurrent Seizure

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Background: Although a significant problem worldwide, acute organophosphate (OP) toxicity is uncommon in North America (NA). Due to the rare occurrence of exposures in the United States, management can be challenging. We report a case of diazinon exposure with delayed and predominant neurotoxicity.

Hypothesis: In this patient, diazinon exposure caused delayed, recurrent seizure activity but not persistent peripheral muscarinic or nicotinic toxicity.

Methods: This is a case report for which data were obtained retrospectively via poison center chart review.

Results: This 39-year-old male with a history of prior seizure in the setting of pesticide exposure presented to the emergency department (ED) following a witnessed seizure at home. The day prior he spilled diazinon onto his hands and forearms while applying to crops. He continued working through the day and did not decontaminate until showering that evening. Around 12 hours later, while sleeping his wife witnessed a generalized seizure that self-terminated prior to EMS arrival. On arrival to the ED, heart rate was 48 BPM, blood pressure 112/67 mmHg, respirations were 18 breaths/minute, pulse oximetry was 98% of room air, and temperature was 36.6°C. He was confused with dilated pupils, vomiting, and a tongue laceration. There were no

other muscarinic findings nor motor weakness or fasciculation. Within the first hour in the ED, heart rate increased to 100–120 BPM and his mental status cleared. Poison center recommendations included repeat decontamination and a single dose of pralidoxime 30 mg/kg IV over 15 minutes. Lacking muscarinic findings, atropine was held. The patient experienced a second generalized seizure in the ED treated with lorazepam, levetiracetam, and a continuous infusion of pralidoxime 10 mg/kg for 12 hours. The patient was observed for 24 hours after discontinuation of pralidoxime with no further signs of toxicity. RBC cholinesterase activity from presentation is pending at the time of submission.

Conclusion: Diazinon is a lipophilic thiophosphoric acid OP requiring metabolic activation by hepatic cytochrome P450 enzymes. These pharmacologic characteristics may explain delayed toxicity. It is unusual that there was a paucity of muscarinic findings and a lack of any neuromuscular toxicity. Diazinon toxicity in NA is uncommon and management is challenging for clinicians without experience treating these exposures. This case highlights an unusual presentation of a rare toxin in the United States and the utility of pralidoxime in the treatment of nicotinic toxicity.

138. The Paxlovid-Carbamazepine Interaction During COVID-19 Treatment

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Background: Nirmatrelvir-Ritonavir (Paxlovid) is a widely used oral antiviral therapy for treating mild to moderate COVID-19 in high-risk populations. Ritonavir, a component of Paxlovid, enhances nirmatrelvir's bioavailability through potent inhibition of cytochrome P450 3A4 (CYP3A4). However, this inhibitory effect poses a significant risk of drug-drug interactions, particularly with medications metabolized by CYP3A4, such as carbamazepine, leading to potential toxicity. While a single case report published last year documented Paxlovid-carbamazepine interaction resulting in life-threatening toxicity necessitating dialysis, we present a second case of significant toxicity that was successfully managed without dialysis.

Methods: This is a single-patient case report. A 60-year-old female with a history of a seizure disorder on carbamazepine presented to the emergency department with altered mental status shortly after starting Paxlovid therapy for COVID-19. The patient's clinical and laboratory data were reviewed, including carbamazepine concentrations, neurological assessments, and other relevant diagnostics (CT brain). The management strategy involved immediate discontinuation of Paxlovid and serial monitoring of

carbamazepine concentrations. Patient's mental status improved without requiring dialysis.

Results: Laboratory testing demonstrated a carbamazepine (CBZ) concentration exceeding 20 µg/mL, though precise quantification was limited due to sample saturation. Following the cessation of Paxlovid, serial measurements revealed a gradual decline in carbamazepine concentrations from >20 µg/mL to 16.0 µg/mL, 15.2 µg/mL, and eventually 5.5 µg/mL over 48 hours. The patient's mental status improved in parallel with the decline in carbamazepine concentrations.

Conclusion: Carbamazepine, primarily hepatically metabolized by CYP3A4, can reach toxic concentrations when co-administered with potent CYP3A4 inhibitors such as ritonavir. Toxicity may manifest as severe neurologic and cardiovascular symptoms. This case highlights the critical need for clinicians to recognize and mitigate drug interactions when prescribing Paxlovid in patients on concurrent CYP3A4 substrates. Strategies include close monitoring, potential dose adjustments, and considering alternative therapies to prevent adverse outcomes in high-risk patient populations.

DAY 3: LIGHTNING ORALS, ABSTRACTS 139–146

139. Characterization of Nitazene Involved Overdose Deaths in Ontario, Canada

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Background: Nitazenes are highly potent 2-benzylbenzimidazole opioids increasingly detected in drug-related deaths. The American College of Medical Toxicology and National Association of Medical Examiners advocate for inclusion on the cause of death (COD) statement of all substances detected post-mortem that may have contributed to death. We sought to characterize nitazene-involved drug deaths and examine the extent to which post-mortem detection of nitazenes is incorporated in COD statements

Methods: We conducted a population-based retrospective cohort study of nitazene-involved deaths between October 1, 2019, and December 31, 2022, in Ontario, Canada, using data from the Centre of Forensic Sciences information management system. We included cases if nitazenes were detected in post-mortem blood samples and COD was due to drug toxicity. Each record was reviewed by an independent forensic pathologist who was blinded to the interpretation of the original pathologist. The primary outcome was the level

of agreement between pathologist COD statements calculated using Cohen's kappa.

Results: During the 39-month study period, we identified 86 cases meeting the inclusion criteria. Most (n = 49; 57%) involved subjects with a documented history of opioid use disorder (OUD; %). The majority of cases (n = 84; 98%) were associated with another substance (median: 7 substances; IQR 6–10 substances). The most frequently co-detected substance was fentanyl (n=69), with a median concentration of 31 ng/ml (IQR 11.5–40.0 ng/ml). Novel psychoactive substances were detected in 71 (83%) cases, and multiple nitazenes were detected in 9 (10.5%) cases. Nitazenes were incorporated into COD statements in 22 (25.6%) cases by the original case pathologist with no agreement between pathologists as to whether nitazenes were incorporated in the COD statement ($\kappa = -0.02$). Factors associated with agreement between pathologists included fentanyl concentration below the limit of quantification (< 1.3ng/ml) and presence of a nitazene without detection of another novel psychoactive substance or stimulant ($p < 0.05$). In contrast, fentanyl was included in the COD statement in 66 (95.7%) cases, even when present below the limit of quantification, with moderate agreement between pathologists ($\kappa = 0.49$).

Conclusion: In this study, nitazene related deaths generally involved multiple substances, with no agreement between pathologists as to whether nitazenes contributed to death. Fentanyl was the most commonly co-detected substance and was frequently incorporated into COD statements, while nitazenes were not. These findings suggest that contribution of novel substances, like nitazenes, in overdose deaths are overlooked. This goes against national recommendations and may have public health consequences.

140. Patients With Substance Use Disorders Seen By Peer Coaches Have Fewer 90-Day ED Revisits Compared To Usual Care

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Background: Efforts to improve substance use disorder care include peer recovery support services (PRSS), but there have been limited efforts to evaluate outcomes associated with interaction with these services. It has yet to be determined how effective this is on outcomes such as emergency

department (ED) revisits, hospital admission, or rates of overdose. We describe the experience of LINC-UP, a PRSS system at an urban ED and the associated outcomes.

Research Question: How do PRSS impact ED revisits, hospital admissions, and rates of overdose in patients with substance use disorders?

Methods: This is a retrospective analysis of patients presenting with substance use disorder seen at a single hospital. We utilized a convenience sample from the consult list of peer recovery coaches (PRCs) between May 2023 and June 2024. Cases consisted of patients who met with PRCs either in person or by telehealth which were compared with controls, defined as those who did not meet with PRCs. Data were abstracted by chart review. The primary analysis evaluated the difference-in-difference effect (pre/post consult by peer coach interaction) in a mixed-effects Poisson regression for ED visits.

Results: A total of 632 PRSS consults were reviewed. The mean age was 45 years. The most common primary substance used was alcohol ($n = 185$, 43%), followed by cocaine ($n=173$, 27%), opioids ($n = 132$, 21%), and methamphetamine ($n = 67$, 11%). One hundred eighty-four patients (32%) endorsed poly-substance use and 104 (18%) arrived with a chief complaint of overdose. Four hundred and thirty-eight patients saw a PRC; there were 194 controls who did not. Control patients had an average of 1.08 ED visits in the 90 days pre-intervention which increased to 1.5 visits in the 90 days post-intervention. PRSS patients had an average of 1.3 visits in the 90 days pre-intervention which decreased to 1.23 post-intervention. The interaction was significant ($p = .0003$) indicating an effect of the intervention. There was a significant increase in visits for control patients (rate ratio = 1.39, 95% CI: 1.16–1.65), and nonsignificant decrease for PRSS patients (rate ratio = 0.94, 95% CI: 0.84–1.06). There was no significant change in overdose or hospital admissions for either group.

Conclusion: Seeing a PRC was associated with fewer ED revisits as compared to usual care, but did not appear to affect rates of overdose or hospital admission. Further analysis is needed to examine additional factors such as residential placement or medication for opioid use disorder initiation/compliance.

141. *Delta-9 THC Positivity in Breast Milk*

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Background: The risk of infant exposure to drugs via consumption of breast milk is an ongoing concern as studies have shown that both pharmaceutical and illicit drugs can transfer to varying extents through the breast milk. Some human studies on maternal cannabis use and breastfeeding suggest an association between cannabis detected in breast milk and decreased motor development for infants at one

year. Due to limited research available, the American College of Obstetrics and Gynecology and the American Academy of Pediatrics recommend that breastfeeding mothers refrain from cannabis use.

Methods: This is a retrospective review of cannabis exposure trends in breast milk from specimens received from January 2018 through September 2024. Testing was performed by request either as a directed analysis for cannabinoid compounds or as comprehensive toxicological analysis with screen and confirmation.

Results: During this period, 502 breast milk specimens were analyzed. Of these, 48 samples (9.5%) underwent confirmation or direct testing for cannabinoids; 36 cases (7.1%) reported positive results for delta-9 THC and one or both of its metabolites (11-hydroxy-THC and delta-9 carboxy-THC). Reported average cannabinoid concentrations include delta-9 THC 16 ng/mL (range 0.71–83 ng/mL), 11-hydroxy-THC 3.0 ng/mL (range 2.6–3.5 ng/mL), and delta-9 carboxy-THC 9.9 ng/mL (range 9.7–10 ng/mL). Four specimens reported delta-9 THC as >50 ng/mL, the upper limit of quantitation for the analytical method. Of cases where comprehensive toxicological testing was performed, 40 were positive for cannabinoids, with 15 of these cases reporting additional findings. Opioids were the most common concurrent drug class identified (13 cases, 86%). In a postmortem investigation demonstrating potential exposure through breast milk, both breast milk and infant blood were analyzed simultaneously. Delta-9 THC concentrations of 16 ng/mL and 0.80 ng/mL were reported in breast milk and postmortem cardiac blood, respectively; delta-9 carboxy-THC was 5.3 ng/mL in the infant's blood and present in the breast milk below the reporting limit (5 ng/mL).

Conclusion: As legalization becomes more mainstream, pediatric exposures to cannabis are increasing. As shown, pediatric exposure to active THC (and/or metabolites) can occur via transfer through breast milk. While focus is given to the developmental impacts of in utero drug exposure, studies on the impacts of breast milk exposure are currently limited. Proactive measurements to monitor drug exposure through breast milk can be beneficial to the clinician in treatment and care of both the mother and child.

142. *Feasibility of Assessing Alcohol Withdrawal Syndrome With a Wearable Biosensor: An Interim Analysis*

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Background: Alcohol withdrawal syndrome (AWS) is a commonly encountered pathology in ED and hospitalized patients with significant associated morbidity and mortality.

Inpatient management of AWS generally involves symptom-triggered benzodiazepine therapy based on a protocolized bedside assessment scale such as the Clinical Institute Withdrawal Assessment (CIWA) or the Withdrawal Assessment Scale (WAS).

Hypothesis: It will be feasible to collect physiologic data using a wrist-worn sensor in patients hospitalized for treatment of AWS, and patients will find the sensor acceptable.

Methods: This is a prospective observational study investigating the feasibility of collecting physiological data (heart rate and heart rate variability, electrodermal activity, skin temperature, 3-dimensional accelerometry) using a wrist-worn sensor (Empatica EmbracePlus) in patients hospitalized for AWS treatment. Acceptability is assessed using a survey.

Results: Since enrollment began in September 2024, six participants have completed their study period. Wearable sensor data was successfully collected from all six participants. Within this sample, we collected a total of 189.43 hours of usable wearable sensor data with a median of 31.33 hours (range 15.91–46.15 hours). Data, organized in minute-long increments, were defined as usable if the sensor successfully recorded physiologic data for at least 80% of that minute. Among the six participants, 70 total WAS measurements were documented with a median WAS score within the sample of 9.5 (range 0–30). Among all documented WAS scores in this sample, 9% (6/70) exceeded 20 (considered severe AWS per institutional protocol) and 41% fell between 10–19 (considered moderate AWS). In comparing median WAS scores for each participant's hospitalization period, the highest median WAS score was 16 and the lowest was 3. Acceptability survey data indicate all participants found the sensor comfortable (median score 5/5), and would be willing to wear the sensor for 2–3 days in a row (median score 5/5) for AWS monitoring. No participant expressed concern about the sensor representing a privacy violation (median score 1/5) or having a detrimental impact on their hospital experience (median score 1/5).

Conclusion: This interim analysis shows successful collection of wearable sensor data from all enrolled study participants. Acceptability survey data suggests participants have found the wearable sensor comfortable and would be open to wearing it again for AWS monitoring. More in-depth analysis is needed to investigate the quality of the physiologic data collected by the sensors and the degree to which the data correlate with other validated measurements of AWS severity.

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143. Effect of Gastric pH and Duodenal pH on Water Bead Expansion Rates

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Background: Water bead ingestions in young children are frequently reported to poison centers, with the most serious sequelae resulting in small bowel obstructions. We present a research study evaluating water bead expansion rate in an acidic solution and subsequent placement into a neutral solution to simulate pediatric gastric emptying from the stomach into the duodenum.

Hypothesis: We hypothesize that the mean rate of size increase is greater in more neutral solution compared to acidic solution.

Methods: This research study used a set of water beads purchased from an online store for which the manufacturer states each bead may expand up to 60 millimeters (mm). Mean gastric emptying time for the population (< 5 years old) is three hours. Mean pH of gastric fluid is 2 and of duodenal fluid is 6. Seven water beads (same brand) were placed into a hydrochloric acid-based gastric simulant solution with a pH of 2. Each water bead was measured at zero, one, two, and three hours while in the acidic solution. After three hours (mean gastric emptying time), the beads were transferred into the duodenal simulant solution with a pH of 6. Measurements of each bead were then taken at four, six, eight, 10, and 12 hours. All measurements were recorded using calipers. Ordinal variables were compared using the Wilcoxon Signed-Rank test.

Results: The largest water bead expanded to 34 mm at 12 hours. The mean rate of increased water bead diameter in the gastric simulant solution (pH = 2) and duodenal simulant solution (pH = 6) were 0.96 mm/hour and 2.47 mm/hour, respectively ($P < 0.05$, $z = -2.3664$).

Conclusion: The rate of water bead expansion is increased in a duodenal simulant solution with pH 6 compared to a gastric simulant solution with pH 2. This is consistent with the pathophysiology of bowel obstruction cases - beads minimally expand in the stomach, fit through the pylorus, and then expand rapidly in the upper small bowel. These results will be used in future studies to determine the effect of various interventions on water bead expansion rates in neutral environments. The primary limitation of the study is that it is in vitro and may not reflect in vivo conditions.

144. Drug Shortage Outcomes and Solutions Reported to the ToxIC Registry over a 22-Month Period

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Background: Drug shortages have become increasingly common and often involve antidotes. Data describing the impact of antidotal shortages on patients, and mitigation strategies clinicians and hospitals employ, are limited.

Hypothesis: Antidotal shortages adversely affect poisoned patients.

Methods: This is an analysis of data reported to the Drug Shortage Supplemental Registry within the Toxicology Investigators Consortium (Toxic) Core Registry. This supplemental registry was created in January 2023 and prospectively tracks shortage mitigation strategies and outcomes including level of care, length of stay, morbidity, and mortality. Cases affected by a drug shortage were queried from January 1, 2023 through November 7, 2024. Rates of shortage, mitigation strategies, and adverse outcomes were described.

Results: Fifty-seven poisoned or envenomated patients whose care involved a shortage were identified, representing 0.4% of all patients reported to the Toxic Core Registry during the period. Drugs implicated were physostigmine (N = 48, 84% of all cases), calcium disodium edetate (N = 4, 7%), *Latrodectus mactans* antivenom (N = 2, 3.5%), dimer-caprol (N = 1, 1.75%), glucagon (N = 1, 1.75%), and lorazepam (N = 1, 1.75%). Physostigmine shortage was reported in 35 cases after an imported German product became available in November 2023. Physostigmine shortage was mitigated by substitution in 40/48 (83%) cases: 35 patients received rivastigmine, four received benzodiazepines, and one received dexmedetomidine. Calcium disodium edetate shortage necessitated inter-institutional sharing, compounding, succimer substitution, and emergent drop shipment. Shortages adversely impacted 65% (37/57) of patients: 30 had increased length of stay, seven required a higher level of care, and three were intubated. Delay to chelation was reported in three cases. Excessive somnolence from dexmedetomidine was the only adverse reaction from drug substitution described. No adverse effects from oral and/or transdermal rivastigmine use, including in combination with physostigmine, were reported. No deaths occurred due to shortage.

Conclusion: Antidote shortages did not affect the management of most poisoned or envenomated patients using data obtained from medical toxicology consultations across the United States. However, adverse outcomes were reported in the majority of patients whose treatment was impacted by

shortage. Shortages predominantly involved calcium disodium edetate and physostigmine, despite FDA-facilitated physostigmine importation. Adverse effects from rivastigmine substitution were not reported. These findings should inform treatment and importation protocols during antidote shortages.

Toxic: This research was performed by the ACMT Toxicology Investigators Consortium

145. Manganese Exposure Causes Neurodegeneration by Disrupting Neuroinflammation and Mitochondrial Apoptotic Pathways in the Rat Brain

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Background: Exposure to manganese (Mn) has been linked to various neurodegenerative conditions, although the exact underlying mechanisms remain unclear. The relationship between mitochondrial defects and neuroinflammation following Mn exposure is still not fully understood.

Hypothesis: This study demonstrates that impaired mitochondrial function caused by Mn exposure can enhance the NLRP3 inflammasome-driven pro-inflammatory response, contributing to neurodegeneration.

Methods: Male rat pups were given intraperitoneal injections of Mn at a dosage of six mg/kg of body weight over two weeks, starting from postnatal day (PND) 15 until PND 28.

Results: Our results indicated that exposure to Mn significantly increased the expression of neuroinflammatory genes. These genes included NLRP3, caspase-1, inducible nitric oxide synthase (iNOS), interleukin-1 beta (IL-1 β), and tumor necrosis factor-alpha (TNF- α) in the cortex and hippocampus of rats at postnatal days (PND) 29, 60, and three months of age. Additionally, to investigate the role of mitochondrial apoptosis, we found that Mn exposure notably downregulated the mRNA expressions of aconitase, caspase-3, and caspase-9 in selected age groups of rats. Furthermore, exposure to Mn also significantly decreased the levels of synaptosomal dopamine and the specific activity of monoamine oxidase (MAO). In contrast, the expression of tyrosine hydroxylase was up-regulated considerably at PND 29 but down-regulated at PND 60 and three months of age. We analyzed the density of noradrenergic axons in the frontal cortex (regions M1 and M2) and the hippocampus (specifically the dentate gyrus, CA1, and CA3) using immunohistochemical staining. The results showed a slight decrease in the density of noradrenergic axons in both the frontal cortex and hippocampus. Similar findings were observed in the expression of the noradrenergic transporter

(NET) and levels of norepinephrine at PND 29, PND 60, and at three months of age. Histopathological examinations of the hippocampus showed neuronal degeneration and atrophy in the subiculum and nuclear pyknosis in the neurons of the fascia dentata. The cortex exhibited a localized area of vacuolation, significant hemorrhagic lesions, and edema after exposure to Mn. Exposure to Mn resulted in notable deficits in spatial reference memory acquisition, reversal learning, and working memory performance in the Morris water maze test. Further, significant reductions were observed in total locomotor activity and grip strength behavior in rats at PND 29, PND 60, and at three months of age.

Conclusion: Our findings suggest that Mn exposure causes changes in dopaminergic and noradrenergic systems by affecting mitochondrial function and NLRP3 inflammasome signaling.

DAY 3: MODERATED POSTERS, ABSTRACTS 146–152

146. Attitudes Toward Xylazine Presence in Illicit Opioid Supply Among People Who Use Opioids

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Background: Xylazine, an alpha-2 adrenergic agonist used mainly for large animal sedation, has rapidly become a common adulterant in illicit drug supplies with regional variations. Limited research exists on awareness of and attitudes towards xylazine among people who use drugs.

Research Question: What is the current understanding of the effects of xylazine and preferences related to xylazine adulteration among people who use opioids (PWUO)?

Methods: This is an ongoing, prospective study of PWUO who present to an emergency room or are hospitalized at a large, urban healthcare system in the Deep South. Inclusion criteria include age ≥ 18 years with urine drug test-confirmed active fentanyl use and self-reported active use of non-prescribed opioids within the last 96 hours. PWUO who are pregnant, incarcerated, unable to provide consent, or unable to complete the study questionnaire are excluded. Patients who meet inclusion criteria and provide consent are given a self-administered questionnaire to elicit substance use-related behaviors, medical history, and their views on the effects of, and attitudes, towards xylazine. Descriptive statistics were used to analyze the responses.

Results: Eleven patients have been enrolled since August 20, 2024. Participants were predominantly male 64% ($n = 7$) and Caucasian 73% ($n = 8$). Fifty-five percent ($n = 6$) were undomiciled/homeless. Sixty-four percent ($n = 7$)

reported a history of injection drug use. Of the respondents, 46% ($n = 5$) had heard of xylazine and reported to know what it was, while 36% ($n = 4$) had never heard of xylazine. When asked about xylazine effects, 36% ($n = 4$) reported that xylazine prolonged the effects of opioids, 36% ($n = 4$) reported that it improves the high from opioids, 9% ($n = 1$) reported that it worsens the high from opioids, and 27% ($n = 3$) reported that xylazine increases the risk of fatal overdose. Seventy-three percent ($n = 8$) of respondents reported a preference to avoid xylazine use while 19% ($n = 2$) were neutral towards xylazine exposure and 9% ($n = 1$) preferred the presence of xylazine.

Conclusion: This ongoing prospective study evaluating awareness of and attitudes towards xylazine adulteration among PWUO in the Deep South suggests that fewer than half of respondents know what xylazine is, and that perceptions of its effects are highly variable. Future confirmation of xylazine exposure via biological specimens is planned to provide further information on regional prevalence. Future harm reduction interventions may need to be tailored based on users' knowledge of xylazine and their expressed preference regarding its effects.

147. Analysis of Pediatric (Ages 0–5 years) Single Substance Exposures resulting in Endotracheal Intubation in the National Poison Data System

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Background: We aim to describe the characteristics of single substance exposures that resulted in intubation in the pediatric population (ages 0–5 years) as reported to United States Poison Centers.

Methods: We conducted a retrospective review of the National Poison Data System (NPDS) over a 15-year period, between 1/1/2009 through 12/31/2023. We queried single substance exposures with intubation reported as a clinical effect among the age group of 0–5 years. We described exposures over time and change in trends of the most frequently reported xenobiotics using substances' generic codes. Given the limitations of using generic codes, we then assessed the most common exposures by category of xenobiotics as provided in NPDS.

Results: During the study period, 6,768 single substance exposures with intubation were reported to poison centers in patients aged 0–5 years with a mean of 451 exposures per year. The total number of exposures increased from 2009 to 2012 where it peaked at 541 reports but since has overall decreased and reached a nadir of 402 reports in 2019. The most common reported exposure over the study period was clonidine ($N = 1350$), this was followed by liquid laundry

detergents (N = 183), lamp oils (N = 159), carbon monoxide (N = 157), methadone (N = 150), and scorpion stings (N = 105). Cardiovascular drugs (which include clonidine) was the most frequently reported drug category every year over the study period. Household cleaners were the second most common from 2012–2015, while analgesics (which includes acetaminophen, opioids and their combination) ranked second between 2009 to 2012 and between 2016 and 2022. In 2023, cannabinoids surpassed analgesics and were the second most reported category of xenobiotics resulting in intubation. Cases of intubations involving cannabinoid products increased from nine in 2020 to 58 in 2023.

Conclusions: Most toxic exposures in ages 0–5 years are exploratory or accidental and intubations in this age group are infrequent. Clonidine is the most common reported exposure by a large margin. The severity and frequency of clonidine exposures in this age group may not be well recognized. This data is consistent with prior reports but shows the trend has continued and additionally shows the recent increase in frequency and severity of cannabinoid exposures. These trends are most likely due to the increasing use of clonidine to treat ADHD in young children and the increasing availability of edible preparations of cannabinoids even in states which have not legalized recreational cannabis.

148. Substance Exposures in Children 6–12 Years: Suspected Suicidal Intent Exposures Are Increasing

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Background: Research and prevention of pediatric suicide have historically focused on adolescents; however, suicide was the eighth leading cause of death among children 5–11 years old during 2013–2017 and the suicide rate for this age group has been increasing during the past decade. An evaluation of substance-related suicidal exposures among preteens in the context of other substance exposures at the national level is needed.

Research Question: This study investigates the characteristics and trends of exposures to medications, dietary supplements, and psychoactive substances among children 6–12 years old reported to US poison centers, with a focus on exposures associated with suspected suicidal intent.

Methods: This is an observational study of exposures involving medications, dietary supplements, and psychoactive substances among children 6–12 years old reported to the National Poison Data System from January 1, 2000, through December 31, 2023. July 1st intercensal and post-censal population estimates were obtained from the US Census Bureau to calculate annual exposure rates, including age-specific and sex-specific rates.

Results: There were 1,541,565 primary substance exposures among 6–12-year-olds reported to US poison centers from 2000–2023. Most involved a single substance (90.1%), boys (58.2%), or occurred in a residence (95.8%). Although most exposures were associated with minimal medical consequences, 3.5% of children were medically admitted, 4.0% experienced moderate effects and 0.3% had major effects; there were 95 reported deaths. Therapeutic errors accounted for 48.6% of exposures. Although exposures associated with suspected suicidal intent represented 4.7% of exposures overall, they accounted for 25.8% of exposures among 12-year-olds. Exposures associated with suspected suicidal intent were more likely to be medically admitted (RR: 14.32 95% CI: 14.10–14.56) or experience a serious medical outcome (RR: 8.04, 95% CI: 7.91–8.17) than other reasons for exposure. The overall rate of exposure increased by 53.8% from 2000–2023, while the exposure rate associated with suspected suicidal intent increased by 311.2%.

Conclusion: There were >1.5 million exposures among children 6–12 years old involving medications, dietary supplements, or psychoactive substances reported to US poison centers from 2000–2023, and the rate of exposure increased, especially for exposures associated with suspected suicidal intent. Additional targeted research and interventions are needed to prevent substance exposures among 6–12-year-olds, especially exposures associated with suspected suicidal intent.

149. Estimating Healthcare Costs Associated with Pediatric Cannabis Exposures in New York State

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Background: Recent years have witnessed a dramatic rise in rates of pediatric exposures to cannabis products. There is a paucity of literature describing the cost burden of these exposures on healthcare systems.

Hypothesis: We hypothesized that pediatric cannabis exposures and associated healthcare costs increased from 2020 to 2023 in New York State.

Methods: This is a retrospective review of data reported to the two Poison Control Centers providing coverage for New York State between the years of 2020 and 2023. A query was performed using NPDS codes for known or suspected exposures to cannabis products for patients aged 0–18 years. Cases from outside NY state and cases not presenting to a health-care facility were excluded. In cases of polysubstance ingestion, cases were reviewed by a medical toxicologist and were excluded if the cause for medical evaluation and treatment was more likely to be due to a non-cannabinoid exposure. Cases were stratified based on duration of effect, level of healthcare setting required, and interventions required. Length of treatment was determined using averages from duration of effect noted for individual cases. Cost was assigned using NY State average healthcare costs for ED visits and admissions for poisoning/intoxication from the Healthcare Cost and Utilization Project database. Descriptive statistics were used and trends over time were assessed using a generalized linear model.

Results: Our initial query resulted in 2,982 cases related to pediatric cannabis exposure in New York State between 2020–2023. Of those cases, 1,750 met inclusion. Approximately 52% of included patients were female, and average patient age was 7 years. Nearly 84% of exposures occurred in the patient's own residence, and 40% of exposures were to edible cannabis preparations. A majority of patients (62%) were treated and released from the ED, with 26% being admitted to a floor setting and 10% admitted to a critical care setting. Estimated healthcare costs associated with pediatric cannabis exposures during this timeframe ranged from a minimum of \$19,055,000 to a maximum of \$22,206,800, or an average of \$5,157,725 per year. Average annual costs increased linearly per year demonstrating a 165% increase between 2020 and 2023 ($p < 0.0001$).

Conclusion: Between 2020–2023, pediatric exposures to cannabis products reported to New York State Poison Control Centers resulted in an average cost of \$5,157,725 per year. Costs increased annually, coinciding with legalization and decriminalization of cannabis products.

150. What's the Buzz About Wasp Dope? Recreational Pyrethroid/Pyrethrin Exposures Reported to US Poison Centers

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Background: News articles periodically describe individuals using ant, wasp, and/or roach killers recreationally for euphoric effects. Published literature is limited to a few case reports of patients developing significant toxicity after using “wasp dope” for its purported stimulant properties. A single survey of recreational drug users in rural Appalachian

Kentucky found that 16.1% of participants had recently used “wasp dope” for its ‘methamphetamine-like rush’.

Hypothesis: Pyrethroids/pyrethrins are being used recreationally and are associated with toxicity.

Methods: This is a retrospective review of The National Poison Data System (NPDS) data. NPDS was queried for exposures to pyrethroids and pyrethrins, by reason of intentional abuse, for the years 2021 through 2023. Data was separated into single substance exposures and exposures with coingestants; and were analyzed for age, gender, route, clinical effects, therapies, medical outcome, and number of cases by year. For cases with coingestants, the classes of additional drug exposures were tabulated.

Results: In total, 122 cases were identified over the three year period with 48 exposures in 2021, 39 in 2022, and 35 in 2023. The majority were male 88 (72%) compared to female 34 (28%). Ages ranged from 9 to 88 years, with a mean of 35.5 and median of 34 years. Most exposures were coded for pyrethroids 116 (95%) compared to pyrethrins 6 (5%). There were 64 (52.5%) single substance exposures and 58 (47.5%) exposures with coingestants. The most common coingestants were cannabinoids (16), alcohol or mouthwash (11), amphetamines (10), prescription opioids (4), and illicit opioids (3). The most common route of exposure was inhalation (83), followed by ingestion (33), dermal (13), and parental (7). Some patients had multiple routes of exposure. Exposures involving recreational pyrethroids/pyrethrins decreased from 48 to 35 during the study period (27%). Thirty-eight (65.5%) cases involving coingestants were associated with more severe outcomes (moderate, major, or death) compared to single substance exposures to pyrethroids/pyrethrins (37.5%). Coingestant cases had significantly more cases with major CNS depression and intubation.

Conclusion: Recreational pyrethroid/pyrethrin use is rarely reported nationally to US poison centers and has decreased in recent years. While serious symptoms and outcomes are possible with recreational pyrethroid/pyrethrin use, more severe symptoms associated with sedation are seen in cases with coingestants. Pyrethroid abuse is thought to be excitatory, yet some of the single substance showed sedation; it is possible some of these cases involved coingestants that were not in the provided history or coded.

151. Xylazine Knowledge and Beliefs in Patients Presenting to the Emergency Department with an Opioid or Stimulant Overdose

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Background: Xylazine is a veterinary sedative that has been increasingly detected as an illicit opioid adulterant in the United States. As an adulterant, it remains unclear whether xylazine is being sought out or if exposure is inadvertent, and xylazine use patterns and beliefs remain understudied. Therefore, this study investigated the knowledge and beliefs surrounding xylazine use among people presenting to emergency departments (EDs) for opioid and/or stimulant overdose.

Methods: The Toxicology Investigator's Consortium (Toxic) Drug Overdose Toxicology-Surveillance (DOTS) reporting program was a 2-year multicenter project (2022–2024) that prospectively enrolled patients experiencing a severe/life-threatening opioid and/or stimulant overdose who presented to one of 17 participating medical centers in the United States. This analysis evaluates patient interviews on xylazine knowledge, belief, use, and withdrawal experiences during the patient interview. All patients provided informed consent and central/site IRBs approved this project.

Results: Between April 18, 2023 to September 30, 2024, 1002 patients were enrolled in DOTS, with 391 responding to xylazine-related questions between 3/1/24 and 9/30/24. The average age was 45 years old, and 66% were male. Knowledge of xylazine was reported in 38% of patients ($n = 148$), and of these 41% ($n = 61$) thought they had used xylazine in the past. Approximately 70% ($n = 43$) of patients with a history of self-reported xylazine use indicated they could detect when xylazine was present. Most patients indicated xylazine was identifiable by the effects felt when used (84%, $n = 36$), taste (37%, $n = 16$), and smell (23%, $n = 10$). Of the 61 patients who reported xylazine use in the past, 41% ($n = 25$) experienced a xylazine-specific withdrawal when they did not use it. Nearly 40% ($n = 10$) of patients who experienced xylazine-specific withdrawal used one or more other substances to alleviate symptoms, most commonly reporting the use of gabapentin ($n = 4$), clonidine ($n = 4$), and/or prescription benzodiazepines ($n = 4$).

Conclusions: Only 38% of patients experiencing overdose had heard of xylazine in the past. Almost half of the patients with knowledge of xylazine reported utilizing a substance to mitigate their xylazine-specific withdrawal in the past. Further investigation of the motivations for xylazine use would benefit harm reduction strategies, such as widespread distribution of test strips to help patients limit xylazine exposure.

Toxic: This research was performed by the ACMT Toxicology Investigators Consortium

152. National Response to Illness Resulting from the Consumption of Diamond Shroomz™-Brand Products

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Background: Edible products containing psychoactive compounds are increasing in availability across the U.S. On May 31, 2024, America's Poison Centers notified the U.S. Centers for Disease Control and Prevention (CDC) and other partners about severe acute illnesses among individuals who consumed Diamond Shroomz™-brand chocolate bars, cones, and gummies marketed as containing a proprietary blend of nootropic mushroom extracts and adaptogens. CDC released a Health Alert Network advisory June 12, 2024, to alert clinicians and public health professionals. This outbreak also resulted in a nationwide product recall initiated on June 27, 2024, and a multijurisdictional public health investigation.

Methods: CDC issued a national call for cases to identify illnesses associated with the consumption of Diamond Shroomz™-brand products. The aim was to determine the magnitude and extent of the outbreak and to characterize reported cases. Cases were defined as those with moderate or major clinical effects or death following the consumption of recalled products or other chocolate products marketed as containing mushrooms. Related clinical effects reported in poison center exposure calls were identified via the National Poison Data System (NPDS) and used to create a standard case reporting form. State and local health departments collected information on demographics, exposures, and clinical characteristics through patient interviews, clinician interviews, and medical records.

Results: A total of 175 cases, 70 hospitalizations, and three deaths were reported by 33 states during January 1, 2024, through September 27, 2024. There were 38 people with cases admitted to the intensive care unit and 29 were intubated. The age range of people with reported cases was 3–80 years (mean = 28.7 years). Among people with cases who had a documented sex, 94 (59.5%) were male and 64 (40.5%) were female. The most frequently reported symptoms included confusion ($n = 97$, 55%), agitation ($n = 70$, 40%), drowsiness/difficulty staying awake ($n = 65$, 37%), loss of consciousness ($n = 64$, 37%), and hallucinations/delusions ($n = 56$, 32%). Seizures were reported in 39 people with cases (22%).

Conclusions: Consumption of Diamond Shroomz™-brand products was associated with significant illness, including severe symptoms, such as central nervous system depression, respiratory failure, seizures, and need for hospitalization. This investigation showcases the risks of mushroom-containing edible products, advertised to have psychoactive properties, that may have unidentified or misformulated ingredients with the potential to cause harm. Information from regional poison centers and the NPDS can be used to assist in identifying outbreaks from mislabeled or unsafe products.

DAY 3: POSTERS, ABSTRACTS 153–210

153. “Modified” Release: Hyperkalemia From Oral Potassium Chloride Overdose

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Background: Most oral potassium exposures reported to United States poison centers are unintentional and rarely result in hyperkalemia. However, intentional oral potassium overdose can result in life-threatening hyperkalemia. We describe a case of intentional potassium chloride ingestion that resulted in significant hyperkalemia and electrocardiogram changes despite normal renal function.

Methods: This is a single patient chart review. An 87-year-old woman opened and ingested the contents of approximately 50 extended-release capsules of 10 mEq potassium chloride (each containing 750mg of potassium chloride) in a suicide attempt four hours prior to presentation. According to the drug’s monograph, individual crystals of potassium chloride are microencapsulated with a polymeric coating, designed to facilitate the slow release of the drug through the membrane. These microcapsules are encased in a hard gelatin capsule.

Results: Initial labs showed serum potassium of 8.2 mEq/L, BUN 11 mg/dL, Cr 0.8 mg/dL, and GFR >60 mL/min. Her electrocardiogram demonstrated peaked T-waves. The patient received 10g of sodium zirconium cyclosilicate by mouth followed by whole bowel irrigation, 1g of IV calcium chloride, 10 units of insulin with 25 grams of IV dextrose, 50 mEq of IV sodium bicarbonate, nebulized albuterol, and 60mg of IV furosemide. Serial serum potassium measurements over 15 hours were: 7.4 mEq/L; 6.2 mEq/L; 5.0 mEq/L; 4.0 mEq/L.

Conclusion: We present a patient with profound hyperkalemia and electrocardiogram abnormalities after the intentional ingestion of microencapsulated potassium chloride. Hyperkalemia developed within four hours of ingestion, which may be a result of modifying the extended-release preparation, the total amount ingested, or both. Prompt GI decontamination and aggressive medical management led to improved serum potassium and a positive outcome, though hemodialysis may also have a role in similar scenarios.

154. Positively Prurient. Users Describe *Mucuna Pruriens* More Favorably Than Levodopa in an Online Forum Devoted to Parkinson's

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Background: Parkinson’s Disease results from loss of dopamine-producing neurons. The main treatment is levodopa (L-DOPA). Approximately 80% of Parkinson’s patients also use herbal and dietary supplements (HDS) including *Mucuna pruriens* (MP), a natural source of L-DOPA. MP seeds contain 2–4% L-DOPA based on analytic testing. MP-containing supplements may reach 40%, which could lead to perceptions of greater efficacy but also more frequent side effects.

Research Question: How do descriptions of *Mucuna pruriens*’ effects compare to those of L-DOPA in online forums dedicated to Parkinson’s Disease?

Methods: We conducted a retrospective thematic analysis of public comments from the Reddit forum r/Parkinsons, from its 2017 inception to 2024. We applied our previously developed software to retrieve comments explicitly mentioning using L-DOPA or MP, and, if mentioned, the effect and dose. We excluded comments from deleted accounts or flagged by moderators as spam. Two physicians manually reviewed each comment mentioning MP or L-DOPA to verify that the correct effects and doses were extracted. Our outcome measure was whether the frequencies of reported beneficial and adverse events differed between MP and L-DOPA.

Results: We obtained 12,329 comments from 993 posts; 11,932 were unique and 427 mentioned L-DOPA and 34 MP. Comments about MP and L-DOPA reported thematically similar benefits (e.g., reduced bradykinesia and tremor) and adverse effects (mania, hallucinations), although gastrointestinal adverse effects were unique to L-DOPA. MP was most used to self-diagnose or self-treat Parkinson’s when unable to access care (14/34, 31%). Approximately 38% of comments mentioning L-DOPA discussed medication effects; 6/427 (1.4%) mentioned using MP and L-DOPA. The median daily dose of L-DOPA was 300 mg, mostly levodopa/carbidopa with 10% (43/427) of comments discussing extended-release formulations. Nearly 38% (153/427) mentioned also using other medications or HDS. The median dose of L-DOPA from MP was 360 mg, using the commenter’s stated conversion. MP comments were significantly more likely to mention positive effects than L-DOPA comments (Fisher’s exact test, $p=0.0318$). This result did not depend on the formulation of L-DOPA.

Conclusion: Despite similar active ingredients and doses, online discussions about MP were more positive than those about L-DOPA. Our study demonstrates the potential of online forums to better understand HDS use in Parkinson’s. This is valuable because one in three patients do not discuss HDS use with their neurologist, creating the potential for drug-supplement interactions. Future studies can combine online and in-person cohorts to validate these findings.

155. A Case Series of Two Cyclopeptide Mushroom Poisonings: A Comparison of Silymarin and Cyclosporine as Adjunctive Treatments

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Background: Management of cyclopeptide-containing mushrooms presents a challenge due to difficulty with identification and limited treatments options with uncertain efficacy.

Hypothesis: Inhibition of OATP1B3 with either silymarin or cyclosporine may be an effective adjunct to standard therapies in cyclopeptide mushroom ingestion.

Methods: This case series describes two patients with cyclopeptide mushroom ingestion treated with inhibitors of OATP1B3.

Results: Case 1: A 64-year-old male developed vomiting and diarrhea six hours after eating foraged mushrooms identified as *Amanita virosa*. He presented the following morning with lethargy. Examination was notable for tachycardia, tachypnea, abdominal distention, and tenderness. Laboratory studies were notable for AST 87 U/L, ALT 66 U/L and acute kidney injury. He was given multiple doses of activated charcoal (MDAC) and intravenous N-acetylcysteine. He received one dose of oral milk thistle complex followed by intravenous silymarin 36 hours post ingestion. Silymarin was administered for approximately 24 hours. The patient's AST/ALT improved to 41 U/L, and he was discharged on hospital day three. Case 2: A 52-year-old female presented with gastrointestinal distress beginning four hours after consuming soup containing foraged mushrooms including *Galerina spp.* Examination was normal except for hypertension at 170/129 mmHg. Symptoms persisted for 10 hours. Initial laboratory assessment showed AST 67 U/L and ALT 86 U/L. N-acetylcysteine and MDAC were started. Hours later, the patient had rising aminotransferases and received intravenous cyclosporine and octreotide. Thirty hours after ingestion, ALT peaked at 1079 U/L, total bilirubin peaked at 3.7, and INR remained normal. No renal injury occurred. The patient recovered completely and was discharged on hospital day six.

Conclusion: Poisoning by cyclopeptide-containing mushrooms remains a challenge due to high morbidity and limited data on available treatment options. We present two cases of hepatotoxicity secondary to foraged cyclopeptide-containing mushrooms, one treated with silymarin and the other with cyclosporine. Both received MDAC and n-acetylcysteine, and both recovered fully. Silymarin and cyclosporine are promising options owing to competitive inhibition of OATP1B3 limiting hepatic uptake of toxin. Intravenous

silymarin is appealing given its limited side effect profile yet is limited by availability and need for investigational new drug application. Cyclosporine is readily available due to its routine use for transplant rejection but is nephrotoxic. Mycologists confirmed mushroom identification in both cases via consultation by the Poison Center. Our series adds to the available data that either silymarin or cyclosporine may be effective treatments for cyclopeptide mushroom poisoning.

156. What's for Dinner? A Case Series of Foraging Misadventures Resulting in False Hellebore Toxicity

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Background: False hellebore (*Veratrum viride*) is a perennial plant native to both the eastern and western United States, known for containing veratrum alkaloids that open sodium channels and lead to bradycardia and hypotension. Toxicity is rare and associated with the misidentification of plants during foraging, commonly with the look-alike species ramp (*Allium tricoccum*).

Methods: This is a case series of three patients who presented for medical evaluation following ingestion of false hellebore. Two cases misidentified the plant as skunk cabbage (*Symplocarpus foetidus*) and one case was a pediatric exploratory ingestion.

Results: Two previously healthy adults presented to the emergency department (ED) two hours after ingesting two and three tablespoons of false hellebore, misidentified as skunk cabbage, with dinner. Both were initially asymptomatic on arrival and activated charcoal 50 g was ordered. The 39-year-old female remained asymptomatic with normal vital signs and electrocardiogram following activated charcoal and was discharged from the ED after a six-hour observation period. The 38-year-old male developed vomiting prior to receiving activated charcoal with ensuing bradycardia and hypotension refractory to intravenous fluids. He was treated with intravenous fluids totaling four liters, atropine 0.5mg bolus, epinephrine infusion titrated to maximum dose 0.1 mcg/kg/min, and admitted to the medical intensive care unit. Due to rising lactic acid levels, he was transitioned to norepinephrine infusion with maximum dose 0.1 mcg/kg/min. Vasopressor medications were weaned successfully after eight hours. There was no change in mental status, and he was discharged on hospital day three with normal vital signs. A previously healthy two-year-old female presented to a local ED with vomiting and lethargy two hours after exploratory ingestion of a plant foraged by parents and

subsequently identified as false hellebore via mobile application. She was hypotensive and vomiting without compensatory tachycardia on arrival. She received antiemetic medications, 20 cc/kg intravenous fluid bolus, and 1.5x maintenance fluids with improvement in blood pressure. She was then transferred for admission to the pediatric intensive care unit for close monitoring. Intravenous fluids were discontinued seven hours after initial presentation, and she was discharged on hospital day two without further intervention.

Conclusion: Ingestion of false hellebore can cause severe bradycardia and hypotension that responds well to intravenous fluid resuscitation and vasopressor support. Time to onset of symptoms was approximately two hours in this case series. False hellebore is sometimes mistaken for edible plants such as skunk cabbage or ramps, which can lead to unintentional poisoning.

157. Recurrent Ventricular Fibrillation and Cardiac Arrest Following *Psilocybe Cyanescens* Ingestion

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Background: The principal ingredient in "magic" mushrooms is psilocybin. Used recreationally for its psychedelic properties, serious harm from psilocybin is uncommon. We report the case of a young man who developed cardiac arrest on two occasions after using psilocybin containing mushrooms.

Results: A previously-well 28-year-old male collapsed 30 minutes after ingesting 3.5 grams of psilocybin-containing mushrooms (*Psilocybe cyanescens*) purchased online. He had not consumed mushrooms previously. Bystander CPR was initiated, and EMS found him to be in ventricular fibrillation. Sinus rhythm was restored after four rounds of defibrillation. Thirty days later, he consumed 1.5 grams of the same brand of mushrooms with friends. Within 30 minutes, he again experienced cardiac arrest and was defibrillated twice by EMS. During both hospitalizations, an electrocardiogram, echocardiogram, stress test and cardiac MRI were all unremarkable. He had a normal coronary angiogram, and a procainamide infusion did not induce a Brugada pattern. He declined ICD implantation on both occasions. One year later, he had a third unprovoked cardiac arrest while playing video games. He was pulseless but responded to shock using a home defibrillator. Investigations were again unremarkable, and an ICD was implanted. Upon reassessment one year later, clinical testing

remained normal. Genetic testing was performed to explore genes associated with congenital arrhythmia syndromes. The only abnormality was a rare variant (c.6275G>A, p.G2092E) in the *CACNA1D* gene. The patient was later seen by an electrophysiologist specializing in inherited arrhythmias who deemed the variant insignificant. The Naranjo adverse drug reaction (ADR) probability scale was completed, suggesting definite ADR with a score of nine.

Conclusion: The serial occurrence of cardiac arrest shortly after mushroom ingestion suggests a possible causal relationship, especially in the absence of a competing explanation such as a channelopathy, cardiomyopathy or ischemia. While the basis for any such effect is speculative, psilocybin's active metabolite psilocin has been demonstrated to have agonist activity at the 5-HT₄ receptor, which is found in human cardiac tissue and when stimulated, it leads to increased cAMP, along with increased intracellular calcium in myocardial tissue and increased force of contraction. In this case, psilocybin may have provoked an arrhythmia due to 5-HT₄ mediated calcium imbalance which may have induced triggered activity, although the exact mechanism is unclear.

158. Postmortem Toxicological Presence of THC Among Colorado Residents Younger Than 25 Years

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Background: Epidemiologic studies have shown a possible association between adolescent cannabis use and suicidality. In an attempt to understand this association the Colorado Department of Public Health and Environment (CDPHE) collects mortality data to determine whether tetrahydrocannabinol (THC), the main psychoactive constituent of cannabis, by itself or in conjunction with alcohol or other scheduled drugs, were present in postmortem toxicology test results (PMTR) of Coloradans younger than age 25 whose deaths were non-natural and non-homicide.

Research Question: In this population of interest, has THC presence in PMTR increased since legalization and is it present more in suicides?

Methods: This is a cross-sectional study looking at deaths among Coloradans younger than age 25 that occurred between January 1, 2010 and December 31, 2022. Data is obtained from three sources, the Colorado Violent Death Reporting System, the State Unintentional Drug Overdose Reporting System, and death certificates. PMTR were used to identify and stratify into groups based on the presence of THC and other substances, when available, and to examine differences in cause of death and demographics by age, sex, race, and ethnicity. Crude mortality rates were examined to

compare differences by year and between groups based on the presence of THC and other substances.

Results: In 2022, THC-only test results account for 8.5% of the deaths among the total population of interest and this is consistent with data from January 2010 to December 2021, with THC-only accounting for 8.7% of deaths. Since 2010, suicide has consistently been the leading cause of death in the population of interest, with an overall mortality rate of 8.8 deaths per 100,000 persons in 2022. Among suicides with toxicology results available, the mortality rate for those with presence of THC-only or THC plus other substance were each at 1.3 deaths per 100,000 persons, compared to the rates for those with no substance present (2.5 per 100,000) and other substance(s) present (2.3 per 100,000).

Conclusion: Among the population of interest, presence of THC-only in PMTR has not increased in Colorado since legalization of cannabis and the suicide mortality rate is low. Presence of a substance in a PMTR does not indicate the substance was the cause of death. In respect to THC specifically, presence is also non-equatable with THC intoxication at the time of death. More research is needed to assess how PMTR values relate to intoxication.

159. Rigid Thinking: An Atypical Case of Neuroleptic Malignant Syndrome with Hyperreflexia and Clonus

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Background: Neuroleptic malignant syndrome (NMS) is a potentially lethal neurologic disorder following exposure to a dopamine receptor antagonist or withdrawal of a dopamine receptor agonist. Classic manifestations of NMS include hyperthermia, muscle rigidity, and elevated creatine kinase. Deep tendon reflexes are usually decreased. The presence of hyperreflexia or clonus would typically favor a competing diagnosis such as serotonin syndrome.

Hypothesis: Does the presence of hyperreflexia and clonus exclude NMS?

Methods: This is a single patient chart review. A 24-year-old man with a history of major depressive disorder and generalized anxiety disorder was admitted initially to psychiatry due to aggressive behavior towards family and transferred to the ICU with concern for NMS. He had been on haloperidol decanoate (last dose 10 days prior to ICU) and in psychiatry was started on haloperidol 10 mg BID as well as trazodone 50 mg nightly. The patient had a history of cannabis use but no other substances. He developed diaphoresis, tachycardia, dysautonomia, and increased tone in the upper and lower extremities, with brisk deep tendon reflexes and 6/8 beats of ankle clonus bilaterally.

Results: Neuroleptics and serotonergic agents were discontinued upon admission. Creatine kinase peaked on ICU day

two at 1070 U/L. MRIs of the brain, cervical, thoracic, and lumbar spine were obtained to exclude concomitant upper motor neuron pathology, which was ultimately negative. CSF studies were obtained, which were ultimately negative for an infectious, autoimmune, and paraneoplastic process. There were no epileptiform discharges by electroencephalography. Thyroid stimulating hormone and metanephrines were normal. Psychiatry was consulted and the patient did not meet criteria for catatonia. The patient was started on GABA agonists including benzodiazepines and phenobarbital without significant change. He was started on bromocriptine 2.5 mg three times daily with gradual improvement over two weeks and was subsequently discharged home on an outpatient taper. His ankle clonus had gradually declined with complete resolution by the fourth week of his five week hospitalization. Through an exclusionary diagnostic process, the patient was ultimately diagnosed with NMS.

Conclusion: Although an atypical presentation, hyperreflexia and clonus may be seen in neuroleptic malignant syndrome. However, the rare nature of such a case should prompt further investigation.

160. Seizure Prophylaxis in Bupropion Toxicity: Is Phenobarbital the Better First-Line Choice?

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Background: Bupropion is a known cause of drug-induced seizures. Previous studies have evaluated the utility of certain clinical findings, such as tachycardia, QRS and QTc durations, hyperglycemia, reported dose, and psychomotor agitation. However, limited data exists on the utility of pharmacologic seizure prophylaxis in high-risk patients. An ideal therapeutic agent would exhibit rapid onset, with sustained anticonvulsant activity and minimal sedative effects. There has not been a head-to-head comparison of phenobarbital vs. benzodiazepines in the setting of symptomatic bupropion ingestions.

Methods: This single poison center retrospective observational chart review analyzing symptomatic, single substance bupropion ingestions >900mg during a six-month period (May 4 – November 4, 2024) in patients who received prophylactic benzodiazepines or phenobarbital. Patients with preceding seizures, cardiac arrest, or intubation were excluded. The following case details were compiled and enumerated: presenting (or earliest available documented) heart rate, development of seizure activity, admission to an

intensive care unit (ICU), and hypotension (SBP < 90 mmHg). Statistics were performed using an unpaired, one-tailed t-test. **Results:** Twenty-three patients met inclusion criteria, five of whom received phenobarbital and 18 who received benzodiazepines. The most common confirmed formulation of bupropion ingested were the 150/300 mg XL formulations (PB vs. BZD group) ($n = 3/5$ vs. $10/18$, respectively). Although the poison center recommendation was 10 mg/kg phenobarbital loading dose, there was no consistency in the dosing of phenobarbital. The most common benzodiazepine administered was lorazepam ($n = 12/18$). One patient from either group received single dose activated charcoal, with the benzodiazepine-administered patient subsequently being admitted to the ICU. Seizures (PB vs. BZD group) ($n = 0/5$ vs. $3/18$, $p = 0.04$), hypotension ($n = 0/5$ vs. $3/18$, $p = 0.04$), intubation ($n = 0/5$ vs. $2/18$, $p = \text{NS}$) and ICU admissions ($n = 0/5$ vs. $11/18$, $p < 0.0001$), only occurred amongst patients in the benzodiazepine group. No significant difference existed between the mean presenting heart rate ($p = \text{NS}$), or intubation rates.

Conclusions: Data on the efficacy of phenobarbital versus benzodiazepines for seizure prophylaxis in symptomatic bupropion toxicity is limited. Our single center retrospective review demonstrates a statistically significant difference in the number of patients with seizure activity following use of phenobarbital vs. benzodiazepines as a first-line therapy. This review is limited by its sample size, retrospective nature, at times unclear documentation of patient course, and lack of confirmatory testing of both bupropion and its hydroxybupropion metabolite. In light of these preliminary findings, phenobarbital warrants further consideration as a potential first-line agent in symptomatic bupropion overdoses.

161. Ketamine Exposure Trends Reported in the U.S. National Poison Data System

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Background: Ketamine is being increasingly used globally as a recreational drug. While rates of ketamine overdoses in the U.S. remain low, illicit ketamine use and availability have generally increased. The present study sought to evaluate the recent trends in toxic exposures to ketamine reported to the U.S. poison centers (PCs).

Methods: The National Poison Data System (NPDS) was queried for ketamine exposures that were reported to the U.S. PCs from 2018 to 2023. We identified and descriptively assessed the relevant demographic and clinical characteristics. Poisson regression models were used to evaluate the trends in the number and rates (per 100,000 human exposures) of ketamine. Percent changes from the first year of the study (2018) were reported with the corresponding 95% confidence intervals (95% CI).

Results: There were 2,188 ketamine-related cases resulting reported to the U.S. PCs during the study period. The frequency of ketamine exposures increased by 99.2% (95% CI: 85.6%, 112.6%, $p < 0.001$) while the rate increased by 101.1% (95% CI: 90.8%, 111.4%, $p < 0.001$). Single substance ketamine exposures accounted for 44.4% ketamine exposures, with this proportion increasing during the study period (44.5% to 46.2%). The proportion of calls from acute care hospitals was 66.2% and it decreased during the study period (73.6% vs. 63.1%). Among cases, ages between 20 and 29 years (29.9%) constituted the most common age group followed by ages 30 – 39 (23%) and ages 13–19 (11.1%). Males accounted for 54.6% cases. The most frequently co-occurring substances observed with the cases were benzodiazepines (17%) and alcohol (10.7%). Intentional abuse and suspected suicides were the most common reasons for exposure. Among the sample, 18.8% of the cases were admitted to the critical care unit; the majority of the patients were treated, evaluated and released. Serious (major and moderate) effects were seen in 47.6% of cases. Central nervous system depression, agitation, tachycardia, confusion, and hypertension were the commonly encountered clinical effects. Sedatives (e.g., benzodiazepines, propofol) and naloxone were the most common pharmacological therapies used.

Conclusion: The number of ketamine exposure cases handled by the PCs increased significantly. The younger population was most affected by such toxic exposures. Naloxone was administered to a high percentage of patients due to misidentification as an opioid overdose.

162. Neuroleptic Malignant Syndrome in a Frontotemporal Dementia Patient with Concurrent Quetiapine Use

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Background: Patients with frontotemporal dementia (FTD) may have underlying disordered dopaminergic transmission.

Hypothesis: FTD and atypical antipsychotics, even at low doses, may predispose patients to developing neuroleptic malignant syndrome (NMS).

Methods: This is a case report of a 65-year-old male with a four-year history of both FTD and epilepsy who presented to the emergency department after prolonged seizure-like activity for the second time within four months. For the previous 14 months, he was on two low-dose atypical antipsychotics for FTD-related agitation. After 12 months of risperidone, he switched to quetiapine due to adverse effects. Initial vitals were temperature 38.6°C, pulse 118 bpm, blood pressure 93/68 mmHg, and respiratory rate 40/min. On exam, he was unresponsive with diffuse tremors. He was intubated due to seizure-like activity refractory to benzodiazepines. Initial

diagnostic labs revealed creatinine kinase (CK) 665 U/L, lactate 3 mmol/L, and WBC 15.8 k/mcL. Approximately three months prior, he was also hospitalized for seizure-like activity and was initially treated empirically for clinical refractory convulsive status epilepticus. During this first hospitalization, however, the first 24-hour EEG was negative for seizures and NMS features included altered mentation, CK elevation (> 20,000 U/L), flexed right upper extremity, and continued use of risperidone.

Results: From days two to four of his second hospitalization, the patient had recurrent episodes of dysautonomia with low-grade fevers, significant hypertension, tachycardia, tachypnea, diaphoresis, diffuse rigidity, tremors, and agitation. On day three, his agitation necessitated a dexmedetomidine infusion. Until this point, he received his home valproate but no antidopaminergic agents. By day five, his mentation improved, and he was extubated. No electrographic ictal or epileptiform activity was seen during these dysautonomia events. Neuroimaging was negative for radiographic abnormalities. He had rhabdomyolysis (peak CK 6832 U/L) and coagulase-negative staphylococcus bacteremia on initial cultures. Concern for toxic encephalopathy from sympathomimetics was low due to lack of exposure to such agents and a negative urine drug screen. In the absence of other causes, the patient's paroxysmal autonomic instability with significant blood pressure elevation and fluctuation, hyperthermia, rigidity, CK elevation, and altered mentation in the setting of chronic quetiapine use and possible concomitant infection are consistent with NMS. He ultimately recovered and was cleared for discharge on day 10.

Conclusion: Atypical antipsychotics have been less strongly associated with NMS than typical antipsychotics, however, the risk of NMS in the setting of FTD with long-term atypical antipsychotic exposure warrants further investigation.

163. Combined Metformin and Valproate Overdose Leading to Synergistic Toxicity

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Background: Metformin and valproate are both xenobiotics that cause mitochondrial dysfunction in overdose through separate but related mechanisms. We present a patient with an acute overdose of metformin and valproate, whose clinical course suggests there exists synergism between these two toxins. This combination has not been previously reported in humans.

Methods: This is a case report of a single patient treated in our institution. The patient is a 57-year old man who presented within six hours of an intentional overdose of approximately 30 g metformin and 30 g delayed release valproic acid. On presentation, the patient's vitals were within normal

limits, and he had somnolence without focal neurological deficits on physical exam. His initial laboratory studies were remarkable for a creatinine of 1.42 mg/dL, normal transaminases, bicarbonate of 17 mmol/L, anion gap of 22, pH of 7.27, lactate of 7.7 mmol/L, ammonia of 90 mmol/L, and a valproate level of 344.5 mcg/ml. He was admitted to the ICU and started on L-Carnitine. eight hours later the patient became bradycardic, apneic and was intubated. Repeat labs demonstrated a bicarbonate of 7 mmol/L, anion gap of 48, pH of 6.98, lactate of 29.8, a peak ammonia of 418 mmol/L, and a downtrending valproate level of 228 mcg/ml. Ethylene glycol and methanol levels were negative. He was started on continuous renal replacement therapy (CRRT) and multiple vasopressors. On day three, he was extubated and no longer required vasopressors. On day four, CRRT was discontinued and his mental status and creatinine normalized. A metformin level was drawn with his repeat labs six hours after presentation which resulted at 66 mcg/ml.

Results: Metformin and valproate both alter mitochondrial function. Valproate toxicity diverts metabolism from mitochondrial beta oxidation into omega oxidation while metformin inhibits pyruvate carboxylase and is also thought to be a complex I inhibitor. In isolated cases of metformin associated lactic acidosis and valproate toxicity patients who exhibit this degree of toxicity often are found to have higher levels than seen in our patient, suggesting a synergistic effect between these agents.

Conclusion: Our patient had a critical clinical course with serum levels of both metformin and valproate below that which is often found in patients with similarly severe presentations. This suggests the ingestion of these two mitochondrial toxins may lead to a "two-hit" mechanism of mitochondrial toxicity causing a more severe toxicity than would otherwise be predicted.

164. Delayed Onset of Oculogyric Crisis Following Risperidone Overdose in Young Female Patient With Complex Psychiatric History

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Background: Oculogyric crises (OGC) are a rare neurological symptom presenting with sustained dystonic bilateral, usually upward, fixation of the eyes. Currently all accepted explanations for the pathophysiology of an OGC involve disrupting dopaminergic signaling in some fashion. Risperidone is a second-generation antipsychotic that is known to cause dystonia including oculogyric crises both acutely within hours of administration and days into a treatment regimen.

Research Question: Can the onset of OGC be significantly delayed after a one-time ingestion of risperidone?

Methods: In this case report we describe a 23-year-old female who presented to a tertiary care Emergency Department in acute distress because of a bilateral upward fixed gaze, diagnosed in the ED as an oculogyric crisis, 24 hours after a suicide attempt using a friend's risperidone. Per EMS, the patient took six tablets of 1 mg risperidone approximately 24 hours prior to arrival. Upon examination, the patient stated she was unable to move her eyes. Eye exam was notable for a fixed upward gaze bilaterally, pupils were equal and reactive to light measuring 2–3 mm bilaterally, grossly intact visual fields, with increased eye blinking. Patient denied eye pain. Remainder of the physical exam was notable for intermittent tongue protrusion and superficial cuts to the left forearm. She had a blunted affect with a linear thought process.

Results: Throughout a 1–2-hour observation period while obtaining lab workup, the patient's fixed upward gaze persisted, after which time the patient was given 1 mg of intravenous benztropine. Upon re-evaluation approximately one hour following medication administration, the patient's upward gaze deviation had completely resolved. Upon chart review, the patient did not have recurrence of dystonia while in the PEC for approximately 20 hours and was ultimately transferred to an inpatient psychiatric facility.

Conclusion: This case report presents an atypical case of oculogyric crisis that occurred approximately 24 hours after ingestion of a significant dose of risperidone. Clinicians should recognize that although most OGC and acute dystonic reactions occur within a few hours after ingestion, delayed reactions are definitely possible. Delaying treatment of OGC could cause further complications such as prolonged symptoms and psychological impact.

165. Dopamine Agonist Withdrawal Syndrome in a Patient without Parkinson's Disease

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Background: Dopamine agonist withdrawal syndrome (DAWS) has been reported upon tapering or discontinuation of dopamine agonists in patients with Parkinson's disease (PD) with impulse control disorders (ICD) and more rarely in patients with restless leg syndrome (RLS). Patients may experience panic attacks, anxiety, fatigue, insomnia, and autonomic symptoms not attributable to other conditions. Symptoms may develop promptly after dose reduction or tapering and are often refractory to treatment with medications other than the inciting dopamine agonist.

Hypothesis: Developing tolerance to supratherapeutic doses of pramipexole for RLS can lead to DAWS after abrupt cessation of therapy.

Methods: This is a single patient chart review. A 53-year-old man with a past medical history of RLS, hypertension, lumbar radiculopathy, and depression presented to the emergency department (ED) with anxiety and panic attacks. He had stopped taking pramipexole three days prior to presentation as he was unable to obtain a new prescription. He had been prescribed 1 mg of pramipexole nightly for RLS for two years, though he reported taking higher than prescribed dosing up to 3 mg nightly. He continued taking his prescribed duloxetine, gabapentin, furosemide, and medical marijuana. He denied recreational use of ethanol or benzodiazepines; external pharmacy records did not reveal prior benzodiazepine prescriptions.

Results: Physical examination revealed an anxious-appearing man with diaphoresis. Electrocardiogram revealed sinus tachycardia at 108 beats/minute without ischemic changes. Temperature was 36.6°C; blood pressure was 168/92 mmHg. Oxygen saturation and respiratory effort were normal. Laboratory analyses revealed mild leukocytosis, normal thyroid stimulating hormone, and normal electrolytes. Urine drug screen was positive for cannabinoids; amphetamines, benzodiazepines, buprenorphine, cocaine, fentanyl, methadone, monoacetylmorphine, opiates, and phencyclidine were not detected. The patient was given 1.5 mg pramipexole with symptomatic improvement and was discharged after brief observation.

Conclusion: We present a case of suspected DAWS in a patient on pramipexole for the treatment of RLS rather than PD. Lifetime cumulative dose of dopamine agonists and ICD are hypothesized to be risk factors for DAWS; however, chronic use of higher doses than prescribed with abrupt discontinuation may have contributed to this patient's symptoms. As the patient improved after reinitiation of the dopamine agonist, workup was otherwise unrevealing, and history was not suggestive of sedative-hypnotic withdrawal, sympathomimetic intoxication, or thyroid dysfunction, this supports the diagnosis of DAWS.

166. The Altered Elderly: A Case of Parkinson's Hyperpyrexia Syndrome

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Background: Parkinson's hyperpyrexia syndrome (PHS) also known as neuroleptic malignant-like syndrome (NMLS), is a rare but potentially life-threatening condition

seen in patients with Parkinson's disease, often triggered by abrupt discontinuation of dopaminergic medications. The syndrome remains underdiagnosed, with only a few cases reported in the literature so far.

Results: This is a single-patient case report. A 74-year-old man was brought to the emergency department for altered mental status. On arrival, he appeared deeply sedated with diffuse rigidity. His medical history included Parkinson's disease and thrombocytosis. He was compliant with his medications, including levodopa-carbidopa (dopamine replacement), rotigotine patch (dopamine agonist), entacapone (catechol-O-methyltransferase inhibitor), zolpidem (sedative-hypnotic), and escitalopram (selective serotonin reuptake inhibitor). His initial vital signs included a blood pressure of 116/64 mmHg, a heart rate of 144 beats/minute, a respiratory rate of 28 breaths/minute, temperature of 41°C, and an oxygen saturation of 100%. He was intubated for airway protection. Initial lab results were notable for a bicarbonate of 14 mmol/L, creatine phosphokinase of 1,390 IU/L, sodium of 116 mmol/L, lactate of 4.6 mmol/L, and white blood cell count of 15,800 cells/L. Early empiric treatment included cooling, antibiotics, and IV hydration. Liver function tests, inflammatory markers, urine drug screen, CT angiography of the brain, chest, and abdomen, and a lumbar puncture were all unremarkable. Review of his medical history revealed that levodopa-carbidopa had been reduced to half of the original dose 10 days prior by his physician. NLMS remained the highest on our differential diagnosis, so anti-parkinsonian medications were promptly reintroduced, and target temperature was achieved using cooling measures. The patient was subsequently admitted to the intensive care unit, where he had a complicated stay before being transferred to another facility, where he eventually passed away months later.

Conclusion: Parkinson hyperpyrexia syndrome results from a central hypodopaminergic state caused by abrupt withdrawal, reduction, or cessation of dopaminergic drugs. To the best of our knowledge, there are no diagnostic criteria for PHS. However, it is characterized by hyperthermia, autonomic instability, altered mental status, and muscular rigidity, resembling the features of neuroleptic malignant syndrome, which our patient had. Patients with Parkinson's disease are inherently dopamine-depleted, making them especially susceptible to this syndrome if antiparkinsonian medications are withdrawn. In cases with high clinical suspicion, it is vital to promptly reintroduce antiparkinsonian medications. Other supportive measures include managing the hyperthermia, airway protection, benzodiazepines for any neuromuscular agitation, and monitoring.

167. Neurotoxicity After Intrathecal Cefepime Administration

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Background: Cefepime is a fourth-generation cephalosporin and beta-lactam antibiotic. Although cefepime is generally well tolerated, there are reports of neurotoxicity proposed to result from competitive antagonism of γ -aminobutyric acid (GABA) receptors.

Methods: This is a case report based on a single patient chart review. A 10-year-old male with a past medical history of severe traumatic brain injury status post decompressive craniotomy, cranioplasty, and persistent cerebrospinal fluid (CSF) leak was admitted for scheduled lumbar drain placement and transmastoid repair with ossiculoplasty. Surgery was performed with no complications and he was admitted to the pediatric intensive care unit (PICU). In the PICU, the patient was inadvertently administered 50.54 mg/kg cefepime intrathecally via the lumbar drain. He immediately developed pruritus of his lower back and gluteal region, emesis, and muscle spasms to his lower extremities. Shortly following the initial symptoms, he displayed seizure-like convulsions, desaturated, and became unconscious. The patient was emergently intubated and given lorazepam, midazolam, levetiracetam, fosphenytoin, pentobarbital, and propofol. CT of the brain was unremarkable. Twenty-seven mL of CSF was removed via the lumbar drain. Propofol, midazolam, and pentobarbital infusions were continued as continuous EEG was consistent with status epilepticus. Medical toxicology was consulted and recommended dialysis. A CSF exchange was considered but deemed too high risk. Initial CSF and serum cefepime concentrations were 760.6 mg/L and 6.3 mg/L, respectively. Dialysis was started and the patient was kept on continuous EEG.

Results: After two days, serum cefepime concentrations were undetectable and CSF concentrations had decreased to 89.4 mg/L. After initial hemodialysis, the patient was continued on continuous veno-venous hemofiltration (CVVH) for four days. Antiepileptics and sedatives were gradually weaned. After seven days, cefepime was undetectable in CSF. The patient remained seizure-free on levetiracetam, perampanel, and phenobarbital. The patient was extubated after nine days, was transferred out of the PICU on day 16 and discharged on day 29.

Conclusion: Our case report is the first documented incident of neurotoxicity from the intrathecal administration of cefepime resulting in immediate neurotoxicity and an extremely high CSF cefepime concentration of 760.6 mg/L. In contrast to previous reports of CIN, symptom onset was immediate and progressed rapidly to status epilepticus. CSF cefepime concentrations significantly decreased but remained toxic despite two days of hemodialysis and CVVH. The patient gradually improved with aggressive

anti-epileptic therapy, mechanical ventilation, and hemodialysis, but had a protracted clinical course lasting 29 days.

168. Withdrawal of Care After Non-Futile Baclofen Overdose

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Background: Baclofen is known to mimic brain death in overdose.

Hypothesis: Surrogate decision making after suspected suicide attempt is at risk of early withdrawal of care in non-futile cases.

Methods: This is a single patient case review. The patient is a 63-year-old woman with a history of multiple sclerosis, bipolar disorder, and hypothyroidism found unresponsive at home after being seen well five hours previously. Police on scene did not feel a pulse and initiated CPR. On EMS arrival, CPR was continued with a mechanical compression device and at first pulse check the patient was found to have a pulse. She was noted to have seizure-like activity prior to transport which self-resolved in less than 2 minutes. She was transported to the emergency department where she was emergently intubated. She was admitted to ICU and initiated on therapeutic hypothermia. On hospital day one, a family meeting with her husband and adult children occurred, revealing a strong interest in withdrawal of life-sustaining treatment. The treatment team advised to re-evaluate after rewarming, which the family was agreeable to. On hospital day two, the patient had a burst-suppression pattern on EEG consistent with encephalopathy and rewarming began. The patient's family revealed the patient had been researching suicide on her phone and had previously inquired about death with dignity, but her multiple sclerosis was not considered terminal. On hospital day three, the patient had an EEG with improvement from burst suppression to periodic generalized discharges, considered improved but with moderate-severe encephalopathy. Neurology noted exam and clinical data trending towards improvement. The patient was extubated based on the surrogate's goals of care. On hospital day four, the patient was noted to have hypoglycemia. On hospital day five, the patient transitioned to comfort measures only. On hospital day six, the patient opened her eyes to voice, tracked with her eyes, but did not respond to commands. She was transferred to in-patient hospice. On hospital day seven (in hospice) the patient awoke from a comatose state and requested food. On hospital day eight (in hospice), the patient was fully awake and stated she did not want to be in hospice and she did not want to have a do not resuscitate order.

Results: The patient was readmitted to the hospital after waking up in hospice. The baclofen concentration from hospital day one resulted after her hospital stay and was supratherapeutic at 2.1 mcg/mL (therapeutic 0.08–0.4 mcg/mL). She did not recall the overdose and did not admit to a suicide attempt.

Conclusion: Suicidal ideation is temporary, withdrawal of care is permanent. Care should be taken to avoid withdrawal of care in non-futile cases.

169. Neuroleptic Malignant Syndrome and Catatonia in Pregnancy Treated with Electroconvulsive Therapy

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Background: There is emerging evidence for electroconvulsive therapy (ECT) in the treatment of neuroleptic malignant syndrome (NMS). We describe a rare case of NMS with catatonia in a first trimester pregnant patient resistant to standard medical management but responsive to electroconvulsive therapy.

Hypothesis: Use of ECT for refractory or prolonged NMS should be strongly advocated to modulate the potential complications and length of illness.

Methods: This is a single patient chart review. A 34-year-old woman with a history of bipolar versus schizoaffective disorder in the first trimester of pregnancy was admitted to a local facility for decompensated psychosis in the setting of medication nonadherence. She was rapidly up titrated on aripiprazole, quetiapine, and haloperidol. On day 10 of hospitalization, three days after starting haloperidol, she developed autonomic instability, hyperthermia, lead-pipe rigidity, tremor, mutism, with a Bush-Francis Catatonia Rating Scale (BFCRS) of 13 concerning for NMS vs. malignant catatonia. She was transferred to our tertiary care center for further care.

Results: Neuroleptics were immediately discontinued, and she was treated with escalating doses of benzodiazepines. Treatment continued with dantrolene, bromocriptine, and lorazepam reaching maximal dosing over the course of 7 days. Work up including EEG, MRI brain, and lumbar puncture were unremarkable. ECT was considered due to inadequate response to medical management. Although she received clearance for the procedure from the maternal-fetal medicine team, ECT could not be performed immediately as she was unable to provide consent and required transfer from the ICU to an ECT-capable facility. While awaiting a court order, the patient's dysautonomia improved. Medical treatment with bromocriptine and dantrolene was tapered over 25 days. Despite the stabilization

of vital signs, she continued to exhibit catatonic features requiring benzodiazepines. Her hospital course was complicated by rhabdomyolysis, thrombophlebitis, aspiration pneumonia, and pregnancy loss. After 92 days of hospitalization, she underwent ECT with marked improvement after her second treatment. She completed 16 rounds of ECT and ultimately discharged home on hospital day 130 with outpatient psychiatric follow up.

Conclusion: Early initiation of ECT in this case may have afforded rapid symptom reduction leading to decreased hospital length of stay and potentially avoid associated complications.

170. Acute CNS Depression After Tumescant Lidocaine Injection and Aborted Liposuction

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Background: Tumescant lidocaine has gained popularity for procedures such as liposuction due to its ability to be administered in large quantities (35–55 mg/kg) and its slow absorption rate into the bloodstream, with peak plasma concentrations reached around 12–18 hours post-administration. Toxicity differs from other modalities, such as intravenous injection or high-dose infiltration, due to its delayed presentation; however, it shares similar central nervous system (CNS) and cardiovascular toxicity as well as treatment approaches. This case highlights a patient who exhibited signs of acute CNS toxicity following an aborted tumescant liposuction procedure and showed rapid reversal with lipid emulsion therapy. **Methods:** This is a single patient chart review. A 46-year-old female with no past medical history presented from a liposuction clinic with altered mental status. At the facility, she received 500 mg acetaminophen, 650 mg tranexamic acid, cephalexin 1000 mg, 2x 5–325 mg oxycodone-acetaminophen and 2 mg alprazolam. Five liters of tumescant anesthesia (5 L lactated ringer with 2,500 mg of lidocaine) were injected into the adipose tissue. However, before any liposuction was performed the patient exhibited signs of over-sedation, and was given 1 mg flumazenil and 0.4mg naloxone without any change in exam. The procedure was aborted, and a second dose of 0.5 mg IV naloxone was given without improvement. On ED arrival, her vitals were T 97.4 F, HR 78, BP 117/82, RR 20, SpO2 100% on 5L nasal cannula. On exam she was only nonverbal, responsive to painful stimuli, pupils mid-range at 3–4 mm and reactive, with slight “shaking” of the extremities. There was no clonus, hyperreflexia, or rigidity. EKG: NSR rate 76, QRS 88, QTC 459. **Results:** She received a 100 ml bolus of 20% lipid emulsion therapy and returned back to mental status baseline by 90 minutes after infusion. The patient was observed overnight in the

MICU without any recurrence of sedation or shaking episodes. She was discharged approximately 19 hours after ED arrival.

Conclusion: This case suggests that tumescant lidocaine toxicity may present with isolated CNS depression. It also highlights the potential need for lipid emulsion therapy in clinics that administer large quantities of lidocaine, to prevent delayed treatment, reduce the risk of worsening toxicity, and avoid unnecessary interventions for patients.

171. Severe Outcomes Following Intoxication by Attention Deficit and Hyperactivity Disorder Medications

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Background: Globally, attention deficit hyperactivity disorder (ADHD) affects 6–7% of children and 2.5% of adults, accompanied by a surge in ADHD medication dispensing and misuse.

Research Question: Are there independent predictors of severe outcome following ADHD medication intoxication, defined as critical care unit (CCU) admission or in-hospital death?

Methods: We conducted a multinational longitudinal cohort study using a toxico-surveillance database, capturing data from January 2010 through March 2023, using the Toxicology Investigators Consortium (Toxic) network of the American College of Medical Toxicology database. Toxic captures real-time exposure data from 47 sites across five countries (United States, Canada, United Kingdom, Israel, Thailand). The cohort consisted of recorded cases where acute stimulant ADHD medication intoxication has led to hospital-based care and/or death. We included individuals of all ages who presented to the emergency department (ED) at a participating Toxic hospital with an acute stimulant ADHD medication intoxication. We identified independent predictors of severe outcome (composite primary outcomes: CCU admission or in-hospital death) following stimulant ADHD medication intoxication using multivariable logistic regression model including temporal trends, demographic, and clinical characteristics.

Results: Among 1,582 ADHD medication intoxications, 1324 (83.7%) were intentional. Only 58 (3.7%) occurred in individuals diagnosed with ADHD. The annual number of intoxications doubled during the study, led by adolescents.

Overall, 53 (3.4%) intoxications were severe, including seven in-hospital deaths (0.4%). Mental health conditions other than ADHD (adjusted odds ratio [aOR] = 20.48, 95% CI = 8.5–48.8; $p < 0.001$) and an ADHD diagnosis (aOR = 2.49, 95% CI = 1.0–6.0; $p < 0.05$) were independently associated with severe outcome.

Conclusions: Most ADHD medication intoxications are intentional and occur in individuals who do not have ADHD, suggesting significant drug diversion. Mental health illness and ADHD diagnosis are associated with CCU admission and in-hospital mortality following ADHD medication intoxication.

Toxic: This research was performed by the ACMT Toxicology Investigators Consortium

172. Scorpion Sting as a Dangerous Occupational Hazard of Farming in Egypt Resulting in Respiratory Failure

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Background: Scorpion stings provide a significant health risk, particularly in developing countries. The African continent and the Middle East have the greatest prevalence and/or severity rates. Farmers, laborers, and rural residents are particularly vulnerable. Farming, irrigation, and a lack of enough artificial light could all contribute to their excessive exposure to scorpion stings.

Hypothesis: Scorpion sting results in respiratory failure in a farmer.

Methods: This is a single patient chart review. A 60-year-old male who worked on a farm in El Fayoum Governorate presented to a nearby hospital, complaining of nausea, vomiting, dizziness and dyspnea. He presumed to be stung by a small snake because his work place has plenty of them, but he couldn't identify it clearly at the time of the event because he was working on his farm at dusk. The patient had no medical history. He received antiemetics and antihistamines and was discharged. Two hours later, while on his way home with his relatives, he collapsed and was returned back to the same hospital. The patient was unconscious, tachypneic, his BP was 170/80, RR 25, pulse 110, SpO₂ 80% on room air. He was intubated, ventilated by bag valve mask with high flow oxygen, received one dose of snake antivenom, and transferred to our National Environmental and Clinical Toxicology Research Centre (NECTR), Cairo University four hours after the sting.

Results: On arrival he was unconscious, his initial vital signs: BP 180/120, pulse 120, temperature 37.3°C, RR 30, SpO₂ 97% with BVM ventilation and high flow oxygen, Glasgow Coma Score (GCS) 8/2t, and no local signs of

the sting on his right foot. Complete blood count, serial arterial blood gas measurement, cardiac enzymes, random blood sugar, electrolytes, liver and renal function, ECG, and chest x-ray were done. He was put on mechanical ventilation for being hypoxic, tachypneic, with respiratory acidosis. Then, he received at our center five snake antivenom, but he didn't show significant response after six hours. For this lack of improvement and the above clinical presentation, scorpion sting was suspected and three antiscorpion vials were given, after which the patient started to regain his consciousness, his vital signs stabilized, and he was extubated 12 hours after admission.

Conclusion: Farmers are vulnerable to envenomation. Scorpion sting should be suspected according to clinical presentation even when the history misleads to snake bite. Scorpion sting results in respiratory failure.

173. Pediatric Envenomation by the Northern Blacktail Rattlesnake (*Crotalus molossus*) Resulting in Amputation of Finger

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Background: *C. molossus* is native to the southwestern U.S. and Mexico. There are only three reports of *C. molossus* envenomation in the medical literature, including four patients, the youngest of whom was 12 years old. In none of these cases is loss of a digit reported, but one patient was diagnosed with compartment syndrome.

Hypothesis: *C. molossus* envenomation can be associated with severe tissue injury.

Methods: This is a single patient case report of a 9-year-old male with autism spectrum disorder who was envenomated in the right fourth finger with subsequent necrosis and amputation of the finger. A photograph of the rattlesnake was identified by a herpetologist as *C. molossus*, the Northern Blacktail Rattlesnake.

Results: The patient presented to an emergency department in northern Arizona after a bite to his right fourth finger by a rattlesnake. No tourniquets or other field interventions were administered. He had rapid onset of swelling but no systemic effects. Ten vials of Anavip® (Fab2AV) were given 1.5 hours after the bite and the patient was transferred to a toxicology referral center. No tourniquets, ligatures, or other non-standard treatments were administered in the field. On arrival, 2.5 hours post-bite, there was diffuse and severe swelling of the hand and forearm with hemorrhagic blebs and pallor to the fourth finger. Capillary refill remained less than 3 seconds. Dexmedetomidine infusion was administered as compliance with elevation and extension of the limb could not be maintained without sedation. Hemotoxicity did

not occur but upper extremity swelling progressed. A total of 34 vials of Fab2AV were given over 36 hours. The finger became increasingly dusky and necrotic appearing despite antivenom and elevation. Hand surgery performed debridement of the finger, fasciotomies of the ulnar and dorsal hand compartments, and fasciotomy of the wrist with carpal tunnel release on hospital day two. It was noted intraoperatively that all muscles appeared healthy but there was minimal bleeding of the distal finger. On hospital day five the finger was amputated and the fasciotomies were closed. He was discharged on day six. At 21 day follow up, the patient had returned to baseline function excluding the amputated digit. He did not develop bleeding, serum sickness, or other late complications.

Conclusion: Envenomation by *C. molossus* can cause significant tissue injury despite usual care including early and aggressive antivenom administration.

174. Severe Envenomation Due to Ingestion of Snake Head

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Background: Snake bites are a tropical disease, with 1.8 million envenomations reported annually, of which 138,880 are fatal. It affects agricultural workers and children in poor communities in developing countries where it is considered a public health issue. We present a case of envenomation secondary to the ingestion of snakehead.

Methods: This is a single patient chart review. A 45-year-old male from Tlaxcala, Mexico, roasted and ingested the head of a dwarf rattlesnake (*Crotalus ravus*) four hours before presenting to the emergency department with nausea, abdominal pain and dysarthria. His vital signs were blood pressure 100/80 mmHg, heart rate 105 beats/minute, respirations 18 breaths/minute, and temperature 36°C. He was admitted, and two vials of equine antivenom (Fab'2) were administered. During his stay he presented with elevated creatine phosphokinase at 2,500 IU, creatinine 4 mg/dl, INR 3. Toxicological advice was requested and classified as grade 2 poisoning; hence, it was suggested to increase the dose of antivenom. However, the vials were not available, and the patient developed hepatic and renal failure, requiring intubation and 3 hemodialysis sessions. After 15 days of supportive care, he was discharged.

Results: The inoculation of snake venom by bite has a lymphatic distribution. In cases of ingestion, it has been

described that the venom is broken down, limiting its absorption. In South Korea, a case of ingestion of 100 ml of snake wine by a 63-year-old man with somnolence and coagulopathy has been reported; he was treated with antivenom and discharged without complications. In Ecuador, a woman who ingested 1 ml of Bothrops snake venom presented with abdominal pain, nausea, hematuria, jaundice and acute kidney injury 72 hours later and was treated with renal replacement therapy, but there are no reports of venom gland ingestion as in our case, despite being roast before ingestion. In a study by Ownby and co-workers it was shown that some hemorrhagic toxins of snake venom can retain their properties at temperatures of 100°C, besides the absorption of toxins depends on the epithelium of the mucosa and the gastric permeability.

Conclusion: The ingestion of *Crotalus ravus* venom may lead to systemic effects such as coagulopathy and myotoxicity, so the patient should be treated and classified in the same way as in snakebite envenomation.

175. Venom Ophthalmia Due to a Non-Spitting-Snake: An Unusual Form of Envenomation

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Background: Venom ophthalmia occurs when the eye is exposed to snake venom, primarily associated with elapids. However, when it results from exposure to a non-spitting snake, such as a viperid, it is an even rarer phenomenon. Such exposures typically happen accidentally and can lead to painful ophthalmic lesions due to the presence of neurotoxins, hemotoxins, and cytotoxins in the venom. These components can cause ocular hemorrhage and inflammation, and the lack of systemic complications reported in the literature is thought to be due to the limited absorption of venom into systemic circulation. We present a case report of a venom ophthalmia following accidental exposure to *Crotalus* venom while attempting to kill the snake.

Results: A 58-year-old man presented to the emergency department after experiencing accidental venom exposure to both eyes by a *Crotalus*. The incident occurred seven hours prior, while he was attempting to kill the snake, which inadvertently discharged venom. He reported pain in his left eye, and physical examination revealed periorbital

edema, conjunctival hemorrhage and chemosis in the left eye, with minor involvement of the right eye. Vital signs, laboratory tests, including a 12-lead electrocardiogram, were within normal limits. Initially, the patient received two vials of F(ab')₂ antivenom, followed by an additional five vials, along with ophthalmic irrigation. Ophthalmologic evaluation revealed no further lesions, and ophthalmic anti-inflammatory treatment was initiated. After 12 hours of observation, the patient was discharged from the emergency department without developing any additional complications, showing clinical improvement without any visual impairments.

Discussion: While venom-related injuries are often associated with bites, this case underscores that exposure can happen in other ways, including post-mortem encounters. Hemotoxin-induced retinal hemorrhage remains a leading cause of permanent vision loss, highlighting the need for timely treatment. Immediate ophthalmic irrigation and timely administration of F(ab')₂ antivenom may have improved the outcome, making prompt intervention crucial for preventing long-term complications and ensuring proper care for venom-induced ocular injuries.

176. Immaculate Envenomation

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Background: While rattlesnake envenomations are almost always associated with visible wounds, cases have been reported in which the physical exam is not consistent with typical findings of an envenomation, leading to potential delays in diagnosis and treatment. This report details a case of a pediatric envenomation that occurred without an identifiable bite wound.

Methods: This is a single patient chart review. A 7-year-old male with a history of autism and language impairment presented to a pediatric emergency department with several hours of hand swelling. He was outside playing when his family noticed that his left thumb was swollen, which quickly progressed to involve his entire hand. The family was concerned about rattlesnake envenomation because he frequently caught small animals, including several rattlesnakes. On initial evaluation, the patient's hand swelling and ecchymosis had progressed to include the hand, forearm, and elbow. He had also developed myokymia on his forearm, arm, and face. The skin was thoroughly examined but no wound could be identified. Complete blood counts, chemistries, and coagulation studies were obtained.

Results: Initial labs revealed a mildly elevated prothrombin time of 17.3 seconds and INR of 1.28. Platelet count and fibrinogen concentration were within normal limits. Ten vials of crotalidae immune F(ab')₂ (equine) were administered for treatment of a presumptive rattlesnake envenomation, with expected clinical response. On hospital day two, the patient's family discovered a live snake in the patient's home terrarium which was positively identified as a Southern Pacific Rattlesnake after review of several pictures by medical toxicology. He was ultimately discharged on hospital day three; platelet count and coagulation studies remained within normal limits on recheck one week after discharge.

Conclusion: Skin findings, such as puncture wounds or lacerations, are typically expected as part of the clinical presentation of rattlesnake envenomation. This unusual case illustrates that the absence of an identifiable wound cannot exclude a rattlesnake envenomation in the setting of other major clinical findings, such as progressive swelling, ecchymosis, coagulopathy, and myokymia.

177. Repeated Misdiagnosis of Rattlesnake Envenomation Resulting in Delayed Administration of Antivenom and Lower Extremity Fasciotomy

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Background: Patients with rattlesnake envenomation do not always present with a clear history of a bite. This may lead to misdiagnosis, delayed treatment, and unfavorable outcomes.

Hypothesis: Delayed diagnosis of rattlesnake envenomation leads to unfavorable outcomes.

Methods: This is a single case report. A seven-year-old girl presented to an emergency department (ED) with left ankle pain and ecchymosis after a trip and fall two hours prior while running outside. She had multiple episodes of vomiting, attributed to pain. She was diagnosed with an ankle sprain after negative x-rays and discharged in an orthopedic boot. The following morning, she re-presented to her pediatrician due to extension of ecchymosis and edema to the calf and inability to bear weight. They sent her to another ED, where labs were notable for INR 1.98, WBC 16.9 K/uL, hemoglobin 12.6 gm/dL, platelets 292 K/uL. CT angiography of the left leg showed soft tissue edema. She was transferred to our facility, where the diagnosis of rattlesnake envenomation was made 28 hours post envenomation. Exam was notable for edema, tenderness, and ecchymosis of her left leg extending from toes to groin. Labs upon arrival were notable for CK 1328 U/L, INR 1.5, WBC 19.3 K/uL, hemoglobin 12.7 gm/dL, platelets 274 K/uL, fibrinogen 260 mg/dL.

Results: Upon admission, conscious sedation with ketamine was required to straighten and splint her leg in elevation. Progressive swelling of her leg was treated with 30 vials of F(ab')₂ over 11 hours. Despite treatment, pain and tense edema progressed, toes became pale, and capillary refill became delayed. She was emergently taken to the operating room by orthopedics, and was noted to have elevated compartment pressures in the lower leg. She underwent fasciotomies of all compartments in the lower leg and foot. Her hospital course was further complicated by symptomatic anemia requiring transfusion and development of pulmonary edema. Hemotoxicity (platelet nadir 92 K/uL, fibrinogen nadir 200 mg/dL) resolved by day five post bite. Foot and lateral lower leg incisions were closed, and she was discharged on hospital day eight with plastic surgery follow up. Medial lower leg incision was closed day 13 post bite.

Conclusion: Without a clear history of snake encounter, rattlesnake envenomations can be misdiagnosed. Clinicians should maintain a high index of suspicion for envenomation when patients present with extremity pain, swelling, ecchymosis, and coagulopathy in endemic areas.

178. Do Patients with Multiple Rattlesnake Bites Require Larger Doses of Antivenom?

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Background: The mainstay of treatment of rattlesnake envenomation is antivenom. Current administration and dosage guidelines are based around frequent reevaluation of progression of signs and symptoms. Most hospitals have a limited supply of antivenom that is immediately on hand. Finding predictors of a clinical course requiring higher doses of antivenom may be helpful in terms of pharmacy logistics and timely care. Multiple bites may have a higher dose of venom inoculation. Given the stoichiometric binding of antivenom to venom, multiple bites may indicate a need for more total antivenom for treatment.

Methods: This is a retrospective review of consecutive cases of rattlesnake envenomation from January 2019 to June 2019 reported to the California Poison Control System. All patients were included even if they were not treated with antivenom. Each chart was reviewed for the type and total dosage of antivenom. Any charts that described more than one bite by history or physical exam were considered to have multiple bites.

Results: A total of 60 patients with rattlesnake envenomation were identified over six months. Seven cases (11.6%) were asymptomatic and patients were not treated with any antivenom. Fifty-one patients (85%), 2 patients (3.3%), and 3 patients (5%) received crotalidae polyvalent immune Fab (Ovine) (CroFab) only, crotalidae immune F(ab')₂ (equine) (ANAVIP) only, and both CroFab and ANAVIP, respectively. The average dose for patients treated with single

agents were 9.0 ± 5.8 vials and 10 ± 0 for CroFab and ANAVIP, respectively. Patients received 9.3 vials and 7.3, respectively, when treated with both CroFab and ANAVIP. We identified two patients that were each bitten twice, each with two bites on the same extremity. Both patients with multiple bites were treated with CroFab only. One patient received 21 vials and one patient received 16 vials.

Conclusion: In this small retrospective study, patients who were bitten twice were treated with a higher dose of antivenom than was received on average. Multiple bites may be a valuable clinical predictor for which patients will need additional doses of antivenom. A larger study could explore this predictor further.

179. Where Did the Blood Go? A Case Report of Delayed Anemia Following Rattlesnake Envenomation

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Background: Rattlesnake envenomation commonly leads to coagulopathy and thrombocytopenia, affecting many patients in the Southwest USA. Although venom-induced thrombocytopenia is well-recognized, delayed anemia without bleeding or hemolysis is unprecedented. This report highlights a rare case of delayed rattlesnake venom-induced anemia.

Methods: A single patient case is presented. A 63-year-old female with a history of bladder cancer (status post-2017 tumor excision) and gastroesophageal reflux disease presented 1.5 hours after a rattlesnake bite on her right anterior tibial area during a hike. On arrival, her vital signs were stable, and a puncture wound with surrounding erythema and edema was noted. Laboratory results showed a white blood cell count of $6.1 \times 10^3/\mu\text{L}$, hemoglobin of 13.4 g/dL, platelets at $220 \times 10^3/\mu\text{L}$, fibrinogen of 257 mg/dL, and INR of 1.1. She received six vials of Crotalidae polyvalent immune Fab, with subsequent pain and swelling improvement. On hospital day three, she experienced sudden hypotension and a hemoglobin drop from 12.4 g/dL to 10.5 g/dL, with a platelet count decrease to $208 \times 10^3/\mu\text{L}$. Further hemoglobin declines were recorded (7.3 g/dL), and platelet counts fell to $165 \times 10^3/\mu\text{L}$, prompting a transfusion of one unit of packed red blood cells. By day five, hemoglobin further decreased to 6.8 g/dL with platelets at $131 \times 10^3/\mu\text{L}$. A second transfusion improved hemoglobin to 8.1 g/dL and platelets to $152 \times 10^3/\mu\text{L}$. She was discharged with hemoglobin at 7.5 g/dL and platelets at $120 \times 10^3/\mu\text{L}$. At a 10-day follow-up, hemoglobin was 10.5 g/dL, and platelet counts normalized to $320 \times 10^3/\mu\text{L}$. Imaging (CT and ultrasound) showed no bleeding or clots. Hemolysis markers (lactate dehydrogenase, haptoglobin) remained stable, with no evidence of schistocytes.

Conclusion: This case of delayed-onset anemia post-rattlesnake bite diverges from known thrombocytopenic and coagulopathic effects. The absence of hemolysis, active bleeding, or clots points to mechanisms such as erythrocyte sequestration, aggregation, or marrow suppression, possibly mediated by venom-antivenom complexes or complement activation. While delayed thrombocytopenia is recognized, this is the first case of delayed anemia without bleeding, hemolysis, or clots, raising questions on mechanisms and optimal management strategies (e.g., transfusion, observation, or antivenom).

180. Severe Hemorrhagic Bulla Formation Due to Rattlesnake Envenomation

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Background: Rattlesnake envenomation can cause variable clinical manifestations including pain, edema, hematologic abnormalities, and systemic effects. Hemorrhagic bullae formation may occur, most commonly in distal extremities. Underlying tissue necrosis can occur in severe cases. We report a case of a large hemorrhagic bulla on a digit that was treated with an incision and drainage.

Methods: This is a single patient case report. A 57-year old left hand dominant male mechanic presented to the emergency department after rattlesnake envenomation to his right hand. He initially presented to an outside hospital 45 minutes after envenomation. Examination showed a puncture wound to the distal tip of the right third digit with edema spreading proximally in the finger. He received 10 vials of Crotalidae Immune F(ab')₂ antivenom. During the two-day hospitalization, he developed progressively enlarging hemorrhagic bulla to the affected digit. He never developed any coagulopathy or thrombocytopenia. Hand surgery was consulted, but the patient left against medical advice prior to their evaluation. Three days after the envenomation, he presented to our emergency department for evaluation. His exam showed a clearly demarcated circumferential fluctuant hemorrhagic bulla extending from the proximal interphalangeal joint to the distal tip. The bulla had enlarged the circumference of the patient's digit to more than twice the original size. The patient had diminished sensation at the distal tip of the digit but had normal motor function. Medical toxicology was consulted and recommended evaluation by hand surgery with concern that the patient may eventually require partial amputation.

Results: Hand surgery completed a bedside incision and drainage of the bulla with a one cm incision over the dorsal ulnar aspect of the digit. This resulted in a sudden release of

uncoagulated dark red blood (a video of the procedure will be available for presentation). The patient had immediate return of sensation to the digit, and the finger had marked improvement in its appearance after the procedure. The finger was dressed with Xeroform®, and the patient was discharged home with a seven day prescription for cephalexin for prophylaxis. Thirteen days after the initial envenomation, he returned to the hand surgery clinic. Examination at that time showed appropriate healing of the wound apart from an eschar formation on the pad of the finger.

Conclusion: Large hemorrhagic bullae may form after rattlesnake envenomation. Delayed incision and drainage with appropriate wound care can salvage a potentially digit or limb threatening condition.

181. Once, Twice, Three Times a Bite Victim: Recidivism in Snake Envenomation

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Background: Most snakebites occur when the victim unknowingly enters the snake's vicinity, and most snakebite patients will sustain only one bite in their lifetimes. However, there are certain occupations and behaviors that place people at risk for multiple lifetime snakebites. The purpose of this study was to describe the cases reported to the North American Snakebite Registry (NASBR) in which a patient being treated for a snake envenomation reported one or more previous bites.

Methods: This was a review of prospectively collected de-identified patient information reported to NASBR by medical toxicologists providing bedside care for snakebite patients between January 1, 2013 and December 31, 2023. Data regarding the circumstances of the snake encounter, patient demographics, previous snakebites, antivenom utilization, and clinical outcomes were reviewed.

Results: Of the 2,140 snakebites reported to NASBR during the study period, 94 (4.4%) involved patients with a history of one or more previous snakebites. The number of previous snakebites ranged from 1 – 10. Males accounted for 80 (85%) victims. The median patient age was 40 years (range: 7 – 84). Bites to the upper extremity occurred in 73 (78%) cases. Occupational exposures accounted for 14 (15%) bites. Sixty (64%) bites followed intentional interaction with the snake. In these cases, 54 (90%) victims were

male. The median patient age was 26 years (range 7 – 78). Unsurprisingly, 57 (95%) bites were to the upper extremity. Alcohol was implicated in 14 (23%) cases, and captive snakes accounted for 18 (30%) bites. Most (17, 52%) of the unintentional bites were to the lower extremity. There were 25 (76%) male patients. Alcohol use was reported in 3 (9%) cases, and there were no bites from captive snakes. Antivenom was administered to 80 (85%) patients. CroFab®, the only antivenom approved by the Food and Drug Administration for North American crotalid envenomations for most of the study period, was administered to 54 (68%) patients. Anavip® was used in 17 (21%) cases. Three (4%) patients received both products. Acute adverse reactions were observed in 6 (7.5%) patients: 2 (3.7%) patients who received only CroFab®, 2 (12%) patients treated with Anavip®, and 2 (67%) patients to whom both products were administered.

Conclusion: Risk factors for sustaining multiple lifetime snakebites include intentional handling of the snake and male sex. Alcohol use was more common in patients who intentionally interacted with the snake. All bites from captive snakes resulted from intentional interaction with the snake.

Toxic: This research was performed by the ACMT Toxicology Investigators Consortium

182. Rattlesnake Envenomation Causing Tenosynovitis and Abscess

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Background: Rattlesnake envenomation is a common occurrence in southwest states. Their envenomation most commonly causes local tissue injury and coagulopathy. Infrequently, rattlesnake envenomation can cause infection and tissue necrosis requiring surgical debridement.

Methods: A 35-year-old man presented to the hospital after a rattlesnake bite six hours prior on his left fourth and fifth digits. The patient used a dirty knife to cut open the wound to “release poisons.” He walked several hours in the desert before he was able to find help. He was given 10 vials of F(ab’)2 antivenom by EMS. Physical exam revealed two puncture wounds to the dorsal surface of the left fourth and fifth digits, a one-cm laceration to the left fifth digit with no active bleeding, and significant swelling to the left upper extremity with ecchymosis to the hand; he had decreased range of motion of the digits with preserved

capillary refill and sensation to light touch. Sensorimotor function was intact to the left arm. The patient’s initial lab values demonstrated hemotoxicity with platelets 80k/uL, PT 27.15s, and fibrinogen < 35 mg/dL. Over the next twenty-four hours, he received 26 vials of F(ab’)2 in the hospital with resolution of hemotoxicity and improved swelling. He was started on oral antibiotics twenty-four hours after admission for fevers of 38°C and concern for cellulitis of the left hand. Though he met clinical criteria for discharge, the patient remained hospitalized due to logistical barriers. On hospital day five, fevers recurred with worsening pain in his fourth/fifth digits and hand. Streaking of the left upper extremity was noted. A CT scan of the left upper extremity showed an abscess overlying the dorsal fifth digit, 1.1 x 1.9 x 3.2 cm, with extensor tenosynovitis of the fifth digit.

Results: Antibiotics were broadened and surgery was consulted. The patient went to the operating room for wash-out and debridement. Wound cultures were positive for *Enterobacter cloacae* complex. The patient was discharged home a few days after surgery with hand-surgery follow up.

Conclusions: While infections after rattlesnake envenomation are rare, open wounds are at increased risk. In this case, acute infection likely resulted from a self-inflicted, opening wound. This serious infection that developed should remind clinicians to educate the public about the potential consequences of wound manipulation after snakebites.

183. *Philodryas baroni* Envenomation and Subsequent Management

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Background: *Philodryas baroni*, commonly known as “Baron’s green racer,” is a species of mildly venomous, rear-fanged colubrid snake endemic to South America, popular among collectors for its bright coloration and distinctive appearance. While bites do occur, there are few reported cases of significant envenomation requiring hospitalization.

Research Question: What is the optimal management and expected clinical course for *Philodryas baroni* envenomation?

Methods: This is a single-patient chart review. A 26-year-old male presented to the emergency department after being bitten on his right third finger by his pet snake at home, identified as *Philodryas baroni*. The envenomation site developed progressively worsening pain and swelling over six hours, extending over the entire hand down to the wrist. The immediate area surrounding the bite was noted to be ecchymotic, with gradual blistering developing on the ulnar

aspect. The patient had significant pain, requiring repeated doses of oxycodone, hydromorphone, and acetaminophen for adequate analgesia. The limb was elevated to help mitigate further tissue swelling, and amoxicillin-clavulanic acid was administered empirically. Initial labs included a white blood cell count of 15.8k cells/ μ L, hemoglobin of 15.0 g/dL, platelets at 380 k/ μ L, fibrinogen of 280 mg/dL and an INR of 1.0. An x-ray showed no evidence of retained foreign bodies. The orthopedic surgery service was consulted with concerns for possible compartment syndrome; ongoing elevation and observation were recommended. The patient's swelling gradually progressed to the proximal forearm, though without significantly worsening pain. A mild decrease in platelet count was noted (348 to 336 k/ μ L), but fibrinogen remained stable (283 to 290 mg/dL). No evidence of worsening systemic illness, bleeding or clinically significant coagulopathy developed. After 38 hours he was discharged home in stable condition.

Results: *Philodryas baroni* bites are uncommon, and while this rear-fanged snake is considered to be relatively safe and legal for purchase in certain areas in the United States, adverse events from envenomations do still occur. Laboratory analysis of *P. baroni* venom has shown proteolytic activity, including hydrolysis of the A α -chain of fibrinogen, and inhibition of collagen and thrombin-induced platelet aggregation. In murine models, venom injection has induced local myonecrosis, hemorrhage, edema, and leukocyte infiltration. Our patient's clinical course is consistent with previously documented envenomations, some of which have produced clinically significant effects.

Conclusion: While not considered dangerous to humans, *Philodryas baroni* envenomations may still produce clinically significant toxicity with local tissue injury requiring supportive inpatient management.

184. Does Indian Common Krait Envenomation Affect Coagulation Parameters?

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Background: Indian common krait (*Bungarus caeruleus*) toxin causes pure neuro-paralysis due to its pre synaptic action. There have been some reports of venom induced consumptive coagulopathy without clinically significant bleeding. In this study we aim to look for coagulation abnormalities in common krait envenomation.

Methods: Twenty-two cases of neuroparalytic snake envenomation attributed to Indian common krait were included in this prospective study. Detailed history, clinical examination, complete blood counts, routine biochemistry and coagulogram were recorded at admission (day zero), 24, 48

hours, day seven, 14 and 28. The duration of hospital stay and outcomes were recorded. All the patients were admitted in the high dependency unit at our institute and given standard treatment with anti-snake venom. Supportive therapy in the form of oxygenation and ventilation was provided as clinically indicated. Results are presented as a trend of coagulation abnormalities noted during hospitalization and on follow up.

Results: The mean age of patients was 31 years. All the patients had clinical evidence of neuro-paralysis and required mechanical ventilation support. Average bite to ASV time was 407 minutes. Mean duration of hospitalization was three days. All 22 patients survived. There was no evidence of any clinically significant bleeding observed at any stage in our study population. If we take day 28 parameters as representative baseline parameters, there was an increase of one second noted in Prothrombin time noted on day one and two, however, it started reverting to near normal by day three. There was no significant difference observed in aPTT, INR or thromboplastin time. The platelet count remained normal throughout.

Conclusion: In our study cohort of Indian common krait envenomation, we did not observe any significant alteration in coagulation parameters and did not encounter any significant bleeding during hospitalization.

185. Regional and Temporal Trends in Snakebite Antivenom Adverse Events: Exposures Reported to the National Poison Data System 2010 to 2024

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Background: Recent studies suggest a possible relationship between snakebite antivenom adverse drug reactions (ADRs) and galactose-alpha-1,3-galactose (alpha-gal) sensitization. Antivenom utilization patterns in alpha-gal endemic regions have also changed over time following FDA approval of Crotalidae Immune F(ab')₂ (equine) for non-rattlesnake species in 2021.

Hypothesis: We propose that there exist regional differences in antivenom ADR rates and that these differences may have changed over time with the introduction of new antivenoms.

Methods: This is a retrospective observational study of exposures reported to the National Poison Data System. We examined all cases in which snakebite antivenom was administered between 2010 and 2024. We excluded zip code prefixes with fewer than 20,000 participants or cases where no zip code was provided. We used published data

to ascertain rates of alpha-gal sensitization using clustered three-digit zip. States were defined as “high prevalence” (known sensitization rate 20% or higher) or “low prevalence” (sensitization rate less than 20%). Comparisons were made within states based on three-digit zip. We also examined ADR to therapy and antihistamine use in phase 1 (2010–2020), before expanded use of F(ab')₂, and in phase 2 (2021–2024). We used the Chi-square test to compare the two phases.

Results: In total, 27,797 AV administrations were coded and 27,018 met criteria. The “low prevalence” population was older at a mean of 41 years vs 36.3 years ($p < 0.001$) and had a higher proportion of males (66.7% vs 62.6%, $p < 0.001$). There was no baseline difference in ADR to therapy in the phase 1 period (3.9% vs. 4.2%, $p = \text{NS}$). ADR to therapy in “low prevalence” states increased slightly between the two phases from 3.9% to 4.4% ($p = 0.04$). ADR to therapy in “high prevalence” states increased substantially from 4.2% to 11.2% ($p < 0.001$). Use of antihistamines in “low prevalence” states was consistent across the phases (8.1% vs 8.5%; $p = \text{NS}$). Use of antihistamines in “high prevalence” states increased from 10.1% to 15.6% ($p < 0.001$). There were statistically significant differences in antihistamine use between higher prevalence regions of Arkansas and North Carolina compared with lower prevalence regions. There was no difference identified among Oklahoma, Missouri, Kentucky, or Kansas regions.

Conclusion: We find significant increases in antivenom ADRs and antihistamine use over time, particularly in areas with high alpha-gal prevalence, where non-rattlesnake species predominate. The timing of this change supports a relationship between alpha-gal sensitization and F(ab')₂ antivenom hypersensitivity.

186. Emergency Cesarean Section Due to Severe Maternal Loxoscelism Mimicking Sepsis

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Background: The venom of the violin-backed brown recluse spider (*Loxosceles reclusa*) causes local skin pain, irritation, ulceration, and local necrosis, classically in an asymmetrical tricolored bullseye. Systemic loxoscelism can occur days to weeks following envenomation and can cause hemolytic anemia, myonecrosis, rhabdomyolysis, acute kidney injury, renal failure, and even disseminated intravascular coagulation. Systemic loxoscelism in pregnancy is extremely rare. We present a case of emergency delivery due to severe maternal systemic loxoscelism with critical hemolysis requiring multiple transfusions.

Methods: This is a single case. An otherwise healthy eighteen-year-old G2P1 female presented to the prenatal assessment center by EMS for evaluation of a headache and concern for an unwitnessed spider bite to the abdomen the day prior.

Results: She was initially stable but with leukocytosis and mild anemia, which quickly devolved into hypotension, worsening tachycardia, and hypoxia requiring resuscitation with intubation, blood transfusions, and vasopressors. Within 18 hours of her initial presentation, she underwent an emergency cesarean section at 27 weeks 3 days due to prolonged fetal heart rate decelerations. She was extubated the following morning but was still requiring vasopressors and fluid resuscitation. Her ongoing shock was attributed to a combination of loxoscelism and sepsis secondary to spider bite - it was treated as an infectious process including infectious disease consultation and treatment with antibiotics despite an unremarkable infectious workup. The patient transiently improved following delivery but was transferred back into the ICU, and toxicology was consulted on hospital day five due to worsening anemia to a hemoglobin of 3.6 g/dL, rising bilirubin, and lack of improvement with antibiotics. Her abdominal wound had developed the classic tricolored appearance of a dark necrotic center with ragged edges, a rim of pallor, and peripheral ring of erythema. She received additional transfusions and methylprednisolone followed by prednisone with improvement and discharge two days later. The neonate exhibited a decrease in hemoglobin and hematocrit and received one transfusion. She had no other signs or symptoms of loxoscelism and showed normal development in the NICU.

Conclusion: We report severe systemic loxoscelism requiring emergency cesarean section at 27 weeks gestation due to severe hemolysis requiring multiple transfusions. The neonate received a transfusion for falling hemoglobin and hematocrit. Fortunately, both mother and infant recovered. Early poison control center and medical toxicologist consultation should accompany any suspicion for brown recluse bite or loxoscelism.

187. Computed Tomography Imaging of Early Wound in Patient with Systemic Loxoscelism

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Background: Systemic loxoscelism is a relatively uncommon complication of brown recluse spider (*Loxosceles reclusa*) envenomation. The extent of local tissue damage is not thought to predict the development of systemic loxoscelism, although young patient age and proximal wounds may increase risk. Wounds associated with brown recluse envenomation are occasionally imaged late in their course

in an infectious workup; however, imaging findings associated with early brown recluse envenomation are unknown.

Research Question: What cross-sectional imaging findings are associated with early brown recluse envenomation?

Methods: This is a single patient chart review. A 10-year-old male with a history of beta thalassemia trait presented with two days of progressively worsening chest wall pain and redness. He also reported fevers, nausea/vomiting, and fatigue. Initial labs demonstrated a hemoglobin of 11.9 g/dL, total bilirubin of 2.4 mg/dL, and direct bilirubin of 0.3 mg/dL. There was concern for a possible deep abscess along the chest wall extending into the left axilla on point of care ultrasound. He was started on antibiotics.

Results: A computed tomography scan of the chest with IV contrast was obtained. Findings included diffuse soft tissue edema involving the left anterolateral chest and axillary region associated with ill-defined fluid tracking along the anterior aspect of the left pectoralis muscle, which extended posteriorly along the anterior serratus muscle. There was no discrete fluid collection/abscess. Toxicology was consulted. Physical exam revealed a wound with a central area of necrosis and surrounding erythema over the left lateral chest wall. The patient was diagnosed with systemic loxoscelism given history and physical exam findings. Antibiotics were discontinued, and he was admitted for symptom and laboratory monitoring. He was discharged after four days with a hemoglobin of 10.8 mg/dL and overall feeling improved. The patient returned to the emergency department two days later with altered mental status and was found to have severe hemolytic anemia with a post-transfusion hemoglobin of 4.4 mg/dL. Laboratory studies were consistent with hemolysis. He received four units of packed red blood cells and IV fluids. Ultimately, he was discharged after a brief admission once his hemoglobin had stabilized and his mental status had returned to baseline.

Conclusion: Wounds associated with early brown recluse envenomation may present with fluid tracking along deep tissue planes, which can mimic serious infectious processes. It is unclear if this has any association with systemic loxoscelism or the risk of progression to severe hemolysis.

188. A Rare Case of “*Latrodectus facies*” in a Brown Widow Spider Envenomation

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Background: The brown widow spider (*Latrodectus geometricus*), originally native to Africa, can now be increasingly found within the United States. As a close relative of the more well-known black widow spider (*Latrodectus mactans*), the brown widow’s bite generally results in a milder envenomation but can still lead to severe systemic

toxicity and latrodectism. A rare clinical presentation, characterized by periorbital edema, lacrimation, conjunctivitis, rhinitis, and blepharospasm, known as “*Latrodectus facies*” or “*facies latrodectismica*” can develop following envenomation by *Latrodectus* species. This case report highlights the presentation and management of this rare clinical manifestation following a brown widow spider envenomation in a pediatric patient.

Methods: Single Patient Chart Review. A nine-year-old boy presented to the ED after sustaining a spider bite to his right hand accompanied by periorbital edema, lacrimation, conjunctivitis, and abdominal pain. The patient was at a nature camp where he was accidentally playing with a brown widow spider when he sustained the bite. The brown widow spider was positively identified by a nature camp counselor who was educating the children on various species of spiders in the area. The patient initially was complaining of abdominal pain which progressed to periorbital edema, conjunctivitis, and lacrimation within an hour of the bite, consistent with his physical examination in the ED. Medical Toxicology was consulted for treatment recommendations. The patient remained hemodynamically stable and was non-toxic-appearing and was treated with intravenous analgesics. He was observed for 10 hours with resolution of all symptoms. No recommendation for antivenom was given.

Results: The patient’s clinical history and physical exam findings correlate with toxicity from *Latrodectus* species envenomation, including the rare and unique physical exam finding of *Latrodectus facies*. Generally known for its milder clinical effects, the brown widow spider bite injects a smaller amount of venom that is just as potent as the black widow. Reports of black widow spider envenomations are common, but there are exceedingly few cases of brown widow spider envenomations in the literature. Furthermore, *Latrodectus facies* is an uncommon occurrence and specifically not reported in brown widow bites.

Conclusion: *Latrodectus facies* is a rare clinical finding consisting of periorbital edema, lacrimation, conjunctivitis, rhinitis, and blepharospasm that can occur with bites from *Latrodectus* species. Although not as well-known, the brown widow spider can also cause severe latrodectism including *Latrodectus facies*.

189. Spiny Dogfish (*Squalidae* spp) Envenomation Treated with Hot Water Immersion (HWI)

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Background: The Spiny Dogfish, also known as Dogfish, are among the best described members of the *Squalidae* family of sharks that have a wide distribution, which includes much of the Eastern US coastline. They contain a spine in

front of their dorsal fins that contain venom that can cause erythema, edema, and severe pain; typically used as a defensive mechanism. Currently there is no description of the composition of Squalidae venom in scientific literature.

Hypothesis: Hot water-immersion will treat the pain associated with envenomation from the dorsal spine of the Dogfish.

Methods: This is a single patient case report. A 49-year-old male presented to an Urgent Care center approximately six hours after he was stuck on the palmar aspect of his right index finger by the dorsal spine of a Dogfish that he was trying to remove from his fishing line. The patient complained of worsening pain radiating up his right arm. He did not take anything for pain prior to arrival. Hot water immersion (HWI) was initiated along with co-treatment with ibuprofen.

Results: The patient demonstrated significant improvement after 30 minutes of HWI, at approximately 40°C per report. X-Ray of the hand demonstrated no foreign bodies, and the patient had his tetanus updated.

Conclusion: This is a single case report that demonstrates that HWI may be effective in the treatment of envenomation from Squalidae species, much like other marine envenomations.

190. Jellyfish Envenomation Resulting in an Elevated Troponin Without Cardiac Dysfunction in Saipan

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Background: Multiple species of Cubozoa (box jellyfish) are associated with severe systemic manifestations and cardiac injury, particularly those of the order Carybdeida (ex. *Carukia barnesi*, *Alatina* (formerly *Carybdea*) *alata*). Cases have been reported in Australia, Indonesia, Thailand, Hawaii, Florida, and the Caribbean, but not previously in Saipan, where *A. alata* and *Copula* (formerly *Carybdea*) *sivickisi* are common.

Methods: This case report describes a jellyfish envenomation in Saipan with elevated high-sensitivity troponin despite resolution of symptoms and lack of electrocardiographic or echocardiographic evidence of ongoing cardiac dysfunction.

Results: A 15-year-old 75 kg boy was stung on the right elbow by an unidentified, 3–4-tentacled, “white jellyfish” while spearfishing at night in late summer. Thirty minutes later, he arrived at the hospital reporting “crushing” chest pain, shortness of breath, nausea, vomiting, and muscle cramping of the neck, back, and stomach. Initial vital signs were pulse 116 bpm, blood pressure 135/78 mmHg, respirations 22 per minute, and 100% oxygen saturation on room air. On examination, he appeared in acute distress with facial flushing, diaphoresis, tachycardia with bounding peripheral

pulses, and small faintly erythematous macules on the right elbow. No lower extremity edema or abnormal breath sounds were noted. Topical acetic acid, IV fentanyl, and IV acetaminophen relieved the elbow pain. High-sensitivity troponin I was 85.4 pg/mL one hour after arrival. Electrocardiography showed sinus tachycardia with normal intervals and no signs of ischemia. Chest x-ray demonstrated no pulmonary edema. Laboratory studies demonstrated serum creatinine 1.20 mg/dL, normal electrolytes, and normal transaminases. A 14-substance urine drug screen was negative. Symptoms resolved after administration of ondansetron, diazepam, and normal saline. Troponin concentrations continued to rise, peaking at 108.9 pg/mL twelve hours after arrival. An echocardiogram showed normal ventricular size and function with 71% ejection fraction and no pericardial effusion. The patient remained asymptomatic and hemodynamically stable during admission. His troponin decreased to 90.7 pg/mL prior to discharge on hospital day two.

Conclusion: Cardiotoxicity following jellyfish envenomation has not previously been reported in Saipan. This may reflect rarity or underreporting. Although not identified as the cause, *A. alata* is known to be in the region and has been associated with cardiac injury, possibly via direct venom effect or catecholamine excess. The marked troponin elevation without persistent symptoms, electrocardiographic or echocardiographic evidence of abnormal cardiac function, or significant renal dysfunction was unexpected. As a single case report without an identified jellyfish species, conclusions are limited.

191. Antibiotic Use Trends for Marine Envenomations: A 17-Year Retrospective Analysis

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Background: Marine envenomations are common in some coastal regions of the western United States due to several native venomous species, in particular stingrays. A previous study by Clark et al. 2007 suggested that use of prophylactic antibiotics following stingray envenomation may reduce the incidence of wound infection. However, use of prophylactic antibiotics for marine envenomations remains controversial.

Research Question: Did use of prophylactic antibiotics for marine envenomations increase following the original study findings?

Methods: This is a 17-year (1/1/2007 - 1/1/2024) retrospective chart review of all patients who presented to two urban emergency departments and an affiliated urgent care after known or presumed marine envenomation. Cases were divided into acute (within 24 hours of sting) and subacute

(24 hours or more) groups. Patient demographics, type of envenomation, disposition, and antimicrobial administered were collected.

Results: In total, 829 cases were identified. Three hundred eighty-five (46%) patients presented to the emergency department with a mean of 27 cases annually. In total, 444 (54%) presented to urgent care, with a mean of 55 cases annually starting in 2016 when the facility opened. Median age was 28 years (IQR: 21–40 years) for emergency department patients and 31 (IQR: 23–43 years) for urgent care. Ninety-seven (12%) cases were under 18 years of age. A majority (62%) were male. Most (97%, $n = 741$) encounters were reported as stingray envenomations. The most common injury location was to the lower extremity (95%; $n = 703$). Of the emergency department patients, 373 (97%) were discharged. One patient left against medical advice, three eloped prior to disposition, one was transferred for cellulitis to an in-network hospital, and two were admitted due to cellulitis that did not respond to outpatient antibiotics.

In total, antibiotics were prescribed in 544 cases (65%): 230 (60%) emergency department and 314 (71%) urgent care patients received antibiotics. Majority (60%, $n = 275$) of patients in the acute group and 269 (73%) in the subacute group received antibiotics. Of the cases prescribed antibiotics, the most common classes were tetracyclines (48%; $n = 268$), fluoroquinolones (22%; $n = 124$), and cephalosporins (19%; $n = 108$).

Conclusion: Compared to the previous study, fewer antibiotics were prescribed overall for both acute (60% vs. 70%) and subacute cases (73% vs. 100%). Tetracyclines were most prescribed, whereas fluoroquinolones were previously; fluoroquinolone use appreciably decreased from 56% to 22%. Further research is needed to determine the most appropriate management strategies for marine envenomations.

192. Characterization of Toxicity and Outcomes Related to Exposure to Therapeutically Used Botulinum Toxin Reported to the National Poison Data System, 2002 - 2023

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Background: Botulinum neurotoxins (BoNT), particularly type A and B, used therapeutically to treat various conditions, can cause clinical outcomes ranging from local to systemic toxicity.

Research Question: We aimed to characterize trends, clinical effects, outcomes, therapies, and demographics of BoNT exposures reported to the National Poison Data System (NPDS) over a 21-year period.

Methods: We conducted a retrospective analysis using the NPDS between January 1, 2002 to December 31, 2023. We queried the NPDS for cases that included BoNT-related ID codes. We described trends in exposures over time. We analyzed clinical effects, therapies, and outcomes of BoNT exposures.

Results: In total, 1,476 cases were identified over the study period (0.003%, $n = 49,966,432$). The analysis revealed an increasing trend from 2002 to 2023 (mean 67 cases/year, max 118). Approximately 62% of patients identified as female ($n = 1,252$). Reason for exposure included unintentional therapeutic errors ($n = 137$; 9%), intentional misuse ($n = 17$; 1%), and adverse drug reactions ($n = 1,332$; 90%). Dosages were available for 208 exposures and ranged from 1 - 17,000 IU/units (mean 278; median 77). A total of 525 (35%) cases reported at least one related adverse effect. Of those, 206 (14%) reported minor adverse effects, 285 (19%) reported moderate adverse effects, and 42 (3%) reported major adverse effects. The most common clinical effects were muscle weakness ($n = 132$; 9%), dysphagia ($n = 103$; 7%), headache ($n = 57$; 4%) and numbness ($n = 54$; 4%). Serious effects such as paralysis ($n = 27$; 2%), respiratory depression ($n = 12$; 1%), were reported. In total, 468 exposures (31%) were managed at a non-health care facility, 101 (7%) required admission to the critical care unit, and 130 (9%) were admitted to the noncritical care unit. Therapy was performed in 431 cases. The most common therapies included IV fluids ($n = 88$; 20%), antihistamines ($n = 81$; 19%), irrigation/wash ($n = 68$; 16%), and steroids ($n = 58$; 14%). Eight patients (2%) received botulinum antitoxin. There was one reported fatality (0.1%).

Conclusion: This analysis highlights an increase in therapeutic BoNT exposures over two decades. Most exposures were limited to mild and moderate clinical effects. There were rare cases that required use of botulinum antitoxin and a single fatality was reported. Given the increased usage and prevalence of BoNT, it is important to be aware of the range of outcomes.

193. Pumping Iron: Over-Chelation of Iron by Deferasirox Leading to Hyperammonemia and Acute Encephalopathy

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Background: Chronic iron overload is a common clinical entity in patients requiring repeated blood transfusions such as sickle cell disease. Repeated administration of intravenous iron chelators is expensive and impractical. Oral iron chelators such as deferasirox are now standard practice for patients with chronic iron overload. We report the case of a

28-year-old man with hyperammonemia due to over-chelation of iron by deferasirox.

Results: A 28-year-old man was brought to a tertiary emergency department after being found writhing on the floor with acute encephalopathy. His vital signs were as follows: heart rate 134 beats/minute, blood pressure 167/108 mmHg, temperature 95.2°, respirations 20 breaths/minute, and oxygen saturation 99% on room air. An extensive work-up in the ED was unrevealing and included a lumbar puncture without signs of meningitis and a head CT without evidence of acute intracranial abnormalities. He had an acute kidney injury with a creatinine of 1.92 mg/dL, up from a baseline of 0.94 mg/dL. Hemoglobin was higher than baseline at 9.8 g/dL compared to 7.3 g/dL. There was no detectable ethanol, salicylate, or acetaminophen. Due to agitation, he required sedation with droperidol and midazolam and was subsequently intubated with ketamine and rocuronium. He was admitted to the critical care team who requested additional laboratory testing including ammonia. The ammonia level returned at 329 umol/L. Toxicology was consulted for assistance. A valproate level was below the limit of detection. Acute hepatitis and HIV serologies were negative. On chart review, the patient had a ferritin level of 513 ng/mL four months prior to his admission. In the hematology literature, discontinuation of deferasirox is recommended when ferritin levels are below 500 ng/mL. During that visit, his deferasirox was continued. Six days prior to admission, the ferritin level was rechecked, but deferasirox was continued pending results. His ferritin level resulted at 34 ng/mL. A fax was sent recommending discontinuation of deferasirox, but it was not seen until 24 hours prior to admission. Given critical hyperammonemia, the decision was made to initiate hemodialysis, and ammonia fell to 64 umol/L within 24 hours. Deferasirox was held and the patient returned to baseline mental status 48 hours after admission.

Conclusion: In patients on deferasirox for chronic iron overload, hyperammonemia should be considered as a potential etiology for acute encephalopathy. Depletion of iron from hepatocyte mitochondria is a hypothesized mechanism for hyperammonemia as conversion of ammonia to urea requires a significant input of adenosine triphosphate.

194. Ingestion of Multiple Button Batteries - A Case Report

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Background: Button battery ingestions are more common in children than adults, with potentially fatal consequences

if unrecognized. Adult ingestions are usually associated with developmental delay or deliberate self-harm. There are few reports of multiple battery ingestions in adults or children, with the literature focusing more on the management of single button battery ingestions that are lodged in the oesophagus or airway. There is a lack of clear guidelines or evidence for those patients who have ingested more than one button battery that has passed the pyloric sphincter.

Results: A 49-year-old female presented to the emergency department having ingested 15 button batteries 18 h prior as an act of self-harm. She was not prescribed any medications and had several mental health comorbidities. On presentation she was asymptomatic with no abdominal pain, nausea, or vomiting. Vital signs were within normal limits. Initial radiographs confirmed the reported battery ingestion and their location below the pylorus. The patient was admitted to hospital and whole bowel irrigation (WBI) was undertaken. She received 3 L of a macrogol based solution (Movicol®) orally over 24 h, resulting in the passage of 11 out of 15 batteries within 24 h of commencing WBI (36 h post-ingestion). Due to tolerance issues (nausea and faecal incontinence) this was changed to 500 mL of movicol twice daily. She was then transferred to a mental health facility, and continued on twice daily Movicol® until she passed the remaining four batteries. Serial imaging confirmed passage of all batteries 11 days post-ingestion.

Conclusion: The evidence for managing adult patients ingesting multiple button batteries is limited. Complications appear to be rare from single button battery ingestions which have passed beyond the pylorus. Extrapolating this to multiple button batteries, suggests that the risk of complications is low, which was confirmed in our case. There appears to be little role for endoscopic intervention and although WBI was used in our case it was not well tolerated after 24 h, so regular aperients may be sufficient. The ingestion of multiple button batteries in adults is unlikely to cause major complications and can probably be managed with regular aperients and serial abdominal radiographs.

195. Rare Drug-Drug Interaction: Severe Rhabdomyolysis with an Antiandrogen Drug

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Background: Abiraterone is a CYP17A1 inhibitor indicated for use in metastatic prostate cancer with rare cases of associated rhabdomyolysis reported in the literature. No drug-drug interaction with statins is reported in common physician references.

Hypothesis: Abiraterone in combination with rosuvastatin can lead to severe rhabdomyolysis.

Methods: This is a single patient chart review.

Results: A 76-year-old male with a history of chronic kidney disease, diabetes, hyperlipidemia, and prostate cancer (stage IIIc) presented to the emergency department with bilateral thigh pain refractory to over-the-counter analgesics. He had been started on abiraterone and prednisone four months prior and had been on rosuvastatin for years. On presentation, he had severe rhabdomyolysis (creatine phosphokinase (CK) = 32,454 IU/L [ULN: 294 IU/L]) and an acute kidney injury (creatinine = 2.9 mg/dl; baseline, 2.1 mg/dL). He was started on a normal saline infusion at 200 mL/hr. Abiraterone, prednisone, and rosuvastatin were discontinued. Over the course of a four-day admission, his creatinine returned to his baseline, and his CK improved to 14,000 IU/L prior to discharge. It further improved on outpatient follow-up to <1000 IU/L two weeks after presentation.

Conclusion: This patient developed severe rhabdomyolysis and acute kidney injury. Multiple case reports now show the idiosyncratic development of rhabdomyolysis in patients receiving concurrent therapy with abiraterone and rosuvastatin. This adverse effect might be explained by the inhibition of hepatocellular uptake (and thus metabolism) of rosuvastatin via abiraterone-mediated inhibition of OATP1B1.

196. Weighing In: GLP-1 Receptor Agonist Exposure Calls to Poison Centers Before and After FDA Approval for Weight Loss

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Background: Glucagon-like peptide-1 receptor agonists (GLP-1 RAs) have been utilized to treat type 2 diabetes since 2005. They mimic the effects of the endogenous hormone glucagon-like peptide-1 (GLP-1), which helps regulate blood glucose, reduce appetite, improves glycemic control and reduces cardiovascular risk in type-2 diabetes patients. The Food and Drug Administration (FDA) approved once-weekly semaglutide injections for chronic weight management on June 24, 2021. The drug's ability to cause substantial weight loss has led to increased interest from patients as well as prescribers. Primary adverse events are nausea and vomiting, and clinical trials and pharmacosurveillance studies have inconsistently shown an association with pancreatitis and hypoglycemia. However, the incidence of these side effects in the context of overdoses, especially acute or acute-on-chronic exposures, is not well-documented. Our objective was to examine the changes in reported exposures and describe the adverse events and outcomes during the pre-approval and post-approval for weight loss time phases.

Methods: We examined exposure data from therapeutic misadventures involving GLP-1 RAs reported to the National Poison Data System from 2012 to 2023 in patients aged 13 years or older, focusing on data before and after July 1, 2021 (used as a proxy date for FDA approval of once-weekly semaglutide for chronic weight management).

Results: In total, 10,033 GLP-1 RA exposures (3,113 pre-approval and 6,920 post-approval) met inclusion criteria. The rate of calls was 30.2% annually in the pre-approval period and 444% annually in the post-approval period. The largest change in substances pre- to post-approval were semaglutide (+39.6%), liraglutide (-25.1%), and dulaglutide (-16.7%). Post-approval, the mean age of the patient population decreased from 57.1 to 51.6 years. In the post-approval period, patients experienced nausea at 2.1, vomiting at 3.0, abdominal pain at 2.2, and diarrhea at 2.0 times the pre-approval rate; in contrast, the rate of hypoglycemia decreased post-approval. The percentage of patients either already in a healthcare facility or referred to one to manage their symptoms increased from 23.0% to 33.5%. Notably, no cases of pancreatitis were observed.

Conclusion: In summary, the post-approval cohort reflects a younger population experiencing symptoms at a higher rate than the pre-approval period and with more presentations to emergency departments. We hypothesize that these trends might be explained by prescriber and patient lack of familiarity with dosage titration strategies, misunderstandings about daily versus weekly dosing, or the proliferation of counterfeit or poorly labeled products to meet patient demand during drug shortages.

197. Sodium Selenite Toxicity - A Gun of a Different Color

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Background: Toxic ingestions of selenium, commonly in the form of selenious acid (gun-bluing solution) follow a rapid and often fatal clinical course. We present the case of a young man who ingested 15 grams (g) of sodium selenite mixed in beer.

Hypothesis: We hypothesize that sodium selenite ingestion results in a toxic syndrome distinct from that of selenious acid.

Methods: This is a single patient chart review. A 29-year-old male presented to the emergency department with vomiting, abdominal and testicular pain following a deliberate ingestion of 15 g of sodium selenite. He was tachycardic at

102 bpm with otherwise stable vital signs. His initial lactate concentration was 4 mmol/L, rising to 5.3 mmol/L over the next 3 hours despite crystalloid resuscitation. At 36 hours, he developed pulmonary edema requiring intubation. He subsequently developed rhabdomyolysis, myocardial injury (with mildly reduced ejection fraction but preserved cardiac output) and acute kidney injury. He developed hypotension requiring multiple vasopressors. Despite ventilator optimization, he developed severe hypoxemia lasting several hours and underwent venovenous extracorporeal membrane oxygenation (VV-ECMO) cannulation. Continuous renal replacement therapy (CRRT) was started on hospital day (HD) three. He received N-acetylcysteine IV on HD 3–8 and methionine (1g 3 times daily via nasogastric tube) on HD 5–10. Diffuse cerebral edema was demonstrated on HD three, progressing to microhemorrhages complicated by profound thrombocytopenia. Over the next 10 days, his hemodynamics and pulmonary function improved, allowing him to be decannulated on HD 13 and extubated on HD 17. Though intermittently responsive to commands, his clinical course was complicated by seizures and persistent encephalopathy. On HD 48, he had an aspiration event, developed refractory septic shock, and died on hospital day 51.

Results: Retrospectively obtained serum selenium concentrations revealed 7380 mcg/L (normal is less than 180 mcg/L) on HD zero, 195 on HD four and 203 on HD eight. Urine selenium was measured HD four at 203.4 mcg/L, (mcg/g creatinine not calculated as urine creatinine was undetectable).

Conclusion: This patient demonstrated a course of progressive myopathy, renal failure, and pulmonary toxicity. His CNS injury was felt to be primarily secondary to prolonged hypoxia. Notably his cardiac function remained relatively normal throughout toxicity. Selenium replaces sulfur in enzymes important for cellular homeostasis. Selenomethionine interrupts methionine's cellular function. Methionine and N-acetylcysteine were therefore supplemented. Our case demonstrates sodium selenite toxicity which may have a more protracted clinical course than selenious acid. VV-ECMO, hemodialysis, N-acetylcysteine, and methionine are proposed antidotal options.

198. Rapidly Progressive Multi-Organ Failure and Death After Injection of Concentrated Diquat

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Background: Ingestion of bipyridyl herbicides causes widespread oxidative injury, resulting in gastrointestinal mucosal corrosion, renal failure, respiratory failure, hepatotoxicity, cardiotoxicity, seizures, and coma. However, there is limited

information regarding the effects of acute poisoning by intramuscular and intravenous routes.

Hypothesis: Injection of diquat causes an acute toxic syndrome similar to ingestion, characterized by multi-system organ failure and significant morbidity and mortality.

Methods: We present a case of acute diquat poisoning via subcutaneous and suspected intravenous injection. A 26-year-old transgender man presented to an outside hospital after reportedly injecting 7.5 mL of 37.3% diquat in both arms and the left leg. Approximately 300 mL were missing from the original container. He was initially alert and agitated with diaphoresis, nausea, and vomiting. Vitals were notable for mild tachycardia. Physical exam was significant for erythema and induration over the left antecubital fossa, wrist, and thigh. Nine hours later, he became obtunded and was intubated for airway protection and transferred to our facility.

Results: Upon admission to the intensive care unit, laboratory results showed leukocytosis, acute kidney injury, metabolic acidosis, transaminitis, rhabdomyolysis, and troponinemia in the setting of distributive shock. Urine drug screen and mass spectrometry were negative. He experienced a generalized seizure approximately 13 hours after the exposure and was treated with midazolam 4 mg and phenobarbital 20 mg/kg. He received judicious fluid resuscitation and multiple vasopressors for shock. In addition, N-acetylcysteine, deferoxamine 5 mg/kg/hr, vitamin C and E, aspirin 325 mg every six hours, and dexamethasone 10 mg were given. Due to anuria and acidosis, continuous renal replacement therapy and a bicarbonate infusion were initiated. Endoscopy to evaluate for gastrointestinal injury was considered but not performed due to hemodynamic instability. Despite interventions, his multi-organ failure continued to worsen. Electroencephalogram demonstrated late-stage status epilepticus. Due to the patient's grim prognosis, his parents transitioned him to comfort care and he died 25 hours after exposure. Serum diquat level obtained approximately 15 hours after the initial injection was 23,000 ng/mL, (lower limit of detection = 1,000 ng/mL).

Conclusion: Clinical effects after ingestion of diquat have been well-described. While rapidly absorbed, less than 10% of an oral dose reaches systemic circulation. Introduction of diquat directly into the systemic circulation results in severe, rapidly progressive, and irreversible multi-system organ failure.

199. A Case Report of an Acephate Ingestion

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Background: Acephate is an organophosphate compound that is used commercially as an insecticide. Acephate is

a weak acetylcholinesterase inhibitor that is metabolized in insects into the more potent organophosphate methamidophos. This conversion occurs at a much lower rate in mammals, with most of the metabolites of acephate in mammals being inactive. For this reason, acephate is thought to be minimally toxic to mammals.

Methods: This is a single patient case report. Patient is an otherwise healthy 25-year-old male presenting after intentional ingestion of an insecticide containing 50% acephate in a powdered formulation. He consumed roughly one cup of the powder followed by one cup of water. The patient received atropine one mg IV per pre-hospital protocol for organophosphate poisoning, though no bradycardia was noted. On arrival, he was given symptomatic treatment and his symptoms resolved over a six-hour observation stay in the emergency department. Ultimately, he was transferred to the psychiatric ward and discharged in stable condition.

Results: On arrival to the ED, he was vomiting, tachycardic, tachypneic, hypertensive, and confused, though neurologically intact. EKG revealed sinus tachycardia with normal intervals. Venous blood gas demonstrated a respiratory alkalosis, likely secondary to hyperventilation. Initial lactate 4.9 mmol/L, which normalized after fluids. It is possible that some of his presenting symptomatology was secondary to atropine he received prehospital. Notably, red blood cell (RBC) cholinesterase level was decreased at 11 U/g hemoglobin. This indicates inhibition of acetylcholinesterase, a hallmark of organophosphate exposure.

Conclusion: We present a case of intentional overdose of acephate, supported by depressed RBC cholinesterase levels. There is a paucity of data regarding human ingestion of acephate. This case report supports the supposition that acephate is minimally toxic to mammals, with the patient being medically cleared after a six-hour period of observation.

200. Extracorporeal Clearance of Linezolid With Intermittent Hemodialysis in Severe Linezolid Toxicity Associated With Improvement in Serum Hyperlactatemia

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Background: Linezolid is a broad spectrum gram-positive antimicrobial agent. Severe toxicity has been associated with inhibition of mitochondrial protein synthesis and lactate accumulation. We present a case of severe toxicity treated with intermittent hemodialysis with demonstrated serum linezolid level clearance.

Hypothesis: Intermittent hemodialysis is capable of extracorporeal elimination of linezolid from peripheral circulation in supratherapeutic accumulation.

Methods: We describe a case report of a 65-year-old male, with a baseline creatinine of 1.0 mg/dL, status post liver transplant for alcoholic cirrhosis, who received prophylactic oral linezolid over a five month period. He presented with altered mentation associated with acute renal injury (creatinine 2.3 mg/dL on presentation). Initial random serum linezolid level was 43.7 mg/L (normal trough 2–8 mg/L) with serum lactate peak of 14.0 mmol/L. Metformin was not detected.

Results: The subject underwent intermittent hemodialysis over a 37-hour period for toxin removal. Post-hemodialysis linezolid decreased to 2.4 mg/L at nine hours into the treatment. Intra-dialysis lactate improved to 7.2 mmol/L and post-dialysis was 3.6 mg/L. During hemodialysis, the patient experienced complications of significant hemodynamic instability requiring pressor support and respiratory failure requiring intubation. Over subsequent days, he experienced persistent pancytopenia. Due to multiple infectious sequelae of long-term immunosuppression, intubation, and hemodynamic support, he died after six weeks in the hospital.

Conclusion: Linezolid toxicity has been associated with chronic exposure, especially in individuals with hepatic and renal dysfunction. Elevated lactate levels in severe linezolid toxicity are likely secondary to interference with mitochondrial respiration due to ribosomal inhibition. Given low Vd (0.27 L/kg), relatively low protein binding (31%) and small molecular size, linezolid would be an ideal candidate for extracorporeal removal. Although metformin toxicity could have a similar presentation, no detectable metformin was identified. Removal with hemodialysis was associated with improvement in lactic acid levels, suggesting an association between hyperlactatemia and linezolid in this individual. In severe lactate associated metabolic acidosis related to linezolid accumulation, intermittent hemodialysis is capable of linezolid removal. The effect of dialysis on other toxicities related to linezolid, such as hemotoxicity, remains unclear.

201. Mailaise-Symptomatic Outbreaks at Two Local Prisons

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Background: Drug impregnated mail has been discovered by correctional facilities. Methods have been proposed to reduce exposure, including implementing electronic mail scanners instead of distributing hard copies.

Research Question: Are recent outbreaks of symptoms in the staff of 2 local prisons secondary to drug exposure?

Methods: Outbreaks of similar symptoms at two separate prisons were managed by the Illinois Poison Center. Sample analysis consisted of 1298 drugs, 1008 are new psychoactive substances. The analytical platform is LC-Quadrupole Time-of-Flight Mass Spectrometer.

Results: Prison 1 (14 patients): This cluster began with an incarcerated individual having a seizure and being transported to the hospital. Two correctional officers responding experienced lightheadedness, rash, and fainting. Two days later, 12 correctional staff experienced lightheadedness, fainting, tachycardia and hypertension. Laboratory studies were unremarkable and symptoms resolved without intervention. Blood plasma from six of the initial blood samples obtained in the emergency department were submitted to University of California San Francisco's Clinical Toxicology and Environmental Biomonitoring Laboratory for analysis. Samples were positive for acetaminophen (3), caffeine (6), citalopram (1), quinine (1), lamotrigine (1), venlafaxine (1), cotinine (2), diphenhydramine (1) and naloxone (1). Caffeine was present in all patients. Prison 2 (10 patients): A week later at a nearby prison, a guard developed nausea, headache, and had syncope. The next day, five correctional officers responded to a seizing patient. They all complained of nausea, headache, and tingling sensation in their fingers. One patient experienced vomiting, one stuttering, and one tremor. An officer in a different part of the prison developed similar symptoms. The guard who loaded this patient into an ambulance experienced syncope, had seizure-like activity, and was tachycardic. Two more guards were sent to the hospital that afternoon complaining of lightheadedness, nausea, memory loss, a "foggy feeling" and a headache. Two samples were sent for comprehensive analysis. Caffeine, cotinine, naloxone, and nicotine were positive in both. The second sample had amphetamines, lidocaine, sertraline, acetaminophen, and lorazepam. The guards at both facilities reported concern for exposure to drugs from the mail system. The staff have been lobbying for electronic mail scanners.

Conclusion: No substances in the samples explain the symptoms experienced by the officers in the first outbreak. Amphetamines can cause tachycardia and seizure-like activity, though the guard experiencing these symptoms had no exposure to mail. These clinical sequelae raise questions as to the etiology of the symptoms experienced by this cohort in the setting of recent lobbying for electronic mail scanners.

202. Unintentional Occupational UV-C Exposure

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Background: Excessive Ultraviolet-C (UV-C) exposure can result in short-term cellular changes in human and animal cells in vitro, as well as short and long-term clinical effects primarily on skin and eyes. UV-C exposure may be linked with cancer in humans per the International Agency for Research on Cancer (IARC). Both the Recommended Exposure Limit and the Threshold Limit Value (TLV) for UV-C at 254 nm based

on an eight-hour work shift by the American Conference of Governmental Industrial Hygienists (ACGIH) is 6.0 mJ/cm². This case report describes an occupational exposure from an inappropriately installed UV-C germicidal bulb.

Methods: This is a case report of a patient evaluated in an occupational toxicology clinic (OTC). Records from one local Emergency Department (ED) visit that preceded her clinic visit were reviewed.

Results: In August 2024, a 50-year-old female with no relevant prior medical history visited the clinic to manage persistent symptoms after an inadvertent exposure to UV-C radiation lasting four-six hours without the use of any personal protective equipment. A preliminary ultraviolet light assessment detected UV-C wavelengths between 249 nm and 259 nm. The source was a 254 nm UV-C light emitting germicidal "bug lamp" light bulb that was replaced on the southwest wall of the property approximately six feet from the floor. All the readings taken at or around the source measured detectable wavelengths with the duration required to reach the TLV ranging from 0.02 seconds to 16.15 seconds, depending on distance from the source. One day after exposure, the patient was diagnosed with punctate epithelial keratopathy by Ophthalmology in an ED. The patient reported facial peeling and sensitivity days after exposure, and reported persistent facial and eye sensitivity, facial rash, and transient episodes of blurred vision three months later. On exam in OTC the patient had fine erythematous papules across the face.

Conclusion: UV-C exposure can cause acute health effects to the skin and eyes and may increase the risk of long-term complications like cataracts and cancer. There are substantial technical challenges in estimating or measuring the dose absorbed by target organs which limit prognostication of long-term complications. Workplaces utilizing specialized light sources should take caution to avoid inappropriate installation of UV-C bulbs where unsafe exposure can occur.

203. A New Tool for Toxicosurveillance of Acute Poisonings in Patients Attending the Emergency Departments in Spanish Hospitals

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Background: The Spanish Foundation of Clinical Toxicology (FETOC) maintains a multicenter Toxicosurveillance System in the Emergency Departments of 20 public hospitals, reporting cases of acute poisoning caused by chemical agents since 1999. We have decided to expand the scope of included cases to encompass all acute poisonings treated at these hospitals, using an online form that feeds into a shared database.

Research Question: To conduct a pilot validation of the system, analyzing all cases collected from two hospitals between January 1 and March 31, 2024, by evaluating the system's effectiveness in terms of the quality of the obtained information.

Methods: The questionnaire was built using the Jotform tool and includes demographic, etiologic, clinical, biochemical, and toxicological data, as well as other complementary diagnostic tools, treatments, and patient outcomes. Most fields consist of dropdown lists allowing single or multiple selections. Data is collected through an encrypted web server connection (SSL) and stored in a shared database.

Results: A total of 443 patients were admitted from the two hospitals, with an average age of 39.6 years (SD 19). There was a slightly higher proportion of men (53%) compared to women (47%). The main reasons for exposure were substance abuse ($n = 205$), suicide attempts ($n = 153$), domestic accidents ($n = 91$), and other accidents ($n = 24$). The primary agents involved were drugs of abuse ($n = 281$) and medications ($n = 186$). Chemical products were responsible for 57 cases. The main substances involved were ethanol (175 cases), benzodiazepines (129 cases), and illegal drugs of abuse (128 cases: cannabis 63, cocaine 47, amphetamines 18). No cases of opiate abuse were recorded. Of the total, 375 cases were symptomatic at admission, presenting primarily with neurologic (60%), cardiovascular (37%), psychiatric (23%), and digestive (13%) symptoms. Treatment was administered to 416 patients, including charcoal in 65 cases, gastric lavage in three cases, hemofiltration in three cases, and symptomatic measures in 312 cases. Severe clinical presentations occurred in 44 cases, with only two fatalities.

Conclusion: This Toxicosurveillance tool for Emergency Departments has proven to be highly effective in providing an updated profile of acute poisonings within the population and in enabling real-time alerts for potential epidemiological variations.

204. Phenobarbital Brain Death Mimic with Serial Concentrations

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Background: Phenobarbital is a sedative hypnotic that has multiple clinical indications and is classically used as an antiepileptic for seizure management. Phenobarbital increases the duration of time that chloride channels are open, causing central nervous system depression. Other barbiturates, specifically pentobarbital, are reported as brain death mimic xenobiotics.

Methods: This is a case of a 75-year-old female with past medical history of depression and epilepsy maintained

on valproic acid and phenobarbital who presented with decreased mental status and no brainstem reflexes on physical exam.

Results: The patient presented with agonal respirations and was emergently intubated. Family provided collateral information of an argument prior to the last time she was seen three days prior. During her emergency department evaluation, serum concentrations of her anti-epileptic medication were obtained. Her valproic acid was subtherapeutic at 16 µg/mL (50–100 µg/mL) and her arrival phenobarbital concentration was suprathreshold at 81.8 µg/mL (15–40 µg/mL). Multidose activated charcoal (MDAC) was initiated along with a sodium bicarbonate infusion. She was discussed with nephrology for consideration of dialysis and admitted to the MICU.

During her admission, she continued to receive MDAC and sodium bicarbonate infusion. An EEG was performed which showed diffuse cortical slowing, no epileptic activity. The patient's phenobarbital concentration peaked at 95.9 µg/mL ten hours following her arrival. Approximately 48 hours after hospitalization, she began to have a gag reflex and was successfully extubated later that day with a normal neurologic exam. Her phenobarbital concentration near the time of extubation had improved to 42.1 µg/mL.

Conclusion: Despite general understanding of barbiturates as potential brain death mimics, previous reviews on xenobiotics brain death mimics have not recorded a case involving phenobarbital. We present a case of a patient with absent brainstem reflexes in the setting of phenobarbital overdose that made a full neurologic recovery.

205. Methotrexate-Induced Epidermal Necrosis

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Background: Methotrexate-induced epidermal necrosis (MEN) is a rare and potentially fatal mucocutaneous reaction that clinically mimics Steven-Johnson's syndrome/toxic epidermal necrolysis (TEN). It presents as painful dusky macules that may progress to full epidermal detachment.

Methods: This a case of a 63-year-old female who was admitted to Guam-Regional Medical (GRMC) Center for skin infection and pancytopenia after starting methotrexate (MTX) for psoriasis. She was started on 10 mg/weekly of MTX without folic acid supplementation; one week later she was seen at GRMC-ED for a soft tissue skin infection and started on TMP-SMX. Two weeks after starting MTX she was admitted for a desquamating rash covering >70% of her body. There were no concerns for acute MTX ingestion as the patient's daughter, who controls her medications, confirmed

the once-a-week dosing of MTX. This case was complicated by geographical and social constrictions to include no burn unit at GRMC, and the patient did not possess an identification card for travel off the island. Hemodialysis was considered but not performed due to lack of available nephrologists. With no burn unit available, she was started on leucovorin q6h for treatment. During her hospitalization she had several labs to include MTX concentrations and a skin biopsy performed.

Results: On day of admission, she was noted to have pancytopenia with a WBC 3,000 cells/mL, Hg of 6 g/dL, and platelet count of 81,000 plt/mL. Her renal function showed a creatine (Cr) of 3.4 mg/dL with baseline of 2.0 mg/dL and BUN of 41 mg/dL. She had a nadir with a WBC 600 cells/mL, platelet 19,000 plt/mL. During her hospitalization, she received five units of pRBCs for anemia. Her MTX concentration the day after admission was 0.09 μ M/L, and slowly cleared to 0.04 μ M/L two weeks after admission. A punch biopsy was performed and resulted with “*vacuolar alteration, which is associated with a sparse lymphocytic infiltrate and dyskeratotic keratinocytes (Civatte bodies) at the dermal/epidermal junction.*”

Conclusion: MEN is a rare cutaneous disorder that displays keratinocyte dystrophy on histopathology. Risk factors for MEN include age >60, chronic kidney disease, and high initial dose of MTX without folic acid supplementation. This case highlights the importance of considering these risk factors in a patient started on standard therapeutic methotrexate dosing.

206. Two Cases of Anticholinergic Toxicity Associated With Improperly Prepared Lupine Beans in Lebanon

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Background: Lupine beans, or Termos, are part of the legume family closest to peas. They are a popular snack in the Mediterranean region, a high-protein food source, and a traditional remedy. Few cases of anticholinergic toxicity related to improper preparation of certain bitter Lupine varieties were reported worldwide.

Hypothesis: Consuming improperly prepared Lupine beans can cause anticholinergic toxicity.

Methods: We describe a case report of two patients who ingested improperly prepared Lupine Beans and were managed at the American University of Beirut Medical Center in Lebanon.

Results: Case 1: A 62-year-old female presented with ataxia, numbness, lower extremity weakness, and a dry mouth six hours after ingesting improperly cooked Lupine Beans. On the physical exam, her blood pressure was 106/68 mmHg,

heart rate was 88 beats/min, respiratory rate was 18 breaths/min, temperature 36.7°C, and pulse oximeter was 100% on room air. She had mydriasis with a sluggish light reaction, dry mucous membranes, and flushed skin. EKG and primary laboratory results were unrevealing. The patient was treated with IV hydration and midazolam for anxiety. Symptoms resolved within 7 hours of ingestion, and she was discharged home. Case 2: A 58-year-old female presented after experiencing four episodes of vasovagal syncope, dizziness, abdominal pain, vomiting, dry mouth, urinary retention, and palpitations. Examination revealed an ill-appearing patient with dilated reactive pupils, epigastric tenderness, and sinus tachycardia. Workup for pulmonary embolism, hemorrhagic and ischemic stroke, and cardiac etiologies was negative. Upon further questioning, the patient reported consuming home-prepared Lupine that was soaked for only a few hours before consumption, after which her symptoms started. The patient was admitted for supportive management, and symptoms resolved within 24 hours of ingestion.

Conclusion: Bitter lupin, commonly consumed in the Mediterranean region, contains quinolizidine and piperidine alkaloids, primarily sparteine, which taste bitter and can cause anticholinergic toxicity, impacting the nervous, circulatory, urinary, and digestive systems. These beans require debittering, which is done by soaking them in water for several days to decrease their toxicity. In contrast, sweet lupin, more popular in Australia, contains low amounts of alkaloids, primarily lupanine, making toxicity after ingestion less prevalent. Diagnosis can be challenging and necessitate meticulous history taking and high clinical suspicion. Given the region's high consumption of Lupine Beans, raising physician awareness for timely diagnosis and public awareness of proper preparation and use is essential to managing and preventing anticholinergic toxicity.

207. Characteristics of Dextromethorphan-Bupropion Exposures Compared with Exposures Involving Dextromethorphan Alone or Bupropion Alone Reported to United States Poison Centers

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Background: Dextromethorphan-bupropion (DXM-BUP) is a novel antidepressant approved for treatment of major depressive disorder. Despite concerns regarding toxicity in an overdose, there is little information available regarding the effects of a DXM-BUP overdose.

Research Question: The objective of this study is to investigate the characteristics and outcomes of DXM-BUP exposures reported to US poison centers and to compare these exposures to those associated with bupropion alone or dextromethorphan alone.

Methods: We analyzed exposures involving DXM-BUP, bupropion, and dextromethorphan reported to the National Poison Data System (NPDS) during 2023. Single-substance exposures involving DXM-BUP, bupropion, and dextromethorphan among adults aged 18 years and older were identified using NPDS generic and product codes.

Results: Among the 11,739 exposures in this study, 0.9% ($n = 106$) involved DXM-BUP. Two-thirds (67.0%) of DXM-BUP exposures were associated with no or minor effects or were not followed, and 54.4% did not receive care in a healthcare facility. One-third (33.0%) of DXM-BUP exposures were associated with serious outcomes compared with 25.4% of bupropion exposures (OR: 1.56, 95% CI: 1.02–2.34) and 25.8% of dextromethorphan exposures (OR: 1.42, 95% CI: 0.92–2.14). More than one-fourth (28.1%) of DXM-BUP exposures received inpatient medical treatment. Among DXM-BUP exposures, the most frequent related clinical effects were tachycardia (31%), confusion (13%), hypertension (12%), agitation (10%), QTc prolongation (9.4%), nausea (8.5%), and mild CNS depression (8.5%). Compared with dextromethorphan alone, DXM-BUP exposures were more likely to be associated with seizures (OR: 8.60, 95% CI: 2.81–21.88).

Conclusions: This study investigated the characteristics and outcomes of DXM-BUP exposures reported to US PCs and compared these exposures to those associated with exposures involving bupropion alone or dextromethorphan alone. Although most exposures involving ingestions of DXM-BUP were associated with minimal effects and about half of the exposures did not require treatment in a HCF, serious outcomes occurred in one-third of these exposures and more than one-fourth of DXM-BUP exposures were admitted to a HCF for medical treatment.

208. Withdrawn

209. Poisoning Related Admissions to the Intensive Therapy Unit at the General Teaching Hospital in a Small Island State

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Background: Studies worldwide have shown a trend toward an increase in the number of Intensive Therapy Unit (ITU) admissions due to intentional and unintentional poisoning. However, there is a paucity of publications about the

characteristics and demographics of these patients. The aim of this study was to conduct a fully anonymized retrospective analysis of patients admitted to the ITU at the Mater Dei Hospital, the general teaching hospital in Malta, a small island state, with poisoning related issues and to identify emerging admission patterns and assess the progress and outcome of such patients.

Methods: A detailed retrospective observational study from anonymized patient records was conducted following relevant ethics and data protections approval. The data of all patients admitted to the ITU over 18 years of age for any poisoning related issues from January 1, 2015 through December 31, 2021 were analyzed. Medical information collected included the nature of drug toxicity or overdose, including reason for admission to ITU, management in ITU, length of stay in ITU and outcome of patient.

Results: A total of 3,394 adult patients were admitted to the ITU during the period studied. From these admissions, 252 were related to poisoning. The age of patients ranged from 18 to 87 years, with a median age of 39.5 years. Gender distribution showed 94 females (37.3%) and 158 males (62.7%). The study identified seven most frequently involved causes of poisonings: recreational drugs (19.9%), sedatives (13.9%), antidepressants (11.3%), antipsychotics (11.3%), alcohol (10.7%), analgesics (6.9%) and antihypertensives (4.6%). Patient survival rate was 97.6%. It was also observed that elderly patients over 60 years old with comorbidities experienced a longer duration of stay in the ITU compared to younger patients (>5 days vs. 1–2 days).

Conclusion: This study, being the first of its kind in Malta, provides key insights into the critical issue of poisoning-related admissions to the intensive therapy unit in the small island state. The results of this study highlights the necessity for further research in this field in order to ensure better patient care and patient outcomes.

210. Accuracy of Vital Signs in Early Assessment of Acute Nephrotoxicity in Acutely Poisoned Patients

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Background: Poisoning represents a public health problem. Acute kidney injury (AKI) and chronic kidney disease are known complications that can occur after acute poisoning with nephrotoxic drugs or poisons.

Research Question: What is the accuracy of vital signs as predictors of AKI and outcome of acutely poisoned patients?

Methods: This prospective observational study was carried out on 100 acutely intoxicated patients by nephrotoxic drugs and poisons.

Results: The study revealed that 72% of the patients were men and 36% of the patients were between the ages of

18 and 30 years. AKI affected 21% of patients. Regarding the outcome, 43% of patients died or were discharged with issues requiring prolonged follow-up, whereas 57% of patients had recovered fully by the time they were discharged. Vital signs showed a non-significant difference between AKI groups and non-AKI patients' groups. Systolic and diastolic blood pressure significantly differ between completely recovered and dead or complicated recovered patients. The Receiver Operating Characteristic Curve found that the systolic blood pressure below 95 mm/Hg had an accuracy rate of 65.2% with acceptable discrimination for mortality and morbidity, sensitivity of 55.8%, and specificity of 80.7%. Diastolic blood pressure below 55 mm/Hg had an accuracy rate of 64.6% with acceptable discrimination for mortality and morbidity, sensitivity of 46.5%, and specificity of 84.2%.

Conclusion: The study concluded that the vital signs cannot be used as predictors for the incidence of AKI but systolic and diastolic blood pressure are accepted prognostic markers for the morbidity and mortality in acutely intoxicated cases with nephrotoxic drugs or poisons.

Author Index

Author Name	Program Codes		
Abdel Jalil, Sharif	103	Arens, Ann M	041
Abesamis, Michael G	023, 132, 169	Arnold, Thomas	002
Abston, Stephanie	076, 090, 151	Atti, Sukhshant	120
Abtahi, Shadi	088	Audette, Megan	099
Abussa, Sarah	077	Avera, Robert S	014
Acosta Olvera, Itzel A	117, 175	Balajee, Adayabalam	202
Ahmed, Marwa Ashraf	172	Barmo, Nour	206
Ahsan, Salman	110	Barnes, Jeff	007, 125
Akpunonu, Peter D	064, 136, 199	Barreto-Vazquez, Hector Daniel	019
Al Atbi, Al Yaqdhan H	166	Basse, Sara	012, 013
Al Hooti, Ibrahim	068	Bassi, Manpreet K	138, 179
Al Lawati, Duaa M	068, 206	Batista Minaya, Santiago	130, 163, 170
Al Sukaiti, Waleed S	068	Bator, Steven	030
Al Zahran, Tharwat M	166	Baumgartner, Kevin T	003, 009, 110 121, 131, 187
Al-Shmali, Hala	068	Bautista Albiter, Mayré I	117
Alam, Louisa-Maria H	166	Bebarta, Vikhyat	039
Albertini, Lisa	157	Belcher, Christopher N	199
Aldy, Kim	058, 060, 072, 076, 085, 090, 095, 096, 151, 101, 102	Beneke, Laura Lee S	167
Alegria Rivas, Fátima A	117, 175	Berg, Sarah E	008, 009, 016, 121
Ali, Ahmed Maher	172	Berling, Ingrid	126, 194
Allen, Bennett	114	Berman, Adam	129
Alptunaer, Timur	052	Beveridge, Majella	194
Alvarez, Melissa	095	Bhalla, Ashish	184
Amador Meza, Pamela J	117, 174, 175	Bierman, Jesse	063
Anderson, Amber E	181	Bleifuss, William J	054, 183
Anderson, Robert	133	Bloom, Joshua	159
Appleton, Johanna	088	Bodenberg, Paul	089
		Boley, Randy	046
		Boley, Sean	079
		Bollich, Hannah L	041
		Boynton, Samayah	140
		Bradford, William S	146
		Brambl, Wells	163
		Bratches, Reed	146
		Brenner, Marielle A	014
		Brent, Jeffrey	058, 060, 072, 076, 085, 090, 095, 096, 101, 102, 151, 171
		Breslin, Tyler	127
		Brousseau, Stacy	089
		Bryant, Sean	201
		Bunting, Amanda M	114
		Burinsky, Alex	030
		Burke, Sarah G	134, 137, 155
		Burkhart, Keith	072
		Burns, Michele M	144
		Butty, Emmanuelle	007
		Calello, Diane P	012, 013, 053, 153
		Calleo, Vincent	155, 197
		Campleman, Sharan	010, 058, 060, 072, 076, 085, 090, 095, 096, 101, 102, 151, 171, 181
		Canning, Joshua E	173
		Cantrell, Lee	044

Cao, Dazhe J	034, 094, 108	Desai, Milap H	045
Caparrelli, David	030	Deutsch, Aaron B	081
Capt, Braden	010	Dibhar, Debaprasad	184
Carpenter, Joseph E	017, 083, 086, 140	Dicker, Frank	009, 131
Carreiro, Stephanie P	069, 088	DiFilippo, William	135
Carroll, David K	020, 021, 109, 160	Ding, Kele	148
Carroll, Gerard	077	Dolcourt, Bram	020, 109
Carter, Craig T	064	Downes, Michael A	126, 194
Carter, Daniel	071	Duma, Jennifer N	115
Castelli, Rachel	075	Dunavin, Adrienne	012, 013
Cates, Alexis L	041, 052, 087	Durrani, Timur S	104
Cavuoto, Lora	071	Dye, Daniel W	146
Chai, Peter R	071	Eagle, Sonja	191
Chakraborty, Amar	015, 079	Eassa, Heba	103
Chambers, Carson C	067	Ebeling-Koning, Natalie E	029, 081, 112
Chang, Arthur	152	Ebersole, Joseph M	017, 036, 140, 152
Charlton, Nathan P	006, 022, 119, 147	Echols, William R	064
Chary, Michael	154	Ehrhardt, Tori F	202
Chawarski, Marek	077	El Zahran, Tharawat	206
Chen, Kathleen Q	094	Ellebedy, Ali H	003
Chhabra, Neeraj	046	Elzinga, Jason	051
Chircop, Robert	209	Etedali, Nahvid	125
Clark, Joshua	164	Fahd, Ghina E	166
Clark, Richard F	044, 180, 191	Faizan, Imam	070
Clemency, Brian M	071	Falise, Alyssa M	058, 072, 076, 085, 090, 095, 096, 101, 102, 151
Clement, Megan	112	Farah, Rita	006, 022, 119, 147, 161
Clemons, Joseph Z	124	Farinelli, Lisa	001
Clukies, Lindsay	008	Farkas, Amy	099
Cohen, Neta	171	Farkas, Andrew	099
Cook, Leanne	044, 176, 180, 191, 192	Farmer, Brenna	144
Corcoran, Justin	099	Farokhnia, Mehdi	001
Counts, Christopher J	053, 098, 153	Faryar, Kiran A	014
Covington, Whitney	146	Faulkner, Monica	001
Cowdery, Colleen P	011, 032, 033, 204	Feldman, Talia	088
Cregan, Brianne P	085	Felix Bernstorff, Dania M	117, 174, 175
Culbreth, Rachel	058, 060, 072, 076, 085, 090, 095, 096, 101, 102, 151	Fenton, Emily M	141
Curry, Steve	005	Fernandez, Denise	128
Córdoba, Francisca	203	Ferrer Dufol, Ana	203
D'Aloia, Mitchell R	046	Filip, Ari B	038, 185
D'Onofrio, Gail	077	Finkelstein, Yaron	171
Daigh, Arthur W	050	Fisher, Erik S	193
Daniel, Johnni	152	Flannery, Patrick	103
Darling, Aria	020, 021, 109, 160	Font, Allison R	043, 092, 105
Davis, Gregg	002	Ford, Maureen	089
Davuljigari, Chand Basha	145	Foster, Howell R	038, 185
Dawood, Murtaza	030	Fouad, Marwa Mohammed	172
De Halleux, Cyrille	157	Fox, Erin R	144
De Olano, Jonathan	083	Fraser, William	039
Dejman, Masoumeh	001	Fredrickson, Caleb J	061, 186
del Ángel González, Natanael	174, 175	Frisch, Adam	142
Dernbach, Matthew R	086	Frost, Kyra	177

Gaetani, Samantha L	018, 102, 182	Howell, Chamberlyn S	029
Garcia, Eddie C	178	Hoyte, Christopher	039
Gastanaduy, Mariella	087	Hudson, Jack	140
Gehan, Daniel	127	Hughes, Adrienne	190
Gerona, Roy	094	Ibragimov, Umed	140
Getz, Tatiana	140	Iddins, Carol	202
Gittinger, Melissa	202	Imperato, Nicholas S	098, 100
Glaser, Timlin P	173, 182, 198	Innis, Charles J	069
Glatstein, Miguel Marcelo	042	Isbister, Geoffrey K	126, 194
Goding, Julian C	069	Isbister, Tessa	126
Goertemoeller, Sheila	057	Ivanov, Ivan D	027, 189
Goldberger, David J	165	Jafari, Christianne	009
Golleru, Manohar	071	Jang, David H	073
Gollob, Michael H	157	Joanna, Finstad	125
Gooley, Brian	079	Johnson, Brett E	069
Graeme, Kimberlie	116, 198	Johnson, Dane	113
Gramm, Erin R	023	Johnson-Arbor, Kelly K	025
Gray, Zachary	112	Jones, Courtney	149
Grazioli, Alison	030	Joseph, Nicholas	039
Greene, Spencer C	010, 181	Kacinko, Sherri L	059
Greller, Howard A	027, 053, 091, 098, 153, 189	Kaczor, Eric E	071
Griswold, Matthew	103	Kalinina, Ekaterina	096
Groff, Veronica	177, 182, 198	Kao, Louise W	050, 065, 073
Gupta, Mayank	206	Kara, Zweerink E	201
H, Mohan Kumar	184	Kaser, Taylor	008, 009
Hall, Samuel M	136, 199	Kashani, John	189
Han, David	196	Katz, Kenneth D	081
Han, Rachel T	050	Kazmierczak, Steve	063, 075
Harding, Stephen Alexander	019	Kazzi, Ziad N	017, 166, 202, 206
Haroz, Rachel	077	Keenan, Michael P	134, 155
Hays, Hannah L	066, 093, 106, 148, 207	Kelleran, Kyle J	071
Heard, Julia M	037	Kelly, Haley A	093
Hebbard, Carleigh FF	110, 131	Kendric, Kayla J	084, 104
Hedge, Matthew	020, 021	Kennedy, Christopher L	033, 035, 078, 204, 205
Heil, Jessica	077	Kent, Jessica T	139, 157
Hendrickson, Robert G	011, 074, 076, 078, 080, 143	Kerns, Abigail F	031
Henhaffer, Robert	100	Kertesz, Stefan	146
Henry, William H	136, 199	Khan, Anas	162
Her, Jiwoong	007, 125	Khezri, Mehrdad	114
Hern, Gene	077	Khoury, Michael O	043, 045, 092, 105, 165
Hernández Sánchez, Diana	174	Kiernan, Emily	017, 037, 202
Herring, Andrew	077	Kimbrough, Tara	052
Hezumuryango, Louange	171	Kimpel, Kathryn C	065
Hieger, Michelle A	045	King, Andrew	020, 021, 160
Hoang, Danthy	075	King, Joshua D	030, 047, 073
Hodgman, Michael	137	Kirschner, Ron	124
Holdman, Richard P	158	Kistangari, Sandhya	106, 148, 207
Holstege, Christopher P	161	Knowles, Taft	052
Hom, Grant L	031	Knutson, Devin	057
Horowitz, B Zane	035	Kocurek, Emily G	038
Horowitz, Keahi M	011, 063, 075, 190, 204	Kolbeck, Matthew	155
Howard, Elizabeth	087	Korenoski, Amanda S	135

Kristensen, Kieran A	140	MacVane, Casey	168
Krotulski, Alex J	058, 059, 072, 076, 090, 095, 101, 102, 151	Mahony, Forrest P	069
Krueger, James A	092, 105	Makar, Gregory	116, 182
Krueger, Jessica J	005, 116	Malley, Carin K	133, 168
Kumar, Shivram	149	Mancera Castillo, Lorena	117, 174, 175
Kurtz, Camden E	186	Manini, Alex F	060, 095, 101
Kuschner, Cyrus E	129, 130, 163	Mankodiya, Kunal	088
Kusin, Shana	123	Mantilla, Valeria	087
Kusko, Rebecca E	089	Marciniec, Kasia A	014
Labato, Mary Ann	007	Marinescu, Mark	197
Lai, Jeffrey T	069	Marlin, Michael B	167
Lakamp, Elizabeth	164	Marraffa, Jeanna M	149, 155
Langston, Catherine	007, 125	Marshall, Stacy A	120, 146
Lara, Vanessa	077	Martin, Rachel D	118
Lark, Mary C	116, 173, 177, 182	Masom, Clifford	163
Larochelle, Madeline C	133, 168	Massengill, Danae	039
Laskey, Dayne	103	Mazer-Amirshahi, Maryann	144
Laskowski, Larissa K	114	McArdle, Kylie	126
Lasoff, Daniel	044, 180	McCabe, Daniel	113
Lavon, Ophir	048, 049	McCray, Lauryn	140
Le, Anh Thu Thi	040	McDonald, Conner T	006, 022, 119, 147
Le, Hoang Linh Tu	004	McKamie, Garrett	038
Le, Nghia Quang	004	McKean, Nicholas D	031
Le, Thuan Quang	004, 040	McVicker, Christopher	002
Le, Vu Tuan	004	Meaden, Christopher	128
Lee, Ryan T	031	Menza, Daniel	055, 130, 163
Leggio, Lorenzo	001	Merchant-Borna, Kian	070
Leibowitz, Josh	030	Metrejean, Christina	002
Leonard, James B	185	Micciche, Andrew F	064, 136, 199
LeSaint, Kathy	024, 062, 188	Midthun, Kari M	059, 141
Levine, Michael	171	Mifsud, Janet	209
Lewis, Brian G	005	Miglani, Andrea	149
Li, Shao	085, 171	Miller, Jordan	196
Liberio, Brianne M	050	Miller, Robert	196
Lieu, Kevin	024	Minns, Alicia B	044, 180, 192
Light, Brooke	112	Mishra, Meena	087
Lima, Rafael	028	Mitchell, Christopher P	165
Lippi, Matthew	044, 176, 180, 191, 192	Mok, Travis KC	017
Liss, David	008, 009, 016, 110, 131	Moran, Timothy P	036, 140
Livshits, Zhanna	138, 179	Moriguchi, Riku	044, 176, 180, 191, 192
Logan, Barry K	058, 059	Mudd, Philip A	003
Lopachin, Tyler	083	Mueller, Kristen	008
Lothet, Emilie H	008, 009, 131	Mullins, Michael E	009, 016, 061, 122, 186
Love, Jennifer S	060	Murphy, Christine	002
Lovett, Caitlyn	126	Murray, Austin	161
Lucyk, Scott	051	Murray, B Patrick	066, 093
Lynch, Joshua	071	Myran, Daniel T	171
Lynch, Kara L	084	Nacca, Katherine	127
Lynch, Michael J	056	Nacca, Nicholas	012, 013, 070, 127, 197
Ma, Mariel	198	Nahass, Thomas	128
Macdonald, Victoria A	047	Ndikumana, Robyn	139
		Neavyn, Mark J	133, 168

Negroni, Natalie	091	Rodda, Luke	062
Nekkanti, Sidhvi	089	Rogers, Thomas A	155, 197
Nelson, Lewis S	013	Roth, Brett	034
Ngo, Ngoc Duc	004	Roth, Kaitlin	039
Ngo, Sonia	207	Ruck, Bruce	153
Nguyen, Kim-Long R	009, 015, 016, 121, 122, 061, 131	Ruge, Matt J	148
Nguyen, Nguyen Trung	004, 040	Ruha, Anne-Michelle	010, 173, 181
Nguyen, Tao Thien	004	Rumph, Jelonia T	152
Nguyen, Tuan Van	004	Ryan, Erin	018
Nillas, Andrea	034, 094, 108	Salmo, Ellen	009
Nogar, Joshua	055, 129, 130, 170	Saltzman, Matthew	077
Novak, Matthew	150	Sanders, Taylor	002
O'Connor, Ayrn D	073	Santos, Cynthia D	100, 153
Olivas, Madelyn	106	Scaglione, Jaclyn	091
Olives, Travis D	183	Scanlon, Matthew P	132, 156
Orahoske, Cody M	084	Schaffer, David H	029, 112
Ostrowski, Simon J	056, 111, 132, 135, 142, 156, 169, 200	Schamber, Emily	046
Owen, Makena	129, 130, 163, 170	Schmalzried, Scott G	006, 022, 119, 147
Padilla-Jones, Angela	005	Schmitz, Aaron J	003
Painter, Orian B	071	Schnall, Amy H	152
Paquin, Zachary	089	Schneir, Aaron	180
Parris, Mehruba A	027, 053, 091, 098	Schuh, Suzanne	171
Patel, Abhisek A	064	Schultheis, Paige A	050
Patel, Kaleena	177	Schwarz, Evan S	072
Patel, Shrey	129	Scoccimarro, Anthony D	159
Patriarca, Tiana	120	Scott, Karen S	146
Pepin, Lesley	054	Seltzer, Justin	044, 176, 191
Pepper, Michael	052	Selvam, Suresh	184
Pereira, Melina	209	Seo, Claire	162
Perkins, Christopher R	069	Shanahan, Elizabeth G	165
Perrone, Jeanmarie	072, 096, 102	Sheen, Andrew	116, 173, 177, 182
Pizon, Anthony F	056, 118, 096, 142	Shenoi, Jessica	036, 037
Poitras, Mark	113	Sherman, Garrick	001
Pola, Sai	164	Shokry Zaghary, Meray M	210
Pérez Hernández, Juan C	175	Shulman, Joshua	085, 095, 132, 169, 200
Pérez Tuñón, Jorge G	117, 174, 175	Sidlak, Alex	026, 195
Raciti, Christopher	062, 188	Siegel, Marisa R	132
Rahman, Irfan	070	Silberman, Zachary H	023, 056, 111, 132, 135, 142, 156, 169, 200
Ralston, Samuel A	164	Simone, Karen E	133
Ramirez, Victoria	198	Singer, Michael F	043, 092, 105
Ran, Ran	063	Singh, Bhupinder	073
Reddy, Keshav	096	Singh, Harpreet	184
Rees, Madeline Ann	019	Slayyeh, Brian H	185
Reif, Brandon M	066	Smith, Alyse	192
Rine, Natalie	093	Smith, Dale	046
Rine, Natalie I	066, 106, 148, 207	Smith, Gary A	106, 148, 207
Riney, Lauren C	115	Smith, Jeffrey D	076
Rivera Pescatore, Jessica	120	Smith, Karen	124
Rivera, Daniel	041	Smollin, Craig	179
Riviello, Christopher D	043, 092, 105	Snow, Jerry	005
Roberts, Katherine L	156	Solanki, Dhaval	088

Solazzo, Lisa	153	Vaid, Raizada A	134
Spadaro, Anthony	091, 128	Varney, Shawn	196
Spillane, Amanda M	125	Vearrier, David J	167
Spungen, Hannah	116	Venkatasubramanian, Krishna	088
Spyres, Meghan	018, 073, 102, 173, 177, 182	Vi, Quang The	040
Stavros, Fiona	073	Vohra, Varun	020, 021, 109, 160
Steck, Alaina	036, 086, 140	Vu, Phong Dinh	004
Stines, Cole	057	Wahl, Michael	150, 201
Stokkeland, Kelsey	183	Walsh, Steven J	043, 045, 092, 165
Strand, Annika	079	Walton, Sara E	058, 059
Stratton, Darien L	056, 111, 132, 135, 142, 156, 169, 200	Wang, Hao	164
Stripp, Matthew	162	Warpinski, George	010, 181
Suarez, Fermin	039	Wax, Paul	012, 013, 015, 058, 060, 072, 076, 085, 090, 095, 096, 101, 102, 151, 171
Suen, Kyle	019	Wei, Yudan	067
Supervía, August	203	Weiss, Stephanie T	001
Suri, Vikas	184	Wermuth, Mary	028
Surka, Azim	029	White, Sean M	029
Sutphin, Amanda M	015, 101	Whitledge, James D	144
Suvak, Mary K	135, 156	Williams, Andrew S	139
Swatek, Jennifer L	141	Williams, Frank B	087
Sweeney, Michael T	136	Wing, Sarah E	050
Syed, Rahamathulla	145	Winkels, Jessica L	187
Sánchez Ramírez, Tania A	175	Winquist, Andrea	152
Taha, Sammy	025, 026, 195	Winters, Callie	154
Tai, Carolyn	007	Yakey, Brandtly	020, 021, 160
Taylor, Quincy M	056, 111, 132, 135, 142, 156, 169, 200	Yang, Jingzhen	106
Temple, Courtney	032, 074, 080	Yasgur, Brooke C	038
Theriot, Lauren	002	Yeh, Andrew	008
Thompson, John A	204, 205	Yeh, Michael	152
Thompson, Trevonne M	046	Yemets, Masha	030
Thorpe, Dillon	046	Yeung, Kara	044, 176, 180, 191, 192
Tirado, Daniel	035, 123, 143, 204	Yin, Shan	057, 115
Toomey, David	070, 137, 149	Young, Amy C	094, 108
Toxicology Investigator's Consortium (Toxic)	010, 045, 058, 060, 072, 076, 085, 090, 095, 096, 101, 102, 105, 144, 151, 171, 181	Young, Conor	137, 155
Trautman, William J	023, 111, 118, 135	Zager, Richard A	073
Trebach, Joshua D	014, 113	Zawilla, Nermin Hamdy	172
Trecki, Jordan	094	Zhang, Victoria	070
Trieu, Connie	190	Zhu, Jianmin	067
Troeschel, Alyssa	152	Zhu, Motao	106, 148
Turner, Jackson S	003	Zweerink, Kara E	150
Ulici, Alexandru	054		
Urdangarin, Agustin	203		