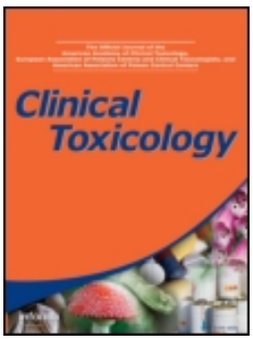

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ABSTRACTS

2015 Annual Meeting of the North American Congress of Clinical Toxicology (NACCT)

1. Success of an online poison information web resource

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Background: Exposure call volume to US Regional Poison Centers (RPCs) declined 13.8% from 2008–2013. One suggested explanation for the decline is that consumers are using the internet to obtain poison information instead of calling an RPC. In 10/2012, a poison information web resource, "My Child Ate" (MCA), was developed to meet the needs of consumers who want to obtain poison information via the internet. MCA provides management information for common, minimally toxic pediatric exposures to household substances (e.g. silica gel, soap, and diaper rash cream). Each webpage is dedicated to one substance, is written for consumers, and lists information on toxicity level, expected symptoms, and treatment recommendations. The national poison center phone number (1–800-222-1222) is highlighted in several places on each page, so consumers can reach a live RPC specialist for more information.
Methods: Metrics for the MCA pages were analyzed using Google Analytics from 10/1/2012-3/31/2015. Metrics for total page views, traffic channels (how the consumer reached MCA), % of traffic from mobile devices, and clicks to 1-800-222-1222 were reviewed.
Results: In the 27 months since its inception, the number of MCA page views has grown exponentially (2280% increase). Use of a mobile device to view MCA pages has increased from 35% of page views in 2012 to 78% of page views in 2015. When MCA first launched, 40% of traffic came from within the RPC region; currently 93% of users come from outside the RPC region. 87% of users arrive by an organic internet search (vs direct link). These metrics may indicate that the pages are being viewed to obtain information after an exposure. When MCA pages are viewed using a smartphone, the national poison center phone number (1-800-222-1222) appears as a hyperlink throughout the page. Users can click on the number to be immediately connected to their RPC. Currently, MCA is generating over 400 clicks per month to RPCs.
Conclusion: Consumers are looking for poison information online; mobile devices are the preferred platform when searching for pediatric poison information. An RPC resource to provide this information currently provides nearly 25,000 information/exposure encounters per month to consumers; almost 2% of smartphone users will call their RPC for additional information.
Keywords: Poison center, Pediatric, Epidemiology
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	2012 (10/1–12/31)	2013	2014	2015 (1/1–12/31)
Average page views per month	1,032	4,768	14,342	24,555
Mobile device (% of page views)	35%	63%	74%	78%
Arrive by organic search	Not available	70%	87%	87%
Traffic from within RPC region	40%	11%	7%	7%
Average clicks on 1–800-222–1222 per month	Not available	102	234	414

2. Ease of Identifying and Purchasing Popular "Research Chemicals" via the Internet

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Background: Novel psychoactive substances (NPS) marketed as "research chemicals" (RC), are sold online for ill-defined medical and scientific "research". This tactic—and the label "not for human consumption"—allows online RC retailers to avoid legal restrictions. This study's aim is to identify what RCs are currently popular, and ascertain whether they can be obtained from publicly-accessible websites.
Methods: From December 2014 to March 2015, background research identified increasingly-popular RCs online, using the websites Google Trends, Reddit, Erowid, and Bluelight. Highly-trending RCs were identified using Google Trends search interest from January 2004 to March 2015; additional compounds of interest (COIs) were identified using drug user forums. Google and Reddit were then used to identify e-commerce enabled internet retailers with standard payment portals (credit card, PayPal, Western Union, bank transfer) that would ship to the US. Darknet sites, websites accepting only bitcoin currency, and wholesale-only websites were excluded. Shipping information and domain name searches were used to identify retailer locations. RC analysis was done with liquid chromatography-quadrupole time-of-flight mass spectrometry (LC-QTOF/MS).
Results: Ten highly-trending RCs were identified: AB-CHMINACA, 6-MAPB, 5-MAPB, AL-LAD, methoxetamine, etizolam, deschloroetizolam, flubromazepam, flubromazolam and ethylphenidate. Ten user forum COIs were identified: MDBP,

25B-BOMe, 25C-NBOMe, 25I-NBOMe, 25N-NBOMe, PX-2, MDPV, 5-MeO-DALT, 3MeO-PCP and 4MeO-PCP. Eight RC e-commerce websites meeting inclusion criteria were identified. They were based in the United Kingdom (UK) (4), Netherlands (1), Canada (1), China (1), and 1 was based in the UK but shipped from China. In February-March 2015, 8/10 highly-trending RCs and 6/10 COIs RC specimens were purchased from these websites. Methoxetamine, AL-LAD, MDBP, MDPV, 3MeO-PCP and 4MeO-PCP could not be purchased. In all 34 specimens representing 14 advertised RCs were ordered. Twenty-eight of 34 (82%) were delivered by the end of the study period. LC-QTOF/MS confirmed 23/28 (82%) specimens were the advertised chemical. These include 25B-NBOMe, 25C-NBOMe, and 25I-NBOMe which are illegal (US Schedule I, UK Class A). The other compounds are potential subjects for prosecution under the US Synthetic Drug Abuse Prevention Act.

Conclusions: This study demonstrates that NPS sold as "research chemicals" are readily available for purchase on the internet via conventional payment portals. Toxicologists and law enforcement personnel should be aware of this growing potential public health threat.

Keywords: Designer drug, Surveillance, Internet

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3. Neurotoxicity due to Sri Lankan Russell's viper envenomation is caused by a weak presynaptic neurotoxin

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Background: Neurotoxicity is only reported in Russell's viper (Daboia russelii) envenomation in Sri Lanka and South India and its clinical significance, causative neurotoxins and effectiveness of antivenom in treatment are unclear.

Methods: We prospectively collected Russell's viper envenomation cases presenting to one hospital from April to October 2014. Only cases with expert snake identification or detection of Russell's viper venom in serum by enzyme immunoassay were included.Clinical features of neurotoxicity were recorded at pre-defined times during all patients' hospitalization, and 6 weeks and 6 months post-bite. Single fiber electromyography (sfEMG) of orbicularis oculi was performed in 51 patients. Size exclusion and reverse-phase high performance liquid chromatography were used to fractionate Sri Lankan D. russelli venom and isolate any neurotoxins. In vitro neurotoxicity was investigated using the chick biventer cervicis nerve-muscle preparation.

Results: 189 definite bites were enrolled a median of 2.5 h (interquartile range [IQR]:1.5–3.5) post-bite. Ninety three (49%) developed clinically detectable neurotoxicity, all initially with ptosis within 12 h of the bite. Twenty one patients developed diplopia, 10 strabismus and 59 external ophthalmoplegia. Complete ptosis only occurred in three. None had facial, bulbar, respiratory or limb paralysis. High jitter without blocks was seen in 8% of pooled fibers of clinically neurotoxic (n = 28) as well as non-neurotoxic patients (n = 23). An initial dose of 20 vials of Indian polyvalent antivenom, given a median of 3.5 h (IQR: 2.5–4.75) post-bite, bound all free venom in most cases.However, neurotoxicity persisted for a median of 3 d (1–8 d).When 41 patients with no neurotoxicity were given antivenom, 29 (71%) developed neurotoxicity within 6h.

Larger snakes (>50 cm) and higher pre-antivenom venom concentrations (>50 ng/ml) were significantly associated with neurotoxicity ($p < 0.01$). There was no clinical neurotoxicity or abnormal sfEMG on follow up. A 13.6 kDa toxin was isolated from the only venom fraction that displayed in-vitro neurotoxicity. The toxin made up 30% of the venom andcaused a pre-synaptic neuromuscular blockin vitro,but was not able to completely abolish twitches even at high concentrations (600nM). Indian antivenom did not neutralise this neurotoxicity at recommended doses.

Conclusions: Neurotoxicity due to Sri Lankan Russell's viper envenomation appears to be non-life-threatening and is likely to be caused bya weak presynaptic toxin in the venom. Consistent with findings in-vitro, early antivenom did not reverse established neurotoxicity nor preventitsoccurrence.

Keywords: Neurotoxicity, Venom, Snake bite

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4. Analysis of 2011 and 2012 Medicare Payments for Poisoning and Toxic Drug Effects

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Background: Limited literature is available describing and comparing costs of treating poisonings. The objective of this study is to characterize charges and payments for the treatment of poisoning and toxic drug effects in the Medicare population.

Data source: Medicare Fee-For Service Provider Utilization & Payment Data Inpatient Public Use File.

Methods: Medicare claims and payments for DRG codes 917 (poisoning or toxic drug effect with major clinical complication) and 918 (poisoning or toxic drug effect without major clinical complication) from 2011 and 2012 are described for facilities with >11 discharges. Differences between hospitals with and without medical toxicology services are analyzed by T test. Facilities with medical toxicology treatment services (MedTox) were identified via the American College of Medical Toxicology's website.

Results: Over this 2 year period Medicare paid a grand total of $26.4 million against covered charges of $118.4 million for DRG 917 and 918, representing 91,927 discharges from 2,225 facilities. DRG 917 represented 39% of discharges with average covered charges of $40,786 ($8,344 – $236,456), average total payments of $10,925 ($6,902 – $31,149) and average Medicare payments of $9,696 ($5,232 – $30,683). DRG 918 represented 61% of discharges with average covered charges of $17,806 ($3,956 – $79,625), average

Table 1. Comparison of discharges, charges and payments between facilities with and without medical toxicology treatment services. *P values < 0.05.

	917 MedTox	917 No MedTox	918 MedTox	918 No MedTox
Average annual covered discharges per facility	24	20*	29	21*
Average covered charges per visit	$ 47,307	$ 40,527	$ 19,573	$ 17,757
Average total payment per visit	$ 14,801	$ 10,770*	$ 6,080	$ 4,483*
Average Medicare payment per visit	$ 13,609	$ 9,540*	$ 5,066	$ 3,527*

total payments of $4,527 ($3,041 – $14,999) and average Medicare payments of $3,569 ($1,604 – $13,655).

Conclusions: There is variability in the charges and payments for DRG codes 917 and 918 between individual facilities. On average facilities with medical toxicology treatment services had more discharges and receive higher payments for codes 918 and 918 from patients in the Medicare population.

Keywords: Billing, Medicare, poisoning

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5. Trends in Alcohol-Related Emergency Department Visits and Resource Utilization, 2001–10

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Background: Alcohol intoxication accounts for approximately 1.5% of all US emergency department (ED) visits. In the context of a strained emergency services system, understanding the epidemiology of alcohol-related ED visits represents an important area of research and intervention. This study characterizes trends in alcohol-related visits to US EDs over time.

Methods: A retrospective review of adult (≥ 18 yrs.) ED visits from the National Hospital Ambulatory Medical Care Survey (NHAMCS), 2001–10 was performed. Alcohol-related visits were identified using ICD-9 codes and reported reason for visit. Demographic characteristics were analyzed for trends over time. Resource utilization for alcohol-related visits was examined, including length of stay (LOS), diagnostic imaging, return visits, ambulance transport, procedures and medication use. Data were grouped into two-year sets to improve statistical power. Proportions were compared using survey-weighted chi square tests, while tests for trend were assessed using survey-weighted logistic regression. Measures of resource utilization were not uniformly collected every year and therefore trend analysis was not possible for all variables.

Results: Between 2001-02 and 2009-10, alcohol-related visits increased 48.5% from 2.4 to 3.6 million ($p = 0.007$). There was no notable increase in the proportion of visits across age, sex, race and payer, or based on hospital characteristics. Total alcohol-related hours spent in EDs nationwide increased 113.5% from 5.1 million in 2001 to 10.8 million in 2010 ($p < 0.001$), compared with an increase in overall ED hours of 53.6% ($p < 0.001$). Overall LOS increased 18.3% ($p = 0.014$), while LOS among admitted patients increased 32.3% ($p = 0.034$). Admission rates for alcohol-related ED visits remained stable. In 2009-10, 6.4% of visits were returns to the hospital within 72 hours and 56.4% had > 2 visits in the previous 12 months. Ambulance transport was used in 48.7% of visits in 2003 compared to 57.7% in 2010 ($p < 0.001$). The use of CT and MRI increased 98.3% from 11.5% to 22.8% between 2001–02 and 2009-10 ($p < 0.001$), while x-ray use remained stable. The mean number of medications provided per visit increased from 1.41 to 1.66 ($p = 0.005$). The most common medications for alcohol-related visits were lorazepam, normal saline, and thiamine. Procedure rates (including IV placement) remained stable over time at nearly half of all visits.

Conclusion: Alcohol-related ED visits are increasing at a greater rate than overall ED visits and represent a growing burden in length of stay and resource utilization. Future research efforts should focus on mitigation strategies, particularly substance abuse programs.

Keywords: Alcohol, Epidemiology, Public health

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6. Do New Child Resistant Closures Reduce Injury Following Accidental Ingestion?

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Background: Unintended childhood ingestions (UIs) of liquid medications occur frequently despite the child-resistant-closure packaging of these bottles. As part of a national initiative to reduce UIs, new Pediatric Exposure Limiting Packaging (PELP) incorporating a flow restrictor closure has been added to many liquid acetaminophen 160 mg/5mL bottles. In simulated settings, these flow-restrictors have been shown to substantially reduce both frequency and amount of ingestion. We sought to determine whether these benefits occur in the real world.

Methods: All pre-hospital UIs of single ingredient acetaminophen involving children < 12 years old reported to 6 participating poison centers (PC) were eligible. Parents were contacted within several days after the event by phone and invited to participate in a phone interview about the event. Interview responses were entered into a research-formatted electronic database program. PC narrative notes were used to extract dose. PC survey data were used to evaluate packaging type. Data was limited to reports between 01 August 2013 and 31 January 2014.

Results: 1952 UIs were reported; 528 parents completed surveys (27%). Pediatric single ingredient acetaminophen liquids were the only product ingested in 289 cases (54.7%). Of these, 53 (20.2%) involved a child < 2 yr, 178 (67.9%) a child 2 or 3 yr, 28 (10.7%) a child 4 or 5, and 3 (1.1%) a child 6–11. Boys comprised 151/289 (52.2%) of cases. Dose for weight could be calculated in 262 cases (90.7%). The average individual dose among these cases was lower when new packaging was involved, as compared to those with old packaging and with undetermined packaging. An acetaminophen

	New (n = 179)	Old (n = 70)	Unknown (n = 13)
Average Dose (mg/kg) + STD	76.79 + 54.34	106.73 + 61.12	110.99 + 61.70
Max Individual Dose ≥ 150 mg/kg	19/179 (10.6%)	16/70 (22.9%)	5/13 (38.5%)

dose of 150 mg/kg is often used by poison centers as the threshold for referral to an ED for further evaluation, so the frequency at which this level was exceeded was used as a study endpoint.

A lower percentage of cases with new packaging type had a maximum individual dose > 150 mg/kg compared to old packaging type (p = .0002).

Discussion: The odds of a dose > 150 mg/kg being ingested was 2.5 times larger with old packaging than new (95% CI: 1.20, 5.19).

Conclusions: UIs of liquid acetaminophen from flow-restrictor packages were significantly less likely to involve a clinically significant dose (> 150 mg/kg). More extensive use of flow restrictor packaging for liquid medications would likely reduce the morbidity and mortality associated with UIs. Further implementation of flow restrictor packaging should be encouraged.

Keywords: pediatric acetaminophen, unintentional ingestion, flow restrictor

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7. A Prospective Study of Ketamine versus Haloperidol for Severe Prehospital Agitaiton

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Background: Undifferentiated severe agitation (SA) in the prehospital environment is a commonly encountered problem that represents a safety issue for both the patient and their caregivers. When rapid sedation is indicated, controversy exists regarding the ideal agent. We hypothesized ketamine (K) 5 mg/kg intramuscular (IM) would be superior to haloperidol (H) 10 mg IM for SA in the prehospital environment, with time to adequate sedation as our primary outcome measure.

Methods: This is a prospective open label Waiver of Consent study (45 CFR 46.116) of all patients in our EMS system needing chemical restraint for SA that were subsequently transported to our ED. From October 2014 to February 2015, all patients in our EMS system with SA were treated with H. Our standard treatment for prehospital SA in February of 2015 was subsequently changed to K. All paramedics in our EMS system were trained in the Altered Mental Status Scale, a validated ordinal scale of agitation. Paramedics carried stopwatches and measured time to adequate sedation after injection. Secondary outcomes included additional sedatives given, ethanol concentration, intubation, vomiting, dystonia, akathisia, emergence reaction, laryngospasm, or hypersalivation.

Results: 89 subjects have thus far been enrolled; 64 received H, 25 received K. Median age of the H arm was 32 (range 18–69); median age for K was 36 (range 20–55). For gender, 32/63 (51%) were male in the H arm; 15/25 (60%) were male in the K arm. Twelve subjects in the H arm required another medication prehospital for sedation; all were given midazolam 5 mg IM. No subjects in the K arm required additional sedation prehospital. In the H arm 38/64 (59%) achieved adequate sedation prehospital; in the K arm 24/25 (96%) achieved adequate sedation prehospital (p = 0.001). Median time to adequate sedation in the H arm was 19.6 min (range 3.8–84); median time to adequate sedation in the K arm was 5.5 min (range 1.6–15) (p < 0.0001). Regarding intubation, 2/64 (3%) of subjects in the H arm were intubated versus 12/25 (48%) of subjects in the K arm (p < 0.001). Complication rate including vomiting, dystonia, akathisia, emergence reaction, laryngospasm, or hypersalivation were higher in the ketamine group (3/55, 5% in the H arm versus 10/22, 45% in the K arm). Complications in the H arm included only dystonia and vomiting. All other complications were seen in the K arm. Median breath ethanol in the H arm was 0.16 g/dL (n = 53, range 0–0.42), in the K arm it was 0.18 g/dL (n = 10, range 0–0.34).

Conclusion: For severe prehospital agitation, ketamine 5 mg/kg IM is superior to haloperidol 10 mg IM regarding time to adequate sedation. Ketamine is, however, associated with a significantly higher complication rate.

Keywords: Delirium, Substance abuse, Alcohol

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8. Characterization of Deaths due to Snake Envenomation in The United States between 2000–2013

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Background: Snakebite is not a rare occurrence in the U.S. While snakebite in African and Asia is commonly associated with mortality, death from snakebite in the U.S. is generally considered rare. Though animal related fatalities have been published, to our knowledge, this is the first analysis of National Poison Data System (NPDS) exposures of snake envenomation deaths in the U.S. NPDS exposures are compiled by the American Association of Poison Control Centers.

Methods: We reviewed all NPDS data coded for snake envenomation from 2000–2013 to characterize the frequency, age, location and snake phylogenesis of cases resulting in death.

Results: NPDS reported 45,699 exposures to venomous snakes between 2000–2013. Most were copperheads (17,017; 37.2%) and rattlesnakes (16,970; 37.1%). 41 bites resulted in death. 35 victims (85.4%) were male. Deaths per year ranged from 1 in 2010 to 6 in 2005. 36 victims (85.4%) were age 18 or older. Four were less than 18 years (one was < 1 year-old; the others were 2, 3 and 17 years). One patient's age was unknown. Rattlesnakes accounted for 26 deaths, of which, 8 were Timber rattlesnakes and 5 were Eastern Diamondbacks. Mojave, Great Basin and Northern Pacific rattlesnake envenomations resulted in 1 death each. 10 deaths were from unknown species of rattlesnakes. Copperhead and cottonmouth envenomations accounted for 2 deaths each, unknown pit vipers for 6 deaths, non-native (exotic) snakes for 3 deaths (1 from the African rhinoceros viper, 1 from the South American urutu,1 from the Asian bamboo viper) and 2 deaths resulted from

unknown species of snakes. No deaths due to coral snakes were reported. Deaths occurred in 19 states. Florida had the most with 6 (14.6%), Georgia and North Carolina each had 5 (12.2%), Arizona and Virginia had 3 (7.3%) and the other 14 states had 1 or 2 each (2.4–4.8%). 6 (14.6%) deaths involved co-exposure with ethanol or opioids.

Conclusion: Our data confirm that deaths from snakebite in the U.S. are rare. No prior studies have summarized the cumulative data from NPDS relating to these deaths. Rattlesnake envenomations are generally considered to be more medically significant than bites of other native pit vipers. Our study supports this. Though the number of copperhead exposures is slightly greater than that of rattlesnakes, of the 36 native pit viper deaths, the majority (at least 72%) were from rattlesnakes. Our data are limited by the volunteer nature of NPDS data; thus, we are likely missing some snakebite deaths. Non-native species caused 7.3% of snakebite deaths. 16 deaths (39%) were isolated to just 3 southern Atlantic coast states. Co-exposures with CNS altering agents accounted for almost 15% of the deaths.

Keywords: Envenomation, Snake bite, Death

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9. Diglycolic Acid, The Nephrotoxic Metabolite of Diethylene Glycol, acts as a Calcium Chelator

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Background: Diethylene glycol (DEG) has caused numerous epidemics of acute kidney injury and deaths world-wide. Metabolism of DEG to diglycolic acid (DGA) is a key feature in the pathogenesis of the renal dysfunction. Our recent studies have confirmed that DGA produces a mitochondrial dysfunction (ATP depletion) that leads to cell death and tissue damage, although the mechanism for the mitochondrial effects is not known.

Methods: Rat kidney mitochondria were isolated by homogenization and centrifugal separation. Oxygen consumption was determined in control and DGA-treated mitochondria using either succinate or glutamate/malate as substrates with (State 3) and without (State 4) ADP. Electron transport complex activities in isolated mitochondria were assessed spectrophotometrically. Calcium-induced mitochondrial swelling was assessed to determine whether DGA induces the mitochondrial permeability transition (MPT), which can explain the inhibition of oxidative phosphorylation-produced ATP.

Results: DGA decreased both succinate and glutamate/malate-induced State 3 respiration but affected glutamate/malate at much lower concentrations (0.5 mM vs. 100 mM). In contrast, DGA reduced Complex II activity (succinate dehydrogenase), but had no effect on Complexes 1, 3 or 4. Although previous studies have shown that DGA reduces the mitochondrial membrane potential in kidney cells, the present studies demonstrated the surprising finding that DGA did not induce the MPT with either succinate or glutamate/malate as energizing substrates, but rather completely blocked the MPT. Follow-up studies using calcium assays indicated that DGA reduces free calcium levels in solution similarly to the known chelator EGTA.

Conclusions: Because glutamate/malate-supported respiration is calcium dependent and because induction of the MPT requires calcium, the fact that DGA chelates calcium could explain its inhibitory effects on these parameters. These studies suggest that DGA produces mitochondrial dysfunction by chelating calcium to decrease substrates and reducing equivalents necessary for Complex I and directly by inhibiting Complex II activity at higher concentrations. Further studies on calcium chelation are needed to help define the critical targets of DGA activity, such that therapies might be developed for DEG nephrotoxicity.

Keywords: Diethylene glycol, Renal toxicity, Mitochondrial dysfunction

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10. Low dose intramuscular cobinamide with magnesium thiosulfate versus intravenous cobinamide alone in the treatment of acute cyanide toxicity and apnea in a swine (Sus Scrofa) model

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Background: Cobinamide (COB) is a cyanide (CN) antidote that is more potent and more water soluble than hydroxocobalamin. We previously showed that intravenous (IV) or Intramuscular (IM) COB were as efficacious as IV hydroxocobalamin at one-fifth the dose. We propose a small volume ($<$3ml) of combination of magnesium thiosulfate (MagTHIO) and low dose cobinamide is as effective as 5 times the cobinamide alone.

Objective: To compare the time to spontaneous breathing among three groups of swine with acute CN induced apnea treated with IM COB+ Mag THIO, IM COB, or IV saline (control).

Methods: 33 swine (45–55 kg) were intubated, anesthetized and instrumented [continuous MAP and cardiac output (CO)]. Inhaled anesthesia was decreased to allow spontaneous breathing on room air (0.21 FiO2), then CN was continuously infused until apnea and observed for 1 min before treatment. Animals were then randomly assigned to IM COB (15 mg/kg), IM COB (3 mg/kg) + IM MagTHIO (6.9 mg/kg) or saline (20 ml) and monitored for 60 min. Drug doses were based on our previous studies. Sample size of 11 animals per group was determined to achieve a power of 80% to detect a 0.25 difference effect size in mean time to spontaneous breathing among the groups (alpha 0.05). Repeated measures ANOVA was used to determine statistically significant changes among groups over time.

Results: Baseline weights (50, 49, 51 kg), time to apnea (9:36, 8:46, 10:54, min:sec), and CN dose at apnea (1.6, 1.5, 1.7 mg/kg) were similar ($p > 0.10$). At time of treatment, mean CN blood (1.76, 1.71, 1.76 mcg/ml) and lactate levels (2.8. 2.7, 2.8 mmol/L), and decrease in MAP from baseline (~ 33%) were similar ($p > 0.10$). 2/11 animals in the saline group survived ($p < 0.001$), as compared to 10/11 in IM COB groups and 11/11 in the IM COB/MagTHIO. Time to spontaneous breathing after antidote was similar between IM COB (4:55 min: sec) and IM COB/MagTHIO (4 min 10 sec, $p > 0.05$). Blood CN levels were undetectable after IM or IV COB. No significant differences were detected between IM COB and IM COB/MagTHIO for HR, CO, MAP, RR, or minute ventilation over 60 min. Lactate (1.5 vs. 1.6 mmol/L), pH (7.46 vs. 7.43) and PCO2 (43 vs. 41 mm Hg) at 60 min were similar ($p > 0.10$).

Conclusion: A combination of IM COB (3 mg/kg) + Magnesium thiosulfate (6.9 mg/kg) was as effective at IM COB (15 mg/kg) alone at a dose 1/5th the COB dose for successfully returning animals to spontaneous respiration and had 100% survival in a model of cyanide-induced apnea and severe toxicity.
Keywords: Cyanide, Antidote, Inhalant
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11. Rats poisoned with a sarin analogue and rescued with atropine and pralidoxime develop retention memory deficits improved with naltrexone

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Objective: Humans (1) and rats (2) poisoned with sarin develop neurological disabilities not prevented with antidotal therapy with atropine and pralidoxime (1,3). This study investigates learning and memory in rats poisoned with the sarin analogue diisopropylfluorophosphate (DFP) resuscitated with atropine and pralidoxime. The neuroprotective effects of naltrexone are investigated, extending prior study (3).
Methods: IACUC approval was obtained. Long Evans rats (250–275 grams) were randomized to: DFP group (N = 8): an intra-peritoneal (IP) injection of DFP (5mg/kg). Treatment group (N = 9): IP DFP (5mg/kg) and naltrexone (5mg/kg/day). Control group (N = 12): an equal volume IP injection of isopropyl alcohol, the DFP vehicle and naltrexone (5mg/kg/day). After injection, rats were monitored for cholinesterase toxicity. If toxicity developed, therapy was initiated with atropine (2mg/kg) and pralidoxime (25mg/kg) and repeated as needed. Rats underwent testing for place learning (acquisition) across five days of training using the Morris Water Maze. On day 6 a probe test for retention of memory was performed. Statistical analysis was performed using IBM SPSS Statistics.
Results: Rats receiving DFP developed toxicity within 5 minutes of injection requiring antidotal rescue. No differences in acquisition were seen between the DFP-poisoned rats treated with naltrexone vs. those who did not receive naltrexone. During probe testing for memory retention, DFP-poisoned rats spent significantly less time (29.4 ± 2.11 versus 38.5 ± 2.5 seconds, $p < 0.05$) and traveled less distance (267 ± 24.6 versus 370 ± 27.5 cm, $p < 0.05$) in the target quadrant compared to the treatment group. Rats poisoned with DFP and treated with naltrexone performed as well as control rats that did not receive DFP ($p < 0.05$) on the probe testing for memory retention.
Conclusion: Poisoning with DFP induced hippocampal-based cognitive deficits as evidenced by impaired memory. Deficits were not prevented by acute rescue with atropine and pralidoxime. Chronic naltrexone treatment led to preserved memory after DFP poisoning.

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Keywords: Neurotoxicity, Antidote, sarin
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12. Rationalisation of antivenom use in funnel-web spider envenomation: enzyme immunoassays for venom and antivenom concentrations

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Background: Funnel-web spider (FWS) envenomation is rare but causes severe neuromuscular and autonomic excess, including early cholinergic and prolonged adrenergic effects. An antivenom is available but measurement of venom concentrations have not been used to assess antivenom effectiveness. This study aimed to use serial venom concentrations to better define envenomation and antivenom effectiveness.
Methods: Serum was collected from eight patients with suspected FWS bites and clinical effects were extracted from medical records. Sandwich enzyme immunoassays were developed to measure FWS venom and antivenom concentrations. Goat anti-rabbit whole serum was coupled to UltraLink resin and added to patient samples to remove bound venom (antivenom-venom complexes). Antivenom efficacy was taken as antivenom binding all free venom and effectiveness as the resolution of clinical features.
Results: Venom was detectable in samples from five of the eight patients. In the three without venom detected, patients had only moderate non-specific symptoms of envenomation, which did not completely respond to antivenom and no spider was identified. In the other five cases a male Atrax spp. (Funnel-web) spider was identified. Two patients had moderate envenomation which responded to antivenom. Three patients had severe envenomation and developed catecholamine induced myocarditis and acute pulmonary oedema. Although cholinergic and non-specific clinical features appeared to respond to antivenom, the myocarditis and pulmonary oedema lasted 2 to 4 days. The median venom concentration before antivenom in four of the five patients with available samples was 5.9ng/mL (3.2 to 25.5ng/ml). The median venom concentration in immediate post-antivenom samples decreased and was 1.6ng/ml (0 to 3.1ng/ml). However, the venom concentrations decreased by $> 80\%$ suggesting that most of the venom detected post-antivenom was bound. One patient did not have a pre-antivenom sample but had venom detected post-antivenom which decreased by $> 80\%$ when bound venom was removed.
Conclusion: Detection of venom in patients with suspected funnel-web spider bites identified definite cases with characteristic envenomation and where a spider was identified. Measurement of venom concentrations before and after antivenom demonstrated that all venom was bound by antivenom, but in severe cases there was no reversal of cardiac toxicity similar to myocardial effects in scorpion envenomation.

Keywords: Spider bite, Antivenom, Laboratory
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13. Markers of oxidative stress in workers exposed to engineered nanoTiO2 particles: Dose-dependent biological effects.

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Background: Experimental studies of TiO2 nanoparticles show possible health effects in the humans. However no data are available for highly exposed workers. The objective was to search for biomarkers for preventive examinations of the workers exposed to TiO2 aerosol containing nanoparticles.
Methods: Malondialdehyde (MDA), 4-hydroxy-trans-hexenale (HHE), 4-hydroxy-trans-nonenale (HNE), 8-isoProstaglandin F2α (8-isoprostane) and aldehydes C6-C12 were analysed by LC-ESI-MS/MS after solid-phase extraction as markers of oxidation of lipids in the pre-shift and post-shift exhaled breath condensate (EBC) in 20 workers exposed to TiO2 aerosol, in parallel with 20 controls in 2012. There were 16 production workers with a higher risk level category, and 4 research workers. At the follow-up study in the same plant in 2013, 14 production workers, 14 office employees and 25 controls were examined. Raman microspectroscopy was performed to detect anatase or rutile TiO2 crystals in EBC samples, urine, and in the workplace dust. In addition, workplace aerosol was monitored by P-TRAK and DustTRAK DRX.
Results: Median mass concentration in TiO2 production plant was 0.65 and 0.198 mg/m3 in the production (3 spots) part and research part, respectively. Median number concentration was 1.99 and 1.32 x 104 particles/cm3, respectively. One year later, the concentrations in the production part were 0.40 mg/m3 and 2.32 x 104 particles/cm3. Median 80% particles in the production and 60% in the research part were smaller than 100 nm in diameter.

In the EBC of the workers in both years, all markers of oxidation of lipids were higher than in the controls ($p < 0.001$); already the pre-shift MDA, HHE, HNE, 8-isoprostane and C6–12 in EBC were higher ($p < 0.001$). Their lung functions have not been impaired. In the production workers, the concentration of all markers was higher ($p < 0.05$) than in research workers. Also office workers had most markers elevated ($p < 0.05$) comparing to controls, except 8-isoprostane, C11 and C12. Raman spectrometry found anatase and/or rutile particles in 40% pre-shift and 70% post-shift EBC samples of the workers, and in 10% post-shift urine samples.

Multiple regression analysis confirmed a key association between exposure to TiO2 and the levels of the markers of oxidation of lipids in the EBC.
Conclusions: The study suggests a dose-depending effect of exposure to nanoparticles of TiO2 and persistence of the particles and their effect in the EBC from previous shifts. The non-invasive collection and analysis of EBC biomarkers appears useful for monitoring effect in workers exposed to TiO2 nanoparticles.
Acknowledgements: University Project P28/1LF/6.
Keywords: Occupational, Biomonitoring, Nanoparticles
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14. Are Blood and Hair Aluminum Levels Associated with Vaccine Aluminum Loads in Healthy Infants?

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Background: Aluminum (Al) is a neurotoxin with no known physiologic role. Some parents are concerned about the aluminum content of vaccines – which can contain up to 850 ug per dose as an adjuvant – and its potential for adversely affecting their child's neurodevelopment. The relationship between aluminum exposure from vaccines and biomarkers of aluminum is not well described. The objective of the current study was to determine whether Al biomarker levels are associated with estimated cumulative Al load received from vaccines in healthy 9–13 month-old infants.
Methods: Infants presenting to a large urban pediatric practice for 9- or 12-months well child care were recruited into a cross-sectional study of infant development as related to aluminum exposure: Development in Infants & Aluminum Levels Study (DIALS). Exclusion criteria at study entry were a history of renal failure, prior treatment with parenteral nutrition, or prior treatment with Al-based antacids. The current study of infant vaccines described here included only some of the data collected for the larger DIALS investigation. Al concentrations in hair and blood were measured by inductively coupled plasma-mass spectrometry (ICP-MS). Quality assurance measures were used to prevent contamination of blood and hair samples during collection, handling, and laboratory analysis. The correlation between blood (B-Al) and hair (H-Al) aluminum levels and estimated cumulative vaccine Al load was assessed. Al load for each subject was calculated using immunization histories redacted from medical records, published data on vaccine aluminum content by brand name and vaccine manufacturer, and assumptions of 100% bioavailability.
Results: In total, 85 infants (44 males, 41 females) with a median age of 287 days (25th, 75th percentiles: 277 days, 305 days) were included in the analysis. B-Al ranged from 0.9–952 ng/mL (median 15.4 ng/mL; $n = 80$) and H-Al ranged from 2,758-211,690 ng/g (median 42,542 ng/g; $n = 82$). The median estimated cumulative vaccine Al load was 2.9 mg (range: 1.43–3.55 mg) with the 25th and 75th interquartile range 2.88 mg, 2.99 mg. There was no statistically significant correlation between B-Al or H-Al and estimated cumulative Al load from vaccines (Spearman's rho = -0.13, $p = 0.26$ for B-Al; Spearman's rho = 0.06, $p = 0.56$ for H-Al).
Conclusions: At the Al levels observed in this sample of healthy infants, neither blood nor hair Al biomarker levels were correlated with a 9–12 month-old infant's estimated cumulative vaccine Al load.
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15. Trends in Suspected Suicide Involving Prescription Opioids by Four US Regions

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Background: Little is known about the use of prescription (Rx) opioids with suicidal intent by region of the US. This study aims to describe these trends during 2006–2014.
Methods: Trends in suspected suicidal intent involving Rx opioids during 2006–2014 were examined by four geographic regions defined by the U.S. Census: Midwest, Northeast, South and West. Data were used from the Researched Abuse, Diversion and Addiction-Related Surveillance (RADARS®) System Poison Center Program, which collects and reviews human exposure cases from participating US poison centers. Each case is classified by exposure reason and substance(s) used. Cases classified as intentional suspected suicide involving buprenorphine, fentanyl, hydrocodone, hydromorphone, methadone, morphine, oxycodone or tramadol were summed by year and region. Sums were divided by the covered population for each region to calculate rates. Polynomial regression using a Poisson distribution was used to model trends for the 4 regions. Linear and quadratic terms for year, and year by region were fit and assessed for significance in the model. A dispersion parameter was estimated for each region to allow for potentially unequal variances.
Results: Terms that were significant in the model were: region (p-value < 0.0001), linear term for year (p-value < 0.0001), the quadratic term for year (p-value < 0.0001), and the interaction of region and the linear term for year (p-value $= 0.0099$). There was a not a significant interaction of region and the quadratic term for year (p-value $= 0.4766$). The trends demonstrate a rise in rates early in the study period followed by a decline later. Although rates in the South were higher in 2006, compared to the other regions, rates in the South began to decline earlier (1Q2011) than other regions. The West had the most striking change in rates, moving from the second to lowest rate in 2006 to the highest rate in 2014. Further, compared to the other regions, the decline in rates in the West was observed later in the time period (3Q2012).
Conclusion: Data from the RADARS System suggest that during 2006–2014, there was an initial increase in rates of use of Rx opioids cases with suspected suicidal intent, followed by a recent decline in all regions. Awareness of regional trends is critical in order to facilitate the continued decline in all rates.
Keywords: prescription opioids, exposures, suicide
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	Estimated 2006 Rate (CI)	Estimated 2014 Rate (CI)	Start of Decline in Rate
Midwest	5.03 (4.56, 5.54)	7.55 (6.97, 8.18)	1Q2012
Northeast	3.83 (3.45, 4.26)	5.52 (5.09, 5.98)	3Q2011
South	5.08 (4.54, 5.68)	6.57 (5.96, 7.25)	1Q2011
West	4.18 (3.77, 4.65)	7.87 (7.26, 8.53)	3Q2012

16. To tell or not to tell?

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Background: Poison exposures in the workplace are commonly handled by poison center staff. In 2013, 570 cases were reported to this poison center (PC), a total of 25,946 occupational exposures were reported nationwide. While managing the exposure and providing treatment recommendations for the exposed victim remains our primary concern, efforts to further protect the worker and prevent future events from occurring are lacking. In 1970 Congress passed the Occupational Safety and Health Act to assure safe and healthful workplaces for working men and women. This act established the Occupational Safety and Health Administration (OSHA) and authorized OSHA to promulgate and enforce workplace health and safety standards. In June of 2014, this PC entered into a formal agreement with the Regional OSHA office to refer poison cases originating in the workplace for possible further investigation and action by the governmental agency. Our experience over the past 9 months is described.
Methods: In early 2014, the authors held informal meetings with OSHA to discuss workplace exposures previously reported to this PC. In June of 2014, a memorandum of understanding was jointly drafted and approved by each organization. A data collection strategy was established, various in-services were performed to train center personnel as to how to collect information, and a substance-based coding plan was incorporated into the PC's EMR system for further identification of eligible cases. Queries were run and reports were generated on a weekly basis. Only cases meeting all inclusion criteria were then sent to OSHA offices for further review and evaluation.
Results: Over a 9 month period, 172 cases that met the criteria for workplace exposures were sent to OSHA. Of those sent, 41% forgot to ask for permission, 34% were not granted permission, and 17% were granted permission to OSHA for review, evaluation and possible investigation. 3% were not in jurisdiction, 3% were given citations and 2% were unsure cases. From the 172 cases sent, 5 cases warranted an investigation and/or were fined and given citations from OSHA.
Conclusion: Through this cooperative effort, our PC has enhanced OSHA's knowledge of exposure scenarios that occur in our state and has allowed them the opportunity to provide corrective action for different workplaces that would not normally be inspected through conventional targeting. The PC's partnership with the occupational safety agency, allows the agency to implement workplace corrective measures more quickly, and provides the PC with more information about the case and strategies for avoiding a recurrence of the event. With this collaboration, both are assuring safe and healthful working conditions for working men and women.
Keywords: Public health, Poison center, Education
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17. Use of e-cigarettes to vape recreational drugs in clubbers in London, UK

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Background: E-cigarettes and e-vapourizers are battery-operated nicotine delivery devices that have been introduced in the last ten years. They heat nicotine into a vapour that is inhaled, a process called 'vaping'. The role of e-cigarettes in smoking cessation remains uncertain[1], and there have been increasing reports of calls to US poisons centres regarding potential nicotine toxicity related to e-cigarettes[2]. A further concern is the use of e-cigarettes and vapourizers to vape recreational drugs[3], but there is limited data to be able to substantiate these concerns. The aim of this study was to report on the use of e-cigarettes to vape recreational drugs in individuals attending a south London nightclub that have previously been shown to have a high prevalence of use of recreational drugs.
Methods: A convenience sample of 102 patrons of a South London club were surveyed over the course of 2 weekends in March 2015 as part of a larger survey on drug and alcohol use. There were asked if they used e-cigarettes to vape nicotine and if they used e-cigarettes to vape other substances (and if so what substances).
Results: 90 (89.1%) of respondents were male and the mean ± SD age was 29.5 ± 7.43 years. Overall 80 (78.5%) of respondents currently smoked cigarettes. 20 (19.6%) of respondents had used e-vapourizers for vaping nicotine. Six (5.9%) respondents reported that they had used e-vapourizers to take other substances, two for 'liquid cannabis' and four did not elaborate on the substance(s) involved. Of these six, three were using e-cigarettes to vape nicotine and three had never used e-cigarettes to vape nicotine
Conclusion: 5.9% of individuals in this sample reported using e-cigarettes or e-vapourizers to vape substances other than nicotine. Interestingly 50% of those who had used e-cigarettes to vape other substances, had not used them to vape nicotine. Further work is required in larger populations to determine how common this is and to inform appropriate public education.

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Keywords: Substance abuse, Inhalant, Drug of abuse
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18. Misidentification of snake species for snakebite calls to a poison control center

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Background: This Southern US state is home to five species of pit vipers, subfamily Crotalinae, the copperhead (Agkistrodon contortrix), cottonmouth or water moccasin (Agkistrodon piscivorous), pigmy rattlesnake (Sistrurus milliarius streckeri), timber rattlesnake (Crotalus horridus horridus), and the eastern diamondback rattlesnake (Crotalus adamanteus). There is currently some controversy as to whether or not bites from copperhead snakes should be treated different than other pit viper bites, since they are generally viewed as less toxic and the antivenin is very expensive. The purpose of this study was to examine the accuracy of identification of snake species by the lay public and medical facilities.
Methods: Between September 4, 2012 and October 17, 2014, all snakebites called in to a poison control center (PCC) were asked to take a picture of the snake, if available, and forward the picture to the PCC. The identification of the snake and who made the identification was recorded. The final snake identifications were obtained by comparing the pictures with snake pictures obtained from the state herpetologist.
Results: During the study period there were 286 cases of snakebites reported to the PCC. Pictures were obtained on 49 snakes and one snake was identified by the host institution Emergency Department and then seen by one of the medical toxicologists. Identification of any rattlesnake species was considered as correct if it was identified as a rattlesnake. The results of the initial caller identification are shown in the table. The largest number of misidentifications was for juvenile water moccasins identified as copperhead snakes. Both have a generalized brown color, but have very distinctive body markings. 44% of the snakes identified as copperheads were actually for juvenile water moccasins. In this study, 75% of the venomous snakebites were identified as copperheads, which is consistent with our historical data. In actuality, copperheads accounted for only 48% of the venomous snakebites in the state, with water moccasins also comprising 48% and rattlesnakes 4%. Patients, families and friends were correct on 63% of the snake identifications and medical staff were correct 65% of the time.

Initial snake ID	# of Identifications	# Correct	% Correct
Copperhead	36	20	56%
Moccasin	5	5	100%
Rattlesnake	3	2	67%
Unknown	4	0	0%
Nonvenomous	2	2	100%
All	50	29	58%

Conclusions: Lay public and hospital staff identification of venomous snake species is often inaccurate, specifically when it comes to the misidentification of juvenile water moccasins as copperheads. Almost half of copperhead identifications were actually juvenile water moccasins.
Keywords: Snake bite, copperhead, water moccasin
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19. The European Drug Emergencies Network (Euro-DEN) Project a model for multi-centre data collection on acute recreational drug toxicity

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Background: Recreational drugs and new psychoactive substances (NPS) can cause significant acute toxicity. However, there is a significant public health gap, as there is no systematic collection of data on acute drug/NPS toxicity across Europe. The aim of the Euro-DEN project is to develop a network of sentinel centres in Europe collecting data on acute recreational drug/NPS toxicity to address this public health gap.
Methods: 16 sentinel centres in 10 European countries (Denmark, Estonia, France, Germany, Ireland, Norway, Poland, Spain, Switzerland and the UK) collected data on all acute recreational drug/NPS toxicity presentations to their Emergency Rooms (ERs) for 12 months (Oct 2013-Sept 2014).We used a purpose designed minimum dataset in a pre-formatted Excel® spreadsheet to collect the following data from the hospital chart: demographics, the drugs/NPS used, clinical features, management and outcome.
Results: A total of 5529 presentations (range 15–1478 per centre) involving 8709 drugs (mean± SD 1.6 ± 0.97 drugs per presentation) were recorded; a median (IQR) of 0.3 (0.2–0.7)% of all ER presentations. Median (IQR) age was 31 (24–39) years and 75.4% were male. Classical recreational drugs were the most common category of drugs (64.6%) followed by prescription drugs (26.5%); NPS were only 5.6% (484 reports). Opioids were the most common type of drug (1962 (22.5% of all drugs)) then benzodiazepines (1099 (12.6%)) and cocaine/crack cocaine (1093 (12.6%). The top five drugs were heroin (1345 (15.4%)), cocaine (957 (11.0%)), cannabis (904 (10.4%)), GHB/GBL (711 (8.2%)) and amphetamine (593 (6.8%)).Within NPS presentations, cathinones were the most common NPS (378 reports). Geographical patterns included: high GHB/GBL use in three cities (London, Oslo and Barcelona) and over 95% of the NPS reports concentrated in five cities (London, Gdansk, York, Munich and Dublin). Some benzodiazepines (diazepam, alprazolam) were reported by most centres, others (bromazepam, oxazepam) were from a minority. Although serious clinical features were not seen in most presentations and 56.9% were medically discharged from the ER (median length of stay 4 hours 38 minutes), 6.0% were admitted to critical care (level 2 or 3 bed). A significant minority (26.5%) were agitated and 10.5% had GCS ≤ 8. There were 27 fatalities (opioids implicated in 13 deaths and NPS in 3 deaths).
Conclusion: Euro-DEN has collated a rich dataset providing a unique insight into the drugs/NPS involved in, the clinical patterns and outcomes of acute recreational drug/NPS toxicity presentations to ERs in Europe. This could serve as a model for data collection more widely.
Keywords: Bath salt, Drug of abuse, Epidemiology
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20. N-OH-PABA, the active hydroxyl metabolite of benzocaine, can produce MetHB in control blood

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Background: Methemoglobinemia (MetHb) after exposure to benzocaine (BZC) has been reported for more than 50 years. Several studies have shown direct administration of BZC to blood does not produce MetHb and the mechanism of MetHb production by benzocaine has been shown to require hepatic activation to a hydroxl metabolite. The most likely metabolite is the hydroxyl metabolite N-hydroxy-para-amino benzoic acid (N-OH-PABA), which we have previously identified in-vivo, post BZC exposure in a patient with MetHb. The most likely hepatic pathway is though CYP1A2. We had previously obtained a standard of > 97% purity of N-OH-PAPBA and tested it to verify if it was capable of producing MetHb in fresh human blood.
Methods: Six samples of venous blood were drawn: 2 samples each from 3 volunteers, with each volunteer to serve as their own control. Six 1 ml samples were separated for venous blood gas (VBG) determination. Three samples had N-OH-PABA added and were allowed to incubate at room temperature for 5 minutes and 30 minutes prior to VBG determination. Prior to use the N-OH-PAPBA was stored at -80 degrees F. VBG results for test blood and controls were obtained on the same device in rapid sequence.
Results: N-OH-PABA produced rapid and clinically significant MetHb in all three volunteer samples. (Table 1) Additionally carboxyhemoglobin (COHb) increased with increasing MetHb, which may reflect machine interference.
Discussion: We have previously established the in-vivo presence of the active metabolite N-OH-PABA in a MetHb patient post BZC exposure. The present work shows that N-OH-PABA can independently produce MetHB. Of interest was the increased COHb which we believe may have been due to interference with device methodology by the metabolite or an unknown oxidative effect on the hemoglobin. Elevated COHb has not been previously associated with benzocaine.
Conclusion: N-OH-PABA, the hydroxyl metabolite of benzocaine, is capable of producing rapid and clinically significant MetHb in human blood.
Keywords: Methemoglobin, Local anesthetic, carboxyhemoglobin
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	Sample A (5 min)	Sample A (30 min)	Sample B (5 min)	Sample B (30 min)	Sample C (5 min)	Sample C (30 min)
Hb (control)	14.2 g/dl	14.3 g/dl	15.4 g/dl	15.4 g/dl	16.1 g/dl	16.2 g/dl
COHb (control)	1.0%	0.8%	1.4%	1.5%	1.5%	1.2%
MetHb (control)	0.2%	0.3%	0.1%	0.2%	0.2%	0.3%
Hb (N-OH-PAPA)	16.3 g/dl	16.4 g/dl	15.7 g/dl	16.3 g/dl	17.4 g/dl	18.1 g/dl
COHb (N-OH-PABA)	23.6%	33.7%	5.8%	9.1%	19.2%	26.8%
MetHb (N-OH-PABA)	41.1%	44.9%	21.4%	34.3%	32.5%	42.5%

21. Validation of Patient Specific Functional Scale in Copperhead Snakebite Patients

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Background: Copperhead snake envenomation is a common medical problem with approximately 1,800 envenomations reported to US poison centers in 2013. Currently, there are no validated assessment tools used to measure limb function, impairment, and quality of life in the setting of snakebite. The Patient Specific Functional Scale (PSFS) provides a parsimonious way to assess patient reported functional impairment due to a variety of orthopedic disorders.

The objective of this analysis is to describe the overall correlation of the PSFS with other standard assessments to demonstrate construct validity in the use as a measure of recovery from copperhead snakebite envenomation.

Methods: Copperhead snakebite patients enrolled in a prospective observational study were administered a series of assessments used to measure recovery at 3, 7, 14, 21, and 28 days post-envenomation. Patients were treated with or without antivenom per local standard of care. Recovery was assessed using PSFS, Disabilities of the Arm, Shoulder, and Hand (DASH; upper extremity patients only), Lower Extremity Functional Scale (LEFS; lower extremity patients only), Patient Global Impression of Change (PGIC), Numeric Pain Rating Scale (NPRS), Numeric Swelling Scale (NSS), Patient Global Assessment of Recovery (PGAR), and SF-36v2 (acute) instruments. Overall estimated correlations in the presence of repeated measures were calculated to compare all scored assessments to PSFS. A repeated measures analysis of variance model was used to measure the association between PSFS and PGAR over time.

Results: 20 subjects completed the study. Overall correlations between PSFS and standard assessments used to measure limb function were very high. Overall correlations of PSFS with patient self-reported pain and swelling and the Physical Component Scale (PCS) of the SF-36 were also high, while correlation with the Mental Component Scale (MCS) of the SF-36 was low. PSFS was moderately correlated overall with PGIC. Responses to the PGAR were significantly associated ($p = 0.0415$) with PSFS when accounting for repeated measures taken over time post-envenomation.

Conclusions: The PSFS provides an efficient way to assess overall limb function recovery following snakebite. The PSFS was well correlated with other standard methods of questioning patient self-reported recovery of limb function, pain and swelling over 28 days post-envenomation, demonstrating strong construct validity.

PSFS Correlation	Absolute Correlation (ρ)
LEFS	0.9076
DASH	0.8300
NPRS	0.7374
NSS	0.7026
SF-36 PCS	0.6621
PGIC	0.3422
SF-36 MCS	0.1151

Keywords: snakebite recovery, copperhead, Patient Specific Functional Scale

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22. Acute iron overdose in the setting of active labor with fetal umbilical cord serum iron concentration

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Background: Many over-the-counter and prescription supplements contain iron. Although iron toxicity is well reported in the medical literature, toxicity to the unborn fetus after maternal acute iron overdose is not. Iron's ability to cross the placenta is poorly understood and human case reports are scant.

Case Report: A 28 year-old 32-week pregnant female presented to an Emergency Department with vomiting, lethargy, and respiratory depression. She reported ingesting an unknown amount of an unidentified iron supplement within the last 10 hours. Vital signs included: blood pressure, 107/75 mmHg; heart rate, 63 beats per minute; temperature, 36.4° Celsius. Significant physical exam findings included: mental status depression, pallor, and repeated vomiting. Laboratory assessment was notable for: iron, 470 mcg/dL; potassium, 3.3 mEq/L; lactate, 1.9 mmol/L; pH, 7.4; PCO_2, 28.7; HCO_3, 22 mEq/L. An abdominal radiograph was negative for tablets. The fetal heart rate was strong and regular. Multiple boluses of 0.9% saline were infused without hemodynamic improvement.

Her mental status worsened and active labor began (2 to 5 cm dilation over 1 hour). She became hypotensive to 90/50 mmHg and deferoxamine was started. She tolerated deferoxamine without complication and her hemodynamics improved over the next 3 hours. Her repeat lactate was 1.4 mmol/L 6 hours after presentation, but her mental status remained altered.

The neonate was delivered 8 hours after presentation without complication. Venous umbilical cord blood demonstrated an iron concentration of 67 mcg/dL (normal ≈ 100 mcg/dL). The neonate had a transient acidosis with a pH, 7.17; PCO_2, 49; PO_2, 62; which resolved with airway management.

Approximately 24 hours after presentation her mental status improved, her laboratory derangements resolved, and deferoxamine was stopped. She was discharged home without sequelae.

Discussion: Despite routine iron use during pregnancy, overdose is uncommon in the third trimester. Risk for fetal toxicity after maternal iron overdose is not well understood. Current literature indicates that higher maternal serum iron concentrations are associated with more severe fetal outcomes; however the mechanism of fetal toxicity is not known. Animal data and 3 human case reports suggest that iron is not capable of crossing the placenta. The neonatal umbilical serum iron concentration obtained in our case supports this hypothesis.

Conclusion: Overdose in pregnant females is uncommon. However, these patients regularly utilize iron supplementation. Fetal risk in the setting of iron overdose remains unclear and more study is required to determine if free iron crosses the placenta.

Keywords: Iron, Pregnancy, Overdose

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23. 16 units/mL is a stable and practical solution for administration of high dose insulin for treatment of beta blocker and calcium channel blocker toxicity

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Background: High dose insulin has become a first-line therapy for treating severe calcium channel blocker (CCB) and beta blocker (BB) toxicity. Though optimal dosing has yet to be established, dosing requirements of 10 units/kg/hr and higher have been reported. The traditional insulin concentration for intravenous infusion is 1 unit/mL. This concentration presents a practical challenge to administration of high dose insulin as large doses require large fluid volumes. Higher concentrations of insulin have been suggested, but stability of insulin in polyvinyl chloride (PVC) bags at concentrations above 1 unit/mL is currently unknown. For this project, a High Performance Liquid Chromatography (HPLC) method was used to determine the stability of concentrated insulin in 0.9% NaCl solution.
Methods: 8 mL of regular insulin from a stock vial containing 100 units/mL (800 units) were added to 50 mL of 0.9% NaCl solution in a PVC bag to make a final concentration of 16 units/mL. Two insulin bags were stored at 4°C and two at 25°C. Samples were withdrawn periodically for 14 days and tested in duplicate for insulin concentration. HPLC separation was achieved using a reverse phase C-18 column (250 mm x 10x4.6 mm, 3.5 µm) at 214 nm with a mobile phase of de-ionized water/acetonitrile (v/v 90:10) at a pH of 2.1 and a flow rate of 1.0 mL/minute.
Results: High dose regular insulin in a PVC bag remained within 90% of equilibrium concentration at all timepoints, indicating the 16 units/mL concentration was sufficiently stable both refrigerated and at room temperature for 14 days.
Discussion: Some sources have proposed a 10 unit/mL insulin concentration for treating BB and CCB toxicity. However, the Institute for Safe Medication Practices (ISMP) discourages tenfold multiples of high-risk medications due to the risk of dosing errors. Our institution has proposed a 16 unit/mL insulin concentration for the treatment of CCB and BB toxicity. This concentration was chosen for ease of preparation, clear distinction from the standard 1 unit/mL concentration, and sufficiently high concentration to treat a patient with severe BB or CCB toxicity for a reasonable time period without an excessive fluid load. As an additional precaution against inadvertent dosing errors, use of this concentrated formulation is restricted to the institution's high dose insulin protocol for BB and CCB toxicity.
Conclusions: Insulin at a concentration of 16 units/mL is stable for 14 days, the maximum timeframe allowed by USP 797. This stability data will allow institutions to issue beyond-use-dating for IV fluids containing concentrated insulin and used for treating BB and CCB toxicity.
Keywords: Insulin, Calcium channel blocker, Antidote
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24. Evaluating an Increase in Case Exposures Reported from a Texas Prison Facility

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Background: The United States has the largest prison population in the world, and the most prisoners of any developed country. The State of Texas has more than 146,000 inmates in prisons. The objective of this study is to review a recent increase in human exposure calls reported to a statewide poison center (PC) system by one prison facility.
Methods: A retrospective review of human exposures reported from one specific prison facility to a statewide PC network from 2000 to 2014. Data was broken down by year, age, exposure route, exposure reason, management site, substance, clinical effects, therapy, and outcome.
Results: The prison facility studied houses about 2800 male inmates. From 2000–2014, there were 255 human exposures reported from this prison facility. Between 2000–2013 reported human exposures remained steady ranging from one to twenty-seven exposures reported each year. In 2014, there was a 274% increase in reported human exposures drastically rising from 27 reported human exposures in 2013 to 101 human exposures in 2014. Patient ages ranged from 15 to 55 years of age with the mean age being 30 years-of-age. Ingestions accounted for 98% of route of exposures. Intentional suspected suicides accounted for 69%, intentional unknown 10%, intentional misuse 6%, and intentional abuse 5% accounted for exposure reason. Forty percent of these prison exposures were managed on site by healthcare personnel and 53% were transported and treated at a healthcare facility. The most common classes of substance included analgesics 27%, unknown drugs 22%, anticonvulsants 20%, and antidepressants 18%. The most common treatment recommended was activated charcoal 49%, intravenous fluids 29%, and gastric lavage 13%. Forty-five percent of patients that were transported to the healthcare facility remained asymptomatic, 12% had minor symptoms, and 12% had moderate symptoms. Out of these 255 human exposures reported, only three patients had major effects documented.
Conclusion: This research provides data on a drastic increase of exposures from one prison facility and may assist this facility in evaluating current policies related to the handling of medications. Due to the reported substance and amount ingested, PCs often refer a majority of poisoned patients to a healthcare facility. This data shows that a vast percentage of the patients that are referred to the healthcare facility remain asymptomatic or develop mild symptoms. Current prison policies allow inmates who have displayed good behavior to handle their own medications without direct oversight. Policies such as this could be one factor to increased exposures reported to PCs. Providing direct oversight may help ensure inmate compliance with their medication.
Keywords: Prison, Public health, Poison center
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25. Rhabdomyolysis associated with laboratory confirmed FUB-AMB use

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Background: Synthetic cannabinoids (SC) are a heterogeneous group of compounds. Their structures and toxicity continue to evolve. We report a case of rhabdomyolysis associated with use of FUB-AMB, a SC not previously described in the medical literature.

Case Report: A 25 year old female with scoliosis and depression presented to the emergency department complaining of back pain and bilateral lower extremity weakness that began on awakening 8 hours prior. She denied seizures, injury or immobilization. Her vital signs were heart rate 73 bpm, blood pressure 120/71 mmHg, respiratory rate of 17, and a temperature of 36.8 C. She was anxious but oriented. Physical examination noted effort related weakness in her lower extremities with intact sensation, no swelling, mild tenderness and normal reflexes. Pain was present with movement. Blood counts and basic chemistry, including serum creatinine (sCr) were normal. She continued to have severe pain and would not ambulate. A thoracic/lumbar spine MRI was normal. A neurology evaluation felt an acute neurologic problem was unlikely and to consider musculoskeletal causes. At this time a creatinine kinase (CK) was found to be 5265 U/L (normal 21–215 U/L). She was started on intravenous fluids and admitted. Her CK peaked at 17991 U/L 24 hours later. Her sCr remained normal. She admitted to smoking what she stated was marijuana the night before. Her urine immunoassay drug screen done on admission was negative. Serum from admission was screened by liquid chromatography-quadrupole time-of-flight mass spectrometry (QTOF 6550, LC 1260, Agilent) and detected FUB-AMB at a concentration of 4.2 ng/mL. The screen was negative for 549 other substances. Also detected were formula matches to predicted metabolites of FUB-AMB- C21H22FN3O4 and C20H20FN3O3- which could not be confirmed due to lack of reference standards. The patient could not provide a name or sample of what she had smoked. She was discharged 3 days later with CK 4972 U/L and was lost to follow up.

Case Discussion: FUB-AMB is a SC structurally related to AB-PINACA and 5-fluoro AMB. In the last year, FUB-AMB has been identified in incense or "spice" products but there are no reports in the medical literature of FUB-AMB toxicity. Rhabdomyolysis has previously been attributed to SC use however those reports were limited by lack of analytical confirmation and presence of other known causes of rhabdomyolysis (agitation and seizures). The mechanism by which FUB-AMB may cause muscle injury is not known and further investigation is warranted.

Conclusion: Analytically confirmed FUB-AMB exposure was associated with significant rhabdomyolysis. Toxicologists and other health care practitioners should be aware of this possible complication.

Keywords: Designer drug, Drug of abuse, Laboratory

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26. Combined therapy with high-dose insulin and vasoactive drugs for beta blocker/calcium channel blocker overdose: characteristics, complications and outcomes

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Background: High Dose Insulin (HDI) is a useful treatment for severe beta blocker (BB) and calcium channel blocker (CCB) poisoning. HDI is often prescribed as monotherapy, however the practice at our institution is to rapidly titrate HDI to 10 U/kg/hr then add vasopressors and/or inotropes (V/I) as needed to achieve adequate perfusion. The aim of this study is to describe the combined use of these therapies in severe shock.

Methods: This was a single center, retrospective review of poisoned patients treated with a HDI protocol. We searched the regional Poison Center database (Toxicall®) for cases of therapeutic insulin use that originated or were transferred to our hospital. We further narrowed this cohort to patients with the HDI protocol documented on the medication administration record. Data abstracted included serum electrolytes, dextrose administered, ischemic complications, V/Is used (including doses), arrhythmias, and survival.

Results: Fourteen patients received HDI following an intentional overdose (OD) (n = 11) or for treatment of multifactorial shock (n = 3). The average age was 54 (range 24–87 years) and 8 (57%) were female. Responsible poisons were: BB (n = 9), CCB (n = 2) and combined CCB and BB (n = 3) The mean (± SD) maximum HDI infusion was 6.0 (± 3.9) U/kg/hr (range 0.5–10 U/kg/hr) with a mean duration of 22 (± 19) hours (range 1–75). Eleven patients received dual therapy with HDI and V/I support; 3 patients (all intentional OD's) received only HDI. The most common V/I was norepinephrine (n = 9) with a mean maximum dose (MMD) of 0.32 mcg/kg/min. Other V/I's used were: dopamine (n = 6, MMD = 15 mcg/kg/min), phenylephrine (n = 2, MMD = 2.3 mcg/kg/min), vasopressin (n = 5, MMD = 0.04 U/min), epinephrine (n = 2, MMD = 0.2 mcg/kg/min), and methylene blue (n = 1, maximum dose of 0.75 mg/kg/hr). Eleven patients survived. The 3 deaths were the 3 patients with multifactorial shock; all were elderly patients that were given a BB during their hospitalization that was thought to be contributory. Adverse events included hypoglycemia (< 70 mg/dL, n = 25) in 7 patients. Pulmonary edema occurred in 3 patients secondary to fluid overload. Five patients developed hypokalemia (< 3.0 mEq/L). One patient that died developed ischemic gangrene of the digits prior to HDI administration. No tachydysrhythmias were observed.

Conclusion: In this series, HDI titrated up to 10 U/kg/hr with subsequent use of vasopressors and inotropes was a safe and effective approach to treat intentional overdoses of beta blockers and calcium channel blockers. We observed poor outcomes with HDI as a rescue therapy for perceived adverse drug events related to beta blockers.

Keywords: Overdose, Insulin, Cardiac toxicity

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27. Acetaminophen-protein adducts and GSH levels at intake of N-acetylcysteine in acetaminophen-treated mice

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Background: Acetaminophen (APAP)-induced liver toxicity occurs with depletion of glutathione (GSH) and formation of APAP-cysteine protein adducts (AP-CYS). AP-CYS is now used as a specific biomarker of APAP toxicity in patients with acute liver injury. The primary role of N-acetylcysteine (NAC) in the treatment of APAP toxicity is thought to be the replacement of intracellular stores of hepatic GSH (Lauterburg,1983), However we only have a little information from initial studies about the variation of GSH in liver in APAP overdose and the effect of NAC. The objective of this study is to reevaluate the relationship between GSH levels and formation of AP-CYS in APAP-treated mice and also the effect of NAC.
Methods: C557BL/5 mice(10 weeks of age) are divided into five groups (n = 4/groups) and dosed with 300 mg/kg APAP i.p. or an equal volume per body weight of saline. At 0 (saline group), 1, 2,3, 4 and 5 h, mice were anesthetized with CO2, and blood samples are removed. The liver were removed surgically, and a portion of each liver was weighed and homogenized in a 3:1 v/w of 0.25 M sucrose, 10mM Hepes, 1mM EDTA buffer, pH 7.5. The protein samples are dialyzed (or gel filtrated) and then digested with protease. The AP-CYS is then quantified by HPLC-ECD. The GSH levels were determined using GSH assay kit. 1.2 g/kg NAC(i.p.) is dosed 1h after administration of APAP. The same applies hereafter.
Results: A time course for the formation of APAP-CYS and GSH depletion in liver and serum APAP-CYS were determined in mice treated with APAP (300mg/kg). As GSH levels fell, APAP-CYS increased. APAP-CYS were detected 1 h and increase to 3h(1.515 ± 0.469 nmol/mg protein) after administration of APAP. During this time period, GSH levels became the minimum (8.38 ± 5.39ï¼…) and declined more than 70% from 1h to 3h. After administration of NAC, GSH levels gradually increased and became equal to a control (saline) group 3 h later.
Conclusions: In early studies, a time course for APAP-CYS and GSH in liver after administration of APAP was shorter than this study. We confirmed the relationship of hepatic GSH levels and APAP-CYS and the effectiveness of NAC as GSH replacement.
Keywords: Acetaminophen (paracetamol), N-acetylcysteine, GSH
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28. Liver toxicity as a new finding of imidacloprid insecticide

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Background: Imidacloprid belongs to a new insecticide class consisting of chloronicotinyl neonicotinoids, a highly selective agonist at the nicotinic acetylcholine receptor. Animal studies have indicated a relatively low mammalian toxicity resulting in its favorable toxicological profile. Despite this safety belief, there has been increasing evidence of imidacloprid toxicity including even death. The clinical features of intoxication are not well-defined and the clinical studies are still limited. Therefore, this study was aimed to identify the characteristics of poisoning from imidacloprid exposure cases in Ramathibodi Poison Center (RPC) Toxic Surveillance System, Thailand over the last 5-year period.
Methods: We carried out a retrospective study by reviewing cases from the RPC toxic surveillance system.
Results: A total of 91 imidacloprid exposure cases were carefully reviewed. Most of them were consulted from the central and north-eastern regions of Thailand (59.4%). Males (61.5%) were the predominant group. The median age of the patients was 31 years (range 1–86). Eighty five percent of cases were exposed to imidacloprid alone. The main circumstance and route of exposure were intentional ingestion. The amount of consumption varied and depended on the different formulations. The majority of patients had only minor initial severity with mild gastrointestinal (GI) symptoms. We did not find nicotinergic features in our patients. No mortality was demonstrated in our study. However, we found hepatotoxicity in 4 cases. The patterns of liver toxicity showed either cholestasis or hepatitis. Two of them were fully investigated for the etiologies of their hepatotoxicity. The other possible causes were all excluded. We postulated that the liver injury was mainly caused by imidacloprid toxicity. All of them were recovery and safely discharged.
Conclusions: Most imidacloprid exposure patients had only mild toxic effects. The common presenting features were nonspecific GI symptoms. In our study, we found liver injury as a new finding of imidacloprid toxicity. The hepatotoxicity included both cholestasis and hepatitis. However, we have not investigated the pathophysiology of hepatotoxicity after imidacloprid ingestion. Further studies and more case reports are needed to confirm this liver injury finding.
Keywords: Imidacloprid, Hepatotoxicity, Insecticide
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29. Uptake characteristics of diglycolic acid and its effects on glutathione in human proximal tubule cells

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Background: Diethylene glycol (DEG) is an industrial solvent that has been implicated in mass epidemiological poisonings. The hallmark sign of DEG poisoning is proximal tubular necrosis, ultimately leading to renal failure. Diglycolic acid (DGA) has been shown to be the responsible metabolite for this toxicity, demonstrating remarkable accumulation in the proximal tubule, as well as mitochondrial damage and cellular necrosis. DGA exhibits a structural similarity to several TCA cycle intermediates, including succinate. We hypothesize that DGA is being taken up by proximal tubule cells via the same sodium dicarboxylate cotransport (NaDC) system as succinate. Furthermore, we believe that DGA is acting

on an organic acid transport system, preventing its efflux out of the cell, thus causing accumulation in the proximal tubule. In addition, DGA may be exerting mitochondrial damage by disrupting glutathione homeostasis within the cell.

Methods: To measure DGA uptake and efflux, human proximal tubule (HPT) cells were grown to confluency and subcultured onto inserts, allowing uptake and efflux measurements from both apical and basolateral interfaces. Using 14C-substrates, uptake was measured at increasing concentrations for both succinate and DGA, along with measurements of sodium dependence of the NaDC transporters. DGA efflux was measured at increasing time points. HPT cells subcultured onto 6-well plates were treated with a toxic DGA dose (50 mmol/L) and mitochondrial fractionation was performed in preparation for glutathione (GSH) measurement using a GSH assay kit.

Results: Cellular uptake of succinate from both the apical and basolateral direction demonstrated sodium dependence as expected, while DGA uptake demonstrated essentially no sodium dependence from either apical or basolateral direction. Cells exhibited miniscule efflux of DGA from the basolateral direction, with minimal apical efflux occurring very early in the time course. Cellular treatment and mitochondrial fractionation successfully yielded ~80 % separation of mitochondria and cytosolic components, with glutathione levels likely decreasing by 6h.

Conclusions: These results suggest that DGA is not taken up by the sodium dependent mechanism observed for succinate in the proximal tubule. DGA appears to accumulate in proximal tubule cells due to the disruption of the balance between significant uptake and minimal efflux. This toxic build-up is probably responsible for the mitochondrial damage DGA that has previously been shown to elicit and the latter is likely to occur in relation to the glutathione depletion that is observed in the cell.

Keywords: Diethylene glycol, dicarboxylate transporter, mitochondrial toxicity

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30. The Epidemiology of Insect Bites and Animal Envenomations of the United States National Park System from 2012–2014

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Background: There is currently limited literature regarding the nature and epidemiology of insect bites and animal envenomations occurring in the US National Park Service (NPS).

Objective: We sought to characterize the epidemiology of insect bites and animal envenomations, and the demographics of patients sustaining such injuries in the US NPS over a two-year period.

Methods: After institutional review board approval, a prehospital database utilized by the NPS was queried for all cases coded for animal bites or animal envenomations between January 1, 2012 and December 31, 2014.

Results: A total of 215 cases were identified as "animal bites" or "animal envenomations," with 180 cases categorized as "insect bite" or "animal envenomation" during the study interval. "Bees" (n = 52, 29%), "jellyfish" (n = 35, 19%), and "insect" not otherwise identified (n = 29, 16%) were the most common exposures. Twenty (11%) snakebites were identified with 5 (3%) documented by NPS EMS to be venomous. The majority of envenomated patients were treated and released (n = 82, 46%) or treated and transported (n = 31, 17%). Many refused care through "against medical advice" (n = 29, 16%), "treated and refused transport" (n = 19, 11%), or refused care all together (n = 15, 8%). White, non-hispanic patients (n = 115, 64%) accounted for the majority of documented ethnicities. There was an equal distribution of males (n = 91, 51%) and females (n = 84, 47%) with 5 (3%) undocumented cases. Most encounters occurred in young people with ages 18–30 (n = 37, 21%), 11–17 (n = 30, 17%), and 6–10 (n = 22, 12%) being the most common. Pain (n = 108, 60%), swelling (n = 99, 55%), and rash (n = 32, 18%) accounted for the majority of symptoms. Most encounters occurred at Padre Island (n = 37, 21%), Sequoia/Kings Canyon (n = 21, 12%), Yosemite (n = 21, 12%), Death Valley (n = 15, 8%), and Zion (n = 11, 6%) with other encounters spread out over 29 other national parks during the months of June (n = 34, 19%), July (n = 41, 23%), and August (n = 41, 23%).

Conclusions: Most envenomations occurred during the busiest season for visits in the US NPS. The majority of patients afflicted were under the age of 30 and non-hispanic white with an equal distribution between males and females. Symptoms were most consistent with local reactions alone. No deaths were reported in our data set. Eighty-two patients (46%) were treated and released with only 31 patients (17%) being transported by NPS EMS to definitive medical care. The demographics and epidemiology of insect bites and animal envenomations occurring in the US NPS has important funding, planning, and public health implications. Limitations for this study include no documented outcomes after contact with NPS EMS.

Keywords: Envenomation, Environmental, Epidemiology

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31. Reversible Metronidazole-Induced Encephalopathy

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Background: Metronidazole is a 5-nitroimidazole antimicrobial active against protozoa and anaerobic bacteria. It is a generally well-tolerated drug but can cause rare idiosyncratic neurologic reactions most notably, as this case illustrates, encephalopathy.

Case Report: An 82-year-old man presented with a two-day history of dysarthria, and a two-week history of ataxia. He was diagnosed 11-weeks prior with osteomyelitis of his first right metatarsal, treated with ceftriaxone and metronidazole. Physical examination was significant for neurologic incoordination specifically dysarthria and unsteady wide based gait.

Complete blood count and electrolytes were normal. Serum creatinine was 141 μmol/L. ECG showed atrial fibrillation. A non-enhanced computed tomography (CT) of the brain showed chronic ischemic changes in the cerebral white matter, but no acute abnormalities. Subsequently, a magnetic resonance imaging (MRI) of the brain was performed revealing bilaterally symmetric hyperintensity in the dentate nuclei and in the splenium of the corpus callosum on T2-weighted FLAIR (fluid attenuated inversion recovery) images. The differential diagnosis for T2-hyperintense lesions in bilateral dentate nuclei includes methyl bromide intoxication, maple syrup urine disease, enteroviral encephalomyelitis,

Wernicke encephalopathy, and metronidazole-induced encephalopathy. In light of the antibiotic history, a diagnosis of metronidazole-induced encephalopathy was made.
Case Discussion: Metronidazole-induced encephalopathy is rare with less than 100 cases reported. Clinical features include cerebellar dysfunction, altered mental status and seizures. Cases have been reported with cumulative doses from 0.25g to 182g. The pathophysiology is postulated, but unknown. Metronidazole has a large volume of distribution and readily crosses the blood brain barrier. Intermediate metabolites can bind neuronal RNA and inhibit protein synthesis resulting in reversible axonal edema as well as modulation of γ-aminobutyric acid.
Conclusion: The patient was on metronidazole for 11 weeks with a cumulative dose of more than 80 grams. Seven days following discontinuation of metronidazole he had marked improvement and at one month follow up complete resolution of his neurologic symptoms. This case highlights a rare side effect of a commonly prescribed medication. Treatment is supportive in addition to discontinuing metronidazole. The vast majority of reported cases resolve after drug cessation, although there are 2 case reports where the patients died, emphasizing the importance of timely recognition for a condition that is largely reversible.
Keywords: Antibiotic, Metronidazole, Encephalopathy
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32. Comprehensive Analysis of Powdered Caffeine Products Purchased from the Internet

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Background: Pure powdered caffeine (1,3,7-trimethylxanthine) is sold, often from the Internet, as an additive to beverages. Fatalities have occurred from powdered caffeine overdose, raising suspicion that other potent stimulants may be added to some powdered caffeine products. Our objective was to qualitatively and quantitatively analyze the contents of nine commercially available powdered caffeine products purchased from the Internet in order to determine if any products contained contaminants or adulterants such as designer drugs or stimulants which could contribute to toxicity**.**
Methods: A convenience sample of nine powdered caffeine products were purchased from the Internet. Study authors obtained all powdered caffeine products available for purchase with U.S. dollars by performing a Google Internet search for 'powdered caffeine'. This approach was taken in an attempt to mimic that most likely taken by a potential Internet purchaser of powdered caffeine products. Descriptions of each product were documented prior to chemical analysis. Liquid chromatography- quadrupole time-of-flight mass spectrometry (LC-QTOF/MS) was then utilized to identify and quantify all substances in the purchased products. Duplicates of each sample were run for quantitative analysis. Standard descriptive statistics were used to calculate purity of the compounds tested.
Results: Nine powdered caffeine products were purchased and analyzed. Labeling on these products varied – most recommend a dose of 200 mg with max daily dose of 800 mg by mouth. Suggested serving sizes ranged from 50–300 mg (~1/32-1/16 teaspoon) and suggested dose per day ranged from 50–800 mg. One product recommended using a 'microscale' to weigh dose, and a second product came with a measuring spoon, but the other 7 products did not provide instructions regarding how to measure out the recommended dose. All products contained only caffeine and no other stimulants. Comparison of actual mass versus labelled mass of caffeine demonstrated a mean purity of 88.25% (SD 13.41%) and median purity of 90.1%.
Conclusions: Comprehensive analysis of powdered caffeine samples purchased from the Internet revealed the products to consistently contain high concentrations of pure caffeine. No other stimulants were found in any of the products. Dosing instructions on all packages purchased were vague regarding amount to be ingested. High purity and lack of clear dosing instructions may place users at risk for overdose. Fatalities and severe toxicity with exposure to powdered caffeine products may actually be due to high purity, as opposed to contamination or adulteration with non-caffeine stimulants.
Keywords: Powdered caffeine, Quantification, Liquid chromatography-quadrupole time-of-flight mass spectrometry
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33. Loaded backpacks: School medication disbursement leading to overdoses in children

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Background: Nearly one-third of children in the United States have a chronic medical condition. Daily medications for chronic conditions are usually administered at home, but sometimes are given at school. At the end of an academic year, remaining medications are often disbursed back to the student for transport to home. This is a vulnerable time where at risk children have increased access to medications without school or parent supervision. Intentional ingestion for intoxication or suicide attempt may occur as a result of this vulnerability. We report two such cases.
Case 1: A 14-year-old boy taking lorazepam 1 mg tabs for anxiety was given the remainder of a bottle of 1mg tabs to take home on the last day of school. He took 8 tablets for recreational abuse. He presented with drowsiness and slurred speech. Vital signs were normal and he was observed for several hours without intervention required.
Case 2: A 12-year-old boy brought home bottles of guanfacine extended-release 2 mg tablets and risperidone 0.25 mg tablets on his last day of school. He estimated taking a couple tablets each and presented to a healthcare facility with agitation and tachycardia with a heart rate of 110. He was admitted to the pediatric intensive care unit where he developed asymptomatic bradycardia with heart rate in the 50–602 and blood pressure 100s/60s mmHg. The bradycardia resolved without requiring additional intervention and the patient was discharged home 23 hours post-ingestion.
Case Discussion: These two cases directly link last day of school medication disbursal to intentional ingestions. Though there is a risk present in giving medications directly to students, there is little

regulation of the process. Current state health department guidelines include approving only pharmacy labeled medications, but suggest further policy details be developed by each district in order to cater to their population of students. A snapshot of eight local school districts showed half of the districts recommend, but do not require, having parents bring medications to the school initially. There is no differentiation for controlled substances such as those prescribed for ADHD or anxiety, as in the case above. Two districts addressed medications leftover at the end of the school year, asking for parental arrangements for pick up or consent for medications to be sent home with the student. Policies that limit unrestricted access to medications may prevent these overdoses in children.

Conclusions: Last day of school medication disbursement provides access to medications for misuse or abuse by children. This is a potential opportunity for poison centers to provide education to both parents and schools.

Keywords: Pediatric, Public health, Overdose

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34. Angel Dust Trauma: Effect of phencyclidine positive urine immunoassay drug screens on morbidity or mortality from trauma

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Background: Phencyclidine (PCP) use can lead to agitation and injury. Though it is frequently tested for, little is known about PCP's effect on trauma patients' clinical outcomes . We sought to determine characteristics of trauma patients with a PCP positive urine immunoassay drug screen (UDS) and if they had increased morbidity or mortality.

Methods: A five year retrospective review of a level 1 trauma center's trauma registry identified patients with a PCP positive UDS. Data collected included age, sex, race, vital signs, Glasgow coma score (GCS), mechanism of injury, injury severity score (ISS), rate of endotracheal intubation, ventilator days, ICU days, hospital days, disposition (home, jail, rehab), mortality and serum ethanol level (sEtOH). This group was then compared to 2 randomly selected control groups from the same trauma registry which were matched for age and sex but differed in one had no sEtOH detected and a negative UDS (Drug Free group) while the other had sEtOH or an other-than-PCP positive UDS (Other Drugs group). Subgroup analysis was performed comparing PCP positive patients with undetectable sETOH to Other Drug patients with undetectable sEtOH. Statistical significance was determined using Student's t-test and Pearson's chi-squared test where appropriate.

Results: The registry contained 7770 patients of which 156 met inclusion criteria. The mean age was 33.4 years (range 19–63) and 77% were male (n = 121). When compared to Other Drug group the PCP positive group had significantly lower ISS, rates of ICU admission, and sEtOH. Table 1 shows the characteristics where statistically significant differences exists between the PCP positive group and at least one of the control groups. No difference was seen in vital signs, mechanism of injury, ventilator days, ICU days, total hospital days, disposition, or mortality between the three groups. The presence or absence of ethanol did not significantly change any outcomes. This study is limited by its retrospective nature and lack of confirmatory PCP testing.

Conclusion: This study suggests a PCP positive UDS in the setting of trauma is not associated with increased morbidity or mortality.

Keywords: Drug of abuse, Phencyclidine, Trauma

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35. Surreptitious Adulteration of Heroin: A Case Series of Clenbuterol Toxicity

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Background: Adulteration of recreational drugs of abuse may be done to increase profit margin. Some adulterants may be relatively innocuous while others can result in significant toxicity. Clenbuterol is a β2-adrenergic agonist with veterinary uses but is not FDA approved for human use. It is an infrequently reported adulterant in heroin. We describe a recent cluster of hospitalized patients with laboratory confirmed clenbuterol exposure resulting in serious clinical effects.

Case Reports: Ten patients presented over a 10 day period with unexpected symptoms shortly after heroin use. Seven patients presenting to our emergency department are summarized. Five patients reported insufflation, three intravenous injection, and two did not report the route. Presenting symptoms included chest pain (6/7), dyspnea (5/7), palpitations (5/7), and nausea/vomiting (4/7). All patients were male with median age 40 years (IQR 38–46). Median Initial vital signs included HR 120 bpm (IQR 91–137), RR 20 breaths per minute (IQR 18–22), O_2 saturation 98% (IQR 95–99), temperature 36.8 C (IQR 36.7–37.0), and SBP 107 (IQR 91–131). Median serum potassium nadir was 2.5 mEq/L (IQR 2.2–2.6), initial glucose level 179 mg/dL (IQR 125–231), and highest

Table 1. Characteristics and Statistically Significant Differences.

	PCP positive	Drug Free	Other Drugs
% Black (n)	76 (119)*#	18 (28)	22 (34)
Mean ISS [SD]	7.64 [8.18]*#	9.74 [9.55]	10.839 [12.32]
Mean GCS [SD]	13.73 [2.68]*	14.37 [2.35]	13.03 [3.94]
% Intubated (n)	17 (26)*	6 (10)	20 (31)
% Admitted to ICU (n)	39 (61)#	44 (68)	54 (84)
Mean Serum Ethanol (mg/dL) [SD]	58 [91.67]#	0 [NA]	103 [116.79]

* = $p < 0.05$ between PCP positive and Drug free group.
# = $p < 0.05$ between PCP positive and Other drug group.

reported CPK 953 units/L (IQR 367-10,363). Troponin was positive in six patients at some point during their hospitalization. Three patients underwent cardiac catheterization, all revealed no significant coronary artery disease. Qualitative clenbuterol was detected in the urine of all five patients who had comprehensive testing. All patients survived to discharge with supportive care.
Case Discussion: Atypical presentations of illicit drug intoxication may raise concern for drug adulteration. In the case of heroin use, presence of adrenergic symptoms and/or chest pain with hypokalemia, lactic acidosis and hyperglycemia suggests adulteration with a beta agonist like clenbuterol.
Conclusions: Clenbuterol adulteration of heroin can result in serious signs, symptoms, and often requires hospitalization. In this series, patients recovered with supportive care.
Keywords: Heroin, Substance abuse, Adulterant
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36. Epidemiology of adolescent substance use in London schools: Low prevalence of use of Novel Psychoactive Substances

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Background: Most of the data available on the prevalence of substance use in the UK and Europe is based on adult population and sub-population surveys. Currently there is limited data available on substance use in adolescents. There has been a change in the recreational drugs available to users in recent years, with increasing availability of new psychoactive substances (NPS). The aim of this study was to investigate the prevalence of alcohol, classical recreational drug and NPS use amongst adolescents aged 15–18 years in London schools.
Methods: Students aged 15–18 years in three London schools self-completed a questionnaire which collected data on ethnicity and the frequency of use of alcohol, tobacco, classical recreational drugs and NPS. The study was approved by the local University research ethics committee.
Results: 533 students completed the survey. 250 (47.8%) reported using alcohol at least once; those from White (n = 59, 79.7%) and mixed ethnic groups (n = 34, 72.3%) were more likely to report ever using alcohol than those in other ethnic groups (Afro-Caribbean: n = 67, 48.2%; Asian: n = 27, 22.9%; other: n = 10, 48.2%), $p < 0.001$. 382 (74.2%) students reported using tobacco at least once, students from ethnic minorities (Afro-Caribbean: n = 109, 79.0%; Asian: n = 95, 80.5%; Other: n = 28, 84.8%) were more likely to report ever having smoked than those who were white (n = 47, 63.5%) or of mixed ethnicity (n = 31, 66%),$p < 0.05$. 113 (20.4%) reported life-time use of at least one recreational drug, cannabis (96, 18.7%) was by far the most commonly reported; after cannabis the most commonly used substances were magic mushrooms (n = 10, 1.8%), amphetamine (n = 10, 1.8%), khat (n = 7, 1.6%) and solvents (n = 7, 1.4%). Only 6 (1.1%) reported use of an NPS (synthetic cannabinoid receptor agonists (n = 4), mephedrone (n = 1), methoxetamine (n = 1)).
Conclusion: Smoking and alcohol use were common in this study of 15–18 year olds in London schools, with different patterns amongst different ethnic groups. Drug use was much less common and the most commonly used drug was cannabis. Data on the prevalence of substance use in school and college aged students is important to inform appropriate prevention and educational activities.
Keywords: Adolescent, Drug of abuse, Substance abuse
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37. Development of a Reproducible Swine Model of Survivable Hydrogen Sulfide Toxicity for Antidote Testing

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Background: Hydrogen sulfide (H2S) is a suicide agent, terrorist weapon, and potential workplace catastrophe. It is an attractive terrorism tool because of its high toxicity, difficulty in diagnosing exposure to high concentrations, and ease of manufacturing. Because the main toxic effect of H2S is inhibition of oxidative phosphorylation, similar to cyanide, several potential antidotes are available for H2S poisoning, but none have been completely successful.
Objective: To develop a swine model of potentially survivable H2S toxicity which produces apnea, significant hypotension, and biomarkers that resemble lethal human exposure.
Methods: 20 swine (45–55 kg) were anesthetized, intubated, and instrumented with continuous femoral and pulmonary artery pressure monitoring to determine the concentration and infusion rate of sodium hydrosulfide (NaHS), the infusible form of H2S, needed to produce apnea without producing immediate death. A NaHS infusion (concentration of 8 mg/ml) was begun at 1 mg/kg/min until apnea; confirmed by capnography. This NaHS rate was sustained for 1.5 minute post apnea, then decreased to 0.7 mg/kg/min for 4.5 min post apnea, at which time it was decreased to 0.1 mg/kg per min for the 60 min observation period. All animals reached apnea prior to cardiac arrest, showed increased serum levels of potassium (6 mmol/L) and lactate (4.4 mmol/L), average mixed venous oxygen saturation of 30% at apnea plus one min, and urine thiosulfate levels 32 times higher than baseline at apnea plus four min (62.4 mcg/mL). We are currently collecting data to compare the effects of intravenous cobinamide, a novel, potent antidote to cyanide toxicity, compared to saline. Cobinamide binds cyanide and sulfide; hence it has the potential to be an effective antidote to H2S toxicity. Importantly, cobinamide can be delivered intramuscularly. To date we have collected data on 5 animals; three control and two cobinamide treated pigs.
Results: 100% of the control animals did not survive longer than 5 minutes post apnea, whereas 100% of the cobinamide treated animals survived for the entire 60 minute observation period. Cobinamide treated animals resumed respirations at 3 minutes post treatment with pH (7.47) and lactate values (1.5 mmol/L) normalized by 20 minutes post treatment. Because cobinamide interferes with near infrared spectrometry measurements, mixed venous oxygen comparisons are impossible post treatment.
Conclusions: 100% survival of the treated animals compared to no survival of the untreated animals (preliminary data) suggests this model is a reproducible, survivable model for H2S

toxicity and may be used to evaluate drug therapies. Data collection continues.
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38. The Use of Ketamine for Agitated Patients in the Prehospital Setting: A Systematic Review of the Literature

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Background: Prehospital providers are often faced with intoxicated, agitated or violent patients placing both patients and providers at risk. While some EMS systems are using ketamine for agitation little is known about the safety and efficacy of this approach. Our objective was to identify, summarize and analyze the available literature to determine the efficacy and safety of the use of ketamine for the treatment of undifferentiated agitation in the prehospital setting.
Methods: Using broad search terms we conducted an electronic search of relevant databases from 1946 - January 2015, hand searched references from pertinent journals and articles, as well as the gray literature. We selected original studies that evaluated the use of ketamine in the prehospital setting with agitated or violent patients. Two investigators identified eligible studies, evaluated validity and extracted data. Study quality and risk of bias were evaluated. Case reports and series were also collated and summarized.
Results: 263 papers were identified for possible inclusion and 257 were excluded leaving six studies (168 patients) for full systematic appraisal. One case series and 5 single case reports (7 patients) were also located. All of the studies (n = 6) used a retrospective methodology. Studies evaluated time to sedation (n = 1), sedation level (n = 1), provider's assessments of improvement (n = 1), the rates of prehospital (n = 1) and emergency department endotracheal intubation (ET) (n = 2), adverse events (n = 4), mental status changes (n = 1) and the need for additional sedation (n = 1). Sample size ranged from 1 to 52 patients. Ketamine doses varied from 4–5 mg/kg IM to 0.5 to 2 mg/kg IV. Five studies reported 43 adverse events in 41 patients (25%) with the most common being ET (n = 17, 10%), hypertension or tachycardia within 72 hours (n = 10, 6%), hypoxia or respiratory depression (n = 7, 4%), emergence reaction (n = 3, 2%), and laryngospasm (n = 2, 2%). All 6 studies reported improvement in agitation or increased sedation following ketamine. Case report/series outcomes supported research findings with decreased agitation noted in each case along with tachycardia (n = 3), transient hypertension (n = 1), and laryngospasm (n = 1).
Conclusions: Little empiric evidence regarding the efficacy and safety of the use of ketamine for acutely intoxicated, agitated, or violent patients in the prehospital setting exists. Current studies are retrospective and are limited by potential sources of bias. While the current literature supports ketamine's efficacy in decreasing agitation in this environment, prospective study with standardized outcomes assessment and careful evaluation of adverse events is warranted.
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39. Prevalence of pediatric emergency department visits for low toxicity exposures that could otherwise be safely managed by calling a poison center

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Background: One value of poison centers (PCs) is as a triage resource that reduces health care visits and costs. PCs have experienced a decline in case volume in recent years; however the acuity and complexity of cases managed in a health care facility (HCF) is increasing. This study was undertaken to determine the number of 2014 pediatric cases where the patient was already in an HCF, the PC had not been called prior to arrival, and the exposure could have been managed at home if the PC had been contacted in the pre-HCF setting.
Methods: Retrospective review of a single multi-statewide PC's 2014 cases was performed. Cases were screened for patients aged < 6 years, already in or en route to an HCF, and discharged from the emergency department (ED). 1080 cases met these criteria. All of these cases with disqualifying symptoms requiring send-in (such as bleeding, cyanosis, lethargy, confusion) were excluded. This left 717 cases for final review. Case narrative details were analyzed, including exposure type/amount, length of time from exposure, and any reported symptoms. All drug/product ingestions that exceeded send-in amounts based on poison center policy, as well as those lacking full information (such as unclear history or incomplete charting) were excluded.
Results: Of the 717 prescreened cases, 434 cases (60.5%) described patients that were either asymptomatic or had only minor symptoms, and exposures involved products known to cause minimal toxicity or below send-in amounts. This represents 40.2% of the total sample of 1080 pediatric cases evaluated and discharged from the ED. These cases could have been managed at home with appropriate follow-up as determined by PC treatment guidelines if the PC had been contacted prior to arrival at the HCFs.
Conclusion: Our study suggests there continue to be cases presenting to HCFs which could have been effectively and safely managed at home if a PC had been contacted first. With a conservative estimate of $1,000 per ER visit, this reveals a potential annual health care cost savings of $434,000.
Keywords: Poison center, Triage, Health care costs
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40. Comparison of Various Oxymetalozine Nasal Decongestants in Inverted Position

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Background: Oxymetalozine is a commonly used imidazoline nasal decongestant and has potent peripheral alpha properties. With systemic absorption can also stimulate central alpha adrenoreceptors resulting in bradycardia, hypotension and respiratory

depression similar to clonidine. We performed in vitro study to assess the volume of oxymetalozine released from inverting bottles of oyxmetalozine nasal decongestants.

Methods: Three different OTC products of oxymetalozine 0.05% were purchased: 30 mL (Kroger), 30 mL (Target) and 20 mL (Merck). To mimic the administration of intranasal administration to supine child and also self-administration following accidental oral ingestion, container held at 45 degrees using angle ruler. A single depression of container into 1 mL (1000 μL) tuberculin syringe performed three separate times for each product i.e., triplicate and measured. Mean and standard deviation were calculated for each product.

Results: The results of three repeated measurements for each product as follows: Kroger product administered a mean of 0.66 ± 0.07 mL (660 μL ± 70 μL) with a range of 0.59 to 0.73 mL (590 to 73 μL); Target product administered a mean of 0.9 ± 0.09 mL (900 μL ± 90 μL) with a range of 0.8 to 0.96 mL (800 to 960 μL); Merck product administered a mean of 0.72 ± 0.04 mL (720 μL ± 40 μL) with a range of 0.68 to 0.75 mL (680 to 750 μL).

Discussion: FDA released a Drug Safety Communication regarding adverse events in children following exposure to imidazoline decongestants. These agents are not recommended for children < 6 years. However, many parents continue to use these medications in children for nasal decongestion e.g., bronchiolitis. Also accidental pediatric oral ingestion is not uncommon. Many physicians use oxymetalozine both in operative and non-operative settings for pediatric patients for various indications. Oxymetalozine is rapidly absorbed from gastrointestinal tract when ingested. In addition, systemic effects can be seen with intranasal administration alone. The approximate volume of of oxymetalozine with each accuation when held in upright in "normal" position is 30 μL. We demonstrated the volume when held inverted at 45 degrees increased twenty to thirtyfold higher, 590 to 960 μL, than when held upright. These volumes are in the range of where toxicity can be seen in pediatric patients and followed a single depression of the container. These volumes would be doubled if the volume was administered in each nare i.e., 1180 to 1920 μL. The major limitation of our study is we utilize an in vitro model.

Conclusion: Our data support the concern of administration of oxymetalozine to a child in the supine position or accidental self-administration orally by a child.

Keywords: Pediatric, Imidazoline, Oxymetalozine

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41. Undetectable Total Phenytoin in a Patient with Elevated Kappa Light Chains

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Background: Phenytoin is an effective and important antiepileptic. Toxicity is recognized by characteristic symptoms and confirmed with serum drug levels. Undetectable total serum phenytoin during steady state therapy is unusual and suggests noncompliance, inadequate dosing or lab interference. We present a case of a patient with adequate phenytoin therapy yet undetectable total phenytoin levels, likely due to interference from excess immunoglobulin light chains.

Case Report: A 52 year old male with a history of type II diabetes, benign prostatic hypertrophy, and generalized seizures, presents to a medical clinic for phenytoin continuation. The patient resides at a facility with 24/7 nursing and supervised medication administration. He was restarted on phenytoin 300mg daily, yet total serum phenytoin was undetectable 12 days later. Correct medication administration was confirmed, phenytoin dosage increased, and total serum levels remained < 3.0 mg/L after 2 weeks. A simultaneous free phenytoin level was 0.9 mg/L corresponding to a calculated total level of 8.3 mg/L. Complete blood count was remarkable for hemoglobin 12.5 g/dL and Hematocrit 37.8%. Comprehensive metabolic panel noted alkaline phosphatase 116 U/L and was otherwise normal (creatinine 0.79 mg/dL, BUN 21 mg/dL, eGFR 120 mL/min, albumin 4.4 g/dL). Urinalysis was completely normal and HIV non reactive. Serum IgG, IgA, and IgM concentrations were normal and Human anti mouse antibody (HAMA) was undetectable. Serum free kappa light chains (20.0 mg/L), urine free kappa light chains (43.10 mg/L), and urine kappa/lambda light chain ratio (17.52) were elevated.

Discussion: Serum phenytoin analysis is useful in evaluating and preventing toxicity. Disruption of the immunoassay may result in falsely undetectable levels and has been reported in renal failure and IgM gammopathy. HAMA may also disrupt the murine-based phenytoin immunoassay. Our patient had been administered phenytoin daily, had excellent seizure control, yet multiple total serum phenytoin measurements were undetectable. Renal failure and HAMA were unlikely to be causing interference. After a dose increase generated discordant values between measured and calculated total phenytoin, an underlying immune disorder was suspected and subsequent work up suggests light chain disease, monoclonal gammopathy of undetermined significance, or plasma cell dyscrasia.

Conclusions: Undetectable total phenytoin in a patient with adequate free phenytoin, normal renal function, and absent HAMA, may suggest assay interference from excess immunoglobulins. Although previously reported in cases of IgM gammopathy, this may be a sentinel case associated with excess kappa light chains.

Keywords: Anticonvulsant, Biomonitoring, Drug interaction

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42. Recurrent Ibuprofen-induced Renal Tubular Acidosis

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Background: Ibuprofen-induced renal tubular acidosis (RTA) with severe hypokalemia is an under-recognized and potentially life threatening adverse effect. We describe a case of recurrent severe metabolic acidosis secondary to repeated ibuprofen use.

Case Report: A 45-year-old patient presented to hospital on multiple separate occasions for unexplained generalized weakness and acidemia. Each presentation was significant for hyperchloremic, hypokalemic metabolic acidosis. During the latest admission, investigtions revealed a pH of 6.89, a bicarbonate of 5 mmol/L, a potassium level of 2.5 mmol/L, and a urine pH of 7.0 with a positive urine gap after fluid resuscitation.

The patient had no significant medical co-morbidities and reported only taking pantoprazole. Initial toxicologic testing was negative for acetaminophen, salicylates, toxic alcohols, and other drugs of abuse. Subsequent laboratory investigation with High Performance Liquid Chromatography (HPLC) detected ibuprofen in both serum and urine. Upon repeat questioning the patient endorsed a habit of taking ibuprofen at home. During each hospital admission, ibuprofen was never prescribed and all symptoms and metabolic abnormalities resolved with supportive treatment.

Case Discussion: Ibuprofen is a nonsteroidal anti-inflammatory drug (NSAID) available over the counter (OTC) since 1983. It is commonly used as an anti-pyretic and analgesic. Metabolic acidosis secondary to ibuprofen is an under-reported condition. The pathophysiology is unknown, but the most commonly cited mechanism is an ibuprofen induced RTA. Alternative explanation is direct acidemia from ibuprofen and its metabolites, all of which are weak acids. In all reported cases, metabolic abnormalities resolve with drug cessation and supportive treatment.

Conclusion: We describe a patient with recurrent episodes of weakness, acidemia and investigations consistent with distal RTA secondary to ibuprofen. Abnormalities resolved with drug cessation and supportive treatment. Once ibuprofen was identified as the culprit, the patient remained off this drug and has been out of hospital since. This case highlights a severe, yet reversible, complication of a common OTC medication.

Keywords: NSAID, Acidosis, Adverse drug event

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43. Implementation of a Voluntary Opioid Prescribing Guideline Is Effective in Altering the Prescribing Habits of Emergency Department Doctors in an Urban Setting

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Background: The United States is currently experiencing a prescription opioid abuse epidemic. Policies to limit emergency department (ED) prescribing of opioids to patients with chronic pain complaints have been proposed but data on the effectiveness of such policies is limited.

Methods: We set out to evaluate whether the implementation of an institutional guideline for the prescription of opioids to discharged ED patients with chronic non-cancer pain affected the prescribing habits of ED doctors in an urban setting. The study was conducted at two urban EDs staffed by the same group of providers.

An institutional guideline was drafted based on the Model Emergency Department Pain Treatment Guidelines published by the American Academy of Emergency Medicine. Physicians could adhere to the guideline at their own discretion.

A retrospective structured chart review was performed of all discharged patients for a pre-implementation and post-implementation period of one month each.

Results: During the pre-implementation period, 513 (15%) of 3,383 visits at ED #1 and 315 (9%) of 3,355 visits at ED #2 were for chronic pain complaints. During the post-implementation period, 541 (14%) of 3,047 visits at ED #1 and 329 (10%) of 3,376 visits at ED #2 were for chronic pain complaints.

At ED #1 during the pre-implementation period, 204 (40%) chronic pain visits resulted in an opioid prescription. During the post-implementation period, 106 (20%) chronic pain visits resulted in an opioid prescription, a statistically significant decrease of 20% (95% CI [15%, 26%]) ($p < 0.001$).

At ED #2 during the pre-implementation period, 136 (43%) chronic pain visits resulted in an opioid prescription. During the post-implementation period, 53 (16%) chronic pain visits resulted in an opioid prescription, a statistically significant decrease of 27% (95% CI [20%, 34%]) ($p < 0.001$).

At both emergency departments, the number of pills per opioid prescription decreased after program implementation ($p = 0.011$), but the difference was so small (less than 1 pill) as to be clinically insignificant. Physician prescribing behavior varied to a statistically significant degree in response to program implementation ($p = 0.04$) with 16 (70%) writing fewer opioid prescriptions, 3 (13%) writing the same number, and 4 (17%) writing more opioid prescriptions as compared to the pre-implementation period.

Conclusion: An opioid prescribing guideline is effective in decreasing the amount of prescriptions written for patients being discharged from the ED with chronic pain complaints, even if the use of the guidelines among physicians within a practice is optional.

Keywords: Prescription Opioid, Chronic Pain, Public health

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44. An unusual method of loperamide abuse leading to opiate withdrawal

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Background: Loperamide is a peripherally-acting opioid antidiarrheal agent generally considered safe at recommended doses due to poor oral bioavabilabiliy, extensive metabolism through CYP3A4, and interaction with p-glycoprotein (p-gp). We present a case of a patient with loperamide withdrawal after using loperamide at supratherapeutic doses in conjunction with over-the-counter CYP3A4 and p-gp inhibitors.

Case Report: A 42-year-old female patient with history of psychiatric illness, chronic pain, and opiate abuse presented to the Emergency Department (ED) complaining of symptoms of opiate withdrawal after using 120–140 mg (60–70 tablets) of loperamide daily for one week in an effort to treat an exacerbation of her chronic pain. She simultaneously ingested a quarter gallon of grapefruit juice and up to 6 tablets of cimetidine per day after reading on the Internet that this could increase loperamide absorption and allow it to cross the blood-brain barrier. After abruptly cutting her dose of loperamide, she experienced opiate withdrawal symptoms, including severe anxiety, vomiting, and diarrhea.

In the ED, she was very restless and exhibited mydriasis and piloerection. Her anxiety improved after 2 mg of intravenous lorazepam. Urine drug screen was positive only for benzodiazepines, and further laboratory evaluation was relatively unremarkable. She was evaluated by the toxicology service, diagnosed with opiate withdrawal, and discharged home without incident.

Case Discussion: Unlike many other opioids, loperamide does not produce central opiate effects due to its interaction with p-gp, an efflux protein found in the intestine and blood-brain barrier that

limits drug absorption and central nervous system (CNS) accumulation. Loperamide is also extensively metabolized via CYP3A4, decreasing its oral bioavailability. Bioactive flavanoids found in grapefruit juice are inhibitors of both p-gp and CYP3A4, and cimetidine is a reversible inhibitor of CYP3A4. When ingested together with these substances, loperamide can accumulate in the serum and CNS, producing desirable central opiate effects like analgesia and euphoria. Cessation of loperamide abuse can lead to withdrawal symptoms similar to those seen with other centrally-acting opiates.

Conclusion: While usually considered safe, clinicians should be aware of the abuse-potential of loperamide when used in conjunction with CYP3A4 and p-glycoprotein modulators like grapefruit juice and cimetidine.

Keywords: Loperamide, Abuse, Withdrawal

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45. Abuse and Withdrawal from the Veterinary Agent Zolazepam-Tiletamine

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Background: Zolazepam-tiletamine is a combination veterinary anesthetic which combines the N-Methyl-D-aspartate (NMDA) antagonist tiletamine with the pyrazolodiazepinone derivative zolazepam which is structurally related to benzodiazepines. Abuse of this agent is a rarely reported phenomenon. We report a case of chronic abuse and withdrawal from this combined anesthetic agent.

Case Report: A 43 year old veterinary technician presented to the emergency department with tremors that progressed to chorea- like movements. The patient reported using intravenous zolazepam-tiletamine for 2 years and had recently increased her use to more than 5 times per week. She became more depressed and developed auditory hallucinations. Due to these symptoms, she abruptly ceased her use and 1 day later developed tremors, first in her hand and then in her legs.

Initial vital signs were within normal limits. Her exam was significant for both tremors and overwhelming chorea-like movements of bilateral upper and lower extremities. The movements increased with intention, all in the setting of a normal mental status without a defined toxidrome. The patient also had ataxia with finger to nose testing, and a narrow based, ataxic gate.

Initial treatments with diphenhydramine and haloperidol were not effective. She was then given diazepam with gradual improvement in her symptoms. An MRI showed mild cerebral and cerebellar cortical volume loss. At 6 month follow-up the patient had persistent mild tremor of her upper extremities but the coarse movements had ceased.

Case Discussion: Zolazepam-tiletamine is a 1:1 mix of zolazepam, a benzodiazepine agonist, and the NMDA antagonist tiletamine. The combination is commonly used as a small animal general anesthetic. Reports of human use are rare with no prior reports of withdrawal from these agents.

Recent research has found that glutaminergic neurons act in conjunction with dopaminergic neurons in the striatum to help coordinate voluntary movements. Excess excitatory input caused by abrupt withdrawal of the NMDA antagonist tiletamine could result in an imbalance between excitatory and inhibitory input resulting in abnormal movements. We theorize that this mechanism could explain our patient's symptoms along with the improvement with benzodiazepines.

Conclusion: We report a case of abuse and withdrawal from the veterinary anesthetic zolazepam-tiletamine. Toxicologist need to be aware of additional health care sites like veterinary offices as sources of emerging drugs of abuse.

Keywords: Abuse, Withdrawal, Dissociative

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46. Prevalence of Serious Adverse Events by Injection or Inhalation of Prescription Stimulants

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Background: According to the National Survey on Drug Use and Health, there were 1.4 million individuals who abused prescription stimulants in the US in 2013. As with prescription opioids, some of these individuals tamper with these products to obtain a greater high. This study assesses whether abuse cases that reported either injecting or inhaling a prescription stimulant were more likely to experience a serious adverse event (SAE) than those that did not.

Methods: Data from the RADARS® (Researched Abuse, Diversion, and Addiction-Related Surveillance) System Poison Center Program were used. Route of administration of prescription amphetamine and methylphenidate pills were analyzed from abuse cases reported to the participating poison centers between 1Q2010-4Q2014. An SAE was defined as a medical outcome of major or death or where the case resulted in admission to a heath care facility. Only cases with known medical outcomes and routes of administration were included. Multiple logistic regression was used to determine whether use via injection or inhalation was significantly associated with a greater odds of an SAE. Potential confounders were controlled for such as the age in years of the case, gender, and number of substances.

Results: There were 3546 prescription stimulant abuse cases that met inclusion criteria, of which 1320 (37%) experienced an SAE. There were 137 (4%) injection cases and 442 (12%) inhalation cases. Six cases ($< 1\%$) reported both injection and inhalation of a stimulant. Cases that reported injecting a stimulant had greater odds of experiencing an SAE than those that did not inject [adjusted odds ratio (AOR) = 1.75, 95% confidence interval (CI): 1.23 to 2.49, $p = 0.002$]. Inhalation was not significantly associated with an SAE (AOR = 0.90, 95% CI: 0.73 to 1.12, $p = 0.346$). Both age (AOR = 1.03, 95% CI: 1.02 to 1.04, $p < 0.001$) and the number of substances reported with the cases (AOR = 1.30, 95% CI: 1.22 to 1.39, $p < 0.001$) were positively associated with an SAE.

Conclusion: Injecting a prescription stimulant is associated with SAEs among abuse cases. As with prescription opioids, tamper resistant formulations of prescription stimulants could potentially reduce the number of SAEs.

Keywords: prescription stimulants, serious adverse event, route of administration
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47. Acute Cholecystitis Associated With Kratom Abuse

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Background: Derived from Mitragyna speciosa, Kratom is a unique drug of abuse with opioid effects. The primary alkaloid mitragynine is thought to contribute to the mu-agonist activity of the drug. Case reports describing Kratom associated toxicity include seizures, fatalities and one report of cholestatic hepatitis. Here we describe a case of transaminitis and cholecystitis subsequent to Kratom ingestion documented with blood levels.
Case Report: A 26-year-old male with no past medical history presented to the Emergency Department (ED) describing 2 weeks of right upper quadrant (RUQ) pain, subjective fevers, and dark urine. Two weeks prior to arrival, the patient attended a party, consumed a large quantity of alcohol (15 to 20 drinks in 24 hours) and ingested a total of 15 g of Kratom. Two days later, he experienced subjective fevers, and a dull, constant RUQ pain radiating to the shoulders and left flank.

On arrival to the ED, the patient's vital signs were: BP 103/47, HR 92, RR 16, SpO2 98% RA, T 37°C. His physical exam was unremarkable except for RUQ tenderness to palpation with a positive Murphy's sign. While in the ED, the patient developed a fever to 38.6°C and tachycardia. The patient's initial labs included total bilirubin of 2.3 mg/dL, alkaline phosphatase 171 U/L, alanine aminotransferase (ALT) of 448 U/L, aminotransferase (AST) of 483 U/L, and an undetectable acetaminophen level.

An abdominal ultrasound showed diffuse gallbladder wall thickening with pericholecystic fluid without cholelithiasis or sludge. During admission, the patient was treated symptomatically and was noted to have negative acute viral hepatitis titers, a normal 24-hour urine copper level, and normal ceruloplasmin level. The patient's transaminases peaked at AST of 483 U/L, and ALT of 703 U/L. Transaminases, and the patient's symptoms steadily improved. The patient was discharged on hospital day 3.

Liquid chromatography-quadrupole time-of-flight mass spectrometry was used to analyze samples collected during hospitalization to quantify serum and urine mitragynine levels (see table).
Case Discussion: We present a case of a patient with evidence of acute cholecystitis following Kratom ingestion. While Kratom use has been previously associated with cholestatic hepatitis, this is the first case report of hepatotoxicity with evidence of gallbladder pathology.
Conclusion: Kratom abuse may be associated with hepatotoxicity, including cholecystitis.
Keywords: Drug of abuse, Abuse, Hepatotoxicity
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Table 1. Serum and urine mitragynine concentrations.

Sample	Time	Mitragynine Concentration (ng/mL)
HD#1 Serum	1736H	13.0
HD#2 Serum	2038H	7.4
HD#3 Serum	1535H	< LOQ (3.5 ng/mL)
HD#1 Urine	1830H	356.3

48. Suicide Online: Google Searches and National Poison Data System (NPDS) Exposures

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Background: NPDS tracks exposures and Google Trends (GTs) provides relative search frequency data by week. We examined the relationship between GTs for medications commonly involved in suicide attempts and suicidal exposures as reported by NPDS.
Methods: We examined NPDS exposures with Reason = Suspected suicide (NRS), from Jan-2004 (the year Google was started) through Dec-2014, by week, and related NRS to GTs for suicide and substances commonly involed. Changes over time in the NRS and GTs were examined via graphical plots, linear regression and correlation analyses. Stepwise regression analysis determined the best of the 20 predictors (19 GTs + Time) for each of 7 NRS groups over 11 y (573 wk). All analyses were via SAS JMP 9.0.0.
Results: There were 2,379,285 NRSs, 551,947 in the 13–19 y group. Ratio of female to male cases was 1.8:1 for All ages and 2.8:1 in the 13–19 y group. The table shows the NRS (mean/wk and mean increase/wk), and the number of GT measures contributing to the best model for each NRS group. Strongest GT contributors for 13–19 y were GTs for 'cold medicine + suicide', 'antidepressants', and 'benadryl or diphenhydramine'; for All ages were GTs for 'commit suicide', 'aspirin', and 'teen + suicide'. NRS for antihistamines increased over time and correlated ($r > 0.733$) with several GTs including 'antihistamine', 'benadryl', and 'diphenhydramine' ($p < 0.0001$).
Conclusions: NPDS suicidal exposures were related to Google searches over this 11 year period. Suicidal exposures for All ages were best predicted by the GT predictors. These results suggest that patients at risk for suicidal overdoses may use Google to search for information prior to overdosing in self-harm attempts.
Keywords: NPDS, Public health, Suicide
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Table 1. Best GT Predictors of NPDS Suicidal Exposures 2004–2014
*$p < 0.0001$.

NPDS Exposures Reason = Suicide	Mean Exposures/ Week	Increase in Exposures/Week [95% CI]	Best model (stepwise) # of GT Predictors	R^2
13–19 Y	962	0.448 [0.378,0.517]	10	0.583*
All ages	4146	1.63 [1.54, 1.73]	7	0.750*
Acetaminophen	345	0.0105 [–0.006, 0.027]	10	0.268*
Antidrepressant	747	0.230 [0.205, 0.256]	8	0.529*
Antihistamine	384	0.278 [0.025, 0.295]	7	0.739*
Aspirin	145	–0.010 [–0.017, –0.002]	6	0.154*
Cough and cold	37.6	0.0541 [0.050, 0.058]	8	0.659*

49. Oculogyric Crisis in a Child after Administration of Ondansetron

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Background: Oculogyric crisis (OGC) is an acute dystonic reaction characterized by prolonged involuntary upward deviation of the eyes. Eyes may also converge, deviate upward and laterally, or downward. It has been associated with administration of neuroleptics, metoclopramide, cetirizine, carbamazepine, chloroquine, cisplatin, and other medications. It is also associated with Parkinson's, Tourette's, multiple sclerosis, head trauma, and herpes encephalitis. This case describes the development of OGC after administration of ondansetron in a child.

Case Report: A 3 yr-old boy was evaluated in the ED with 4 days of abdominal pain, nausea, intermittent emesis, and headache. There had been no trauma, respiratory symptoms, fever, or blood/bile in the emesis. On examination, T 37.9, P 130, R 36, wt 18 kg. He was uncomfortable but would console for family. Eyes showed pupils that were midline, equal, and reactive to light. Extraocular movements were normal. His abdominal exam had focal right lower quadrant tenderness. Remainder of exam was normal. Laboratory studies, an appendix ultrasound, and surgery consultation were obtained. He was given IV 20cc/kg NS and IV ondansetron 2 mg (0.11 mg/kg). Patient was being discharged home when parents noted that he was very anxious and had "strange" eye movements. They felt he couldn't look at them and was not acting normally. Upon repeat examination, he was noted to have intermittent prolonged deviation of his eyes upward as well as periods of convergence alternating with rapid beats of horizontal nystagmus. He was very anxious and seemed unaware of his surroundings. A head CT was obtained and was normal. He was then given IV diphenhydramine (1.1 mg/kg) to treat suspected OGC and had resolution of his ocular symptoms and mental status change within 20 minutes. Call to parents the following day revealed no return of the symptoms.

Case Discussion: OGC appearing alone, as well as with other dystonic reactions, has been described in post-approval use of ondansetron. OGC can be associated with other dystonic symptoms as well as with acute mental status change. Dystonic movements reportedly arise from a drug-induced alteration of dopaminergic-cholinergic balance in the basal ganglia. In this case, the child did not have other dystonic movements, but did have temporary mental status change. All symptoms resolved shortly after a single IV dose of diphenhydramine.

Conclusions: This is the first reported case of a child developing OGC after administration of a standard therapeutic dose of ondansetron. This medication is typically well tolerated, but clinicians must be aware of this possible side effect. Treatment in this case was successful with a single IV dose of diphenhydramine.

Keywords: Adverse drug event, Pediatric, Oculogyric crisis

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50. Buprenorphine induced acute precipitated withdrawal in the setting of loperamide abuse

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Background: Loperamide is an anti-diarrheal agent that exerts its therapeutic effect through mu-receptor agonism and other anti-motility mechanisms. It has become a drug of abuse due to its central opioid effects after high doses. Cardiac conduction disturbances and life threatening dysrhythmias have been reported in the overdose setting. To our knowledge, withdrawal has not been reported.

Case Report: A 30 year-old male with a history of opioid addiction and loperamide abuse presented to an Emergency Department with syncope. His electrocardiogram (ECG) demonstrated sinus rhythm with a rate of 60 beats per minute, a QRS of 192 ms, and QT of 704 ms. He left against medical advice and was later found pulseless and apneic. CPR was performed with return of spontaneous circulation. He had multiple ventricular dysrhythmias, including polymorphic ventricular tachycardia (PMVT). He was successfully treated with magnesium sulfate and monitored. He admitted to abusing approximately 400 mg of loperamide daily for 7 days. Within 24 hours of presentation he complained of withdrawal symptoms. A 12 mg dose of sublingual buprenorphine was administered. He became agitated and combative with hallucinations. Lorazepam was given without effect. He then had multiple episodes of non-sustained ventricular tachycardia, which ultimately deteriorated to PMVT. He was resuscitated, started on an isoproterenol infusion, and sedated with propofol. The serum loperamide concentration (reported after the fact) was approximately 41 ng/mL at the time of buprenorphine induction. The conduction blocks slowly normalized to a QRS of 96 ms and QTc of 489 ms on hospital day 9.

Case Discussion: The authors are unaware of any cases of withdrawal due to cessation of chronic loperamide abuse. Conduction disturbances and dysrhythmias have been reported in the overdose setting. Our case demonstrated clinical findings consistent with acute precipitated withdrawal after the administration of 12 mg of buprenorphine sublingually, and subsequently developed cardiac dysrhythmias. The patient's loperamide concentration was found to be supratherapeutic at the time of induction, suggesting he had significant mu-receptor agonism when buprenorphine was administered. The patient's loperamide elimination was not consistent with the reported pharmacokinetic profile, and was likely due to prolonged toxicokinetics.

Conclusion: Loperamide abuse may be associated with a withdrawal syndrome in the setting of drug discontinuation. Use of buprenorphine in patients actively intoxicated with loperamide may cause rapid reversal of mu-receptor agonism and induce acute precipitated withdrawal.

Keywords: Loperamide, Abuse, Withdrawal

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51. Variation in Poison Center Recommendations for Lab Studies in Acetaminophen Overdose

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Background: Emergency Department (ED) evaluation of suspected acetaminophen (APAP) overdose patients has been shown to vary with regard to blood tests ordered, including timing of serum APAP concentrations ([APAP]). The aim of this study was to assess the variability of poison center (PC) recommendations for lab testing in such patients.
Methods: A survey link was emailed to medical and managing directors of all 55 US PCs. Survey questions were designed around two hypothetical scenarios: A) an alert adolescent with suicidal APAP ingestion one hour prior to presentation, and B) an unresponsive adult found with multiple pill bottles (including APAP) and unknown ingestion time. For each scenario directors were asked when they would recommend [APAP], which additional lab studies they would recommend, and how various factors would influence their recommendations for a prothrombin time (PT) / international normalized ratio (INR).
Results: The 44 respondents included 20 managing directors, 21 medical directors, and 3 who did not specify their role.
Scenario A: 42/44 (95.5%) would recommend a 4 hour [APAP], but 5 would also recommend [APAP] upon ED arrival and 4 would recommend serial [APAP]s. Reasons for serial [APAP]s included ruling out nomogram line-crossing, ensuring that [APAP] declined, and estimating APAP half-life as a prognostic indicator. 20/43 (46.5%) would recommend a metabolic panel that included hepatic aminotransferases (ATs). Factors influencing recommendations for coagulation testing (PT/INR) were [APAP] for 17/44 (38.6%) respondents, ATs for 38/44 (86.4%), though the AT threshold varied, and treatment with N-acetylcysteine (NAC) for 13/44 (29.5%). In addition, 8/44 (18.2%) would recommend a baseline PT/INR.
Scenario B: 39/43 (90.7%) PC directors would recommend an [APAP] on ED arrival and 18/43 (41.9%) would recommend some form of serial [APAP]s. 35/42 (83.3%) would recommend a chemistry panel that included ATs. In this scenario, 31/43 (72.1%) would recommend a PT/INR on arrival. Other factors influencing recommendations to obtain PT/INR were ATs for 31/43 (72.1%), [APAP] for 15/43 (34.8%), and treatment with NAC for 9/43 (20.9%).
Conclusions: Despite agreement over the importance of obtaining a 4 hour [APAP] in early-presenting patients, and baseline [APAP] in late presenters, our results suggest considerable variability in poison center recommendations for subsequent [APAP] determinations and the use of coagulation testing. Further study could potentially lead to enhanced consistency of PC recommendations and promote more cost effective use of lab tests in APAP overdose.
Keywords: Acetaminophen (paracetamol), Laboratory, Poison center
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52. Variation in Lab Ordering Practices of Emergency Department Providers in Acetaminophen Overdose

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Background: Despite decades of experience with acetaminophen (APAP) overdose, there appears to be much variation with regard to specific blood tests ordered by emergency department providers (EDPs) and timing of APAP concentrations ([APAP]). A survey was undertaken to assess lab ordering practices among EDPs in order to guide poison center (PC) professional educational efforts.
Methods: An electronic survey link was emailed to 104 EDPs and faxed to 170 emergency departments (EDs) throughout the service area of one PC. Survey questions were designed around two hypothetical scenarios: A) an alert adolescent with suicidal APAP ingestion one hour before presentation, and B) an unresponsive adult found with multiple pill bottles (including APAP) and unknown ingestion time. For each scenario EDPs were asked when they would obtain [APAP], which additional lab tests they would obtain, and how various factors would influence their ordering of coagulation studies. The survey also included questions on the use of standardized order sets for suspected overdose (OD) patients.
Results: Responses were obtained from 30 EDPs, including physicians (76%) and mid-level providers (24%). Respondents were not asked if they obtained the survey link by email or from the faxed letter, so an exact response rate could not be determined. 12/28 (42.9%) respondents reported that their ED had standardized order sets for suspected OD patients; 7/12 (58.3%) included international normalized ratio (INR) and 11/12 (91.7%) included [APAP]. Of OD order sets that included [APAP], 90.9% did not specify timing of the sample.
Scenario A: 19/30 (63.3%) respondents would obtain an [APAP] at 4 hours post-ingestion. 17 (56.7%) would do so upon ED arrival, 10 of whom would also obtain a 4 hour [APAP]. 90% would order a metabolic panel that included hepatic aminotransferases (ATs). The decision to order an INR would be guided by ATs for 53.3% and [APAP] for 40%. In addition, 30% would order an INR upon ED arrival.
Scenario B: 24/28 (85.7%) respondents would obtain an [APAP] upon arrival and 10/28 (35.7%) would obtain serial [APAP]s. 96.4% would obtain ATs. The decision to order an INR would be guided by ATs for 33.3% and [APAP] for 37%. In addition, 70.4% would order an INR upon ED arrival.
Conclusions: Most ED providers would obtain [APAP] at 4 hours in a patient with known early ingestion time, but some would also do so on arrival. In addition, there is variability in the ordering of coagulation studies. There appears to be a need for further education aimed at promoting cost effective timing and use of lab studies in APAP overdose. Standardized overdose order sets may contribute to inappropriate or unnecessary testing.
Keywords: Acetaminophen (paracetamol), Laboratory, Emergency Department
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53. Compartment Syndrome of the Hand Due to N-acetylcysteine Extravasation Requiring Emergent Fasciotomy

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Background: Extravasation of intravenous (IV) xenobiotics during therapy can compromise the treat-ment of overdoses and increase morbidity.
Case Report: This is a chart review of a 26-year-old male with schizophrenia who presented to the emergency department (ED) more than 12 hours after a self-harm attempt by ingestion of

unknown amounts of haloperidol, benztropine, aripiprazole, paroxetine and diphenhydramine. He was asymptomatic and his vital signs and physical exam were normal. He was found to have an acetaminophen level of 16 mcg/mL and his aspartate aminotransferase measured 41 U/L (normal: 0–37 U/L). He was started on N-acetylcysteine (NAC) due to an unclear history of exposure and delayed presentation. During phase three of the NAC infusion the patient complained of pain and swelling to his right hand around the IV site. Exam showed tense swelling from the hand to mid forearm, pain with passive movement, paresthesias and subjective sensory deficits. His pulses were diminished but palpable. A hand surgery consultation measured a compartment pressure of 45 mmHg with a delta pressure of 17 mmHg. The patient underwent emergent fasciotomy to treat compartment syndrome. Intraoperatively the surgical team noted a "rotten egg" odor emanating from the hand as soon as the compartments were released, and antibiotics were immediately initiated out of concern for infection. Postoperatively, the patient's severe pain, paresthesias, and sensory deficits abated. The swelling and range of motion improved over the next 2 days.

Discussion: Any liquid of sufficient volume that accumulates into a confined anatomic space may cause compartment syndrome. Extravasation of an antidote is one such cause. Many IV xenobiotics act indirectly as vesicants or irritants that cause local tissue destruction and edema if extravasated, while others act directly as space-occupying lesions that augment venous outflow. It is difficult to determine which occurred in this case.

Conclusion: Monitoring IV sites during antidotal infusions is important to avoid significant extravasation injuries. Normal odor characteristics of NAC should be communicated to surgical teams when a compartment syndrome occurs due to extravasation of this xenobiotic. Oral NAC is a safe alternative to IV NAC in cases where IV access is difficult.

Keywords: N-acetylcysteine, Adverse drug event, Overdose

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54. Recurrent Inhalational Methanol Toxicity during Pregnancy

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Background: Methanol toxicity after inhalational solvent abuse ("huffing") has recently been noted in our local patient population. Exposure via this route is has not been well described in the literature. Little information is available regarding optimal treatment protocols or resultant maternal & fetal outcomes when methanol toxicity occurs during pregnancy.

Case Report: A 31 year old woman, gravida 4 para 3, presented to hospital four times during her third trimester with complaints of abdominal pain, dyspnea, and/or intoxication. She endorsed frequent inhalational abuse of lacquer thinner. Metabolic acidosis with elevated anion gap was documented each time; initial methanol levels were 8.5–11.9mmol/L (27.2–38.1mg/dL). At her fourth presentation, she was in active labour with a methanol level of 8.5mmol/L. Less than 12 hours later, she delivered a term infant at 37 weeks 5 days gestational age, weighing 3338g. Apgar scores were 8 (1 min) and 9 (5 min). No neonatal resuscitation was required. Initial laboratory parameters and treatments administered during each presentation are outlined below:

Gestational age	pH	HCO_3	Anion gap	Methanol (mmol/L)	Treatment
34^0	7.27	9	27	9.5	Fomepizole + dialysis
34^4	7.43	19	18	10	Fomepizole × 1
35^3	7.33	11	20	11.9	Fomepizole × 8
37^5	7.35	13	16	8.5	Fomepizole × 1

Case Discussion: Serum ethanol during all presentations was undetectable. At 34 weeks GA, a single dose of IV fomepizole, followed by a single session of hemodialysis (HD), resulted in undetectable methanol levels and resolution of acidosis. At 34^4 and 37^5 GA, a single dose of fomepizole 15mg/kg IV was administered. In both instances, the patient was asymptomatic but left hospital against medical advice with methanol levels of 5–5.6mmol/L (16–17.9mg/dL). Her longest admission began at 35^3 GA. She was treated with fomepizole only, 15mg/kg loading dose followed by 10mg/kg q12h for 7 doses. Her methanol level was undetectable upon discharge. Fomepizole carries a pregnancy risk rating of C; degree of excretion in breastmilk is uncertain.

Conclusions: Unintentional methanol toxicity can occur as a result of inhalational solvent abuse. Fomepizole followed by hemodialysis, or fomepizole alone, can be used successfully to treat moderate methanol toxicity in pregnancy. No immediately evident maternal or fetal adverse outcomes were noted following either regimen. Further research is needed to describe the incidence & presentation of methanol toxicity following solvent abuse, as well as neonatal outcomes when exposure to methanol and its antidotes occurs antenatally.

Keywords: Methanol, Huffing, Pregnancy

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55. Severe local pain after Hump nosed viper bite alleviation with new Methods: Audit in Base Hospital Elpitiya Sri Lanka.

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Hump-nosed viper bite is common in Sri Lanka mainly causing sever local effects including pain. The objective of the study was to audit the local pain, methods used in pain relief and the outcome after hum-nosed pit viper bite at the Base Hospital, Elpitiya, Sri Lanka. The audit included patients from January to December 2014 who had diagnosis of hump-nosed pit viper bite.

There were 181 patients comprising 108(60%) males and 73 (40%) females. All had local pain developed within few seconds after the bite and 12 patients were free of pain on admission. Ninety six patients (53%) were categorized as severe pain, 71 (40%) and 14 (7%) were categorized as moderate pain and mild/no pain respectively. Irrespective of the severity of the pain, all the patients were prescribed acetaminophen as a drug of choice for pain relief. Five patients with severe pain in the bitten finger had been given a ring block with lignocain. Ring block was given on consensus agreement of management team. Local anesthetic agent was lignocaine and those who received it had immediate pain relief which did not recur. Local anaesthetic "Emla" had been applied on

the bite site of 12 patients. These patients had pain relief in 5–20 minutes, but three patients had complained mild pain after five hours. Patients who had severe and moderate pain and given only paracetamol have complained no response (92%) and 15 patients complained pain even at discharge.

We found lack of standard pain management after hump-nosed pit viper bite other than giving paracetamol. On the other hand giving a ring block has shown promising results as a method of pain relief to hump-nosed pit viper bites. But there are reservations to use this method. Therefore, using "Emla" as a topical anaesthetic agent seems to be a good option. We recommend controlled trials to study the benefit of these novel findings.

Keywords: Hump-nosed, Ring-block, Emla

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56. Fulminant Hepatic Failure in a Morbidly Obese Woman with safe 4-Hour Acetaminophen Concentration

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Background: At the time, the Rumack-Matthew Nomogram was derived (1974), obesity rates were low. Little is known about how to apply the nomogram in obese patients.

Case Report: A generally healthy, morbidly obese 31 year old woman (202 kg; body mass index 62.1) presented following an acute ingestion of acetaminophen, aspirin, cephalexin, cetirizine, ibuprofen, prednisone, and a vitamin supplement ("Acti-Vite"; ingredients unknown). Time of ingestion was 40 (+/– 10) minutes prior to hospital arrival. Four hours after ingestion, her serum acetaminophen concentration was 109.2 mcg/mL. Liver tests were normal (AST 28 units/L; ALT 48 units/L; INR 1.2) and serum ethanol was 93 mg/dL. Based on the Rumack nomogram, n-acetylcysteine (NAC) was not administered. She was admitted to the hospital and did not develop toxic effects from the coingestants. The following morning, studies showed acute liver injury (AST 2067 units/L; ALT 897 units/L). Intravenous NAC was initiated. Workup for other causes of liver injury was negative though she later endorsed drinking 3 alcoholic beverages daily. She developed fulminant hepatic failure with severe hepatocellular injury (AST 22760 units/L; ALT 8249 units/L), encephalopathy (grade 2), acidosis (lactate 6.5 mmol/L), coagulopathy (INR 6.9), renal insufficiency (creatinine 2.2 mg/dL), hypoglycemia (glucose 45 mg/dL), and jaundice (bilirubin 6.1 mg/dL). The patient recovered without transplantation, and NAC was discontinued on day 6.

Case Discussion: This patient developed fulminant hepatic failure despite a serum acetaminophen concentration well below the US treatment line. Obesity is associated with increased cytochrome p450 (CYP) 2E1 activity and toxic acetaminophen metabolite formation in mice. Obesity also prolongs time to peak acetaminophen concentrations in man. Although the volume of distribution of acetaminophen (on a per-kg basis) is less in obese than non-obese people, the calculated total body burden is more. The relative contribution of these and other mechanisms to this patient's unexpected vulnerability to acetaminophen poisoning is unknown. CYP 2E1 induction from ethanol may also have contributed. Adulteration of the supplement is a potential alternate cause.

Conclusion: In this single-case report, a morbidly obese woman developed fulminant hepatic failure despite an acetaminophen concentration not expected to cause toxicity. A conservative approach to risk estimation may be needed in this population.

Keywords: acetaminophen, obesity, CYP 2E1

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57. Cardiac Arrest, Persistent Ischemic Encephalopathy, and Death Following Intravenous Ferumoxytol Administration

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Background: Ferumoxytol (Feraheme™) was recently approved by the US FDA in 2009 as an IV iron replacement therapy for adults with chronic kidney disease and iron deficiency anemia. The infusion is tolerated with rare serious adverse effects that are related to hypersensitivity reactions.

Case Report: This is a single patient chart review. A 71 year-old male with a history of diabetes, hypertension, stroke, iron deficiency anemia, and chronic kidney disease was asymptomatic at the time of his ferumoxytol 510 mg infusion at the nephrology clinic. After 30 minutes of the infusion, he became unresponsive and was found to be in cardiac arrest. His initial rhythm was Pulseless Electrical Activity. Return of spontaneous circulation was achieved following CPR, and his vital signs included blood pressure 100/60 mmHg, heart rate 65 beats/min, respiratory rate 8 breaths/min, and oxygen saturation of 85%. On exam, he did not have any airway edema, skin rash or wheezing. He was then intubated and started on vasopressor infusions for hypotension. His vitals post-intubation and resuscitation were blood pressure 136/58 mmHg (on vasopressors), heart rate 73 beats/min, respiratory rate 18 breaths/min, temperature 37.4°C, and oxygen saturation 100%. Physical exam revealed no signs of angioedema, urticaria, or wheezing. Labs were remarkable for creatinine 3 mg/dL, BUN 45 mg/dL, potassium 4.6 mEq/L, lactate 5.1 mmol/L, INR 1.2, and troponin 4.26 ng/mL.The EKG showed normal sinus rhythm. Head CT and MRI imaging demonstrated severe hypoxic brain injuries which included multiple ischemic infarcts and areas of necrosis. Despite aggressive medical management, there was no improvement in his clinical condition and the patient died on hospital day 8.

Discussion: Ferumoxytol is marketed as an iron replacement product with less risk of hypersensitivity reactions compared to other iron replacement therapies. Hypersensitivity reactions are typically responsible for serious adverse effects which include anaphylaxis, and cardiac arrest.Our case report demonstrates that a fatal hypersensitivity reaction occurred without the classic anaphylactic signs of wheezing, urticaria, and angioedema.

Conclusion: Providers should be aware that ferumoxytol infusions pose a risk of hypersensitivity reactions that may occur precipitously.

Keywords: Adverse drug event, Adverse drug event, Adverse drug event

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58. Effects on Denial Management Procedures in a Private Medical Toxicology Practice

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Background: Over the past several years, we have presented several key performance metrics on the topic of clinical reimbursement from a Medical Toxicology consulting service. We now present data regarding initial third party claim denials for clinical care charges.

Methods: Clinical financial data over a 12-month period from March 1, 2014 to February 28, 2015 of a private, sole-practioner, full-time Medical Toxicology Consultation Practice were analyzed. The encounters were billed by Current Procedural Terminology (CPT) codes and included acute care encounters (inpatient/Emergency Department) along with outpatient clinic encounters. Initial claim denial data was tracked throughout the appeals process with a focus on denial categories. Initial denial is defined as the first denial posted on a charge that does not include "out/informational only" or "duplicate claim."

Results: Over the entire 12-month period, a total of $489,222 was billed, of which $439,787(89.9%) was categorized as clean claim and $49,435 (10.1%) was the initial denial amount. Following the appeal process, a total of $21,915 (4.5%) was the final denial amount and subsequently written off. Thus, about 60% ($27,520) of the initial denial charges or about 5.6% of total practice charges was retrieved. The top 3 common reasons for initial denial were coding (involving an invalid CPT of ICD-9 or any combination), eligibility (patient not covered under policy billed or service is covered by a liability carrier, such as Workman's Compensation) and benefit policy issues (patient's insurance does not cover the service). These 3 categories account for 59 (80%) of the 69 total of all denials in the period from December 2014 to February 2015. This is similar to the period of April 2012 to March 2013, whereupon these 3 categories accounted for approximately 79% of the total denied charges. The most common coding denials, over the period of September 2014 to February 2015, are as follows:

Discussion: In our experience, an aggressive denial management approach, by a dedicated biller, can increase charges by approximately 6%. Prolonged inpatient service with no direct contact (CPT code 99358) accounts for a majority of charges of coding-based denials.

Conclusion: Aggressive denial management procedures can eventually retrieve most of the charges sequestered in the initial denial determination.

Keywords: Reimbursement, Coding-Procedures, Denial

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Procedure	Qty	Charges	% of Coding Denial
99358-Prolonged Inpt Serv, No Contact, 1st Hr	14	$4,760	52.5%
99291-Critical Carem E/M 30–74 Minutes	3	$1,741	19.2%
93042-Rhythm ECG, Report	48	$1,440	15.9%
99173-Visual Screening Test, Bilat	10	$820	9.0%
99215- Office/Outpt	1	$308	3.4%
Grand Total Coding Denials	76	$9,069	100.0%

59. Force required to burst single-use laundry detergent sacs (SUDS)

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Background: Previously published data showed that serious outcomes and higher rates of admission occurred more frequently in people exposed to All® Mighty Pacs® ("All®") or Purex® UltraPacks® ("Purex®") brands of single-use laundry detergent sacs (SUDS) when compared to exposures to Tide® Pods™ ("Tide®") (Huntington; Clin Toxicol; 2014; 52: 220–225). The reason for why certain brands were associated with worse outcomes has not been determined. We hypothesize that brands associated with worse outcomes require less force to burst open the SUDS ("burst force").

Method: Fifteen different types of SUDS, from 6 brand names, were studied. Burst force was measured with an ExTech Digital Force Gauge Model 475044-SD in "Peak Hold" mode using a 6.5 mm wide chisel tip. Individual SUDS were placed horizontally at the bottom of a plastic funnel. The force gauge tip was then placed at the center of the packet and pressed down until the SUDS burst. Peak force (i.e. the burst force) was recorded. Each type of SUDS was tested in triplicate. The funnel and force gauge tip were cleaned and dried between each test.

Results: The burst force for each SUDS ranged from 16.2 to 35.4 Newtons (average 26.1 N). The burst force for the two Purex® types were 16.2 and 19.1 N, the three All® types were 19.8, 20.4, and 22.1 N, and the five Tide® types ranged from 29.6 to 32.1 N. The burst force for the three Gain® flings!™ ("Gain®") types were 32.5, 34, and 35.4 N, the one Persil® type was 18.9 and 20.6 N (this individual SUDS has two distinct compartments to it) and one Up&Up® type was 25.3 N.

Statistical analysis was performed with one-way ANOVA followed by post-hoc Tukey HSD pairwise comparison. The burst force for both the All® and Purex® SUDS were significantly lower than that of the Tide® SUDS ($p < 0.0004$). The burst force for all three types of the Gain® SUDS showed no statistical difference from the burst force for all of the Tide® SUDS. However, the Gain® SUDS burst force was significantly higher than the burst force of all of the All® and Purex® SUDS ($p < 0.0004$).

The burst force of the Up&Up® SUDS was statistically higher than that of the Purex® SUDS ($P < 0.0004$) but statistically less than that of the Tide® and Gain® SUDS ($P < 0.0004$). The burst force of the Persil® SUDS was not statistically different than that of the All®, Purex®, and Up&Up® SUDS.

Conclusions: This data supports the theory that those brands of SUDS associated with worse outcomes and greater hospital admission rates (All® and Purex®) rates require less force to burst the SUDS when compared to that required to burst the Tide® SUDS. The lesser bursting force may be one of the factors contributing to the differences in outcomes between brands of SUDS.

Keywords: Laundry detergent packet, Detergent burst force, Public health

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60. Subacute intrathecal methotrexate toxicity treated with dextromethorphan

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Background: Subacute neurotoxicity is well-described after intrathecal and high dose intravenous methotrexate (MTX) chemotherapy. Symptoms can strongly resemble a stroke, and include headache, sensory deficits, altered mental status, aphasia, dysphagia, focal neurologic weakness, hemiparesis and seizure. Diffusion-weighted magnetic resonance imaging (MRI) typically shows restricted diffusion in cerebral white matter. MTX induced elevations in homocysteine are theorized to be partially responsible for neurotoxicity via N-methyl-D-aspartate (NMDA) receptor agonism resulting in neuronal apoptosis. Several reports exist of patients with subacute intrathecal MTX neurotoxicity who have been treated with dextromethorphan with rapid resolution of symptoms.
Case Report: We present here a 19-year-old female with T-cell acute lymphoblastic leukemia (ALL) who presented 6 days after intrathecal methotrexate treatment with altered mental status, headache, aphasia, right-sided weakness, and non-purposeful movements of the left leg and arm. The patient's chemotherapy regimen included intrathecal MTX, intravenous cytarabine (4 days prior), and mercaptopurine (2 tabs by mouth daily)– last dose on day of presentation). Diffusion weighted MRI images obtained in the emergency department were consistent with MTX toxicity; findings included restricted diffusion in the bilateral frontal lobe periventricular white matter, the centrum ovale bilaterally, and within the left parietal periventricular white matter. The patient was not treated with glucarpidase due to lack of overdose and time since methotrexate dosing. Leucovorin was administered immediately after her last dose of methotrexate. The patient was given a 1 mg/kg oral dose of dextromethorphan and experienced symptom resolution within 12 hours.
Case Discussion: The history, time course, symptoms, and imaging results in this case support a diagnosis of subacute MTX neurotoxicity. No MTX levels were obtained. There is a physiologic basis for the effectiveness of dextromethorphan for MTX neurotoxicity, and this patient experienced a resolution of symptoms with a similar temporal association as reported in previous cases. Two months after discharge the patient has had no further neurologic symptoms.
Conclusions: MTX is a mainstay of the treatment of ALL; however, severe neurotoxicity can occur even in the absence of overdose. Dextromethorphan should be considered in patients presenting with MTX neurotoxicity. Agonism of NMDA receptors by dextromethorphan may prevent homocysteine induced neuronal apoptosis.
Keywords: Antineoplastic, Neurotoxicity, Dextromethorphan
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61. Comparison of detergent viscosity in single-use laundry detergent sacs (SUDS)

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Background: Previously published data showed that serious outcomes and higher rates of admission occurred more frequently in people exposed to All® Mighty Pacs® ("All®") or Purex® UltraPacks® ("Purex®") brands of single-use laundry detergent sacs (SUDS) when compared to exposures to Tide® Pods™ ("Tide®") (Huntington; Clin Toxicol; 2014; 52: 220–225). The reason for why certain brands were associated with worse outcomes has not been determined. We hypothesize that brands associated with worse outcomes have a lower viscosity detergent in their SUDS.
Method: Fifteen different types of SUDS, from 6 brand names, were studied. SUDS were cut open and approximately 450 mL of each detergent was collected in a 600 mL beaker. Viscosity of each sample was then tested in triplicate using a Brookfield Digital Viscometer Model DV-E with an LV spindle #62 and guard leg. Viscometer RPM was adjusted to keep torque between 10–100%. The spindle and guard leg were cleaned and dried between each test.
Results: The detergent viscosity of the 15 SUDS ranged from 164.7 to 1308.3 cP (average 736 cP). The detergent viscosity of the three All® types were 164.7, 223.7 and 237.3 cP; the two Purex® types were 231.7 and 250 cP; and the five Tide® types ranged from 1044 to 1218 cP. The detergent viscosity of the three Gain® flings!™ ("Gain®") types were 1225, 1266.7 and 1308.3 cP, the one Persil® type was 324 cP and one Up&Up® type was 170.7 cP.

Statistical analysis was performed with one-way ANOVA followed by post-hoc Tukey HSD pairwise comparison. The detergent viscosities of both the All® and Purex® SUDS were significantly lower than that of the Tide® SUDS ($p < 0.0005$). The detergent viscosity of the three types of the Gain® SUDS was significantly higher than 4 out of 5 Tide® SUDS ($p < 0.0005$), and was significantly higher than all of the All® and Purex® SUDS ($p < 0.0005$).

The detergent viscosity of the Up&Up® SUDS was statistically no different than that of the All® and Purex® SUDS. The detergent viscosity of the Persil® SUDS was statistically higher than that of the All® Mighty Pacs® Stainlifter® SUDS ($P < 0.0005$), but not statistically different than that of the other two All® SUDS or the two Purex® SUDS.
Conclusions: This data supports the theory that those brands of SUDS associated with worse outcomes and greater hospital admission rates (All® and Purex®) have lower viscosity detergents than that of the Tide® SUDS. The lower detergent viscosity may be one of the factors contributing to the differences in outcomes between brands of SUDS.
Keywords: Laundry Detergent Packet, Detergent Viscosity, Public health
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62. True or False? Analysis of phencyclidine positive urine drug immunoassays with liquid chromatography-time-of-flight mass spectrometry

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Background: Urine drug immunoassays (UDS) are frequently ordered despite literature demonstrating their poor specificity and lack of clinical utility. The phencyclidine (PCP) screen, in particular, is described to have poor specificity. We sought to analyze PCP positive UDS samples from an academic medical center with liquid chromatography-quadrupole time-of-flight mass spectrometry (LC-QTOF/MS) to determine characteristics of confirmed and unconfirmed specimens.
Methods: At a tertiary care academic medical urine samples with a PCP positive UDS result were identified from January 2014 to January 2015 and then sent for LC-QTOF/MS analysis using a library of 550 drugs. This includes 285 novel psychoactive substances (NPS) of which 10 are PCP analogues. Results were grouped as PCP confirmed, known interfering substance confirmed, or unknown interfering substance. Our institution's PCP UDS reporting limit is 25 ng/mL while the LC-QTOF/MS limit of quantification for PCP is 5 ng/mL. For this study known interfering substances were dextromethorphan (DXM), diphenhydramine (DPH), doxylamine, tramadol, venlafaxine, meperidine, ketamine, lamotrigine, and thioridazine. Clinical data (age, sex, location of patient when UDS ordered, and disposition) was gathered by retrospective chart review. Groups were compared for statistical difference using Fisher exact probability test.
Results: 53 samples were collected and tested. Mean age was 37 years (range 22–72) and 39 (74%) were male. Thirty-seven (68%) of the screens were ordered in the emergency department. Twenty-four (45%) were confirmed true PCP positives. Of the false positives, only 6 (21%) were from known interfering substance with 3 being attributed to dextromethorphan alone, 2 to tramadol alone and 1 to DXM and DPH combination. In the DXM/DPH combination case, the novel psychoactive substances (NPS) mcPP and pentylone were also detected. They were the only NPS detected in this study. No PCP analogues were detected. In the remaining false positive cases (n = 24) no known interfering agent was identified. In this group cotniine was detected in 20 cases, caffeine/theophylline/theobromine in 15 cases, buspirone in 2 cases and citalopram in 1 case. There was no statistical significant difference in any clinical data between the 3 groups.
Conclusions: In this study, only 45% of collected positive PCP USD were confirmed to be true positives. In 80% of false positives cases, no known interfering substance could be identified. Further testing is warranted to identify the cause of these false positives. This study further highlights the poor specificity of the PCP UDS.
Keywords: Laboratory, Phencyclidine, Dextromethorphan
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63. Use of Workarounds is Associated with Increased Rate of Errors with Heparin Infusions in the Emergency Department

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Background: While the use of computerized physician order entry (CPOE) has resulted in a decrease of certain types of medication errors, the complexities of the different available programs have led to new categories of errors. One source of such errors is the use of workarounds, or shortcuts that bypass steps in the ordering process usually done for efficiency or convenience. We report our experience with the use of workarounds with a heparin infusion order set and the resulting impact on medication errors.
Methods: We reviewed all charts of patients receiving an intravenous unfractionated heparin infusion in the emergency department over a eighteen month period from August of 2013, when a standardized heparin infusion orderset was initiated, to February 2015. PTT reorders and dose adjustment are designed to occur automatically with the orderset. The patient weight is set to be entered with the nursing assessment. Data was abstracted for age, gender, weight, coagulation studies, and heparin infusion and bolus dose. Both high (80 units/kg bolus followed by 18 units/kg/hour) and low (60 units/kg bolus and 12 units/kg/hour) intensity drips were included. Specific attention was paid to following the programmed recommendations for maximum dosing for bolus and infusions.
Results: There were a total of 247 patients who had an intravenous heparin infusion started in the emergency department. The median age of the patients was 71 years (range, 21–103); the mean BMI was 32.37; 57% received the low intensity protocol and 43% the high intensity protocol. The most common diagnoses associated with receiving the heparin infusion was Non-ST Elevation MI, followed by DVT/PE. 47/247 (19%) had an error in their infusion. 37 of the 47 (79%) did not have routine PT/PTT and infusion adjustment done; 21/47 (45%) received too high a dose of either the bolus or infusion. In 7 patients, a supratherapeutic PTT was recorded; in 29 of the group who did not have a routine PT/PTT ordered, the interval between initiation of the infusion and repeat PTT was 12.7 hours. In 45/47 cases, the error was tracked back to the physician manually entering the patient weight, which then deactivated all the remaining preprogrammed orders for labs and dose adjustments in the CPOE system.
Discussion: In our study, we found a substantial percentage of patients receiving an unfractionated heparin bolus and infusion had one or more errors occurring in the ordering of the infusion. In the vast majority of these cases, it was a workaround by the physician that was the proximate cause of the problem. Targeted education of the emergency department medical staff may reduce this type of error.
Keywords: Anticoagulant, Medical toxicology, Public health
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64. Gender Differences in Outcomes for Patients Presenting to the Emergency Department with Alcohol Withdrawal

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Background: Gender is typically a significant variable in most disease states. Preliminary animal models suggest that this gender difference occurs in alcohol withdrawal (AW) where female animals are more susceptible to withdrawal excitability and neurotoxicity. However, this is a poorly described phenomena in clinical practice.
Objective: We hypothesized that gender is an independent variable in the outcome of patients diagnosed with AW presenting to the emergency department.

Methods: We conducted retrospective chart review of patients admitted to a tertiary care suburban-based hospital (90,000 annual visits) with a primary diagnosis of AW. This study occurred during the implementation of an alcohol withdrawal protocol (9/1/09 through 11/30/11). Charts were reviewed for demographic data and specific outcomes (leaving prior to complete treatment, length of stay, admission to the intensive care unit (ICU), death, and readmission during the 30 days after initial discharge). Logistic regression and chi-square were used to analyze the data.
Results: Charts from 523 consecutive patients (359 males) admitted for AW during the study period were reviewed. A total of 84 patients were admitted to the ICU (68 out of 359 males). Males were significantly more likely to be admitted to the ICU for AW than females (16 out of 164 females; $p<.008$). There was no significant difference in other end points.
Conclusion: In this single site study, males were significantly more likely to be admitted to the ICU for AW. This is in contrast to preliminary animal models suggesting more severe AW in females. Future studies should attempt to clarify the differences in the presentation and treatment of AW between men and women.
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65. Hydromorphone associated myoclonus following acute exposure

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Background: Opioids have been associated with acute neuroexcitatory effects including myoclonus. Typically these effects are seen at higher doses such as in the palliative care setting. This case reports acute onset of myoclonic encephalopathy following short term exposure to intravenous (IV) hydromorphone.
Case Report: A 68 year-old female with a history of seizure and pulmonary embolus, presented for a proximal humeral fracture requiring operative repair. Following anesthesia the patient returned to baseline mental status (MS), however, on post-operative day one, the patient developed acute MS changes with diffuse spontaneous myoclonus. The patient was minimally responsive upon examination with no limb rigidity, but with mild hyperreflexia. Her myoclonus and encephalopathy resolved after administration of naloxone 0.1 mg IV. She developed recurrence of myoclonus and altered MS, requiring further boluses of IV naloxone which improved the myoclonus with each administration. Head CT did not reveal any acute intracranial abnormality; continuous EEG was negative for epileptiform activity. Laboratory evaluation revealed a normal AST, ALT, creatinine, blood urea nitrogen, and was otherwise unremarkable. Pre and post operatively the patient received 6 doses of hydromorphone 0.5 mg IV. Post-operatively she received 3 doses of tramadol 50 mg, and oxycodone 10 mg every 3 hours as needed. Myoclonus resolved approximately 24 hours after discontinuation of hydromorphone. Tramadol was discontinued, and her oxycodone was decreased in dose and in frequency of administration. The patient continued to show improvement in both acute encephalopathy and myoclonus, and was discharged on oxycodone.
Case Discussion: With the absence of metabolic or other apparent etiologies, the patient's myoclonus may be attributed to the hydromorphone metabolite hydromorphone-3-glucuronide. Animal studies implicate that hydromorphone-3-glucuronide may precipitate myoclonus; however in human case reports most neuroexcitatory symptoms are noticed with chronic high dose use. It is debated whether naloxone reverses opioid induced neuroexcitatory effects. A prior case reports myoclonus after one injection of low dose hydromorphone, which was reversed by naloxone. This case demonstrates temporal association between naloxone administration and myoclonus cessation. While the patient was also on oxycodone, she was on this medication prior to hospitalization and continued on it after resolution of symptoms.
Conclusion: Opioid metabolites are known to cause neuroexcitatory effects such as myoclonus. This case demonstrates improvement of myoclonus after the administration of naloxone and cessation of hydromorphone.
Keywords: Opioid, Adverse drug event, Naloxone
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66. North Pacific Rattlesnake (Crotalus oreganus) envenomation leads to ocular destruction and systemic toxicity

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Background: Crotalus oreganus, or the Northern Pacific rattlesnake (NPRS), is found in the northwestern US. Bites usually cause local tissue destruction and, on occasion, systemic effects. Bites to the eye uncommon, and to the best of our knowledge, this is the first case report of an ocular envenomation by a North American pit viper.
Case Report: A 23-year-old man with no past medical history presented approximately 10 hours after sustaining a bite to the right eye from his pet NPRS. On arrival, he was somnolent. His vitals were: BP, 140/88 mmHg; HR, 99/min; RR, 16/min; and oxygen saturation 100% on 2L NC.

Physical exam revealed bilateral periorbital swelling and ecchymosis, greater on the right. Edema extended to the right periauricular region, submandibular region, and neck. The right globe appeared proptotic with chemosis and diffuse subconjunctival hemorrhage. Intraocular pressure was 18 mmHg and a positive Seidel test was noted.
Initial laboratory testing revealed the following pertinent results lactate 3.1 mg/dL, potassium 5.6 mEq/L, platelets, 13x103/mm3, PT 12.2 sec, INR 1.1. On repeat testing, his potassium was 8 mEq/L, likely due to hemolysis.

He was intubated for airway protection and treated for hyperkalemia. Four vials of Crotalidae Polyvalent Immune Fab antivenin were given about 1 hour after arrival to ED, 11 hours after his reported time of envenomation. He was transferred to the regional snakebite center for further management, where he received 18 additional vials of antivenin following current manufacturer recommendations. Repeat laboratory testing revealed improvement of his platelet count to 140x103/mm3 and potassium to 5.3 mEq/L. Ophthalmology serially evaluated his right eye, but ultimately deemed it unsalvageable. He was extubated on hospital day 4 and discharged the next day.

Table 1. depicts his platelet count trend.

Day Post Envenomation	Platelet Count (per mm^3)
0	13,000
1	140,000
2	142,000
3	92,000
7	51,000
13	160,000

Outpatient follow-up revealed recurrent thrombocytopenia with a platelet count of 51x103/mm3 day 7-post envenomation. His platelet count normalized by day 13.

Case Discussion: NPRS, have fangs that release a complex venom capable of causing significant local tissue damage and interfering with platelets and the coagulation cascade. Systemic effects, including thrombocytopenia and coagulopathy, are usually of greatest concern. This case is unique in that it demonstrates visual loss associated with NPRS envenomation. This patient also had significant thrombocytopenia, an indicator of systemic toxicity.

Conclusion: Envenomation by NPRS to the eye can cause irreversible ocular destruction as well as systemic toxicity.

Keywords: Snake bite, Envenomation, Venom

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67. Severe Toxicity after Synthetic Cannabinoid Exposure in an Infant

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Background: Synthetic cannabinoids have become popular drugs of abuse with the first reports in the U.S. of adverse effects occurring in 2009. Although numerous significant adverse effects such as hypertension, tachycardia, agitation, hallucinations and acute psychosis have been reported in young adults, very little is known about the clinical effects on younger pediatric patients. We report a case of severe toxicity including bradycardia, apneic spells, and obtundation in an infant.

Case Report: A 10-month-old infant was brought to the ED with altered mental status after ingesting "potpourri" several hours prior to arrival. Patient was unresponsive, moaning, and rigid on arrival. Initial vital signs were blood pressure 108/71 mmHg, pulse 71 beats/min, respirations 22 breaths/min, pulse oximetry 100% on room air, and rectal temperature 90.4°F. Bedside glucose on arrival was 162 mg/dL. A chest radiograph and noncontrast computed tomography of the brain were negative. Serum chemistry was significant only for blood urea nitrogen of 32 mg/dL. Serum lactic acid was 3.6 mmol/L. Serum ethanol concentration and urine drug screen were within normal limits. The patient was endotracheally intubated in the ED for prolonged apnea spells with associated oxygen desaturation. He had one further episode of hypothermia the night of admission requiring active external warming but otherwise had no further complications. He was extubated on hospital day two and discharged home in his usual state of health three days after admission. Analysis of the substance ingested revealed the presence of the synthetic cannabinoid MAB-CHMINACA. Serum analysis confirmed the presence of MAB-CHMINACA and a known metabolite of this synthetic cannabinoid.

Discussion: With a wide spectrum of clinical presentations and no readily available confirmatory tests, synthetic cannabinoid intoxication often becomes a clinical diagnosis based on a high level of suspicion. Systemic toxicity in young patients can potentially be severe and even life threatening if not recognized.

Conclusion: Ingestion of synthetic cannabinoids by infants can cause significant adverse effects. We present the youngest reported case of synthetic cannabinoid exposure and suggest that bradycardia, prolonged apnea, and severely depressed level of consciousness are some of the significant effects that may be seen in infants and young children who are exposed to these substances.

Keywords: Cannabinoid, synthetic, Bradycardia, Apnea

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68. Medication Errors Associated with Cardiovascular Drugs

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Objective: To investigate medication errors associated with cardiovascular drugs in the United States.

Methods: A retrospective analysis of Unintentional therapeutic errors associated with cardiovascular drugs from 2000 to 2012 was conducted using the National Poison Data System. Inclusion criteria were 1) unintentional therapeutic errors and 2) human exposure to a cardiovascular drug, using a search based on AAPCC generic codes. Clonidine was excluded as a large portion of these exposures were due to clonidine use in ADHD in children. Nitroprusside and vasopressors were excluded because their principal use occurs in the in-hospital setting.

Results: From 2000 to 2012, there were 278,444 medication errors associated with cardiovascular drugs reported to Poison Control Centers (PCCs) in the United States. The frequency and rate of cardiovascular medication errors showed a significant linear increase from 2000 to 2012 ($p < 0.01$). The majority (62.5%) of errors occurred among females. The gap between the female error rate and male error rate widened over the study period by 47.5%. The highest rate of medication errors was seen among older adults, with a peak of approximately 30 errors occurring per 100,000 US residents 80 years of age. The cardiovascular drugs most commonly implicated in medical errors were beta blockers (28.2%), calcium channel antagonists (17.7%), angiotensin converting enzyme (ACE) inhibitors (15.9%), antihyperlipidemics (11.0%), and angiotensin receptor blockers (ARBs) (9.4%). Based on the hazard index, the cardiovascular drugs most often associated with death and major effects were cardiac glycosides (HI = 24.00), calcium antagonists (HI = 6.25), and antiarrhythmics (HI = 5.36). Conversely, ARBs (HI = 0.31), ACE inhibitors (HI = 0.32), and antihyperlipidemics (HI = 0.33) were least associated with death and major effects Most medication errors occurred as a result of patients inadvertently taking a medication twice (50.6%), inadvertently taking someone else's medication (11.6%), or taking a wrong medication (10.6%).

Conclusions: In the US, one medication error associated with cardiovascular drugs occurs every 25 minutes. Currently, more than 28,000 of these errors occur annually and they have important consequences for patients and the health care system.
Keywords: National Poison Data System, Poison center, Cardiac toxicity
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69. Prolonged Sodium Nitroprusside Infusion Resulting in Fatal Cyanide Poisoning During National Sodium Thiosulfate Shortage

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Background: Sodium nitroprusside (SNP) is a vasodilator used primarily to treat hypertensive emergencies and improve cardiac output in heart failure. Toxicity results from conversion of SNP to cyanide (CN) and can occur when SNP is infused at doses >2 mcg/kg/min for prolonged periods. The diagnosis of superimposed cyanide toxicity in critically ill patients is challenging: the patient may deteriorate without the usual laboratory markers of acute cyanide overdose. Concomitant administration of sodium thiosulfate (STS) prevents accumulation of CN and is considered standard of care for patients receiving prolonged SNP infusion. Currently there is only one FDA-approved distributor of STS and the drug has been on national shortage since 2011.
Case Report: A 23-year-old woman with recent diagnosis of severe dilated cardiomyopathy was admitted to the intensive care unit and started on an infusion of SNP, with documented maximum rate of 3.0 mcg/kg/min. Despite initial improvement she deteriorated on hospital day 4. Respiratory failure prompted intubation, which was complicated by a PEA arrest. Return of spontaneous circulation was achieved after 15 minutes of ACLS. After confirming that she had not received STS during her hospital course, healthcare providers (HCPs) suspected CN toxicity secondary to prolonged SNP infusion. She was empirically treated with 300 mg sodium nitrite (SN) and 12.5 g of STS (Nithiodote®), then re-dosed (per package guidelines) with 150 mg SN and 6.25 g STS. CN levels were sent pre and post-treatment, returning at 6.289 mg/L and 0.128 mg/L respectively. Never recovering from her PEA arrest, she required increasing vasopressor support for cardiogenic shock and hemodialysis for acute kidney failure. Unfortunately, ARDS progressed. Her family ultimately withdrew care, and she expired on hospital day 5. Prior to the national shortage, STS was routinely administered with all NPS infusions at this institution per standardized order set.
Case Discussion: CN toxicity from SNP infusion is well-documented in the literature, but it appears that significant morbidity related to SNP infusion is rare due to the routine administration of STS. The ongoing shortage of STS may result in further cases of SNP toxicity. HCPs are unlikely to be familiar with SNP's mechanism of toxicity and likely rely on standardized order sets that may be altered without sufficient warning by hospital pharmacies during drug shortages.
Conclusions: HCPs should be cognizant of drug shortages and their negative effects on previously standardized treatment modalities. Additionally, in the setting of prolonged SNP infusion, HCP's must maintain vigilance for CN toxicity.
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70. Centuroides sculpturatus envenomation in three adult patients requiring treatment with antivenom

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Background: Poison centers receive more than 10,000 calls each year regarding scorpion stings. The most commonly suspected species, Centuroides sculpturatus, or the bark scorpion, is the only scorpion native to the United States with clinically significant toxicity. Severe symptoms of envenomation are well described in children and antivenom is commonly used in this population. Despite reports of adult scorpion envenomation being 2.5 times that of children in 2014, (8062 compared to 2901, respectively), case reports describing adult envenomings could not be found. Here are 3 cases of adult scorpion envenomation demonstrating severe symptoms requiring antivenom therapy.
Case Series: Case 1: A 22 year old woman presented with complaints of muscle aches and generalized numbness following scorpion sting. Initial exam showed slurred speech, involuntary muscle movement, paresthesias, and hypersalivation. She was tachycardic, tachypnic, had diffuse wheezing, and myoclonus of the bilateral lower extremities. 3 vials of antivenom were given and symptoms resolved within 2 hours.
Case 2: A 33 year old man presented with slurred speech, blurry vision, facial twitching, numbness in all extremities, and difficulty with fine motor movements following scorpion sting. On exam, he had opsoclonus, rhinorrhea, hypersalivation, tachycardia, hypertension, and fasciculations of his tongue, feet and thenar muscles. Nebulized ipratropium, atropine, glycopyrolate, and lorazepam were given and hypersalivation resolved. 3 vials of antivenom were given after nuerologic symptoms persisted, which improved 30 minutes after antivenom. He was discharged home from the ED.
Case 3: A 52 year old woman described an "electric and jabbing" pain, blurry vision, hyposmia, decreased hearing, dysphagia, muscle twitching, decreased fine motor movement, a salty taste associated with food and fluids, and a granular sensation in her throat, nose, and eyes following scorpion sting. She had opsoclonus and fasciculations on exam. She was treated with 3 vials of antivenom. Symptoms improved in 30 minutes and were resolved at time of discharge 5 hours later.
Discussion: All three patients presented with severe signs and symptoms of envenomation including symptoms unable to be described by envenomated children. Symptoms began to resolve within 60 minutes of antivenom administration in all patients, and no long-term sequelae were seen.
Conclusion: Adults with bark scorpion envenomation may present with complaints not classically described in children. Use of

antivenom is effective in the adult population, and may avoid the need for hospitalization or prolonged suffering.
Keywords: Antivenom, Scorpion, Envenomation
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71. A Fatal Case of Poison Ivy: Unsuspected Pheochromocytoma Multisystem Crisis Triggered by Glucocorticoids

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Background: Pheochromocytoma is a rare neuroendocrine tumor that produces symptoms through the excess release of catecholamines. However, the classic symptoms occur together in less than 50% of patients. In these patients, the diagnosis is often missed, and the patient can develop severe pheochromocytoma crisis (PMC) during incidental surgery, pregnancy or administration of medications. This report presents the case of a young woman with an unsuspected pheochromoctyoma who rapidly developed PMC after a course of steroid therapy for poison ivy.
Case Report: An otherwise healthy 28 year old female presented to the emergency department (ED)complaining of vomiting, nausea, palpitations and right lower abdominal pain that awoke her from sleep. Two days prior she had been prescribed prednisone and cortisone cream for a poison ivy that had developed on her left lower leg earlier that week. The patient rapidly became hypotensive with episodes of hypoxia in the ED. Patient was started on norepinephrine and transferred to intensive care (ICU) on mechanical ventilation. On arrival in the ICU, the patient developed ventricular tachycardia and was placed on veno-arterial extracorporeal membrane oxygenation (ECMO). Patient was also required continuous venovenous hemodiafiltration, multiple vasopressors, and broad spectrum antibiotics. Her clinical condition continued to worsen as she developed progressive four limb ischemia. On day 3, the patient's neurologic function remained poor and her EEG showed diffuse cerebral dysfunction. A care conference was held, care was withdrawn and the patient expired. On autopsy, a right adrenal pheochromocytoma was found. In addition, multisystem organ failure was revealed showing extensive myocardial necrosis, pericardial effusion, diffuse alveolar damage, hepatomegaly, and diffuse cerebral edema with bilateral uncal and tonsillar herniation.
Discussion: Steroids help induce the production of catecholamines by stimulating the enzymes involved in their production. PMC should be considered in any patient with unexplained shock or left ventricular failure, multi-organ failure, hypertensive crisis or unexplained lactic acidosis. Initial investigations should include urine and plasma catecholamines and metanephrines. The recommended management of PMC includes the use of alpha-blockade, which isstrongly associated with survival of a crisis.
Conclusion: PMC is a rare occurrence, but if unrecognized can be deadly. This case highlights that crisis can be triggered by medications and that PMC can cause a wide variety of derangements that often mimics other disease processes.
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72. A first report of acute life-threatening laryngeal dystonia precipitated by intramuscular olanzapine

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Background: Olanzapine, a second generation antipsychotic with fewer reported extrapyramidal side effects than haloperidol, is commonly used to sedate agitated patients. Dystonia is a well-described side effect of antipsychotic medications, but is rarely implicated as an acute life threat. Laryngeal dystonia is not previously reported following olanzapine use.
Case Report: A 32-year old male with depression was brought to an emergency department (ED) after he was found in a local pharmacy with agonal breathing, small pupils, and peripheral oxygen saturation (SpO2) of 73%. Medics easily ventilated the patient with a bag valve mask after placing an oral airway. Fingerstick glucose was 169 mg/dL. He received 1 mg of intravenous (IV) naloxone with prompt improvement. His heart rate was 130 bpm, SpO2 98% and respiratory rate 28 breaths/min. He admitted to ingesting 12 tablets of hydrocodone/acetaminophen. In the ED somnolence recurred, improving with 0.2 mg of IV naloxone. Breath ethanol was 0.06 g/dL.

Suspicion arose for intentional self-harm. He became angry and aggressive when held pending psychiatric evaluation, tearing out a peripheral IV and requiring 4 point restraint. 10 mg of intramuscular (IM) olanzapine were given; 7 minutes later he was hypoxic and unresponsive with a left-deviated gaze and absent chest rise. SpO2 dropped to the mid-70% range. Emergent BVM ventilation revealed high-pitched upper airway stridor with minimal air movement. Jaw-thrust, oral airway, anaphylaxis treatments and lidocaine applied to the vocal cords yielded no improvement. Progressive bradycardia ensued. He was emergently intubated utilizing 20 mg of etomidate and 200 mg succinylcholine. Within 30 seconds of succinylcholine, the patient abruptly bagged without difficulty; SpO2 normalized. He was admitted to the ICU and extubated the next day. He was discharged on hospital day #2 following psychiatric assessment.
Discussion: Dystonia is a common complication of neuroleptic administration, but laryngeal dystonia is not previously described following administration of olanzapine. Decisively executed emergent airway maneuvers including jaw thrust, aggressive BVM ventilation, and neuromuscular paralysis with intubation were required to save the patient. This management pathway is uncommonly considered when olanzapine is used to control agitation.
Conclusion: We report a case of olanzapine-mediated laryngeal dystonia, a rare but potentially fatal complication of agitation control in an ED patient. Provider education may serve to eschew preventable morbidity and mortality; further pharmacosurveillance is warranted to quantify the incidence of this complication.
Keywords: Antipsychotic, Adverse drug event, Sedation
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73. Exploratory analysis of data from acute acetaminophen overdoses

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Background: The Rumack-Matthew nomogram is the most commonly used tool for assessment of acute acetaminophen (APAP) overdoses. It relies on a single timed plasma acetaminophen concentration (PAC) obtained at least 4 hours post ingestion, when absorption is assumed to be complete. However, authors have recently reported delayed absorption of APAP well beyond 4 hours. The purpose of the study is to evaluate sequential PACs in acute APAP overdoses reported to a single poison center. The objectives were to perform an exploratory analysis of the toxicokinetic parameters of APAP in the overdose setting using non compartmental analysis.
Methods: Retrospective analysis of all acute APAP overdoses reported to a single poison center between June 15 2010 and April 1 2014 (45.5 months, 3.8 years) who were treated in a health care facility was conducted. Inclusion criteria: acute ingestion of APAP, presentation within 5 hours of ingestion, at least 2 PACs, first PAC $<$ 5 hours and second PAC $<$ 9 hours post ingestion. Exclusion: unknown time of ingestion, second PAC $<$ 30 mg/L (upper limit of therapeutic). Three groups were compared: APAP-only, APAP+ Antihistamine, and APAP+ Opioid. The mean observed time to maximum concentration (Tmax) in hours was estimated in each group using Phoenix WinNonlin 6.4 software. Ninety nine percent confidence intervals were estimated. Wilcoxon rank sum test was used.
Results: 306 acute ingestions of APAP with at least 2 PACs in the designated time frames were analyzed. Median age was 23 years (range 1–93 years). The majority (94%) were suspected suicides. Of the 306 cases, 148 were in the APAP-only, 111 in the APAP+ Antihistamines and 47 in the APAP+ Opioid group. The mean observed Tmax in all three groups are presented in table 1. The difference between APAP+ Antihistamine and APAP-only was statistically significant ($p = 0.016$). However, the difference between APAP+ Opioid and APAP-only was not ($p = 0.063$).
Conclusion: In this retrospective analysis of 306 acute acetaminophen overdoses, mean observed Tmax was significantly shorter in the APAP+ Antihistamine group compared to the APAP-only group. There was no statistical difference between APAP+ Opioid and APAP-only groups. Future study will focus further analysis to explain these findings and building a predictive model adjusting for covariates.
Keywords: Acetaminophen (paracetamol), Toxicokinetics, Opioid
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Table 1.

Group	N	Mean observed Tmax (hours) (99% CI)
APAP-only	148	3.51 (3.11, 3.91)
APAP+ Antihistamine	111	2.99 (2.58, 3.40)
APAP+ Opioid	47	4.15 (3.36, 4.94)

74. Antidepressants and the Risk of Seizures: A population-based, nested case control study

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Background: Antidepressants are the most commonly prescribed drug class in the United States, consumed by 11% of American adults. They are associated with a wide range of adverse events. Most antidepressants can precipitate seizures in susceptible patients at therapeutic doses, but whether the risk differs among antidepressants is unknown.
Methods: We conducted a population-based nested case-control study between April 2002 and March 2013. Cases were Ontario residents $\geq$ 65 years hospitalized for a first seizure within 60 days of filling a prescription for one of nine commonly prescribed antidepressants (citalopram, venlafaxine, paroxetine, sertraline, escitalopram, fluoxetine, duloxetine, fluvoxamine or bupropion). Each case was matched with up to 4 seizure-free controls on sex, age, date and a seizure-specific disease risk index. We used bupropion (a known pro-convulsant) as the reference exposure for all analyses.
Results: During the 11-year study period, we identified 2,987 patients hospitalized with a first seizure within 60 days of an antidepressant prescription, along with 10,111 matched controls. Relative to bupropion, monotherapy with escitalopram (odds ratio (OR) 1.93; 95% confidence interval [CI] 1.48 to 2.53) and citalopram (OR, 1.89; 95%CI 1.48 to 2.40) were associated with the highest risk of seizures. Fluvoxamine, paroxetine and sertraline were also associated with an increased risk of seizure compared with bupropion, while fluoxetine, venlafaxine and duloxetine were not.
Conclusions: The risk of seizures varies significantly among popular antidepressants. The risk is highest with citalopram and escitalopram, drugs taken by millions of patients daily, and is higher than for bupropion, an antidepressant which has been temporarily pulled off the market for this adverse effect. Clinicians should be mindful of this risk when selecting an antidepressant for patients at increased risk of seizures.
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75. Cocaine And Alcohol Result In Worse Outcomes In Trauma Patients Than Amphetamines And Alcohol

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Background: Ethanol (EtOH) is known to contribute to traumatic injury and death. The stimulant drugs (STIM) cocaine (COC) and methamphetamine (METH) are abused in conjunction with EtOH, but the effects of these combinations have not been well defined in trauma patients. The objective of this study was to describe the effects of METH and COC in combination with EtOH in trauma patients.

Methods: A retrospective review of all trauma patients at a Level 1 Trauma Center from 2008–2012 was performed. Data collected included patient demographics, injury related information including mechanism, initial vital signs, blood alcohol concentration (BAC), urine drug of abuse screen (DOA) results, length of stay (LOS), insurance status and outcomes. Urine DOA screening was by competitive enzyme immunoassay and the presence of AMP was considered a surrogate for METH positive in our patient population. Patients were considered EtOH positive with a BAC > 0.00. Statistical analysis was performed using Mann Whitney U and Chi-square tests. Significance was attributed to a p value < 0.05.
Results: During the study period, 12,394 trauma patients were identified. Patients without a DOA or BAC screen (n = 6154, 49.7%) were excluded, leaving 6240 in the analysis. STIM were present alone or in combination with other drugs in 1021 patients (16.4%). AMP alone was present in 190 patients (3.0%) and COC alone in 74 (1.2%). No differences existed between the AMP only and COC only groups, with the exception of race and EtOH ($p < 0.001$; COC with more African-American and more EtOH). 2008 patients (32.2%) had EtOH, and of these patients, 412 (6.7%) had STIM in combination with other drugs and 140 (2.3%) were positive for STIM only. When combined with alcohol, COC+ EtOH patients were more severely injured than AMP+ EtOH with higher ISS (17 vs 12, $p = 0.04$) and lower probability of survival (Ps; 0.84 vs 0.91, $p = 0.04$). The addition of EtOH to AMP did not affect initial vitals or LOS, but COC+ EtOH patients had lower GCS (12 vs 14, $p = 0.02$) and longer ICU and hospital LOS (ICU: 3 vs 2, $p = 0.03$; hospital: 9 vs 6, $p = 0.04$) than COC only patients. There were no statistically significant differences in mortality between the groups; however, COC+ EtOH resulted in 6 deaths (12.5%) while no COC only patients died ($p = 0.06$).
Conclusion: STIM and EtOH positive trauma patients showed drug-specific differences in outcomes, with the combination of COC and EtOH resulting in worse injuries and longer ICU and hospital stays than AMP and EtOH.
Keywords: Amphetamine, Cocaine, Alcohol
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76. Pseudo-hyperchloremia with sodium bromide use still a problem

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Background: Pseudo-hyperchloremia following bromide salt ingestion was once a common laboratory abnormality. It was caused by interference by bromide with the analyzer's chloride selective electrode. However, it is generally believed that modern laboratory analyzers have corrected for this interference. We report a child receiving sodium bromide (NaBr) for intractable seizures who had significant pseudo-hyperchloremia using a modern analyzer.
Case Report: An 8-month-old boy with a history of hypotonia, severe developmental delay, and intractable seizures presented with two weeks of intermittent fever and poor oral intake. For his seizure disorder, the patient was prescribed NaBr 185 mg orally twice daily (total daily dose = 71.2 mg/kg). His initial laboratory studies performed on the Siemens Dimension Vista 1500 were: sodium, 144 mEq/L; potassium, 4.8 mEq/L; chloride, 179 mEq/L; bicarbonate, 21 mEq/L; BUN, 6 mg/dL; creatinine, 0.1 mg/dL; and glucose, 63 mg/dL, with an anion gap of negative 56. A serum bromide concentration was sent to a third-party laboratory for quantitative analysis, however the sample was hemolyzed and could not be resulted. The patient was admitted for observation and treated with intravenous sodium chloride. In consultation with the patient's neurologist, he was discharged home with the same dose of NaBr as no other medications provided adequate seizure control.
Case Discussion: This case illustrates that a modern chloride assay still has significant interference in the presence of bromide. The patient was maintained on NaBr for seizure control due to failure of multiple less toxic anticonvulsants. The patient's neurologist confirmed his current dosage. Although the incidence of bromism has declined due to myriad alternative therapies, bromide salts are still used clinically in patients with refractory epilepsy.

While most chloride assays have now minimized the interference with bromide salts, this finding of marked hyperchloremia highlights the need for health-care providers to recall this potential laboratory interference and causes of a negative anion gap.
Conclusions: Laboratory interference resulting in falsely elevated chloride using modern assays may still occur in the setting of bromide salt use. Health care providers should be aware of this rare but potentially clinically significant phenomenon.
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77. The Grocery Baking Aisle and Non-beverage Alcohol Abuse

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Background: In 2012, US Poison Centers reported 4,096 calls for "non-beverage" alcohol consumption. Reported methods include eating alcohol-infused food like gelatin and watermelon, inhalation, intravenous injection, and mucosal absorption through tampons, enemas, and "eyeballing." This report illustrates another source of non-beverage alcohol consumption (available to minors) and the clinical Results.
Case Report:A 14 year-old male was brought to the emergency department by his father and friends for altered mental status. He required a wheelchair as he was unable to walk on his own. His medical history was remarkable for Attention Deficit/Hyperactivity Disorder, depression and tonsillectomy. He had no history of suicidal ideation or inpatient psychiatric treatment. His friends denied any recent conversation involving suicide or self-harm. The patient had normal vital signs, but his exam was remarkable for the presence of vomitus and absence of gag reflex on oropharyngeal exam and a Glasgow Coma score of 6 on neurologic exam. Given failure to protect his airway, the patient was intubated. Laboratory evaluation revealed a negative screen for drugs of abuse and a normal acetaminophen level, but his serum ethanol level was 233 mg/dL. His arterial blood gas also showed a non-gap metabolic acidosis with appropriate respiratory compensation. He was admitted to the local pediatric ICU where he was extubated later that day and had psychiatric consultation.
Case Discussion: The patient's friends admitted that they went to the grocery store and purchased cooking extract in an attempt to get

drunk. They chose lemon extract after comparing different extract product labels and finding that lemon had the highest alcohol content. The patient drank 24 ounces prior to becoming unresponsive.

In order to investigate the alcohol content in cooking extracts, we visited multiple grocery stores and performed a google search to discovered 17 companies that listed the alcohol content in 91 different extract products. Lemon extract, the choice of extract for our patient, has a similar alcohol content as bourbon and absinthe.

Conclusions: Cooking extracts are a potential source of non-beverage alcohol consumption that is available to minors. The alcohol content in most extracts is similar to traditional alcoholic beverages. Adolescents, who are unable to legally buy alcoholic beverages, can legally buy and consume cooking extracts. Other than one FDA regulation stipulating that vanilla extract must contain at least 35% alcohol, there is limited regulation on the amount of alcohol that cooking extracts contain and there is little regulation for how the alcohol content is displayed on the product packaging.

Keywords: Alcohol, Adolescent, Overdose

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78. 1,4 Butanediol Withdrawal and Pharmacologic Management: A Case Series

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Background: 1,4-butanediol(BD) is a GABA-B agonist that is bioconverted to gamma-hydroxybutyrate(GHB). Its availability is ubiquitous in industry as it is used as a solvent. Scant literature exists on management of BD withdrawal.

Case Series: Over an eleven month period, six patients presented to a single medical center with varying degrees of GHB withdrawal symptoms including tachycardia, tremors, agitation, delirium and visual hallucinations. All patients endorsed obtaining BD at the same store selling alternative health products. Patients reported durations of chronic BD use ranging from eight months to eight years, with regular dosing every two to four hours. Two of the patients required ICU admission, three were eligible for inpatient telemetry monitoring and one was discharged from the emergency department(ED). The ICU patients were placed on a standard severe ethanol withdrawal protocol with diazepam and the novel addition of baclofen ranging from 10 to 40 mg every 8 hours via NG tube. Additionally, dexmedetomidine (up to 0.012 mcg/kg/min) was used for sedation due to its clonidine like effects for improving withdrawal physiology. Patients who went to the floor were placed on scheduled baclofen ranging (10 to 20 mg every 8 hours) plus prn diazepam and clonidine. Hemodynamic instability was controlled and no patients suffered seizures. Most were discharged with baclofen tapers with initial doses of 10–20 mg every 8 hours. Two of the patients had multiple return visits due to withdrawal and stated they restarted BD when their baclofen ran out. A sample of the abused product was confirmed via gas chromatography to demonstrate the presence of large amounts of BD with no GHB detected.

Case Discussion: BD and other GHB analogues are available through many venues. GABA-B withdrawal is difficult to control and no protocolized therapy exists. As a GABA-B receptor agonist, baclofen is an ideal treatment modality for withdrawal from GHB and its analogues To ensure adherence to BD abstinence, a prolonged baclofen taper with close PMD follow-up is advisable.

Conclusion: Long term BD abuse can present with life threatening withdrawal. Consider baclofen early and in combination with protocolized withdrawal treatment strategies. For critically ill patients, sedation with the alpha-2 agonist dexmedetomidine may help augment withdrawal therapy by improving autonomic instability.

Keywords: Withdrawal, Drug of abuse, gamma-hydroxybutyrate(GHB)

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79. Status epilepticus and transient cardiomyopathy associated with synthetic cannabinoid UR-144

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Background: Synthetic cannabinoids have higher affinity to cannabinoid receptors CB1 and CB2 than natural cannabinoids. They are perceived to give a more intense high and escape detection by traditional urine drug screens. Their use has been associated with a number of complications including seizures, myocardial infarction, ischemic stroke and acute renal failure. UR-144 is a synthetic cannabinoid that has selective agonist activity for peripheral cannabinoid CB2 receptors with lower affinity to CB1 receptors. We report a case of UR-144 use associated with significant neurological and cardiac toxicity.

Case: A 19-year-old female presented to the emergency department in status epilepticus after smoking "Space." Her vital signs were: heart rate 138 beats per minute, blood pressure 90/60 mm Hg, respiratory rate 28 per minute, temperature 37.1°C, and glucose was 10.1 mmol/l. Three hours of recurring seizure activity was finally controlled after intravenous infusions of midazolam, propofol, phenytoin and levetiracetam. On hospital day 3, the patient developed severe biventricular failure; echocardiography showed an ejection fraction (EF) of 16% with sparing of the ventricular bases. Coronary angiography and myocardial biopsy were unremarkable. A cardiac MRI confirmed the diagnosis of stress-induced cardiomyopathy. Serum troponin peaked at 268 ng/L [normal 1–14 ng/L]. The patient improved a week post admission with a left ventricular EF of 40% and was discharged on hospital day 10. The comprehensive urine drug screen via GC-MS was positive for UR-144 and negative for all other drugs of abuse.

Discussion: To our knowledge this is the first case describing transient severe biventricular failure in association with exposure to synthetic cannabinoids. Marijuana exposure has previously been associated with cardiovascular complications, including coronary artery vasospasm and reversible cardiomyopathy. The mechanism of transient stress-induced cardiomyopathy following UR-144 use is unclear, though catecholamine surge and coronary vasospasm

are possible underlying mechanisms. Cannabinoid receptors have been shown to mediate neuronal excitability via γ-aminobutyric acid (GABA) and glutamate neurotransmission. While seizures have been described following synthetic cannabinoid use, the status epilepticus experienced by this patient appears to be unique in the literature, and may have contributed to her cardiomyopathy.
Conclusion: UR-144 use may be associated with prolonged status epilepticus and stress-induced cardiomyopathy. Physicians should be aware of these potentially lethal complications from this synthetic cannabinoid.
Keywords: Cannabinoid, synthetic, Cardiac toxicity, Seizure
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80. Assessment of the Pediatric Expertise of the Medical Toxicologist

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Background: Pediatrician toxicologists were central to the establishment of the discipline of Medical Toxicology. Since the recognition of Medical Toxicology as a medical subspecialty in 1993, nineteen pediatrician toxicologists have been certified with only four in the last 6 years. Recent changes to the medical toxicology fellowship accreditation decreased the requirement for exposure to pediatric patients (from 25% to 10%) over the course of a two year fellowship.
Methods: REDCap survey was administered to practicing medical toxicologists who are members of American Academy of Pediatrics and/or American College of Medical Toxicologists on the inclusion of pediatric clinical care, research and education in their practice. Survey submissions were anonymous.
Results: Out of 208 total respondents, 29 (14%) had primary board certification in pediatrics while 149 (72%) were board certified in Emergency Medicine. Regarding training, 135 (65%) stated they had exposure to a practicing pediatric toxicologist. Bedside consultation for acute poisoned or potentially poisoned pediatric patients was provided by 175 (84%), and 194 (93%) provided phone consultation. Eighty (38.5%) toxicologists provided outpatient care to pediatric patients. Less than 50% were involved in poison prevention advocacy efforts whereas over 50% were involved in pediatric research. Of those trained in pediatrics, 76% feel "very comfortable" in managing the critically ill poisoned pediatric patient compared to 40% of those trained in Emergency Medicine. Comments offered suggested comfort was dependent on the collaboration between medical toxicologist and pediatric specialists caring for patients. Others felt that "any toxicologist that cares for children is a practicing (pediatric) toxicologist."
Limitations: The survey did not provide adequate definitions which may have resulted in inaccurate responses.
Conclusions: Despite 84% of respondents stating some comfort in caring for critically ill poisoned pediatric patients, only 44% feel very comfortable. The lack of training in pediatrics and decrease in board certified pediatrician toxicologists may result in loss of important pediatric expertise and have detrimental effects on pediatric advocacy efforts.
Keywords: Pediatric, Medical toxicology, Expertise
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81. Prolonged recurrent coagulopathy after North American crotalus envenomation

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Background: Rattlesnake envenomation can cause local tissue destruction and hematologic abnormalities. Late coagulopathies have been reported several weeks after envenomation. We present a case of recurrent coagulopathy that persisted for 80 days. Abbreviations: Platelets (plt 1000/mm3) Fibrinogen (fib mg/dL) Prothrombin Time (PT sec) InternationalNormalized Ratio (INR) Partial Thromboplastin Time (PTT sec) Antivenom (AV)
Case: A 53 year old woman presented to the emergency department (ED) after a rattlesnake bite to the ankle. She had swelling to the mid-calf and complained of pain and numbness to her foot. Initial lab values were plt 17, PT 11.3, INR 1, and fib 139. Six vials of AV were given and she was admitted to the intensive care unit. Swelling progressed and labs worsened, so she was given two subsequent 6 vial doses of AV. She was also given 10 units of cryoprecipitate in the ED. After initial control was obtained, 3 maintenance doses of AV were given. She was discharged home on day 3 with labs of plt 86, INR 0.95, and fib 232. Later that day she contacted the poison center to reported oozing from the bite site. On follow up 6 days post bite labs showed plt of 49. She was given 4 vials of AV and readmitted. Repeat lab values were plt 75 PT, INR, PTT unmeasurable, and undetectable fib. She required 2 more 4 vial doses of AV. She was discharged on day eight with labs of plt 100, PT 11.3, INR 1, PTT 28.7, and fib 127. On day 10 she reported increased pain and edema to her primary physician. Duplex ultrasound was negative for clot. Labs at that time were plt 130, PT 11.2, INR 1.1, PTT 24.5, and fib 156. Day 16 outpatient labs showed plt 203, PT 55.8, INR 5, and undetectable fib. She was once again readmitted to the hospital and 10 vials AV total. Labs at discharge were plt 183, PT 16, INR 1.3, PTT 30, and fib 74. Outpatient labs were then collected at least once weekly over the next 62 days, and showed decreasing trend in platelet count. The last set of labs collected, on day 80, showed plt 111, PT 10.7, INR 1, PTT 25.9, and fib 246. Hematologist evaluation favored thrombocytopenia secondary to envenomation as the most likely cause of her thrombocytopenia. The patient was then lost to follow-up.
Discussion: This case describes the longest reported coagulopathy after envenomation by a North American rattlesnake. Her initial recovery to normal platelet levels after AV and negative work-up by hematology make a pre-existing coagulopathy unlikely. Further studies to characterize the mechanism of recurrent and prolonged envenomation effects are needed.
Conclusion: While the mechanism of prolonged coagulopathies after a rattlesnake envenomation is unknown, outpatient follow up of rattlesnake patients is necessary to mitigate potential bleeding risk.
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82. Emergency Department Resource Utilization in Poisoned Patients

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Background: A renewed focus on Emergency Department (ED) operational efficiency nationwide has led to great interest in ED resource utilization and ED throughput. The degree to which poisoned patients differ from general ED patients on these measures is unclear, but has significant potential impact with respect to resource allocation, staffing needs, and publically reported measures of ED throughput. This is particularly true for centers which treat large numbers of poisoned patients.
Methods: We performed a retrospective, case-control study of two years of patient visits at a single hospital. We identified poisoned patients (index cases) through a review of chief complaints, ED diagnoses, and admission diagnoses. We identified control patients who were of similar age (within 5 years) and sex and who presented during similar times (day, evening, or night), day of the week, and season of the year (Jan-Mar, Apr-Jun, Jul-Sep, Oct-Dec) as index cases. Control patients were weighted based on the number of control cases identified per given index case. Outcomes of interest were Emergency Department length of stay (LOS); ESI score, which is designed in part to predict resource utilization; and the rate of administration of intravenous medications and fluids per patient (IV M/F), a measure of nursing resource utilization.
Results: There were 54,284 visits in the two-year study period; we identified 169 poisoned patients and 3,972 controls. Mean results (SD) for poisoned patients were LOS, 331 (342) minutes; ESI 2.36 (0.66); and IV M/F 2.31 (2.73) per patient. Mean results (SD) for controls were LOS, 217 (48) minutes; ESI 3.16 (1.34), and IV M/F 1.56 (0.77) per patient. Differences between the means (95% confidence intervals) were as follows: LOS, 114 (61–166) minutes longer in poisoned patients; ESI, 0.75 (0.69–0.81) units more acute in poisoned patients; IV M/F 0.75 (0.32–1.18) greater in poisoned patients.
Conclusions: In a single-site study, poisoned patients were more resource-intensive than matched controls with respect to ED length of stay, ESI score, and the number of intravenous medications and fluids administered. These results suggest that centers which care for a disproportionate number of poisoned patients may require higher resource allocations than would be predicted by patient volume alone.
Keywords: Resource Utilization, Emergency Department, Administration
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83. Clinical and Demographic Factors in Marijuana Toxicity: The ToxIC Registry Experience since 2010

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Background: Legalization of marijuana has increased its availability, and diversified the route of exposures. THC concentrations are also higher than in past decades. Such factors may alter exposure patterns and clinical effects of marijuana.
Methods: Cases involving marijuana as the sole primary agent reported to the ToxIC Registry between January 1, 2010 and March 31, 2015 were reviewed. Data collected included demographics, exposure year and conditions, clinical outcomes, and treatment.
Results: 223 cases listing marijuana as the sole primary agent were identified, and 158 cases from 14 states were included. 109 were males. Most (96) were ages 19 to 65 yrs. There were 45 teenagers (age 13–18 yrs), and 17 children ≤ 12 yrs (8 under 2 yrs, 6 age 2–6 yrs, and 3 age 7–12 yrs). 15/17 (88%) pediatric cases occurred during or after 2013. Annual exposures increased from 9 in 2010 to 42 in 2014. Compared to total annual exposures, this represented a doubling, from 0.2% in 2010 to 0.4% in 2014. 22 (13.9%) were unintentional exposures, the proportion of which increased each year (0% in 2010, 4.0% in 2011, 11.1% in 2012, 12.8% in 2013, 21.4% in 2014, 37.5% in 2015). 20 (90.9%) unintentional exposures were in the pediatric population. 120 (75.9%) reported signs or symptoms of toxicity. Abnormal vital sign events included 8 hypertension (SBP > 200 mm Hg), 3 hypotension (SBP < 80 mm Hg), 17 tachycardia (HR > 140 bpm), 3 bradycardia (HR < 50 bpm), 1 bradypnea (RR < 10 bpm) and 1 hyperthermia (T > 105 F). Neurologic symptoms are detailed in Table 1. Unexpected clinical outcomes included 1 ventricular dysrhythmia, 4 respiratory depression, 3 metabolic acidosis (pH < 7.2), 2 acute kidney injury (Cr > 2.0), and 2 rhabdomyolysis (CPK > 1000). Toxicologic treatment was given in 68 (43.0%) patients.
Conclusions: 158 cases of marijuana as the single agent of toxicity were reported to the ToxIC Registry over 5.25 years. Since 2010, the number of exposures has increased. The rising number of pediatric exposures and proportion of unintentional exposures likely reflects wider availability of marijuana products resulting from legalization. Neurologic findings were common. Unexpected clinical outcomes including seizure, dysrhythmia, respiratory depression, metabolic acidosis, and acute kidney injury occurred. A limitation of this study is absence of confirmatory testing in all cases.

Table 1.

Neurologic Symptoms	Number of Patients
Coma/CNS depression	24
Agitation	20
Delirium/Toxic Psychosis	16
Seizure	8
Hallucination	7
Weakness/paralysis/numbness/parasthesia	4
EPS/dystonia	1

Keywords: Marijuana, Adverse drug event, Substance abuse
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84. APAPxAT as a Hepatotoxicity Predictor in Patients with Acetaminophen Ingestions of Chronic, Subacute, or Unknown Time

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Background: The APAPxAT product has been proposed as a means to predict hepatotoxicity following acetaminophen (APAP) overdose. The initial APAP concentration (mcg/mL) is multiplied by initial aminotransferase (AT) level (units/L), being the higher of aspartate (AST) or alanine (ALT) transferase from the same sample. The APAPxAT product can be calculated without a specific ingestion time, suggesting utility in patients who do not meet criteria for use of the Rumack-Matthew nomogram. However, studies examining this method to date have excluded such patients. The objective of this study was to compare the diagnostic validity of APAPxAT for the primary outcome of APAP-induced hepatotoxicity in patients presenting with APAP overdose among acute, subacute, chronic, and ingestions of unknown time.
Methods: We performed a retrospective chart review of patients hospitalized for APAP ingestion reported to our poison center between 2003 and 2006. Subjects must have been at least 12 years old, had a measured APAP and AST/ALT taken from the same sample, received N-Acetylcysteine, and must have had at least one followup AST/ALT documented. Undetectable APAP levels at presentation were converted to 1 mcg/mL. Patients were excluded if they had pre-existing liver disease or were missing a necessary data point. Ingestion time was categorized as acute, chronic, subacute, or unknown. For each case, an initial APAPxAT was calculated and compared with maximum reported AT level. Hepatotoxicity was defined as AT $>$ 1000 units/L at any time. Receiver operating characteristic (ROC) curves were used to establish sensitivity and specificity of the test.
Results: 205 charts met the search criteria. 11 had a history of hepatitis and 62 were missing AT or APAP levels. Of the remaining 132 patients, 44 were deemed acute, 42 chronic, 21 subacute, and 25 unknown. An initial APAPxAT $>$ 10,000 was found to be 81.0% sensitive and 67.9% specific for hepatotoxicity (AUC 0.849, 95% CI 0.787, 0.912). When acute ingestions were removed from analysis, APAPxAT $>$ 10,000 was 76.9% sensitive and 72.2% specific for hepatotoxicity (AUC 0.866, 95% CI 0.794, 0.938).
Limitations: Our search criteria favor cases suspected of hepatotoxicity on admission because we excluded cases lacking initial AST/ALT measurement. Converting undetectable APAP on presentation to 1 mcg/mL for analysis provides a conservatively low APAPxAT product in these cases, which may enhance specificity of the test at the expense of sensitivity.
Conclusions: These preliminary results indicate that APAPxAT may be a viable risk stratification tool for APAP overdose patients of chronic, subacute, or unknown nature.
Keywords: Acetaminophen (paracetamol), Hepatotoxicity, Laboratory
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Do you or any member of your immediate family have a relevant financial interest or other relationship with the manufacturer(s) of any of the products or providers(s) of any of the services you intend to discuss?

Commercial Interest	What Was Received	For What Role?
Cumberland Pharmaceuticals	Research Grant	Research Grant

85. Systemic inflammatory response syndrome following injection of boiled poppy seed tea to avoid withdrawal

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Background: Opioid-dependent patients may go to great lengths to avoid withdrawal symptoms despite the potential dangers. Extensive Internet discussion threads describe use of injected poppy seeds to avoid symptoms or achieve intoxication. We report the case of a young patient who developed the syndrome of systemic inflammatory response (SIRS) following an attempt to avoid opioid withdrawal by injecting a poppy seed brew.
Case Report: A 22-year-old man presented to the emergency department (ED) with a chief complaint of malaise, body aches, and rigorous chills. He had been assaulted several days previously and at that time prescribed hydrocodone, which he described being stolen in the interceding days. He endorsed a history of substance abuse and methadone maintenance, but denied recent use of either. However, he admitted to boiling 1 pound of poppy seed tea in 1 cup of water and subsequently injecting the supernatant solution. In the ED he was found to be tachycardic, tachypneic and febrile with a rectal temperature of 38.9°C. He was noted to be somnolent but protecting his airway. He was noted to have one large volume emesis consistent with poppy seeds.

Labs revealed marked leukopenia and a negative HIV assay. Urine chromatography revealed methadone and dextromethorphan. Cerebrospinal fluid and urine were unrevealing of infection. No other focal nidus of infection was uncovered. Naloxone administration was not undertaken. He was treated for presumed sepsis and toxic encephalopathy in the setting of a large volume nonsterile intravenous injection, and recovered over the course of 4 days before being discharged home. Two sets of blood cultures remained sterile.
Discussion: Transient inflammatory responses to injected particulate matter ("cotton fever") have previously been reported. The injection of a large volume preparation of poppy seed material, however, is very infrequently reported. In an otherwise healthy young adult, the bolus injection of antigenic material may cause a robust inflammatory response. In this case, the parenteral administration of poppy seeds to abuse the morphine contained therein led to extensive infectious workup in the setting of such an inflammatory response.
Conclusion: Poppy seed tea may reasonably be considered an attractive substance of abuse in patients with few other options to treat or prevent opioid withdrawal. It represents an antigenically active substance with both opioid activity and the capacity to provoke SIRS. Providers should anticipate rapid inflammatory response in patients who report injecting this substance.
Keywords: Opioid, Withdrawal, Abuse
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86. ST elevation myocardial infarction following envenomation by North American Crotalus species

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Background: Cases of myocardial infarction following snake envenomation have been reported in the medical literature, but are rare. To date, only one case has been described secondary to North American Crotalus species envenomation. Here we describe a case of ST elevation myocardial infarction (STEMI) following rattlesnake envenomation.
Case: A 56 year old man presented to the emergency department (ED) via ambulance after a rattlesnake bite. He was bitten on his left thumb and self-identified the snake as a Mohave rattlesnake. En route to the ED he experienced a fleeting sensation of perioral tingling and diarrheal incontinence. After ED arrival he had another episode of diarrhea and became hypotensive, with systolic blood pressures (BP) in the 80s to 90s. An electrocardiogram (EKG) was obtained, which was unremarkable. Minimal local tissue swelling was seen at the bite site. Fluids were administered but he remained hypotensive. His hypotension was felt to be venom related and 6 vials of antivenom (AV) were administered. Intermittent ST depressions were then noted on telemetry, and repeat serial EKGs showed an evolving STEMI. The patient denied chest pain or dyspnea and had normal mentation. Laboratory studies included WBC 8.6, Hgb 14.3, plt unable to be counted secondary to presence of clumps, PTT 19.1, PT 15.1, INR 1.2, fibrinogen 501, and troponin < 0.02. In the cardiac catheterization lab, the left anterior descending artery revealed proximal 60–70% thrombotic stenosis with ulcerated plaque and distal obstructive clot. Also seen was an obstructive clot in the distal second diagonal branch and 70% stenosis of mid-circumflex proximal to the second obtuse marginal branch. He underwent thrombectomy and stenting. Post procedure he received eptifibatide, ticagrelor, and was started on AV maintenance doses. He further developed significant swelling to the level of his upper arm and required several additional AV bolus doses. A total of 22 vials of AV were administered during the hospitalization. Platelets and fibrinogen remained normal throughout treatment course. He was discharged home on day four.
Discussion: It remains unclear how viper envenomation may contribute to the development of a STEMI. Proposed mechanisms include hypotension, involvement of tumor necrosis factor-α, and direct venom myotoxicity. Patients with existing coronary artery disease may be at increased risk. Care is further complicated by the propensity for coagulopathy in these envenomations.
Conclusion: STEMI following envenomation by North American rattlesnake remains a rare but potentially fatal complication and presents challenges in management.
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87. Delayed Post-Hypoxic Leukoencephalopathy following Heroin Abuse with Serial Neuropsychometric Testing

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Background: Delayed post-hypoxic leukoencephalopathy (DPHL) is a rare demyelinating syndrome following a period of insufficient cerebral oxygenation. Typically this is characterized by recovery from an acute event that is then followed by neuropsychologic deterioration days to weeks later. Case reports in the literature infrequently report results of neuropsychometric testing (NPT) in this patient population. We report a case of DPHL with results of serial NPT.
Case Report: This is a single patient chart review. A 50 y/o male was admitted on day zero with heroin overdose and respiratory failure. He received mechanical ventilation and intensive supportive care. Upon discharge on day 7, he was reportedly back to baseline. He returned to work and independent living. On day 20, he presented to the emergency department with altered mental status and agitation that required physical and chemical restraint. His condition was presumed to be secondary to substance abuse and he received benzodiazepines and supportive care. Head CT showed scattered nonspecific white matter gliosis. Toxicology was consulted on day 24 due to persistent encephalopathy. On exam, he would not respond to commands or answer questions but was awake, moved all extremities, made some purposeful movements, and had normal tone. At this time MRI demonstrated diffuse abnormal increased T2 signal in the supratentorial white matter with diffuse restricted diffusion (figure available). His clinical course and MRI findings were consistent with DPHL. The patient had a fairly slow recovery although he did significantly improve. Further neurologic and medical testing did not reveal an alternative diagnosis. Given concerns regarding the patient's cognitive capacity, NPT was performed on day 70. The testing demonstrated moderate to severe bihemispheric disturbance with impairments reflecting a clear decline in his higher cognitive functioning. Repeat NPT was performed on day 92, and the patient showed significant improvement (Table 1). On day 93 he was discharged and returned home.
Case Discussion: We report a case of DPHL following heroin abuse with documented improvement in clinical status and NPT.
Conclusion: The clinical course and serial NPT results are reported for a case of heroin induced DPHL.
Keywords: Heroin, Leukoencephalopathy, neuropsychometric testing
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Table 1.

	Results in Percentile		Degree of Impairment	
Testing Parameters	Day 70	Day 92	Day 70	Day 92
Attention, Concentration, and Orientation	5th	25th	Mild-moderate	None
Language	< 1st	22nd	Moderate-severe	Mild
Visual-spatial	1st	22nd	Moderate-severe	Below average
Problem solving	Failed	Normal	Severe	Normal- mild
Memory	2nd (average)	19th (average)	Severe	Mild
Wechsler Adult Intelligence Scale	5th	37th	Severe	None

88. Three cases of medication error resulting in unintentional human inoculation with equine vaccine

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Background: The cost of preventable medication errors is estimated to be more than $1 billion and may lead to death and disability. Dispensing of the wrong medication is estimated to occur in approximately 0.1% of all medication errors. Here we present three cases where a medication error led to human inoculation with an equine vaccine.
Case Series: An outpatient clinic contacted the poison control center after a 42 year old woman was mistakenly injected in the left arm with 1 vial of Fluvac Innovator 6 equine vaccine, instead of a human flu vaccine, which were being stored together. The manufacturer was contacted and determined the product to be a killed vaccine protective of contemporary equine influenza caused by type A2 viruses, equine rhinopneumonitis due to herpes types 1 and 4, equine encephalomyelitis due to Eastern, Western, and Venezuelan virus, and tetanus. The product contains an unlabeled amount of thimerosal, neomycin, and polymyxin B preservatives, and does not contain mineral oil. A large-animal veterinarian was contacted and presented concerns for anaphylactoid reaction or serum sickness. Through phone follow up, the patient reported fever, chills, erythema and bruising at the site, and swelling in the contralateral arm on the day of the injection. The patient, who is also a health care provider, was given 2 vials of the product and vaccinated two other individuals, an 18 and 14 year old female. These patients initially developed fevers. On day 2 all three patients were improved with only minor pruritus at the site. On day 5 one of the adult patients complained of fever and neck pain, which lasted for three days and was treated with acetaminophen. The other two patients remained asymptomatic. All three patients were confirmed to be asymptomatic 3 weeks after the exposure.
Discussion: The effects of veterinary vaccines on humans are not well studied. A previous retrospective review of 509 human cases has been reported, but the full nature of these cases (i.e. needlestick v. inoculation) is unclear. Collaboration with the manufacturer and a veterinarian proved to be important resources for these cases. While none of these patients developed any serious or chronic effects, veterinary vaccines have the potential to do harm when used in humans. Medication errors resulting in humans being exposed to veterinary vaccines have the potential to cause severe outcomes. These outcomes can be easily avoided by separating human and veterinary medications.
Conclusion: These cases highlight the potential for human harm from exposure to animal vaccines and the usefulness of collaboration with the manufacturer and veterinarians in management of these exposures.
Keywords: Adverse drug event, Veterinary vaccine, Adverse drug event
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89. Incidence of delayed and recurrent coagulopathies following rattlesnake envenomation in patients initially treated with rattlesnake antivenom

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Background: Approximately 4000 people are envenomated by pit vipers in the US each year. Despite adequate antivenom therapy, coagulopathies can occur several weeks after envenomation. This may be best explained by a kinetic mismatch of venom and antivenom, or the presence of a venom depot at the bite site. The mechanism of late coagulopathies is not fully understood. While medically significant bleeding weeks after envenomation is rare, the potential for poor outcomes exists. For the past 2 years, this poison center has followed patients after hospital discharge for a minimum of 2 weeks, with at least 3 sets of labs and multiple calls home or clinic visits to evaluate for coagulopathies and bleeding. The purpose of this study was to characterize the incidence of late coagulopathies following envenomation.
Methods: This retrospective chart review used poison center data. Analysis included all patients with rattlesnake exposure from January 1, 2013 through December 31, 2014 who were treated with antivenom and received full outpatient follow up. Coagulopathy was defined as platelets < 150k, fibrinogen < 150 mg/dL, or INR >1.5. "Late" coagulopathies were defined as occurring after completion of maintenance doses, and were described as "delayed" (no initial coagulopathy) or "recurrent" (initial coagulopathy occurred).
Results: Of 315 rattlesnake exposures identified, 239 were confirmed bites. Dry bites occurred in 46 (19%) of these 239 bites. 193 were treated with antivenom and eligible for data analysis. Of these, 120 (62%) had complete follow up and were included in analysis. 59 patients (49%) had an initial coagulopathy, 61 (51%) did not. Late coagulopathies occurred in 63 patients (53%). Of those with no initial coagulopathy, 19 (31%) developed a delayed coagulopathy. Recurrent coagulopathy occurred in 44 patients (75%) with an initial coagulopathy. Those with initial coagulopathy, compared to those without, were 2.3 times more likely to develop late coagulopathy (95% CI 1.56–3.51). 17 patients (14%) required retreatment. Of these, 2 had delayed and 15 had recurrent coagulopathies. No serious bleeds were reported in any patient, though it is unknown if any potential inciting events occurred. Slightly more antivenom was required for initial control in patients with an initial coagulopathy than those without (11 v. 8 vials, respectively, $p < 0.001$).
Conclusions: Outpatient follow-up is imperative to monitoring for coagulopathies. Need for retreatment post-discharge is infrequent, and no serious bleeds occurred in this population. The risk of clinically significant bleeds after envenomation remains unclear.
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90. Systemic lidocaine toxicity associated with tumescent liposuction

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Background: Liposuction is a procedure for the removal of unwanted fat tissue. Tumescent liposuction (TL) was first performed in 1985 as a method of liposuction requiring only local anesthesia. This technique involves the infiltration of a large volume of dilute lidocaine into the subcutaneous fat until it becomes distended and tense. Lidocaine doses of up to 50 mg/kg are used, well beyond the recommended maximum dose (7 mg/kg) for other procedures. Advocates believe dilution and subcutaneous infiltration alter the pharmacokinetics. Despite several safety studies, there are reports of TL-associated fatalities with post-mortem lidocaine concentrations. We report a case of significant lidocaine toxicity and elevated serum level following standard tumescent liposuction.
Case Report: A previously healthy 37-year-old woman was transferred to the emergency department (ED) from an outpatient surgical center with agitation. The patient had undergone TL with the infiltration of 1 L of 0.1% lidocaine (1 gram total dose; 13mg/kg) into her abdominal fat. Shortly after initiation of the procedure, the patient became acutely agitated and aggressive. Her vital signs upon arrival were; blood pressure, 122/79 mm Hg; heart rate, 57 beats/min; respiratory rate, 18 breaths/min; temperature, 96.8°F; oxygen saturation, 100% on room air. Her electrocardiogram was sinus rhythm with normal intervals. She was agitated, restless, perseverating and described the sensation of "dying and coming back to life." The skin of her abdomen was pale, cool and had some superficial pitting edema. A lidocaine concentration on arrival to the ED was 9.7 mcg/mL (therapeutic, 1–5 mcg/mL). The patient received benzodiazepines, IV fluids and was admitted for telemetry monitoring. She was discharged the following day without sequelae.
Discussion: Concentration-dependent effects of lidocaine toxicity are well reported. Initial symptoms of toxicity (3–6 mcg/mL) may include confusion and disorientation. As concentration increases (6–9 mcg/mL) symptoms will progress to agitation, tremor and seizure. Finally, severe toxicity may result in coma and cardiovascular collapse (greater than 10 mcg/mL). The patient's excitatory symptoms with near-death delusions are classic signs of early toxicity and a harbinger of potential severe toxicity. To our knowledge this is the highest reported non-fatal lidocaine concentration associated with TL.
Conclusions: This case highlights the risk of systemic lidocaine toxicity following tumescent infiltration of very large doses of lidocaine during liposuction procedures. The lidocaine dose accepted by surgeons who perform this procedure may need to be reconsidered.
Keywords: Local anesthetic, Tumescent liposuction, Adverse drug event
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91. A RANKLing Case: Denosumab-Induced Hypocalcemia

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Background: Denosumab is a human monoclonal antibody approved in 2010 for post-menopausal women at risk for osteoporosis and to prevent skeletal-related events (SRE) in patients with solid tumor bony metastasis. We report a case of denosumab-induced hypocalcemia to highlight the toxicity and treatment considerations of this novel agent.
Case Report: A 66-year-old man with prostate cancer, small cell lung cancer, bone metastases, and chemotherapy-associated anemia requiring transfusions presented to oncology with fatigue, weakness, tremor, and intermittent muscle spasm. Sixteen days prior he received cycle 6 of cisplatin 30 mg/m2 and etoposide 100 mg/m2 IV daily x 3; leuprolide 22.5 mg SC; and denosumab 120 mg SC (initial dose). Laboratory analysis included: hemoglobin, 8.0 g/dL; total serum Ca, 5.2 mg/dL (pre-denosumab Ca, 8.9 mg/dL); albumin, 4.0 g/dL; and creatinine, 1.9 mg/dL. An ECG showed normal sinus rhythm and QTc of 456 ms. He received 2 units packed red blood cells (citrated) and Ca gluconate 2 g IV, increasing his Ca to 5.6 mg/dL. Upon transfer to the ED, his vital signs were: 157/87 mmHg; pulse, 76 beats/min; respirations,18/min. He had a slight resting tremor, normal strength, and negative Chvostek sign. After administration of Ca gluconate 3 g IV and calcitriol (activated vitamin D3) 0.5 mcg PO, retesting revealed Ca, 6.5 mg/dL (iCa 0.86 mg/dL) and Mg, 0.7 mg/dL. He was admitted to telemetry. In the first 24 hours, he required 16 g IV Ca gluconate and 2.5 g PO CaCO3 (2.5 g CaCO3 = 1 g elemental Ca), which raised his Ca to 8.4 mg/dL. For hypomagnesemia, possibly related to recent cisplatin use, he required 8 g IV MgSO4 and 400 mg PO MgO2. A serum vitamin D of 30.8 ng/mL (range: 30–80 ng/mL) prompted ergocalciferol 50,000 units PO daily x 4, cholecalciferol 5,000 units PO once, and calcitriol 0.25 mcg PO daily (initiated on HD #3). Oral Ca, Mg, and vitamin D was continued post discharge on HD 4. He continued to have fluctuations in serum Ca after hospitalization, which required close monitoring and frequent PO Ca adjustments.
Case Discussion: Denosumab inhibits osteoclastic maturation and bone destruction, binding to receptor activator of nuclear factor κ B ligand (RANKL), which tumor cells can upregulate. This antiresorptive property contributes to lower SRE rates compared to bisphosphonates, but increases hypocalcemia risk. Denosumab is eliminated via the reticuloendothelial system, with an elimination half-life of 28 days. Thus, optimal dosing and duration of Ca and vitamin D administration can be unpredictable.
Conclusion: We report a case of denosumab-induced hypocalcemia, requiring high doses of Ca and vitamin D supplementation. This case highlights the protracted course and specific challenges related to denosumab.
Keywords: Adverse drug event, Antiresorptive, Hypocalcemia
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92. Rivaroxaban abd apixaban ingestions reported to 8 PCs

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Rivaroxaban and apixaban are part of a new group of oral anticoagulants targeting factor Xa approved by the FDA in 2011 and 2012. These oral anticoagulants are given at fixed daily doses without the need for laboratory guided adjustments. There is limited data available on supra-therapeutic doses or overdose of the oral Xa inhibitors

Method: A retrospective study collected data from 8 regional poison centers covering 9 states. Cases were initially identified by a search of the poison centers databases for case mentions involving a human exposure to Xarelto, rivaroxaban, eliquis or apixaban. Inclusion criteria included single substance exposure. Exclusion criteria were animal exposure, polysubstance exposure or information call. Data for the study was collected by individual chart review including case narratives and compiled into a single dataset after PHI had been removed.

Results: There were 223 patients of which: 124 (56%) were female, mean age was 61 and 19 were children < 12 years (9%). 198 patients ingested rivaroxaban (89%) and 25 ingested apixaban (11%). Dose was reported in 183 rivaroxaban patients with a mean dose of 64.6 mg (range 10 mg to 1200 mg) and in 21 apixaban patients with a mean dose of 9.6 mg (range 2.5 mg to 20 mg).

Bleeding was reported in 15 patients (7%): 11 rivaroxiban (6%) and 4 apixaban (16%). The site of bleeding was GI (8) oral (2), Nose (1), bruising (1), urine (1), subdural (1). The subdural bleed occurred post fall and head injury. All cases with bleeding were chronic ingestions: ADR (12) therapeutic error (2), unknown reason (1). Coag tests were normal in a majority of patients with bleeding: PT 5 of 6 (83%), PTT 5 of 6 (83%) and INR 4 of 9 (44%). Blood products were used in 6 rivaroxaban patients (1 suicide) and 3 apixaban patients. No bleeding or altered coagulation tests cases occurred in children. All 12 Suicide attempts ingested rivaroxaban: 1) altered coagulation tests occurred in 5 (42%), 2) no bleeding occurred, 3) 1 patient treated with FFP (INR of 12.47), 4) dose by patient Hx did not predict risk of altered coagulation or bleeding.

Conclusion: bleeding is uncommon. PT, PTT or INR may be elevated in a minority of cases but appear unreliable to measure risk of bleeding. Massive acute ingestion in suicide attempt may result in significant ainticogulation. Single exploratory ingestion by children did not result in toxicity.

Keywords: anticoagulant, Xa inhibitors, Rivaroxaban

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	Rivaroxaban n = 198	Apixaban n = 25
Patients PT recorded	49 (25%)	6 (24%)
PT elevated (% with recorded PT)	7 (17%) (PT range 22.5 to 126.3)	0 (0%)
Patient INR recorded	61 (31%)	5 (20%)
INR elevated (% with recorded INR)	13 (21%) (INR range 1.4 to 12.47)	0 (0%)
Patients with PTT recorded	49 (25%)	6 (24%)
PTT elevated (% with PTT recorded)	5 (10%) (Ptt range 44.2 to 114.9)	0 (0%)

93. Does This Chart Check Out? - Check Yes or No

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Background: Consistency and completion of charting is integral to poison center operations. Practices for review of charts vary by poison center. At one poison center, chart audits are performed through peer review. To date, there has been no evaluation of, or standard set, for the chart audit process.

Objective: To evaluate current chart audit processes and to establish a standard for checking completed poison center charts.

Methods: Researchers initiated a quality assessment project to review the chart audit process. The evaluation method was derived from LEAN and Six Sigma principles as incorporated by the facility process improvement department. Principles of this method include: Defining Opportunity, Building Understanding, Acting to Improve, and Sustaining. Results: The evaluation will have two phases. In Phase One, researchers will create a tracking tool to identify areas of inadequacy and inconsistency in the chart audit process. The tracking tool will be used to assess 250 charts over a three week period. A chart check tool will be developed to set the standard for the peer audit process. Other needs in the process will be identified and strategies to address these, developed. In Phase Two, the impact of the chart check tool will be evaluated during an additional 3 week period.

Results: Five Specialists in Poison Information (SPI) members, with participation of the poison center manager, led the process. In Phase One, 250 charts from 30 SPIs were checked with the tracking tool during a 3 week period in August 2013. Researchers found that 64% of charts had gaps in required information. Patterns of concern included general chart quality and time lapses between chart closure and review. The chart check tool standardized the chart check process. A central chart location reduced time between completion and review. Training for SPIs on legal requirements for charting and the chart check tool ensured understanding and adoption. In Phase Two, the chart check tool was piloted and evaluated. Researchers reviewed 228 charts and found that 28% had gaps in required information which demonstrates a 56% reduction in errors and omissions. As of August 2014, the chart check tool was adopted as standard operation procedure at the center.

Conclusions: Without standards, chart audit outcomes are inconsistent. Creating a tool to identify areas of concern in the peer review process enabled researchers to develop a standard of practice, identify education needs of staff, and improve workflow. Implementing a consistent and objective chart audit process demonstrated a significant improvement in poison center charting.

Keywords: Quality Assurance, Poison center, Chart Audit

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94. Physostigmine reversal of baclofen? Inadvertent administration of intrathecal physostigmine

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Background: Physostigmine salicylate is a carbamate with a tertiary amine structure used to reverse anticholinergic delirium.

Case reports also describe its use in the reversal of respiratory depression caused by baclofen overdose. We describe the case of a patient inadvertently administered intrathecal physostigmine while initiating baclofen therapy.

Case Report: A 62-year-old woman presented to a health care facility early in the day to continue an early trial of intrathecal baclofen therapy. She was naive to baclofen, and physostigmine was readied by providers in the event of baclofen-induced respiratory depression. A trial of baclofen on the day before had been successful, however no intrathecal pump had yet been installed. Once the thecal sac had been accessed, 2 mg of physostigmine was inadvertently instilled instead of baclofen.

Shortly after administration, the patient reported profound nausea without emesis. Vitals were notable for a heart rate of 77 beats per minute and a blood pressure of 150/84 mmHg. Expectant management of seizures with benzodiazepine therapy was recommended, and the patient was admitted to a monitored bed awake, alert, and talking.

The patient experienced no vomiting despite her initially forceful nausea. Her vital signs remained normal, and she developed no seizures, bradycardia or other evidence of cholinergic excess. She required no therapies over her stay, and was discharged the following day.

Case Discussion: The structure of physostigmine salicylate allows it to penetrate the blood:brain barrier, unlike quaternary amines (i.e. neostigmine), however direct intrathecal instillation has been reported only rarely. Notably feared complications of physostigmine administration include seizures, bradyasystole, increased oropharyngeal and upper respiratory secretions, and bronchospasm. Historically, cases of anejaculation were treated with intrathecal administration of neostigmine (Chapelle et al 1976), but only vague references to direct intrathecal administration of physostigmine. Both the paucity of cholinergic excess – apart from transient nausea – and the absence of ensuing seizure activity precipitated by intrathecal injection of physostigmine administration are particularly noteworthy.

Conclusion: Current recommendations for the administration of physostigmine emphasize the slow administration to avoid side effects of seizure and bradydysrhythmia. This case demonstrates a lack of significant side effects following the direct instillation of 2 mg of physostigmine into the cerebrospinal fluid (CSF), suggesting low risk of seizure with transiently elevated CSF physostigmine concentration.

Keywords: Physostigmine, Adverse drug event, Antidote

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95. A survey of physicians™ perspectives on a mandatory prescription monitoring program

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Background: Prescription monitoring programs (PMPs) have emerged as one tool to combat prescription drug abuse. New York State mandates that prescribers use its PMP (the Internet System for Tracking Over-Prescribing, or ISTOP) prior to prescribing controlled substances. In an effort to identify areas of improvement for PMP policy and implementation, we sought to assess physicians' attitudes and behaviors regarding ISTOP and its mandatory use.

Methods: An electronic survey sent by email to attending physicians, from all clinical specialties, at one large urban academic medical center. The survey contained a mix of prompted and free text responses.

Results: Of the 207 physicians who responded, 89.4% had heard of ISTOP, and of those, 91.1% were registered to use it. The physicians who reported using ISTOP had diverse experiences with the program, with 45.7% using it once per week or more frequently. There was significant negative feedback about the program, with 40.4% of respondents describing ISTOP as "rarely" or "never helpful," and 39.4% describing it as "difficult" or "very difficult" to use. Physicians expressed frustration with the login and password process, the amount of time or number of steps required to perform a query, and the lack of ISTOP integration with electronic medical records. Only 83.1% were aware that ISTOP use is generally mandated. A minority of respondents agreed with this mandate (44.2%); surgeons, males, and those who prescribe controlled substances at least once per week had significantly lower rates of agreement (22.6%, 36.2%, and 33.0%, respectively). The most common reasons for disagreement were time burden and concerns about helpfulness, the potential for undertreatment, and the erosion of physician autonomy. Only 48.4% of non-emergency physicians reported perfect compliance with the mandate; surgeons and male physicians also reported significantly lower rates of perfect mandate compliance (18.2% and 36.8%, respectively). Emergency medicine physicians, who are largely exempt from the ISTOP mandate, were the most likely to believe that ISTOP was helpful and the least likely to be registered users.

Conclusions: While limited in scope, this study offers a unique window into how one academic medical faculty has experienced New York State's mandatory PMP. Many responding physicians believe ISTOP is difficult to use and generally unhelpful. Furthermore, many disagree with, and are not complying with, its mandatory use.

Keywords: Substance abuse, Public health, Prescription Drug Monitoring

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96. Bong Water Cotton Fever: Parenteral administration of sterilized, desiccated and reconstituted methamphetamine water pipe runoff

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Background: Cotton fever—originally described in cotton mill workers—is an acute, self-limited febrile syndrome associated with intravenous injection of drugs filtered with cotton. We describe a case report in which the pathophysiologic process underlying cotton fever was reproduced through the injection of sterilized, desiccated and reconstituted methamphetamine bong water.

Case Report: A 37 year old male with a remote spinal infarct associated with intravenous drug abuse was brought to the emergency room (ER) 10 minutes after the sudden onset of dysphoria, shaking chills, and angor animi. Vital signs were labile: over the next 2 hours, BP ranged 66/41 to 169/133, (average MAP 61); HR increased from 84 to 144; temperature peaked at 38.2C;

respiratory rate ranged from 18–26, with oxygen saturation 98–100%. Broad-spectrum antibiotics, 7L of normal saline, and a norepinephrine drip (4 mcg/min) were administered. He was admitted to the intensive care unit, where BP increased from 75/39 to 97/52 over 4 hours.

Laboratory values revealed mild renal impairment (creatinine 1.57 mg/dL, BUN 20). After 9 hours, his white blood cell count increased from 6 to 21 k/uL (94% neutrophils), hemoglobin decreased (12.3 from 14.2 g/dL); creatine kinase peaked at 488 U/L; AST/ALT peaked at 322/121 U/L. He was never acidotic; peak lactic acid was 2.2 mmol/L. Extended urine drug screen revealed methamphetamine and metabolites; chest x-ray was normal. Blood cultures grew Propionibacterium acnes from one of four samples, thought to be a contaminant. Vasopressors were weaned over 8 hours; broad-spectrum antibiotics were continued. He left against medical advice 14 hours after admission, but returned to the ER 4 days later because of the aforementioned blood cultures. He was asymptomatic, with normal labs and vital signs. He endorsed taking 3-month-old water from a methamphetamine bong, desiccating it (5 hours, 500F in the oven), freezing it for 5 hours, reconstituting it with water, and injecting it into his left femoral vein immediately prior to the onset of his symptoms.

Case Discussion: Cotton fever is associated with the re-use of cotton used to filter particulate matter from intravenous drugs; it has been theorized to be the result of injection of Gram-negative endotoxin. Although identification of endotoxin in the patient's bong water or biological specimens was impossible, his symptoms and the description of his activities are consistent with the clinical diagnosis of cotton fever.

Conclusions: We report a case of cotton fever associated with the injection of desiccated, sterilized water from a methamphetamine bong.

Keywords: Abuse, cotton fever, Drug of abuse

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97. Acetaminophen protein adducts and GSH levels at intake of N-acetylcysteine in acetaminophen-treated mice

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Background: Acetaminophen (APAP)-induced liver toxicity occurs with depletion of glutathione (GSH) and formation of APAP-cysteine protein adducts (AP-CYS). AP-CYS is now used as a specific biomarker of APAP toxicity in patients with acute liver injury. The primary role of N-acetylcysteine (NAC) in the treatment of APAP toxicity is thought to be the replacement of intracellular stores of hepatic GSH (Lauterburg,1983), However we only have a little information from initial studies about the variation of GSH in liver in APAP overdose and the effect of NAC. The objective of this study is to reevaluate the relationship between GSH levels and formation of AP-CYS in APAP-treated mice and also the effect of NAC.

Methods: C557BL/5 mice(10 weeks of age) are divided into five groups (n = 4/groups) and dosed with 300 mg/kg APAP i.p. or an equal volume per body weight of saline. At 0 (saline group), 1, 2,3, 4 and 5 h, mice were anesthetized with CO2, and blood samples are removed. The liver were removed surgically, and a portion of each liver was weighed and homogenized in a 3:1 v/w of 0.25 M sucrose, 10mM Hepes, 1mM EDTA buffer, pH 7.5. The protein samples are dialyzed (or gel filtrated) and then digested with protease. The AP-CYS is then quantified by HPLC-ECD. The GSH levels were determined using GSH assay kit. 1.2 g/kg NAC(i.p.) is dosed 1h after administration of APAP. The same applies hereafter.

Results: A time course for the formation of APAP-CYS and GSH depletion in liver and serum APAP-CYS were determined in mice treated with APAP (300mg/kg). As GSH levels fell, APAP-CYS increased. APAP-CYS were detected 1 h and increase to 3h(1.515 ± 0.469 nmol/mg protein) after administration of APAP. During this time period, GSH levels became the minimum (8.38 ± 5.39ï¼…) and declined more than 70% from 1h to 3h. After administration of NAC, GSH levels gradually increased and became equal to a control (saline) group 3 h later.

Conclusions: In early studies, a time course for APAP-CYS and GSH in liver after administration of APAP was shorter than this study. We confirmed the relationship of hepatic GSH levels and APAP-CYS and the effectiveness of NAC as GSH replacement.

Keywords: Acetaminophen (paracetamol), N-acetylcysteine, GSH

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98. Clinical effects after 4-fluoroamphetamine exposure

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Objectives: In Europe, 4-fluoroamphetamine (4-FA) is one of the most commonly detected new psychoactive substances (NPS). Its prevalence of use in Dutch nightlife visitors is increasing, with a reported lifetime use of almost 10%. However, knowledge on the health risks of this substance is lacking. Therefore, we investigated the clinical effects following 4-FA use reported to the Dutch Poisons Information Center (DPIC).

Methods: The database of the DPIC was searched retrospectively for all cases of 4-FA exposure up to December 2014. Cases were evaluated for patient details, co-exposure to other substances and clinical effects.

Results: The DPIC was first consulted on 4-FA in June 2011. Thereafter, the annual number of 4-FA exposures increased from 2 exposures in 2011 to 3 in 2012, 11 in 2013 and 27 in 2014. All cases involved adults ≥ 18 years (median age 23 years; range 18–39 years) with a male-female ratio of 1:1. In all cases, the route of exposure was ingestion. Co-exposure to other illicit drugs was reported in 40% of the cases (N = 17), including 3,4-methylenedioxy-methamphetamine (MDMA) (N = 10), amphetamine (N = 4), cocaine (N = 4), cannabis (N = 2), 4-bromo-2,5-dimethoxyphenethylamine (2C-B) (N = 2), 5-(2-aminopropyl)benzofuran or 6-(2-aminopropyl)benzofuran (5-APB/6-APB) (N = 1), 2,5-dimethoxy-4-ethylphenethylamine (2C-E) (N = 1), phenazepam (N = 1) and gamma hydroxybutyric acid (GHB) (N = 1). In 4 cases (9%) 4-FA was combined with alcohol. To characterize the clinical effects caused by 4-FA, only mono-exposures were

included (N = 24). Reported clinical effects were: headache (N = 10), nausea/vomiting (N = 7), hypertension (N = 7), tachycardia (N = 5), palpitations (N = 3), restlessness (N = 3), confusion (N = 3), hyperventilation (N = 3), mydriasis (N = 3), chest pain (N = 2), dizziness (N = 2), hyperactivity (N = 2), muscle spasms/cramps (N = 2), tremors (N = 2), anxiety (N = 2), fainting (N = 2), abdominal pain (N = 2). The following symptoms were mentioned once: accommodation disorder, hypotension, ECG-changes, tachypnea, reduced consciousness, disorientation, hallucinations, euphoria, light-headedness, paresthesia, diaphoresis, dysphagia, jaw clenching, neck pain, photophobia, red skin, warm skin, hyponatremia, incontinence, general discomfort and dry mouth. At least 24 patients (56%) were admitted to hospital.

Conclusions: The number of 4-FA exposures in the Netherlands is increasing. So far, the clinical effects of 4-FA seem to be comparable with other amphetamine-derivatives and can be severe. Monitoring cases of 4-FA and other NPS exposures by PICs can aid in identifying trends in NPS use, but also provide information on clinical effects and treatment. As a result, dangerous NPS can be recognized more quickly.

Keywords: Drug of abuse, New psychoactive substances, Amphetamine

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99. Characterization of Single Substance Baclofen Exposure in the Toxicology Investigators Consortium Registry

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Background: Baclofen is a $GABA_B$ agonist used for skeletal muscle spasticity. In overdose, baclofen may cause both inhibitory and excitatory neurotoxicity as characterized in case reports and series. These reports are limited by sample size and co-ingestants. This study aims to characterize clinical effects of isolated oral baclofen overdose using the Toxicology Investigators Consortium (ToxIC) registry.

Methods: Retrospective analysis of prospectively collected data from the ToxIC registry from 1/1/2010 – 4/3/2015 limited to single substance oral baclofen exposure. Cases related to withdrawal or deemed "unlikely tox related" were excluded from the analysis. Descriptive statistics characterized overdose effects and therapies administered.

Results: 42 single substance oral baclofen overdose cases were reported. Mean age was 44 years (range 4–86 years). 45% were male. Exposures included 23 acute, 16 acute on chronic, and two chronic cases. 12 cases were self-harm attempts, and seven cases were misuse/abuse. Acute exposure doses ranged from 20–300 mg. 39 (93%) were symptomatic with most common symptoms including coma/central nervous system (CNS) depression, sedative-hypnotic toxidrome, agitation, and respiratory depression (see Table). Hyperreflexia/myoclonus/clonus/tremor and seizures occurred in five and three cases, respectively. 13 (31%) patients were intubated for ventilatory management. 20 (48%) patients were admitted to the intensive care unit (ICU).

Conclusions: Prospectively collected by medical toxicologists validates previous reports and rates of CNS/respiratory depression, agitation/delirium, neuromuscular hyperactivity, and seizures.

Table. Frequency of clinical effects single substance oral baclofen overdose.

Clinical Effects	Count (%)
Coma/CNS depression	24 (57)
Sedative-Hypnotic Toxidrome	12 (29)
Agitation	7 (17)
Respiratory Depression	6 (14)
Bradycardia (P < 50)	5 (12)
Hyperreflexia/Myoclonus/Clonus/Tremor	5 (12)
Delirium/Toxic Psychosis	4 (10)
Seizures	3 (7)
Hypertension (SBP > 200 and/or DBP > 120)	2 (5)

Although this study is to-date the largest single substance exposures analysis of baclofen overdose, no concentrations of baclofen at time of exposure were reported. Overall, despite the severity of clinical effects and high proportion of ICU admissions, oral baclofen overdose can be safely managed with aggressive supportive care with no mortality reported in this series.

Keywords: Baclofen, Toxicology Investigators Consortium (ToxIC), Overdose

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100. Beware of blue pills and blotting paper hallucinogens severe toxicity with NBOMe

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Background: NBOMes are a novel class of potent synthetic hallucinogens being used as recreational drugs. They are N-benzyl-methoxy- derivatives of the 2C class of hallucinogens, often sold as "acid".

Case Reports: A 16 year old male presented after having three seizures. He had ingested "acid" on blotting paper while camping. In the emergency department he had GCS 9 and was hypoventilating. He had a fourth seizure and was given 5mg midazolam intravenously. He was then intubated, ventilated, paralysed with rocuronium and sedated with morphine/midazolam for transfer to a tertiary intensive care unit. He remained haemodynamically stable and was extubated the following day. On day 2 he had a rising creatinine and creatine kinase with normal urine output. His creatinine peaked at 246mmol/l and his CK at 34,778 IU at 90h post-ingestion. He did not report any hallucinations and was not agitated. He was discharged day 5. A 27 year old male was hallucinating, violent and aggressive after taking "acid". He was given 5mg midazolam intramuscularly and transported to hospital. On arrival he was more settled, heart rate 98bpm, blood pressure 146/99 and Glasgow coma score (GCS) 14. He had dilated pupils 8–9mm, was diaphoretic and hallucinating. He developed tachycardia (maximum HR 117 bpm) and continued to have hallucinations and agitation. He was transferred to a tertiary toxicology unit and treated with intravenous fluids. He continued to hallucinate for 24h but was discharged with no complication 36h post-ingestion. He stated at discharge that he had ingested a tablet called "blue

batman". Blood samples from both patients were analysed with high performance liquid chromatography/mass spectrometry and 0.089µg/mL of 25B-NBOMe was detected in patient 1, 22h post ingestion and 0.164µg/mL of 25C-NBOMe in patient 2, about 15h post-ingestion.

Case Discussion: These are the first analytically confirmed cases of 25B- and 25C-NBOMe intoxication reported in Australia and are consistent with previous reports of NBOMe with seizures, agitation, hallucinations, rhabomyolysis and acute kidney injury(1). The effects appear to be more severe than 25I-NBOMe which has been reported more commonly around the world. In both cases the patients believed they were taking LSD, but NBOMe appears to be far more toxic than LSD.

Conclusion: Physicians should be aware of the potential dangers of NBOMes, including treating behavioural disturbance, seizures and renal impairment.

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Keywords: Hallucinogen, Abuse, Neurotoxicity

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101. Acute hepatotoxicity associated with therapeutic doses of intravenous acetaminophen

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Background: Oxidation of acetaminophen forms a reactive intermediate that binds to cellular hepatic proteins resulting in the formation of acetaminophen-protein adducts. Serum adducts (APAP-CYS) are considered a specific biomarker of acetaminophen exposure and concentrations have been found to correlate with acetaminophen-induced hepatotoxicity. Hepatotoxicity from intravenous (IV) acetaminophen at therapeutic doses has not been previously reported.

Case Report: A 92 year old, 68 kg woman was treated with IV acetaminophen, 1 gram every 6 hours, for 5 days following surgery for bowel obstruction. At the start of therapy transaminases were 24 IU/L AST and 10 IU/L ALT. On day 5, AST and ALT were found to be 4698 IU/L and 3914 IU/L respectively, INR 1.68, ammonia 60, T Bili 1.8. Plasma acetaminophen was 15.3 mcg/mL 26 hours after her last dose. Renal function was normal and there was no acidosis or other abnormal chemistries. No medication errors or additional sources of acetaminophen were reported. No other hepatotoxic medications were given. There was no history of ethanol use, malnutrition or viral hepatitis and infectious hepatitis titers were negative. Hepatic ultrasound showed hepatic steatosis and possible cirrhosis prior to acetaminophen administration. Acetaminophen was discontinued and IV acetylcysteine given per standard protocol and continued at the second maintenance dose rate for a second 16-hour infusion. Acetylcysteine was discontinued when the AST/ALT were 964/1805 IU/L respectively, INR 1.3, ammonia 36, T Bili 1.7 and mentation at baseline. The patient remained clinically well and was discharged two days later with AST/ALT of 333/1024 IU/L, ammonia 36 and baseline mental status. Serum APAP-CYS concentrations were consistent with acetaminophen-induced liver injury (Table).

	Day 3	Day 5	Day 6	Day 7	Day 8
Time (24 hr)	06:25	08:50	07:40	07:43	07:23
APAP-CYS (uM)	1.79	4.81	2.92	1.31	0.95

Case Discussion: We have identified a case of acute liver failure associated with therapeutic dosing of IV acetaminophen. The serum APAP-CYS concentrations are higher than expected from oral therapeutic dosing, and consistent with cases of hepatotoxicity following with repeated supratherapeutic acetaminophen ingestion. No other likely etiologies were identified.

Conclusion: This case illustrates a potential hazard of IV acetaminophen and demonstrates the utility of APAP-CYS adducts in evaluating causality in acute liver injury.

Keywords: acetaminophen-protein adducts, IV acetaminophen, hepatoxicity

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102. Methemoglobinemia and Hemolysis in an Undiagnosed G6PD Patient After Receiving Pegloticase

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Background: Pegloticase (PGL) is a pegylated recombinant uricase FDA approved for treatment of refractory gout. This enzyme catabolizes uric acid into allantoin, a water-soluble substance excreted renally. We present a case of methemoglobinemia (metHgb) with hemolysis in a patient with an unknown glucose-6-phosphate deficiency (G6PD) after PGL infusion.

Case: A 59-year-old African American male with a complex medical history presented via EMS with shortness of breath and cyanosis. He reported feeling well until approximately 8 hours post-receipt of PGL for refractory gout. Compromised respiratory status including severe dyspnea, cyanosis, and oxygen saturation of 68% were noted. Treatment with bilevel positive airway pressure and 100% oxygen was initiated and while decreased distress was observed oxygen saturation corrected only to 80%. Initial laboratory findings included hemoglobin (Hgb) 11g/dL, metHgb 18.2%, and oxygen partial pressure 345mmHg. Following early improvement, the patient's respiratory status worsened resulting in endotracheal intubation for congestive heart failure (CHF). Methylene blue was held for concern of unknown G6PD status. Over the next 3 days, significant hemolysis was noted with LDH 961 IU/L and Hgb nadir 6.9 g/dL. Our patient received packed red blood cells and underwent exchange transfusion. G6PD was confirmed and metHgb was undetectable by hospital day 5. Clinical course was protracted including the development of respiratory failure from pulmonary edema and pneumonia, persistent hemolytic anemia, non-ST segment elevation myocardial infarction (NSTEMI), renal failure, and delirium.

Discussion: G6PD is a contraindication to the use of PGL and rasburicase, a similar uricase well-described to cause metHgb and hemolysis. Confirmation of G6PD status is recommended prior to treatment in high-risk patients. In this case, a G6PD test was ordered but not resulted prior to infusion. With unknown G6PD status there was appropriate concern for giving methylene blue. Although it would not have treated hemolysis it is unclear whether it may have improved oxygen-carrying capacity, a likely contributor to his respiratory compromise and probable ischemic NSTEMI. Product insert materials also warn for exacerbation of CHF and while this patient did have CHF the role of PGL in this aspect of his clinical course is unclear. Development of metHgb and hemolysis were potentially preventable adverse events based on mechanism of action, notable class effect, and product warning.
Conclusion: We report a case of metHgb and hemolysis with prolonged hospitalization following initiation of PGL in a patient with previously unknown G6PD status.
Keywords: Pegloticase, Methemoglobin, G6PD
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103. Serotonin syndrome associated with therapeutic metaxalone dosing in a patient with cirrhosis

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Background: Metaxalone has recently been associated with serotonin syndrome (SS) in the setting of overdose. We report the first case of SS with therapeutic metaxalone dosing in a cirrhosis patient.
Case Report: A 65 year old male presented to the ED with altered mental status. He was recently prescribed metaxalone (800mg every 12 hours) for a back injury. Family reported within 1 hour of each ingestion the patient developed confusion, diaphoresis, facial flushing, and muscle stiffness. Symptoms would gradually improve over several hours but then worsen with each subsequent dose. Medical history included cirrhosis, depression, and thrombocytopenia. Home medications included venlaxafine, quetiapine, propranolol, and rifaximin.

Initial vital signs were BP of 154/62, HR of 78, RR of 20, temperature of 38.2 C, and oxygen saturation of 94%. The patient was confused, agitated, and profusely diaphoretic. Patient had ocular clonus, mydriasis, hyper-rigidity and sustained clonus of the lower extremities. Lab values showed platelets 114 thou/cmm, creatinine 1.68 mg/dl, lactate 3.2 mmol/L, ammonia 90 umol/L, normal aminotransferases, and a negative urine drug screen. EKG showed normal sinus rhythm. Computed tomography of the head showed no abnormality. Metaxalone level, drawn approximately 12 hours after last dose, was 11mcg/ml (peak plasma concentrations average 1.7mcg/mL 3 hours after 800mg dose).

The patient was intubated for airway protection using etomidate and rocuronium. Diagnosis of SS was suspected. Fentanyl was started for sedation, however this was replaced with midazolam. Hyperthermia resolved after intubation without antipyretics. Serotongeric symptoms gradually improved over several days. The patient had prolonged hospital course complicated by GI bleeding and hepatorenal syndrome.
Case Discussion: Metaxalone, a 2-oxazolidinone, has been theorized to have reversible MAOI properties at elevated concentrations. Previously reported cases involve overdoses of metaxalone as a single drug or in combination with another pro-serotonergic agent. This is the first case of SS in therapeutic metaxalone dosing with a confirmed serum concentration.

Metaxalone primarily undergoes hepatic metabolism although the impact of hepatic disease on the pharmokinetics of metaxalone has not been established. We propose that cirrhosis led to decreased elimination of metaxalone and an elevated serum concentration. Supratherapeutic metaxalone serum concentrations combined with a SNRI triggered SS.
Conclusion: Hepatic insufficiency may lead to accumulation of serum metaxalone. At high concentrations or when combined with another pro-serotonergic agent this can lead to SS.
Keywords: Serotonin syndrome, Metaxalone, Skelaxin
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104. Monitoring Emerging Toxicology Trends Using Social Media: Eyeballing, Vaportinis, and Funnelling

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Background: Social platforms, including video sharing websites, provide a venue for teens and young adults to freely share their experiences, post questions, comments, and opinions about different drugs. The primary aim of this proposal was to characterize the content and popularity of dangerous trends involved in alcohol consumption by teens and young adults on the video-sharing Web site YouTube.
Methods: This is a retrospective content analysis study. Using YouTube's search engine, we identified videos using 52 specific terms relating to hazardous alcohol consumption. Videos were viewed between November 2014 and January 2015. Key quantitative and qualitative descriptive variables included the number of views, participants, and the technique used or described. Viewers' comments from the videos on YouTube were examined as an index of viewer response. The scientific claims made by the videos were classified as substantiated or unsubstantiated using opinions of two toxicologists. Descriptive statistics and frequency tables were used to describe research findings. Interrater reliability was determined using the Kappa score.
Results: During the 3-month study period, 103 YouTube videos relating to hazardous alcohol consumption were identified. The most common practices described were alcohol enemas (33%), alcohol inhalation(23%), vodka eyeballing (18%), alcohol-soaked tampons (16%), funneling (6%) and marijuana moonshine (4%). Only 8 of these videos (7.8%) posted trigger-warnings, intended to warn users that website content be inappropriate for some users. These videos were collectively viewed 18,829,402 times on YouTube; mean number of views per video was 184,600. These videos were marked as a "favorite" a total of 98,571 times with an average of 957 times per video. In total, 347 participants or observers were identified in the videos; the majority were male (76%), Caucasian (79%), and between the ages of 20 to 25 years (43%). Twenty-eight (27%) videos had informational content;

however, the majority (66%) of the scientific statements contradicted the toxicology literature. Interrater reliability calculated across 30 videos was excellent (Kappa = 0.84).

Conclusions: Knowledge about what people are viewing may help health care practitioners better understand their patients' own informational databank, stay informed about the latest trends in drug abuse, and position themselves as more credible resources to their patients. Educating parents about these Internet Web sites may also facilitate improved communication between parent and child regarding contemporary alcohol and drug use.

Keywords: Alcohol, Social Media, Substance abuse

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105. Persistent Hyperinsulinemia Following High Dose Insulin Therapy

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Background: In high dose insulin therapy (HDI), supplemental glucose is often needed during treatment and for up to 24 hours after cessation of therapy. Scant literature exists describing insulin levels and kinetics in vivo after HDI. We report a case of persistently elevated insulin levels after HDI and discuss the implications for duration of supplemental glucose.

Case Report: A 51-year-old 100 kg man with a history of hypertension presented to a rural hospital after ingestion of approximately 40 tabs of 25 mg metoprolol and 40 tabs of 5 mg amlodipine in a suicide attempt. The patient was awake and alert on initial presentation but was vomiting. Vital signs initially showed a heart rate (HR) in the 50–60 range and systolic blood pressure (SBP) near 100 mmHg. He was intubated for worsening drowsiness and given 3 g calcium gluconate and a 1 U/kg bolus of regular insulin followed by an infusion at 100 U /h. On arrival to a tertiary care hospital 4 hours (hr) after ingestion, BP was 79/49, HR 38. An EKG showed junctional bradycardia. His BP reached a nadir of 55/45 mmHg with HR in the 20–30 range. Insulin infusion was increased to 10 U/kg/h (1000 U/h) with improvement in SBP to 80–90 mmHg. An epinephrine (epi) infusion was started at 0.1 mcg/kg/min. The patient was maintained on infusions of HDI at 10 U/kg/h and epi at 0.1 mcg/kg/min for 35 hr. Following the discontinuation of HDI, a 50% dextrose infusion was needed for 37 hr. A 10% dextrose infusion was then continued for 5 days. Enteral feeding by post pyloric feeding tube was started on hospital day (HD) 2, providing 2,160 kilocalories daily. Two additional days of a 5 % dextrose infusion was used. Insulin levels were followed every 8 hours after the HDI was stopped. Initially measured at > 1000 μIU/mL (normal range 2.6–24.9 μIU/mL), the insulin level trended down over 7 days (see table). Insulin half life varied (range 3.2–86.6 hours) and did not follow first order kinetics. The patient was transferred to Psychiatry on HD 9 with no sequelae.

Discussion: To our knowledge, there have been no reports of persistently elevated insulin levels following cessation of HDI therapy. This finding suggests that some patients may require supplemental dextrose for greater than 24 hours following discontinuation of HDI. Further studies are needed to determine which factors (e.g. dose, timing of discontinuation and length of treatment) may contribute to this phenomenon.

Conclusion: Insulin kinetics in HDI are unpredictable, and concentrations may remain high for many days after cessation of HDI. Persistent hypoglycemia may occur beyond 24 hours.

Keywords: Antidote, Overdose, Pharmacokinetics

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106. Novel use of ertapenem to intentionally decease serum valproate concentration after an intentional overdose of valproate resulting in toxicity

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Background: Valproate (VPA) toxicity is common as a result of intentional and unintentional poisoning. Carbapenems have been observed to decrease VPA levels when given for antimicrobial purposes.

Case Report: A 31 year old male with newly diagnosed bipolar disorder presented to the Emergency Department after taking 10–23.5 g of divalproex sodium extended release and 6–8 mg of lorazepam in a suicide attempt. On arrival to the ED 6.5 hours after ingestion, the patient was somnolent but arousable. Activated charcoal was not given due to patient's somnolence. Vitals were BP 130/82, HR 95, RR 20, T 97.2° F, SpO2 97%. Ammonia was 158 mcg/dL (15–45) and total VPA concentration was > 300mcg/dL. Laboratory testing and exam was otherwise unremarkable. The patient was given 1 g of ertapenem 10.3 hours after ingestion and 6 g of levocarnitine 11 hours after ingestion. He gradually improved clinically and was discharged to a psychiatric facility on hospital day 4.

Case Discussion: Numerous case studies document rapid reduction of therpeutic VPA levels with the administration of carbapenems. Proposed mechanisms include inhibition of the

Hours after ingestion	serum total VPA (mg/L)	Apparent t1/2 (hours)
6.8	298	
10	268	21
16.6	226	26.7
21	207	34.7
25.3	189	33
27.9	146	7.2
32.3	82	5.3
38.9	39	6.1
41.8	33	12
46.2	28	18.7
50.2	25	24.8

Table.

Time (hr after HDI stopped)	0	5.5	12	18	24	30	37	44	52	58	65	89	107	114	134	139	157
[Insulin] (μIU/mL)	> 1000	> 1000	301	220	160	135	129	59	80	18.1	53	78	22.7	73	26.1	39.8	20.3

Renal values.

Creatinine [µmol/l] (normal 52–117)/ urea [mmol/l] (normal 3.3–10.8)

	30.11.	1.12.	2.12.	3.12.	4.12.	5.12.	8.12.	9.12.	11.12.	12.12.	23.12.
Dog 1	1151/28	1014/52*	830/36*	727/25*	–	771/24*	758/28*	571/26*	429/32	391/36*	122/14
Dog 2	757/30	–/40	1347/45	1083/58*	882/36*	565/22*	593/29	650/34*	458/30*	440/29	154/13
Dog 3	364/26	510/36	674/41	846/44	971/46						

*Subsequent hemodialysis.

intestinal transporter for VPA, suppression of beta-glucuronidase to prevent enterohepatic recirculation, enhanced metabolism via increased glucuronidation in the liver, and increased distribution of VPA into the red blood cells. Reported peak levels are expected 4 – 17 hours after ingestion of extended release tablets. In this patient, the VPA level had likely peaked prior to ertapenem administration. The apparent elimination half-life was significantly shorter in the 24-hours following ertapenem administration, suggesting reduced absorption or enhanced elimination during that phase. At 24–36 hours after ertapenem administration, the VPA half-life increased to pre-ertapenem times. These levels suggest VPA clearance was increased by the presence of ertapenem in a concentration dependent manner. Of note, in addition to decreased VPA levels, the patient improved clinically following the administration of ertapenem despite increasing ammonia levels.

Conclusion: We present a case of a novel use of ertapenem administration to decrease VPA levels in a case of intentional valproate overdose resulting in toxicity. Further work is warranted to determine reproducibility and to elucidate possible mechanisms.

Keywords: Anticonvulsant, Drug interaction, Antibiotic

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107. Acute tubular necrosis in three dogs after ingestion of a small amount of a descaling agent containing maleic acid

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Background: Maleic acid is a frequent component of household descalers. As these products are used in water kettles, accidental ingestion in humans is common, but of low risk. We report three dogs with severe course after the ingestion of a descaling agent containing maleic acid.

Case series: Three dogs (1: Labrador 9 y, f, 22.4kg; 2: Golden Retriever 9 y, f, 24.6kg; 3: Golden Retriever 13.75 y, m, 29kg) were accidentally fed a descaling solution composed of 650ml water and one descaling tablet of 15g (maleic acid $>$ 30% sulfamic acid $<$ 25%, benzotriazole $<$ 5%, and sodium bicarbonate) late in the evening. During the night the dogs started vomiting. Because of persistent vomiting and excessive drinking, the next day the owner contacted the poisons centre and the veterinarian. The dogs received a symptomatic treatment. One day later the dogs' condition deteriorated and the owner contacted the veterinarian again. Significantly increased creatinine and urea serum levels were found in all dogs. On the same day, dog 1 was hospitalized and seven hemodialysis sessions were performed over the next days. The dog was discharged 19 days later. Dog 2 was hospitalized two days after the ingestion, had 5 hemodialysis sessions, and was discharged after 16 days. The two dogs fully recovered. Dog 3 was euthanized 6 days after the ingestion due to advanced age and uncertain outcome. Histology revealed acute proximal tubular necrosis. Laboratory findings are shown in the table.

Case Discussion: No similar cases with descaling agents are described in the literature, but maleic acid has been reported to induce nephrotoxicity resembling Fanconi's syndrome in laboratory animals (1). The lowest maleic acid dose resulting in histomorphological and clinical evidence of acute tubular necrosis in dogs was 9mg/kg, observed in a study analyzing the nephrotoxicity of pravadoline maleate, an antiinflammatory drug (2).

Conclusions: Very small amounts of descaling products containing maleic acid may induce acute tubular necrosis in dogs. As maleic acid is occasionally used to synthesize the corresponding salt of pharmaceuticals, one should be aware that dogs may develop tubular necrosis after the ingestion of large amounts of drugs in form of maleates.

References

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Keywords: Maleic acid, Descaling agent, Dog

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108. The recovery of serum pseudocholinesterase and clinical characteristics of patients by organophosphate poisoning route

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Background: Organophosphatesare commonly used pesticides that are associated with a high risk of poisoning. A serum pseudocholinesterase ilevel s used for diagnosis of organophosphate poisoning and estimation of severity. This study was performed to compare serial change of serum pseudocholinesterase level and severity in the setting of organophosphate poisoning.

Methods: We compared and analyzed serum pseudocholinesterase level change and clinical characteristics with oral route poisoned group and non-oral route poisoned group in patients who visited the emergency department due to organophosphorus intoxication from January 2000 to May 2012.

Results: A total 199 patients were enrolled that 168 were oral route poisoned group and 31 were non-oral route poisoned group. A serum pseudocholinesterase level was lower in oral route poisoned group than non-oral route poisoned group at the early stage within 5 days after poisoning. A hundred and twelve patients in oral route group and 11 patients in non-oral group suffered from respiratory distress (P = 0.001). In oral route poisoning group, 128 patients required mechanical ventilation with endotracheal intubation and 61 patients developped aspiration pneumonia. On the other hand, 12 patients needed a mechanical ventilation with endotracheal intubation and 5 patients developped aspiration pneumonia in the non-oral route poisoning group. The rate of admission and intensive care in oral route poisoned group was higher than non-oral route poisoned group.
Conclusions: Serum pseudocholinesterase level in the oral route group was lower than non-oral route group at the early stage. A frequency of respiratory complications rate was higher in oral route poisoned group than non-oral route poisoned group.
Keywords: Organophosphate, Intoxication, Pseudocholinesterase
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109. Emergency Physician Use of Statewide Prescription Drug Monitoring Program (PDMP): Barriers to Use and Changes to Practice

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Background/Objectives: Prescription opioid abuse and misuse is a major public health problem. PDMPs may identify and prevent prescription drug abuse, misuse and diversion. Our objective was to characterize emergency physician (EP) utilization of a statewide prescription drug monitoring program(PDMP), as well as to identify barriers to use and how the PDMP changes practice.
Methods: An online survey was disseminated to members of the American College of Emergency Physicians state chapter 1 year after implementation of a statewide PDMP. Descriptive statistics were performed using STATA.
Results: 64 EPs completed the survey (16.5% response rate). Of the 61 EPs who had heard of the PDMP, 24.6% (n = 15) were not registered. The two most common reasons for not being registered were that they did not know how to register (n = 6) and that they did not have a DEA number (n = 5). Of the 46 EPs who were registered, 89.1% (n = 41) used the PDMP during an emergency department shift – of these, 29.3% (n = 12) use it once a week or less, 31.7% (n = 13) used it 2–4 times a week, and 39.0% (n = 16)used it 5 or more times a week. Of the 41 who used the PDMP, 97.6% (n = 40) found it useful for confirming clinical suspicion of drug abuse. 90.2% of users indicated that the PDMP information sometimes or often changed their management of a patient. 100% of the EPs aged 36–45 (n = 14) reported using the PDMP compared with EPs aged 46–55 (70%, n = 7) and aged 56–67 (66.7%, n = 8). 43.9% (n = 18) of EPs who used the PDMP would refer a patient to substance abuse treatment while only 13.0% (n = 3) of those who did not use the PDMP reported taking this action. The majority of EPs who used the PDMP (70.7%) stated that they had written fewer prescriptions, specifically 63.4% (n = 26) reported writing fewer prescriptions for opioids and 24.4% (n = 10) for fewer benzodiazepines (n = 10) since the implementation of the PDMP.

Qualitative data indicated that the most commonly listed barriers to use were the complicated log-in process and the amount of time required to utilize the program. 81% of EPs stated that a printout of a patient's PDMP information at triage would encourage their use of the information. 73.2% of users stated that their workplace was supportive of PDMP use, while only 39.1% of non-users had supportive workplaces.
Conclusions: Although barriers exist for EPs to use the PDMP, utilization often changed patient management and was associated with more referrals to substance abuse treatment and less reported opioid and benzodiazepine prescribing. Increased use was observed in EPs aged 36–46 and supportive workplace environments. Targeted education to sectors of EPs and healthcare organizations may increase PDMP utilization.
Keywords: Public health, Substance abuse, Presciption Drug Monitoring Program
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110. Physician Recognition and Knowledge of Medications with Boxed Warnings

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Background: "Boxed warnings" (BW) are the most serious level of warning provided by the Food and Drug Administration (FDA). The FDA reserves such warnings for medications in which a severe adverse drug reaction may lead to death or serious injury. The purpose of this study was to assess physician recognition and knowledge of BW medications, and to better understand where physicians obtain information about serious adverse drug reactions for medications they commonly prescribe. We hypothesized that knowledge of such warnings would be poor and that physicians would use diverse resources.
Methods: A cross-sectional survey instrument was administered to Attending physicians and resident physicians at UCSF. The survey instrument assessed awareness of medications possessing a BW and familiarity with the warning content for 15 medications (5 with and 10 without boxed warnings).
Results: The survey was distributed to 198 physicians, and there were 81 completed responses. Of the respondents, 28% were Attending Physicians, 1% Fellows, and 71% residents. Emergency physicians and Pediatricians made up 62% and 36% of respondents respectively. Respondents correctly identified only 36.3% of medications with BW and 83.8% of medications without such warnings. There was a statistically significant difference in the ability of attendings and fellows to identify medications with and without BW when compared to residents ($P < 0.05$). Among the residents, there was a statistically significant increase in the ability to identify medications with and without BW with increasing year of training ($P < 0.05$). The ability to correctly identify the content of the BW was poor. Respondents correctly identified the content of the BW with an accuracy of only 13.3%. There was no statistically significant difference in the ability of attendings compared with residents to correctly identify the content of a BW. There was also no statistically significant difference in the ability of residents to identify the content of such warnings by year of training. Only 37% of Emergency Physicians and 48% of Pediatricians reported

that they consider BW when prescribing medications. Furthermore, 29% of all respondents reported that they did not stay current or had no method of staying current with BW information.
Conclusion:A single cross-sectional survey of physicians and at an academic institution showed limited ability to identify medications with BW. With higher levels of training, providers were better able to identify which drugs contained a BW, but were no better at determining the content of the warning. Physicians infrequently considered BW when prescribing medications, and had no consistent resources for obtaining information about BW.
Keywords: Adverse drug event, Boxed Warnings, Education
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111. Marijuana Exposure Among United States Children Younger than Six Years Old

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Objective: This study investigates marijuana exposures among children < 6 years of age in the United States and examines the association between these exposures and legalization of marijuana for medical use.
Methods: Using data from the National Poison Data System, a retrospective analysis was conducted of marijuana exposures among children < 6 years of age from 2000 through 2013.
Results: There were 1,969 marijuana exposures among children < 6 years old from 2000 through 2013. The average number of cases per year was 140.6 or 5.90 per million children < 6 years. The mean age of an exposed child was 1.81 years (median = 1.58), and 77.7% of the exposed children were < 3 years of age. The majority of the children were exposed through ingestion (75.0%) or inhalation/nasal route (14.5%), and 18.5% of exposures required admission to a health care facility. The rate of marijuana exposure was significantly (2.82 times) higher in states where its use was legalized prior to 2000 compared with states where its use is not legal. From 2006 through 2013, the annual rate of marijuana exposure increased significantly by 147.5%.
Conclusions: Marijuana exposures among young children are rare, but the rate of exposure nationwide is rising, especially in states where the medical use of marijuana is legal. With more states likely to pass legislation legalizing the medical and recreational use of marijuana, increased efforts to establish child-focused safety requirements regarding the packaging of commercially sold marijuana products are needed to help prevent more children from being exposed to this Schedule I substance.
Keywords: Marijuana, Public health, Poison center
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112. TCA Trends, Twists, and Turns

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Background: Safer agents historically replaced tricyclic antidepressants (TCA) as the drugs of choice for the management of depression. We have noted a resurgence of patients with a diagnosis of depression being poisoned by TCAs. Additionally, TCA exposures are occurring in patients with diagnoses other than depression (ie. migraines, chronic pain syndromes, fibromyalgia...). The aim of this study is to characterize the evolution of TCA cases reported to a regional poison center (RPC) over time.
Methods: Utilizing Crystal Reports v. 11, RPC data were retrospectively queried for all intentional TCA exposures in patients 6 years and older. Cases from 2003 and 2004 (Group 1) were compared to those from 2013 and 2014 (Group 2). Data recorded included 1) total number, 2) indication for TCA, and 3) clinical effects/treatment (heart rate > 100, QRS > 100, altered mental status, bicarbonate requirement, intubation, and death).
Results: A total of 416 exposures occurred in Group 1, while 564 exposures were managed in Group 2. Indications for TCA therapy included managing withdrawal, migraines, cyclic vomiting, pain syndromes (neuropathic, muscular (shoulder, back, phantom limb), ovarian cysts, cancer), fibromyalgia, sleep disorders, MS, and PTSD. In Group 1, 2.5% of cases included patients on TCAs for medical conditions other than depression, while 12.5% were present in Group 2. Both study groups were relatively equal in rates of tachycardia (49–50%) and altered mental status (69–71%). Other clinical effects/treatment in Group 1 vs Group 2 resulted in the following respectively (QRS widening 18% vs 27%; bicarbonate therapy 21% vs 15%; intubation 22% vs 18%; death 0.2% vs 0.7%).
Conclusions: Our RPC experienced an increased number of intentional TCA exposures over a 12 year span. Interestingly, these data reveal a 5-fold increase in number of cases reported in patients on a TCA for indications other than depression. The overall number of deaths increased 3.5-fold. While these data are limited by its retrospective design, TCA poisoning continues to be a serious issue and may be secondary to management of broader indications other than depression.
Keywords: Tricyclic Antidepressant, Poison center, Alternate indications
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113. Sketchy Spice: Characteristics and limitations of synthetic cannabinoid-related toxicologic case reports

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Background: Case reports remain important in the clinical management of novel psychoactive substance (NPS) intoxications such as synthetic cannabinoids (SC) due to challenges in identifying and studying these compounds. Variability in the quality of these case reports may impair their clinical utility. The aim of the current study is to characterize the quality and limitations of synthetic cannabinoid (SC) case reports.

Methods: A literature search was performed via PubMed using the term "cannabinoid". Articles were limited to English language and involving human exposures. All results from May 1st, 2014 through March 31st, 2015 were then manually reviewed to identify case reports and case series related to SC ingestion. Selected articles were systematically reviewed by medical toxicologists. Fleiss' Kappa was used to characterize inter-rater reliability. Laboratory analyses were also appraised by a clinical toxicology laboratory researcher.
Results: Of 368 articles identified, 23 articles met inclusion criteria; these comprised 67 individual SC cases, 63 of which were reported in peer-reviewed journals. Fleiss' Kappa was 0.70 (95% CI = 0.67–0.74) between the three reviewers. Journal types included toxicology (n = 24, 36%), emergency medicine (n = 10, 15%), internal medicine (n = 4, 6%) and others (n = 29, 43%). 21% (n = 14) of cases were presented as single cases. Seven (10%) cases were autopsy cases. Cases were 72% (n = 48) male and 9% (n = 6) female; sex was not reported in 19% (n = 13) of cases. Mean age was 24.8 ± 8 years, with 19% (n = 13) of cases having no reported age. There was significant variability in the level of detail related to exposures. 33% (n = 22) did not mention the street name of the product, while 54% (n = 36) contained no mention of co-ingestions. 25% (n = 17) did not detail the time between ingestion and onset of symptoms. Of 60 non-autopsy cases, 51 (85%) did not report full physical exam findings, and only 12 (20%) included vital signs. Nineteen (28%) cases contained no details regarding severity of clinical effect. Details regarding interventions were reported in only 43% (n = 29) of cases. Serum or blood laboratory confirmation was performed in 69% (n = 46) of cases, of which 25 (54%) provided quantitative analyses. 8% (n = 5) of cases reported testing the actual product in question. Potential confounders were not addressed in 75% (n = 53) of cases, while 63% (n = 42) made no mention of study limitations.
Conclusions: Significant variability exists in the content of SC case reports, potentially impairing their clinical utility. Consensus-based criteria should be considered to improve the quality of these case reports.
Keywords: Cannabinoid, synthetic, Case reports, Medical toxicology
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114. Deprescribing proton pump inhibitor™s on a general internal medicine ward: a pilot quality improvement study

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Background: Unnecessary medication use is a preventable source of harm. One class of medication that is known to be overused, has significant associated adverse effects, and is a source of substantial costs are proton pump inhibitors (PPI's). While beneficial for specific conditions, the duration usually should be fixed; however, patients often remain on PPI's indefinitely, even after their acute indication has resolved. This contributes to polypharmacy and puts patients at risk for problems including C. difficile colitis, acute interstitial nephritis, pneumonia, osteoporotic fractures, as well as vitamin and electrolyte deficiencies. As a result, there is a growing emphasis on discontinuation of unnecessary drugs– a process coined "deprescribing".
Methods: This is a pilot quality improvement (QI) study using the Model for Improvement involving one clinical pharmacist serving one general internal medicine ward. An audit & feedback strategy is carried out wherein the pharmacist prospectively reviews newly admitted patients during their medication reconciliation with added focus on PPI's. For patients found to be on a PPI without an evidence-based indication, a suggestion to "deprescribe" is made to the medical team if the patient is agreeable to trial discontinuation. Prescription refill records 3 months post discharge will be audited to determine whether or not this medication was restarted. Rates of PPI use are compared to a control ward not involved in this QI study. The primary outcome is the percentage of patients that remain on a PPI without indication upon discharge.
Results: As of April 14, 2015, the intervention has been implemented for 4 weeks. On the intervention ward, 21 patients were admitted on a PPI. 8/21 had no evidence-based indication for ongoing therapy. Of these 8 patients, 6 had their PPI successfully stopped, 1 had their dose reduced, and 1 required their PPI restarted due to symptom recurrence. All changes were documented in the discharge summary. During the same period on the control ward, 18 patients were admitted on a PPI. Of these patients, 10 did not have an appropriate indication for therapy, and all 10 remained on their PPI upon discharge.
Conclusions: Admissions to hospital can serve as a window of opportunity to review medications for appropriateness and "deprescribe" any unnecessary drugs. A pharmacist-led screening intervention can lead to reductions in PPI use as demonstrated by our pilot study. Further patient recruitment is ongoing to better characterize the impact of this intervention. Lastly, 3-month follow-up of PPI prescriptions will determine whether changes made during hospital admission persist as outpatients.
Keywords: Quality Improvement, Deprescription, Proton pump inhibitors
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115. Meeting Millennials Through Music: Poison Center Collaboration with the Electronic Dance Music Scene - A Novel Public Health Approach

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Background: Young adults are historically difficult to target with drug safety messaging and public health campaigns. We describe the Poison Center's unique collaboration with Public Health entities and Electronic Dance Music (EDM) producers following a fatal overdose in an effort to reach this underserved demographic. As a result of this collaboration, the Poison Center was invited to an EDM event to promote drug safety awareness and the Poison Center 1-800 number.
Case Report: Our Poison Center was consulted on a cluster of high-profile Molly overdoses, including one fatality, which occurred on the first night of a large two-day EDM festival. Through public health messaging and collaboration with local

officials, event coordinators cancelled the 2nd night due to the potential public health risk.

Discussion: Following the fatality, the Poison Center hosted a debriefing with local public health, emergency medical response, police and healthcare facility representatives. Among the strategic goals developed, all parties agreed that increasing pre-event messaging to attendees and increasing communication between the various groups would be vital to improving health outcomes. The Poison Center was identified as a change agent for harm reduction, with potential for community wide impact.

While developing a relationship with local EDM producers, two of our staff pharmacist CSPIs, a toxicologist, and a volunteer wearing our Poison Center mascot costume participated in a subsequent EDM festival with 13,000 young adults in attendance. We used pre-event social media messaging to increase awareness of Poison Center services. Our focus at the event was to utilize a familiar mascot to increase visibility, while working in conjunction with their volunteers to promote safety and remind everyone of our state 'Good Samaritan' law protecting individuals who call for help.

Conclusion: The Poison Center was warmly received by party attendees, and many demonstrated their appreciation. Verbal communication is challenging in the event atmosphere, and requires more visual outreach tools. EDM festivals represent a novel and unique opportunity for Poison Center public education and outreach efforts to connect with this underserved poison population of Millennial young adults.

Keywords: Public health, Adolescent, Education

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116. Para-suicide by Fire (Extinguisher)

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Introduction: Acute phosphate toxicity (APT) can manifest after inhalation, ingestion or absorption of ammonium phosphate salts, resulting in phosphate nephropathy leading to acute renal failure (ARF). Unusual phosphate sources are dry chemical fire extinguishers (DCFEs), which contain high concentrations of ammonium dihydrogen phosphate [NH3(H2PO4)]. We report a case of intentional ingestion/inhalation of NH2(H2PO4) by a 66 year-old male, leading to ARF.

Case Report: A 62 y/o male was brought to ER after a suicide attempt where he intentionally placed the nozzle of a dry chemical fire extinguisher into his mouth releasing its contents. He arrived to an ED 30 minutes later with a powdery white facial residue. He was awake and alert, with chief complaint of respiratory distress. His O2 saturation was 95% on RA; the balance of the respiratory exam was unremarkable. Initial bloodwork showed a WBC of 16.1 k/uL; pH of 7.14; PCO2 30; PO2 82; bicarbonate 11; ammonia 38; Lactate 1.5 mmol/L; BUN 26 mg/dL and Creatinine 1.0 mg/dL. Six 6 hours after arrival his sodium was 141 mmol/L; potassium 4.2; Chloride 111 mMol/L and CO@ 14; BUN 22 mg/dL; Creatinine 0.8 mg/dL; Glucose 85 mg/dL; Measured osmolality 276; Anion Gap 16; Phosphorus 18 mg/dL;. His Calcium was 7.6 mg/dL and PTH 213 pg/mL. Labs were repeated 8 hours later which showed a BUN of 22 mg/dL; Creatinine 0.8 mg/dL; Glucose 85 mg/dL; Phosphorus 8.3 mg/dL and CO2 of 14 mEq/L. The patient underwent hemodialysis. Post dialysis labs showed BUN 17 mg/dL; Calcium 6.6 mg/dL; CO2 20 mEq/L; Phosphorus 3.9 mg/dL. He was treated with sodium bicarbonate and calcium supplements. Methanol and ethylene glycol were not detected. At 24 hours post-exposure, the patient complained of weakness and body aches. He developed a fever, nonproductive cough; and diminished breath sounds; requiring oxygen supplementation. The rest of his hospital stay was uneventful and he was discharged 72 hours post exposure.

Case Discussion: The patient responded well to one round of hemodialysis, sodium bicarbonate and calcium supplementation and supportive care.

Conclusion: There are few reports of intentional exposures involving (DCFEs); the present case adds to that literature, with all patients experiencing elevated serum phosphate concentrations and ARF. Elevations in serum phosphate induce electrolyte imbalances through influences on renal cell physiology. Early hemodialysis, along with calcium and sodium bicarbonate repletion, correct hyperphosphatemia, hypocalcemia and metabolic acidosis, reducing the risk of ARF, ventricular arrhythmias and hemodynamic decompensation.

Keywords: Renal toxicity, Hyperphosphatemia, Fire Extinguisher

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117. Deaths involving antipsychotic medications in New Zealand

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Background: Concern has been raised regarding increasing levels of quetiapine prescribing for off-label indications in New Zealand, and the potential for related harm.(1) This study aims to identify deaths which include quetiapine as a contributing agent, and compare these to both total poisoning fatalities and those involving the presence of other antipsychotic medications.

Methods: Coronial findings for the period 2008 to 2011 were obtained from the Coronial Service of New Zealand and reviewed by a medical toxicologist. Total deaths due to poisoning were examined, and those were antipsychotic drugs were contributory identified. In fatalities involving multiple drugs it was not possible to reliably discern the causative agent; therefore, analysis was of any drug involved in death considered due to poisoning. National population figures were obtained from Statistics New Zealand. Data were manipulated using Microsoft Excel®.

Results: Poisoning fatalities declined (table 1), with national death rates of: 6.0/100,000 population in 2008; 5.7/100,000 in 2009; 5.4/100,000 in 2010, and; 4.8/100,000 in 2011. There were 70 deaths involving at least one antipsychotic, with yearly fatalities increasing: 12 deaths in 2008; 21 in 2009; 15 in 2010; and, 22 in 2011. Two antipsychotics were concurrently ingested in three cases. The median age of antipsychotic related decedents was 42 (range 17 to 68 years), 54.3 % were male, and intent to self-harm identified in 44.3 % of cases.

In deaths associated with a single drug, clozapine was the most common antipsychotic, followed by olanzapine and then quetiapine with 12, 6 and 3 deaths respectively.

Table 1. Deaths involving antipsychotics.

Year	2008		2009		2010		2001	
Total Poisoning Deaths	258		248		235		213	
Antipsychotics	n	(%)	n	(%)	n	(%)	n	(%)
Quetiapine	1	(0.4)	5	(2.0)	5	(2.1)	10	(4.7)
Clozapine	4	(1.6)	11	(4.4)	2	(0.9)	5	(2.3)
Olanzapine	5	(1.9)	4	(1.6)	7	(3.0)	4	(1.9)
Risperidone	1	(0.4)	0	(0.0)	2	(0.9)	4	(1.9)
Chlorpormazine	1	(0.4)	1	(0.4)	1	(0.4)	0	(0.0)
Total* (% of Deaths)	12	(4.7)	21	(8.5)	17	(7.2)	23	(10.8)

*Note that three deaths involved two antipsychotic drugs.

Conclusion: During a period when deaths due to poisoning declined, fatalities involving antipsychotic medications doubled, and those that included quetiapine increased ten-fold. However, in cases where only a single antipsychotic was ingested, the leading cause of death was clozapine, followed by olanzapine then quetiapine.

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Keywords: Antipsychotic, Death, Overdose

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118. The Impact of Marijuana Legalization on Poison Center Calls in the Evergreen State

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Background: Washington State legalized medical marijuana in the year 1998 and became only one of two states to have legal recreational marijuana with the passage of bill I-502 in 2012. During the summer of 2014, the state's first retail marijuana shops opened for business. We looked at the impact of legalized recreational marijuana on the numbers of marijuana exposures, demographics, and outcomes reported to the state's poison center.

Objective: To examine trends in marijuana exposures called to the poison center in Washington State during 2014.

Methods: Retrospective cohort study from January 1, 2014 through December 31, 2014 of marijuana exposures reported to the state poison center.

Results: In 2014, there were 245 exposures involving marijuana called into the poison center, which is over a 150% increase from 2013 (n = 158). A significant portion of these calls regarded the intentional use of a marijuana substance in ages 13–29 years old (n = 109) followed by unintentional, unsupervised ingestion predominantly in children less than 12 years of age (n = 65). Ingestion was the most common reported route of exposure (n = 182) followed by inhalation (n = 88) and dermal application (n = 1). Products implicated in these cases included but were not limited to marijuana chocolate bars, brownies, infused drinks, gummy candies, and butane hash oil. A majority of patients were already in a healthcare facility at the time of the call (n = 128) and most were evaluated and released (n = 93). Seventy-five exposures (30%) were managed in a home residence withfollow-up from the poison center.

Conclusions: The use of marijuana products, both recreational and medicinal, in Washington State has posed unique challenges for the state's poison center and health department. The poison center data is used by the Liquor Control Board, which regulates recreational marijuana in the state, to make decisions on approved marijuana products and public education campaigns. The data is also presented as a monthly Toxic Trends Report on cannabis to inform the public and media on exposures occurring statewide. Since the passage of I-502, there has been an increasing trend in the number of exposures called to the poison center. It remains to be seen if this trend represents an increase in actual exposures or an increase in utilization of poison center services.

Keywords: Marijuana, Public health, Drug of abuse

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119. Survival from Supralethal Methemoglobin Level

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Introduction: Methemoglobin (MetHb) concentrations greater than 70% are generally thought of as not compatible with life. We describe survival in a child presenting in extremis with a MetHb concentration of 85%.

Case: A 6 year old female presented via EMS after being found vomiting, apneic, and "gray". She received rescue breaths at home and was intubated in the field with a 4.0 tube. She was an ex-27 week preemie with grade IV intracranial hemorrhage and developmental delay. On arrival, a large air leak was noted on the ventilator. Blood draw revealed "chocolate brown" blood and methylene blue (MB) 1 mg/kg was given. She was extubated and on preparation for reintubation she was agitated and breathing spontaneously. She was given second and third doses of methylene blue 1 mg/kg with midazolam for sedation. At that time the initial MetHb was 86.2% and lactate, 9.5 mmol/L. MetHb after the third dose of MB was 59.8% and she was given a fourth dose. She was admitted to the PICU.

Repeat MetHb level after the fourth dose was 52.2%, and lactate 10 mmol/L. Due to apparent diminishing effect of repeated MB dosing, we performed exchange transfusion with 285 cc of packed red blood cells. Repeat MetHb was 36.4% after exchange transfusion, with lactate of 0.6 mmol/L. The following morning, MetHb was 22.2% with marked improvement in mental status. Of note, the urine drug screen was positive for amphetamines and benzodiazepines.

Investigation of the patient's home found an empty tube of sensitive-formula toothpaste containing benzocaine. A source for the positive amphetamine screen was not found.

With supportive treatment, the MetHb level declined and her clinical condition improved to baseline. She was discharged on HD 6 in custody of the state child protection agency. Urine benzocaine level was 8.5 mcg/ml (reporting limit 5 mcg/ml, GC/MS). Comprehensive drug screening was positive for midazolam. Urine confirmation for amphetamines was nondetectable for amphetamine, methamphetamine, pseudoephedrine, ephedrine, methylenedioxyamphetamine (MDA), and methylenedioxymethamphetamine

(MDMA) (GC/MS). Sulfhemoglobin from HD 1 was 0.4%. (0.1–0.4%) G6PD activity was 9.7 U/g Hb (8.8–13.4 U/g Hb).
Discussion: The association between topical anesthetics and methemoglobinemia is well-established. Survival from supralethal methemoglobin concentration (98%) has been reported from exposure to Indian Holi dyes. It is possible that a structural similarity between benzocaine and amphetamine may be responsible for the positive screen. Additional research is needed to determine factors in surviving such severe toxicity.
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120. Deaths involving sedative-hypnotic medications in New Zealand

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Objective: New Zealand national Coronial findings during 2001 identified that sedative-hypnotic drugs were implicated in 39 of 200 (19.5 %) poisoning deaths. Since that time the dispensing of this class of pharmaceutical has increased dramatically. This study examines if this change has resulted in increased mortality.
Methods: Coronial findings for the period 2008 to 2011 were obtained from the Coronial Service of New Zealand and reviewed by a medical toxicologist. Total deaths due to poisoning were identified, and those involving sedative-hypnotic drugs further analysed to identify the offending agents and the number of related deaths. In fatalities involving multiple drugs it was not possible to reliably discern the causative agent; therefore, analysis was of any drug involved in death considered due to poisoning. National population figures for the years under study were obtained from Statistics New Zealand. Data were manipulated using Microsoft Excel®.
Results: Overall poisoning fatalities declined during the study period (table 1), with national death rates of: 6.0/100,000 population in 2008; 5.7/100,000 in 2009; 5.4/100,000 in 2010, and; 4.8/100,000 in 2011. There were 191 deaths involving at least one sedative-hypnotic agent: two drugs of this class were ingested in 39 of these cases and three implicated in five deaths. The median age of sedative-hypnotic related decedents was 45 (range 17 to 90 years), 55% were male, and intent to self-harm identified in 44% of cases. Of deaths throughout this period attributed solely to exposure to a single drug of this class, zopiclone was the most common agent, followed by benzodiazepine (not otherwise specified) and triazolam with 11, 3 and 3 deaths respectively.
Conclusion: During a period when deaths due to poisoning declined, fatalities involving sedative-hypnotic medications increased. The agent involved in most deaths, both as a single drug and in multiple overdose, was zopiclone.
Keywords: Death, Overdose, Public health
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Table 1. Deaths involving sedative-hypnotics.

Year	2008		2009		2010		2011	
Total Poisoning Deaths	258		248		235		213	
Sedative-Hypnotic	n	(%)	n	(%)	n	(%)	n	(%)
Zopiclone	19	(7.4)	28	(11.3)	28	(11.9)	34	(16.0)
Diazepam	8	(3.1)	15	(6.0)	15	(6.4)	12	(5.6)
Clonzepam	1	(0.4)	9	(3.6)	5	(2.1)	5	(2.3)
Benzodiazepine	3	(1.2)	3	(1.2)	3	(1.3)	5	(2.3)
Lorazepam	2	(0.8)	3	(1.2)	6	(2.6)	2	(0.9)
Triazolam	1	(0.4)	4	(1.6)	5	(2.1)	3	(1.4)
Temazepam	2	(0.8)	1	(0.4)	5	(2.1)	3	(1.4)
Alprazolam	1	(0.4)	0	(0.0)	2	(0.9)	0	(0.0)
Nitrazepam	2	(0.8)	1	(0.4)	0	(0.0)	0	(0.0)
Oxazepam	0	(0.0)	1	(0.4)	2	(0.9)	0	(0.0)
Total* (%)	39	(15.1)	65	(26.2)	71	(30.2)	64	(30.0)

*Note that 39 deaths involved two sedative-hypnotic agents and in 5 cases three

121. Use of a real-time continuous glucose monitor in a pediatric sulfonylurea exposure

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Background: Sulfonylureas are one class of medications commonly used in the treatment of diabetes. As the prevalence of diabetes increases, the chance of accidental exposure to these medications by children also increases. Management of these exposures requires frequent finger stick blood sugar (FSBS) checks as persistent hypoglycemia can occur. The following case describes the use of a real-time continuous glucose monitor (CGM-RT) in a child with sulfonylurea ingestion. To the best of our knowledge, this is the first report of GCM-RT used for this purpose.
Case: A two-year-old girl presented to the emergency department (ED) after suspected ingestion of a 5mg tablet of immediate release glipizide. She had been found playing with her grandfather's pill container and one pill was unaccounted for. The mother called the local poison control center and was advised to call 911. According to her mother, the child was acting normal. Upon EMS arrival to the home the mother decided to drive the child to the emergency room herself. Initial FSBS obtained by EMS is unknown. En route, the mother gave the child three tablespoons of granulated sugar mixed into soup and orange juice to drink. In the ED, the initial FSBS was 160 mg/dL with a repeat of 106 mg/dL fifteen minutes later. Vital signs were remarkable for a borderline heart rate of 130. She was age-appropriate, active, non-toxic, and fussy but consolable. Remaining physical exam was unremarkable. Laboratory studies were remarkable for an elevated lactate of 3mg/dL. The poison center was called and recommended FSBS every 15 minutes for one hour followed by checks every 30 minutes for 11 hours, and admission to a monitored bed. The patient was then transferred to the pediatric intensive care unit (PICU). A CGM-RT was placed for close monitoring in order to prevent needle sticks to the child, if possible. FSBS were obtained along with the monitor for the first two hours to ensure good correlation. Overnight, the monitor alarmed once with a reading of 55 mg/dL. FSBS obtained after the time of the alarm was 81 mg/dL. No intervention was performed. The patient did not require intervention with dextrose or octreotide overnight. After 24 hours without a hypoglycemic episode, she was discharged home with her parents.

Discussion: This case illustrates the potential utility of CGM-RT in suspected sulfonylurea ingestion in children. Such a device is less resource intensive, less invasive than repeated measurement of FSBS, and reduces sleep interruptions.
Conclusion: CGM-RT in the setting of suspected sulfonylurea ingestion in children may help improve the experience for the patient by decreasing painful procedures, and allow better utilization of healthcare resources.
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122. Whole Bowel Irrigation: Ten Years Experience at One Poison Center

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Objectives: Since 1997, position statements have recommended limiting use of whole bowel irrigation (WBI) to a more narrow set of indications. Our objective is to describe the changing use of whole bowel irrigation over the past 10 years at our poison control center (PCC).
Methods: Records of all healthcare facility (HCF) calls logged to our PCC from Nov 1 2004 through Nov 1 2014 were retrospectively reviewed. Cases from this period with WBI coded as performed were reviewed for equipment used and reported result of WBI including adverse reactions. Documented indication for WBI was compared to the AACT/ EAPCCT WBI position statement. AAPCC clinical outcome codes of WBI cases were compared to outcomes from all HCF cases using chi square.
Results: Out of 71,451 PCC cases managed in HCF during the study period, 102 cases were included in the study. Indications for WBI were met in 98 of these cases, the PCC recommended WBI in 80. Overall, annual frequency of WBI decreased with time, peaking at 19 cases in 2007 and falling to 3 in 2014. WBI was used in cases involving 62 different substances, 39 were polysubstance ingestions. The most common substances ingested were drugs of abuse and metals, including 32 body packers/ stuffers, 24 lithium, 11 iron, and 6 lead. Apparatus description was available in 67 cases – nasogastric or orogastric tubes were used in 45 of these. WBI results were described in 62 cases, of which 22 described a clear effluent or return of foreign matter. Twenty-six adverse events related to WBI were described; 16 vomited and 2 aspirated. Case outcomes were more severe in the WBI group than in the total population of patients managed in a healthcare facility during the same period (Chi-square $(5) = 45.8$, $P < 0.0001$).
Conclusions: WBI is rarely used and declining over time, but its use is typically consistent with recommended indications and it is often performed with appropriate equipment. WBI is associated with more severe outcomes, but it is unclear whether this is due to selection bias or effects of WBI. This study is limited by its retrospective design and reliance on poison center charts, which may have incomplete reporting of data.
Keywords: Decontamination, Whole Bowel Irrigation, Lithium
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123. Poisoned and Hallucinating: A 12-year review of California Poison Control System data

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Background: Hallucinations are associated with a variety of xenobiotics. While xenobiotics associated with hallucinations have been characterized individually, no comprehensive review of ingestions and exposures associated with hallucinations has been conducted. We sought to characterize those exposures associated with hallucinations that were reported to the California Poison Control System (CPCS).
Methods: We conducted a retrospective review of CPCS hospital-based calls with the symptom code "hallucinations" from 1997–2013. There were no exclusions, and institutional review board approval was obtained. Individual variables were gathered and analyzed using Excel.
Results: 7236 exposures associated with hallucinations were identified. The mean age was 25.7 ± 16 years, and 57.8% of cases were male. The most prevalent exposures were: plants (21.9%), anticholinergics (18.4%), illicit drugs (12.5%), combination medications (9.3%), and antidepressants (7.2%). Plant exposures were mainly anticholinergic plants (49.6%) and mushrooms (33.8%). Illicit drugs were most commonly methamphetamine (18.2%), although MDMA (17.8%), other amphetamines (15.7%), and LSD (15.7%) were also commonly reported. Combination medications were mostly anticholinergic- (42.4%) or dextromethorphan-containing (39.0%). The most common antidepressant associated with hallucinations was bupropion (41.7%) followed by selective serotonin reuptake inhibitors (21.4%). When analyzed over time, patient age increased from 25.2 to 28.8 years, plant exposures decreased (peak of 29.6% of cases in 2004 to 10.2% of cases in 2013), while hallucination cases associated with antidepressants and combination medications increased from 6.4% and 3.2% to 12.9% and 9.8% of total cases respectively, from 2009–2013. Illicit drugs associated with hallucinations declined from 20.8% to 14.5% of cases. Geographic data revealed that most cases originated from large central and large fringe metro areas; adjusting by case density revealed antidepressant cases were more frequent in small metro and nonmetropolitan areas, while plant exposures were more likely in large metropolitan regions.
Conclusions: The most frequent xenobiotics associated with hallucinations were from anticholinergic plant ingestions, followed by anticholinergic medications and illicit substances. The pattern of xenobiotics reported to the CPCS fluctuated over the 12 year span with an increase in antidepressant, combination medications, and decrease in illicit drug exposures over the last 5 years. Types of exposures varied by geographic location.
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124. Prospective evaluation of e-cigarette fluid exposures

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Background: E-cigarettes(ecig) are nicotine delivery systems designed to simulate cigarettes. The ecig device vaporizes liquid nicotine using a battery-powered heated coil. Refill containers are available in a variety of sizes/concentrations.

Cholinergic crisis has been described with the ingestion of other nicotine-containing products including cigarettes, chewing tobacco, and plants. However, it is unclear whether an exposure to ecig fluid may produce toxicity.

Methods: This IRB-approved study was performed at a single poison center(PC). Entry criteria were: a PC case with exposure to ecig liquid/vapor. A prospective data collection form included demographics, product information, and symptomatology, as well as coding instructions and mandatory follow up at 4h. Exclusion criteria were: symptoms determined to not be related to nicotine.

Data was collected from 10/14/2014 – 4/10/2015. Data was retrieved by searching the PC database for all cases coded for "e-cigarette" in the "Substance" category.

Results: 55 cases were recorded and met inclusion criteria and 1 case was excluded for a total of 54 study patients (9.15/mo). 34(65%) were children, 2(4%) adolescents, and 17(31%) adults.

Of the 34 children, 10(30%) were exposed to the ecig device and 1/10(10%) developed symptoms ('agitation' in 1 child).

24(71%) children were exposed to a refill container and 8/24(33%) developed symptoms, including vomiting(4), diarrhea(1), irritation of the lips/eyes(2), tachycardia(2), agitation(1), lethargy(1), and coughing(1), and 3 received hospital observation.

Overall, 25/34(74%) were asymptomatic and remained so.

Only 2/9(22%) children with symptoms continued to have mild symptoms at 4 hour follow up.

Of the 17 adults and 2 adolescents, 13(68%) developed irritation of the eye or mouth due to contact with liquid; 4(21%) patients "vaped too much" and developed nausea, diaphoresis, diarrhea, confusion, tachycardia, sedation, seizure, and drooling; 2(11%) spilled refill containers and developed vomiting lasting more than 4h and asymptomatic bradycardia (50bpm).

We identified 20 different refill products with 14 different flavors. Concentrations ranged from 0.2mg/mL-24mg/mL.

Conclusions: Exposures to ecig devices and refill fluids are common. Adult/adolescent exposures are typically irritation from exposure to liquid or cholinergic symptoms from overuse. Of the pediatric calls, few patients developed symptoms after sucking on the device, but exposures to refill containers produced more common and more severe symptoms.

Keywords: e-cigarette, nicotine, cholinergic

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125. Decline in carbon monoxide poisoning deaths in New Zealand

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Objective: New Zealand national Coronial findings during the 200 1 to 2002 period identified that 206 of 469 (43.9 %) poisoning deaths were a result of carbon monoxide exposure.(1) It was postulated that the increasing introduction of catalytic converters into automobile exhaust systems – thereby reducing emissions of toxic carbon monoxide gas – would reduce these numbers.(2) This study examines whether this reduction has occurred and compares carbon monoxide deaths to those due to asphyxiating gases.

Table 1. Deaths involving toxic/asphyxiating gases.

Year	2008		2009		2010		2011	
Total Poisoning Deaths*	258		248		235		213	
Gases	n	(%)	n	(%)	n	(%)	n	(%)
Carbon Monoxide	74	(28.9)	54	(21.8)	56	(23.8)	47	(22.1)
Butane	5	(2.0)	3	(1.2)	5	(2.1)	5	(2.3)
Helium	3	(1.2)	3	(1.2)	4	(1.7)	5	(2.3)
Total (% of total deaths)	82	(32.0)	60	(24.2)	65	(27.7)	57	(26.8)

*Deaths due to all forms of poisoning.

Methods: Coronial findings for the period 2008 to 2011 were obtained from the Coronial Service of New Zealand and reviewed by a medical toxicologist. All deaths assessed as due to poisoning were extracted, and those due to carbon monoxide, butane or helium (i.e. toxic/asphyxiating gases) identified. Yearly national population estimates were obtained from Statistics New Zealand. Data were manipulated using Microsoft Excel®.

Results: Overall poisoning deaths declined during the study period (table 1), with national rates of: 6.0/100,000 population in 2008; 5.7/100,000 in 2009; 5.4/100,000 in 2010, and; 4.8/100,000 in 2011. Carbon monoxide related decedents throughout this period were predominantly male (84 %), with a median age of 43 (range 2 to 93 years) and poisoned themselves with suicidal intent in 93.5 % of cases. Deaths due to carbon monoxide fell significantly as a percentage of total poisoning deaths when compared to the 2001 to 2002 period (43.9 % to 24.2 %).

Conclusion: A reduction in deaths related to carbon monoxide exposure for the years 2008 to 2011 was identified when compared with 2001 to 2002; and a trend of declining carbon monoxide deaths apparent within the 2008 to 2011 period itself. Interestingly, a reduction in deaths related to gases other than carbon monoxide was not identified. It appears that the increasing introduction of catalytic converters has reduced carbon monoxide fatalities and contributed to an overall reduction in poisoning deaths.

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Keywords: Carbon monoxide, Death, Public health

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126. Street Drug Exposures in Hospitalized Patients as Reported to the Toxicology Investigators Consortium Case Registry

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Background: According to the 2013 National Survey on Drug Use and Health, there were an estimated 24.6 million current illicit drug users age 12 and older, accounting for 9.4% of the population.

	Marijuana	Heroin	Cocaine
Total Cases Reported	99	349	252
Cases Meeting Inclusion Criteria	20	79	38
Age Range in Years (Mean)	1–55 (20)	14–64 (32)	19–60 (37)
Male	15	55	21
Female	5	24	17
Number Receiving Toxicological Treatment	11	66	28

Given this self reported national survey estimate, we sought to evaluate the frequency of street drug exposures in hospitalized patients seen by members of the Toxicology Investigators Consortium (ToxIC) and to compare patient characteristics.

Methods: In this retrospective review, all consult and attending cases reported to the ToxIC registry were reviewed between January 1, 2014 and December 31, 2014 if they were listed as exposures to the following categories: marijuana, heroin, or cocaine. Cases were included if these drugs were listed as the first primary exposure agent and if signs and symptoms were felt to be most likely tox related. Cases were excluded if the nature or location of toxicologist exposure was unspecified or only listed as ED unless they were also categorized as attending (inpatient). Cases were also excluded if they were categorized as either adverse drug reactions or adverse drug events.

Results: The table lists patient characteristics for the cases meeting inclusion criteria. Of the included marijuana cases, 2 were associated with seizures. Both of these cases were associated with marijuana inhalation and required intensive care unit (ICU) monitoring. Exposure to synthetic cannabinoids was not documented in either seizure case. There were an additional 7 marijuana cases requiring ICU monitoring, for a total of 9. Interestingly, 66 of the included heroin cases required treatment, with 35 receiving opioid receptor antagonist therapy. Additionally, of the 37 heroin cases requiring ICU monitoring 21 received opioid receptor antagonist therapy. Of the included cocaine cases, 15 required ICU monitoring. Three cases received sodium bicarbonate with documented QRS prolongation ($\geq$120 msec), 2 of which were also associated with ventricular dysrhythmias. There were 3 reported cases of seizure, one associated with prolonged QRS, but none associated with ventricular dysrhythmias.

Conclusions: Here, we were able to use data from the ToxIC case registry to evaluate frequency of marijuana, heroin, and cocaine exposure in hospitalized patients and to compare case characteristics. Data extracted from the ToxIC case registry can help identify trends in street drug exposure among hospitalized patients.

Keywords: Cocaine, Marijuana, Heroin

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127. Pediatric "Coma Bullae" after Buprenorphine Overdose

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Background: "Coma bullae" are a well known finding in adults with overdoses of opiate, sedative / hypnotic and other CNS-depressant medications. Such lesions are rarely reported in children, particularly in the context of an acute drug overdose.

Case Report: An 11 y.o boy did not awaken at his usual time, and his mother found him prone in bed, with his legs curled underneath his torso, his elbows tucked under his head and his face in his hands, with some vomitus noted on his mouth and the bed. He was minimally responsive, with most verbalizations incomprehensible, and was unable to stand unassisted. He was taken to a community hospital ED. There had been no prior fever, respiratory, gastrointestinal or dermatologic symptoms. Home medications included several taken by his parents including aripiprazole, citalopram, zolpidem, cyclobenzaprine, and buprenorphine, as well as loratadine and certirizine taken by the patient and his sister for seasonal allergies. On arrival to a community hospital ED, his VS were: T 36.7o, HR 124/min, RR 20/min, BP 125/75 mmHg, and SpO2 98% on NRB oxygen supplementation. His GCS was 9, and he was noted to have pinpoint pupils, with some "bruising" noted on extremities. A head CT and ECG were normal, and urine drug screen was negative. He was intubated and transported to a children's hospital. In the PICU there, his VS were: T 38o C, HR 124/min, RR 17/min (on ventilater), BP 87/48 mm Hg, and SpO2 100% on FiO2 35%. His PE was further notable primarily for elbow and knee swelling with erythematous patches and bullae on his face and extremities (see Figures). He underwent an extensive evaluation with consults to neurology, rheumatology, infectious diseases, and dermatology, and the PCC was called. His diagnostic workup included a large array of laboratory and imaging tests, including neurology recommendations for CSF evaluation, brain MRI, MRA/MRV and video EEG and rheumatology recommendations to test for sarcoid, vasculitis, oncologic processes, and macrophage activation syndrome. The patient improved rapidly overnight, and was extubated the next day. Comprehensive drug screening proved positive for buprenorphine and norbuprenorphine. The remainder of the diagnostic evaluation was essentially negative. The child was referred for psychiatric evaluation.

Discussion: Coma bullae are thought to be of multifactorial origin, but likely at least in part due to pressure associated with prolonged immobility. This patient manifested classic coma bullae after buprenorphnine overdose, yet underwent an extensive workup seeking an alternative diagnosis prior to toxicology consultation.

Conclusion Clinicians caring for children should be aware of this rare pediatric phenomenon.

Keywords: Buprenorphine, coma bullae, Pediatric

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128. QRS widening associated with quetiapine toxicity

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Background: Quetiapine induced cardiovascular effects including hypotension, tachycardia, and QTc prolongation are frequently noted following overdose. In contrast, quetiapine is often listed as a sodium channel blocking agent but quinidine like effects are rarely encountered in practice.

Case Report: A 32 year-old female with a history of intravenous heroin use was found unresponsive. Medics administered Epinephrine 1mg IV and Naloxone 2mg IV while providing

cardiopulmonary resuscitation and assisted ventilation with return of spontaneous circulation. On arrival to the hospital, the patient was noted to be pulseless. Compressions resumed and Epinephrine 1mg was administered. A wide complex tachycardia was noted and the patient received Sodium Bicarbonate 100meq IV with return of pulses. Review of prior ECG revealed a QRS of 92ms. Classic signs of sodium channel blockade - a QRS > 160ms and an R-wave in aVR - were present on the initial post-arrest ECG. Her QRS then between 148ms and 166ms on serial ECGs in response to an additional 550meq of Sodium Bicarbonate administered in 50–100meq boluses. She was hemodynamically unstable with refractory hypotension. Following intubation, she was started on sodium bicarbonate, norepinephrine, and epinephrine drips, received IV lipid emulsion, and was cooled. Routine labs were obtained and notable for a pH of 7.27 and a lactate of 25 mmol/L.

By 12 hours post arrest, the QRS had narrowed to 108ms with a loss of the R-wave in aVR. She was rapidly weaned off vasopressors. The course was complicated by rhabdomyolysis, acute kidney injury, persistent metabolic acidosis, and cerebral edema. On hospital day 3, the patient expired.

Autopsy was performed and cause of death was "drug toxicity". Quantitative analysis of postmortem peripheral blood revealed quetiapine 5529 ng/ml (therapeutic 200–600 ng/ml), oxycodone 59 ng/ml, free morphine 27 ng/ml, and methamphetamine/amphetamine < 50 ng/ml.

Case Discussion: To the best of my knowledge, aside from 1 abstract describing a single episode of QRS widening following orogastric lavage, case reports describing quetiapine associated QRS widening have all been complicated by the presence of cardiotoxic coingestants or lack of quantitative analysis. In this case, no other toxin potentially responsible for sodium channel blockade was identified, and the quetiapine concentration was massively elevated at time of death. Furthermore, the cardiovascular status and ECG parameters were responsive to sodium bicarbonate therapy.

Conclusions: A large, fatal quetiapine ingestion was associated with quinidine like cardiac effects.

Keywords: Antipsychotic, Arrhythmia, Postmortem

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129. Acute Rivaroxaban Overdose with Whole Blood Concentrations

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Background: Rivaroxaban is a novel oral anti-coagulant (NOAC) that specifically inhibits factor Xa. Routine monitoring of coagulation markers is not recommended with therapeutic rivaroxaban use. However, it only recently received FDA approval in 2011 and there are limited data regarding the clinical and laboratory manifestations of acute overdose. We report a single case of massive rivaroxaban ingestion.

Case Report: A 71-year-old man with atrial fibrillation, aortic valve replacement, and congestive heart failure presented to the Emergency Department (ED) after an intentional ingestion of 97 tablets (20 mg each; 1,940 mg total) of rivaroxaban in a suicide attempt. At presentation approximately two hours post-ingestion, he was asymptomatic with normal vital signs and had an unremarkable physical examination. His initial laboratories revealed: PT, 60.2 seconds; aPTT, 55.7 seconds; INR 7.2; BUN 28 mg/dL; and creatinine 1.2 mg/dL. The initial whole-blood rivaroxaban concentration obtained on hospital-day three was 160 ng/mL.

Day	PT (seconds)	aPTT (seconds)	INR	Rivaroxaban Concentration (ng/mL)
1	60.2	55.7	7.2	
2	46.3	47.1	5.2	
3	31.0	40.0	3.1	160
4	26.7	39.7	2.5	120
5	17.7	31.6	1.5	

The patient was admitted to the hospital for continued observation. Over the course of his hospitalization, the coagulation markers trended downward as shown in the table and he had no major bleeding events. On hospital-day four, he developed a small hematoma on his upper back, which was treated with compression alone. He was transferred to a psychiatric facility on hospital-day five at which time his coagulation markers had normalized. No reversal agents or blood products were given during his hospitalization.

Serial coagulation studies and rivaroxaban concentrations

Case Discussion: This case represents a massive, acute overdose of rivaroxaban confirmed by an elevated whole-blood rivaroxaban concentration three days post-ingestion. Phase II studies of rivaroxaban in therapeutic dosing showed a maximum concentration ranging from 40–400 ng/mL. The patient had no significant bleeding complications despite markedly abnormal coagulation studies. While the patient did experience a minor bleeding complication, it was self-limited and did not require any coagulation factor replacement.

Conclusions: In the setting of a single, acute rivaroxaban overdose, abnormal standard coagulation markers, including PT, aPTT, and INR may develop. Although this is a single case in a patient with normal renal function, rivaroxaban appears to be relatively safe in acute overdose and despite abnormal coagulation studies, administration of PCC or other coagulation factors may not be necessary.

Keywords: Anticoagulant, Overdose, Ingestion

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130. Retrospective review of conduction disturbances following diphenhydramine ingestions reported to Florida poison control centers

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Background: Diphenhydramine is commonly implicated in medication overdose likely due to its wide over-the-counter accessibility. In addition to commonly observed central and peripheral anticholinergic effects, diphenhydramine is also reportedly cardiotoxic, although literature regarding this cardiac toxicity is limited. The purpose of this study was to characterize the various

conduction disturbances following diphenhydramine overdose reported to the Florida Poison Information Center Network. Furthermore, this study evaluated how often pharmacologic interventions are initiated as a result of these conduction disturbances.
Methods: All single substance diphenhydramine ingestions reported to the three poison control centers comprising the Florida Poison Information Center Network from January 1, 2010 to October 31, 2014 were identified. Cases were excluded if they involved the history or presence of co-ingestants; a past medical history of coronary artery disease, arrhythmias, conduction disturbances, heart failure, or myocardial infarction; or if past medical history was not documented. Information collected included age, sex, amount ingested, reason for ingestion, duration of symptoms, length of stay, and associated medical outcome. Clinical evidence of cardiotoxicity including cardiac rhythm, rate, and QRS/QTc interval duration on ECG was recorded. In addition, the use of sodium bicarbonate or sodium acetate bolus or infusion, magnesium sulfate, antiarrhythmic agents, physostigmine, and activated charcoal was collected. Laboratory markers such as serum potassium, serum magnesium, arterial or venous pH were also collected.
Results: A total of 198 known single substance diphenhydramine exposures were included for analysis, 126 (64%) of which were female. Ages ranged from 9 months to 84 years, with a mean age of 26 ± 15.9 years. Sixty-six percent (n = 131) of cases were acute, intentional ingestions. Tachycardia and conduction disturbances were the most common cardiac manifestations reported, accounting for 96% (n = 190) and 30.3% (n = 60) of the cardiotoxic events respectively. QTc prolongation accounted for 86.7% (n = 60) of conduction disturbances, with a mean QTc of 461 ± 58.4 msec. Successful serum alkalinization (confirmed serum pH) was performed in 3 (1.5%) cases. Predictive factors for both primary and secondary outcomes will be reported.
Conclusion: Tachycardia and conduction disturbances were the most commonly reported cardiac manifestations. Of the conduction disturbances reported, QTc prolongation was most common. Predictive factors for both primary and secondary outcomes will be reported.
Keywords: Anticholinergic, Cardiac toxicity, Ingestion
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131. Hyperkalemia in the setting of digoxin toxicity had low mortality without use of digoxin specific fab fragments: a poison center observational study

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Background: Digoxin specific Fab fragments (Fab) remain standard treatment for patients with moderate to severe digoxin toxicity. Hyperkalemia remains an important indication for administration of digoxin specific Fab fragments based on the Bismuth study published in 1973. Outcomes of patients with digoxin toxicity and hyperkalemia, not treated with Fab has not been reevaluated. We sought to evaluate whether hyperkalemia in the setting of digoxin toxicity is associated with mortality.
Objectives: To describe outcome in patients with digoxin toxicity and hyperkalemia that were not treated with Fab.

Table 1.

Hyperkalemic Patients	N	[median dig], (IQR) ng/mL	[median K+], (IQR) mEq/L
No Fab, survived	15	3.1 (2.5–3.5)	6.0 (5.7–7.0)
Fab, survived	24	4.3 (3.4–5.4)	6.1 (5.9–6.8)
No Fab, death	1	4.0	6.3
Fab, death	2	6.0, 3.1	6.1, 6.3

Methods: Single PCC case review from 2002–2014. Search terms included digoxin and whether Fab fragments were administered as a treatment. Each chart was reviewed for mortality, type of exposure (acute, acute on chronic, chronic, or unknown). If available, the initial serum digoxin level (presumed ng/mL), creatinine (mg/dL), and potassium level (mEq/L) were recorded. Based on the Fab package insert, hyperkalemia was defined as potassium > 5.5mEq/L.
Results: A total of 358 cases of digoxin exposure were identified. Of these, 210 were treated in a healthcare facility (HCF). Of these, 42 were hyperkalemic and 16 did not receive Fab fragments. From this subset of patients there was 1 fatality. Of the 26 patients that were hyperkalemic and received Fab there were 2 fatalities. Median digoxin and potassium concentrations are listed in table 1.
Conclusions: Death associated with digoxin toxicity was uncommon in our series. The proportion of fatal outcomes in patients with hyperkalemia was similar regardless of Fab therapy. Limitations include hyperkalemic patients not treated with Fab tended to have lower serum digoxin concentrations and may have been less likely to have significant digoxin toxicity. Pseudohyperkalemia could have confounded our Results:
Keywords: Cardiac glycoside, Antidote, Hyperkalemia
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132. Rapid resolution of severe lactic acidosis following hydroxocobalamin administration in an intentional potassium cyanide overdose

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Background: Cyanide inhibits oxidative phosphorylation resulting in cellular hypoxia and lactic acidosis. Blood cyanide concentrations greater than 3.0 mcg/mL are usually associated with fatal outcomes. We report an intentional potassium cyanide overdose with a potentially fatal blood cyanide concentration whose lactic acidosis rapidly resolved after hydroxocobalamin administration.
Case Report: A 24-year-old man was found unresponsive by EMS in his car after he left a suicide note indicating he ingested "KCN". The ingestion was presumed to have occurred up to 2 hours prior. Upon ED arrival, he was unresponsive (GCS 8) and foaming at the mouth. Initial vital signs: BP 107/57 mmHg, HR 129 bpm, RR 26 bpm, O_2 sats 97%, Temp 33.3°C. Significant initial labs include: venous blood gas pH 6.9, pCO_2 24 mmHg, bicarbonate 4.8 mmol/L; serum lactate 29 mmol/L, Na 149 mmol/L, CO_2 5 mmol/L, AG 37 mmol/L, Cr 1.49 mg/dL, and Phos 6.1 mg/dL; WBC 35.7 K/mcL; troponin 0.01 ng/mL; urine drug screen positive for amphetamines and benzodiazepines; serum acetaminophen,

salicylate, and ethanol negative. ECG showed atrial fibrillation with rapid ventricular response, QRS 116 ms, QTc 572 ms, and rate 116 bpm. He was intubated and received normal saline IV x 1 L, $NaHCO_3$ 150 mEq/L IV x 1 L, hydroxocobalamin 5 grams IV infusion, and propofol IV 40 mcg/kg/min. Within 2 hours of ED arrival, the patient had one episode of hypotension (systolic BP 70 mmHg) responsive to IV fluids x 2L. Sedation was switched to dexmedetomidine IV (range 0.2–0.51 mcg/kg/hr). At 35 mins, 2 hrs, and 3 hrs post hydroxocobalamin administration, serum lactates were 19, 11.4, and 6.5 mmol/L, respectively. Within 7 hours of ED presentation, serum lactate normalized (1.4 mmol/L), and acidosis resolved (ABG pH 7.49; AG 8 mmol/L). ECG showed normal sinus rhythm with non-specific ST and T wave abnormalities, QRS 92 ms, QTc 406, and rate 71 bpm. Troponin peaked (0.51 ng/mL) 12 hours post-presentation. The patient was extubated 14 hours post-presentation and was discharged to an in-patient psychiatric facility within 48 hours of presentation. Blood cyanide concentration at ED presentation was 4.02 mcg/mL.

Case Discussion: Hydroxocobalamin is used alone or in combination with sodium thiosulfate as an antidote in the treatment of suspected cyanide poisoning. The temporal relationship between hydroxocobalamin administration and resolution of lactic acidosis in cyanide-poisoned patients has not been well described.

Conclusions: A patient with a potentially lethal cyanide concentration had rapid resolution of severe lactic acidosis after administration of hydroxocobalamin.

Keywords: Hydroxocobalamin, Cyanide, Acidosis

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133. Reported Suicide Attempt Exposures Continue to Increase Despite Decreasing Human Exposures

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Background: As nationwide human exposure case volume steadily declines, poison centers continue to see an increase in specific types of exposures such as suicide attempts. This study aims to examine the steady rise in suicide attempt exposures and evaluate temporal trends associated with these exposures.

Methods: A retrospective analysis of suicide attempt exposures compared to total human exposures reported to a statewide poison center system from 1998 to 2014. Monthly call volume data by year for both total human exposures and suicide attempt exposures were also analyzed.

Results: A total of 2,834,362 human exposures were reported from 1998–2014. Of these, 287,128 (10%) were suicide attempt exposures. From 1998–2004, human exposures gradually increased from 145,380 to 176,589. Between 2004–2010, human exposures plateaued before starting a decline from 2010–2014. In 2010 human exposure call volume peaked at 179,568 and continued to decrease to 161,095 in 2014. Suicide attempt exposures have steadily increased from 13,296 in 1998 to an all-time high of 20,000 reported exposures in 2014. Over this seventeen-year span, December and February account for the months with the lowest number of reported suicide attempt exposures, whereas; April and May account for the months with the highest number of reported suicide attempt exposures.

Conclusion: Research on seasonal effects of suicide rates suggests that the prevalence of suicide is greatest during the late spring and early summer months, despite the common belief that suicide rates peak during the cold and dark months of the winter season. This research provides supporting data by showing that suicide attempt exposures reported to a poison center system peak during April and May. Exposure specific data such as this can be used to prepare staff for handling specific types of exposures at appropriate times and months where call volume is expected to be high.

Keywords: Suicide, Epidemiology, Trends

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134. Accidental Pediatric Flecainide Overdose Treated with Intravenous Lipid Emulsion and Sodium Bicarbonate

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Background: Flecainide toxicity includes hypotension, seizures, and cardiac effects including QRS prolongation and ventricular tachycardia. Sodium bicarbonate (NaHCO3) is considered the mainstay of treatment, but the complexity of toxicity has prompted the search for adjunctive therapies. Cases of adult flecainide poisoning have reported rescue with Intravenous 20% Lipid Emulsion (ILE). The following is a report of a pediatric patient who was successfully treated with both ILE and NaHCO3 after developing life–threatening flecainide toxicity due to a dosing error.

Case Report: A 17 month-old female on 17 mg of flecainide was brought to the Pediatric Emergency Department after receiving 100 mg of flecainide at daycare. She was lethargic, hypotensive (BP, 64/41 mmHg) and had a wide complex tachycardia on EKG (QRS 162 msec). NaHCO3 was immediately ordered. At 11 minutes after arrival no improvement was apparent so ILE was given as an 11mL (1mL/kg) bolus and an infusion of 165 mL/hr (0.25mL/kg/min). It was then discovered that NaHCO3 had not been given and a 2 mEq/kg bolus of 4% NaHCO3 was administered at 26 minutes. At 29 minutes, she improved with a BP of 104/63 mmHg, QRS of 62 msec and QTc of 356 msec. Her remaining hospital course was uneventful with no known adverse effects (i.e. pancreatitis, pulmonary compromise) of ILE. Laboratory tests were not repeated until several hours after admission but no interference from the ILE was observed. She was subsequently resumed on flecainide.

Case Discussion: This case describes treatment of flecainide toxicity with ILE and NaHCO3 in a 17 month-old female. Flecainide is a complex drug that blocks cardiac sodium channels and weakly inhibits ryanodine receptors. Increasing extracellular sodium decreases effect of flecainide and the use of NaHCO3 is supported in case reports and animal studies. ILE has been used in adult cases of flecainide intoxication. No reports of ILE treatment for flecainide intoxication in children are identified. Based on the time course it is unclear if NaHCO3, ILE or the combined therapies were responsible for clinical improvement. The ILE dose was based on a report in a 20 month-old female of comparable weight experiencing cyclic antidepressant toxicity.

Conclusion: ILE and NaHCO3 were safely co-administered in a 17 month-old child with resultant clinical improvement. ILE,

NaHCO3 or a combination of the two may be promising in the treatment of flecainide intoxication.
Keywords: Pediatric, Antidysrhythmic overdose, Lipid therapy
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135. Non-Dermal Routes Used in Fentanyl Patch Intentional Exposures

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Background: Fentanyl is a powerful synthetic opioid, approximately 80 to 100 times more potent than morphine. Fentanyl transdermal patches have proven to be effective in the treatment of chronic pain, with characteristics that are beneficial in delivering long term, consistent relief. However, the same physical characteristics that make the patch effective present opportunities for a broad spectrum of abuse, misuse, suicide, and other types of intentional exposures through unintended use. This analysis examines non-dermal routes reported in fentanyl patch intentional exposures.
Methods: This analysis uses data from the Researched Abuse, Diversion and Addiction-Related Surveillance System (RADARS®) Poison Center Program from 2012Q1–2014Q4. Intentional exposure cases involving fentanyl patches were assigned routes by trained personnel. Routes were categorized as non-dermal (swallowed whole, crush/chew, inhale, inject, transmucosal, or other), dermal, or unknown. Multiple routes are possible within a case. Cases that mentioned a non-dermal route in addition to dermal were classified as non-dermal. Frequencies of route by intentional exposure reason (suspected suicide, misuse, abuse, and intentional unknown) were generated over the entire time period. For cases in which a non-dermal route was used, the distribution of the specific routes was also examined.
Results: From 2012Q1–2014Q4, there were 2,522 intentional exposures to fentanyl patches (2,665 routes mentioned) reported to the RADARS System Poison Center Program. Of those, 1,407 (55.7%) cases involved a non-dermal route. There were 717 (28.4%) suspected suicide, 409 (16.2%) misuse, 1,118 (44.3%) abuse, and 278 (11.0%) intentional unknown exposures. Non-dermal route was reported in 32.5% of the suicide cases, 52.6% of misuse cases, 76.1% of abuse cases, and 38.8% of intentional unknown cases. The most common non-dermal route for all intentional exposures was crush/chew, accounting for over 50% of routes in all categories of intentional exposures.
Conclusion: The majority of fentanyl patch intentional exposures reported involved a non-dermal route. Abuse cases had the highest proportion of non-dermal routes. The most common non-dermal routes mentioned for all intentional exposures were crush/chew and swallowed whole, accounting for approximately three quarters. Risk of harmful outcomes is increased with non-dermal routes; more so when involving a potent drug such as fentanyl patches. Therefore, interventions are necessary to identify and educate the public on the dangers involved with non-dermal routes in fentanyl patch exposures.
Keywords: Fentanyl patch, intentional exposures, unintended routes
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136. Gastrointestinal Decontamination Considerations in Weight Loss Surgery Patients

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Objective: The prevalence of patients who have chosen to undergo weight loss surgical procedures has risen in recent years. Some of these patients are being identified after having presented to emergency departments with a reported toxic ingestion. Because of altered anatomy, caution may be advised when poison centers make recommendations with regard to gastrointestinal decontamination (GID) procedures in these cases. This study aims to describe the GID procedures used in the post bariatric surgery population affected by poisoning.
Methods: A descriptive retrospective analysis was made of cases reported to a poison center system during the past 10 years involving toxic exposures in patients with a history of a weight loss surgical procedure and a GID procedure performed. Search terms like bariatric, lap band, gastric band, gastric bypass and sleeve gastrectomy were used.
Results: A total of 527 cases were identified. Activated charcoal was recommended and performed in 14% of cases and multi-dose activated charcoal in 0.19%. Gastric lavage was recommended in 0.39% of cases but performed in 2.16%, while whole bowel irrigation (WBI) was recommended in 0.19% of cases but performed in 0.77%. Of the patients on which GID procedures were performed, nausea was reported in 12%, vomiting in 9%, hematemesis in 0.4% and a positive X-ray finding in 0.6%. From these, 12% developed no effects, 17% developed minor effects, 27% moderate effects, and 10% major effects, and 1% were deaths that were deemed unrelated to the toxic exposure. Twenty percent of cases were not followed, 8% of cases were not able to be followed, and 4% were not followed due to unrelated effects noted.
Conclusion: Gastrointestinal decontaminate procedures have been one of the mainstays of treatment in poisoned patients. Due to altered anatomy, post bariatric surgery patients may be more at risk for complications of GID procedures due to their altered anatomy. This study shows that gastric lavage and WBI were performed more often than recommended and these two procedures can be associated with increased complications. A thorough and careful history of any weight loss surgical treatments should be obtained to help guide PC's GID procedure recommendations made by poison centers. Further research is required to determine the impact of weight loss surgical procedures on GID procedures recommended and performed on toxic exposure patients.
Keywords: Decontamination, Bariatric Surgery, Weight Loss Surgery
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137. Hemodialysis used to remove acetaminophen in patients with significantly elevated levels and hepatotoxicity

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Background: Acetaminophen (APAP) toxicity remains a significant clinical problem. Hemodialysis (HD) has been used for patients with massive overdoses of APAP demonstrating signs of mitochondrial dysfunction early after overdose. APAP is amenable to removal by HD and use of this clinical strategy may be beneficial in patients with diminished endogenous clearance, mitochondrial dysfunction, electrolyte/acid base disturbance, and signs of hepatotoxicity.
Cases: Patient A, a 61 y/o female, presented with an initial APAP level of 225.5 µg/mL after multidrug overdose. She was minimally confused with an initial blood sugar of 66 mg/dL, AST 1194 IU/L, ALT 1223 IU/L, creatinine of 1.47 mg/dL and urine drug screen (UDS) positive for benzodiazepines, barbituates, opiates, and oxycodone. Her pre-HD half-life (t1/2) of APAP was 13.9 hours and clearance (Cl) was 46.9 ml/min. Her t1/2 on HD was 4.6 hours with Cl of 160 mL/min . Her Cl due to HD was determined to be 46.9 mL/min with an extraction ratio (Q) of 0.45. Our second case, patient B, involved a 44 y/o male who presented after a multidrug overdose with an initial APAP level of 495 µg/mL. He was unresponsive at time of arrival with an initial lactate of 9.2 mmol/L, blood sugar of 388 mg/dL, AST 579 IU/L, ALT 1106 IU/L, creatinine of 2.9 mg/dL, and INR of 3.6. His pre-HD t1/2 of APAP was 19.6 hours and Cl was 8.3 mL/min. His t1/2 on HD was 7.3 hours with Cl of 183 mL/min. His Cl due to HD was calculated as 116 mL/min and Q at 0.58. Both patients survived and were ultimately discharged home.
Case Discussion: A common clinical conundrum is the care of critically ill APAP overdose patients who exhibit signs of significant hepatic injury but continue to have significantly elevated serum APAP levels. In our cases, HD was initiated early in an effort to remove the parent compound, preventing further production of toxic metabolites and potentially worsening liver injury. In our limited case experience, the clearance of APAP improved with HD and the patients' clinical status improved. There are many factors that may have influenced this, however, we feel the significant difference in APAP clearance observed in these cases cannot be ignored.
Conclusions: Hemodialysis may be beneficial for removal of APAP not only when levels are significantly elevated and when patients exhibit signs of mitochondrial dysfunction, but also when there are signs of decreased endogenous clearance and hepatotoxicity. The use of HD as an adjunct for treatment in these specific variations of APAP toxicity warrants further investigation.
Keywords: Acetaminophen (paracetamol), Hepatotoxicity, Hemodialysis
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138. Benzonatate Overdose Treated with Sodium Bicarbonate

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Background: A benzonatate overdose involving seizures and cardiac dysrhythmias was successfully treated with sodium bicarbonate.
Case Report: A 39-year old female presented to the Emergency Department (ED) with agonal respirations and hypotension. The patient overdosed on benzonatate perles (approximately 3000 mg), 1200 mg ibuprofen, and 1000 mg acetaminophen. Her mental status quickly deteriorated; EMS administered naloxone 1 mg IV without improvement and assisted respirations in route.

On arrival, her vital signs were BP 78/43 mmHg, HR 52 bpm, and oxygen saturation of 99% with bag-mask ventilation. She had a 30 second generalized tonic-clonic seizure that terminated spontaneously. The patient was given lorazepam 2 mg IV and intubated. A point-of-care glucose was normal. The initial rhythm on cardiac monitor was a wide-complex bradycardia. Two separate sodium bicarbonate boluses 100 mEq IV each resulted in narrowing of the QRS. The electrocardiogram showed sinus rate of 83 bpm, normal axis, QRS of 74 msec, and QTc of 436 msec. Additional treatment included 2 liters of normal saline and norepinephrine drip to maintain blood pressure. The QRS repeatedly widened, responding to further sodium bicarbonate boluses. In total, 11 ampules (550 mEq) were given in one hour. ABG was pH 7.44, pCO2 41.5, pO2 162.5, and sodium 150 meq/L.

Initial lab values were: sodium, 145 mmol/L; potassium, 3.5 mmol/L; chloride, 104 mmol/L; bicarbonate, 9 mmol/L; BUN, 19 mg/dl; creatinine, 1.7 mg/dl; glucose, 178 mg/dl; normal CMP; salicylate, 14.3 mg/dl; acetaminophen, 40 mcg/ml; ethanol, <5 mg/dl; urine drug screen positive only for benzodiazepines. Repeat salicylate level was 7.5 mg/dl.

In the MICU, the patient was quickly weaned off the norepinephrine drip. Her mental status improved, and she was extubated 12 hours after ED arrival. She had no further QRS widening, dysthymias, or seizures. On day two, she was discharged with no neurological deficits and normal renal function.
Case Discussion: Few reports of successful resuscitation of benzonatate overdose exist. While the exact mechanism of action is unknown, benzonatate acts peripherally to anesthetize tissue stretch receptors and suppress transmission of the cough reflex. In toxicity, seizures and cardiovascular collapse predominate, analogous to local anesthetic toxicity. One previous case report describes the unsuccessful use bicarbonate. Secondary to its similarity to tetracaine, sodium bicarbonate was ready to administer on patient arrival. This case suggests that sodium bicarbonate is a resuscitative option.
Conclusion: This case of benzonatate overdose with wide-complex dysrhythmia and seizure activity survived to hospital discharge after sodium bicarbonate treatment.
Keywords: Overdose, Cardiac toxicity, Neurotoxicity
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139. Near Death Experience with Baclofen Poisoning and the Role of the Poison Center

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Background: Baclofen is a $GABA_B$ agonist that, in overdose, can cause hypothermia, seizures, and profound coma. Multiple case reports have shown that it can mimic brain death. However, physicians caring for critically ill patients may not be aware of this. We present a case where a baclofen overdose mimicked brain death, and the family was told the patient was in fact brain dead. However, the intervention of Poison Control (PC) prevented withdrawal of care.
Case Report: A 42-year-old man was found comatose at home near pill bottles. Medications included baclofen, hydrocodone-acetaminophen, tizanidine, and gabapentin. He was given 0.4 mg

naloxone en route to hospital with no effect. On Emergency Department arrival, he abruptly had a tonic-clonic seizure. PC was contacted and supportive care was recommended. The patient was subsequently intubated. Vital signs after intubation were as follows: Temperature 32.8ºC, pulse 55 bpm, blood pressure 116/74 mmHg. Physical exam revealed mid-point pupils. Labs included a normal serum creatinine of 0.88 mg/dL. He was admitted to intensive care.

The next day, he continued to be comatose without sedation. The history suggested that the patient did not ingest a large quantity of baclofen. Therefore, brain death was suspected, and an electroencephalogram was performed which revealed no brain activity. A follow-up call from PC revealed that the treating physician gave the grim news of brain death to the family and planned for withdrawal of care in the next 1–2 days. However, the recommendation from PC was to continue supportive care, as the patient was known to have baclofen on his medication list. Furthermore, his presentation was consistent with baclofen overdose mimicking brain death. The physician was receptive and relayed the information to the family members. The patient began moving extremities later that evening and was discharged to Psychiatry in his usual state of health 4 days later.

Discussion: In this case, it was not recognized by the treating physician that a baclofen ingestion could mimic brain death. This caused the patient's family unnecessary grief and nearly cost the patient his life. However, as a result of a PC consultation, the treating physician was made aware of the many reports of baclofen mimicking brain death, and no permanent harm came to the patient.

Conclusion: We report a case of baclofen overdose mimicking brain death that nearly resulted in iatrogenic death. Verification with a PC before declaring brain death in an overdose patient can prevent unnecessary deaths.

Keywords: Coma, Poison center, Overdose

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140. Characterization of Exposures to Liquid Laundry Detergent Packets Reported to US Poison Centers from 01 January 2013 to 30 June 2014

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Background: Since becoming available in the US in 2012, liquid laundry detergent packets (LDPs) have grown in popularity. Along with increased popularity and availability, reported exposures to LDPs to US Poison Centers (PCs) have also increased and the safety of LDPs has been questioned. The largest published analysis of LDP exposures included exposures reported to PCs from March 2012 to April 2013. The objective of this analysis is to further describe LDP exposures reported through 30 June 2014.

Methods: The National Poison Data System (NPDS) was searched for all confirmed exposures involving ≥ 1 LDP product between 01 January 2013-30 June 2014. Cases were excluded if a non-LDP product was also involved. For the purpose of evaluating cases with the most detailed & accurate information, analysis focused on cases followed to a known outcome. Descriptive statistics were used to characterize NPDS categorical data for LDP exposures.

Results: 17,857 exposures to LDPs were reported during the study period, of which 13,307 (74.5%) were followed to a known outcome and involved single substance exposure to a LDP only. The slight majority of cases involved a male patient (51.3%; n = 6,825). Most exposures occurred in children aged < 6 years (93.9%; n = 12,497), with the highest incidence of exposure in children aged 2-< 4 years (42.9%; n = 5,704). Unintentional general exposures accounted for 97.7% (n = 12,995) of cases. Health care facility (HCF) treatment was recommended or received in 51.7% (n = 6,876) of cases with 11.3% (n = 778) of those involving admission to an HCF. Most cases involved minor (66.0%; n = 8,781) or no (22.6%; n = 3,002) effect, but 4 deaths (< 0.1%) were also reported. Vomiting (52.9%, n = 7,042) and dilute/irrigate/wash (81.6%, n = 10,857) were the most common clinical effect and therapy reported, respectively. As CNS depression is a concern among LDP exposures, the frequency of clinical effects and therapies related to CNS depression were also evaluated; drowsiness/lethargy was reported in 8.3% of cases (n = 1,101), respiratory depression in 0.4% (n = 53), and coma in 0.1% (n = 14). Intubation was reported in 0.6% of cases (n = 84) and the use of a ventilator in 0.6% (n = 75).

Conclusions: Exposures to LDPs continue to be reported to US PCs, primarily involving unintentional ingestions in children < 6 years old. Though 4 deaths were reported during this 18 month surveillance period, most exposures resulted in minor or no effect. Although half of reported exposures involved HCF referral or treatment, most cases did not involve admission. Ongoing surveillance will help monitor the safety of LDPs and the measures designed to reduce and/or prevent unintentional exposures.

Keywords: liquid laundry detergent packets, poison data system, Surveillance

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141. Hemolytic Crisis Following Acetaminophen Overdose in a Patient with G6PD

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Background: Relatively few case reports of hemolytic anemia secondary to acetaminophen overdose exist in the literature over the last four decades, and these are controversial with regard to presence of potential confounding factors such as systemic illness, co-ingestions or underlying hepatic pathology.

Case Report: A 30 year-old female was admitted 12 hours following an intentional ingestion of 10g Acetaminophen. Her only medical history is G6PD deficiency with no known baseline anemia or history of drug/ alcohol abuse. Initial labs were remarkable for an acetaminophen level of 72.3 mcg/mL. Her initial hemoglobin was 13.6g/dL. Her initial ALT was reported as mildly elevated and she demonstrated an indirect bilirubinemia. She was started on an infusion of N-acetylcystein (NAC) and admitted for monitoring. In the 42 hours following admission, her AST/ALT rose to 9118/8796 IU/L, and her INR to 3.4. Her haptoglobin level was diminished at 25 mg/dL and her LDH was elevated at 2250IU/l. She had an indirect bilirubinemia with an uncongugated bilirubin level of 6.9 mg/dL and a total bilirubin level of 10.1mg/dL. Her urinalysis was remarkable for bilirubinuria without hematuria, consistent with hemolytic anemia. Repeat serum acetaminophen level was

negative, as were salicylate level and UDS. Despite improvement in her liver function and INR, her anemia worsened over the next 4 days, reaching a nadir of 8.6g/dL on hospital day four, for a total decline of 5g/dL from initial labs.

Case Discussion: This patient presented with uncongugated bilirubinemia, decreasing hemoglobin, scleral icterus, jaundice, hemoglobinuria, diminished haptoglobin and elevated LDH, all consistent with acute hemolysis. During her treatment, the only additional medication she received was NAC, and no reports of hemolytic anemia were found with normal use of this medication. A review of available medical literature seems to establish a pattern of hemolysis in patients with more severe variants of G6PD deficiency, an X-linked recessive condition. While our patient does not have an established history of severe disease, in the absence of oxidative stressors, severity of disease is often not discovered until formal genetic or enzyme activity levels are established.

Conclusion: Acetaminophen has long been advocated as a medication safe for use in G6PD deficiency. Given the growing body of evidence which supports the role of acetaminophen as a direct cause of hemolysis in patients with G6PD deficiency as well as in-vivo and in-vitro studies which provide plausible mechanisms which could result in hemolysis, further study is warranted investigating both the mechanism and the correlation to G6PD disease severity.

Keywords: Acetaminophen (paracetamol), Overdose, Hemolysis

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142. Monitoring exposure rates to laundry detergent capsules as a basis to evaluate effectiveness of preventive measures

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Objective: Previous investigations have shown that liquid laundry detergents capsules (LLDCs) for single use have the potential to cause corrosive eye damages, pulmonary toxicity and serious laryngopharyngeal injuries. The present study is aimed at describing LLDCs exposure trends in order to provide a basis to evaluate the impact of preventive measures.

Methods: The study analyses a series of cases of exposure to laundry detergents handled by an Italian National Poison Control Center between September 1, 2010 and December 31, 2014. Routinely collected information were used to classify exposures according to LLDCs brand and producer, and poisoning severity. Changes in the exposure rates (number of cases/millions of LLDCs units sold by month) during the study period were monitored by using a cumulative sum chart (CUSUM chart) and bootstrapping techniques.

Results: A total of 1,651 cases of exposure to LLDCs were identified. Among them, 871 cases were exposed to products from a major producer (MPPs) and 279 to products from other producers (OPPs). All together, 89% (N. 1,472) of cases were less than 5 years old. About 76% (N. 1,256) of cases suffered signs/symptoms associated to the exposure. The changing point analysis detected one change in the rate of exposure to MPPs, while no changes were observed for OPPs. In particular, MPPs exposure rates changed in December 2012. The confidence that the change actually occurred was 100%. The MPPs average rate before the change was 2.1 (95%CI 1.4–2.4), while after the change it was 0.9 (95%CI 0.5–1.7). The mean OPPs rate during the study period was 1.1 (95%CI 0.6–1.5).

Conclusion: From August 2010 to June 2011, MPPs had been the only LLDC products on the Italian market. Untill August 2012 MPPs were sold in see-through containers, then the producer decided to start selling its brands in obscured containers. OPPs started to be launched on the market in June 2011. All of them were sold in opaque or in see-through containers which were extensively covered by labels and adverting. The observations here reported indicate that the risk of exposure to LLDCs can be halved by the use of obscured containers. However, considering that these products are more toxic than other types of laundry detergents, further preventive measures should also be considered.

Keywords: Liquid Laundry Detergent Capsules, Statistical analysis, Epidemiology

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143. Use of Tissue Perfusion Monitoring to Titrate High Dose Insulin in Beta Blocker and Calcium Channel Blocker Overdose

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Background: Tissue perfusion (StO_2) monitoring uses near-infrared spectroscopy to calculate the concentration of oxygenated hemoglobin in muscle tissue. It has been shown to correlate with surrogate measures of tissue perfusion such as mean arterial pressure (MAP) and has been validated in hemorrhagic and septic shock. Literature supporting its use in poisoned patients is lacking. We present a case of a patient in shock from a beta blocker (BB) and calcium channel blocker (CCB) overdose where therapies were titrated using StO_2 monitoring as the goal for resuscitation.

Case Report: A 51-year-old man presented to a rural emergency department after ingesting forty 25mg tablets of metoprolol and an unknown quantity of 5mg tablets of amlodipine. He became obtunded with a systolic blood pressure in the 50's and a heart rate in the 20's so he was intubated, given push-dose epinephrine and 3g of calcium gluconate. Poison control recommended using high-dose insulin (HDI), which was started at 1 U/kg/hr. He was then transferred to a tertiary care center. On arrival, vital signs showed a blood pressure of 79/49 and a heart rate of 39. The patient was placed on a StO_2 monitor with an initial reading of 69% (normal range 75–85%). An epinephrine drip was started at 0.1 mcg/kg/hr and HDI was increased to 10 U/kg/hr over the next 3 hours to increase StO_2 (see table). The patient was also given 50g of activated charcoal and a total of 9g of calcium gluconate during the resuscitation. StO_2 measurements rose to 73–75% with increasing HDI dosing. MAPs stabilized in the 60's but his heart rate remained in the 30's. The patient was transferred to the intensive care unit (ICU) where StO_2 monitoring was used to guide ongoing resuscitative efforts. Readings slowly increased to the high 70's over the course of two days. He was weaned off of the epinephrine and HDI and was ultimately transferred to the floor on ICU day 9 in stable condition and without neurologic sequelae.

Time (min)	2	22	24	29	32	85	91	100	101	106	110	124	143	188	198	207
MAP (mmHg)	59	57	54	55	59	63	61	62	58	59	60	63	57	57	56	64
StO_2 (%)		67	63	70	71	70	72	71	69	74	74	72	74	72	73	73

Discussion: Historically, achievement of goal MAPs has guided resuscitation in massive BB or CCB oversdoses. StO_2 measurements were used in this case of mixed cardiogenic and vasoplegic shock and correlated well with MAPs. StO_2 monitoring demonstrated adequate peripheral tissue perfusion despite persistent bradycardia. In the abscence of StO_2 monitoring, such bradycardia may have provoked even more agressive resuscitative efforts.
Conclusion: This case suggests StO_2 monitoring may be beneficial in guiding the resuscitation of patients with beta blocker and calcium channel blocker overdoses.
Keywords: Tissue Perfusion Monitoring, Beta blocker, Calcium channel blocker
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144. Preliminary Results of a Carbon Monoxide (CO) Educational Intervention

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Background: The CDC reports an average of 400 deaths annually from non-fire-related CO poisonings. US Poison Centers reported 13,863 CO human exposures calls in 2011. In an effort to reduce CO poisonings in our service area, the Poison Center designed a CO Prevention Program.
Methods: Four program sites were selected, each a Federally Qualified Health Center (FQHC) with patients identified as an at risk population living at or below the poverty level and living in a rural setting. The PC provided training materials to the sites, including CO brochures, job cards, listing essential teaching points and pre/post-tests. Staff instructed patients using the CO brochure and the job card as teaching tools, after which they distributed carbon monoxide (CO) detectors. Each person receiving training completed a pre and post educational intervention survey. A follow-up survey was conducted with those providing a telephone number.
Results: The program is ongoing and started in January 2015. This study represents 88% (480 participants) of the anticipated 546 and includes data through March 2015. Thus far, 70% (333) reported that they did not have a CO detector in their home. Reasons included: 43% (140) forget to purchase; 40% (131) too expensive; 19% (61) up to the landlord to buy and 3% (17) do not think it necessary. Twenty three percent (108) reported having one installed. Also, 63% (285) said they would call the poison center for CO information. Ninety-nine percent (474) would call either 911 or Poison Control with the same symptoms; six (1%) reported they would go back to bed without calling any resource. Following training, 100% of respondents would call 911 or Poison Control with the same symptoms; 99% (466) said they would install the detector. While respondents showed a high level of awareness of potential sources of CO poisoning initially, an increase in awareness was measured following the educational intervention. The follow-up survey was attempted with 307 (64%) patients with a 43% (132) completion rate. Of those 61% (81) had installed the detectors; 39% (51) had not.
Conclusions: This low-socio-economic, rural population recognized the PC as a primary resource for information about CO and would call an appropriate resource with a CO poisoning.

Further study of other socio-economic groups may help determine if the demographics of a population affects compliance with installation of CO detectors following an educational intervention.
Keywords: Carbon monoxide, Education, Poison center
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145. The Epidemiology of Alcohol and Substance-Related Emergency Department Admissions within a University Population

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Background: An all-cause data repository was established in order to characterize admissions to the ED within one university's student body. The primary objective of this study was to characterize the prevalence of substance and alcohol misuse in this population resulting in an ED admission between July 01, 2009 and June 30, 2014. The secondary was to evaluate the referral process used to help the students with their substance abuse problem.
Methods: ED admissions were queried for all unique admissions and identified as a substance abuse admission through a range of diagnostic codes. Clinical presentation characteristics were extracted from admission notes and tabulated. The University's Student Health Center database was queried for visits to the counseling center +/- 30 days of the admission. The prevalence of substance abuse was measured as the proportion of unique student admissions due to substance abuse among all admissions. Differences in demographics between students with substance abuse admissions and those who were admitted for other reasons were evaluated via chi-squared analyses. The range of substances identified through self-reports or laboratory screens and tests, clinical presentations, and clinical management and follow up recommendations were tabulated.
Results: Of the 2,754 unique admissions, 359 (13.0%) were identified as substance abuse-related admissions. There were more admissions among males than females due to substance abuse (53.5% vs. 46.5%, respectively) when compared to non-substance abuse related admissions ($p = 0.011$). Over half (56.3%) of all substance abuse admissions were among those 18–19 years of age, who accounted for 43.6% of overall admissions. Nearly 80% of admissions had chief complaints of alcohol intoxication, followed by non-overdose related medical complaint (20.9%), and altered mental status (3.6%). There were 338 (94.2%) admissions for alcohol intoxication, 21 (5.8%) admissions reporting cannabis, and 5 (1.4%) admissions reporting cocaine. The majority of students (70.2%) were referred to university's Student Health Center. While only 13 (3.6%) of students were seen by the Student Health Center 30 days prior to their ED admission, 33 students (9.2%) had a visit within 30 days after the admission, corresponding with a 230% increase in Student Health Center visits.

Conclusions: By monitoring the university population for alcohol and substance related admissions to the ED, we can evaluate the prevalence or burden within our student body, identify the populations at greatest risk, and establish educational interventions and appropriate counseling regarding substance abuse.
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146. Cost of Extracorporeal Treatments: a Worldwide Survey

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Background: The EXTRIP workgroup recently published systematic reviews and recommendations for extracorporeal treatments (ECTRs) in various poisonings. Intermittent hemodialysis (HD) was found to be both the most efficient and most favoured ECTR to enhance poison elimination. However, data on worldwide cost of HD compared to continuous renal replacement therapy (CRRT), hemoperfusion (HP), therapeutic plasma exchange (TPE), liver support device (LSD), peritoneal dialysis (PD), and exchange transfusion (ET) remain unknown.
Methods: An online survey was sent out from 01/2014 to 03/2015 to clinicians worldwide. Cost data on filters, consumables, dialysate, catheter, anticoagulant, nursing salary, and physician salary were compiled. All cost data were converted to US$ for comparison
Results: There were a total of 963 responders. Demographics of responders showed that 93% were physicians, 73% worked in a tertiary care facility, and 85% had an academic affiliation. Mean completion time was 52 min. Data of ECTR cost could be extracted from 168 responders in 52 countries. The median cost ratios of ECTR versus HD were: CRRT/HD = 1.7, HP/HD = 1.7, TPE/HD = 2.6, LSD/HD = 6.6, PD/HD = 1.4, ET/HD = 3.8 ($p < 0.001$ for all). Further, the median cost ratio of a 4 hour HD treatment over the total cost of one day in the ICU was 60%.
Conclusions: The results of this survey suggest that HD is at least 40% less expensive than other ECTR modalities worldwide, and this remains true regardless of a country's wealth. This lower cost to HD, added to its superior efficacy over other ECTRs, strengthens its preference as the ECTR of choice in acute poisonings.
Keywords: Cost, Enhanced elimination, Survey
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147. Characterizing the toxicity and dose-effect profile of tramadol ingestions in children

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Background: Tramadol is an opioid analgesic with serotonergic and noradrenergic properties. Tramadol overdose has been associated with life threatening seizures and respiratory depression. Few studies of tramadol poisoning include children of less than six years of age. The objective of this study is to characterize the toxicity associated with pediatric tramadol ingestions and determine doses associated with seizure or respiratory depression.
Methods: This is a retrospective evaluation of cases from the National Poison Center Data System between 1/1/2000 and 12/31/2013. Inclusion criteria were age < 6 years and single substance acute tramadol ingestion. For dose effect analysis, cases were eliminated that had insufficient dose quantity information.
Results: 7334 case records met inclusion criteria. Of those, 53.0% were male. Exact ages were reported in 7331 cases with a median age of 2 years. Management sites were non HCF (36.4%), treated/released from emergency department (54.5%), admitted to critical care (2.1%), admitted to non-critical care (3.8%), or other/unknown (3.2%). The majority of outcomes were no effect (84.8%); 12.6% were minor, 2.2% moderate and 0.4% major. There was one fatality. Of 1112 children experiencing clinical effects, the most frequently reported effects were drowsiness/lethargy (611, 54.9%) followed by vomiting (178, 16%). There were 25 cases with seizures, nine of which were multiple and two status epilepticus. There were 36 cases of respiratory depression, including three with respiratory arrest. Of 2772 cases for which total mg dose was available, respiratory depression occurred in 10 cases and seizures in six. Among 2031 cases with mg/kg values, respiratory depression occurred in seven cases and seizures in two. The median doses for respiratory depression and seizures, respectively, were 225 mg (range, 50–600) and 525 mg (range, 50–1050). The minimum weight based dose for respiratory depression/arrest was 7.9 mg/kg and for seizures was 4.8 mg/kg. Children ingesting 4.0 mg/kg or greater were more likely to experience respiratory depression (OR = 5.9; 95% CI, 1.527–22.94) than those ingesting under 4.0 mg/kg.
Conclusion: Seizure and respiratory depression are uncommon in pediatric tramadol exposures, yet they may occur at small doses of 50mg (as little as one tablet).
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148. Use of continuous veno-venous hemodialysis (CVVHD) to treat refractory metabolic acidosis due to massive ibuprofen overdose

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Background: While ibuprofen overdoses are common, massive overdoses requiring treatment with more than standard supportive care are rare. We report a case of refractory metabolic acidosis and hypotension requiring CVVHD.
Case Report: A 16 year-old male was brought to the ED by EMS approximately 5 hours after an intentional ingestion of ibuprofen and was intubated for depressed mental status. Two bottles of ibuprofen 200mg that originally contained 500 tablets each were found empty. Initial labs were remarkable for a pH of 7.2, pCO2 of 50, HCO3 of 14, lactic acid of 7.7, BUN of 10, and Cr of 1.3. Approximately 10 hours after ingestion, labs were significant for a pH of 6.93, pCO2 of 35, HCO3 of 11, lactic acid of 15.9, BUN of 10, and Cr of 1.18. Despite treatment with boluses of NaHCO3 (250mEq total) and a NaHCO3 infusion at 50mEq/hr, the patient's acidosis and hypotension persisted. Patient required ionotropic support with norepinephrine at 0.25mcg/kg/min, epinephrine at 0.2mcg/kg/min, and vasopressin at 0.55milliunits/kg/min. Polyuria was noted. Serum methanol, ethylene glycol, ethanol, salicylate, acetaminophen, and iron levels were unremarkable. A GC/MS

Hours post-ingestion	10	32	50	62	74
Serum ibuprofen level (mcg/mL)	570	171	327	138	62

comprehensive urine drug screen was positive only for ibuprofen, ondansetron, and caffeine. An ibuprofen serum concentration 10 hours post-ingestion was 570mcg/mL (normal 10–50mcg/mL). Due to the refractory acidosis, CVVHD was initiated approximately 11 hours post-ingestion. Patient underwent CVVHD for 19 hours. A rebound in patient's serum ibuprofen level was seen after the cessation of CVVHD but there was no clinical deterioration. Patient made a fully recovery and was discharged on hospital day 5. Cr on discharge was 0.66 and acid-base status was normal.

Case Discussion: Massive ibuprofen ingestions can cause refractory metabolic acidosis and hypotension. Hemodialysis has been described as a potential treatment modality in some of these cases. Use of continuous renal replacement therapy (CRRT) has only previously been reported in fatal cases.

Conclusions: In rare cases of severe, refractory metabolic acidosis and hypotension due to an ingestion of ibuprofen, treatment with CVVHD may be a useful treatment modality in patients too hypotensive for conventional hemodialysis.

Keywords: NSAID, Acidosis, Enhanced elimination

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149. Desvenlafaxine overdose and the incidence of serotonin toxicity, seizures and cardiovascular effects

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Background: Desvenlafaxine is a selective serotonin and noradrenaline reuptake inhibitor used in the treatment of major depressive disorder. Desvenlafaxine is an active metabolite of its parent drug, venlafaxine which has been associated with a number of adverse effects including seizures, serotonin toxicity and cardiac arrhythmias. This study sought to investigate clinical effects of desvenlafaxine in overdose.

Methods: This was a retrospective observational study of desvenlafaxine overdoses over a six year period. Demographic details, details of overdose, clinical effects, treatment, complications (serotonin toxicity, seizures, cardiovascular effects), and length of stay (LOS) were extracted from a clinical database of patients admitted to a tertiary toxicology unit. QT was measured manually from electrocardiograms and plotted against heart rate using the QT nomogram.

Results: There were 131 desvenlafaxine overdoses included in the study. Ninety one of 129 (70%) were female, and the median age of participants was 31 years (range: 15–68 years). The median dose taken was 1050mg (range: 250–5600mg). Eight patients (6%) received single dose activated charcoal between 1 and 4.25 hours post ingestion. The median length of stay (LOS) was 15.9 hours (Interquartile range [IQR]: 11–24hours). Serotonin toxicity (diagnosed by the Hunter Toxicology Serotonin Criteria) occurred in 5% of cases (7/129). Serotonin toxicity was associated with higher ingested dose (median, 2800mg) and longer LOS (median, 37h). Four of these patients ingested other drugs known to cause serotonergic effects. Seizures occurred in two patients (1.6%), 9.75 hours and 14 hours post overdose with doses of 5600mg and 2100mg respectively, and included co-ingestants. No patients had abnormal QT, although one patient developed rate-related bundle branch block. Sixty five of 129 (50%) patients presented with tachycardia (HR > 100bpm), (51/129) 40% with mild hypertension (systolic BP > 140mmHg) and 2% (2/129) with severe hypertension (systolic BP > 180mmHg). Five patients were admitted to intensive care, but all for co-ingestant toxicity – valproate (39g), amitriptyline (1.65g), oxycodone, amisulpride (9g) and one patient who died from a verapamil (7.2g) overdose.

Conclusions: This study shows that desvenlafaxine causes serotonin toxicity in overdose, and has a much lower frequency of seizures compared to venlafaxine, which appears to be dose related. Cardiovascular effects were related to noradrenaline reuptake inhibition, with tachycardia and hypertension, but not QT prolongation.

Keywords: Antidepressant, Overdose, Serotonin syndrome

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150. Concomitant clonidine overdose attenuates bupropion-induced sympathomimetic toxicity

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Background: Clonidine is an alpha 2 agonist used as an antihypertensive and sedative. Presynaptically, it prevents the release of catecholamines causing sympatholysis. In overdose, it causes sedation, bradycardia, and often hypotension. Conversely, buproprion inhibits reuptake of catecholamines in the presynaptic cleft causing a sympathomimetic presentation. It is structurally similar to cathinone, and has been known to cause seizures, hypertension, and tachycardia. Clonidine and bupropion individually produce clinically, opposing effects. We describe the unique clinical course of a patient who ingested large amounts of both clonidine and bupropion.

Case Report: A 17 year-old girl ingested 2.4 mg of clonidine and 1500 mg of bupropion in an attempted suicide. Upon transfer to our tertiary pediatric center, she was noted to be somnolent but arousable, had pin-point pupils and a pulse of 40 beats/minute with a blood pressure of 121/88 mmHg. Salicylate, acetaminophen, and ethanol levels were undetectable and her urine drug screen was negative. She had no acidosis, and an electrocardiogram demonstrated sinus bradycardia with a heart rate of 39/min, a QRS of 86 ms and a QTc of 379 ms. She was given one liter of fluid and admitted to a monitored bed.

During her hospital stay, she remained sedated with bradycardia until 23 hours after her ingestion. Suddenly, she became tachycardic with a peak heart rate of 126/min. She also developed nausea, anxiety, mydriasis, and a witnessed 3–4 minute generalized tonic-clonic seizure that resolved spontaneously. The patient was transferred to the PICU and treated with 1 mg of IV lorazepam for sedation and seizure prophylaxis. For the next 8 hours, she was tachycardic, hypertensive and tremulous. Thirty-one hours after ingestion, her symptoms resolved and her vitals normalized. She was discharged to a psychiatric facility 2 days after her ingestion without sequellae.

Case Discussion: In this case, we suspect the clonidine cleared from the patient first which later unmasked bupropion toxicity. Her clinical picture abruptly changed from bradycardic and sedated to tachycardic and agitated with a seizure. This case report demonstrates how an alpha 2 agonist may control symptoms in a patient who eventually develops toxicity from bupropion. Similarly, dexmedetomidine has been shown in several studies to blunt the sympathomimetic effects of cocaine.
Conclusions: Based on this case presentation, we theorize that alpha 2 agonists may offer a potential treatment for sympathomimetic toxicity. This case presentation suggests drugs like clonidine or dexmedetomidine may offer a therapeutic treatment for sympathomimetic-toxic patients, like bupropion toxicity.
Keywords: Clonidine, Buproprion, Sympathomimetic
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151. Polypharmacy Overdose Treated with Extracorporeal Membrane Oxygenation (ECMO)

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Background: Since 2009, extracorporeal membrane oxygenation (ECMO) has been increasingly used in the treatment of cardiorespiratory failure. Several retrospective studies have shown a good survival rate (76%) in patients treated with ECMO for severe acute drug intoxication. In this case, we report an instance where ECMO was used successfully in the treatment of severe lactic acidosis and cardiorespiratory failure in a pediatric polypharmacy overdose.
Case Report: A 16 year-old male with a history of depression was transferred from a community emergency department after an overdose of multiple medications, including metformin, levetiracetam, and paroxetine in a suicide attempt. On presentation to the emergency department, the patient was unconscious with a pH of 7.13 and lactate of 20.3 mmol/L. He was started on normal saline with bicarbonate, and was admitted to pediatric intensive care. The patient required intubation for altered mental status and vasopressors for profound hypotension. He was initially treated with continuous renal replacement therapy (CCRT) and did have improvement in his lactic acid and WBC levels. On hospital day #2 the patient developed cardiorespiratory failure and he was started on ECMO. Hemodialysis was performed concomitantly to aid in clearance of the patient's lactic acidosis. After six days of ECMO therapy, the patient was able to be weaned from treatment. Ejection fraction recovered and was reported as "normal" at the time of discharge. The patient had a full neurologic recovery and was able to be discharged to an inpatient psychiatric facility.
Discussion: ECMO therapy consists of a large-bore extracorporeal circuit for venous blood that passes through a membrane oxygenator, which in essence, acts as an artificial lung for the patient. In acutely poisoned patients, ECMO has begun to find increasing use as a salvage therapy for refractory shock and ARDS and allows for addition of continuous renal replacement therapy for toxin removal during support.
Conclusion: To our knowledge, this is the first case of ECMO treatment for metformin-induced lactic acidosis in a pediatric patient. We believe ECMO could be a valuable adjunct in the treatment of cardiac failure in acutely poisoned children, although objective clinical and biochemical markers for commencing ECMO therapy remain to be defined.
Keywords: Enhanced elimination, Metformin, Acidosis
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152. High Dose Intravenous Deferoxamine after a Large Iron Overdose

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Background: There is limited evidence regarding the safety and efficacy of deferoxamine (DFO) infused at rates higher than 15 mg/kg/hr in patients at high risk for severe iron toxicity. We report the safe use of high dose DFO in a patient with an extremely high serum iron level, 4573 mcg/dL.
Case Report: A 22 year-old female presented to a rural emergency department (ED) 90 minutes after ingesting ethanol and 180 tabs of 300mg ferrous sulfate tablets (216mg/kg elemental iron). The patient was drowsy, agitated and vomiting with a heart rate (HR) of 124–130, blood pressure (BP) 128/80, respiratory rate 20 and oxygen saturation 98%. The patient was transferred to a regional ED for advanced care. The first reported serum iron level 3 hours after ingestion was 4573 mcg/dL; by 71/2 hours the patient had significant blood loss per os and per rectum, and a metabolic acidosis. As the patient was agitated and willfully obstructing care, she was intubated and ventilated, then received whole bowel irrigation and isotonic intravenous fluids. In anticipation of severe potential toxicity given the serum iron level, intravenous DFO was initiated 8 hours after ingestion at 15mg/kg/hr, then two hours later increased to 30mg/kg/hr. No hypotension occurred with treatment. Because of the perceived potential risk for pulmonary adverse effects from sustained high dose DFO, the rate was returned to 15mg/kg/hr after 4 hours. Sequential urine samples were collected and examined for changes in color. Overnight the patient received a blood transfusion for a dropping hemoglobin concentration but her blood pressure was sustained without inotropic support. By 24 and 16 hours following ingestion and initiation of DFO, respectively, the patient's BP and perfusion remained normal, her HR normalized, her metabolic acidosis resolved and her 'vin rose' urine color cleared. The DFO infusion was stopped at this time because of the patient's clinical improvement and concern for adverse pulmonary effects from sustained DFO treatment. The patient was extubated at 35 hours post-ingestion without subsequent complications or residual adverse effects from the iron overdose or DFO treatment.
Case Discussion: Our patient was at extremely high risk for morbidity and mortality given the large overdose, high serum iron levels and initial severe gastrointestinal (GI) symptoms with associated bleeding that required a blood transfusion. Timely and aggressive therapy may have been lifesaving. Only 4 iron cases have been published in which the patient was treated with high dose DFO and survived.
Conclusion: Our patient had a rapid non-eventful recovery without any reported adverse effects from high-dose DFO despite the high serum iron level and initial severe GI complications.
Keywords: Heavy metals, Antidote, Chelation
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153. A Descriptive Analysis of Toxin-Induced Rhabdomyolysis

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Background: Rhabdomyolysis, skeletal muscle injury that results in the release of myocyte contents into the extracellular space, can be a consequence of toxic exposures. It can occur through a multitude of mechanisms such as exertion, hyperthermia, prolonged immobilization or compression and direct toxin injury. It is the intent of this study to delineate the types of toxins and other clinical aspects associated with the presence of rhabdomyolysis.

Methods: A retrospective case series was obtained from a poison system's electronic records from 2008–2013. The patient population was identified among single toxin exposure cases coded for rhabdomyolysis by poison center specialists. Exclusion criteria included: absence of rhabdomyolysis (creatinine kinase (CK) $<$ 1000 IU/L), unknown toxin or lack of toxic exposure, and cases with poor records or lost to follow up. Data extracted: age, sex, intentionality, reported seizures, trauma and prolonged down time, maximum temperature, heart rate (HR), systolic blood pressure (SBP), CK and creatinine concentrations, use of renal replacement therapy (RRT) and deaths.

Results: Of the 289 cases, 198 were included (males n = 130). Average age was 36.1 years. 87.8% (n = 174) were intentional overdoses. The five most common toxins associated with rhabdomyolysis were methamphetamine, methylenedioxymethamphetamine (MDMA), diphenhydramine, hydrocodone/acetaminophen combination products and quetiapine. The average maximum recorded temperatures, HR and SBP were 38°C, 112 beats per minute, 137 mm Hg respectively. Average maximum CK was 14,959 IU/L. 67cases (33.8%) were associated with prolonged down time and 38 cases (19.2%) with seizures. 98 (49.5%) cases showed increased CK from initial measurement. 56 (28.3%) had a recorded creatinine equal or greater 1.5 mg/dL. 24 (12.1%) patients received some form of RRT. There were 12 deaths. A grouped toxin analysis showed seizures were most frequently seen with MDMA (11/21), antidepressants (6/10) and antihistamines (5/12). Prolonged down time was most frequently associated with opiate (12/14), opiate/acetaminophen products (7/8) and atypical antipyschotics (6/8). MDMA, cocaine and dissociative hallucinogens were associated with the highest maximum temperatures of 39.4, 39 and 38.5°C respectively.

Conclusion: Rhabdomyolysis is associated with a wide array of various toxins. Sympathomimetics, opiate containing products and antihistamines were among the most commonly associated toxins. Seizures and prolonged downtime were often associated with toxin-induced rhabdomyolysis. A considerable amount of toxin-induced rhabdomyolysis was associated with creatinine levels equal or greater to 1.5 mg/dL.

Keywords: Poison center, Renal toxicity, Overdose

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154. Drug safety: results of an Italian pharmacovigilance project based on Poison Control Centers data

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Background: Medication errors (MEs) and adverse drug reactions (ADRs) have a great impact on health and public expense.

Poison Control Centers (PCCs) provide therapeutic indications to the general public or hospitals about MEs and ADRs and collect useful data to plan preventive strategies like modification of the packaging or product recalls. Therefore in Italy six PCCs in collaboration with the National Institute of Health and the National Medicines Agency, have instituted an active pharmacovigilance system to characterize the occurrence of these events, identify emerging risks and contributing factors.

In the present contribution are reported the results of a preliminary descriptive analysis of the data gathered by this system between May 2012 - May 2014.

Methods: For each patient detailed information was collected, including: age, dosage, formulation, active ingredients, cause of the error (in case of MEs), and clinical outcome, using the Poisoning Severity Score (PSS). Each case from the PCCs internal data system was anonymously assigned a univocal code.

Results: Overall 9.007 (91.8%) MEs and 804 (8.2%) ADRs were registered. In MEs two peaks were observed: in the 1–4 age group (n 2,331; 25.9%) and the over 70 age group (n 1.453; 16.1%). The typology of ME was a dosage error in 4,788 (53.2%) of cases, wrong drug 3.151 (34.9%), wrong route of administration 523 (5.8%), expired drug 225 (2.5%), wrong preparation 186 (2.1%), and combinations of multiple errors 21 (0.2%). The error was not specified in 113 (1.2%) cases. Symptoms were absent in 7,630 (84.7%), mild in 1,016 (11.3%), moderate in 263 (2.9%), severe in 30 (0.3%). It was not possible to assign a PSS score to 68 patients (0.7%)

Acetaminophen was the drug most frequently implied (n 1,200; 12.7%) followed by amoxicillin clavulanate (n 284; 3.0%), amoxicillin trihydrate (n 227; 2.4%). Among the first 10 drugs, albuterol (n 216; 2.5%) and tosylchloramide (n 137; 1.5%) represent a rising issue in certain age groups. The ADRs results showed a different age trend hitting more frequently patients $>$ 20 years old (n 608; 75.6%), while the younger patients were only 189 (23.5%).

PSS scores for the ADRs were as follows: mild 416 (51.7%), moderate 299 (37.2%), severe 80 (9.9%). For 9 cases (1.1%) the PSS score was not assignable.

The drugs most frequently involved were: Lithium carbonate (n 47; 4.9%), amoxicillin clavulanate (n 40 4.2%), metoclopramide hydrochloride (n 25; 2.6%).

Conclusions: This data provided an effective characterization and monitoring of the risks connected with the use of drugs in Italy. Additionally, it enabled the competent authorities to promptly identify albuterol and tosychloramide as emerging problems in specific age groups.

Keywords: Medical toxicology, Poison center, Surveillance

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155. The real rat race: Treating a brodifacoum poisoning for 9 months

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Background: Long-acting anticoagulant (LAA) rodenticides are potentially lethal toxins. Reports of LAA ingestion have described long, though widely ranging, duration of anticoagulant action. We report a case of brodifacoum poisoning that required high dose oral vitamin K (vitK) therapy for more than 9 months.

Case Report: A 41-year-old Chinese woman ingested 2.4 grams of doxylamine and 20 mL of a liquid rodenticide imported from China in an attempt at self-harm. She had an episode of torsade de pointes on hospital day (HD) #1 requiring advanced cardiac life support with a return of spontaneous circulation. Her INR rose to 3.5 on HD #2 and her treating clinicians administered low dose vitK therapy. Between HD #2–6, her INR fluctuated between 2.6 and the laboratory upper limit of >6.4. She was transferred to our hospital for management by the toxicology service. On arrival, her Factor VII level was 32% and her INR was 2.6. Factors V and VIII were normal. Physical examination showed no signs of bleeding or liver disease. Oral vitK therapy was initiated at 50 mg every 6 hours, and increased to 75 mg every 6 hours until her INR and Factor VII normalized. Blood samples were positive for brodifacoum by liquid chromatography-mass spectrophotometry on days 168, 185, and 193 after ingestion. Ten other LAA rodenticides and warfarin were not detected. Her coagulation profile and vitK dosing are shown in the Table. She required high doses of oral vitK for 285 days.

Day post-ingestion	INR	Factor VII (%)	Daily vitK (mg)
1	2.6	32	200
2	3.0		300
7	1.1	88	240
12	1.1	88	200
15	1.1	92	160
17	1.1	84	140
21	1.1		100
23	1.2	78	20
30	7.5	2	100
32	1.3	80	100
33	1.3	68	80
35	1.3	66	80
41	1.1	65	80
60	1.2–1.3		70–80
90	1.2–1.4		50–60
120	1.2–1.4		50–60
150	1.2–1.4		30–60
180	1.2–1.6		30–40
210	1.2–3.0		30–50
240	1.1		
270			5–10
285	1.1		0

Case Discussion: This patient required over 9 months oral vitK therapy, representing one of the longer durations of anticoagulation documented in the medical literature. This may have resulted from her ingestion of a very concentrated liquid formulation. Although she was compliant with oral vitK therapy, follow-up appointments, and denied repeat ingestions during the course of therapy, the titration of vitK was still problematic. Multiple studies estimate the half-life of brodifacoum from 243 to 1656 hours. Its duration of action may be even more difficult to estimate, as anticoagulation effects may continue even after serum concentrations become undetectable. Assays for the presence and quantitation of superwarfarins are not readily available, making it difficult to estimate the endpoint of therapy.

Conclusion: Despite multiple reports of the toxicokinetics of brodifacoum, estimating its duration of effect and endpoint of therapy remains difficult.

Keywords: Rodenticide, Anticoagulant, Brodifacoum

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156. Tilmicosin Toxicity Successfully Treated with Calcium, Insulin, and Lipid Emulsion

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Background: Tilmicosin phosphate (Micotil®) is a bovine macrolide antibiotic that has human cardiotoxicity through myocardial depression potentially via decreased transmembrane calcium flux. We present a case of tilmicosin toxicity treated with intravenous (IV) calcium, high-dose insulin euglycemia (HIE) and intravenous lipid emulsion (ILE).

Case Report: A 36 year old man accidentally injected tilmicosin into his left distal forearm. His wife immediately applied a tourniquet which was removed and reapplied by paramedics for an estimated tourniquet time of an hour. Initial ambulance evaluation noted a heart rate (HR) of 110 beats per minute (bpm), blood pressure (BP) 128/88 mm Hg, respiratory rate (RR) 20 breaths per minute, electrocardiogram (ECG) of sinus tachycardia, and a swollen, erythematous left forearm. ED initial assessment one hour post-exposure revealed an alert, anxious patient with HR 110 bpm, RR 20 breaths per minute, BP 133/88 mm Hg, O2 saturations 100% on a non rebreather mask, and scant bilateral crackles on lung exam. Serial ECGs showed sinus tachycardia. Initial chest X-ray (CXR) was unremarkable. Over the next two hours, the patient developed dyspnea, chest tightness, nausea, and hypotension (BP 89/63 mmHg). Despite IV hydration, his BP dropped to 67/32 mm Hg. 1 g calcium gluconate IV bolus, bolus phenylephrine and dopamine at 2.5mcg/kg/minute were initiated. 3 grams of calcium chloride, 25 grams of dextrose and a Humulin R infusion (100 unit bolus then 100 units/hr) were given IV. Systolic BP improved from 50 mmHg to >90 mmHg. A 100 ml bolus and 500 ml infusion of 20% ILE was given over 30 minutes. Dobutamine (replacing dopamine) was initiated at 2.5 μg/kg/minute and was stopped as systolic BP maintained >120 mmHg. The insulin and

calcium infusions were titrated off during the initial 16 hours in the ICU. Repeat CXR showed pulmonary edema. High sensitivity troponin T levels peaked at 281 ng/L [normal 1–14 ng/L] 18 hours post-exposure. Transthoracic echocardiography was normal. The patient was discharged home on hospital day #4 with forearm pain, swelling and erythema treated with over the counter analgesics and cephalexin.

Case Discussion: This case of tilmicosin toxicity responded well to the inotropic effects of calcium, HIE and ILE. With evidence that tilmicosin cardiac toxicity is due to calcium channel blockade, IV calcium and HIE may improve symptoms. As tilmicosin has a similar octanol:water coefficient to bupivacaine, ILE may also provide clinical benefit.

Conclusions: Tilmicosin toxicity responded well to IV calcium, HIE and ILE. Though well known to be potentially lethal in human exposures, aggressive treatment with multiple modalities resulted in a positive outcome.

Keywords: Tilmicosin, Cardiac toxicity, Antibiotic

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157. Adolescent Intentional Abuse Ingestions: Overall 10 year Trends and Regional Variation

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Background: Adolescent intentional ingestions remain a large problem in the United States. There has been little research to date on the over-the-counter or prescription medicines, including opioids, that adolescents abuse, and whether there are trends in substances or frequency of abuse leading to harm. These trends are important for anticipatory guidance by primary care providers, preventative health, and Poison Center outreach.

Methods: This was an observational study using the American Association of Poison Control Centers National Poison Data System (NPDS). The study population consisted of all calls regarding patients aged 13–19 years between 2004–2013 in the database with a coding of "intentional-abuse". A subgroup analysis was performed to include intentional-abuse cases that ingested an opioid containing agent. The estimated population data by Surveillance, Epidemiology, and End Results (SEER) Program was used as the denominator to calculate the average annual rate of opioid ingestions per 100,000 adolescents.

Results: There were 486,255 unique patient calls between 2004–2013 for adolescents aged 13–19. Of these, 95,695calls were for intentional-abuse. The most common agent ingested was antihistamine with dextromethorphan, and remained at the top of the list across the 10 year study period. The next 4 most common agents remained similar across the study period as well and included ethanol, benzodiazepines, dextromethorphan alone, and marijuana. These five agents remained the top ingested across the study period by US territories (West, Midwest, South and Northeast). Among opioid-containing substances, acetaminophen with hydrocodone was the most commonly ingested (31.2%) followed by oxycodone alone (15.4%), unknown narcotic (11.7%), acetaminophen with oxycodone (10.8%), and methadone (10.7%). The South had the highest frequency of opioid ingestions (41.1%) across the study period, followed by Midwest (25.0%), West (18.2%), and Northeast (15.8%). The Midwest and South had the highest average annual rate of 2.0 ingestions per 100,000 adolescents, followed by Northeast (1.6 per 100,000) and West (1.4 per 100,000).

Conclusions: Adolescent intentional abuse ingestions have remained prevalent over the past 10 years. Common cough preparations remain the most commonly ingest among all years. In addition, adolescent opioid ingestions appear to show regional differences. Further population and prescribing practice data is needed to investigate this further.

Keywords: Abuse, Adolescent, Ingestion

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158. Nationwide analysis of the impact of carbon monoxide alarms on carbon monoxide poisoning in the US

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Background: In a 2005 nationwide survey, 29% of respondents reported having carbon monoxide (CO) alarms in their residence. In 2012, however, CO poisoning accounted for ~50,000 emergency visits in the US. To date, existing studies on CO alarm effectiveness are isolated to single states, cities, or counties. The objective of this study was to compare the broad-scale incidence across the US of CO poisonings prior to and following the passing of statewide CO alarm laws.

Methods: Number of hospital discharges with all cause CO poisoning as primary diagnosis from 1997–2012 by state were extracted from Healthcare Cost and Utilization Project (HCUP) database. Unintentional CO exposures by state from 2000–2013 were obtained from American Association of Poison Control Centers (AAPCC) database. Rates (%) per 100,000 population were calculated from the national census. Year statewide CO laws were passed were obtained from published sources. Outcomes measured were hospital discharges (HCUP) and incidence of CO exposures (AAPCC). 3-year pre-CO law and post-CO law averages were compared using paired t-tests ($\alpha = 0.05$). Factors included in multiple regression analyses were temperature (mean low January), average state income and education level, # of years since law passed.

Results: Percent change in all cause CO related hospital discharges ($n = 19$ states) decreased significantly after the passage of statewide CO alarm law ($t = -2.256$, $p = 0.037$). Low temperature also predicted outcome (CO related hospital discharges) in a regression analysis ($p = 0.011$). Looking at AAPCC data, there was no significant difference in rate of CO exposures that resulted in death before and after CO alarm law passage. After CO law passage, there were less unintentional CO exposures managed onsite vs. healthcare facility ($t = 2.454$, $p = 0.019$). However, there was no difference in incidence of total CO exposures by state pre- and post-CO alarm law ($n = 36$ states, $p = 0.204$). Multiple regression analysis of CO exposure rate before and after law passing showed significant association with income ($p = 0.03$) and # of years since law passed ($p = 0.009$).

Conclusions: Statewide CO alarm laws are associated with reduced hospitalizations due to all cause CO poisoning though they have not significantly reduced AAPCC calls related to unintentional CO exposures and deaths. Contributory factors include low temperature, income level, and number of years since CO alarm law

was passed. CO alarm laws may have raised awareness, thereby decreasing exposures requiring hospitalization while maintaining exposure inquiries to poison centers. Further analysis following additional time after the passing of CO alarm laws may confirm these trends.

Keywords: Carbon monoxide, Poison center, National Poison Data System

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159. #FOAMtox 2014: A Year in Review

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Background: The use of Twitter as a social media platform has been increasingly utilized in the field of clinical toxicology. In 2013, the hashtag "FOAMtox" (#FOAMtox) was created by clinicians who are actively engaged on Twitter for the purposes of sharing clinically relevant information within the field of clinical toxicology as a means of accelerating knowledge translation. It serves an extension of #FOAMed (free open access medical education). The purpose of this study was to evaluate the content of tweets that have incorporated #FOAMtox in 2014 in order to characterize the types of tweets generated over the course of the year, which is the first full year since the inception of this hashtag.

Methods: A manual search of #FOAMtox was conducted via Twitter, and a PDF file was generated for analysis for the year 2014, which included the date, time, and a link to the Twitter account of the user from which the tweet originated. Tweets utilizing the #FOAMtox were analyzed and categorized into different categories, which included those that relate to traditional print publications, updated guidelines, clinical pearls, and social media resources discussing various aspects related to clinical toxicology.

Results: A total of 873 tweets were generated from 122 unique international Twitter users using #FOAMtox in 2014. Most tweets were generated by Twitter users who identified themselves as attending physicians (43, 35.2%); other Twitter users who utilized the hashtag included medical residents (24, 19.6%), clinical toxicologists (15, 12.3%), and pharmacists (9, 7.3%). Social media resources available in the forms of educational blog posts and podcasts accounted for the majority of tweets utilizing #FOAMtox (323, 37%). Traditional print publications and guidelines comprised the second largest category of tweets (182, 20.8%); however, 71 (39%) of these tweets were not linked to publications and/or guidelines that were free open access medical resources available to the general public without personal or institutional subscriptions. Approximately 15% of the tweets were related to clinical pearls, but a large proportion of these tweets (79, 62.7%) were not associated with links to supported references.

Conclusion: During the first year of inception, tweets associated with #FOAMtox were primarily related to social media resources, which is concordant with the mission of this educational movement. Opportunities exist for clinicians in the discipline of clinical toxicology to engage in the use of #FOAMtox on Twitter as a means of not only leveraging the sharing of quality and clinically relevant educational materials and resources, but also enabling meaningful interactions with various practitioners from across the world.

Keywords: Education, Internet, Medical toxicology

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160. Evaluation of the affective and cognitive capabilities of paramedics in the United States in assessing and managing toxic alcohol exposures

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Background: Paramedics are important front line health care providers as part of emergency medical services (EMS). According to 2012 data involving poison control center reports in the United States there were a total of 23,939 cases of toxic alcohol ingestion. Many of these cases were the result of ingesting common household products such as rubbing alcohol, hand sanitizers and various cleaning agents containing isopropanol, ethylene glycol, or methanol. Toxic alcohol overdose poses a significant public health and front line emergency care providers such as paramedics need to be well-versed in assessing patients, identifying specific toxicities, and implementing appropriate therapies.

Objectives: The aim of this project is to use a survey to identify the cognitive capabilities of paramedics to identify key clinical, pathophysiological and treatment features of toxic alcohol poisoning. Additionally, the survey is attempting to identify the affective capabilities of paramedics in terms of the level of importance paramedics assign to toxic alcohol emergencies.

Methods: This study is an anonymous online survey using the Qualtrics Software program and server available to University of Florida (UF) faculty and students. Data collection will be in the form of choice questions and brief text answers. The study was approved by the UF institutional review board (IRB). The survey link was sent out to various EMS organizations and individual paramedics for further distribution. Bivariate analysis via Pearson correlation coefficient (PCC) was used to compare variables.

Results: The response rate was 72.5% (58/80). Respondents were able to identify common sources of toxic alcohol exposure to varying degrees with 58% for methanol and 89% for ethylene glycol. Data indicate that a lack of understanding of the underlying pathophysiology was related to missing education ($PCC < 0.05$) and the principles of toxicity. Education appears to be not sufficient in regards to recognizing and treating toxic alcohol exposure. A majority of respondents (80%) believe that assessment and treatment of toxic alcohol poisoning is an important component of their training.

Conclusions: Although symptom recognition for toxic alcohol poisoning is present in most EMS providers, pharmacological intervention and treatment approaches are often not known. This study provides educators and curriculum builders with information to enhance initial and ongoing paramedic educational standards to include additional coverage of topics of toxicological importance such as the anion gap and toxic alcohol assessment, pathophysiology and treatment.

Keywords: Alcohol, Public health, Education

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161. Phantom Menace: Yellow Oleander Dietary Aids Exposures Reported to a Statewide Poison Control System

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Background: Seeds of yellow oleander are surreptitiously marketed as dietary aids, which users are instructed to sliver and consume daily in small amounts. Vomiting, diarrhea, dehydration, and cardiac toxicity can occur due to several cardiac glycosides. We characterized the spectrum of effects from exposures to yellow oleander dietary aids (YODA), as reported to a statewide poison control network.
Methods: Following IRB approval, an electronic statewide database was queried for exposures related to YODA over 10 years. Cases of YODA exposures were reviewed for demographic, clinical, laboratory, and outcome information.
Results: Out of 41 cases resulting from the query, 20 cases were excluded due to misclassification or non-human exposure. Adult females represented the majority of cases (95%); mean age was 35 years (range 2 to 64). The YODA product was obtained from the internet (3 cases), flea markets (1 case), Mexico (2 cases), or patients' friends/family (2 cases). Thirteen patients (65%) had GI side effects (nausea, vomiting, diarrhea, and/or abdominal pain). Neurologic symptoms (dizziness and/or sedation) were seen in 7 patients (35%). Cardiac symptoms were seen in 5 of 20 people (25%), with bradycardia noted in 4 (20%), and hypotension in 1 (5%). EKG results were reported for only 6 patients, and all were normal. Management interventions included activated charcoal (1 case), atropine (1 case) and potassium repletion for hypokalemia (1 case). Digoxin levels were completed in 4 patients (ranging from 0.3–2.4), however no patients were given anti-digoxin antibody treatment. Five percent of patients were asymptomatic, 35% had mild effects and 20% had moderate effects with two patients (10%) admitted to ICU.
Conclusions: Although limited by small sample size, incomplete assessments, voluntary reporting, and lack of analytical confirmation, this statewide study indicates that glycoside-based dietary aids continue to be consumed by dieters. In this series, GI effects were the most frequent complaint, with cardiovascular effects seen in 25% of patients. The majority of YODA exposures were in young women who purchase these items from the internet. This study adds valuable information that can help poison centers continue to research and develop guidelines for risk assessment of this hazard.
Keywords: Yellow Oleander, Cardiac Glycoside, Diet Aid
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162. Dextromethorphan Toxicity and Abuse: A Community-Based Study

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Background: The goals of this community-based study were to analyze dextromethorphan toxicity and abuse in West Michigan. We also hoped to gain insight into the products involved, the most common age groups, and the effect on health care facilities. Evaluating clinical patterns of dextromethorphan abuse may help practitioners target community-wide interventions.
Methods: This was a retrospective, cohort analysis of consecutive patients seen at seven emergency departments (ED) in West Michigan from January 2004 to December 2014 (120 months). Affiliated institutions included three rural medical centers, three university-affiliated hospitals and a children's tertiary care facility. Data collected included age, sex, pre-hospital care, mode of arrival to ED, disposition, product ingested, dose form, coingestants, clinical symptoms, ethanol level, and acetaminophen levels. Outcomes were coded according to the American Association of Poison Control Centers guidelines. Descriptive statistics (mean, SD) and frequency tables were used to describe the key quantitative and qualitative variables.
Results: During the study period, 97 patients were evaluated for DXM toxicity. The mean age was $26 + 21.8$ years (age range 1–91). Elderly and children comprised 29% of the study population. Those over 65 years (9 patients) had adverse reactions to therapeutic doses of DXM; 3 (33%) required hospital admission. The majority (89%) of the children < 13 had accidental ingestions. The remaining ingestions were suicide attempts (28%) or abuse cases (34%). The majority of DXM abuse occurred in adults (70%) rather than adolescents (30%); the average age $22.6 + 14.3$ years (age range 14–47). The most commonly abused product was an extended-release suspension which contains 30 mg of DXM polistirex, a long acting form of the drug. Overall, 23 cases had moderate (18%) or major outcomes (5%). These included anticholinergic toxicity, respiratory depression, serotonin syndrome, toxic encephalopathy and acetaminophen toxicity. Prognosis depended on patient age (> 65 years), comorbidity, polysubstance abuse, and the presence of coingestants commonly found in OTC cough and cold products. There were no fatalities reported.
Conclusions: The spectrum of DXM toxicity is diverse and encompasses all age groups. DXM abuse is clearly not just an adolescent problem, 70% of abuse cases occurred in patients over 17 years of age. Whether accidental, therapeutic or intentional abuse of DXM, a major concern with OTC cough and cold products involves toxicity from the hidden ingredients, such as acetaminophen. Preventive measures, such as placing DXM containing products behind pharmacy counters, may be an effective action to limit this DXM abuse.
Keywords: Abuse, Dextromethorphan, Epidemiology
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163. Double or Nothing: Coingestion of Ethylene Glycol & Methanol

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Introduction: Ingestions of either methanol or ethylene glycol are commonly encountered in clinical practice. However, ingestion of both simultaneously has not been previously reported.
Case Presentation: A 47 year old female patient presented to the Emergency Department via EMS with report of a intentional ingestion of what she described as antifreeze 2 hours earlier. EMS brought the container she reportedly ingested, which was a

Table 1.

Na (meq/L)	137	CO2 (meq/L)	18
K (meq/L)	5.1	Glucose (mg/dl)	67
Cl (meq/L)	102	Osmolality (mOsm/Kg)	404
Methanol (mg/dl)	153	Ethylene Glycol (mg/dl)	330

Table 2.

	Methanol (mg/dl)	Ethylene Glycol (mg/dl)
2 h post 1st dialysis	63	120
2 h post 2nd dialysis	<10	<10

methanol-containing windshield washer fluid. The patient admitted to drinking the methanol-containing product. She denied any co-ingestants. She was noted to be lethargic, with slurred speech, dilated pupils, and a "chemical" odor to her breath. Remainder of physical exam was unremarkable. Initial labs are detailed in table 1. Fomepizole 15 mg/kg was administered and following receipt of the toxic alcohol panel nephrology was consulted for emergent hemodialysis. Results of repeat levels of methanol and ethylene glycol are in table 2. The patient made an uneventful recovery and admitted that she initially drank the ethylene glycol and, a short time later, after she determined she was not dying quickly enough, drank the methanol. She was admitted to psychiatry and repeat labs showed normal renal function prior to discharge from the psychiatric ward.

Discussion: We could not find any previous reports via either PubMed or Google search of coingestion of methanol and ethylene glycol. The patient's minimal acidosis on arrival was likely due to both the relatively short time frame between ingestion and presentation to the ED, and the competition between the two alcohols for metabolism via alcohol dehydrogenase. While ethylene glycol is reported to have a faster rate of metabolism than methanol, it unclear what effect on kinetics coingestion of both substances will have on their individual metabolism. Also, at our institution toxic alcohols are ordered as a panel; in settings where they are separate tests, it is prudent to order both methanol and ethylene glycol levels.

Conclusion: Ethylene glycol and methanol are commonly encountered poisonings, we report a case of coingestion of both substances. This should serve as remainder to clinicians to check levels of both when they are considering a toxic alcohol poisoning.

Keywords: Ethylene glycol, Methanol, Hemodialysis

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164. Characteristics of intentional self-poisonings in adolescents versus adults in ToxIC Case Registry entries

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Background: Intentional self-poisoning (ISP) is the leading method of nonlethal suicidal behavior, with rates increased dramatically during adolescence, particularly among females. ISP during adolescence may be expected to have unique characteristics and require tailored treatment compared to adults yet there are few data. We compared the drugs ingested and the medical consequences and treatments for ISP in hospitalized adolescents and adults.

Hypothesis: We hypothesized that adolescents are more likely to be female; other comparisons were exploratory.

Methods: Cross-sectional analyses of hospitalized ISP cases contained in the American College of Medical Toxicology Investigators Consortium Case Registry (ToxIC) from Jan 1, to Oct 22, 2014. Adolescent (ages 13–18, $n = 758$) and adult (ages 19–65, $n = 1422$) ISP patients were compared on demographic characteristics, the drugs ingested and the associated medical consequences, and the treatments provided. Unadjusted analyses were performed using chi-square. Due to multiple testing, $p < 0.005$ was used to determine statistical significance.

Results: Compared to adults, adolescents were more likely to be female (79% vs. 59%, $p < 0.001$), to ingest a single drug than multiple drugs (60% vs. 48%, $p < 0.001$), and to use non-opioid analgesic (35% vs. 18%, $p < 0.001$). Non-opioid analgesics were also the drug most commonly taken by adolescents in ISP. Adolescents were less likely to ingest an opioid (3% vs. 9%, $p < 0.001$) or a cardiovascular medication (4% vs. 8%, $p = 0.001$). They were also less likely to experience a sedative hypnotic toxidrome (6% vs. 15%, $p < 0.001$) but did not differ on other specific medical consequences or the overall number of organ systems affected. Adolescents and adults did not differ in the overall number of treatments received or in the likelihood of receiving specific treatments with the exception that adolescents were less likely to receive non-pharmacological treatment (29% vs 35%, $p = 0.002$).

Conclusion: Adolescents' greater tendency to ingest single drugs in ISP suggests that prevention efforts based on restriction of access to medications may be more straightforward in this group compared to adults, and analgesics are an important target of such efforts. The fact that adolescents and adults treated for ISP did not differ on the number of organ systems affected or the number of treatments received, markers for ISP severity and treatment complexity, underscores that ISP during adolescence must be taken seriously, with hospital stays providing a critical opportunity to initiate preventive interventions.

Keywords: Overdose, Adolescent, suicidal behavior

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165. Bhutanese Prevention Intervention

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Background: Bhutanese refugees are generally unaware of poison center services. This group comprises an important target for education. Language and cultural barriers along with health literacy challenges need to be addressed to increase the group's use of poison centers.

Methods: 115 Bhutanese refugees in one county were educated about poison prevention in 2013 and 2014 through trainings promoted by a nonprofit resettlement agency. The goal of this IRB-approved project was twofold: to evaluate the effectiveness of providing educational materials and to examine whether an educational intervention had a greater impact on comfort calling the poison center. Each training involved two sessions one week

apart. One interpreter was used throughout. Participants were randomly assigned to a treatment or control group. The initial session consisted of pre- and post- surveys that were read aloud by the interpreter and a poison prevention video in Nepali. Both groups received the same intervention except the treatment group placed a test call to the poison center during the first session. Magnets and postcards were distributed. Both groups were asked to take 7 action steps-including placing a call to the poison center-before the one-week follow-up session. A survey read aloud at the follow-up sessions assessed knowledge retention and reported action steps. The groups were combined for analysis except in comfort level in making test calls. The de-identified data were analyzed for statistical significance at < 0.05 using Fischer's Test.

Results: 62% attended the follow-up sessions. Participants showed statistically significant improvement in the 7 knowledge questions from pre- to post-survey that was maintained at the follow-up session. Nearly all the participants (94%) completed the 6 of the 7 action steps before the follow-up. None of the participants placed a test call to the poison center between sessions. Reported changes in behavior for storing the poison center number in the phone, keeping medicines in a separate place and placing a magnet on the refrigerator were statistically significant. One week after the initial training, more members of the treatment group reported comfort calling the poison center than of the control group (treatment 86%, control 66%).

Conclusions: The program increased knowledge for both groups and met all program objectives except placing call to the poison center between sessions. The treatment group's activity of calling the poison center may have increased comfort calling the poison center compared to the control group; however, comfort calling was not measured in the pre-survey. Pre-survey measurements were needed to assess the treatment intervention's impact on comfort level.

Keywords: Education, Public health, Poison center

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166. Pentobarbital toxicity after self-administration of Euthasol(TM) veterinary euthanasia medication

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Background: Suicide attempt via self-administration of sodium pentobarbital is extremely uncommon but more likely in those who have access to veterinary medications. The presentation of barbiturate-associated poisoning is associated with characteristic features, which can expedite identification and treatment.

Case Report: A 48-year-old woman was found by her veterinarian spouse unresponsive next to a syringe of pink fluid that had been injected into her left antecubital fossa. Upon EMS arrival the patient was unresponsive, apneic, hypoxemic, with miotic pupils. She had bradycardia refractory to atropine. Emergency department findings included: heart rate 46, blood pressure 99/53 mmHg, agonal respirations, temperature 94.6°F, and room air pulse oximetry of 78%. Physical examination revealed: 3 mm pupils, Glasgow Coma Scale 3, and left forearm compartment syndrome. Serum creatine phosphokinase and ethanol measured 806 U/L and 58 mg/dL, respectively. Rapid urine drug screening detected benzodiazepines and barbiturates. She was intubated and transferred for intensive care, where the patient received supportive care and underwent left forearm and carpal tunnel fasciotomy. The spouse identified the pink solution as Euthasol™ (390 mg/mL pentobarbital and 50 mg/mL phenytoin), which was missing from his pharmacy. Serum pentobarbital and phenytoin levels were 12.6 μg/mL (1.0–5.0 μg/ml) and 2.5 μg/mL (10–20 μg/ml), respectively. The drug levels decreased and her coma resolved over 48 hours. The fasciotomy wounds were repaired by plastic surgery and the patient was evaluated and dispositioned by psychiatry without neurologic sequelae.

Discussion: Pentobarbital overdose is rare because it has few modern indications for use, such as lethal injection, veterinary euthanasia, and management of traumatic brain injury and medically induced coma. Distinguishing factors of barbiturate toxicity from that of other sedative-hypnotics include: blisters or bullae, dermal discoloration with necrosis, compartment syndrome, hypothermia, bradycardia, respiratory depression, and profound hypotension. An additional clue to barbiturate toxicity is access to veterinary barbiturates. This patient exhibited most of these historical and physical examination clues to barbiturate toxicity, which, in her case, was compounded by ethanol and benzodiazepines.

Conclusion: Pentobarbital poisoning is rare but should be recognized in patients who develop CNS and respiratory depression, hypothermia, bradycardia, hypotension, and skin findings especially in the setting of exposure to veterinary euthanasia agents. Treatment is supportive via meticulous intensive care.

Keywords: Overdose, Pentobarbital, Euthanasia

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167. Reports of phenibut usage to the Dutch Poisons Information Center (DPIC).

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Background: In the Netherlands the abuse of gamma-hydroxy butyric acid (GHB) has been considerable in the last 10 years. In 2013 the DPIC was consulted in 107 cases of both acute GHB intoxications and severe GHB withdrawal symptoms. GHB addicts use several drugs in an attempt to reduce these withdrawal effects. One of these drugs is phenibut, a p-Cl-derivative of baclofen, with similar psychopharmacological activity as baclofen. Phenibut is a GABA mimetic (mainly GABA-B), stimulant of dopamine receptors, and an antagonist of beta-phenethylamine. Since 2005 phenibut is mentioned on drug fora found on Google Netherlands, and in 2014 over 20 different internet drug fora contained user information about the drug. Since 2007 a strong increase is observed of websites selling phenibut, usually as a dietary supplement. Little is known about the clinical effects of phenibut overdoses or its potential for abuse and dependency. With this report we discuss the cases the DPIC received on phenibut use.

Methods: All cases of phenibut exposure in the DPIC-databse were reviewed retrospectively from the first reported case in 2011 until March 2015.

Results: Since 2011 the DPIC received 8 reports about phenibut (1 in 2011, 3 in 2013, 3 in 2014 and 1 in 2015). In 2 cases patients developed clear withdrawal symptoms after stopping phenibut

intake. Symptoms include tremors, anxiety, insomnia, hypertension, hyperhidrosis, psychosis, tachycardia, widening of QRS complex and convulsions. In 1 case a patient ingested 1 gram of phenibut and became agitated, hyperthermic and tachycardic. One patient ingested 7.5–10 grams of phenibut as a suicide attempt. Gastrointestinal decontamination (gastric lavage and activated charcoal) was performed 45 minutes after intake. The patient was agitated and complained of abdominal pain. The fifth patient ingested 10-15 grams phenibut and 2-3 grams lyrica daily during three months. He developed tremors and dysuria. A sixth patient had ingested an unknown amount of phenibut and presented with agitation, mydriasis and seizures. A seventh patient had ingested 10 grams phenibut daily during several days. He was admitted to the hospital with loss of consciousness. After his discharge he continued using phenibut, and three days later he was again admitted to the hospital with seizures. No clinical data was available for the eighth case.
Conclusion: Since 2011 eight cases of phenibut overdose have been reported to the DPIC. With the increased internet sale of phenibut it may well be expected that the number of intoxications and adverse effects will also increase in the coming years, both in GHB addicts and in people using phenibut for other reasons.
Keywords: phenibut, GHB, Drug of abuse
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168. Standard Oral Pyridoxine Dosing Fails to Prevent Seizures in Isoniazid Poisoning: A Case Series

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Background: Isoniazid (INH)-induced refractory seizure is caused by functional depletion of pyridoxine (B6). B6 is given to patients with suspected or symptomatic INH overdose and is typically dosed on a gram-for-gram basis, or 5g empirically. Intravenous (IV) B6 is preferred but often inadequately stocked; oral (PO) tablets are often used assuming high PO bioavailability. We present two cases of INH-poisoned patients treated with PO B6 who developed delayed seizures.
Case 1: EMS was called for an 18-year old man (66 kg) with latent tuberculosis on INH who had a new onset seizure. Another seizure was witnessed by EMS and terminated with midazolam. In the emergency department he was intubated for respiratory failure. Empiric B6 (5g) was given via orogastric tube at 3 hours post-arrival; he was later started on levetiracetam. See Table 1 for laboratory data. The patient had further seizures despite propofol infusion (50-70mcg/kg/min), including two 2-minute generalized seizures at 16 hours post-arrival and five 1-5 minute seizures over the next 16 hours. Another 5g of B6 was given enterally. CSF showed no infection; MRI revealed no distinct epileptogenic foci. EEG initiated on hospital day (HD) 2 was abnormally slowed, but improving. He had no further seizures and was extubated on HD4, and endorsed taking five 300mg isoniazid tablets (22.7mg/kg) during a dispute with his mother.
Case 2: A 6-year old boy (11.8 kg) with cerebral palsy, hip dysplasia, microcephaly and intellectual disability was given an extra 150 mg of INH after a miscommunication between his parents. His previous dose of 300 mg INH was given 2 hours prior for a total of 450 mg (38.1 mg/kg). He was given an empiric 450 mg PO dose of B6. IV B6 was unavailable. He remained asymptomatic until ten hours post-ingestion and had a tonic-clonic seizure which resolved with lorazepam. The patient was not given additional B6; he remained seizure-free and was discharged at 24-hours.
Discussion: B6 is available as pyridoxine hydrochloride, which is metabolized to its active form pyridoxine 5'-phosphate (PLP). Zempleni (1995) compared the area-under-the-curve (AUC) for PLP between oral and IV B6 and found that the IV AUC was 7.5-fold larger than the PO AUC. It is possible that although the absorption of oral B6 is rapid, first pass effects on the oral drug decrease bioavailability and thus inadequately treat INH overdose.
Conclusion: While PO pyridoxine can be used in INH overdose when the IV product is unavailable due to pharmacy supply, the IV pyridoxine should be the preferred formulation.
Keywords: Neurotoxicity, Seizure, Antidote
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169. Lessons Learned from a Brodifacoum Case Exhibiting Prolonged Morbidity

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Background: Management following overdoses of long-acting anticoagulant rodenticides (LAAR) is multi-faceted. We describe systems issues complicating phytonadione or vitamin K1 (VK) management of a brodifacoum (BF) overdose, resulting in prolonged morbidity.
Case Report: A 45-year-old female patient intentionally ingested 2.5 trays of a brodifacoum (BF)-containing rat poison. Her initial INR that day was 2.3 and she received parenteral (IV) and oral VK. Her INR peaked on day 4 at 6.3 and was discharged on oral VK "as needed". Five weeks later, she presented to an out-of-state health care facility (HCF) with a gastrointestinal bleed; INR was 8.0 and she was treated with PRBC and VK. Six weeks later, she presented to a different HCF with a history of ecchymoses, epistaxis, abdominal pain and melena with a PTT of 99 and was managed with FFP and VK. Her INR post-FFP and VK was 1.7. She admitted that she was not taking the VK due to its cost of $40/5 mg pill (50 mg bid costing $800/day or $5,600 weekly). Her insurance company was petitioned to cover the cost but declined to cover the "vitamin/supplement". The poison center (PC) called the manufacturer to propose oral use of parenteral VK ($282/100 mg or $1,974 weekly); no oral bioavailability data was found. Use of dietary sources including kale and chard was entertained, costing only 5% of prescription VK, but would require $>$ 20 lbs of material daily to meet the VK need. With PC consultation, patient arrangements included receiving VK daily at the hospital at no cost; she missed several days due to lack of transportation and abdominal pain. Four months after initial ingestion, the PC was called by yet another HCF where she had emergent surgery for a hemorrhagic ovarian cyst: her INR was $>$ 8.0. A qualitative BF level was positive. A subsequent admission was required for drainage of an incisional hematoma; INR was 12 (estimated) and a quantitative BF level was $<$ 0.01 ug/ml (5 months after initial ingestion). The patient denied repeat ingestion to staff in all of the HCFs.

Case Discussion: In this case of LAAR toxicity, financial barriers led to gaps in long-term antidotal therapy with VK and multiple subsequent readmissions. The cost of high-dose oral VK for LAAR toxicity is exorbitant, but the estimated hospital costs, covered by her insurer, far surpassed the VK cost. Oral use of parenteral VK would be less costly. The absence of serial semi-quantitative BF levels and clotting factors allow the possibility of repeated ingestion.
Conclusion: Intentional LAAR overdose can result in significant prolonged morbidity; treatment is case-specific. VK may not be covered by insurance; this should be addressed prior to discharge. Partnership with the PC can help with education and coordination of care.
Keywords: Rodenticide, Antidote, Education
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170. Doctors and nurses have more knowledge of and are more confident managing acute toxicity related to the use of classical recreational drugs than novel psychoactive substances

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Background: There is increasing availability of and reports of acute toxicity related to the use of novel psychoactive substance (NPS). Initial management of patients with acute recreational drug/NPS toxicity is often by non-toxicologist medical and nursing staff. The aim of this study was to assess emergency and internal medicine clinicians' knowledge of and confidence in managing acute toxicity related to classical recreational drugs and NPS.
Methods: Nursing and medical staff working in a central London hospital emergency department, and critical care and internal medicine admissions units completed a questionnaire on their knowledge of and confidence in managing acute toxicity related to classical recreational drugs and NPS. Participants self-assessed using scale of 1 to 5 for each variable: Knowledge: 1 = little knowledge to 5 = very knowledgeable; Confidence: 1 = little confidence to 5 = very confident. Knowledge and confidence for doctors and nurses between classical recreational drugs and NPS were compared using a paired student t-test; comparison between nurses and doctors were undertaken by unpaired student t-test.
Results: 188 staff completed the questionnaire (82 medical, 106 nursing staff). Knowledge: Both nursing and medical staff had greater knowledge of classical recreational drugs than NPS. Nursing staff: 2.9 ± 0.9 -vs- 2.1 ± 1.0, $p < 0.0001$; Medical staff: 3.1 ± 0.8 -vs- 2.1 ± 1.0, $p < 0.0001$. There was no difference between nursing and medical staff in knowledge of classical recreational drugs ($p = 0.11$) and NPS ($p = 0.89$). Confidence in managing acute toxicity: Both nursing and medical staff had greater confidence in managing acute classical recreational drug toxicity than acute NPS toxicity; Nursing staff: 3.0 ± 1.1 -vs- 2.3 ± 1.1, $p < 0.0001$; Medical staff: 3.0 ± 0.9 -vs- 2.1 ± 1.0, $p < 0.0001$. There was no difference between nursing and medical staff in their confidence in managing acute toxicity related to the use of classical recreational drugs ($p = 0.85$) or NPS ($p = 0.33$).
Conclusions: Medical and nursing staff had less knowledge of NPS than classical recreational drugs, and less confidence in managing acute toxicity related to the use of NPS. There needs to be greater consideration to ensure that education related to recreational drugs includes appropriate information on NPS to improve the confidence of those who may be initially managing the patient.
Keywords: Bath salt, Drug of abuse, Substance abuse
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171. Two Cases of Tinzaparin Overdose

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Background: Tinzaparin is a low molecular weight heparin (LMWH) used for prophylaxis and treatment of venous thromboembolic disease. Reports of overdoses with LMWHs have been published previously, but none involving tinzaparin.
Case Reports: The first case involved a 33-year-old female who presented to an emergency department (ED) via emergency medical services after a suicide attempt. She admitted to drinking ethanol and smoking marijuana and overdosed on her tinzaparin, which was prescribed for treatment of recurrent pulmonary emboli. She had multiple self-inflicted lacerations in her antecubital fossa and left forearm. Laboratory investigations were significant for an initial hemoglobin of 148 g/L, PTT > 200 seconds, serum ethanol of 53 mmol/L, and urine drug screen of abuse positive for cannabis metabolite. She was given protamine sulfate 25 mg intravenously (IV) and her lacerations were sutured, though her wounds continued to bleed. Her next PTT drawn 9 hours after her initial labs (5 hours after protamine administration) was 116 seconds. Labs 24 hours later were significant for hemoglobin of 99 g/L and a PTT of 40 seconds. Her bleeding at that point was well controlled, and she left the ED against medical advice.

The second case involved a 24-year-old male who injected 240,000 units of tinzaparin one hour prior to presentation. He had a history of antiphospholipid antibody syndrome with resulting recurrent deep vein thromboses. Labs drawn one hour after presentation were significant for a hemoglobin of 121 g/L, PT of 1.9, PTT of > 200 msec, and creatinine of 129 mmol/L (similar to his baseline). He was transferred to a tertiary care ED where he was given 50 mg protamine sulfate IV. His initial heparin assay (drawn 7 hours post-overdose) was > 2.0 U/mL (target level 4 hours post-injection for tinzaparin is 0.85 U/mL). Twenty-four and 48 hours post-overdose, his heparin assay level were > 2.0 U/mL and 0.34 U/mL respectively. His PTT remained > 200 msec 24 hours post-overdose, and then dropped to 102 msec at 48 hours. His PT peaked at 2.4, 5 hours post-overdose, and by 48 hours went down to 1.4. His hemoglobin drifted down to a nadir 91 g/L 3 days post-overdose. No clinically significant bleeding occurred, and he was discharged after 3 days.
Discussion: No life-threatening bleeding complications were observed in these cases. Adverse effects from protamine administration were not observed, however the benefit remains unclear. The second case had the advantage of being managed at a hospital where heparin assays are readily available. Most institutions do not have this luxury and rely on measuring PT/PTT as surrogate markers for coagulopathy.
Conclusion: Low molecular weight heparin overdoses are rare. It remains unclear how to best monitor and manage these cases.

Keywords: Anticoagulant, Overdose, Antidote
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172. Massive inadvertent pediatric ketamine overdose with serial levels

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Background: Ketamine is a dissociative anesthetic commonly used for procedural sedation due to its perceived favorable safety profile. Overdoses of ketamine are rarely reported and there are no reports with serum ketamine levels reported. We report a case of an inadvertent pediatric ketamine 10 time overdose with serial ketamine serum levels that resulted in minimal toxicity.
Case Report: A 2 year-old female presented with an abscess requiring incision and drainage. In the emergency department she was given 2 mg/kg of intramuscular (IM) ketamine for procedural sedation. The child remained sedated 60 minutes after administration of the ketamine. Investigation revealed the child had inadvertently received 20 mg/kg of IM ketamine due to use of a 100 mg/mL product instead of the 10 mg/mL solution. Her vital signs were; blood pressure 92/54 mmHg, pulse 131 beats per minute, and respirations of 28 breaths per minute with 100% oxygen saturation on room air. The child was not arousable to verbal or tactile stimuli but had a normal respiratory effort. Increased oral secretions were noted but resolved with 0.1 mg glycopyrrolate. She was admitted for observation, returned to baseline 4 hours later and discharged 18 hours from ketamine administration with no complications. Serial serum ketamine levels were obtained (Table 1). Norketamine was not measured.
Case Discussion: Ketamine is an NMDA antagonist also thought to have effects on opioid receptors and monoamine transporters. Due to its rapid onset, cardiovascular stability, and preservation of breathing and airway reflexes it has become a preferred agent for procedural sedation. Overdoses of ketamine in this setting are rarely reported. The two prior reports are a case series with no adverse outcomes and a single case report of respiratory distress requiring airway maneuvers. In none of these cases were ketamine levels reported. The initial ketamine level in this case was 50% higher than levels seen when it is used for general anesthesia (~2500 ng/mL). To our knowledge it is the highest non-fatal ketamine level reported in the medical literature. Ketamine is lipid soluble and rapidly redistributes, which explains the rapid decline in levels seen in this case. It is notable that 12 hours after injection, this child still had levels associated with analgesia in previous studies ($>$100 ng/mL).
Conclusion: This case highlights the safety profile of ketamine as a 10 times overdose with markedly elevated initial ketamine levels resulted in no respiratory or cardiovascular complications.

Table 1.

Time after adminstration	Ketamine level (ng/mL)
97 minutes	3800
6 hours	350
12 hours	160

Keywords: Hallucinogen, Pediatric, Overdose
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173. Descriptive Analysis of US Poison Center Calls for Infants 6 Months of Age and Younger

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Background: Prevention efforts and anticipatory guidance aimed at decreasing xenobiotic exposures in the young child have historically focused on limiting access. Since young infants up to 6 months of age have limited mobility, exploratory ingestions would be expected to make a smaller contribution to the source of exposures. If true, this would have important implications for the types of prevention efforts that would be useful in this age group.
Methods: A 10-year (2004-2013) retrospective review of exposure calls for infants up to 6 months of age was conducted using the AAPCC's National Poison Data System.
Results: Over 270,000 total exposures were reported for this age group during the time period studied. A vast majority (96.7%) was unintentional exposures and 36.7% were due to therapeutic error, which was three times the rate for other ages. Fewer than half of the therapeutic error scenarios involved an error in dose (confused units of measure, incorrect formulation or concentration, dispensing cup error, 10-fold dosing error, other incorrect dose). The other common therapeutic errors were: medication given twice or too soon, the wrong medication (e.g. someone else's), or medication given by the wrong route.
Conclusions: US PCCs continue to receive a large number of calls for infants 6 months of age and younger. As expected, nearly all were unintentional exposures and the rate of therapeutic error is three times that found across other ages. The frequency of therapeutic errors arising from an actual dosing mistake was less than 50%. Since a minority of these errors are currently targeted by preventive measures (e.g. flow-restricted bottles with syringes, metric unit standardization of liquids), many exposures may continue. Thus, in order to decrease xenobiotic exposures in this age group, prevention efforts must address all common scenarios.
Keywords: Pediatric, Poison center, Epidemiology
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174. Intentional oral viscous lidocaine overdose resulting in seizure and death in an adolescent

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Background: Lidocaine has been associated with seizures and arrhythmias from sodium channel blockade. Severe toxicity can cause AV block, QRS prolongation, bradycardia, asystole, coma and status epilepticus. We report a case of an adolescent who developed seizures, asystole, and brain death after an oral ingestion of 2% viscous lidocaine.

Case Report: A 15 year-old (41 kg) female was found seizing at 11pm at home, 2 hours after last being seen well. During EMS transport, the patient became asystolic requiring 6 minutes of CPR, epinephrine, and intubation. On arrival to the outside ED, the patient had a HR 160, BP 135/87 mm Hg, GCS of 3T, and fixed and dilated pupils. Initial blood gas revealed pH 6.6, pCO2 91 and lactate 18 mmol/L. Her EKG showed QRS 110 ms, which narrowed to 80 ms within 80 min of administrating 500 mL normal saline and 45 mEq sodium bicarbonate IV. The patient was transferred to a tertiary children's hospital. Further history revealed that the patient had sent a text message to a friend that she consumed 2% viscous lidocaine at 10pm from a 100 mL bottle, which was prescribed for stomatitis. Serum lidocaine levels at 2 hours and 6 hours after ingestion were 16.6 µg/mL and 0.7 µg/mL respectively (ref. range, 1.2-5). Serum toxicology screen was negative for salicylates, ethanol, acetaminophen, and tricyclic antidepressants. Urine drugs of abuse screen was negative. The patient was intermittently febrile, hypertensive, and tachycardic due to thalamic storming. She was hypertonic without any purposeful spontaneous movements or ability to localize to painful stimuli. An EEG did not demonstrate epileptiform activity. Brain MRI approximately 40 hours post-ingestion showed hypoxic ischemic injury in a watershed distribution. On hospital day 9, the patient became apneic and lost brainstem reflexes. At that time, head CT scan was consistent with herniation, and brain death was ultimately declared.
Case Discussion: This patient acutely ingested up to 2 grams (49 mg/kg) of viscous lidocaine that resulted in a toxic serum concentration, seizures, cardiac arrest and death. Viscous lidocaine is frequently prescribed for painful oral lesions at 3-5 mg/kg swish and spit. Even though the oral bioavailability is low (35%), ingestion can lead to seizures and fatal arrhythmias.
Conclusion: Given the limited proven efficacy of viscous lidocaine in treating oral sores and safety concerns with potential for fatal toxic effects when ingested, caution should be used when prescribing oral viscous lidocaine.
Keywords: Seizure, Adolescent, Overdose
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175. Emtricitabine-tenofovir Combination Drug Exposures Reported to Poison Centers

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Background: It has been has been suggested that people who do not have HIV but are at high risk of becoming infected prevent infection by daily taking a combination of two antiretroviral drugs, emtricitabine and tenofovir (Truvada), an approach called pre-exposure prophylaxis (PrEP). Implementation of PrEP might lead to an increased number of individuals exposed to the drug combination and calls to poison centers. This study describes emtricitabine-tenofovir combination drug exposures reported to poison centers.
Methods: All emtricitabine-tenofovir combination exposures reported to a statewide poison center system during 2005-2014 were identified. Exposures not followed to a final medical outcome were included. The distribution of exposures by various demographic and clinical factors were determined. Exposures involving substances other than antiretroviral drugs were excluded from the analyses of management and clinical factors.
Results: Of 108 total cases, 42 involved only the emtricitabine-tenofovir combination, 33 the combination and other antiretroviral drugs but no other substances, 29 the combination and other antiretroviral drugs and other substances, and 4 the combination and no other antiretroviral drugs but other substances. The age distribution was 14% 5 years or less, 6% 6-19 years, and 80% 20 years or more; 73% of the patients were male. The exposure reasons were 37% suspected attempted suicide, 36% therapeutic error, 18% general unintentional, 5% intentional misuse/abuse, 3% adverse reaction, and 2% unknown. Of the 75 exposures that did not involve substances other than antiretroviral drugs, 65% were managed on site, 29% were already at/en route to a healthcare facility, and 5% referred to a healthcare facility. The medical outcome was 24% no effect, 9% minor effect, 4% moderate effect, 11% not followed-judged nontoxic, 37% not followed-minimal effects, 8% unable to follow-potentially toxic, and 5% unrelated effect; there was 1 death involving a patient who had taken only the emtricitabine-tenofovir combination drug. The most common clinical effects were vomiting (9%), dizziness/vertigo (7%), abdominal pain (4%), and nausea (4%). The most common treatments were dilution (21%), food (12%), activated charcoal (9%), and IV fluids (9%).
Conclusions: The majority of emtricitabine-tenofovir combination exposures involved other substances in addition to the emtricitabine-tenofovir combination drug. Patients tended to be adults and male. The most common reasons for exposure were suspected attempted suicide and therapeutic error; there were few adverse reactions. Few specific clinical effects were reported, and these tended to be consistent with the literature.
Keywords: Poison center, Emtricitabine-tenofovir, Antiretroviral
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176. Delays in administration of acetylcysteine for the treatment of acetaminophen overdose

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Background: Acetaminophen (paracetamol) overdose in the UK is treated with the same three infusion intravenous regime of acetylcysteine (NAC) over 21 hours as the FDA regime used in the USA. The complexity of the regime with the requirement for three different infusion concentrations and rates has been associated with administration errors. The aim of this study was to assess the extent of delays in administration with this NAC regime.
Methods: A single centre prescription chart review was undertaken for 4 months from 1st October 2014 until 31st January 2015 at a UK teaching hospital with a clinical toxicology service. All patients treated with NAC for acetaminophen overdose were included. Patients were excluded if treatment was discontinued for clinical reasons before the start of the third infusion. The start times for each of the three NAC infusions were recorded and the difference between administered and prescribed times were calculated to ascertain the delays. Patient smoking status was also recorded to assess if this contributed to delays due to treatment interruptions.

Results: 55 patients were treated with NAC during the study period and 47 started all 3 infusions. The mean ± SD delay compared to prescribed times between the start of infusion 1 and the start of infusion 3 was 162 ± 124 minutes. There were mean delays of 78 ± 97 minutes between the start of infusions 1 and 2 and 84 ± 155 minutes between the start of infusions 2 and 3. 10 (21.3%) patients had a delay of less than 1 hour from the start of infusion 1 and to the start of infusion 3, a further 10 (21.3%) had a delay between 1 and 2 hours and 27 (57.4%) experienced a delay of more than 2 hours compared to prescribed times. 22 patients were current smokers, 13 non-smokers and smoking status was not recorded for 12. The no significant difference in the mean delay for smokers (140 minutes) compared to non-smokers (183 minutes), ($p = 0.26$).

Conclusions: The delays in NAC infusions were of clinical significance and could lead to sub-therapeutic plasma NAC concentrations and potentially avoidable hepatotoxicity. They also cause prolonged inpatient hospital stays impacting on costs and bed occupancy. This study recorded delays only up until the start of infusion 3 so total NAC treatment course delays are likely to be even longer. Possible reasons for the delays include delays in handover or transfer to wards, intravenous cannula problems, adverse reactions, patient refusal, administration errors and nurse time in making up/setting up the NAC. We are currently undertaking an extended multicentre study to further assess this problem and will be reviewing processes locally to further understand the reasons for delays to be able to institute changes to reduce these.

Keywords: Acetaminophen (paracetamol), N-acetylcysteine, Antidote

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177. Patterns of naloxone administration after oral opioid overdose

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Background: The optimal period of observation after overdose of oral opioid agents is unknown. We intend to describe the patterns of naloxone use following oral opioid ingestion in Emergency Department (ED) patients.

Methods: The study was set in a tertiary care hospital with an annual census of 100,000 visits. It was a retrospective chart review of the period from January 1, 2012 to December 31, 2013. Potential cases were obtained from two sources: ED pharmacy records of all patients with an order to receive naloxone, and ED billing records of all patients diagnosed with opioid poisoning (ICD-9 codes 965.0, 965.01, 965.02, 965.09). Inclusion criteria were age 18 years or older with either a diagnosis of oral opioid poisoning by history or confirmed on comprehensive urine drug screen. Data included the time of presentation, time of naloxone doses (including pre-hospital), the opioid ingested, and the time the patient left the ED. The primary endpoint was the time between the first and second naloxone doses. For cases not receiving naloxone, the total observation time in the ED following presentation was recorded. In patients who only received one dose of naloxone, the time from dose to disposition was documented.

Results: 175 cases met inclusion criteria. 118 cases (67%) received naloxone, 50 of which received multiple doses. In cases that received more than one dose of naloxone, median time between first and second dose was 220 minutes (range 1-1210). Cases with one naloxone dose ($n = 68$) were observed in the ED for a median time of 395 minutes (range 24 to 1702). Cases not receiving naloxone were observed in the ED for a median time of 285 minutes (range 67 to 1476). 39 patients received naloxone in the pre-hospital setting. 9 patients were placed on a continuous naloxone intravenous infusion. Excluding cases involving methadone, 30 patients received multiple naloxone doses. Median time between first and second doses in this subset was 164 minutes (range 1-392).

88 patients were admitted and 12 patients left against medical advice. 96 patients were male, 79 were female. The average age of the patients was 43.7 (range 18-92 years old). The most common agents seen in overdose were oxycodone (81 cases), methadone (47), and tramadol (18).

Conclusion: The optimal length of observation following oral opioid overdose is unclear. In this study, there was a wide range in time between administrations in cases requiring multiple naloxone doses. This range substantially overlapped the observation period in cases involving single naloxone doses. Of note, in non-methadone cases the time range between naloxone doses was much shorter (maximum time 392 vs. 1210 minutes). Future prospective studies may provide better clarity on optimal management.

Keywords: Opioid, Naloxone, Overdose

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178. GABA GABA Hey (I wanna be sedated): Phenybut Exposures Reported to a Statewide Poison Control System

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Background/Objectives: B-phenyl-γ-aminobutyric acid (Phenybut, Fenibut, Noofen or phenylbutyric acid) is an emerging drug of abuse which is typically marketed as a nutritional supplement. Chemically similar to baclofen and the neurotransmitter GABA, phenybut can produce acute sedation, chronic tolerance, and life-threatening withdrawal similar to other sedatives. Toxicosurveillance studies of phenybut abuse and withdrawal are lacking. The purpose of this study was to characterize clinical outcomes associated with phenybut toxicity or withdrawal in cases reported to a statewide poison control system.

Methods: Following IRB approval, an electronic statewide database was queried for exposures related to phenybut over nine years. Exclusion criteria included: Non-exposures, animal exposures and wrong substance coding. Cases were reviewed for demographics, toxicological profile of overdose and outcome. Withdrawal symptoms were characterized when patients were chronically on phenybut, and then subsequently stopped taking the medication.

Results: Twenty-five cases met inclusion criteria with 68% male patients with medium age 26 years old (range 11-59 years old). Over the course of nine years, exposures trended up from 2005 (1 case) to 2013 and 2014 (9 cases each year). Majority of cases

Table 1. Adverse Effects of Phenybut Exposures.

Clinical Effects	Cases (N = 25)
Nausea/Vomiting	7
Diarrhea	1
Dizziness	1
Sedation	13
Agitation	4
Confusion	4
Hallucinations	0
Seizures	1
Tremors	2
Tachycardia	2
Bradycardia	4
Hypotension	2
Hypertension	3
Respiratory Depression	3

were acute ingestions (19 cases), however 7 cases were chronic ingestions with median time frame of 1 month (range 1.5 days – 1.5 months) and 4 cases met the criteria for suspected withdrawal. Effects from exposure are seen in Table 1. Treatment with benzodiazepines was given for 5 (14%) cases. Seven patients (20%) were managed at home, 11 patients (31%) were managed in the ED and 6 (17%) were admitted, including 2 (6%) who required intubation. The length of stay varied from less than 12 hours (7 cases; 20%) to 3 days (2 cases; 6 %). Outcome was considered moderate in 8 patients (23%) and minor in 6 (17%).

Conclusions: Phenybut is an emerging sedative agent, causing a variety of toxic effects due to acute exposure or withdrawal. While some patients require admission and prolonged supportive care, most can be managed at home or discharged from the emergency department after a brief observation period. Poison control specialists and toxicologists should consider this emerging drug of abuse in the differential diagnosis of GABA agonist related toxidromes.

Keywords: Phenybut, Abuse, Phenylbutyric Acid

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179. Results of a Medicine Safety Program Pilot Targeting English, Spanish and Chinese Speaking Caregivers of Children Younger Than 6 Years Old

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Background: The Poison Center (PC) developed a medicine safety program targeting caregivers of young children based on findings from previous PC research analyzing parents' dosing errors and a literature review. We report the findings of pilot programs conducted with English, Spanish and Chinese-speaking caregivers of children younger than 6 years old.

Methods: One hour workshops were conducted by bilingual PC educators with native speaking parents/caregivers at community locations. Educational interventions were delivered with a target sample of 75 participants (25 in each language) using the medicine safety guidebook and instructor's manual. A 17 question pre-workshop survey asked 6 knowledge-based, 5 demographic, 4 behavior-based, 1 comfort calling the PC and 1 workshop related question. An 18 question follow-up telephone survey repeated the pre-test with an additional question to gather information about the workshop. The follow-up survey was conducted by phone at least two weeks after the session by a PC educator in the participants' native language. Participants received the medicine safety guide and a bag with PC information, an oral syringe, pen, coin purse and a magnet with the PC number. The pre and post data were analyzed (Chi-Square and T-test) for each language group.

Results: All three groups had a statistically significant increase ($p \leq 0.05$) in knowledge about who answers the PC calls and saving the PC number in their cell phone. Chinese and English speaking groups showed a significant increase in comfort calling the PC; while the English speakers had a significant increase in knowledge about active ingredients. The Chinese speakers had a significant increase in knowledge about dosing medicine based on weight. It was hard to detect statistical improvement on questions for the Spanish group because the follow up sample size was small ($n = 9$). After the workshop, participants reported that they were likely to use the medicine list (100%), emergency information sheet (96%), oral syringe (95%), and medicine communication log (72%).

Conclusions: Overall, the medicine safety program pilot was well received by participants and showed improvements in both knowledge and self-reported medication management strategies across languages. PC educators are incorporating the medicine safety program into outreach efforts across the catchment area.

Keywords: Education, Pediatric, Public health

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180. Decrease in Exposure Calls to Poison Centers: A Look at Opioid and Stimulant Drug Classes Over time By Age Group

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Background: Over the past few years the number of calls regarding opioid or prescription (Rx) stimulant to poison centers (PCs) have decreased. PCs serve as an important resource for the public and health care facilities in the medical management of poison exposures and drug information. The purpose of this study is to look at rates of calls over time for opioids and stimulants by age category.

Methods: Cases involving drugs of interest are received from participating PCs in the Researched Abuse, Diversion and Addiction-Related Surveillance (RADARS®) System Poison Center Program; data from 1Q2006- 4Q2014 were used. Cases involving stimulants were not captured until 4Q2007. Age was grouped by the following categories in years (yrs): 13-19 yrs, 20-29 yrs, 30-39 yrs, 40-59 yrs and 60 + yrs. The drugs of interest include Rx opioids (buprenorphine, fentanyl, hydrocodone, hydromorphone, methadone,

morphine, oxycodone, oxymorphone and tramadol) and Rx stimulants (amphetamines and methylphenidate). Intentional exposures (IEs) (suspected suicide, misuse, abuse, intentional unknown, and withdrawal) for the opioid and stimulant groups were examined. The age group specific population was calculated by interpolating/extrapolating the 2000 and 2010 US Censuses by age group. Population adjusted rates were calculated by dividing the total number of cases in each age group by the age group specific population for covered zip codes in that quarter. Poisson Regression was used to estimate the trend over time by age groups and drug type. A quadratic model was fit to determine if the rate dropped in the last few years.

Results: There were a total of 298,489 Rx opioid cases over the time period. For Rx opioids, there was a significant negative quadratic trend for each age group over the time period ($p < 0.0001$ for each age group) such that rates increased early in the time period followed by a decrease. The 20-29 yrs group had the highest rates throughout the period and the 60 + yrs group had the lowest rates. There were a total of 43,415 Rx stimulants cases over the time period. The trend in rates of stimulant exposures also followed a curvilinear pattern for each age group ($p < 0.0001$ for each group) except for the 60 + yrs group which followed an increasing linear trend ($p < 0.0001$). The 13-19 yrs group had the highest rates throughout the period followed by the 20-29 yrs group, the 30-39 yrs group, the 40-59 yrs group, and the 60 + yrs group.

Conclusion: Although population rates of IE to Rx opioids were highest among the 20-29 yrs age group, rates for each age group rose and then fell during the time period. Population rates of IE to Rx stimulants were highest among the 13-19 yrs age group throughout the period.

Keywords: opioids, prescription stimulants, intentional exposures

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181. Medication Disposal Habits Of Suburban Emergency Department Patients

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Objective: Consequences of incorrect medication disposal may contribute to accidental poisonings and environmental contamination. We sought to determine unused medication disposal methods by patients visiting a suburban emergency department.

Methods: Participants were selected from patients undergoing care in the emergency department (ED); 100 were enrolled. Inclusion criteria included English fluency and greater than 18 years of age. Cognitively impaired patients were excluded. All participants consented to completing the survey. We inquired about the following: basic demographic data, medication storage and disposal habits, the use and disposal of insulin syringes, medication expiration dates, and the awareness of area drop off centers for unused medications. Participants received a tutorial on proper medication storage and disposal and a list of local unused medication drop off centers following the survey.

Results: Mean age was 49 years, 48% were male; 58 Caucasian, 16 African American, 13 Asian, 8 Hispanic, 1 other; 24 completed postgraduate education, 38 college, 34 high school, and 2 grade school.

Table 1.

	Suburban ED (n = 100)
Rx Storage: Bathroom	60
Bedroom	28
Kitchen	5
Other	8
Expiration Date Awareness	66 (Rx = 88, OTC = 76)
Rx Disposal: Garbage	38
Toilet	29
Do not dispose Rx	21
Gave Rx away	4
Insulin Syringe Disposal	8/8 (5 container, 3 sharps box)
Rx Drop-off site	41 (41%)

Results are listed in table 1: 21 participants reported they do not dispose of unused medications, 3 gave medications to treat family members, and 1 participant gave unused medications "away." No participant sold unused medications.

Twenty-two participants dropped off unused medications at local pharmacies, 13 at "other" facilities, and 2 at police stations.

Conclusions: Forty-one percent of participants were aware of suburban unused medication drop off centers. The majority of participants (67%) were unaware of proper medication disposal. Only 66% of participants were aware of medication expiration dates. This study was conducted as follow-up to a study of unused drug disposal habits of patients in an urban hospital setting. Further study to determine the impact of education regarding appropriate medication storage and disposal is warranted.

Keywords: Disposal, Education, Expiration

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182. Pediatric Ingestion of Citalopram: What is a Safe Dose for Home Management?

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Background: Citalopram (Celexa®) was introduced into the marketplace in 1989 for the treatment of depression, and was approved by US FDA in 1998. Additional indications include panic disorder and OCD. The drug, a highly selective serotonin reuptake inhibitor (SSRI) with minimal effects on neuronal reuptake of norepinephrine and dopamine, acts by potentiating serotonergic activity in the CNS. Its safety and effectiveness in children have not been established, and information on its toxicity in pediatric patients is limited. We sought to establish a dose at which children under age 6 years could be safely managed without referral to a hospital.

Methods: We retrieved all cases involving the ingestions of citalopram by a child 6 years and younger from our poison center's electronic medical record system. Between 1/8/2000 and 12/27/2014, 466 cases meeting these criteria were received by this Regional Poison Center; 335 cases involved citalopram alone.

Results: Of the 335 cases of citalopram as a single drug, 89.9% were unintentional and 10.1% were therapeutic errors. The majority, 68.7%, were handled prehospital; 29.6% were in or referred to a health care facility (HCF). Of those in a HCF, 70.7% were treated and released.

Ingestions with exact amounts known were 20.6% of the cases. Of these cases, 11 patients with doses of 0.67 – 10.56 had a known follow-up of no effect; 3 cases with amounts of 1, 1.67 and 3.14 mg/kg had minor effects of drowsiness, with one case of vomiting. An ingestion of 10.77 mg/kg was treated in HCF with activated charcoal and a cathartic and had moderate effects of drowsiness; tachycardia and hypertension were uncertain if related to the ingestion. No patients had major symptoms.

Estimated amounts were reported in 119 (35.8%) cases. Unknown weights were estimated at the 50th percentile weight for age. Doses ranged from 0.2 – 9.57 mg/kg and at 40 mg/kg; 28 cases involved "a taste". Of 32 cases followed to a known outcome: 4 had minor effects at 0.41 – 2.5 mg/kg with "more hyper than usual", drowsy, vomiting and abdominal pain. Moderate effects occurred at 1.67 mg/kg with drowsiness and fever, at 5 mg/kg with a seizure. No effects occurred in 26 ingestions from 0.31 – 9.57 and 40 mg/kg. No major symptoms occurred.

Conclusion: Based on this data, pediatric ingestions of less than 5 mg/kg citalopram are not likely to cause serious toxicity and can be safely managed outside of a HCF. Utilizing this triage guideline, 42 of the 98 cases treated in a HCF could have been managed at home, with only minor effects reported in six patients.

Discussion: Continued monitoring of citalopram ingestions in children <6 years of age will be needed to reconfirm this triage guideline as safe and reliable.

Keywords: Selective serotonin reuptake inhibitors, Pediatric, Poison center

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183. Treatment of flecainide toxicity in a 12-month-old child using intravenous lipid emulsion

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Background: Flecainide is a class 1c antiarrhythmic that is uncommonly used as a second-line agent in the pediatric population for treatment of supraventricular tachycardia (SVT). We report the successful use of intravenous lipid emulsion (ILE) in conjunction with sodium bicarbonate (NaHCO3) infusion in a 12-month-old child with flecainide toxicity.

Case Report: A 12–month-old boy, prescribed flecainide for management of SVT, presented to the emergency department (ED) after being found unresponsive at home by his parents. A 10 cc/kg bolus of normal saline (NS) was administered en route. Upon arrival the patient was awake, crying and had delayed capillary refill, weak central pulses, and BP 60/40 mm Hg. EKG revealed wide complex tachycardia (rate 133 bpm). Following a total of 40 cc/kg bolus of NS and two attempts at synchronized cardioversion, his rhythm converted to sinus tachycardia with wide QRS and intermittent non-sustained runs of ventricular tachycardia (VT). He then received two 1 mEq/kg boluses of NaHCO3 and norepinephrine at 0.05 mEq/kg/min. In the ICU he was intubated, received NaHCO3 infusion at 1 mEq/kg/hr, and 1.5 cc/kg bolus of 20% ILE followed by continuous infusion at 0.25 cc/kg/hr for 2 hours. Thirty minutes after completing the 2-hr ILE infusion, the patient acutely decompensated with recurrence of VT (rate 145 bpm). His electrolytes (potassium and magnesium) were normal. He received 10 cc/kg NS bolus, 2 mEq/kg NaHCO3 bolus, and 20% ILE was restarted at 0.25 cc/kg/hr. Within 20 minutes after restarting the ILE his perfusion improved and his rhythm converted back to a wide-complex sinus rhythm. ILE and NaHCO3 were continued for an additional 18 hrs. The patient was extubated the next day with a narrow-complex sinus rhythm. Serum flecainide level at the time of presentation was elevated at 2.57 mcg/mL (ref. 0.2-1.0 mcg/mL), confirming flecainide toxicity.

Discussion: The use of ILE therapy to reverse cardiotoxic effects from local anesthetics, calcium channel blockers, and other lipophilic drugs has been well described. In this case, we demonstrated the first reported use of ILE therapy in a child with flecainide toxicity. While the patient already had improvement of his arrhythmia prior to starting the ILE infusion, it was remarkable that the patient deteriorated after stopping ILE infusion and that restarting the infusion prevented the recurrence of the non-sustained VT.

Conclusion: ILE infusion in conjunction with standard therapies appeared to be safe and effective in reversing flecainide toxicity in this case. Prolonged ILE infusions should be considered in patients who continue to have ventricular arrhythmias due to flecainide toxicity.

Keywords: Cardiac toxicity, Lipid therapy, Pediatric

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184. Severe symptoms from an unintentional pediatric exposure to AB-PINACA with laboratory confirmation

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Background: AB-PINACA is a synthetic cannabinoids (SC) which has emerged in the last several years. Toxicity from intentional use of this agent has been described, but there are no reports detailing toxicity from unintentional exposures. We report a laboratory confirmed case of an unintentional exposure to AB-PINACA in a 10 month old child which resulted in severe toxicity.

Case Report: A 10 month old female with no past medical history presented to the emergency department after being found by mother chewing on a "K2 cigarette" just prior. On presentation her vital signs were temperature 36 .6° C, heart rate of 132 bpm, blood pressure of 106/69 mmHg, and a respiratory rate of 34 breaths per minute with an oxygen saturation of 97% on room air. The physical exam was non-focal with a normal mental status and respiratory exam. However within 90 minutes the child developed sedation and respiratory depression requiring endotracheal intubation. A post-intubation chest radiograph was normal. Initial laboratory studies were unremarkable and a urine immunoassay drug screen was negative. The patient was admitted to an intensive care unit. She was coincidentally found to be influenza A positive. She remained intubated approximately 36 hours but was extubated

Table 1.

Sample	Hours from Presentation	Chemical Detected	Concentration
Serum	0	AB-PINACA	42 ng/mL
Serum	0	AB-PINACA N-pentanoic acid	345 ng/mL
Serum	12	AB-PINACA N-pentanoic acid	232 ng/mL
Urine	16	AB-PINACA N-pentanoic acid	1.7 ug/mL

without difficulty and recovered fully. Blood and urine specimens were sent for analysis by liquid chromatography-quadrupole time-of-flight mass spectrometry (LC-QTOF/MS) (QTOF 6550 LC 1260, Agilent). Results revealed the presence of (S)-N-(1-amino-3-methyl-1-oxobutan-2-yl)-1-pentyl-1H-indazole-3-carboxamide (AB-PINACA) and its metabolite AB-PINACA N-pentanoic acid as shown in table 1. Analysis was negative for 548 other compounds. The cigarette was not available for analysis.

Case Discussion: AB-PINACA is a newer SC which has recently been scheduled as a controlled substance in the US. Its use has been associated with significant toxicity. Unintentional pediatric exposures have not previously been described. The symptoms seen in the case are consistent with those described with intentional use of AB-PINACA. There are no prior reports of AB-PINACA serum concentrations but when compared to reports of other SC concentrations, this is among the highest serum level reported.

Conclusion: This case suggests unintentional pediatric exposures to AB-PINACA can cause severe sedation and respiratory depression. Health care providers should be aware of this potential risk.

Keywords: Designer drug, Pediatric, Ingestion

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185. A Comparison of Poisoned Patients at Military and Veterans' Administration Hospitals

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Background: California is home to a large number of military bases and active-duty military personnel who use Military Hospitals (MH) for care. Additionally, there are many veterans in California who utilize Veterans' Administration (VA) hospitals for their healthcare. It is not known whether the active duty population differs from the veteran population in terms of frequency and types of toxicologic exposures.

Methods: We performed a retrospective review of the California Poison Control System (CPCS) database (Visual DotLab®) from January 1, 2013 to December 31, 2013. All CPCS records from California MH and California VA were identified for adults ≥ 18 years of age. Data extracted included: demographic data, type of exposure, number of substances exposed to, outcome, and type of hospital (MH or VA). Incomplete records were not reviewed. Descriptive statistical methods were used.

Results: 500 charts were identified. A total of 280 MH exposures were recorded: 191 single-substance (SS) (68%) and 89 multiple-substance (MS). Mean age was 29.7 yr (range, 18–86 yr) in the SS group and 30.3 yr (range, 18-78 yr) in the MS group. 84% of MS exposures had suicidal intent, compared with 42% of SS exposures. A total of 220 VA exposures were recorded: 159 SS (72%) and 64 MS. Mean age was 53.3 yr (range, 21-90 yr) in the SS group and 48.6 yr (range, 21-72 yr) in the MS group. 31% of SS exposures had suicidal intent, compared with 49% of MS exposures. Rates of occupational and environmental single-substance exposures (inhalational, ocular, dermal, or bite/sting) differed between the MH group (57 pts, 29.8%) and the VA group (24 pts, 15.1%). There were 17 major (6.1%) and 53 moderate (18.9%) outcomes in the MH group, versus 5 major (2.3%) and 38 moderate (17.3%) outcomes in the VA group. No deaths were reported in either group.

Discussion: The percentage of exposures due to suicidal intent was higher in patients attending military hospitals following both single- and multiple-substance ingestions. Additionally, the proportion of occupational or environmental exposures was twice as high at MH compared to VA. Patients at MH were generally younger than those at VA, which is expected based upon the ages of active-duty military personnel and their dependents.

Conclusion: Occupational/environmental exposures were fairly common among military personnel. Additionally, our data suggest an increased incidence of attempted self-harm following intentional exposures in patients attending MH compared to VA, although a large number of suicidal exposures were also seen at VA. Our data suggest a need for increased identification and treatment of both MH and VA patients at risk for intentional self-harm via toxicologic Methods.

Keywords: Poison center, Occupational, Military

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186. Intentional Ingestion of Malathion Resulting in Prolonged Hospitalization with Delayed Intubation

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Background: Worldwide, organophosphate poisoning is extremely common, both unintentionally and as a means of suicide. Malathion is a thion organophosphate pesticide that can be easily purchased as a concentrate without restriction in the United States. We present a case of intentional organophosphate poisoning resulting in delayed respiratory compromise requiring mechanical ventilation.

Case Report: A 53-year-old male with a history of alcohol abuse presented after an intentional ingestion of approximately 300 mL of 50% malathion. In the emergency department (ED) his blood pressure was 154/66 mmHg, heart rate was 105/minute, respiratory rate was 20/minute, oxygen saturation was 97% on 4 liters of oxygen and weight was 103.7 kg. He was awake but intoxicated and on exam had pinpoint pupils, mild rales diffusely and diaphoresis. A total of 1.5 mg atropine was given intravenously before control of secretions was achieved and the patient was admitted to the intensive care unit; pralidoxime was initially unavailable. His pulmonary status improved over the next 24 hours and he required no more atropine. Thirty hours into hospitalization he developed respiratory distress and motor weakness with significant

oral secretions and bronchorrhea. He was intubated for respiratory failure and an atropine infusion was started; by this time, pralidoxime became available and 2 grams were administered at hour 55 of hospitalization. The atropine infusion was required for 10 days to control secretions. The patient was extubated on day 13 and transferred to the psychiatric service on day 18.

Discussion: Malathion is a group 4 dimethoxy thion organophosphate that requires metabolism to the direct acting oxon form to have its cholinergic effect. This case shows the delayed, severe respiratory compromise that can occur after organophosphate ingestion. It is unclear whether the patient's late respiratory distress was a reflection of pesticide redistribution from fat stores, delayed metabolism or from the development of an intermediate syndrome. Healthcare providers should avoid dermal contact with patient secretions, vomitus and stool, as they may transmit organophosphate that can be harmful.

Conclusion: Although rare in the United States, organophosphate poisoning can occur, and care should be taken to observe for late exacerbations of symptoms.

Keywords: Organophosphate, Overdose, Ingestion

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187. Hand Sanitizer Exposures Reported to Poison Centers During Ebola Diagnoses in Texas

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Background: In late September-October 2014, three persons were diagnosed with Ebola virus in Dallas, Texas. After the diagnosis of Ebola in these three persons, spikes in sales of hand sanitizers were reported. This investigation examined whether the number of hand sanitizer exposures reported to Texas poison centers increased around the time of the Ebola diagnoses.

Methods: The monthly number of hand sanitizer exposures reported to Texas poison centers during 2000-2014 was identified. In addition, the mean number of exposures for each of the twelve months during 2011-2013 was determined. The number of exposures reported each month during 2014 was compared to the 2011-2013 mean for each month.

Results: The monthly number of hand sanitizer exposures reported in 2014 varied between 115 and 135 during January-August in no clear pattern, increased in September (n = 150) and peaked in October (n = 184) before declining in November (n = 149) and December (n = 141). The October 2014 number of hand sanitizer exposures was the highest reported monthly number of exposures since December 2009 (n = 192). The monthly number of exposures reported during January-August 2014 was lower than the corresponding means in 2011-2013 and during September-December 2014 was higher than the corresponding means for 2011-2013.

Conclusions: The number of hand sanitizer exposures reported to Texas poison centers surged in October 2014, the month when three persons were diagnosed with Ebola virus in Texas. This would suggest that public concerns about the Ebola virus led to an increase in hand sanitizer exposures reported to the poison centers.

Keywords: Poison center, Hand sanitizer, Ebola virus

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188. Antidote Stocking in Free Standing Emergency Centers

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Background: Multiple studies have demonstrated inadequate antidote stocking in hospitals. In 2009, a consensus panel by the American College of Emergency Physicians published guidelines for the stocking of antidotes in hospitals with emergency departments. In the last decade, there has been an increase in the number of free standing emergency centers (FECs). FECs offer more complete care compared to immediate care centers, including treating patients presenting with toxicologic emergencies. The purpose of this study was to evaluate the adequacy of antidote stocking at FECs in our state.

Methods: In November 2014, the pharmacies of six FECs along with their parent hospitals (PHs) were sent surveys requesting current inventories of 13 selected essential antidotes. Since FECs are located within one hour of their PH, it was determined that an adequate inventory was enough to provide one hour of treatment (TX) for an adult, assuming the patient would be transferred to the PH. For PHs, one and eight hour quantities were assessed based on the consensus guidelines.

Results: Five out of six (83%) FECs with their corresponding PHs responded to the survey. Data obtained is summarized in the following table.

Discussion: A cyanide antidote was the only product in which all five FECs were adequately stocked. Acetylcysteine, cyanide kit, deferoxamine mesylate, fomepizole, naloxone hydrochloride are the antidotes most adequately stocked in PHs; all five stocked

Table 1. Antidote Stocking at FECs and PHs.

	Sufficient Inventory				
Antidote	Quantity 1h (100 kg)	Quantity 8h (100 kg)	FEC Adequate 1h TX	PH Adequate 1h TX	PH Adequate 8h TX
Acetylcysteine	15g	28g	2	5	3
Crotalidae Polyvalent Immune Fab	4 vials	12 vials	0	1	0
Sodium thiosulfate/ nitrite or hydroxycobalamin (cyanide kit)	300mg/25g or 5g	600mg/50g or 10g	5	5	5
Deferoxamine mesylate	1.5g	12g	2	5	2
Digoxin Immune fab	10 vials	15vials	1	3	2
Fomepizole	1.5g	1.5g	4	5	5
Glucagon hydrochloride	20mg	90mg	2	4	2
Methylene blue	200mg	400mg	0	4	4
Naloxone hydrochloride	6mg	20mg	4	5	5
Octreotide acetate	75mcg	75mcg	1	3	3
Physostigmine salicylate	2mg	4mg	1	4	4
Pralidoxime chloride	2g	7g	0	1	1
Pyridoxine hydrochloride	5g	8g	1	3	2

these antidotes for a one hour supply. However, only two PHs had sufficient quantity for eight hours, as defined by consensus guidelines. For the five FECs, two had eleven of thirteen antidotes, two had six, and one had four.

Crotalidae Polyvalent Immune Fab, physostigmine salicylate, and pralidoxime chloride were consistently understocked by FECs and PHs at both 1 hour and 8 hour stocking recommendations.

Conclusion: Previous studies have shown hospitals with emergency rooms are inadequately stocked with antidotes. Our study demonstrates that FECs are even less prepared, based on one hour requirements.

Keywords: Antidote, Freestanding emergency center, Hospital preparedness

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189. Persistent hypokalemia despite aggressive potassium replacement following a hydroxychloroquine overdose

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Background: Hydroxychloroquine overdoses are rare and management is extrapolated from chloroquine toxicity. We report a case of severe hydroxychloroquine toxicity with refractory hypokalemia.

Case Report: A 22 year old female with a past medical history of Sjogren's syndrome, fibromyalgia, and bipolar disorder was admitted for 72 hours after ingesting approximately hydroxychloroquine 6 g, tramadol 1.5 g, and meloxicam 450 mg. Upon hospital arrival, She was unresponsive and had a seizure that responded to lorazepam. Her blood pressure and heart rate decreased from to 130/70 to 88/56 mmHg and 148 to 88 bpm, respectively. After intubation, gastric lavage was performed and she was sedated on midazolam. Significant initial laboratory studies include serum hydroxychloroquine 2000 ng/mL (therapeutic range not established but typically < 1000 ng/mL), lactate > 10 mmol/L, bicarbonate 10 mEq/L, and potassium 3.0 mEq/L. Electrocardiogram showed sinus tachycardia, QRS 116 msec, and QTc 399 msec. Her vital signs improved and QRS narrowed after a sodium bicarbonate bolus, after which a continuous infusion was started. Over the next 12 hours, her potassium ranged between 2.5 and 2.7 mEq/L and her QTc prolonged to 551 msec despite receiving a total of KCl 280 mEq IV. Her potassium normalized at 12.5 hours but peaked 6.5 hours later to 5.6 mEq/L. The hyperkalemia resolved spontaneously and the remainder of her hospitalization was uncomplicated.

Case Discussion: Our patient presented with signs and symptoms consistent with severe hydroxychloroquine toxicity. A toxic serum hydroxychloroquine concentration has not been well established since fatalities have occurred at levels as low as 640 ng/mL and survival with concentrations as high as 26,000 ng/mL. Inability to correlate toxicity with serum levels has prompted clinicians to seek surrogate markers, including hypokalemia, for severe toxicity. Previous case reports describe 3 patients who each survived cardiac arrest after ingesting hydroxychloroquine 20 g and having serum levels of 9870 ng/mL, 13,800 ng/mL, and 26,000 ng/mL, respectively. All 3 patients received sodium bicarbonate and aggressive potassium replacement with total KCl reuqirements between 140 and 220 mEq. Our patient received more KCl than the highest reported in the aforementioned cases despite a markedly lower serum concentration, which might have drawn before its peak. Hyperkalemia resolved on its own without complications in all patients.

Conclusions: Hypokalemia may serve as a surrogate marker for severe hydroxychloroquine toxicity. Aggressive potassium replacement in these patients is controversial but should be considered for severe toxicity.

Keywords: hydroxychloroquine, Overdose, hypokalemia

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190. Rates of Suicide Involving Prescription Opioids Before, During and After the Great Recession

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Background: Little is known about the rates of use of prescription (Rx) opioids with suicidal intent surrounding the Great Recession, the steep economic decline during the late 2000s. This study aims to describe these trends in the US before, during and after the Great Recession.

Methods: Data were used from the Researched Abuse, Diversion and Addiction-Related Surveillance (RADARS®) System Poison Center Program, which collects and reviews human exposure cases from participating US poison centers, to assess suspected suicide trends involving Rx opioids. Cases classified as intentional suspected suicide involving buprenorphine, fentanyl, hydrocodone, hydromorphone, methadone, morphine, oxycodone or tramadol were used. Guided by the Bureau of Labor Statistics, the periods were defined as Pre-Recession (Pre) 1Q06 – 4Q07; Active Recession (Active) 1Q08 – 2Q09; and Post Recession (Post) 3Q09 – 4Q14. Population rates were calculated in each quarter by dividing the total number of cases by the covered population. The population was calculated by interpolating and extrapolating the 2000 and 2010 US Censuses. Spline Poisson regression was used to estimate the average quarterly change in the population rate in each of the periods. Pre and Post average quarterly rate changes were compared to the Active average quarterly rate change.

Results: The average quarterly change in rate of use of Rx opioids with suspected suicidal intent was 5.69% in the Pre period (p-value < 0.001), 2.64% in the Active period (p-value < 0.001), and -0.34% in the Post period (p-value $= 0.053$). The Pre average quarterly change was significantly higher than the Active average quarterly change (p-value $= 0.034$). The Post average quarterly change was significantly lower than the Active average quarterly change (p-value < 0.001). The rate of increase was greatest during the Pre period. During the Active period, the population

Period	Average Quarterly Change % (95% CI)	Average Quarterly Change p-value	Difference In Slopes Compared to Active p-value
Pre	5.69 (4.01, 7.41)	<.001	0.034
Active	2.64 (1.22, 4.08)	<.001	–
Post	–0.34 (–0.69, 0.01)	0.053	<.001

rate continued to increase, but less dramatically. During the Post period, the population rate decreased.
Conclusion: Although the Active period shows an increase in suspected suicide rates involving Rx opioids, results indicate that the Pre period experienced the greatest quarterly increase in rates compared to the other two periods examined. There appeared to be a decline in rates during the Post period. Examination into the demographics of the Pre period data is recommended to help better understand who should be targeted when intervention is needed.
Keywords: prescription opioids, exposures, suicide
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191. A Prevalence Study of Illicit Drug and Alcohol Use in Pregnant Women

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Background: The use of illicit drugs and alcohol during pregnancy has been linked to pregnancy complications and adverse fetal outcomes. Identification of current illicit drug and alcohol use rates among pregnant women could help healthcare providers target intervention strategies. The purpose of this study was to assess prevalence rates of illicit drug and alcohol use among pregnant women as identified by definitive quantitative lab Results.
Methods: This was a prospective, multi-site study conducted with convenience sampling over 14 days at a tertiary care University hospital serving an urban population. Included were pregnant women at any stage of pregnancy who presented to one of two obstetric ambulatory office sites as part of their routine obstetric care. Excluded were non-pregnant patients or patients who provided more than one urine sample during the study period. Included patients provided a urine sample as part of routine care. Urine samples were de-identified at the time of study sample collection, and no patient identifiers were recorded. Mass spectrometry analysis of urine was performed with quantitative testing done for a pre-selected sample of illicit drugs and alcohol. Positive urinalysis results were grouped by drug or drug category. Descriptive statistics were performed.
Results: Urine samples were collected from 317 patients. 22 patients were excluded. A total of 19/295 (6.4%) patients were in their first trimester, 89/295 (30.2%) patients were in their second trimester, and 187/295 (63.4%) patients were in their third trimester. Urinalysis results are listed in Table 1.
Conclusions: In this anonymous drug screening study of pregnant patients, marijuana, opioid analgesics and ethanol were most frequently detected in urine. Marijuana has previously been described as one of the most commonly used illicit drugs during pregnancy, and our data continues to reflect its use in pregnancy. The opioid use rates may mirror overall general population opioid use increases. The rates of ethanol use are of interest considering the public health warnings regarding ethanol use during pregnancy. Prevalence rates were highest during the third trimester, which may reflect our patient trimester distribution or may reflect a patient-perceived increase in drug use safety as pregnancy nears term.

Table 1. Drug or drug category detected on urinalysis listed by trimester.

Drug or Drug category	All Trimester Use number (%)	First Trimester Use number (%)	Second Trimester Use number (%)	Third Trimester Use number (%)
Marijuana	12 (4)	2 (1)	1 (1)	9 (5)
Cocaine	1 (<1)	0	1 (1)	0
Ethanol	18 (6)	2 (1)	3 (3)	13 (7)
Opioids	13 (4)	0	2 (2)	11 (6)
Sedative Hypnotics	3 (1)	0	1 (1)	2 (1)

Keywords: Ethanol, Opioid, Drug of abuse
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192. Dermal Burns Due to Dermal Exposures Reported to Poison Centers

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Background: In 2013, the second most common exposure route among all exposures reported to US poison centers was dermal (7% of total). One potential injury to result from dermal exposures is dermal burns. The purpose of this study was to describe dermal exposures that resulted in dermal burns reported to poison centers and to compare the different degrees of burn severity.
Methods: Cases were dermal exposures reported to a statewide poison center system during 2000–2014 where a clinical effect of 2nd-3rd degree (23D) or superficial (SUP) burns was reported. Exposures not followed to a final outcome were included. The distribution of cases for each burn type was determined for selected characteristics. Comparisons were made by calculating the rate ratio (RR) of 23D to SUP cases and 95% confidence interval (CI).
Result: Of 8,024 total cases, 2,426 (30%) had 23D and 5,598 (70%) had SUP burns. The most common substance categories involved in the exposures were chemicals (41% 23D vs 29% SUP), household cleaning substances (16% 23D vs 20% SUP), hydrocarbons (8% 23D vs 9% SUP), and cosmetics/personal care products (5% 23D vs 8% SUP). Patients 20 years or older accounted for 82% of 23D and 70% of SUP cases (RR 1.16, 95% CI 1.13-1.19); 72% of 23D and 59% of SUP patients were male (RR 1.22, 95% CI 1.18-1.26). 93% of 23D and 92% SUP exposures were unintentional (RR 1.01, 95% CI 0.99-1.02); 2% of 23D and 5% SUP exposures were adverse reactions (RR 0.54, 95% CI 0.41-0.71). The exposure occurred in the patient's own residence in 47% of 23D and 63% of SUP cases (RR 0.75, 95% CI 0.71-0.78) and in the workplace in 42% of 23D and 26% of SUP exposures (RR 1.64, 95% CI 1.54-1.75). The management site was managed on site (11% 23D vs 48% SUP, RR 0.22, 95% CI 0.20-0.25), already at/en route to a healthcare facility when the poison center was contacted (61% 23D vs 37% SUP, RR 1.66, 95% CI 1.58-1.74), and referred to a healthcare facility (25% 23D vs 13% SUP, RR 1.93, 95% CI 1.75-2.13). Serious outcomes were reported in 98% of 23D and 25% of SUP cases (RR 3.86, 95% CI 3.68-4.04).
Discussion: 23D exposures were more likely than SUP exposures to involve adults and males, involve chemicals, and occur at the workplace. Since 23D exposures were more likely to be serious, they were more likely to be managed at a healthcare facility.
Keywords: Poison center, Burns, Dermal exposure
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193. A Retrospective Analysis of Prehospital Activated Charcoal Use in Antipsychotic Poisoning

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Objective: Antipsychotic overdose is a common call to our EMS system. Severe cases can lead to complications including death. Activated charcoal (AC) is known to bind to antipsychotic medications, and may limit absorption if administered soon after ingestion. We studied the complications and timing implications of prehospital activated charcoal (PAC) administered in cases of antipsychotic poisoning.
Methods: Our city prehospital protocol allows administration of up to 50 grams of AC by standing order or in consultation with our PCC or a base hospital in awake and cooperative patients with gag reflex intact who ingested a substance potentially bound by AC. We retrospectively reviewed prehospital records over 32 months for all antipsychotic overdose cases. Cases of antipsychotic overdose where PAC was administered were compared to cases of these overdoses where it was not. Data were collected for amount and type of ingestant, clinical findings, timing of PAC, timing of transport and arrival into the emergency department (ED), and complications. Complications were defined as either a decline in blood pressure (<90 systolic with a drop of at least 30 mmHg from baseline), decline in oxygen saturation ($<90\%$ with a drop in SpO2 of at least 5%) or declining mental status (compared to baseline, subjectively described as becoming "unarousable" or with GCS <11 by medics) after patients received PAC, whether or not these effects were related to AC administration. Incidence of emesis was also tracked in all patients.
Results: A total of 107 cases of antipsychotic overdose were identified from EMS records. After 45 cases were excluded, 30 cases received PAC and 24 did not. The median time from toxic ingestion to EMS arrival for patients who did receive PAC was 27.1 min (IQR 19.3-37.3 min, range 8-120 min) and 36.6 min (IQR 21.0-60.6 min, range 6-120 min) for patients who did not ($p = 0.1416$). The median total EMS encounter time for patients who received PAC was 26.8 (IQR 22.6-33.8 min, range 10-53 min), compared to 25.6 min (IQR 22.5-29.8 min, range 10-39 min) for those that did not ($p = 0.4715$). The median ambulance transport time for patients who received PAC was 13.6 min (IQR 9.3-17.4 min, range 1-42 min), compared to 12.0 min (IQR 9.8-15.7 min, range 1-25 min) for those who did not ($p = 0.865$). Complications were seen in 4.2% of patients who received PAC, compared to 6.7% of those who did not ($p = 0.689$). There was one case of emesis among patients who did not receive AC (4.2%), compared to 3 cases (10%) among those who did receive PAC ($p = 0.418$).
Conclusions: PAC did not appear to markedly delay transport or arrival of antipsychotic overdose patients into our region's ED, and was generally safe.
Keywords: Decontamination, Antipsychotic, Ingestion
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194. Evaluation of intentional quetiapine abuse compared to other atypical antipsychotics reported to the National Poison Data System

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Background: Recent studies utilizing the National Poison Data System (NPDS) have demonstrated that quetiapine is frequently obtained for purposes of intentional abuse. The goal of this study was to utilize the NPDS to compare the intentional abuse of quetiapine to other atypical antipsychotics.
Methods: A 10-year retrospective analysis was conducted (2003 – 2013). NPDS data was obtained for all atypical antipsychotics, selecting single-substance exposures coded as intentional abuse. All quetiapine cases were analyzed as one cohort and compared to a cohort of all other atypical antipsychotics combined.
Results: There were 2118 cases of quetiapine exposures and 1380 cases of other atypical antipsychotic exposures coded as intentional abuse. Median age in the quetiapine cohort was 17 years and median age in the other atypical antipsychotic cohort was 18 years. Methods of exposure were similar between the two groups with oral ingestion being most common (93.9% quetiapine cohort, 94.8% other atypical antipsychotic cohort). Other routes of exposure included inhalational (5.6%, 5.3%) and parenteral (0.8%, 0.4%). Critical care admissions were common in both groups (10.3%, 9.3%). Of cases with known outcomes (1446 quetiapine cohort, 920 other atypical antipsychotic cohort), there were similar rates of major outcomes (1.7%, 2.5%, odds ratio (OR) 0.66, 95% confidence interval 0.37 – 1.17) and death (0.07%, 0.1%, OR 0.63, 0.04 – 10.1). Cases of quetiapine abuse were more likely to result in drowsiness or lethargy (54.5%, 39.3%, OR 1.85, 1.56 – 2.18), syncope (1.8%, 0.3%, OR 5.60, 1.69 – 18.5), hypotension (5.6%, 3.2%, OR 1.75, 1.14 – 2.69), and respiratory depression (1.0%, 0.2%, OR 4.49, 1.02 – 19.8). Abuse of other atypical antipsychotics was more likely to result in dystonia (0.6%, 12.5%, OR 0.04, 0.01 – 0.08) and agitation (5.5%, 8.0%, OR 0.67, 0.48 – 0.92). There were similar rates of intubation (1.4%, 1.5%, OR 0.91, 0.45 – 1.80), seizure (0.8%, 1.0%, OR 0.85, 0.36 – 1.71), and electrocardiogram changes (0.7%, 0.5%, OR 1.66, 0.59 – 4.67).
Conclusions: Quetiapine appears to be intentionally abused significantly more often than any other atypical antipsychotic. The demographic and clinical features of quetiapine abuse and abuse of other atypical antipsychotics are overall fairly similar. There may be a tendency for more cardiovascular and respiratory effects resulting from quetiapine abuse and more dystonia resulting from abuse of other atypical antipsychotics. Both cohorts demonstrate that atypical antipsychotic abuse can result in significant morbidity.
Keywords: Abuse, Antipsychotic, National Poison Data System
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195. Hallucinogenic Tryptamine Exposures Reported to Poison Centers

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Background: Tryptamines are a class of indole alkaloid chemicals, many of which have hallucinogenic effects. The number of hallucinogenic tryptamine reports to a US forensic laboratories database increased greatly during 2006-2010. The objective of this study was to describe hallucinogenic tryptamine exposures reported to a statewide poison center system.
Methods: Cases were hallucinogenic tryptamine exposures reported to a statewide poison center system during 2000-2014. Psilocybin and hallucinogenic mushroom exposures were excluded. Exposures involving other substances and those not followed to a final medical outcome were included. The distribution of exposures by various demographic and clinical factors was determined.
Results: There were 52 total exposures, of which 27 involved N,N-dimethyltryptamine (DMT), 7 α-methyltryptamine (AMT), 5 4-acetoxy-N,N-dimethyltryptamine (4-AcO-DMT), 5 N,N-dipropyltryptamine (DPT), 4 5-methoxy-N,N-diisopropyltryptamine (5-MeO-DIPT), 2 5-methoxy-α-methyltryptamine (5-MeO-aMT), 1 5-methoxy-N,N-diallyltryptamine (5-MeO-DALT), and 1 unknown. The annual number ranged from 0 to 8 with no clear trend. The mean patient age was 21 years (range 13-39 years); 77% were male. 81% of the exposures were due to intentional abuse or misuse, 8% suspected attempted suicide, 6% unintentional, and 6% unknown; 87% of the exposures occurred at the patient's own residence, 2% another residence, 2% public area, and 10% unknown location. The exposure route was 65% ingestion alone, 9% inhalation alone, 5% ingestion and inhalation, 4% rectal, and 18% unknown. 85% of the patients were already at/en route to a healthcare facility, 12% referred to a healthcare facility, and 4% managed on site. The medical outcome was 2% no effect, 12% minor effect, 65% moderate effect, 8% major effect, 6% not followed-minimal effects, and 8% unable to follow-potentially toxic. The most common adverse effects were tachycardia (50%), hallucinations/delusions (48%), agitation/irritable (40%), confusion (25%), mydriasis (19%), hypertension (10%), and drowsiness/lethargy (10%). The most common treatments were IV fluids (52%), benzodiazepines (38%), activated charcoal (17%), and cathartic (10%).
Conclusion: Few hallucinogenic tryptamine exposures were reported to this poison center system, and the number does not appear to be increasing. The most common drugs were DMT and AMT. The patients tended to be young and male. The drugs were most often ingested. The majority of exposures had serious outcomes and were managed at healthcare facilities.
Keywords: Poison center, Tryptamine, Hallucinogenic drug
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196. Hot Under the Collar

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Background: Inappropriate exposure to commercially available chemical products can cause potentially significant toxicity. A case of a patient who intentionally ingested a piece of a chemical hand warmer which contains between 5-8 grams of elemental iron is presented.
Case Report: A 32 year old woman presented to the emergency department with a "warm sensation" in her mouth and epigastrium after reportedly ingesting part of a "Hot Hands 2" brand chemical hand warmer the night prior. She denied nausea, vomiting or diarrhea.

In the ED vital signs were within normal limits. Physical exam was remarkable only for a black granular substance in her teeth.The Material Safety and Data Sheet for the product lists ingredients as polymer, iron powder, activated charcoal, water, vermiculite, and salt. A serum iron level was obtained approximately six hours after ingestion and measured 235 mcg/dL (40-180). An abdominal radiograph was performed, revealing scattered radioopaque material mixed with stool in the lower right abdomen, consistent with the presence of metal fragments (photos available). As the patient demonstrated no new abdominal complaints and no evidence of systemic iron toxicity, she warranted no specific treatment and was discharged uneventfully with primary care physician follow up.
Discussion: Ingestion of hand warmer products has been described in several reports, usually among elderly patients suffering from dementia with unintentional ingestion. One case report includes specific amounts of each ingredient as reported by a local distributor: iron powder 50%, purified water 25%, activated carbon 20%, vermiculite 3%, and sodium chloride 2%, with weights of product ranging from 95-120. This information suggests that a packet of hand warmer may contain as much as 60g iron powder. Per a Heatmax, Inc representative, each product contains between 5 -8 grams of elemental iron. Although our patient was essentially asymptomatic, the potential for significant iron toxicity exists depending on the extent of exposure to this or similar products. Emergency physicians must be aware of the toxicity associated with ingestion of commercially available hand warmers, especially in pediatric, elderly, or frail patients with low body weight. The product is distributed in tear-open foil packaging, which can be mistaken for a food product and is easily accessible. Furthermore, information regarding the amount of iron in the product is not readily available on the internet, nor is it included in the MSDS. We recommend obtaining a serum iron level on every patient with possible ingestion of a commercial hand warmer, and to immediately consult a medical toxicologist or poison control center due to the potentially significant morbidity and mortality associated with iron toxicity.
Keywords: Ingestion, Iron toxicity, Education
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197. Outcomes in Lithium Toxic Patients Treated with Hemodialysis Versus Supportive Therapy

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Background: Controversy exists regarding the management of lithium-toxic patients. Current recommendations suggest patients with elevated lithium levels receive dialysis for neurologic toxicity, hemodynamic instability, renal insufficiency, or significantly elevated serum lithium levels. However, little data exist to support these recommendations. To date, only limited data have directly compared neurologic outcomes in patients presenting with lithium toxicity who were treated with dialysis compared to those who were not. We conducted a retrospective chart review to evaluate neurologic outcomes in patients receiving dialysis for lithium toxicity compared to those who received only supportive care.

Variable Mean (95% CI)	Non-Hemodialysis (n = 95)	Hemodialysis (n = 8)	p-value
Age, yrs	40.6 (37.4–43.8)	49.3 (40.6–53.3)	0.13
Female, no. (%)	52 (54%)	2 (25%)	0.10
Initial Serum Creatinine, mg/dL	1.39 (1.18–1.6)	3.56 (0.78–6.34)	< 0.001
Initial Lithium level, meq/L	2.42 (2.21–2.63)	5.13 (3.49–8.41)	< 0.001
Peak Lithium level, meq/L	2.72 (2.51–2.93)	5.27 (3.63–6.91)	< 0.001
Length of Stay, days	4.41 (3.58–5.24)	13 (3.91–22.1)	< 0.001

Methods: The Division of Medical Toxicology's database of patient encounters at a tertiary academic medical center was utilized to identify all patients ≥ age 13 who presented with acute, acute-on-chronic, or chronic lithium toxicity from February 1, 1998 through August 31, 2013. Demographics, laboratory studies, and outcome data were collected. The primary outcome of this study was return to baseline neurologic function prior to discharge. Secondary outcome was hospital length of stay. Descriptive statistics, Student's t-test, and Fisher's exact test were used to analyze the data where appropriate.
Results: After excluding patients with sub-toxic lithium levels (n = 23) and those whose medical record lacked pertinent data (n = 8), 103 patients were included into the study. See table for Results. All cases initiated dialysis for a high lithium level and some cases had multiple indications which included either altered mental status (n = 2) and/or acute kidney injury (n = 3). All patients in both groups returned to their neurologic baseline prior to hospital discharge.
Conclusions: In this retrospective analysis, all patients in both groups returned to neurologic baseline upon hospital discharge. Based on these results, dialysis does not appear to alter neurologic outcomes. Significantly longer hospital stay was seen in patients who received dialysis which is likely the result of confounding or increased comorbidities (older average age, higher baseline creatinine, and higher peak lithium level) in this group.
Keywords: Lithium, Hemodialysis, Neurotoxicity
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198. Non-medical Use of Prescription and Illicit Drugs in Public versus Private Colleges & Universities

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Drug Category	Public N (%)*	Private N (%)*	Odds Ratio	P-value
Any Drug	5,705 (33.1)	1,635 (28.4)	0.85	< 0.0001
Opioids	3,130 (18.1)	896 (15.6)	0.88	0.005
Sleeping Aid	1,508 (8.74)	439 (7.63)	0.89	0.079
Stimulant	1,930 (11.2)	562 (9.77)	0.90	0.091
Muscle Relaxer	1,847 (10.7)	502 (8.73)	0.91	0.146
Anti-Depressant	1,521 (8.82)	471 (8.19)	0.97	0.686
Anti-Anxiety	1,779 (10.3)	564 (9.81)	0.99	0.893
Any Illicit Drugs	1,796 (10.4)	552 (9.60)	1.01	0.842

*Multiple endorsements are possible between categories.

Background: Non-medical use (NMU) of prescription (Rx) drugs is a growing concern in the United States and is the fastest growing drug problem among young adults. From the Monitoring the Future study, approximately 1 in every 10 persons ages 18 – 25 reported NMU of Rx opioid analgesics in 2003. This age group is at risk for developing adverse drug habits stemming from sustained use during college years. This abstract aims to address whether NMU endorsements of these drugs are different between public and private institutions.
Methods: The Researched Abuse, Diversion and Addiction-Related Surveillance (RADARS®) System College Survey Program collects data from approximately 6,000 respondents annually during the spring, summer, and fall semesters. The online survey inquires about demographics, Rx drug NMU of stimulants, opioids, muscle relaxants, anti-anxiety, anti-depressants, sleeping aids and lifetime illicit drug use. NMU was defined as use without a doctor's Rx or any reason other than prescribed during the last three months. Students attending a public or private 4-year institution from 2010 to 2014 were analyzed. The "Any Drug" categories were created based on endorsements of at least one Rx with or without an illicit drug. Logistic regression was used to determine if NMU was more prevalent in public (reference) or private institutions (adjusted for age, gender, and Greek life status [yes/no]).
Results: Of the 23,000 eligible respondents, 17,248 (75%) reported attending a public school and 5,752 (25%) reported attending a private school. After adjusting for covariates, the odds of endorsing any drug and opioids were lower for private schools compared to public (0.15 and 0.12 times lower, respectively). There were no statistically significant differences among the other drug categories.
Conclusion: Endorsement of at least one drug and the opioid categories provided evidence of a significant difference in NMU between public and private schools. Identifying populations at risk for NMU of Rx drugs can inform targeted prevention strategies. Our study indicates there may be a greater impact of interventions targeted toward public institutions.
Keywords: non-medical use, prescription drugs, college survey
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199. Geographic Differences in Naloxone Use With Prescription Opioid Analgesic Exposures

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Background: Naloxone (Narcan) is an opioid antagonist used to counter the effects of opioids, particularly with opioid overdose. Because of an increase in opioid overdoses and deaths in the US, greater access to naloxone by first-responders and the public has been advocated. Since there are geographic differences in prescription opioid analgesic exposures, similar differences might be expected with naloxone used to treat these exposures. The objective of this study was to describe the geographic pattern of opioid analgesic exposures and naloxone use in a single state.
Methods: Exposures to prescription opioid analgesics reported to a statewide poison center system during 2000-2014 were identified. Included were exposures with a known caller county, with other substances in addition to the opioid analgesic, and with any

medical outcome. Recommendation or use of naloxone was determined for each case. The cases were grouped geographically by the 11 Public Health Regions (PHRs) into which the state is divided and by rural vs urban county based on US Office of Management and Budget definitions of metropolitan and non-metropolitan. For each group, the opioid analgesic rate per 1,000 population and naloxone rate per opioid analgesic exposures were calculated and comparisons made between the groups.
Result: Of 81,812 total opioid analgesic exposures, naloxone was used or recommended in 10,239 (12.5%). The naloxone rate for PHRs with an opioid analgesic rate of 3.00-4.99/1,000 was 11.9% and for PHRs with an opioid analgesic rate of 4.50-5.99/1,000 was 15.8%. Rural counties had an opioid analgesic rate of 4.37/1,000 and a naloxone rate of 15.8%; urban counties had an opioid analgesic rate of 3.85/1,000 and a naloxone rate of 11.9%.
Discussion: Naloxone was used or recommended in 1/8 of the opioid analgesic exposures. The PHRs with higher opioid analgesic rates tended to have higher naloxone rates. Rural counties had higher opioid analgesic rates and naloxone rates. This information may be useful in determining those areas where naloxone recommendation or use might be expanded.
Keywords: Poison center, Naloxone, Opioid
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200. Availability of Extracorporeal Treatments: a Worldwide Survey

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Background: The EXTRIP workgroup recently published systematic reviews and recommendations for extracorporeal treatments (ECTRs) in various poisonings. Intermittent hemodialysis (HD) was found to be both the most efficient and the most favoured ECTR to enhance poison elimination. However, worldwide availability of HD compared to continuous renal replacement therapy (CRRT), hemoperfusion (HP), therapeutic plasma exchange (TPE), liver support device (LSD), peritoneal dialysis (PD), and exchange transfusion (ET) remain unknown.
Methods: An online survey was sent out from 01/2014 to 03/2015 out to clinicians worldwide.
Results: There were a total of 963 responders. Demographics of responders showed that 93% were physicians, 73% worked in a tertiary care facility, and 85% had an academic affiliation. Mean completion time was 52 min. Data of ECTR availability could be extracted from 341 responders in 89 countries. Mean time to initiate the ECTR was: HD = 79 min, CRRT = 76 min, HP = 111 min, TPE = 163 min, LSD = 165 min, PD = 289 min ($p < 0.05$, for all ECTRs compared to HD, except for CRRT). Availability of ECTR was: HD = 97%, CRRT = 62%, HP = 32%, TPE = 68%, LSD = 14%, PD = 45% ($p < 0.001$ for all ECTRs compared to HD). The availability of acute PD was inversely related to a country's GDP per capita ($p < 0.05$).
Conclusions: The results of this survey suggest that HD is by far the most widely available ECTR worldwide and is also the fastest to initiate. This wider access to HD, added to its superior efficacy over other ECTRs, strengthens its preference as the ECTR of choice in acute poisonings.
Keywords: Enhanced elimination, Availability, Survey
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201. The usefulness of venous ammonia in patients poisoned with glufosinate ammonium herbicide

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Objective: Physicians have difficulty identifying initially asymptomatic patients at risk of developing neurotoxicity following glufosinate ammonium (GLA)-containing herbicide ingestion. This study investigated whether ammonia concentrations can predict GLA herbicide-poisoned patients with a high risk of developing delayed neurotoxicity and the latency of neurotoxicity after ingestion.
Materials and Methods: This retrospective observational case study included patients who presented with an alert mental state and hemodynamic stability within 12 hours after GLA herbicide ingestion. The patients were divided into two groups: non-complicated patients, who did not experience neurotoxicity during hospitalization, and complicated patients, who experienced neurotoxicity during hospitalization. Neurotoxicity was defined as seizures, central respiratory failure requiring mechanical ventilation support, and altered mentality (GCS < 13). The initial ammonia concentration at presentation, peak ammonia concentration, ammonia concentrations during the first 48 hours after ingestion, and the rate of ammonia increase were compared.
Result: The present study included 23 patients with GLA herbicide poisoning. Of these 23 patients, twelve (52.2%) experienced neurotoxicity at 16 hours post-ingestion; the mortality rate was 5.1%. The ammonia concentration at presentation significantly increased within 12 hours after ingestion in only the complicated group. This group had significantly higher venous initial (91.5 (75.3-127.0) μg/dL in the complicated group vs. 68.0 (43.0-95.0) μg/dL in the non-complicated group, $p = 0.016$) and peak ammonia concentrations (154.0 (118.5-201.8) μg/dL in the complicated group vs. 77.0 (43.0-100.0) μg/dL in the non-complicated group, $p < 0.001$) before developing neurotoxicity compared with the non-complicated group. The area under the curve (AUC) of peak ammonia (AUC, 0.962; 95% confidence interval [CI], 0.894-1.00), with an optimal cut-off value of 125 μg/dL, was higher than that at admission (AUC, 0.795; 95% CI, 0.604-0.987). However, the initial and peak ammonia concentrations were not independent predictors of neurotoxicity in the multivariate analysis. The rate of ammonia increase was not associated with the time latency from ingestion to neurotoxicity development.
Discussion and Conclusion: Measuring ammonia in GLA-poisoned patients may help identify those who are at high risk of developing neurotoxicity. However, further qualified trials are required to confirm our results, and to reveal the etiology of hyperammonemia and its causality neurotoxicity, which are currently unknown.
Keywords: Herbicide, Neurotoxicity, Ingestion
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202. Mushroom ingestions: Consultations of the Poisons Information Centre Vienna, Austria from 1996 to 2014

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Objectives: Many people in our country enjoy collecting mushrooms. Since not all of the mushroom hunters are experienced, non-edible mushrooms are sometimes ingested. In addition, children take a bite of or eat single mushrooms. Therefore, mushroom ingestions are frequent reasons for contacting Poisons Information Centres (PIC). Most of the self collected mushrooms are consumed as a meal, only a few are ingested due to their hallucinogen effects.
Methods: We conducted a retrospective review of all consultations of the local PIC concerning mushroom ingestions between 1996 and 2014.
Results: In the last 19 years the PIC had 4208 inquiries concerning suspected mushroom poisonings. In 5.7% of the cases we were repeatedly consulted regarding the same patients.

36% of the callers were hospital physicians, 5.5% practitioners, 57.4% presumptive patients or relatives and 1.1% other callers. Mushrooms were ingested by adults in 75% and by children (< 15 years) in 25%. Mushroom species were specified in 12.4% of poisonings based on symptoms and laboratory values. The most common species were Amanita phalloides, Psilocybe species, Amanita muscaria, Amanita pantherina, Agaricus xanthoderma, Gyromitra esculenta and Boletus satanas. Death due to amanita poisoning was documented in 4 cases. All of these were hospitalised with a delay of at least one day. 67.6% of cases developed symptoms, but most of the symptoms were unspecific (nausea, vomiting, diarrhea and vertigo). In 3.7% hepatic impairment and in 0.24% liver failure was diagnosed. 0.2% developed renal insufficiency and 0.1% kidney failure. In 23.6% of all cases intoxication could be excluded, 6.2% were sent to medical care. 13.7% were already in-patients and further observation/therapy was recommended in the hospital. 56.5% of the cases were not assessable at the time of consultation and further observation was advised. Amanita phalloides poisoning was suspected in 6.8% of the patients and the antidote Silibinin was recommended. Activated charcoal (AC) was administered in 4.8% (1.8% multiple dose).
Conclusions: Severe or specific symptoms or the suspicion of a mushroom poisoning are criteria for the recommendation of admission to a hospital. When Amanita phalloides poisoning is suspected, the local PIC suggests the therapy with the specific antidote Silibinin as soon as possible.
Keywords: Mushroom poisoning, Poison center, Antidote
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203. A Comparison of Opioid Analgesic Exposures Reported to Poison Centers Before & After Hydrocodone Reclassification to Schedule II

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Introduction: The Drug Enforcement Administration (DEA) rescheduled hydrocodone as a class II agent on 10/6/The impact of this change on use of other opioids is unclear, especially in states where special prescription pads are required for schedule II agents. This study compares opioid analgesic exposures reported to a large statewide poison center network (PCN) before and after this change in a state that requires special prescription pads for Schedule II agents.
Methods: Cases were all opioid analgesic exposures reported to a statewide PCN from 5 months before & 5 months after the schedule change, comparing exposures during 5/1/14-9/30/14 with those during 10/1/14-2/28/15. Specific opioids with a large change in reported exposures were further characterized by patient age and exposure intent.
Results: Hydrocodone exposures decreased 28% from 1,315 to 951, while codeine exposures increased 186%, from 155 to 443. Together, there were 1,465 hydrocodone and/or codeine exposures before and 1,369 after the change. Oxycodone exposures rose 38% from 110 to 152. Reported heroin exposures increased only 7% from 132 to 141. Tramadol exposures did not change, and 12 other opioids either did not change much or had a very small number of exposures. Hydrocodone exposures decreased by 28% for patients age < 13 years, 9% age 13-19 years, and 31% age 20 + years. Reported intentional misuse decreased 40%, more than the other exposure reasons. Codeine exposures increased 111% among patients age < 13 years, 113% age 13-19 years, and 263% age 20 + years. Intentional misuse of codeine increased 443% and adverse drug events were up 327%. Oxycodone exposures increased 51% among patients age 20 + years, but did not change in the other age groups.
Conclusion: Due to extra steps required to order class II agents in some states, it was considered that prescribers may turn to the schedule 3-5 agents, such as Tylenol 3 or tramadol, despite concerns over codeine's complicated metabolism or tramadol's serotonergic activity. We found that while tramadol exposures did not change, codeine exposures did increase in all age groups as the hydrocodone exposures decreased in all age groups. The increase in oxycodone exposures may be due to physicians choosing a more potent analgesic than hydrocodone since they had to use the special prescription forms either way.
Keywords: Hydrocodone rescheduling, Opioid, Epidemiology
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204. Community Bus-stop advertising of the poison center: does it work? Evaluation of a Unique Marketing Strategy to Expand Poison Center Utilization

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Background: In 2014 there was an unexpected closure of a poison center in our state and our center began to serve an additional 18 counties new to our center. The previous center had no dedicated educator for several years and no outreach program to these counties. We evaluated the effects of an ad campaign in one new county and compared effects on human exposures (HE) reported to the PC. Method: We placed 18 signs on city bus-stop benches (ads) for 6 months (July-Dec) in the primary city of one of the new 18

counties, at a cost of $5,000. These professional ads featured the national PoisonHelp logo, the 800-222-1222 phone number, and suggestions to call the center if accidental poisoning or medication error. (10 word space limitation per bench ad). We evaluated HE for the one new county (NC) and compared it with the additional new 17 counties (17C) and the 44 counties (44C) already served by our PC. We evaluated the 18 months prior to the ads and the 6 months during the ads, using monthly means and 6 month means. We are collecting data on the 6 months post ads at this time.
Results: In the NC non-HCF HE remained unchanged ($R2 = 0.0002$) and HCF HE increased 18%, ($R2 = 0.652$). In the 17C area non-HCF HE increased 11% ($R2 = 0.131$) and HCF HE remained unchanged ($R2 = 0.01$). In the 44C area non-HCF HE decreased 2% ($R2 = 0.538$) and HCF HE remained unchanged ($R2 = 0.068$). There were no changes during the study period in age categories, gender and substances reported in the NC, 17C or 44C. Over the 2 year period in NC area there was a decrease in the percentage of pediatric HE (6%, $R2 = 0.344$) but there was no change in the slope of decrease between the pre-study period and the study period.
Discussion: There was no increase in HE from residences or non-HCF in the test county (NC) with the bus-stop bench ads. There was an increase seen in HE from HCF in the test county (NC), but we do not believe this was due to the bus-stop ads. Conversely in 17 counties new to our center, but with no bus-stop bench ads in their county, there was a small increase in HE from residences or non-HCF, with no increase in HE from HCF. The 17C area is in a predominantly rural area of the state and is not served by city buses from the NC.
Conclusion: Ads placed on bus stop benches do not appear to influence HE cases reported to a regional poison center. Additional forms of marketing to the public may need to be explored.
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205. Collaboration between a poison control center and 911 agency to conduct outpatient medication reconcilliations

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Background: Efficient use of health care resources is a mainstay of Poison Control Centers' (PCC) activities. An Emergency Medical Services (EMS) agency, within our PCC's region, experienced a disproportional use of its service by "high-use" patients. Initial experiences with a joint EMS and PCC program, tasked with decreasing unnecessary Emergency Department (ED), transports are described.
Method: An urban EMS agency, covering more than 240,000 residents, used their records to identify patients with a disproportion use of services. Our PCC was asked to participate by performing routine 'Home Medication Review Program' for these patients.
Results: After meeting with the EMS Medical Director our center developed a unique Policy and Procedure (P&P) for these activities. Directives and deliverables within the P&P included: all patients were at their base-line health (no acute complaints); patient demographics (used to record an 'information call' to the PCC); complete list of medications (prescription and otherwise); specific time frame for our responses; and protocolized use of MicroMedex® database filtered for severity and documentation. All data were transferred electronically through secure systems. The P&P was used to train PCC 'super-users' and then distributed to staff.
Conclusions: PCC collaboration with regional agencies (e.g. EMS) offers opportunities for enhanced patient care and increased call penetrance. Further experience and analysis of this type of work, including in rural areas, is needed.
Keywords: Poison center, Adverse drug event, Public health
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206. Serum Calcium Levels in Ethylene Glycol Poisoning

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Introduction: It has been suggested that hypocalcemia is observed with metabolic acidosis due to ethylene glycol intoxication. This finding is commonly cited as a clue to suggest ethylene glycol as the cause of severe metabolic acidosis. Consistent supporting evidence is scarce.
Objective: To determine the relationship between serum calcium and pH in ethylene glycol associated acidosis.
Methods: This was a retrospective study of all patients with ICD-9 codes indicating ethylene glycol/toxic alcohol poisoning from a tertiary care hospital between January 1, 2005 and December 31, 2013. Toxicall® was simultaneously searched as a cross reference to ensure that we captured all patients. Inclusion criteria included ethylene glycol or antifreeze exposure. Excluded patients were those without documented ethylene glycol serum concentration. Analysis data collected included the first set of electrolytes obtained on presentation, including calcium and if performed, ionized calcium, as well as albumin and blood gas. For transferred cases, the laboratory data included were the first studies obtained at the outlying facility. The study was deemed to be IRB exempt.
Results: 57 patients initially met inclusion criteria. 51 cases had recorded blood gas and calcium performed on presentation, 18 cases had ionized calcium recorded, and 47 cases had an albumin level allowing for calculation of corrected calcium. The mean age was 40.16 years; 59.6% were male, 75.4% received hemodialysis and 96.5% received fomepizole. Linear regression analysis between pH and all forms of calcium (total, ionized and corrected) showed no statistical significant relationship. In addition there was no difference in the mean calcium level between two groups defined as $pH \geq 7.3$ and $pH < 7.3$.
Conclusion: Our data does not support the assertion that hypocalcemia is commonly associated with ethylene glycol associated acidosis.
Keywords: Acidosis, Ethylene glycol, hypocalcemia
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207. Non-native Snakebites reported to US Poison Control Centers 2007–2013

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Background: Most snakebite exposures within the US come from native species. However, non-native snakes (exotics) are kept by zoos, private collectors, universities and other institutions. Exotic snakes are widely available via the internet, reptile shows, and the international black market. Previous studies have focused on venomous exotics, but the pattern of all exotic exposures, both from venomous and non-venomous species has not been characterised. The purpose of this study is to assess the numbers, types, and demographic associations of all exotic snakebite exposures.
Methods: We obtained data for all exotic snakebite exposures reported to the 57 US poison control centers between 2007-2013.
Results: From 2007 – 2013, 826 exotic snakebite exposures were reported. In 711 (86.1%) of these, the snake was identified either by genus and species, family, or geographical area of origin. The highest number of snakes originated from Central or South America (398, 48.2%), with a smaller number from Asia (115, 13.9%), Australia (88, 10.7%) and Africa (62, 7.5%). 42% (346) were boids eg. boa constrictors and pythons, 26% (214) were elapids including kraits and cobras, 12% (102) were viperids including gaboon vipers and lanceheads and 20% were other snakes. Exotic snake bites occurred in all states except Hawaii, Idaho and North Dakota, with the most occurring in California (70, 8.5%), Florida (69, 8.4%) and Texas (53, 6.4%). More than a third of the bites came from venomous species (342, 41.4%), and more than half came from non-venomous species (446, 54.0%). The venomous status of the snake was unknown in 38 (4.6%) cases. The highest percentage of bites came from the non-venomous species Boa constrictor constrictor (333, 46.8%). Most exposed individuals were male (520, 63%).
Conclusions: Over 800 non-native snakebite exposures in 47 states were reported to US poison control centers during 2007 – 2013. The majority involved non-venomous species.
Keywords: Envenomation, Snake bite, Venom
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208. Seizure incidence associated with bupropion dosing errors reported to a local Poison Center

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Background: Immediate and delayed seizures have been reported after therapeutic use, abuse, and overdose of bupropion. Chronic doses of >450 mg have been associated with a significantly increased risk for the development of seizure. Our Poison Center's current practice requires a 24 hour period of inpatient observation for any bupropion exposure that exceeds 450 mg. The authors are not aware of any literature reporting the incidence of seizure after an acute dosing error in patients chronically using bupropion.
Methods: A retrospective review of bupropion exposures due to unintentional therapeutic error reported to our local Poison Center between January 1, 2008 and April 1, 2015 was conducted. Patients with coingestants, unknown dose ingested, unknown outcome, not chronically taking bupropion, or who ingested ≤ 450 mg were excluded. Data included age if known, gender, dose ingested, preparation if known, duration of exposure, occurrence of seizure, and time to seizure onset if known.
Results: 460 cases were identified, 37 of which met inclusion criteria. Age was reported in 31 cases, the median age was 37 years (range 16-59 years). The tablet formulation was described in 35 cases, with the XL formulation accounting for 83% (29/35), SR formulation accounting for 14% (5/35), and IR formulation accounting for 3% (1/35) of these ingestions. 32 cases were described to have a single acute ingestion and the mean dose ingested was 909 mg (range 600-2250 mg). No seizures were reported in this population. 5 cases were described to have repeated dosing errors and seizure was reported in 1 of these patients. The patient took 300 mg of bupropion SR twice a day for over one week before seizing. The time to seizure onset was unclear due to an incomplete history. A total of 16 patients took a one time dose of ≤ 600 mg. No seizure activity was reported in this population.
Conclusion: Therapeutic use of bupropion is associated with seizures and chronic doses >450 mg further increase seizure risk. Our results demonstrated that a one-time dosing error of >450 mg of bupropion resulted in no reported seizures. In patients who took doses higher than prescribed for multiple days a single seizure was reported. The risk for seizure after a single dosing error resulting in an ingestion of >450 mg of bupropion in a patient on chronic therapy is unclear and further research is needed to clarify this clinical scenario.
Keywords: Bupropion, Seizure, Poison center
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209. Death following ingestion of Clitocybe species mushroom

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Background: Death due to muscarine toxicity after ingestion of wild mushrooms is a rare event. We present a case of a patient that developed a severe cholinergic toxidrome and subsequently died after ingesting Clitocybe mushrooms.
Case Report: An 88 year old woman with a past medical history of coronary artery disease presented to the emergency department with diaphoresis, nausea, vomiting and diarrhea that began 30 minutes after ingesting mushrooms that she picked from her yard in a rural area. Her husband developed similar but milder symptoms after partaking in the mushroom meal. He described the mushroom as a "white cap with an umbrella." The patient developed progressive altered mental status and respiratory distress with pulmonary edema. She was intubated and received symptomatic and supportive care but unfortunately died within 7 hours of ingestion. The husband identified pictures of mushrooms from the yard that looked similar to the ones that were picked and eaten. They were positively identified by a mycologist as Clitocybe species as well as some Coprinus comatus ("shaggy ink cap") and Coprinus atrametarius("common ink cap"). On autopsy, ingested mushroom was found in the stomach that was morphologically consistent with Clitocybe species. The autopsy report concluded that death was due to wild mushroom poisoning, (muscarine poisoning due to Clitocybe).
Case Discussion: There are few documented cases of muscarine poisoning due to mushroom ingestion in the literature. A case series of 14 ingestions of Inocybe mushrooms in Isreal reported

that all patients experienced symptoms of cholinergic excess and all recovered with supportive treatment within 12 hours. The mushrooms' identities were confirmed by an expert. Another case series from India describes 4 patients who presented with "irritability, exhaustion, abdominal cramps, and diarrhea" and recovered within 10 hours after eating mushrooms described as Clitocybe. However, there was no expert identification of these mushrooms. Only one other case report in Australia describes the fatality of a woman within 10 hours after eating a muscarine containing mushroom identified as Rubinoletus sensu lato pro tempe. She presented similarly to our patient with diaphoresis, emesis, diarrhea, and confusion which progressed to bradycardia, hypotension. Her partner ate the mushrooms as well, experienced emesis, and suffered no further illness.

Conclusion: While rare, poisoning from muscarine toxicity after ingestion of Clitocybe mushrooms may be fatal. Avoidance of ingestion of these mushrooms as well as aggressive symptomatic and supportive care after poisoning is recommended.

Keywords: Mushroom poisoning, Death, Clitocybe

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210. Correlation of acute generalized exanthematous pustulosis and hemolysis in brown recluse spider bites

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Background: Acute Generalized Exanthematous Pustulosis (AGEP) has been previously described in several cases following Brown Recluse spider bites, occurring 24 - 48 hours after the bite. Hemolysis has been reported in some of these cases. The correlation, if any, between AGEP and other systemic manifestations of Brown Recluse bites (Loxoscelism) is unknown.

Hypothesis: AGEP can be used as an indicator for systemic involvement in Brown Recluse bites, specifically hemolysis.

Methods: Retrospective chart review of patients 18 years of age and younger with a clinical diagnosis of Brown Recluse Spider bites between January 2009 and December 2014.Extracted data included: Age, gender, ethnicity, bite location, hospital length of stay (LOS), and presence of rash and/or hemolysis.

Results: There were a total of 47 patients, 32 with Loxoscelism (68.1%). There were no differences between the age, ethnicity, and gender distribution in patients with Loxoscelism versus those without. Nineteen out of 32 patients (59.4%) with Loxoscelism developed AGEP, and 20 out of 32 patients (62.5%) developed hemolysis. Thirteen patients (40.6%) were found to have both AGEP and hemolysis; Of the 19 patients with AGEP, 13 (68.4%) developed hemolysis versus 6 (31.6%) who did not ($p = 0.47$). Median LOS for patients with hemolysis (with or without rash) was 5 days versus 2 days for patients with rash only ($p < 0.05$). Patients with rash and hemolysis were more likely to have had a bite on the lower extremity compared to other areas of the body ($p < 0.05$).

Conclusion: Among patients with Loxoscelism those with AGEP did not develop hemolysis more often than those without AGEP. Hospital LOS for patients with AGEP without hemolysis was shorter than for those with hemolysis. Patients with hemolysis and rash were more likely to have had a bite on the lower extremity compared to other areas of the body.

Keywords: Spider bite, Hemolysis, Pediatric

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211. Tosylchloramide sodium: medical errors surveillance data supporting preventive strategies

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Background: Tosylchloramide sodium is a topical oxidative disinfectant that acts on Gram positive and negative bacteria, virus, algae, yeasts and parasites. In our Country it's available in sachets containing 2.5 or 5 g of powder or in bottles containing solutions 1% or 2.5%. This study was conducted to detect the major risk factors and provide data for preventive measures.

Methods: Data were extrapolated from a drug surveillance project run by a net of 6 National Poison Control Centers (PCCs) with the National Institute of Health and the National Medicines Agency. The period taken in consideration was April 2012-October 2014.

Data was collected about: age, gender, formulation of the drug, route of administration, cause of the error, signs and symptoms, recommended treatment and severity of the clinical outcome.

Results: Overall 175 cases of medical errors caused by Tosylchloramide sodium were identified. During the years 2012,2013, 2014 the monthly rate was respectively 5.7, 6.1, 5.6. Males (n 88) and females (n 87) were equally involved. 70% (n 123) of the patients were adults (>19 years).The powder formulation caused the 89% (n 155) of errors. The route of administration was always oral with the exception of an inhalation case.

The most common error (n 138, 79%) was the accidental ingestion caused by confusion with other drugs in the same formulation. In particular it was confused with analgesic and anti-inflammatory drugs (n 58) including nimesulide (n 32) and ketoprofen (n 11) and gastrointestinal drugs (n 16) including lactobacillus (n 12). The second most common (n 35, 20%) error was the misunderstanding about the route of administration.

Signs or symptoms were present in 53% of the patients (n 92). Nausea and vomiting were the most frequent (n 47), followed by heartburn (n 30), abdominal pain (n 16) and others.

A therapy was recommended in the majority of the cases (n 173, 87%), usually a symptomatic treatment (n 146, 83%).

According to the Poisoning Severity Score the clinical outcome was indicated as asymptomatic in 47.4% (n 83), minor in 52.6% (n 88) and moderate in 1% (n 4) of the cases.

Conclusion: The study contributed to reveal the critical aspects responsible for the majority of errors committed during the use of Tosylchloramide sodium. The data about the involvement of powder sachets formulation (89%) and the confusion with another drug in the same formulation (79%) indicates that a marked differentiation of the packaging could be a beneficial crucial aspect. Moreover, the data concerning the misunderstanding about the route of administration (20%) suggests that the "for topical use" indication should be put in better evidence, preferably on each posologic unit.

Keywords: Public health, Tosylchloramide sodium, Surveillance
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212. Provision of poison center services using advanced audiovisual telemedicine

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Background: Advanced telemedicine resources are increasingly used by many health care institutions. An extensive audiovisual telemedicine eICU® (Phillips, Andover, MA) program was recently established within our home institute. Across our healthcare system, eICU® allows continuous real-time monitoring and audiovisual conference with 550 beds in Emergency Departments and Intensive Care Units. Our poison control center (PCC) acquired access to this infrastructure to assist with evaluation and follow-up of patients in our healthcare system. A survey was used to evaluate staff impressions. These results and PCC experiences are described.
Methods: Clinical and medical directors and selected Specialists in Poison Information (SPIs) were trained as super-users by our system's telemedicine staff. These super-users then trained other providers. All involved staff received electronic and hands-on training. Our SPI super-users performed routine patient follow-up evaluations remotely, via audiovisual conference. An internal quality improvement survey about initial eICU® impressions was given to all SPIs nine months after implementation of the system. The survey included six questions related to comfort in utilizing computers, electronic medical record systems (EMRs), and eICU® technology. Questions were answered on a Likert scale of 1 (strongly disagree) to 5 (strongly agree).
Results: A total of ten SPIs completed the survey. The survey questions (mean response score) were as follows: Are you comfortable utilizing computers and EMRs? (4.5); Have you received adequate training for eICU? (3.4); Learning eICU® was easy? (3.2); Are you comfortable using the eICU® system for inpatient follow-up calls? (2.7); Is the eICU® system effective for inpatient follow-ups? (3.4); Is the eICU® system efficient for inpatient follow-ups? (2.9) Specific feedback comments from the survey included requests for a manual and a formal training class.
Conclusions: Advanced audiovisual telemedicine resources may assist with current and future poison center services. The pre-existing computer skills of staff members may affect perceptions and use of new telemedicine technology. Use of audiovisual technology is being expanded at our poison center; additional study is required to optimize implementation.
Keywords: audiovisual telemedicine, Poison center, patient monitoring
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213. Chloropicrin exposure causing Acute Respiratory Distress Syndrome treated with extracorporeal membrane oxygenation

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Background: Chloropicrin is used by farmers as a soil fumigant for its antimicrobial properties. It is also a dermal, ocular, and respiratory irritant. In severe exposures, it causes pulmonary edema and death.
Case Report: A 52-year-old tobacco farmer was treating his fields with a 99.7% solution of chloropicrin (Tri-Pic 100) when tubing failed, spraying the patient's unprotected face. His skin and eyes were decontaminated at a local ED where he was treated with nebulized albuterol/ipratropium, methylprednisolone, and furosemide, then transferred to the ICU of the regional referral center. Three hours after exposure he noted eye pain, chest tightness, and shortness of breath. His vital signs were: blood pressure 110/62 mmHg; heart rate 108/min; respiratory rate 23/min; and room air O2 saturation, 89%, which improved to 98% on 2 L oxygen via nasal cannula. Physical examination was significant for conjunctival injection, corneal abrasions, and diffuse rhonchi. His room air arterial blood gas showed: pH, 7.4; PaCO2, 35.5 mmHg; PaO2, 60 mmHg; methemoglobin, $< 1\%$. Chest CT demonstrated extensive groundglass and solid airspace consolidations. Therapy included erythromycin eye ointment, nebulized bronchodilators, methylprednisolone, and N-acetylcysteine (NAC). He developed hypoxia requiring intubation and chest x-ray demonstrated interstitial edema consistent with ARDS. The patient required high PEEP to maintain oxygenation, however, hypoxia ensued. On hospital day (HD) #2, venovenous extracorporeal membrane oxygenation (ECMO) was initiated with sustained improvement in oxygenation. Bronchoscopy revealed a normal appearing carina and scant yellow fluid in bronchioles. Antibiotics were administered for intermittent fever, though all cultures showed no growth. ECMO was discontinued on HD #6 and the patient was extubated on HD#8.
Case Discussion: A prior report describes severe exposure to chloropicrin resulting in death within four hours. Severe pulmonary edema was noted on autopsy. Other series describe mild to moderate symptoms in communities exposed to low concentrations. In our case of severe exposure, ECMO provided oxygenation that allowed the patient's pulmonary function to recover. The use of NAC may have also contributed to this patient's positive outcome. Studies examining the pathophysiology of chloropicrin on lung cells demonstrate vacuolization, oxidative damage and apoptosis that may be amenable to NAC therapy.
Conclusions: ECMO can serve as a supportive measure to allow for improvement of pulmonary function in patients with ARDS secondary to exposure to chloropicrin.
Keywords: Herbicide, Insecticide, Chloropicrin
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214. Accidental Clonidine Exposures in children < 12 Years Reported to a Statewide Poison Control System

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Background: Clonidine is a central alpha2-adrenergic agonist which reduces CNS sympathetic outflow and is used as adjunctive

treatment of ADHD in children. Clinical experience comparing acute versus acute-on-chronic pediatric ingestions of clonidine are minimal. The purpose of this study was to characterize the severity of toxicity of clonidine exposures in children as well as contrast the outcome severity in both naïve and non-naïve clonidine exposure patients.

Methods: This was a 6-year (2006-2011) retrospective observational case series of clonidine exposures reported to a Poison Center. Cases were individually reviewed to collect information on exposure and clinical course. Inclusion criteria: clonidine as a single ingestant, age < 12 years, treatment in a HCF, and followed to a known outcome.

Results: 458 cases met inclusion criteria with 55% male and median age of 2 years (range 7.5 mo -12 yr). The clonidine dose ingested was reported in 315 cases (69%), with an exact-dose (median dose 0.2 mg; range: 0.05 – 6 mg) reported in 136 cases (30%). There was no significant difference in the odds of a clonidine naïve patient developing lethargy with bradycardia, +/– hypotension compared to a non-naïve clonidine patient. A confounder in the comparison was the median dose ingested by the acute-on-chronic group was higher than the naïve group (0.3 mg vs. 0.15 mg). Of the 458 cases, 338 (74%) developed lethargy with bradycardia +/– hypotension. 248 patients (54%) were treated and released from the ED and 210 patients (46%) were admitted. Treatments included IV fluids in 124 (27%) patients, intubation in 24 (5%) and naloxone in 58 (13%). Of patients receiving naloxone, 37 (64%) of patients had a documented improvement in BP and/or mental status. No patients developed hypotension refractory to IV fluids requiring vasopressors. Medical outcomes: minor in 147 cases (32%), moderate in 146 cases (32 %), major in 30 (6.6% cases) with no deaths.

Conclusions: Unintentional clonidine exposures in children < 12 years of age can cause significant morbidity requiring intubation. Naloxone has been shown to be useful in treatment. Acute-on-chronic clonidine ingestion doses tend to be larger than clonidine-naïve ingestions which could affect poison center triage for HCF referral.

Keywords: Pediatric, Clonidine, Ingestion

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215. Clonidine Withdrawal Induced by Yohimbine Use

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Background: It has been well established that hypertensive urgency can occur from withdrawal of alpha-2 adrenergic agonists. Yohimbine is an alpha-2 adrenergic antagonist which has been associated with mild hypertension in therapeutic use; the few reported cases of overdose have not been associated with severe hypertension. We report a case of severe hypertension in a patient chronically taking clonidine after ingestion of a single dose of yohimbine.

Case Report: A 68 year-old man with a history of hypertension, diabetes, and erectile dysfunction ingested the manufacturer's recommended dose of two 'male enhancement pills' (Zyrexin®) containing a total of 8 mg of Pausinystalia johimbe alkaloid extract. 90 minutes later, he developed shaking, diaphoresis, and elevated blood pressures on home monitoring. He reported good blood pressure control at baseline and compliance with his home medications of clonidine 0.05 mg daily, lisinopril 2.5 mg daily, lorazepam 1 mg as needed, and oxycodone as needed. The patient took 0.1 mg clonidine orally at home with no improvement in symptoms, and presented to his local emergency department. His initial heart rate was 100 bpm with a blood pressure of 235/113 mmHg. The patient subsequently received a total of 0.3 mg oral clonidine, which improved his heart rate to 96 bpm and blood pressure to 170/84 mmHg within one hour. Laboratory evaluation and electrocardiogram were unremarkable. He was observed overnight; his blood pressure continued to improve over the next several hours with no recurrence of hypertension, and he was discharged without further events.

Case Discussion: Our patient experienced short-lived severe hypertension after usage of a yohimbine-containing product. Yohimbine has a higher affinity for the alpha-2a adrenergic receptor than clonidine by a factor of roughly 40, and would be expected to displace clonidine from the alpha-2a receptor in vivo. Reversal of the effects of clonidine overdose by yohimbine has also been reported. We hypothesize that yohimbine usage by this patient precipitated clonidine withdrawal with resultant tachycardia and hypertension. While he experienced only moderate symptoms, the potential for complications of hypertensive urgency may exist for patients taking alpha-2 adrenergic agonists who ingest yohimbine. Limitations of this case include inability to corroborate the amount of yohimbine in the product ingested, as well as lack of re-challenge to firmly establish that the effect was due to yohimbine.

Conclusions: Chronic users of alpha-2 adrenergic agonists may be at risk for withdrawal hypertension induced by yohimbine use, and should be counseled to avoid these agents pending further studies.

Keywords: Herbals, Clonidine, Withdrawal

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216. Emergency Department Follow-Up Calls Performed By A Poison Control Center

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Background: As funding and calls to US Poison Control Centers (PCCs) continue to decrease, PCCs must investigate new roles and services. Our experience with performing follow-up calls for patients discharged from an Emergency Department (ED) is described**.**

Methods: Patients discharged from our health system's EDs received a follow up survey, designed to evaluate their perception of the emergency department patient experience. Our PCC piloted a program where we administered a brief follow up survey, via telephone, within 72 hours of discharge from a 60,000 visit-per-year ED. Patients were chosen to receive follow up calls based on demographic factors believed to predict their influence on NRC Picker® (National Research Corporation, Lincoln, NE) measures of patient satisfaction. Prior to this pilot study, patients were not receiving follow-up by telephone. A comparison of NRC Picker® responses before and after our center's involvement is reported.

Results: A total of 5,365 follow-up calls to discharged ED patients were made by our PCC between July, 2014 and January, 2015. Follow up calls, were performed by designated staff not involved in routine PCC operations. These calls were recorded electronically

and counted towards our center's productivity. Independent (NRC Picker®) data showed improvement in several scores measuring patient satisfaction with regard to specified aspects of ED care. The "would recommend facility" score increased from 63.2% prior to PCC involvement to 71.7%. Key drivers that were measured also included: "respect for patient preferences", "emotional support", and "coordination of care". "Emotional support" and "coordination of care" scores improved by 9.5% and 12%, respectively. The ED's overall satisfaction score of 55.9% increased to 68.8% after PCC involvement.
Conclusions: Our PCC's involvement in ED patient follow-up calls resulted in an improvement with independent patient satisfaction scores. The degree of improvement that can be attributed directly to PCC involvement is unknown. This additional facility-based work added to our center's productivity measures and helped to secure our role within our health care system.
Keywords: Poison center, Cost, Public health
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217. The Tragic Hip: A Case of Cobalt Poisoning

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Background: Systemic cobalt toxicity is a rare complication of metal-containing hip arthroplasty. The highest cobalt level reported in the literature from a patient who survived is 885 micrograms/L (μg/L).
Case: A 51 year old lady presented to hospital in September 2014 in congestive heart failure. In the months leading up to her presentation, she had been diagnosed with obstructive sleep apnea, and severe sensorineural hearing loss. During her admission, an echocardiogram showed severe global left ventricular systolic dysfunction with mild concentric hypertrophy. She had a normal coronary angiogram, and was initially diagnosed with an unspecified non-ischemic cardiomyopathy. Her work-up also revealed hypothyroidism and polycythemia (Hgb = 188 g/L). Although she had no pain in her hip, because her past medical history included a left total hip arthroplasty with two subsequent revisions, a whole blood cobalt level was ordered and measured as 1351.4 μg/L. Upon consultation, the poison centre advised removal of the hip prosthesis. Orthopedics did an urgent revision of the implant where gross metallosis was noted intra-operatively. Post-operatively she was monitored in the ICU. On days 2 and 6 post-operatively, her cobalt levels fell to 326, and 242 ug/L respectively. Oddly, despite an extensive work-up and hemodynamic stability, her serum lactate was persistently elevated above 3.0 mEq/L. After 3 months she was seen for a follow-up appointment at the outpatient toxicology clinic. At this time, her plasma cobalt level was 116.5 μg/L, her hemoglobin was 138 g/L and her thyroid function was stable, though being treated. An echocardiogram showed improvement in her cardiac function to a systolic EF of 45%. Her hearing had improved both subjectively and objectively by audiometry testing. Of note, her lactate was 2.4 mEq/L (upper limit of normal).
Case Discussion: This case reports the highest level of whole blood cobalt in a patient who survived systemic cobalt toxicity from a hip prosthesis and subsequent significant revisions, and documents an impressive recovery of the presumed-cobalt associated dysfunction in her cardiovascular, neurologic and hematologic systems. We also report on the finding of a persistently elevated lactate level, and theorize on its association with systemic cobalt toxicity.
Conclusions: Systemic cobalt toxicity presents with neurologic, cardiovascular and endocrinologic abnormalities which were shown to reverse once the source of cobalt (a metal hip implant) was removed.
Keywords: Heavy metals, Cobalt poisoning, hip prostheses
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218. Toxicology Consultation -Four Years of Billing & Reimbursement

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Background: There are only a few sources for information describing activity and structure of Toxicology Consult Service (TCS) related to billing and reimbursement. We've previously presented this data from the first and second fiscal years of an established TCS.
Hypothesis: The reimbursement profile of a mature TCS becomes more robust with billing encounters and productivity increasing as the service develops and evolves.
Methods: Review and descriptive analysis of a single board certified Medical Toxicologists consultation service current billing records from July 1, 2015 – March 31, 2015 (9 months fiscal year 2014-15) with whole-year projections and comparison to previous years (2011-14). Average monthly charges, net revenue on those charges and consult numbers/frequency are described. The consult service is based at an urban academic tertiary-care center. TCS coverage includes 48/52 weeks onsite with 46 weeks of 6/7 days bedside coverage and phone coverage 50/52 weeks. All charges represent a single covering Medical Toxicologist encounter data.
Results: The average monthly charges for the first 9 months of FY14/15 were $96,665, with average reimbursement of $32,017. This was up from $69,571 in charges and $21,787 reimbursed in FY13/14, $50,340 charges and $14,480 reimbursed in FY12/13, $43,814 charges and $13,083 reimbursed in FY11/12. YTD (3/31/15) total charges are $869,986 with reimbursement $288,156 (projection to 6/31/15 charges $1,159,980, reimbursement $384,204). Average monthly consults for FY14/15 are 195 (new/subsequent) and procedures 41. FY13/14 was 153 encounters with procedures 19; FY12/13 was 118 encounters and 11 procedures; FY11/12 was 100 encounters and 1 procedure. For FY14/15 there will be $384,204 reimbursed on 2340 encounters and 492 procedures compared to, at the start of the consult service in 2011, $156,997 reimbursed on 1198 encounters and 17 procedures in FY11/12, $173,766 on 1420 encounters and 131 procedures in FY12/13, and $261,441 reimbursed from 1832 total encounters and 229 procedures in FY13/14. FY14/15 reimbursement has increased to 2.45 x the amount initially reported for FY11/12. There has been substantial year-on-year growth since the start of the service in 2011.
Discussion: TCS reimbursement will vary depending upon coverage frequency, payor mix and types of consults performed. In addition to standard inpatient/ED encounters critical care, antidote administration, counseling and other opportunities for providing billable services exist.

Conclusion: Establishing a TCS is a sustainable and lucrative activity with growth and development potential.
Keywords: Medical Toxicology, Billing, Consult Service
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219. High dose insulin to treat propranolol toxicity in a 7-month-old infant

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Background: Propranolol is a non-selective, lipid soluble beta adrenergic antagonist used to treat a variety of conditions including hypertension, migraines, and anxiety. It has also become first line therapy for infantile hemangiomas requiring treatment. In overdose, propranolol causes life threatening bradycardia and decreased inotropy leading to cardiogenic shock. High-dose insulin (HDI) is gaining acceptance as a primary treatment for beta blocker overdose. However, a lack of pediatric cases exists, particularly in infants. We present a case of an infant with propranolol toxicity treated with HDI.
Case Report: A 7-month-old 6.1 kg girl receiving 3.6 mg 3 times a day of immediate-release liquid propranolol for treatment of a hemangioma was inadvertently given 36 mg for 3 doses, or 17 mg/kg in a day. The child did not wake for feeding at her usual time the next morning, prompting family to call EMS. On initial presentation she was bradycardic with a heart rate between 60-75 bpm and lethargic with dusky fingers and toes. Peripheral pulses were weak and a reliable blood pressure (BP) was difficult to obtain; 7 attempts to obtain a BP failed. A normal saline bolus of 20 ml/kg was given with BP reading in 80's systolic and no other change. EKG demonstrated sinus bradycardia with normal intervals. An infusion of 1.5 ml/kg of 20% intravenous fat emulsion (IFE) was given over 2 hours with no change. HDI was initiated with a bolus of 1 U/kg regular insulin and 1 g/kg of dextrose. Her BP was 85/46 and heart-rate was 111 bpm, but pulses were still weak and extremities cool. Catecholamines were not given. She was started on infusions of insulin at 1 U/kg/hr and dextrose at 0.5 g/kg/hr. She had one episode of hypoglycemia to 30 mg/dL that was quickly corrected. Her BP remained normal and her perfusion improved, demonstrated by strong peripheral pulses and increasing alertness. Insulin was discontinued 3 hours after the initial bolus and the dextrose was stopped 7 hours later with no further episodes of hypoglycemia. Home propranolol dosing was resumed the evening of her presentation and she was discharged to home the next day.
Case Discussion: This case describes successful outcome of an infant treated with HDI for beta-blocker toxicity. Confounding factors include IFE dosing that deviated from poison center recommendations and the decision to initiate HDI had to be based on her poor perfusion on physical exam rather than other objective measures. While it is difficult to assess the effect of HDI in this case, it does support that HDI can be used safely in young infants.
Conclusion: High-dose insulin to treat beta-blocker toxicity is feasible in an infant.
Keywords: Insulin, Beta blocker, Pediatric
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220. Bedside Ultrasound Identification of Portal Venous Gas in Food Grade Hydrogen Peroxide Ingestion

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Background: Food grade 35% hydrogen peroxide (H2O2) is a strong oxidizing agent which is gaining popularity as a naturopathic treatment. Touted as 'hyper-oxygen therapy,' misleading internet sites imply it is 'completely safe to consume.' On the contrary, 35% H2O2 solutions have been reported to cause severe injury and death when ingested accidentally. We present the novel use of bedside ultrasound (BUS) to detect portal venous gas in a 35% H2O2 ingestion.
Case: A 30 year old woman presented with hematemesis after accidentally drinking 250 mL of 35% H2O2. On presentation she was neurologically intact and hemodynamically stable. An abdominal BUS exam was performed which unexpectedly visualized dynamic movement of portal venous gas bubbles (dynamic ultrasound images to be provided at presentation). CT scan confirmed a large quantity of portal venous gas, pneumatosis, and gas in the right ventricle (RV). The patient underwent hyperbaric oxygen (HBO) treatment at 2.8 ATA given the possibility of a patent foramen ovale (PFO) and inability to follow neurological exams due to intubation. Subsequent CT scan demonstrated resolution of the evolved gas. The patient left the hospital neurologically intact.
Discussion: 35% H2O2 undergoes oxidation almost immediately after coming into contact with the enzyme catalase on mucosal surfaces. One volume of 35% solution creates 115 equivalent volumes of oxygen gas, which can lead to hollow viscus rupture or evolved oxygen gas in the bloodstream. Venous oxygen gas in sufficient quantity can lead to obstructed RV outflow, and may arterialize causing arterial gas embolism (AGE). Arterialization of oxygen occurs via two main mechanisms: right to left shunting through a PFO, or evolved venous oxygen overwhelming the filtering capacity of the lungs.

The optimal management for evolved oxygen from H2O2 ingestion is not definitively known. Although typically not harmful, HBO therapy is likely unnecessary for isolated portal venous gas. On the other hand, many authors agree obstructed RV outflow and mental status changes are compelling indications. Previous literature has focused on CT imaging for evaluation of evolved gas in known H2O2 ingestion, however, we present a case of portal venous oxygen detected by BUS. As not all clinicians may be aware of the AGE physiology of H2O2, identification of portal venous gas via BUS should prompt further evaluation with CT scan.
Conclusion: Ultrasound visualization of portal venous gas should increase suspicion for complications of H2O2 ingestion and prompt further evaluation with CT scan. Identification of portal gas via BUS in austere environments may also aid in the decision regarding transfer.
Keywords: Hydrogen Peroxide, Alternative medicine, Ingestion
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221. Hepatotoxicity Associated with the Use of Psoralea corylifolia Used to Treat Vitiligo

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Background: Ayurvedic and Chinese medical systems have often used plant-based medications as a part of their treatments. Psoralea corylifolia (also known as Babchi) is an herb that has been a component of Chinese and Ayurvedic medical practice. There are few case reports of hepatotoxicity from P. corylifolia. We present a case of acute hepatitis associated with the use of P. corylifolia being used to treat vitiligo.
Case Report: A 48-year-old female with previously normal liver function presented to her physician with weakness, decreased appetite and dark urine. She had not been taking prescription medications, but for the last six weeks she had been ingesting a "teaspoon" of Babchi powder with water daily to treat vitiligo. The powder was purchased online. Initial labs revealed elevated aspartate aminotransferase (AST) and alanine aminotransferase (ALT) levels of 62 and 199 U/L, respectively. Repeat labs two weeks later showed AST and ALT of 458 and 1067 U/L, respectively. At that time the patient was admitted to the hospital. At hospital presentation the patient had normal vital signs and a normal exam with the exception of vitiligo. There was no jaundice or hepatomegaly. During hospitalization the initial AST and ALT were 390 and 923 U/L, respectively, but improved to 365 and 851 U/L, respectively, two days later without specific treatment. The INR was 1.38 and the total bilirubin was 1.6 mg/dL at presentation. Testing was negative for viral hepatitis, autoimmune hepatitis and hemochromatosis. An ultrasound of the liver was normal. The patient requested to be discharged on hospital day two. She was instructed to follow up in the hepatology clinic but was lost to follow up.
Discussion: P. corylifolia use has been associated with acute hepatitis. Unfortunately in our case the xenobiotic's serum level could not be measured. However, the temporal course of symptoms in relation to the Babchi ingestion, as well as the negative infectious and autoimmune studies, supports P. corylifolia as being the cause of the hepatitis. Furthermore, the AST and ALT decreased after cessation of Babchi. The compound psoralen is found in P. corylifolia and is thought to be hepatotoxic by an unknown mechanism. There is evidence that components of P. corylifolia inhibit mitochondrial complex I. This may place affected cells at risk for damage and lead to hepatitis. Animal models show cholestasis and steatosis with chronic ingestion of P. corylifolia.
Conclusion: Although often seen as benign, herbal medication may have toxic effects that need to be recognized and addressed. Increasing vigilance of health care providers and patients to herbal toxicities may prevent inadvertent morbidity and may direct appropriate treatment.
Keywords: Alternative medicine, Herbals, Hepatotoxicity
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222. Unintentional pediatric opioid exposures reported to the ToxIC Case Registry

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Background: As prescribing rates and availability of prescription opioid analgesics has dramatically increased since the 1990's so did unintentional pediatric exposures to these medications. Buprenorphine is a partial agonist at the mu receptor and as such it has a ceiling effect related to CNS and respiratory depression. It is reported to be a safer opioid with regard to the risk of respiratory failure during exposure compared to full mu receptor agonists yet it is one of the most common opioids reported in pediatric patients hospitalized from unintentional exposure to opioid analgesic agents.
Hypothesis: Toxicity from unintentional pediatric opioid ingestions may result in different pattern and severity of toxicity depending upon the specific agent exposure.
Methods: Retrospective review of the Toxicology Investigators Consortium Case Registry (ToxIC) for unintentional pharmaceutical exposures in children aged 0-2 and 2-6 years from 1/1/2010 to 2/19/2015.
Results: 1,762 cased of unintentional pharmaceutical exposures were reported, 13.5% of these involved opioids (n = 238). The most common opioid was buprenorphine (91), followed by methadone (37), oxycodone (30), morphine (14), tramadol (14), hydrocodone (5), and codeine (5). Buprenorphine was the most common opioid in every year (2010-2015) and in both age groups (< 2 and 2 to 6). Naloxone was given in a higher % of morphine exposures (57%) compared to buprenorphine (47%), methadone (43%), oxycodone (40%), and hydrocodone/codeine (both 20%). No tramadol exposures were given naloxone. Tramadol had less reported CNS depression/coma (18%) compared to buprenorphine (59%), methadone (57%), oxycodone (53%) and morphine 57%). Bradypnea (RR < 10) was reported most commonly for morphine (21%) and methadone (19%) compared to buprenorphine (7%), oxycodone (4%), tramadol (0) and hydrocodone (0) and codeine (0). Seizures were reported in 27% of tramadol exposures. 2 deaths were reported one each in methadone and morphine.
Discussion: The ToxIC Case Registry represents a novel mechanism for understanding the types of pediatric poisonings that require Medical Toxicology consultation. Despite the partial agonist effect unintentional buprenorphine exposures appear to result in similar toxicity as other opioid medications in children. Effects other than mu activity are important in the toxicity profile of opioids as a significant proportion of tramadol exposures had seizures whereas none of the other opioid exposures did.
Conclusions: Data from the ToxIC Registry involving therapeutic use helps characterize and understand the more severe type of intoxications associated with this type of ingestion.
Keywords: Pediatric, Opioid, Toxicology Investigators Consortium (ToxIC)
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223. A Retrospective Review of the Presentation and Treatment of Stingray Stings Reported to a Poison Control System

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Objectives: Stingray stings occur on marine beaches throughout the country. We studied stingray stings reported to our poison system to identify regional complications associated with these envenomations.

Methods: We undertook a 14 year retrospective observational analysis of stingray stings reported to our poison system. Extracted data variables included: caller age and gender, outcome, management site, symptoms, treatments, and geographical location of the sting. All symptoms and treatment collected in our study included both reported symptoms by callers and symptoms encoded by poison specialists. We examined suspected infection rate, hot water treatment efficacy, and possible presence of foreign bodies in the wound. Suspected infection rate was defined as "possible infection" or "likely infection" as recorded by poison specialists. Hot water treatment efficacy included only cases called to the system within 24 hours of the initial envenomation in which hot water was listed as a treatment and efficacy could be defined from the chart. Possible presence of foreign bodies in the wound was defined as cases where the history specifically stated that something was visible in the wound.
Results: Envenomations were reported in 576 cases. The majority were male (76%), with an average age of 24 years (range 6-78 years). 77% were coded as minimal clinical effects, 8% minor, and 7% moderate effects. A total of 9% recorded a foreign body or debris at the wound site. Symptoms included pain (79%), puncture wound (65%), and edema (25%). The most common treatments included hot/warm water immersion (62%), decontamination of the wound (50%), and removal of a foreign body (56%). Infections were reported in 9% of cases. Hot/warm water immersion appeared effective for pain relief in 69% of cases where outcome was documented. The geographical locations of stingray envenomations included 88% in Southern California, 4% in Central California, and 8% in Northern California. The most common months for these calls were July and August which recorded 140 and 117, respectively.
Conclusion: Stingray stings are common in California. Hot/warm water seemed to be effective in pain management in our series, while foreign bodies or retained spines and infections were other identified complications.
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224. Cardiac arrest following camphor administration via a PEG tube

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Background: The neurologic toxicity of camphor is well described in the literature. We present a case of cardiac arrest immediately following an accidental camphor ingestion via a Percutaneous Endoscopic Gastrostomy (PEG) tube.
Case Report: A 63 year old male with a history of cerebral aneurysm, left hemiparesis, dysphagia, ventriculoperitoneal shunt, and seizures was accidentally given 4 ounces of a vaporizer fluid containing 6.2 % camphor (estimated 7.4 g) via his PEG tube. In addition to camphor, the product contained alcohol, menthol, cedarleaf oil, eucalyptus oil and nutmeg oil. His wife meant to give him magnesium citrate for constipation. Emergency Medical Services was immediately notified and he was transported to the emergency department (ED). His vomitus en route to the ED smelled of camphor. He arrived to the ED apneic and in cardiac arrest. No seizure activity had been noted up to that time. After 10 minutes of asytole, he had return of spontaneous circulation following 100% oxygen and cardiopulmonary resuscitation (CPR). A basic metabolic panel, complete blood count, and cardiac enzymes were normal. Electrocardiogram (ECG) showed a sinus rhythm with a heart rate (HR) of 63, QTc 458, QRS 101, and t-wave flattening. He was emergently intubated, placed on a ventilator and admitted to the critical care unit where he had a cardiac arrest 2 additional times. Repeat ECG showed a HR of 83 and lengthening of QTc to 540. His subsequent hospital course was complicated by aspiration pneumonitis, hypotension (99/49 mm Hg), acidosis, atrial fibrillation, hypovolemia, new onset bilateral cerebellar massive infarcts and myoclonic jerking. Electroencephalogram (EEG) testing showed periodic lateralized epileptiform discharges (PLEDs). Based on his clinical deterioration, unresponsiveness, and poor prognosis, the family made the decision to take him off life support 11 days after the camphor exposure and the patient expired. No blood camphor levels were available.
Discussion: We present a case of cardiac arrest following the administration of an estimated 81 mg/kg of camphor via a PEG tube. Neurological toxicity has been reported with camphor ingestions $>$ 30 mg/kg. No seizure activity was ever noted in the patient. The EEG finding of PLEDs is traditionally indicative of cerebral insult and not of seizure activity although associated with an increased likelihood of seizures. The temporal relationship between the exposure and the cardiac arrest is suggestive of an association although the patient's extensive medical history likely contributed to his clinical course and ultimate demise.
Conclusion: A large camphor ingestion was associated with a precipitous cardiac arrest.
Keywords: cardiac arrest, overdose, camphor
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225. Not "Just Another Day in the Lab": A Dimethyl Mercury Exposure

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Background: There are four literature reports of fatal dermal exposure to dimethyl mercury (DM). Symptoms may be delayed for months. One fatality resulted from a drop or two splashed onto a latex gloved hand. We report a similar case of an occupational exposure with no systemic effects.
Case Report: A 29 year-old-male chemical waste disposal specialist was transferring a vial labeled "DM" to a container under a fume hood. During the transfer the vial shifted, spilling 1- 2 ml onto his nitrile double gloved hand. Decontamination included rapid glove removal and entry into a decontamination shower. The poison center was consulted and advised immediate transport to a tertiary center, where a second shower was performed. The patient had a normal neurologic exam and was admitted. He was started on succimer, 900 mg (10 mg/kg) twice daily, which was changed to 500 mg three times daily on hospital day 1. He was discharged on day 2 with weekly toxicology clinic appointments. His initial serum mercury level was 4 mcg/L. At his one week visit, he had a normal neurologic exam including cerebellar, strength and proprioception

testing and he was switched to 2,3-dimercapto-1-propanesulfonic acid (DMPS), 600 mg three times daily (6.82 mg/kg). The patient's spot urine mercury was 11 mcg/g creatinine. A 24 hour urine collection was delayed until week three and was 7 mcg/g creatinine. The patient remained asymptomatic and continued on DMPS for a total of three weeks. A final serum mercury concentration was 2 mcg/L and chelation was stopped.

Case Discussion: DM is rapidly absorbed dermally and a drop can lead to severe mercury toxicity and possible death. Delayed neurotoxicity and cerebral encephalopathy are hallmarks of DM toxicity. The decision to treat with chelation is difficult since patients can remain asymptomatic for weeks. Animal studies have shown that outcome is directly related to how quickly therapy is begun. Personal protective equipment (PPE) should include the use of two specialized sets of gloves, such as Silver Shield™. DMPS has been shown to be superior to succimer in animal studies, but availability was limited to a compounding pharmacy making immediate treatment difficult. Little data exists as to treatment duration.

Conclusion: Due to limited cases being reported, poison control staff and health care practitioners may be unaware of the severity of DM exposures. Swift decontamination and early chelation may have protected this patient. His use of double nitrile gloves may have afforded him more protection than latex gloves, albeit providing less dexterity. Specific education regarding PPE is paramount to prevention. Potentially fatal outcome to even small amounts of DM suggests that chelation therapy should not be delayed.

Keywords: dimethyl mercury, Chelation, Occupational

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226. Acute dyspnea and pharyngeal irritation after inhalation of fumes from a concentrated fluoride-containing etching cream

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Background: Fluoride-containing compounds are commonly available in household glass-etching products. Toxicity from exposure can lead to both caustic injury and complications of hypocalcemia. Prolonged exposure via inhalation to fluoride containing creams can produce throat irritation, chest pain and dyspnea.

Case Report: A 41-year-old man with no past medical history presents to the Emergency Department with complaints of sore throat, diffuse burning chest pain, and shortness of breath one hour after using a glass etching cream containing 28-39% ammonium and sodium bifluoride to remove scratches from his glasses. He was hunched over the open container for approximately one hour and denies any ingestion of the product or dermal contact. Vital signs were normal and oxygen saturation was 100%. The patient had pharyngeal erythema but an otherwise normal physical exam and had no evidence of respiratory distress. ECG on arrival showed a normal sinus rhythm at a rate of 60 with a QRS of 84 and a QTc of 440. CBC, electrolytes, renal and liver function tests were within normal ranges and chest x-ray showed clear lungs.

The patient was treated with 2.5% nebulized calcium gluconate out of concern for an inhalational fluoride injury. His symptoms rapidly improved after the first treatment. He ultimately required 4 rounds of nebulized calcium over a 12-hour period due to recurrence of pain and dyspnea and had symptomatic improvement with each treatment. While undergoing telemetry monitoring, his peak QTc was 458. Upon discharge, the patient was asymptomatic with normal electrolytes and ECG intervals.

Case Discussion: The patient presented here used a concentrated fluoride-containing glass-etching compound not previously known to cause inhalation injury. The manufacturer reports that they are unaware of any inhalation injuries from this product in its 35-year existence. The timing of symptom-onset is consistent with fluoride toxicity and its effects as a metabolic poison. Furthermore, symptom abatement after the site-specific application of calcium is also consistent with a fluoride-related injury.

Conclusion: Nebulized calcium gluconate should be considered for the treatment of inhalation injury after exposure to fluoride-containing compounds.

Keywords: Fluoride, Inhalation Injury, Caustic

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227. Congenital lead poisoning in three siblings from a mother with retained bullet fragments

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Background: To date, there is little data guiding the appropriate therapy for fetal or neonatal lead exposure. Some reported consequences of fetal lead exposure are delayed skeletal maturation and neurobehavioral deficits. While these outcomes are possible, the best management strategy remains unknown. Additionally, the effects of chelation on the fetus are uncertain. We report a unique case series in which a mother with an elevated blood lead level (BLL) gave birth to three asymptomatic children, all with fetal lead exposure and all managed differently.

Cases: The mother is a 22-year-old female with chronic lead poisoning due to retained bullet fragments following a shooting when she was 12 years old. As a child, she developed severe encephalopathy with a BLL greater than 100 µg/dL, for which she was chelated. She had a synovectomy to remove the fragments, though some remained, and adult BLLs ranged between 20-40 µg/dL. Her first child (C1) was born with a BLL of 6 µg/dL. Mom was receiving oral succimer chelation, and had a BLL in the 30s-40s µg/dL at some point during pregnancy. C1's BLL at 323 days old was 8 µg/dL. The second child (C2) was born full term with a BLL of 25 µg/dL. Mom had a BLL of 25 µg/dL at an unknown time during gestation, and did not receive chelation during pregnancy. The child received chelation 15 days after birth with oral succimer, and had a post chelation BLL of 9.1 µg/dL. BLL at 260 days old was 7 µg/dL. The third child (C3) was born full term with a BLL of 24 µg/dL. There was no chelation during pregnancy or after birth. Repeat BLL at 25 days old was 13 µg/dL. At 306 days old, C3's BLL was 7.7 µg/dL.

Discussion: Decreasing blood lead concentrations through chelation may induce redistribution of bone stores to blood, though lead steady-state kinetics are not entirely understood. C1, the only birth

where chelation occurred during pregnancy, had a lower BLL at birth than C2 or C3. However, mom was known to be non-adherent with chelation therapy, so the effects of chelation during pregnancy are difficult to determine. C2 received a course of oral chelation after birth, while C3 did not. However, both had a similar change in BLL over time. In C2 and C3, oral chelation two weeks after birth did not have a significant effect on BLL. At approximately 300 days after birth, all children had similar BLLs. Thus, chelation during or soon after pregnancy did not significantly affect BLL over time.

Conclusions: Although chelation during pregnancy was associated with a lower BLL at birth, neither this strategy, nor chelation shortly after birth significantly decreased BLL over time.

Keywords: Lead, Heavy metals, Pediatric

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228. Methylxanthine toxicity with severe hypophosphatemia after single capsule diet agent ingestion

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Background: Dietary agents are available without prescription and often contain stimulants present in unknown quantities. There is no regulation to confirm the presence or concentrations advertised. Patients often perceive a low risk of toxicity from these agents.

Case Report: A 29-year-old female with no past medical history presented to the Emergency Department (ED) with nausea, vomiting, and palpitations 1 hour after her first ingestion of a single capsule of a dietary agent called Synedrex. The patient denied use of any other medications or supplements. The patient presented alert and anxious. Her vitals were blood pressure 124/75 mmHg, heart rate 110 bpm, and she was afebrile. Physical examination was normal aside from a mild tremor. EKG showed a sinus rhythm at a rate of 116 with a QRS of 92 and QTC of 540. Initial laboratory values showed a phosphorous 0.9 mg/dL, magnesium 1.5 mg/dL, WBC 15 K/uL, glucose 150 mg/dL, and bicarbonate 21 mmol/L. The remainder of her electrolytes, renal, liver, and thyroid functions were normal.

The patient was given saline, ondansetron, and 15 mmol of intravenous phosphorous. Repeat phosphorous 5 hours later was 2.1 mmol/L. She remained tachycardic until 18 hours after the ingestion and was discharged on hospital day 2 after an uncomplicated hospital course. Subsequent liquid chromatography/mass spectrometry analysis of 6 capsules from the same bottle showed caffeine levels ranging from 244 mg to 432 mg.

Case Discussion: This case is notable for significant hypophosphatemia and methylxanthine toxicity after reported ingestion of 1 capsule of Synedrex which contains a "proprietary blend" of methylxanthine, methylpentane citrate, sulbutiamine, sandalwood extract, yohimbine extract, alpha lipoic acid, poly-iodo-thyronine, meridextrine, chromium and vitamins B3, B6 and B12. Her significant electrolyte disturbances and EKG changes resolved with minimal intervention consistent with electrolyte intracellular shift due to methylxanthines. Analysis of the capsules showed significant pill-to-pill variance in ingredients that may have contributed to her presentation. Furthermore, phosphorous concentrations are not routinely checked in the ED and may have significant derangements. This case is limited by an inability to obtain serum methylxanthine or metabolite concentrations and an inability to assess for CYP 1A2 polymorphism causing ineffective metabolism.

Conclusion: Patients should be advised of the risks of toxicity from unregulated, non-prescription supplements and providers should consider the possibility of significant electrolyte disturbances including hypophosphatemia in the setting of methylxanthine toxicity.

Keywords: Dietary supplement, Methylxanthines, Adverse drug event

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229. High-dose oral tacrolimus pediatric ingestion

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Background: Tacrolimus is a calcineurin inhibitor and potent immunosuppressive medication used to prevent organ rejection and graft versus host complications in transplant patients. Toxicity is usually due to chronic exposure and presents with neurotoxicity and nephrotoxicity. Limited information is available for the management of acute ingestions. We present a case of a large exploratory ingestion in a pediatric patient.

Case Report: An 18-month-old 11kg male with no past medical history was found playing with a newly-filled bottle of tacrolimus that belonged to his uncle about 1 hour prior to arrival in the Emergency Department (ED). The patient's mouth had the blue discoloration of the pills and 18 tablets were missing; a potential exposure of 90 mg or 8 mg/kg. The family denies any other potential medication exposures. The patient presented to the ED awake and acting at his baseline. His vitals were: blood pressure 119/84 mmHg and pulse 130 beats per minute (bpm). The child's physical examination was otherwise normal. EKG on arrival showed a normal sinus rhythm at a rate of 88 bpm with normal QRS and QTc intervals. CBC, electrolytes, renal, and liver function tests were within normal ranges. The patient was given 11g of activated charcoal and admitted for observation. No events occurred on telemetry monitoring and the patient remained asymptomatic with a normal examination throughout his hospitalization. Repeat electrolytes, renal, and liver function tests were within normal ranges prior to discharge. A serum tacrolimus concentration 5 hours after exposure was 7.5 mcg/L. About 36 hours after ingestion, the serum concentration was 2.7 mcg/L.

Case Discussion: Prior literature on the management of patients with acute exposures to tacrolimus is limited. Renal dysfunction and neurologic toxicity are well documented in patients with chronic exposures and supra-therapeutic concentrations. However, minimal information is available after acute pediatric exposures. Case reports have shown minimal adverse effects in children after exposures of less than 1 mg/kg. Our patient had an exposure of 8 mg/kg and remained asymptomatic with normal laboratory testing during his observation. It is unclear what effect charcoal administration may have had in this case.

Conclusion: Acute tacrolimus ingestions are uncommon with limited data to guide management. Although no toxicity was

evident in this patient, this is one of the largest ingestions reported with confirmatory serum concentrations. Further studies are required to determine the potential toxicity of these ingestions in pediatric patients.
Keywords: Tacrolimus, Pediatric, Ingestion
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230. Cleistanthus collinus poisoning and role of prophylactic potassium supplementation: a retrospective case series

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Background: Cleistanthus collinus, locally known as "oduvan" is the second most common plant utilised for deliberate self harm (DSH) in South India.Though a very common plant used as a toxin, there is a paucity of literature regarding its clinico-epidemiological profile.

This retrospective record based case series conducted in a tertiary care institute in South India was to identify the clinico epidemiological pattern, of Cleistanthus collinus poisoning.
Methods: The case records during the period November 2012 till December 2014, of documented and confirmed Cleistanthus collinus poisoning admitted and managed in our institute was accessed and pertinent data collected using an elaborate proforma. For the purpose of this case series, we have included only 12 out of the 38 cases of Cleistanthus collinus poisoning, for which the plant sample was available for identification. Each individuals data was tabulated in Microsoft Excel® software and the descriptive data was analysed and appropriate tables and graphs produced using IBM®SPSS® ver.20 as required.
Results: All the cases were from the rural region with a male to female ratio 1:4.5

81.8% of the individuals had nausea and vomiting as their initial symptom. 72.7% had normal sinus rhythm on presentation. 63.6% received oral potassium correction prophylactically. 81.8% had an initial serum potassium less than 3.5 whereas 27.3% had it less than 2.5. 18.2% received intravenous potassium correction.

All the patients were discharged better within 6 days of admission except one who expired on the second day.
Conclusion: Majority of the mortality due to Cleistanthus toxicity have been attributed to cardiac rhythm disturbances and distal renal tubular acidosis and hypokalemia.

As part of the institutional policy, for treating Cleistanthus collinus poisoning, the patients were started on oral supplementation of potassium and continued if the initial serum potassium levels were less than 3.5. Two thirds received oral potassium correction empirically. 18.2% individuals this was changed to intravenous supplementation. The overall mortality was less in this case series (9.1%) compared to earlier studies (30%). This can be attributed to many factors including the mode of consumption, initial management strategy and low sample size of this study.

Prophylactic potassium supplementation in Cleistanthus collinus poisoning has not been validated in any prior studies. This warrants further research to establish a guideline in this respect.
Keywords: Cleistanthus collinus, suicide, Plants
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231. Massive Iron Overdose Resulting in a Liver Transplant in an Adult

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Background: The incidence of iron toxicity has dramatically decreased since the Poisoning Prevention Act in 1970 changed how iron was packaged. An ingestion of 20 mg/kg of elemental iron is usually associated with significant morbidity and mortality despite early and aggressive treatment. Iron toxicity results in multi-system organ failure, shock, metabolic acidosis and coagulopathy. Iron toxicity consists of 5 stages, the fourth stage being hepatic failure due to periportal necrosis.
Case Report: A 17 year-old female, approximately 46 kg, with a past medical history of anemia presented to the emergency department after taking "around 10" of her ferrous sulfate 325 mg tabs, two hours prior to arrival. The patient had 4 episodes of non-bloody emesis and complained of epigastric abdominal pain. Her initial vitals were: T: 97.1oF; BP: 99/47 mmHg; HR: 103/min; RR: 22/min; O2 sat: 100% RA. Her pertinent physical exam findings were a flat affect and mild somnolence. Her initial labs were significant for a WBC of 14.9 x103/L, glucose 233 mmol/L, anion gap 22, pH 7.25, bicarbonate 14 mEQ/L, INR of 1.87 and an undetectable acetaminophen level. An abdominal roentogram was negative. The initial iron level at 2 hours was 1000 µg/dL and a 4 hour level was obtained and was 670 µg/dL. The patient was treated with intravenous fluids aggressively and deferoxamine for 24 hours. Over the next three days the patient's AST/ALT went from normal to 2436 u/L and 3309 u/L respectively and the INR was 6.59. The patient remained hemodynamically stable and her acidemia improved. The patient was transferred to a liver transplant center, where her INR became >13. On day #5 status post ingestion the patient received a liver transplant. Liver pathology showed diffuse parenchymal collapse, severe cholestasis and formation of ductular hepatocytes consistent with massive hepatic necrosis compatible with toxin induced liver injury.
Case Discussion: There are many toxins that can cause hepatotoxicity, but few lead to fulminant hepatic failure. Those toxins which are most notable for hepatic failure are acetaminophen and iron. Liver transplantation for acetaminophen induced hepatic failure is well documented, however the literature only reports one case where a liver transplant was performed in the setting of iron toxicity and this was for a 3 year old patient.
Conclusion: Iron overdose can lead to fulminant hepatic failure and death. This is the first case where an adult required and was successfully treated with a liver transplant for iron induced liver failure.
Keywords: Iron, Transplant, Overdose
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232. Being Covered in Spots is a Pain in the Gut

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Background: Loxosceles reclusa may present with localized dermonecrotic lesions and/or systemic vasculitic type rash with hemolysis. Acute Generalized Exanthematous Pustulosis (AGEP) has rarely been described with loxosceles envenomation.
Case Report: A previously healthy 8 year old girl presented with 2 days of abdominal pain and rash. The rash began as pink macules on extremities, coalesced into edematous plaques, spread, and then developed overlying micropustules. There were no associated symptoms, medications, new exposures, or ill contacts. The patient was afebrile, tachycardic, and in moderate distress. She had diffuse abdominal pain without hepatosplenomegaly and a whole body micropustular rash Acute Generalized Exanthematous Pustulosis (AGEP). Labs were remarkable for hemoglobin 10.2 and bilirubin 1.9. She was admitted for serial abdominal exams with suspected AGEP due to a viral infection. She clinically worsened with fever to 102F, hypotension, tachycardia, & generalized edema. Abdominal pain persisted and the rash began to desquamate. Labs were remarkable for elevated inflammatory markers (left-shifted WBC 19, CRP 9.7, ESR 66), elevated bilirubin (3.6), low albumin (2.9), & worsening anemia (Hgb 7.3) with a positive direct antibody test. ID workup was negative for bacteremia, GAS, EBV, CMV, enterovirus. A search for a unifying diagnosis of AGEP with systemic inflammation and hemolysis led to suspicion of Loxosceles spider bite and identification of a small exquisitely tender abdominal plaque with central ulceration. It was previously attributed to rash evolution and micropustule erosion. The rash progressed to superficial desquamation. The patient required supportive care and PRBC transfusion. She was discharged on hospital day 7 with improved abdominal pain and Hgb stable at 9. On follow up 5 days later, the abdominal pain resolved, desquamation continued and she developed scarring at the ulcer site. Repeat hemoglobin was 11 gm/dL.
Discussion: AGEP is a rare skin finding characterized by erythema followed by acute eruption of hundreds of monomorphous, sterile, nonfollicular micropustules. It is due to medications in ~90% of cases and resolves without scarring within 2 weeks of causative drug withdrawal. While an ulcerative lesion at the bite site is typical, skin findings of loxoscelism can rarely include AGEP. Associated systemic symptoms include fever, hypotension, and hemolysis lasting up to a week. Treatment is supportive.
Conclusions: Loxosceles envenomation may result in Acute Generalized Exanthematous Pustulosis which may be a marker of systemic involvement. Hemolysis may be associated with this condition but is seen with systemic loxoscelism.
Keywords: Spider bite, Acute Generalized Exanthematous Pustulosis, Abdominal Pain and Hemolysis
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233. Aluminum Phosphide Poisoning in Saudi Arabia: Case Series

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Background: Aluminum phosphide (ALP) is an effective insecticide and rodenticide used for crop protection during storage and transportation. Use of this highly toxic substance is prohibited in residential areas in Saudi Arabia. In recent years, the Saudi media have reported increasing cases of exposure to ALP which have resulted in both morbidity and mortality secondary to the illegal practice of residential fumigation. ALP has not been known to be a source of pesticide exposure in Saudi Arabia, and the medical literature has not reported any cases of it. The healthcare providers were not aware of the presence of ALP in Saudi Arabia and its clinical presentation. The aim of this case series report is to alert healthcare providers of this potential public-health risk.
Case reports: A family of 5 (4 female, 1 male, ages 22–60) presented to our emergency department (ED) with a history of exposure to pesticide. The pest control company which had applied this pesticide 20 hours before presentation did not informed the family to leave the house after application. Next day, the company informed the family that it had applied ALP. The symptoms started about 15 hours post application, with dizziness, nausea, vomiting, coughing and eye burning sensation. Upon arrival to ED, the patients' symptoms start to improve. The HazMat team was informed about the exposure and the presence of two other families living on the 2nd and 3rd floors who were not aware of the potential exposure. The team was able to reach the exposure site, confirmed the presence of ALP and evacuated the other two families. One evacuated family, who lived on the 3rd floor and had 8 members, ages 2–39, presented to our ED for assessment and was found to be asymptomatic. The family experienced no symptoms during the period of potential exposure. They were discharged with instructions not to enter the home again until it had been well ventilated.
Case Discussion: Our cases fortunately did not result in significant morbidity or mortality or in a rising number of exposure cases. These results were due to our clinical toxicology service's awareness of and alertness to this potential risk based on public media reports. The early notification of the HazMat team prevented further cases of exposure. The delay of symptoms onset and the less severity of presentation might be explained by the occurrence of this exposure in the dry Riyadh weather, compared to other exposure cases in the humid coastal cities which had worse reported outcomes.
Conclusions: Healthcare providers in Saudi Arabia should be aware of the presence and clinical presentation of ALP toxicity, which is used illegally as residential pesticide. If not well controlled, this practice poses a significant public-health risk.
Keywords: Aluminum phosphide, Public health, Pesticide
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234. Severe rhabdomyolysis associated with Garcinia cambogia

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Background: Garcinia cambogia is a pumpkin-like fruit sold as the active ingredient in some over-the-counter weight-loss supplements. The rind of the fruit contains hydroxycitric acid which inhibits ATP-citrate-(pro-3S)-lyase; a critical enzyme in the

formation of fatty acids and triglycerides. Despite a lack of evidence supporting its weight loss efficacy, there are case reports of associated toxicity including: mild rhabdomyolysis, hypoglycemia, serotonin toxicity, and acute necrotizing eosinophilic myocarditis. We report a case of severe rhabdomyolysis following ingestion of "100% pure Garcinia cambogia."

Case Report: A previously healthy 40-year-old man presented to an emergency department with three days of muscle soreness and one day of dark urine. He denied any chest pain. The patient had been taking one capsule of Quality Encapsulations Garcinia cambogia twice daily for two weeks. He denied taking any other prescription medications or supplements. He also denied any recent dehydration or extreme exercise. Initial laboratory evaluation revealed a serum sodium of 142 meq/L, potassium of 3.8 meq/L, blood urea nitrogen of 17 mg/dL, and creatinine of 1.4 mg/dL. The patient's initial serum creatine kinase (CK) was too elevated to result even after a twenty-fold dilution. A follow up CK after 18 hours and 4 L hydration was 163,440 units/L. The patient's aspartate transaminase (AST) was 842 units/L, and alanine transaminase (ALT) was 135 units/L. The patient's troponin peaked at 0.113 ng/mL (normal $<$ 0.045 ng/mL); electrocardiogram showed normal sinus rhythm with normal intervals. The patient was admitted to the hospital for continued intravenous fluid hydration and serial laboratory evaluation. The Garcinia cambogia was discontinued. By hospital day 4 his CK had trended down to 20,000 units/L and he was discharged home without apparent sequelae.

Case Discussion: To our knowledge, there are only two reported cases of mild rhabdomyolysis associated with Garcinia cambogia use. However, both prior reports involved ingestion of a combination product with multiple active ingredients. This patient's use of a single-ingredient product and close temporal relationship to development of rhabdomyolysis suggests Garcinia cambogia played a significant role. Although the mechanism of hydroxycitric acid induced muscle cell toxicity is theoretical, inhibition of fatty acid synthesis may deprive muscle cells of potential fuel source causing heat production and cell damage.

Conclusion: Herbal weight loss supplements are often advertised by the manufacturers to be safe and devoid of side effects. This case report suggests that significant toxicity may occur secondary to the use of Garcinia cambogia for weight loss.

Keywords: Supplement, Garcinia cambogia, Rhabdomyolysis

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235. Time to Metformin-Associated Lactic Acidosis: A Retrospective Review of Regional Poison Center Data

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Background: Metformin is one of the most commonly prescribed antidiabetic agents, accounting for one third of all orally active diabetes prescriptions. Metformin-associated lactic acidosis (MALA) is one of the most feared complications of overdose. Prominent toxicology resources recommend 6 hours of observation post metformin ingestions to monitor for the development of MALA. The aim of this study was to characterize the time to development of MALA after a metformin overdose.

Methods: Utilizing Crystal Reports (Version 11.0), all metformin cases reported to our RPC with a National Poison Data System (NPDS) code of 'acidosis' or 'anion gap' were retrospectively queried over a thirteen-year period (2001-2013). Data was extracted by 2 independent reviewers (NC, JT) and demographic data (age, sex, acute vs. chronic), time to MALA, co-ingestants, use of therapeutic modalities and death were reported. Interrater reliability was assessed using kappa analysis.

Results: A total of 70 cases were analyzed with a kappa of 0.86. The mean age was 41.9 years (range 15-70). Over half were female (40/70). Over half were acute on chronic (40/70). One-fifth co-ingested an additional anti-diabetic medication. Of the 70 cases, 42 developed MALA, as defined by pH $<$ 7.3 or lactate $>$ 5. Eleven patients were diagnosed with MALA within 6 hours of presentation, 8 patients between 6-12 hours, 7 patients after 12 hours, and 14 had an unknown time to MALA. There were 4 deaths, 3 of which had MALA detected beyond the recommended 6 hours observation period (10, 11-13, and 24 hours).

Conclusions: Of the exposures when time to MALA was known, over half (15/26) developed MALA after the often-recommended 6-hour observation period. This calls into question the validity of this recommendation, as a significant portion of exposures developed MALA and died beyond the 6-hour observation period. These data are limited in several ways. Reporting bias, missing data in RPC records, and patients lost to follow-up in this retrospective study make definitive conclusions problematic. Further study defining prospectively the time to development of MALA may improve RPC management for this population.

Keywords: Metformin, Poison center, Acidosis

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236. Near cardiovascular collapse following intentional European Yew (Taxus baccata) ingestion

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Background: Yews are evergreen shrubs known since ancient times for their toxicity, primarily due to the alkaloid Taxine B found in all parts of the plant except the aril. Toxicity results from antagonism of cardiac sodium and calcium channels leading to arrhythmia and cardiovascular collapse. Initial features of toxicity include nausea, vomiting, dizziness, mydriasis and seizures. Severe hypotension and a compensatory supraventricular tachycardia usually precedes further deterioration into a wide QRS tachycardia, followed by bradycardia, complete heart block, and cardiac arrest.

Case Report: A 21 year old female presented to the Emergency Department (ED) following a witnessed syncopal episode. She admitted to consuming 250 mL of cut Yew leaves in water over a 2h period as a suicide attempt. Six hours after ingestion she became dizzy and collapsed at her university campus. When the paramedics arrived she was alert with a blood pressure (BP) of 90/50 and an irregular pulse of 50-60 beats per minute (bpm). Upon ED arrival

she was altert, though noted to have a severe wide complex tachycardia, and her BP declined to 58/35. Intravenous normal saline and norepinephrine (2-20 mcg/min) infusions were started, and she received multiple boluses of sodium bicarbonate (NaB), which were minimally effective. A bolus and infusion of intravenous lipid emulsion (ILE) was then administered, as were additional doses of NaB. The Intensive Care Unit (ICU) was consulted and the patient had femoral venous and arterial lines placed to facilitate emergent initiation of extracorporeal life support (ECLS) should she develop further cardiac decompensation. She was transferred to the ICU where she remained alert with improving hemodynamics and normal biventricular function on echocardiography. She was maintained on an infusion of NaB overnight and by morning her ECG had normalized, she was medically cleared, and transferred to psychiatry.

Case Discussion: Treatment of yew poisoning is supportive and consists of IV fluids, vasoactive agents, and electrolyte replacement. While there is no antidote, specific measures are aimed at antagonizing cardiac sodium and calcium channel toxicity using NaB and calcium salts, respectively. Antiarrhythmic agents, atropine and pacing are not effective. While previous reports have used anti-digoxin Fab fragments, the degree of cross-reactivity is thought to be minimal. ILE or ECLS may be required for ventricular arrhythmia or cardiovascular collapse refractory to the above measures.

Conclusions: We describe the case of an intentional yew ingestion resulting in hypotension and severe arrhythmia that responded to timely supportive care, bicarbonate and ILE.

Keywords: Yew, Cardiac toxicity, Plants

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237. A Regional Poison Center's™ experience in managing 3 communicable disease hotlines

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Background: US Regional Poison Centers (RPCs) are 24/7 call centers staffed by medical professionals experienced in providing immediate phone-based medical information. RPC infrastructure creates a natural partnership with public health officials to assist in the response to emerging communicable diseases. Centralization of questions through a RPC can lead to identification of gaps in existing guidance, encourages consistent messaging, and allows for efficient 24/7 coverage.

Methods: In a 5 year period, a RPC operated 3 separate communicable disease hotlines in conjunction with the state health department (SHD). Hotline operations and call distribution patterns were reviewed.

Results: The RPC set up a hotline for H1N1 influenza in October 2009, for Middle East Respiratory Syndrome (MERS) in May 2014, and for Ebola Virus Disease (EVD) in October 2014. All hotline calls were routed independently of routine RPC poison calls.

Set up time and training: The H1N1 hotline was set up and activated in less than 48 hours; the MERS and EVD hotlines were set up and activated in less than 24 hours. Just-in-time training and frequently updated risk communication information were provided by the SHD and RPC leadership.

Hotline	Days in Operation	Total Calls
H1N1	246	4,063
MERS	19	36
EVD	30	664

Call Volume Trends: All 3 hotlines received the majority of calls early in the activation period. 61% of MERS calls and 48% of EVD calls were received within the first 2 days of activation. The H1N1 hotline was active for 36 weeks; over 50% of the 4,063 total calls were received within the first 4 weeks and 82% of calls were received within the first 8 weeks. The early surge and unpredictability of call volume made staffing the hotlines difficult.

Staffing needs: The MERS hotline call volume did not require additional staffing. Calls on the H1N1 and EVD hotlines were managed with staff overtime and the addition of trained volunteers. Volunteers included senior (4th year) PharmD students and pharmacy residents.

Conclusions: A RPC infrastructure can be successfully and quickly leveraged to provide a communicable disease hotline. Public health hotlines can be established in response to public concern regarding emerging communicable diseases; call volume to the hotlines was highest at the beginning of the activation period. The initial call surge can make training and initial response challenging. Medical professionals in training have medical and drug knowledge which make them a valuable resource in supplementing RPC staff to manage a surge in hotline calls. Just in time training and close collaboration with the SHD is critical for call-taker training and consistent information delivery.

Keywords: Poison center, Public health, Ebola Hotline

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238. Laboratory abnormalities following an unintentional pediatric rivaroxaban ingestion

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Background: Rivaroxaban (Xarelto), a factor Xa inhibitor, is a novel oral anticoagulant (NOAC) used to treat thromboembolic disease and to prevent thromboembolic complications in post-operative patients or in patients with non-valvular atrial fibrillation. Its use is restricted to adults. However, the manufacturer is currently studying the safety and efficacy of rivaroxaban in pediatric patients with venous thrombosis. We report a case of a pediatric rivaroxaban ingestion that resulted in laboratory derangements.

Case Report: A previously healthy 2 year old girl announced that she found candy, when in fact she found a family member's rivaroxaban. Her family witnessed her ingesting several pills. The exact quantity she ingested was unknown, but the maximum amount may have been up to 100 mg. The poison center referred the child to the hospital for evaluation. On physical examination, she had no signs or symptoms of bruising or bleeding. Though she presented within 40 minutes of ingested, she drank a minimal amount of administered activated charcoal. Laboratory studies drawn 100 minutes post-ingestion demonstrated a prothrombin time (PT) of 54 seconds, an international normalized ratio (INR) of 6.1, and a

partial thromboplastin time (PTT) of 57 seconds. Her hemoglobin was 12.2 g/dL. Eight hours after ingestion, her PT was 21.5 seconds, and her INR was 1.9. 14.5 hours after ingestion, her PT was 16.7 seconds, and INR was 1.1. The patient remained stable throughout her hospital course and never developed any bleeding from the ingestion.

Case Discussion: Systemic anticoagulation with the NOACs, such as rivaroxaban, is being becoming increasingly popular because pharmaceutical companies state that monitoring with blood tests is unnecessary. Currently, rivaroxaban is not approved for pediatric use. However, with increased popularity of NOACs, unintentional pediatric ingestions will be more frequent. Pediatric rivaroxaban treatment for venous thrombosis is currently undergoing phase 2 clinical trials. Until that data is reviewed and published, management of unintentional pediatric ingestions will require close clinical and laboratory monitoring. In our patient, coagulation studies revealed significant abnormalities within 100 minutes of ingestion. At therapeutic doses in adults, peak serum concentrations occur between 2 and 4 hours.

Conclusion: Rivaroxaban ingestions in pediatric patients may cause significantly elevated coagulation studies. Real-time rivaroxaban concentrations are not typically available. While coagulation studies are not surrogate tests for drug concentrations, abnormal coagulation studies may provide further evidence of recent ingestion.

Keywords: Anticoagulant, Pediatric, Overdose

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239. Pancreas injury during acute paraquat poisoning

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Background: Pesticide self-poisoning is a global public health problem, killing around 350,000 people every year. Ingestion of paraquat commonly causes multi-organ failure and death; pancreatic injury has been noted in retrospective patients but has not been studied in detail. We therefore studied the prognostic significance of pancreatic injury for survival.

Methods: Patients with acute paraquat poisoning admitted within 72 hours to our hospital from July 2013 to August 2014, with positive urine paraquat tests, were recruited. An extensive series of blood tests including serum amylase were serially checked on days 1, 3, 5, 7 and 9. Patients were sorted according to their serum amylase activity (normal [< 220 U/L], mildly elevated [220 to 660 U/L], elevated [> 660 U/L]), and survival compared between groups.

Results: 177 patients were enrolled to the study, of whom 67 died and 110 survived. 122 (70.62%), 27 (15.25%) and 25 (14.13%) patients were in the normal, mildly elevated and elevated groups, respectively. The case fatality in the elevated group was 100% compared to 17% in the normal group ($P < 0.001$).

Conclusions: Pancreatic injury was not uncommon in parquat poisoned patients. It is a poor prognostic marker after acute paraquat poisoning.

Keywords: Pesticide, paraquat, pancreas

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240. Symptom Timeline Documentation at a Poison Center: Pediatric Nicotine Solution Ingestion

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Background: Nicotine solutions (NIC.SOLN) for inhalation may have high nicotine concentrations with serious risks if ingested by a child. Symptom onset and duration are crucial to monitoring these increasingly common cases. This abstract evaluates timelines documented in a poison center's (PC) practice for this at-risk population.

Method: A PC Toxicall® retrospective review of exposures was conducted for age ≤ 6 years old having an ingestion of NIC.SOLN. Symptoms, onset and duration were estimated with call-time intervals and with times reported within these calls. Symptom onset was defined as the time interval between the exposure and the first reported symptoms. Duration was defined as the time from onset until symptom resolution. Times were usually expressed as a range and were considered well documented if uncertainty was < 60 minutes for onset and < 90 minutes for duration. The maximum possible value of each time interval was used for statistical descriptions to avoid underestimation of times.

Results: Exposures to NIC.SOLN appeared in 369 cases between Jun 2009 and Feb 2015. The cases for age ≤ 6 years old totaled 181. Symptoms were reported in 47 (26%) with vomiting (39), drowsiness (8), pallor (6), tachycardia (5), hypertension (3), cough/choke (3), agitation (3), oral irritation (2), diaphoresis (2) and 1 instance each of dizziness, ataxia, coma, tremor, abdominal pain, diarrhea, excess secretions, anorexia and erythema/flushing. The symptoms were present upon 1st call in 43 of these cases. Onset time was well documented in 41 cases with a mean time of 18 minutes SD ± 13.4 (median 15 minutes; 98th percentile 60 minutes). One case unexpectedly vomited after 2 hours of no symptoms. Duration of symptoms were well documented in 31 cases, with 7 reported as a brief event, with 13 having a duration < 60 minutes (mean 22 SD ± 12.6), and with 11 having a duration ≥ 60 minutes (mean 98 SD ± 58.5). Cases with no reported symptom were 134, but only 58 were followed for ≥ 60 minutes (mean 121 SD ± 71).

Conclusion: Overall, this PC data on pediatric NIC.SOLN ingestion is consistent with a rapidly absorbed and metabolized toxin. The evolution and resolution of symptoms is usually prompt consisting primarily of vomiting but also with neurological or cardiovascular signs. Practices to improve the accuracy of estimates (especially duration) could include time-specific documentation, more frequent follow-up calls and a duration of monitoring ≥ 60 minutes even if asymptomatic. After 60 minutes few cases should develop symptoms and many with symptoms will have resolved. Patients with effects that are severe or durations exceeding 1 hour should be considered for referral to a health care facility.

Keywords: Nicotine, Pediatric, Timeline

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241. The Beef Jerky Blues

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Background: Methemoglobinemia can be inherited or acquired though exposure to various substances such as nitrates or nitrites. Commonly recognized methemoglobinemia-inducing nitrate and nitrite sources are industrial compounds, well water, or therapeutic medications. Food can also contain nitrates and nitrites, most commonly through contamination during the manufacturing process or from vegetable degradation due to improper storage.
Case Report: This is a case series of 2 patients: a 49-year-old male and his 14-year-old daughter who sought emergency department treatment 3 hours after eating homemade beef jerky. The father made beef jerky in the past using pre-made kits, but this was the first time he used sodium nitrate purchased at a grocery store rather than pre-made jerky seasoning mixtures. He purchased a 1.52 lb (24.32 oz) container of sodium nitrate and mixed 2 tablespoons (1 oz) into 5 lbs of meat. The meat and nitrate mixture were refrigerated for 3 hours and then prepared as "beef jerky" in his food dehydrator. The father and daughter both consumed the beef jerky and developed symptoms palpitations and dyspnea 1.5 hours later. Both exhibited mucosal cyanosis: the father had cyanosis to his hands and the daughter had nailbed cyanosis. In the ED, the father had a pulse oximetry of 89%, respiratory rate of 22, blood pressure 142/80mmHg and pulse 82 bpm. The daughter had a pulse oximetry of 80%, respiratory rate 18, blood pressure 126/55 mmHg and pulse 90 bpm. Methemoglobin levels were 34.2% in the father and 44.2% in the daughter. Other screening labs for both were unremarkable, both had normal chest x-rays. Each received 1 mg/kg IV methylene blue. Within 2 hours, both showed clinical improvement. They were observed overnight for rebound symptoms given the unknown amount of beef jerky ingested. They remained asymptomatic, repeat methemoglobin levels were 0%, and they were discharged home the following day after counseling.
Case Discussion: With the advent of do-it-yourself projects and the popular opinion that homemade goods are superior to processed ones, people may expose themselves to chemicals or toxins in unintended ways. In this case the father was able to purchase a tub of sodium nitrate salt from a local grocery market but used much more of it than was recommended by the USDA for making beef jerky. No warning labels or instructions for use were affixed to the container of salt. It is not surprising he and his daughter both developed methemoglobinemia after eating the beef jerky.
Conclusion: Clinically significant methemoglobinemia needs to be considered in symptomatic patients processing their own beef jerky.
Keywords: Methemoglobin, Methylene blue, Public health
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242. Probable Green Tobacco Sickness from occupational preparation of e-cigarette products

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Background: The use of liquid nicotine products is widespread and home compounding of liquid nicotine solutions is becoming more popular. Highly concentrated solutions are readily available for preparation of custom flavors and proprietary products. Green Tobacco Sickness (GTS), systemic nicotine poisoning from dermal exposure to nicotine in workers harvesting tobacco, is well documented. A common case definition is nausea or vomiting plus dizziness or headache and occupational dermal exposure to tobacco within the past day, with patients often having repeated episodes. We report a case of systemic nicotine toxicity with presentation similar to GTS associated with occupational preparation of "e-cigarette" solutions.
Case Report: A 35 year-old man was admitted to the hospital on three separate occasions over a two-week period with a diagnosis of nicotine poisoning. His occupation was operation of a home business preparing and distributing liquid nicotine solutions for e-cigarettes. Presenting symptoms on each visit included hypertension, dehydration, profound vomiting, dizziness, restlessness, and diaphoresis. Abraded hands were noted on one admission, and the patient reported relief with hot showers. Onset and duration were consistent with GTS. The patient denied any ingestion or inhalation use of the product and was treated with skin decontamination, antiemetics, intravenous fluids and minimal sedation. No information on use of skin barrier protection was available. A serum cotinine level of 3 ng/mL was obtained on the second visit more than 36 hours after admission, with a negative serum nicotine level.
Case Discussion: We report a patient with signs and symptoms of systemic nicotine toxicity following occupational exposure to concentrated e-cigarette solution. Other diagnoses were felt less likely, including drug withdrawal, anxiety disorder, marijuana hyperemesis syndrome, and akathisia from repeated iatrogenic administration of phenothiazine anti-emetics, although these may have had some contribution to his findings. If extrapolated back two half-lives, his serum cotinine level reflected recent exposure to nicotine. He required only 1-2 doses of morphine and/or lorazepam during hospitalization, had a negative UDS for THC on 1 of 3 visits, and onset of restlessness was more than 2 days after administration of neuroleptics in each case. Conclusion. Preparation of liquid nicotine may result in systemic toxicity from dermal absorption. Counseling patients about effective personal protective equipment and decontamination with tepid, not hot water, should be considered in anyone with repeated dermal exposure to e-cigarette solutions.
Keywords: Nicotine, Electronic cigarettes, e-cigarettes
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243. Use of poison center resources for hospital-based telephone services: follow-up calls for discharged inpatients

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Background: As the number of calls to US Poison Control Centers (PCCs) and their funding sources continue to decrease, PCCs must investigate new roles and services. Our experiences with performing follow-up calls for inpatients discharged from our home institute are described.
Method: Our hospital established a goal to contact all discharged inpatients within 48 hours of leaving the hospital. This process involved phone call interviews to inquire about their overall inpatient experience. This was in response to an independent surveyor (of random patients) asking patients about their hospital stays and also if they "received a phone call at home?" We worked with our

Service Excellence Department to develop an enhanced questionnaire that also queried about follow-up appointments and medication-related questions. All information about discharged patients was loaded into a unique electronic medical record system (EMR) in 24 hour intervals. Dedicated PCC staff (not answering primary PCC calls) reviewed each patient's discharge instructions with the EMR prior to calling. Up to three attempts were made for each patient before they were recorded as "failed contact" and removed from the database. When possible, messages were left with a 24/7 call back number. All call attempts were logged daily on a call data sheet into one of six categories: completed, messages left, wrong number, readmitted, transferred to another facility or other (busy signals, no answer, requested no call back). All calls were counted towards PCC productivity. Those calls that identified a medication-related event were also documented separately into VDL®.

Results: A total of 26,926 follow-up calls to discharged inpatients were completed by our PCC in 2014. Independent follow-up data showed that prior to PCC involvement (May 2013) only 61.2% of discharged patients received a follow-up call. This increased to 84.2% after being assigned to our center. Almost 40% of total calls resulted in staff leaving a message with call back instructions; these calls had a 10% call back rate. We hypothesize that one reason for the increased completion rate is our ability to use a 24/7 call back number for patient convenience.

Conclusions: Poison centers have inherent resources (trained/experience staff, EMRs, 24/7 staffing) that may allow for other healthcare related services and facility-based productivity. Our ability to manage medication-related calls may enhance patient experiences and prevent adverse drug events.

Keywords: Poison center, Surveillance, Adverse drug event

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244. Plotosus lineatus: A new poisonous Lessepsian immigrant fish in the Eastern Mediterranean Sea

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Background: Plotosus lineatus (Striped eel catfish) is a fish migrating from the Indo-Pacific Ocean to the Mediterranean Sea (Lessepsian immigrant), and colonized there. Its presence in the Eastern Mediterranean Sea was first recorded in 2002, but only recently it has been observed in growing schools, and caught in fishing nets. Its dorsal and pectoral serrate spines contain toxins with lytic, hemolytic and edematous activities; molecular weights are 12,000-180,000 dalton. The literature refers to it as one of the most dangerous venomous fish, envenomation may be fatal.

Objective: To identify the magnitude and characteristics of injuries caused by Plotosus lineatus in the Eastern Mediterranean Sea.

Methods: A prospective study of consultations provided by the National Poison Information Center pertaining to Plotosus lineatus from 2007 to 2014. Demographic and clinical data and method of fish identification were retrieved from the medical toxicological records, and subjected to descriptive analysis. Results are expressed as median (range).

Results: 89 cases were collected, 83 were included in the analysis. The following are the main findings: age 35 (3-80) years, 91.6% males, 53% fishermen, 56.6% of calls came from physicians (49% from emergency departments), time to consultation 1.75 hours (5 min. – 7 days), 77% were injured in the palm and 23% in the foot, 94% and 5% were mildly and moderately injured, respectively. Main local clinical manifestations included pain, puncture wound, swelling, erythema, hematoma and paresthesias (90%, 70%, 34%, 17%, 3.6% and 3.6%, respectively). Systemic signs were minor and infrequent (1.2-2.4%), including vomiting, weakness, dizziness, chills, hypertension (up to 166/100mmHg) and tachycardia (up to 109 bpm). Main treatment recommendations were wound cleansing, disinfection, immersion in hot water, tetanus prophylaxis, and analgesics. No patient required hospital admission. The fish was identified in most cases by the victim; i.e. by typical description, personal knowledge of a fisherman, picture, or a combination of these; very few were identified by a marine biologist.

Conclusions: Plotosus lineatus is a relatively new fish in the Eastern Mediterranean Sea. It affects fishermen who handle fishing nets or hikers who accidentally step on it on the seashore. Injuries are caused by the spines, resulting in minor effects; pain may be severe and prolonged. Our data suggest that the Plotosus lineatus species found in the Eastern Mediterranean water may not be as toxic as reported for the Indo-Pacific one. Treatment is mainly local, together with analgesics and tetanus prophylaxis; observation for secondary infection is suggested.

Keywords: Plotosus lineatus, Mediterranean, Envenomation

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245. Thermostats a Poorly Recognized Source of Mercury Exposure

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Background: The 2008 economic crisis devastated the housing market, producing abandoned homes that often contain older thermostats with elemental mercury switches. Some states now require recycling of older thermostats which often contain 4 grams of mercury. A cluster of these abandoned homes exists in our city, and many homeless persons, often with underlying psychiatric illnesses, use these homes as shelters or to abuse drugs. We report the mercury exposure of a homeless veteran in that setting.

Case Report: A 51-year-old, homeless veteran with multiple prior suicide attempts, injected himself with mercury obtained from a thermostat or thermometers in an abandoned house. He was transported to the hospital after a friend called 911. At admission, the man had no symptoms of mercury toxicity. He had no fever, no headache, no metallic taste, no eye irritation, no sore throat and a normal neurological exam.

He reported injecting mercury into his arm two days earlier, but was unclear about the source. The injection site was unremarkable and he was not chelated. A forearm X-ray showed small metallic densities subcutaneously, consistent with mercury injection. No earlier films were available. His chest film, unchanged from August 2013, showed small metallic fragments consistent with mercury. The patient reported a prior suicide attempt by injecting

mercury from thermometers into his arm in January 2013. Mercury lab testing done on admission returned two weeks later and showed blood mercury concentration level of 55 micrograms/liter and urine mercury concentration level of 15 micrograms/milliliter. On follow up calls his physician reported the patient remained asymptomatic and he was not chelated. The man couldn't provide the specific address, only an intersection, where he had injected the mercury. Local police provided a list of abandoned houses near the intersection. The Environmental Protection Agency inspected the houses, but found no thermostats or thermometer housings that had been tampered with. No clean up was done.

Discussion: The environmental investigation found no exposure source, but the veteran had clearly injected mercury. Abandoned houses may contain thermostats with mercury switches contributing to environmental exposures. The average thermostat is estimated to contain 3-5 grams of elemental mercury, and many states now have recycling programs.

Conclusion: Thermostats and thermometers in homes are an often unrecognized source of mercury.

Keywords: Mercury, Public health, Surveillance

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246. A Regional Poison Center's experience in establishing an Ebola hotline

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Background: US Regional Poison Centers (RPCs) are 24/7 call centers staffed by health care professionals (HCPs) experienced in providing medical information via telephone. This infrastructure has allowed RPCs to partner with public health agencies to address concerns about emerging communicable diseases. Using a RPC as a central point of contact can lead to identification of gaps in existing guidance, encourages consistent messaging, and allows for efficient 24/7 coverage. A RPC was contacted by the state health department (SHD) on 10/15/14 to set up a hotline for inquiries regarding Ebola Virus Disease (EVD). The SHD publicized a toll-free number directed to a RPC-hosted number; hotline calls were routed separately from routine RPC calls. Just-in-time training and reference materials on EVD were provided by the SHD based on state-specific and federal guidance. Notification protocols were established to ensure that complex calls would be routed appropriately.

Methods: EVD hotline setup and operations were reviewed. All hotline inquiries were documented at time of call. Call data were reviewed and categorized by caller type and inquiry content.

Results: The hotline, staffed by RPC personnel working extra shifts and trained volunteers (pharmacy residents), went live within 24-hours of notification at 8am on 10/16/14. The EVD hotline operated for 30 days (10/16-11/14/14), and received 664 inquiries; 48% of these calls were received within the first 2 days of activation. The RPC was able to manage most inquiries; 4% were referred to the SHD. Call summaries were sent to the SHD daily. Reference materials were frequently updated based on situational changes, newly disseminated federal and state-specific guidance, and in response to questions received on the hotline. About half of all public callers had general questions about EVD, such as symptoms and route of transmission. Other common topics among public callers included travel restrictions, hotline number verification, concerns about a possible exposure, and policy issues surrounding EVD (e.g., questioning why there was no travel ban for affected countries). The most common calls from HCPs involved facility protocols and guidelines, symptomatic patients with recent travel history, PPE usage, and handling/testing of clinical specimens.

Call type.

In-state public callers	
General EVD	271
Travel concern	62
Verify number	45
Exposure worry	29
Policy Issue	28
Other	28
Rumor	16
False claims	15
Media	14
Monitored traveler	3
Local health department	3
Calls from HCPs	84
Out of state callers	66
Total	664

Conclusion: RPC infrastructure can be successfully and quickly leveraged to serve as a communicable disease hotline.

Keywords: Poison center, Public health, Ebola hotline

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247. Of Mice and Men

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Background: The Environmental Protection Agency (EPA) has issued new regulations for residential-use rodenticides mandating the use of first-generation anticoagulants or non-anticoagulants, while banning second generation anticoagulants, due to risks to wildlife. As previously described[1] all products must be sold with either a tamper-resistant refillable or a disposable bait station to reduce accidental exposures. However, refill baits are cheaper than disposable bait stations and are not required to be sold in child resistant containers. The former provide easy access and furthermore, additional opportunity for exposures if bait blocks are improperly placed outside of protective bait stations, by consumers. We examined information about currently available products to try and determine if the EPA directives may result in a different and potentially serious risk for rodenticide exposure that could affect poison controlcenters.

Methods: A current list of EPA approved rodenticides was obtained from the EPA website. Utilizing Mobile Access to Pesticides and Labels, available for query by the National Pesticide Information Center, we searched each product by EPA registry number for the following information: active ingredient, refillable vs prefilled/disposable form, package size, block size, presence of bittering agent and availability of an emergency contact number.

Results:

- 39 products meet the EPA standards
- Active ingredient:

- o Bromethalin 0.01% = 21 (54%)
- o Diphacinone 0.005% = 13 (33%)
- o Chlorophacinone 0.005% = 5 (13%)
- Refillable = 16 (41%). Prefilled/disposable = 23 (59%)
- Package size: 1 ounce to 16 ounce
- Block size: 0.5 ounce to 4 ounce
- Bittering agent: Yes = 31 (79%). Unknown = 8 (21%)
- 1-800-222-1222 listed as the emergency contact number = 0 (0%)

Conclusion: There are real concerns for serious exposures and triage and management by poison centers due to these new EPA directives. Due to cost, consumers may be tempted to use cheaper refill products, which are sold in non-child resistant containers. Label directions rely on residential users to adequately comply with proper use to provide sufficient protection for children. These products contain up to one pound of bromethalin, for which there is a toxic metabolite; no established toxic dose, limited toxicological information, lack of blood tests and no known antidote.

1. Brutlag et al. Pet poisonings involving new, EPA-approved bromethalin rodenticides: Implications for pets and humans. Clin Tox 51, 711, 2013 (ABSTRACT 299)

Keywords: Bromethalin, Rodenticide, Pediatric

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248. Nerium oleander: case report of a severe poisoning case involving numerous cows

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Background: the Oleander (Nerium oleander) is an evergreen bush belonging to the Apocynaceae Family. It grows in warm-temperate-subtropical climates and can also be cultivated as an ornamental plant. All the parts of the oleander contain a mixture of very toxic cardio active glycosides which affect the electrical conductivity of the heart causing arrhythmias of various nature. All plants, including the oleander, are often responsible for many poisoning cases that involve both humans and animals. Herein it is described a severe intoxication which concerned a large number of cattle.

Case Report: between 2010-2014 the Poison Control Center received 23 toxicological requests calls involving a total of 181 animals exposed to Nerium oleander: 161 (88.9%) cows, 14 (7.7%) dogs, 2 (1.1%) ducks, 2 (1.1%) mice, 1 (0.6%) horse, and 1 (0.6%) goat. Of these, a total of 24 (13.2%) subjects died. During the summer of 2014 a toxicological request arrived at the PCC for some cows that ate oleander: a large quantity of oleander leaves and branches, resulting from plants pruning, was mistakenly added to fodder, distributed to the mixer and then it was given as food to the cows. The exposure potentially involved 150 pregnant cows and a bull. After a few hours since the exposure, 20 cows died following cardiac arrest.

Case Discussion: in severe humans poisoning cases due to Nerium oleander the antidote is Antidigoxin-Antigen Binding Fragment. However, administering this therapy to large animals such as cows is not cost effective. Therefore an alternative treatment was devised: over hydration, intravenous Ringer and ruminal acidification with 1 to 2 liters of vinegar diluted 3 times, twice a day. Signs and symptoms improved after a few days, the therapy has saved about 80% of the cattle including the dying bull. No cow had to abort the pregnancy, the calves were born healthy and the poison exposure seemed not to have had consequences on survivors.

Conclusion: cardiac glycosides cause a typical symptomatology which involves both cardiovascular and gastrointestinal systems; animals are particularly susceptible to poisoning by oleander. It is widely known that oleander toxins are lethal to ruminants at a minimal dose of 50 mg/kg body weight. In cows, the common clinical effects reported after consuming large quantities of oleander are: anorexia, weakness, locomotion disturbances, depression, diarrhea, arrhythmias, and, in severe cases, sudden death. Poisoning of livestock and pets by plants is a common occurrence. It is important not to underestimate the plants as causative agents of animal poisoning, and to remember that there aren't particular colours, forms, or smells that enable the identification of a toxic plant.

Keywords: Plants, Nerium oleander, cows

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249. Characterization of Patient Safety Net Medication Error Alerts in an Urban Emergency Department

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Background: Patient safety literature suggests that the emergency department (ED) is a high risk area for potential errors. Most of the existing data has looked at prescribing errors from the ED. There is less data available on errors occurring in the ED, or in patients admitted from the ED. We looked at medication errors reported through the UHC Patient Safety Net® (PSN) program that occurred in the ED over a two year period.

Methods: All PSN reports for the calendar years 2013 & 2014 pertaining to medication errors occurring in the ED were reviewed. The lead author abstracted relevant data (type of incident, harm to patient, meds involved).All data were de-identified and the study was approved-exempt by the Institutional Review Board.

Results: All reports from 2013 & 2014 were reviewed, for a total of 99 reports. There were 4 duplicate reports, for a total of 95 discrete incidents. Of these 95 incidents, 27 (28%) involved a medication that was mislabeled or placed in the wrong drawer, which were pharmacy issues. Of the clinical issues, 1 (1.1%) resulted in a serious outcome, and that was a patient receiving epinephrine ordered IM via the IV route. 19 (20%) involved improperly dosed or monitored heparin infusions, 13 (14%) missed antibiotic doses, and 7 (8%) improperly dosed TPA. The most common potentially severe errors involved heparin infusions, which for most of the study period were ordered using an ED-based orderset that did not include any protocolized ordering for PTT or dose adjustment of the infusion.

Conclusions: Review of PSN reports revealed that a few high-risk areas exist that can be targeted for safety and quality improvement initiatives. In our ED, heparin infusions and TPA represented the areas of greatest risk and potential gain among the commonly filed PSN alerts.

Keywords: Adverse drug event, Medical toxicology, Public health

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250. Cordyceps fungi poisoning due to consumption of cicada flower in Vietnam

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Introduction: "Cordyceps" in Chinese traditional medicine means "winter bug summer herb" or "cicada flower". It is an antlered fungus that grows in insect larvae, usually before the insect's cocoon is formed. It is gathered in the early summer. This fungus is found in some countries in Asia, especially in China, and it has been used in cancer treatment, strengthens the immune system, improving renal function. Cicada flowers have been recently found in the Vietnam delta, and cordyceps fungi poisoning have been reported in people who has consumed cicada flowers.
Case-series report: 60 cases of cordyceps fungi poisoning were admitted to 7 hospitals in the South Vietnam (between May 2008 and – March 2015). Signs and symptoms occurred within 30 to 60 minutes of consuming "cicada flower", and they include dizziness, vomiting, salivation, sweating, seizure, myosis, delirium, somnolence, stiff jaw, constipation, urine retention, coma. The severity of poisoning depended on the number of "cicada flower" consumed. All routine laboratory investigations were within the reference range. All the patients were managed with only supportive management during their hospitalization, and their signs and symptoms gradually resolved over two weeks.
Discussion: All these patients were poisoned because they could not distinguish alive cicada nymphs from "cicada flower" (i.e., cicada nymphs' bodies infected by cordyceps fungus). The spores of the fungus attached themselves to the external surface of the cicada nymph bodies where they germinate in the anaerobic underground environment for many years during the development of the cicada nymph. The fungus directly invades and penetrates the exoskeleton of the cicada nymph. By the time the insect is dead, its entire body is full of fungus mycelium. The fruiting bodies of the fungus sprout from the cicada nymph's head in the aerobic environment. When a people consume fungus infected cicada nymphs, they are consuming mostly fungus. We have yet to identify the species of Cordyceps that is a parasite on cicada nymphs in Vietnam and its toxins. The presenting signs and symptoms of our patients appeared similar to the so call ibotenic or pantherina-muscaria syndrome.
Conclusion: Our cases are the first case series of human Cordyceps fungi poisoning and it appeared to be similar to ibotenic or pantherina-muscaria syndrome.
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251. Estimating the financial impact of adopting the revised united kingdom acetaminophen treatment nomogram in the us population

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Background: The decision to treat a patient with an acute acetaminophen overdose is determined by plotting the acetaminophen concentration on the Rumack-Matthew nomogram. In 2012, the United Kingdom's Medicines and Healthcare Products Regulatory Agency lowered the treatment threshold by 50%, mandating treatment if a four-hour acetaminophen concentration exceed 100 mcg/mL. Using a multi-center study in emergency departments throughout the US, we had previously estimated that changing the treatment threshold from the current threshold to the new UK threshold of 100 mcg/mL would result in treating an additional 6,951 adults annually. The purpose of this study was to estimate the financial burden of such a decision
Methods: The averages charges and payments for emergency department visits were obtained by reviewing the Emergency Room Visits (ERV) file of the Medical Expenditure Panel Survey (MEPS) from 2000-2012. The search utilized only patients discharged from the emergency department who were treated for "poisoning by drugs, medicinal and biological substances." The monetary values were subsequently adjusted to 2012 dollars using the medical component of the Consumer Price Index.
Results: For patients discharged from the emergency department, the average total charge per patient was $2221, with an average corresponding patient of $772. Extrapolating these values to the estimated number of additional patients who would require treatment if the treatment threshold were changed yielded an estimated $5.4 million in payments and $15.4 million in charges.
Discussion: Changing the acetaminophen treatment nomogram guidelines in the US to that of the UK would result in estimated charges of more than $15 million and estimated payments of more than $5 million annually. Our estimates do not include costs associated with increased ED referrals from poison centers or costs associated with admissions for the additional patients requiring antidotal therapy. The last step necessary for a full fiscal evaluation will be to estimate if the treatment threshold change will eliminate any patients from developing end-stage liver failure requiring transplantation, thus potentially balancing some of the additional cost incurred from the change.
Conclusions: Changing the treatment threshold would result in significant healthcare costs for a set of extremely low-risk patients, for unclear benefit.
Keywords: Acetaminophen (paracetamol), Cost, Antidote
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252. Delayed-Onset Gastrointestinal Symptoms After Gymnopilus penetrans Ingestion: A Case Report

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Background: Mushrooms are notoriously difficult to positively identify, for amateurs and professionals alike. Delayed-onset gastrointestinal (GI) symptoms are concerning for potential

amatoxin-induced hepatotoxicity, as seen with some Amanita, Lepiota, Conocybe, and Galerina species. We report a case of mushroom ingestion for recreational use, which was ultimately identified using DNA sequencing in collaboration with a mycologist.

Case Report: A 17 year old male presented to the emergency department with delayed-onset abdominal pain five hours after ingesting 15 mushrooms for recreational use. A mycologist examined the dried sample and it was initially identified as a Galerina species. Given the absence of hallucinogenic symptoms in the patient, and the potential for delayed hepatotoxic effects, he was treated with multi-dose activated charcoal, acetylcysteine, and milk thistle. Nausea and vomiting persisted for several days, but hepatotoxicity did not occur. The mushroom sample was later positively identified by DNA sequence as Gymnopilus penetrans.

Case Discussion: Gymnopilus and Galerina species have similar appearance and microscopy, making it difficult to differentiate the two. In this case, visual identification of the mushroom was complicated by the sample being poorly dried. Several Gymnopilus species contain psilocybin, although G. penetrans does not. It has a bitter taste and is considered inedible. There are no previous reports of this species causing delayed GI symptoms, the presence of which may confuse it with the much more toxic Galerina autumnalis. We assume this patient's persisting GI symptoms were side effects of the treatments provided.

Conclusions: In patients with mushroom ingestions who develop delayed-onset GI symptoms, it is prudent to treat as soon as possible for possible amatoxin hepatotoxicity. Silibinin, acetylcysteine, and/or multi-dose activated charcoal may all be beneficial and are of relatively low risk. DNA sequencing of the material is uncommon, may take several weeks, and should not be relied upon to guide therapy. Poison center collaboration with a mycologist who is familiar with local species remains invaluable.

Keywords: Mushroom poisoning, DNA sequence, Mycologist

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253. Fatal copper toxicity despite early aggressive interventions

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Background: Copper sulfate ($CuSO_4$) is highly toxic at doses of 0.15-0.3 g/kg with ensuing hemolysis and multi-organ failure. There is no consensus on the optimal means for enhanced elimination in cases of severe copper (Cu) toxicity.

Case presentation: A 19 year old female ingested $>$ 10g of $CuSO_4$ solution, obtained from her mother who was as a chemist. She had abdominal pain and blue emesis. Exam revealed hyper-salivation and tachycardia. She was intubated due to hypoxia and aspiration. Early bronchoscopy revealed tracheobronchitis and segmental bronchial blue-green staining which was irrigated for decontamination. Endoscopy revealed grade-2 esophagitis, gastritis, duodenitis, and ulcerations. Late on hospital day 1, she developed significant hemolysis, methemoglobinemia, and anuric renal failure. She was started on penicillamine 1.5 g due to a national shortage of calcium disodium edetate and dimercaprol. Trientine was unavailable. She was treated with hemodialysis (HD), exchange transfusions, methylene blue, zinc, and folate. Blood drawn in the ED, resulted on hospital day 3, revealed a serum Cu level of $>$ 500 µg/dL. Cu was undetectable in dialysate after two courses of HD. Her renal function failed to improve and her neurological status deteriorated despite decreased serum Cu levels. After 14 days, given her unimproved clinical status, her family withdrew care. An autopsy was not performed.

Discussion: Our patient manifested severe toxicity after a large ingestion of CuSO4. Bronchial irrigation provided some decontamination. HD was initiated to mitigate direct Cu- and penicillamine-induced nephrotoxicity and support renal function. There was no penicillamine-bound Cu in the dialysate. Blood product replacement and exchange transfusions may have contributed to reducing Cu burden. Serum Cu on day 8 had doubled from day 3, which may represent redistribution.

Conclusions: Acute Cu toxicity is rare but carries a high mortality due to severe hemolysis and multi-organ toxicity. Penicillamine is the standard of care in cases of chronic Cu toxicity in Wilson's disease. There is no evidence as to an optimal chelator for acute toxicity but calcium disodium edetate and dimercaprol have been used successfully. In our case, despite decontamination measures, early multi-organ support, chelation, and attempts at enhanced elimination, the patient died.

Keywords: Heavy metals, Copper, Chelation

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254. Successful treatment of severe pediatric alcohol poisoning with hemodialysis

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Background: Alcohol poisoning in the pediatric patient can be life threatening. Complications include hypothermia, respiratory

Table 1.

	Day 1	2	3	4	6	8	12
Creatinine (mg/dL)	1.69	3.23	4.19	4	8.05	7.04	6.92
AST (U/L)	78	236	187	174	107	79	26
ALT (U/L)	7	36	41	71	82	71	40
Bilirubin (mg/dL)	3.1	10.1	10	10.6	12.6	4.8	1.8
Hemoglobin (g/dL)	11.9	8.3	8.7	8	8.4	6.2	7
Platelets (x10^9/L)	136	81	56	25	43	109	126
Methemoglobin (%)	18	22	16	4.5	1.2		
Serum Cu (mcg/dL)	$>$500		88			161	137
Ceruloplasmin (mg/dL)	30		49				
Dialysate Cu (mcg/dL)			0				

depression, hypotension, coma, and death. Treatment is usually limited to supportive care. We report the successful use of hemodialysis in a child with severe alcohol poisoning.

Case Report: A 3-year 11 month-old, 21 kg, female with cerebral palsy, tracheostomy and G-tube dependent, was found unresponsive (GCS 3) at home and transported by paramedics to the emergency department (ED.) Her medications were phenobarbital, topiramate and levetiracetam. Patient was last seen at normal baseline at 11pm. She was found cold, pale and unresponsive twelve hours later at 11am. In the ED, vital signs were BP 56/25 mmHg, HR 130, and T 33.9° C. Pupils were pinpoint. She received a total of 45cc/kg NS with transient improvement of BP to 83/47 mmHg. Initial ABG: pH 7.15, pCO2 43, HCO3 14.3 mmol/L, base deficit -14, lactate 5.3 mmol/L, and anion gap 27. Serum glucose 165 mg/dL, urine and serum toxicology screens were negative except serum ethanol 958 mg/dL and serum phenobarbital 14.9 mg/L. Patient had recurrent hypotension (BP 65/48 mmHg) and persistent acidosis (blood pH 7.04). Hemodialysis was initiated approximately 5 hours after presentation for duration of 4 hours at blood flow (QB) 80 mL/min. Serum alcohol was 70 mg/dL immediately post-dialysis. The patient's hemodynamics stabilized, anion gap resolved, and she had increased responsiveness and began to open eyes spontaneously. Child protective services and law enforcement were involved from the time of admission.

Case Discussion: There is limited data describing the use of hemodialysis in pediatric alcohol poisoning. This child was critically ill with a potentially lethal serum ethanol of 958 mg/dL who responded well to hemodialysis.

Conclusion: Hemodialysis, along with aggressive supportive care, was an effective treatment for life-threatening alcohol intoxication in a child.

Keywords: Pediatric, Ethanol, Ingestion

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255. Clinical Effects and Outcomes Following Lorcaserin Ingestion

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Background: Lorcaserin (Belviq®) is a serotonin-2C receptor agonist approved in June 2012 for weight management in obese and overweight patients. Prescribing information contains warnings for serotonin syndrome and valvular heart disease. Adverse effects reported in the product insert include: headache, dizziness, fatigue, nausea, dry mouth, and constipation, and hypoglycemia in diabetic patients. There have been no previous studies published documenting lorcaserin toxicity. The objective of this study is to determine if patients exposed to lorcaserin, as reported to NPDS, develop clinical signs of serotonin excess.

Methods: This retrospective study utilized data from the National Poison Data System (NPDS) that has been compiled from calls to U.S. poison centers. Inclusion criteria: exposure to lorcaserin, date: 06/01/12–12/31/14 and single ingestion only. The information requested was the following: age, gender, date, outcome, route, clinical effects, reason, substance, and therapy. IRB approval of the study was obtained.

Results: 44 patients met the inclusion criteria. There were 11 males and 33 females with a median age of 25.5 years (range 10 months to 63 years). Of the 44 patients in the study 30 (68.2%) were unintentional exposures. No deaths or major effects were reported. 8 of the patients (18.2%) had no or unrelated effect, 13 (29.5%) had minor effects, 5 (11.4%) had moderate effects and 18 patients were not followed. 8 patients (18.2%) reported dizziness/vertigo, 8 patients (18.2%) reported headache, and 7 patients (15.9%) reported nausea. Other effects reported included agitation/irritability, ataxia, confusion, diaphoresis, diarrhea, drowsiness/lethargy, muscle rigidity, muscle weakness, mydriasis, numbness, pruritus, slurred speech, tachycardia, tremor and vomiting. Therapies provided included: dilution (10), food (8) and IV fluids (7).

Conclusions: This is the first study examining lorcaserin toxicity. No patient in this study developed life threatening clinical effects and no patient died. Many of the effects reported, including agitation/irritability, diaphoresis, drowsiness/lethargy, muscle rigidity, and tachycardia may be attributed to serotonergic excess. Low numbers, its retrospective nature and reliance on caller information limit the study. Additional study is needed to better define the clinical effects, the dose of lorcaserin required to elicit those effects and other drugs co-ingested leading to the potential development of serotonin syndrome.

Keywords: Serotonin syndrome, Poison center, Adverse drug event

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256. Severe Glycine Infusion Syndrome Successfully Treated Without Hemodialysis

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Background: Glycine infusion syndrome is a well-described complication of gynecologic and urologic surgery that typically occurs intra-operatively after excessive absorption of irrigation fluid by exposed vessels. To our knowledge, we report the first case in which this fluid was administered intravenously in error. Despite severe electrolyte abnormalities accompanied by neurologic symptoms, this patient was treated conservatively without hemodialysis and made a complete recovery.

Case Report: A 32-year-old female presented with severe mental status depression after an elective hysteroscopy, during which she experienced difficult ventilation and acute pulmonary edema. The operative team noted that six liters of 1.5% glycine irrigation fluid had been administered intravenously in error. She developed hypotension, bradycardia, hypothermia and stopped making purposeful movements. Laboratory evaluation revealed an undetectable sodium (< 100 mEq/L), hypocalcemia, hypomagnesemia, hypoosmolality, lactate 2.95 mmol/L, and ammonia 592 ug/dL. Neuroimaging revealed diffuse cerebral edema with concern for impending herniation. The patient was treated with free water restriction, loop diuretics and desmopressin. She did not undergo hemodialysis. She improved neurologically and made a complete recovery. Neuroimaging on hospital day 3 revealed no evidence of central pontine myelinosis with complete resolution of cerebral edema. One month follow-up revealed no neurologic sequelae from this incident.

Case Discussion Glycine infusion syndrome, or TURP syndrome, represents a spectrum of symptoms that accompany hyponatremia, hypoosmolality, and neurologic compromise following absorption of nonconductive intraoperative irrigation fluid. The use of hemodialysis has been recommended in the past to correct electrolyte imbalances and osmotic derangements in patients with significant neurologic symptoms or laboratory abnormalities. This practice, however, is based on a few case reports and studies are lacking. In this patient, severe electrolyte abnormalities, hyperammonemia, hypotension, bradycardia, and cerebral edema developed after glycine solution was administered intravenously in error during an elective hysteroscopy. She was treated conservatively without hemodialysis and made a complete neurologic recovery.
Conclusions: We report the first case of glycine infusion syndrome due to inadvertent intravenous administration of nonconductive irrigation solution. Metabolic derangements and resultant neurologic sequelae that occur in glycine infusion syndrome may resolve without the use of hemodialysis.
Keywords: Neurotoxicity, Adverse drug event, Shock
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257. Are Intentional Suicidal Overdoses Temporally Associated with Season of the Year?

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Background: Suicide, a major public health problem, is the 10th leading cause of death for all Americans. Controversy exists as to whether suicide attempts are temporally related to the seasons or time of year. We performed a retrospective analysis of Poison Control Center (PCC) data from a single center. The study objective was to gain additional insight into the epidemiology of self-poisoning as it relates to intentional suicidal overdoses.
Methods: Cases of intentional attempted suicide among adults greater than or equal to 18 years-old that were reported between 2009 and 2013 were extracted from the PCC database. Logistic regression was used to assess differences in patient characteristics for suspected suicide calls compared to all other types of exposure calls. Poisson time-series regression model was used to assess the relation of suspected suicide calls to season and to month among all cases adjusting for other temporal trends such as year, day of week, holidays and accommodating over-dispersion.
Result: There were significantly more women than men among suspected suicide calls (OR = 1.2, CI: 1.16, 1.25) compared to other types of calls. There were more suspected suicide calls among the younger age group (18-24 year olds) compared to older ages (65 year-olds and above) (OR = 5.36, CI 4.95, 5.81) and suicide calls were more likely to have severe outcomes (OR = 3.84, CI: 3.56, 4.15) for Death/Major Effect vs. None/Not followed or unable to follow). In Poisson regression models, more suicide calls were received in summer (relative rate = 1.11, CI: 1.05, 1.16) and spring (relative rate = 1.07, CI: 1.02, 1.12) compared to winter. When examining a model that controls for the same variables, but includes month rather than season, suspected suicide calls were more likely to occur in spring and summer months compared to December, with the highest relative rate occurring in June (relative rate = 1.15, 1.07, 1.24). There was no significant increase in suicide calls on holidays in either model.
Conclusions: Overall, intentional suicidal overdoses reported to the PCC appear to be associated with season of the year. Further research is required determine reasons for the association and possible exacerbating factors.
Keywords: Public health, Poison center, Overdose
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258. Lead toxicity: A systematic review of recently published cases

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Background: Presentations of lead toxicity are becoming rare in many modern healthcare systems. The diagnosis of lead toxicity can be overlooked. A higher index of suspicion may aid in the identification of cases of lead toxicity leading to appropriate management.
Objectives: To identify all recently published lead toxicity cases and to summarize key clinical symptoms, signs, investigations, and management to aid primary care practitioners in diagnosing and managing lead toxicity.
Methods: A search of Ovid (MEDLINE), EMBASE, Scopus, TOXLINE, and CDC publications was performed for English language cases and case series from 2004 to December 2014 for the terms lead poisoning, lead, adverse effects, toxicity, diagnosis, clinical, nervous system, Burton's lines, and lead colic. Cases outside of North America, Europe, Australia, and New Zealand were excluded. Published reports of routine screening and in utero lead exposure were also excluded. Relevant data was extacted by two investigators (HA, ML) and adjudicated by a third investigator (RC).
Results: Among 1287 articles identified, 129 cases of lead toxicity were included in the study. Patients were largely male (57%, 8.5% unreported) with an average age of 34.5 years (range 0.5 to 84 years) with 83% of patients aged 18 or over. Mean lead levels were 105.1 mcg/dL. Mean time from first exposure to presentation was 5 years 11 months with 19.3% of cases presenting within 3 months of initial exposure (acute exposure). The most common presenting symptoms were abdominal pain or discomfort (58%) and other gastrointestinal symptoms (53%) including nausea, vomiting, and constipation. The most common exposures were bullets/gun shot wounds (20%), Ayurvedic medications (19%), contaminated substances of abuse (13.1%), and paint chips (11.6%). Common lab abnormalities included anemia (62.8%) and basophilic stippling (47.3%). Among cases with lead levels above 70 mcg/dL, 13 of 13 cases (100%) with acute exposure presented with abdominal pain whereas 23 of 38 cases (60.5%) with longer exposure times presented with abdominal pain. Among cases with lead levels above 50 mcg/dL, 13 of 15 acute exposure cases (86.7%) underwent chelation therapy and 30 out of 42 chronic exposure cases (71.4%) underwent chelation therapy.
Conclusions: From this review of recently published cases, lead toxicity should be considered in patients presenting with abdominal

symptoms, anemia and basophilic stippling. A detailed exposure history may elicit important information including previous gun shot wounds or Ayurvedic medication use. Earlier recognition of lead toxicity would prompt further management including exposure removal and possibly chelation.
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259. Toxicity from Intraperitoneal Injection of Digoxin

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Background: Digoxin is a purified cardiac glycoside similar to digitoxin extracted from the foxglove plant, Digitalis lanata. Digoxin is widely used in the treatment of various heart conditions, namely atrial fibrillation, atrial flutter and sometimes heart failure that cannot be controlled by other medication. Digoxin can also be used off label by intra-amniotic injection to induce fetal demise in late term abortion.
Case Report: A healthy 26 year-old, 21 week pregnant female was injected "in the stomach" with 1 mg of digoxin. Approximately 2 hours later patient presented in the ED with c/o burning pain, abdominal cramps and lightheadedness. Patient was tachycardic with a pulse of 140. EKG showed sinus tach. Initial digoxin level 2 hours post injection was 8.1mg/dL, potassium was 3.4 mEq/l. Digibind was recommended but not administered. Repeat digoxin level at 7 hours post injection was 2.5 mg/dL. Symptoms resolved, and she was discharged after 24 hours without identifiable residua. Fetal outcome is unknown.
Case Discussion: In 2011, most abortions (91.4%) were performed at ≤ 13 weeks' gestation; a smaller number of abortions (7.3%) were performed at 14–20 weeks' gestation, and even fewer (1.4%) were performed at ≥ 21 weeks' gestation. Abortion with the use of digoxin injection was pioneered by late-term abortionist George R. Tiller and is now widely used throughout the United States. It has replaced the live partial birth abortion method since the Partial Birth Abortion Ban act was upheld by the U.S. Supreme Court in April, 2007. Tiller describes this particular abortion method as the MOLD Technique, which is an acronym for the four products employed in the abortion process: misoprostol, oxytocin, laminaria, and digoxin. The average serum digoxin level as a result this method is 0.73 ± 0.2 mg/dL (range 0.2–1.2 mg/dL). Since our patient's initial digoxin level was 8, it is likely that patient received medication intraperitoneal vs. intrauterine.
Conclusions: This is the first report of significant digoxin toxicity resulting immediately after intraperitoneal injection. The incidence of this type of exposure is unknown at this time.
Keywords: Cardiac glycoside, Digoxin, Abortion
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260. Characterization of Chronic Pain in College Students as Reported to an Online Survey

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Background: Chronic pain is widespread and poorly understood making it a significant public health concern. The 2010 National Health Interview Survey (NHIS) reported that 19% of adults in the United States are affected by chronic pain and is least frequent in those aged 18 to 29 (7.6%). Chronic pain and characteristics among college students with and without chronic pain are reported.
Methods: The Researched Abuse, Diversion and Addiction-Related Surveillance (RADARS®) System College Survey Program collects data from 6,000 respondents annually during the spring, summer and fall semesters/quarters. This online survey inquires about prescription drug non-medical use (NMU), associated behaviors and lifetime chronic pain (lasting at least three months that either occurs constantly or flares up frequently). NMU was defined as use without a doctor's prescription or for any reason other than recommended by a doctor during the last three months. Gender, age, Drug Abuse Screening Test (DAST-10) scores and NMU of opioids were analyzed. DAST-10 scores, scored from 0 (no problems) to 10 (severe problems), indicate degree of consequences related to drug abuse. Respondents reporting chronic pain were asked three additional questions about their chronic pain: healthcare provider visit, prescription for an opioid and prescription for a long acting opioid. Frequencies, standard deviation (SD) and inter-quartile range (IQR) from 2014 are reported.
Results: Of 5,306 eligible respondents, 1,671 (31.5%) reported chronic pain. In both groups, more respondents were female; 848 (50.8%) with chronic pain and 1,906 (52.4%) without. Mean (SD) age was higher in those with chronic pain [26.4 (5.8)] compared to those without [24.9 (5.6)]. Median (IQR) DAST-10 scores were similar in those with and without chronic pain, 1 (1, 3) and 1 (1, 2), respectively. NMU of opioids was more common in those reporting chronic pain (42.7%) than in those without (18.7%); hydrocodone and oxycodone were the most commonly reported opioids in both groups. Of respondents reporting chronic pain, 1,225 (73.3%) visited a healthcare provider for chronic pain, and 819 (66.9%) of those received an opioid prescription. Of those that received an opioid prescription, 645 (78.7%) received a long-acting opioid.
Conclusion: Chronic pain appears more common than reported by NHIS for this age group. The majority of respondents visiting a healthcare provider received a prescription for an opioid and a surprisingly high number of these respondents received a long acting opioid. Further research is needed to understand the types of chronic pain and risks and benefits associated with treatment in this population, specifically with long acting opioids.
Keywords: chronic pain, college students, online survey
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261. Esophageal Rupture Following Ghost Pepper Ingestion

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Background: The ghost pepper, or 'bhut jolokia' grown in the northeast region in India, is one of the hottest chili peppers in the world. Ghost peppers have a measured 'heat' of greater than 1,000,000 Scoville Heat Units (SHU), more than twice the strength of a habanero pepper. The capsaicinoids found in ghost peppers

have been investigated for their antioxidant and anti-inflammatory properties. To our knowledge, no significant side effects of ghost pepper ingestion have been reported.

Case Report: A 47-year-old male presened to the Emergency Department (ED) with severe abdominal and chest pain following violent retching and vomiting after eating ghost peppers as part of a contest. Just prior to arrival in the ED, the patient ate a hamburger with ghost pepper chilis and immediately began vomiting. In the ED, the patient was given a liquid antacid and lidocaine by mouth without relief, followed by nasogastric (NG) tube placement with lavage, again without relief. A subsequent chest x-ray showed evidence of a left sided pleural effusion and patchy infiltrates. A Computed Tomography (CT) of the abdomen and pelvis showed pneumomediastinum with air around the distal esophagus suggestive of an esophageal perforation and a left-sided pneumothorax.

The patient was intubated and taken immediately to the operating room for treatment of an esophageal tear. In the operating room, the patient was noted to have a 2.5 cm tear in the distal esophagus, with a mediastinal fluid collection including food debris, as well as a left sided pneumothorax. A gastric tube and two left sided chest tubes were placed. Following surgical repair, the patient was treated with broad-spectrum antibiotics and admitted to the intensive care unit (ICU). The patient's hospital course was complicated by transient hypotension immediately following surgery, and a right-sided pleural effusion for which an additional chest tube was placed, draining 1.5 L of serosanguinous fluid. He remained intubated until hospital day 14 at which time the patient was extubated, with persistent delirium. The patient began tolerating liquids on hospital day 17.

Case Discussion: A rare occurrence, Boerhaave syndrome (or esophageal rupture) is the result of non-iatrogenic, non-traumatic injury such as forceful vomiting, as described in this case. Spicy chili peppers, such as ghost peppers may result in severe mucosal irritation and vomiting. Esophageal rupture should be considered in patients with severe chest and/or abdominal pain following spicy chili pepper ingestions and subsequent retching.

Conclusion: We report a case of esophageal rupture as the result of forceful vomiting following ghost pepper ingestion.

Keywords: Ingestion, Caustic, Poison center

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262. A Lead-Intoxicated Patient with End Stage Renal Disease treated with Ca EDTA and High-flux Hemodialysis

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Background: Chelation treatment of lead intoxication in patients with pre-existing renal failure has rarely been reported in the literature. We report the use of intravenous (IV) Calcium Disodium EDTA (Ca EDTA) in the treatment of a patient on chronic hemodialysis who presented with a blood lead level of 100 µg/dL.

Case Report: A 52-year-old Hispanic male, dialysis-dependent for the previous 3 years due to uncontrolled type II diabetes, complained of hair loss and mild abdominal pain of 3-month duration. A suspicion of lead intoxication was raised by his report of ingesting supplements purchased in Mexico, and a habit of eating small pieces of Mexican ceramics. A blood lead level (BLL) was 99 µg/dL (reference range < 5 µg/dL) with a hemoglobin level of 15 g/dL. The patient was instructed to be seen in the Emergency Department (ED) where a repeat, confirmatory lead level was 100 µg/dL. The patient had an unremarkable physical exam in the ED, and a Computed Tomography scan of his abdomen revealed no radio-opaque material in the gastrointestinal tract. The patient was admitted to the hospital for chelation therapy. He received one gram of Ca EDTA in 250 cc normal saline IV over one hour followed immediately by 4 hours of hemodialysis using the F160 high flux dialysis membrane. Over a seven-day course, with 4 rounds of chelation followed by high-flux hemodialysis, the patient's BLL decreased to 33 µg/dL, he noted an improvement in his abdominal pain and the patient was discharged home.

Case Discussion: The change in BLL from 100 µg/dL to 33 µg/dL within one week is indicative of an accelerated chelation-induced decline that would not be anticipated in a chronic renal failure patient in the absence of chelation. Administration of Ca EDTA followed by immediate high flux hemodialysis requires hospitalization, as standard outpatient dialysis units may not be equipped to administer non-routine medications. Evidence from other reports suggest that the oral chelator succimer may require in vivo conversion to mono and di-cysteine adducts in the renal tubules in order to chelate lead, a process that may be diminished in a renal failure patient. Therefore, intravenous Ca EDTA is the chelator of choice in end stage renal disease patients with extremely high BLLs. High flux hemodialysis permits extracorporeal clearance of the EDTA –lead chelate.

Conclusion: The use of Ca EDTA combined with immediate high flux hemodialysis is effective in accelerating the decline of a high blood lead level in a patient with end stage renal disease.

Keywords: Chelation, Lead, Heavy metals

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263. No Cat and Mouse Game for this Tomcat

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Background: Humans have been using rodenticides for centuries to keep rodents at bay. Rodenticide safety has come a long way -since the days when they contained toxicants such as arsenic,thallium, strychnine or red squill. In the 1940's anticoagulant rodenticides were introduced and were subsequently replaced by the more effective super long acting anticoagulants. Recently, a potential ban is being considered for anticoagulant rodenticides due to its toxicity. The majority of rodenticide human exposures are from the anticoagulant rodenticides. Therefore, a movement has occurred toward non-anticoagulant rodenticides such as bromethalin. Bromethalin is a lipid soluble, nonselective mammalian neurotoxicant. The mechanism of toxicity involves inhibition of brain oxidative phosphorylation, followed by cerebral edema, increased intracranial pressure and resulting paralysis. Toxicity from bromethalin in animals is well documented, but minimal toxicity and kinetics data exists for human exposures.

Case Report: A 33 year old female presented to the emergency department via squad one hour post ingestion of two bricks of TomCat Mouse Killer in a suicide attempt. The package of TomCat Mouse Killer was brought to the ED and it was identified to contain the active ingredient: bromethalin (CAS# 63333-35-7) 0.01% and denatonium benzoate 99.99%. The patient had complaints of gastro-intestinal upset and one bout of emesis.
Case Discussion: Due to the high mortality rate from single ingestions of bromethalin in animals, treatment was aggressive. She was sedated, intubated, given activated charcoal, lavaged, started on whole bowel irrigation and given a dose of intralipids She was admitted to the intensive care unit with plans to monitor her intracranial pressure. The patient continued to have multiple bouts of emesis, and a continuous suction nasotracheal tube was placed. She developed significant lab abnormalities and needed replacement of dextrose, potassium, phosphorus, and magnesium. She never showed any abnormalities on her electroencephalogram or with her cardiac status. At twenty four hours post ingestion she was showing improvement in her lab values and mental status. By forty eight hours post ingestion she appeared to be recovered with no apparent sequelae and was discharged to a psychiatric facility.
Conclusion: It is important to note that bromethalin is considered a single lethal dose rodenticide. Minimal toxicity data is available in human case reports. Prior to a ban on the anticoagulant rodenticides and replacement with agents such as bromethalin, further evaluation should be considered for safer alternatives.
Keywords: bromethalin, Rodenticide, Lipid therapy
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264. Cobalt Toxicity from Hip Arthroplasty with Visual/Hearing/Neuropathy Improvement within Days Post Revision

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Background: Systemic cobalt toxicity from hip arthroplasty has been rarely described. We describe a patient with severe, disabling cobalt neurotoxicity associated with a metal on polyethylene dual mobility revision hip arthroplasty following a fractured ceramic acetabular liner with marked neurological improvement post revision.
Case Report: A 60 year old male presented to the Medical Toxicology clinic 11 months following a revised right hip cobalt-chromium alloy-on-polyethylene arthroplasty (Trident x3 bearing-Stryker Corp). The initial arthroplasty was performed for osteoarthritis and a revision was performed due to a fractured alumina ceramic acetabular liner. His symptoms included hypothyroidism (started 2 months post-op); extremity numbness (6-7 months post-op requiring a wheelchair for ambulation) decreased hearing (7 months post-op) and decreased binocular vision (8 months post-op). Physical exam revealed profound vision loss (20/800 bilaterally) due to optic neuropathy, along with inability to walk. Laboratory examination was remarkable for serum chromium (Cr) level of 54 ng/ml, serum cobalt (Co) 1096.5 ng/ml, urine Co of $>$ 1600 mcg/L, serum (Ti) of 224 ng/ml, red blood cell chromium of 13 mcg/L. Hair Cr and Ti were non-detectable while hair Co was 8 mcg/g (normal range $<$ 2 mcg/g). Hemoglobin and hematocrit were elevated at 17.5 g/dl and 55.4%, respectively. The Erythrocyte Sedimentation Rate (ESR) was 1 mm/hr. Upon revision, the color and consistency of crankcase oil was noted in the synovial fluid with ceramic debris embedded in the polyethylene on both bearing surfaces of the dual mobility component. His vision and neuropathy improved significantly within 2 days post-op. Three weeks post-op, his serum Cr, Co and Ti levels were 42.7, 346 and 200 ng/ml, respectively and at six weeks post-op, his serum Cr, Co and Ti levels were 19.5, 98.8 and 164.0 ng/ml, respectively. Two months post-op, vision and extremity numbness had improved although patient still required hearing aids. He no longer required a wheelchair. The patient never received any chelation therapy.
Case Discussion: This individual demonstrated clinical signs of Co neurotoxicity (including visual/hearing/neuropathy) along with polycythemia and hypothyroidism. Improvement of neurotoxicity can occur very soon post revision. Furthermore, hair metal testing and ESR are not indicative of the magnitude of exposure or toxicity.
Conclusion: Unlike most metal induced neurotoxicity, improvement of Co neurotoxicity can be seen within days of removal of source and without chelation.
Keywords: Cobalt, Arthroplasty, Neurotoxicity
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Do you or any member of your immediate family have a relevant financial interest or other relationship with the manufacturer(s) of any of the products or providers(s) of any of the services you intend to discuss?

	Commercial Interest	What Was Received	For What Role?
DePuy Orthpaedics	Stipend	Stipend	

265. Severe Esophageal Stricture in an Infant after Ingestion of a Callus Remover Product

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Background: Potassium hydroxide (KOH) ingestion can cause esophageal injury potentially resulting in stricture formation. This case describes the development of a severe esophageal stricture after ingestion of a widely available beauty product.
Case Report: An 11 mo-old boy presented to an ED after possible ingestion of a callus remover Gena® Callus Off™. He was found playing with a small bottle without a child-resistant lid. The parents estimated the bottle was in his mouth for 5-10 sec resulting in an unknown amount of liquid possibly being ingested. He presented for evaluation within 1 hr of ingestion with no symptoms. His exam was normal with the exception of a white plaque noted at the base of the tongue. The child was able to tolerate oral liquids and was observed for 1 hr in the ED prior to discharge home. The product ingredients listed in order are: water, potassium hydroxide,

glycerin, propylene glycol, and acrylates. The specific quantity or concentration of the ingredients is absent on the label and unavailable from the manufacturer. 18 days later, the child presented to our ED with several days of gagging and vomiting with solid foods and 24 hrs intolerance to liquids. There was no history of respiratory symptoms, fever, or weight loss and the physical exam and vital signs were normal. BMP and CBC were normal. An esophagram revealed no retained metallic foreign body and a severe esophageal stricture extending from the carina to the gastroesophageal junction. He was admitted and underwent gastrostomy tube placement for enteral access. He has subsequently undergone multiple esophageal dilatations over 4 mos with limited success. His course was also complicated by a gastric and esophageal perforation requiring abdominal exploration with gastric repair and endoscopic covered esophageal stent placement.

Case Discussion: This child swallowed an unknown quantity of a widely available callus remover containing KOH not in a child-resistant container. His initial well appearance was deceptive and endoscopy was not performed. He subsequently developed an extensive stricture of nearly the entire length of the esophagus. Despite several interventions, he remains dependent on gastrostomy tube feedings, and will continue to require serial dilatations and possibly esophageal replacement.

Conclusions: Patients, especially when nonverbal, ingesting products containing any amount of KOH should be evaluated thoroughly, including endoscopy, despite their clinical appearance. The potential for severe esophageal injury is high. Commercial callus and wart remover products should be required to have child-resistant closures and list the percentage of KOH and other caustics on their product label.

Keywords: Pediatric, Caustic, Ingestion

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266. Not Just In the Wilderness: An Unusual Case of a Puff Adder Bite to the Neck

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Background: The puff adder (Bitis arietans) is a venomous viper species found throughout sub-Saharan Africa. Largely due to its widespread distribution in highly populated regions and the potency of its cytotoxic venom, B.arietans is responsible for the most snakebite fatalities in Africa. Puff adder envenomations outside of Africa are rare. We present the unusual case of a puff adder envenomation to the submandibular region in a North American female. Our goal is to increase awareness and illustrate a rapid treatment approach performed in an urban facility where snake envenomations are uncommon. To our knowledge, there are no other reported cases in the English literature of puff adder envenomations to the face or neck region.

Case Report: A 50 year old female presented to our Emergency Department after being bitten in the left submandibular region by a South African puff adder that was kept as an illegal pet. Upon arrival, the patient was intubated for airway protection due to significant swelling of her neck and face. The Poison Control Center arranged expedited delivery of SAIMR Polyvalent antivenom from the Philadelphia Zoo by way of a Philadelphia Police escort, and therapy was initiated within two hours of patient arrival. We followed a modified version of a protocol published by the University of California San Diego. We added 10 vials (10 mL each) to 500 mL of lactated ringers and infused intravenously over 150 minutes. Due to concern for worsening edema, our patient received a second dose at 12 hours after arrival. Over the first 48 hours, the patient's platelets trended down from 118K to 82K, along with hemoglobin from 13.4 g/dL to 9.5 g/dL without evidence of hemolysis. PT/PTT remained unchanged. Hematologic parameters then returned to baseline. The patient had a prolonged course of mechanical ventilation secondary to developing pneumonia. The patient was extubated on hospital day 16 and discharged 19 days after the envenomation.

Case Discussion: Pit viper envenomations are most often associated with local tissue cytotoxicity and coagulopathies secondary to hemotoxic effects. Large exposures can result in shock and cardiovascular collapse. Immediate management should ensure airway patency and cardiopulmonary support. Establishing type and degree of envenomation aids in directing antivenin therapy. Our patient received antivenin in a truly expeditious fashion due to streamlined communication and rapid utilization of poison control and law enforcement resources.

Conclusions: Given the growth of the exotic pet industry in recent years, emergency care providers should be familiar with the management strategies and possible complications of exotic pit viper envenomations.

Keywords: Snake bite, Antidote, Venom

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267. Acute Pneumonitis Associated with Nickel Carbonyl Exposure in the Workplace

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Background: Nickel carbonyl (NiC), a volatile liquid at room temperature, is used in smelting. We describe the clinical course of 3 patients occupationally exposed to NiC.

Case Series: Three patients suspected they were exposed to NiC vapor at work after they recognized its odor. All patients worked 40 hours/week as equipment technicians. Urine nickel concentrations are collected 4 times/year. Alarms to detect air NiC concentrations were not functioning at the time of exposure. Patient A was 50 years; patient B was 29 years; patient C was 16 years old. Patient A had previously experienced NiC toxicity with dry cough only. Patient A worked at this company for 4 years. He presented with complaints of nausea, myalgia, and cough. Initial urine nickel concentrations were: A: 692 ug/L, B: 558.5 ug/L, C: 839 ug/L. Patient A had infiltrates on the initial CXR and O2 saturation of 97% on room air. Patient C reported respiratory symptoms with normal CXR. Patient B had no symptoms and normal CXR. All 3 patients started disulfiram 1 g PO, 500 mg 6 hours after the first dose, then 250 mg twice daily for 5 days. Patients A and C both received prednisone 60 mg PO for 5 days. Patient C had no worsening symptoms. Patient A presented 48 hours after the initiation of treatment with persistent coughing, fatigue with exertion, muscle

aches, and rales on lung exam. His O2 saturation decreased to 85% despite 2 days of oral steroids, and he was admitted to a hospital. He had no history of lung disease or smoking. Vital signs: BP 150/85 mmHg, HR 85 bpm, T 36.8 C, RR 20 bpm, O2 91% on 4 L nasal O2. Serum nickel was 28 ug/L (Reference range < 10ug/L). On day 4, his WBC was 17.4 and HCT was 47.6. CXR showed bilateral patchy opacities that were unchanged 3 days later. He received prednisone 60 mg/day PO, 4 L nasal O2, and disulfiram 500 mg twice daily. His pulmonary function was: FEV1 < 59% of predicted; FVC 69% of predicted; FEV1/FVC 84% of predicted, consistent with a restrictive pattern. He was discharged on day 7-post exposure on disulfiram and prednisone. Complete resolution of symptoms occurred 30 days post exposure. Patient B never developed pulmonary symptoms. Patients A and B had elevated transaminases with a peak of A: AST: 41 U/L, ALT: 84 U/L and B: AST: 132 U/L, ALT 303 U/L on disulfiram.

Case Discussion: NiC is a severe respiratory irritant. With comparable initial spot urine nickel concentrations, these 3 patients had markedly different clinical courses. Disulfiram was used off-label in all 3 patients and was based on anecdotal case reports and animal studies.

Conclusions: Inhalation exposure to NiC resulted in acute pneumonitis in 1 of 3 patients. Exposure can cause variable and progressively worsening respiratory manifestations.

Keywords: Disulfiram, Nickel Carbonyl, Pneumonitis

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268. Pediatric Exposures to Veterinary Pharmaceuticals (1999–2013)

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Background: Pet ownership is common in the US, with more than 50% of households owning pets. One minimally studied risk is the inadvertent exposure of children to veterinary pharmaceuticals. The goal of this project is to describe the epidemiology of veterinary pharmaceutical-related exposures to children ≤ 19 years of age based on calls to a regional poison control center.

Methods: A retrospective study of pediatric exposures to veterinary pharmaceuticals managed by a poison center (PCC) from January 1, 1999 through December 31, 2013 was conducted. Using select veterinary and animal key words all case narratives were searched. Narratives of selected cases were reviewed and those containing human exposure to veterinary pharmaceuticals were included and coded for exposure-related circumstance and intend species for pharmaceutical product. Descriptive statistics for the aforementioned variables were generated.

Results: Of the 527,441 cases generated from a key word search, a total of 2954 met inclusion criteria Approximately one-half (49%; 1446) of the cases involved children ≤ 19 years of age, with 43% of all cases involving children ≤ 5 years of age. Exploratory behavior was the most common (61%) exposure-related circumstance. Substances most commonly associated with exposures to pet medications were the following: veterinary drugs without human equivalent (17%), antimicrobials (14%), anti-parasitics (14%), analgesics (11%), hormones (9%), and anticonvulsants (5%). The most common route of exposure was ingestion (93%). The majority of exposures (90%) were expected to result in no long-term or lasting health effects and were managed on site (94%). A total of 86 cases were referred to a health care facility and 7 cases resulted in a moderate or major health effect.

Conclusions: Children are most at risk for veterinary pharmaceutical related exposures. Although most cases were not associated with a serious health effect, the potential for significant health risks, as well as financial and emotional burden, exists. Attention to veterinary pharmaceutical product storage practices may reduce these risks. Avoiding storing human and animal pharmaceuticals in the same location could reduce confusion and misidentification. Dispensing veterinary pharmaceuticals in child-resistant containers with detailed medicating instruction could also help to reduce these exposures.

Keywords: veterinary pharmaceuticals, Pediatrics, Poison Center

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269. Hypercalcemia in a Child from Unintentional Vitamin D Supplement Overdose

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Background: Hypercalcemia is associated with hyperparathyroidism, malignancy, tuberculosis, sarcoidosis, medications, and excess intake of dietary supplements. Supplements are readily available and many children receive them resulting in potential for unintentional overdose.

Case Report: A 6 yr-old male presented to the ED with abdominal pain, fever, and intractable vomiting for 2 weeks. He was recently diagnosed with a viral syndrome and otitis media but could not take the antibiotic due to vomiting. He was intermittently taking ondansetron but no other medications. He had lethargy, a 5-10 lb weight loss, and worsening weakness. Initial laboratories showed elevated serum Ca 21.1 mg/dL (8.8-10.1), PTH < 5 pg/mL (22-94), BUN 27 mg/dL (7-18), and a KUB consistent with constipation. Physical exam revealed normal vital signs, dry mucous membranes, and minimal tympanic membrane erythema only. Additional lab studies on admission showed Vit D, 25-OH > 96 pg/mL (30-80), Vit D 1,25-OH > 200 pg/mL (15-75) and normal CBC, ESR, CRP, Na, K, Mag. EKG showed shortened QTc (362 msec) and sinus bradycardia. Fluid resuscitation was initiated with normal saline (NS) 20 cc/kg boluses and then run at two times maintenance. Upon further questioning, the father revealed he gave the child vitamin (Vit) supplements when he stayed with him on the weekends over a prolonged period of time. He felt Vit D is beneficial to the immune system, and because of the child's recent illness, he had been sprinkling an unknown amount of concentrated Vit D preparation (100,000 units/gm) on his food. Mother also acknowledged giving the child a 400 IU preparation daily. In addition to fluid resuscitation, the child received furosemide (2 mg/kg/day), prednisone (1 mg/kg/day) and pamidronate (0.3 mg/kg). At discharge 5 days later, serum Ca was 12.7 mg/dL and EKG was

normal. Fourteen weeks later, the Ca (10.3 mg/dL) and PTH (21 pg/mL) had almost normalized but Vit D, 25-OH remained high (>96 pg/mL). His weight had increased 2.4 kg.

Case Discussion: Hypercalcemia in this child was caused by an unintentional overdose of Vit D from a supplement. Treatment was with NS diuresis, prednisone to reduce 1,25-dihydrox vit D production and reduce calcium absorption from the GI tract, and low dose pamidronate to reduce serum calcium. Vit D levels remain significantly elevated more than 3 months later. The sibling of this child was also subsequently admitted with hypercalcemia from Vit D supplementation.

Conclusions: Obtaining a thorough history can identify sources of unintentional overdose. Asking about vitamins and supplements should be standard. This case describes the consequences of unintentional overdose of Vit D resulting in significant hypercalcemia.

Keywords: Pediatric, Overdose, Dietary supplement

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270. Adult Exposures to Veterinary Pharmaceuticals (1999–2013)

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Background: With over 50% of the population owning a pet, veterinary pharmaceuticals are commonly found in US households. The extent of the public health impact due to unintentional and intentional exposure to veterinary pharmaceuticals is unknown. The goal of this project is to describe the epidemiology of veterinary pharmaceutical-related exposures to adults ≥ 20 years of age based on calls to a regional poison control center.

Methods: A retrospective study of adult exposures to veterinary pharmaceuticals managed by a poison center (PCC) from January 1, 1999 through December 31, 2013 was conducted. Using select veterinary and animal key words all case narratives were searched. Narratives of selected cases were reviewed and those containing human exposure to veterinary pharmaceuticals were included and coded for exposure-related circumstance and intend species for pharmaceutical product. Descriptive statistics for the aforementioned variables were generated.

Results: Of 527,441 cases generated from a key word search, a total of 2954 met inclusion criteria. Approximately one-half (51%; 1508) of the cases involved adults ≥ 20 years of age. The most common (69%) exposure-related circumstance was associated with misidentification of medication. Substances most commonly associated with exposures to pet medications were the following: analgesics (17%), veterinary drugs without human equivalent (17%), anticonvulsants (13%), hormones (11%), and antimicrobials (11%). The most common route of exposure among adults was ingestion (83%) followed by ocular (5%) and parenteral (5%). The majority of exposures (80%) were expected to result in no long-term or lasting health effects and were managed on site (93%). A total of 24 cases resulted in a moderate or major health effect; most involved analgesics (18%) and anticonvulsants (27%) and were classified as intentional exposure (54%).

Conclusions: In adults, misidentification accounted for the greatest risk of exposure to veterinary pharmaceutical products, which most likely occurred from storing pet products in the same location as human products. Although major and moderate health effects were rare, attention to veterinary pharmaceutical product storage practices may further reduce these important health risks: dispensing pet products in uniquely colored vials and the practice of not storing human and animal pharmaceuticals in the same location to avoid confusion and misidentification. Although infrequent, intentional exposure accounted for over half of all moderate or major health issues, suggesting that additional attention is warranted in this area.

Keywords: Veterinary pharmaceuticals, Poison Center, Adults

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271. Ibogaine Induced Prolonged Qt

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Background: Ibogaine is a psychoactive indole alkaloid found in numerous African plants, most commonly derived from the central African Tabernanthe iboga. Its purported uses include expediting cessation and withdrawal from drug addiction, notably opiates. It has activity on numerous receptors and exerts well-reported cardiac and neurologic effects, specifically QT-segment prolongation, cardiac dysrhythmias, hallucinations, seizures, and CNS depression. Herein we report the case of intentional ibogaine ingestion and ensuing toxidrome.

Case Report: 34 year-old white female with medical history significant for heroin abuse who presents to Emergency Department (ED) with reported seizures after multiple ingestions including ibogaine. One day prior to presentation, patient ingested 2 grams of ibogaine powder, labeled as HCl and "total alkaloid" formulations purchased from an internet supplier (figure 1). The prior day she consumed heroin, cocaine, alcohol, and tobacco. Shortly after ingestion, she experienced hallucinations and was noted by daughter to have 4-5 seizure-like episodes each lasting 2-4 minutes, with no residual confusion after. During the worst spell she became apneic, emergency medical services were contacted, and she was transported to ED.

There she was found to have QT-segment prolongation and was witnessed on monitor to enter self-terminating episodes of torsades de pointes with rigidity and clenching (figure 2). She was admitted to ICU for 3 days with intubation for mental status depression and acute respiratory failure.

Vitals on presentation: temperature 98.2°F, heart rate 76, blood pressure 156/118, respiratory rate 14, blood oxygen saturation 100% on room air.

Pertinent Labs on presentation: Na 139 mmol/L K 3.4 mmol/L Cl 105 mmol/L Bicarbonate 25 mmol/L BUN 20 mg/dL Creatinine 0.68 mg/dL Glucose 131 mg/dL Mg 2.7 mg/dL. Urine drug screen was positive for cannabinoids, cocaine, opiates

She responded to supportive care and magnesium sulfate for her prolonged QTc and torsades. After improvement in mental status and extubation, she transferred to inpatient psych unit for 5 days to monitor persistent confusion. Thereafter she was cleared by Psychiatry for discharge home with outpatient addiction treatment.

At the time of this submission, forensic verification of the suspect sample is pending.

Case Discussion: We report a case of ibogaine ingestion with subsequent toxicity, management, and outcome. We examine the social context, availability, and perceptions of ibogaine, its safety, and its portrayal by online sources.

Conclusion: The clinical course is reported for ingestion of Ibogaine with cardiac and neurologic sequelae with a discussion of the drug's burgeoning availability and social impact.

Keywords: Herbals, Arrhythmia, Plants

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272. Retrospective review of Phenibut exposures reported to Ohio poison control centers

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Background: Phenibut is a γ-aminobuytric acid (GABA) mimetic agent acting primarily at GABA-B receptors. It has been available in Russia as a neuropsychotropic drug for anxiety, insomnia, depression, post-traumatic stress disorder and stuttering. Since its discovery in the 1960s, it purportedly has been used by Russian astronauts in long space missions to treat anxiety. The pharmacologic effects of phenibut have been compared to that of baclofen, the para-chloro derivative of phenibut. In the US phenibut is sold as a dietary supplement in capsule or crystalline form, with claims to support restful sleep, relaxation and to improve mood and stress levels.

Case reports: A retrospective review of phenibut exposures including review of case notes reported to Ohio poison centers for 2013 to 2015 was conducted. Seven cases were identified. Six case involved phenibut overdose and 1 case involved withdrawal. Details of the ingestions are described in the table below:

Discussion: Given its structure and mechanism of action it is interesting that agitation was reported in all 6 exposures. Other notable effects include confusion (n = 5, 83%), hypertension (n = 3, 50%), and muscle stiffening or rigidity (n = 2, 33%) Treatment included benzodiazepines in 4 of the 6 exposure cases. Moderate effect was coded in 4 of the 6 cases.

Conclusion: Phenibut is marketed in the US as a dietary supplement for its calming properties. We describe 6 cases of Phenibut ingestion in which all patients experienced agitation, for which four patients received benzodiazepines. A broader review of phenibut overdose cases is needed to further describe its toxic profile.

Keywords: agitation, phenibut, Herbals

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273. Characteristics of Single-Ingredient Acetaminophen Product Exposures Reported to US Poison Centers

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Background: Acetaminophen is one of the most common medications used to treat fever and pain in the US and is currently available in over 600 different products, including single-ingredient and fixed combination medicines. Though safe when used as directed, hepatotoxicity can occur when maximum daily doses are exceeded. This study focuses on the characteristics and case rate data of adult exposures to single-ingredient acetaminophen products.

Methods: Data from 2007 to 2013 were extracted from the National Poison Data System (NPDS) of the American Association of Poison Control Centers. Case criteria included adult (age > 12 years) human exposures to ≥ 1 oral single-ingredient acetaminophen product. Descriptive statistics were used to illustrate age distribution, exposure reason, and medical outcome associated with the use of these products. Case exposure rates were computed using IRI InfoScan volume sales data (reflecting the number of tablets, gel caps, or liquid equivalents sold) from 2009 to 2013 (sales data not available prior to 2009).

Results: A total of 189,009 adult exposures to ≥ 1 single-ingredient acetaminophen product were detected from 2007 through 2013. Of these cases, 13.1% (n = 24,770) involved exposure to at least one other acetaminophen-containing product. Exposures peaked in 2009 (n = 29,773), then decreased 15.5% to 25,169 in 2013. The majority of exposures involved patients aged 13-19 years (31.8%) or 20-29 years (28.4%). Most common exposure reasons included Intentional-Suspected Suicide (54.9%) and Unintentional-Therapeutic Error (18.0%). In those followed to a known medical outcome (n = 127,933), most reported no effect (33.7%) or a minor effect (31.3%). Over this same period, volume sales of single-ingredient acetaminophen products first decreased from 2009 through 2011, but increased thereafter through 2013. Estimated exposure rates peaked in 2011 at 590.9 cases per 1 million volume sold (95% CI: 583.7, 598.1), then decreased 44.1% to a low of 330.2 cases per 1 million volume sold (95% CI: 326.1, 334.3) in 2013.

Conclusions: Exposures to single-ingredient acetaminophen products reported to US poison centers have steadily decreased since 2009. Case exposure rates have also steadily decreased since 2011, despite fluctuations in sales volumes. Although

Phenibut dose	Co-ingestants	Symptoms	Treatment	Medication history
"10x usual dose"	None reported	Agitation,drowsiness, confusion, hallucinations, elevated creatine kinase and muscle stiffening	Lorazepam, haloperidol	Testosterone, Creatine
Unknown	Quetiapine, Unknown drug	Elevated creatine kinase, hypertension, agitated, diaphoresis, tachycardia, muscle rigidity, confusion, drowsiness	Lorazepam, Precede, Diazepam, Naloxone, oxygen, sodium bicarbonate, intravenous fluids	Unknown
9 grams	Alcohol	Nausea, bloating, anxious, insomnia, agitated	Unknown	None
Unknown	None reported	Agitated, confusion, lethargy, drowsiness	Unknown	Unknown
9.5 grams	Wine	Hypertension, tachycardia, vomiting, agitated, confusion, miosis	Lorazepam, intravenous fluids	Lithium Seroquel, flomax
Unknown	None reported	Hypertension, agitation, confusion, drowsiness, benign cyst on head CT	Unspecified benzodiazepine	None

reported exposures have declined, preventable unintentional therapeutic errors, exposures among young adults aged 13 to 29 years, and simultaneous use of multiple acetaminophen-containing products remain common. Additional interventions targeting the safety of acetaminophen-containing products in this age group may help further reduce unintentional errors with these medications.
Keywords: acetaminophen, exposures, poison centers
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274. Home Observation of Tended-Yard Mushroom Ingestions in Idaho

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Background: Exploratory pediatric mushroom ingestions are typically benign. However, some species may cause systemic toxicity despite minimal early symptoms, and those encountered may vary by region.
Methods: This was a prospective IRB-approved study of pediatric mushroom ingestions in Idaho reported to a regional poison center (RPC). Criteria for home observation were: 1) unintentional ingestion, 2) age <19 years, 3) one mushroom or less from a tended yard or lawn, 4) asymptomatic or no more than one episode of vomiting and/or diarrhea, 5) telephone follow-up possible. Patients were followed at home with phone calls at 6, 24, and 48 hours post-exposure. Parents were instructed to call the RPC for any new or worsening symptoms. Patients with more than self-limited effects (such as persistent vomiting/diarrhea) were referred to a health care facility (HCF).
Results: From 7/8/12 through 2/13/15, 150 patients met entry criteria. 69 (46%) were male and 81 (54%) were female. Age range was 8 months - 17 years, with a mean of 2.77 and a median of 1.96 years. 125 exposures occurred at home. Other sites included friend/relative's home (9), daycare (8), park/public space (5), school (2), unknown (1). Reported symptoms included vomiting (10), diarrhea (9), abdominal discomfort (2), mood disturbance/confusion (2), sore throat (1). 4 patients were evaluated at a HCF and released without specific treatment. 17 patients could only be reached for follow-up at 24 hours, all of whom were asymptomatic at that time. 133 were followed through 48 hours; 131 of these were asymptomatic. 2 had delayed vomiting at 48 hours but both were asymptomatic at 72 hours. Overall 14 patients (9.3%) had self-limited vomiting and/or diarrhea. Symptoms ultimately resolved in all patients followed through 48 hours.
Conclusions: Our findings suggest that unintentional pediatric mushroom ingestions from tended yards in Idaho can be safely managed at home with observation and scheduled telephone follow-up.
Keywords: Mushroom poisoning, Poison center, Home management
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275. Asenapine, Iloperidone and Lurasidone Exposures in Young Children Reported to U.S. Poison Centers

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Background: Asenapine, iloperidone and lurasidone are relatively new atypical antipsychotics. There is limited information on toxicity on pediatric exposures to these drugs. The objective of this study was to compare toxicity associated with asenapine, iloperidone and lurasidone exposures in young children.
Methods: A retrospective study of U.S. National Poison Data System from 2010-2013 of single substance exposures to asenapine, iloperidone or lurasidone in children <6 years of age and followed to known outcome was performed. Data were evaluated for reason, toxicity, management sites and outcomes.
Results: There were 69 asenapine, 52 iloperidone and 29 lurasidone cases that met inclusion criteria. Reason was unintentional general (i.e., exploratory) for all cases, except two therapeutic errors and one intentional misuse. Drowsiness/lethargy occurred most frequently with iloperidone (48.1%) and least often with lurasidone (6.9%). Two iloperidone cases had respiratory depression. For asenapine, iloperidone and lurasidone respectively, management sites were on-site non-health care facility (34.8%, 13.5%, 27.6%), treated/discharged from emergency department (43.5%, 51.9%, 69.0%), admitted to noncritical care (10.1%, 11.5%, 3.4%) and admitted to critical care (10.1%, 23.1%, 0%). For asenapine, iloperidone and lurasidone respectively, coded outcomes were no effect (53.6%, 44.2%, 79.3%), minor effect (40.6%, 34.6%, 20.7%), moderate (5.8%, 19.2%, 0%) and major (0, 1.9%, 0). These findings were significantly different ($p = 0.0010$ for management site; $p = 0.0018$ for medical outcome with moderate/major combined).
Conclusions: These findings suggest that in children under 6 years of age, lurasidone exposures were least serious and iloperidone exposures were most serious based on clinical effects, management sites and coded outcomes. Given the small number of cases, further study is needed to confirm this finding.
Keywords: Antipsychotic, Pediatric, Overdose
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276. High-Dose versus Low-Dose Naloxone for Treatment of Presumed Opioid Intoxication in Pediatric Patients

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Background: Opioid overdose is a public health crisis with increasing prevalence in the pediatric population. Children who present to healthcare with acute opioid toxicity do so because of

unintentional ingestion, overmedication for pain, recreational use, or suicidal intention. Regardless of the cause of the overdose, efficient naloxone administration is important to the treatment of these patients. This study aimed to investigate a single institution's use of naloxone in the reversal of presumed opioid intoxication, specifically analyzing current pediatric dosing practice and delays in delivery.

Methods: This was a retrospective study describing naloxone use at a tertiary pediatric emergency department (PED) from June 2008 through January 2014. The charts of all patients who received naloxone for presumed opioid intoxication were evaluated for inclusion in the study. Data included demographics, chief complaint, dose and timing of naloxone administration, response to naloxone, adverse effects, as well as results of standard urine toxicology screen. During this time period, the electronic ordering system had two pre-populated doses (0.01 mg/kg and 0.02 mg/kg) as well as the option to write-in a dose. For this study, high-dose naloxone (HDN) was defined as the PALS-recommended dose of 0.1 mg/kg (maximum 2mg) and low-dose naloxone (LDN) was defined as any dose less than 0.1 mg/kg. Timing of the naloxone order and administration were abstracted from the medical record. A response to naloxone was defined as any documented improvement in patient's respiratory rate or general mental status.

Results: A total of 50 patients received naloxone in the PED for reversal of presumed opioid toxicity. 30 patients were male (60%). Patients had a bimodal age distribution with peaks at mean ages of 2.8 and 16 years. 28 patients (56%) received HDN and 22 (44%) received LDN (range 0.001 mg/kg – 0.03 mg/kg). There was no difference between the groups with respect to demographics or chief complaint. There was no significant difference in percent response to naloxone between groups: 41% of HDN and 36% of LDN ($p = 0.77$). 38 patients had complete timing administration data for analysis. The mean time from patient arrival to naloxone order was 67 minutes (IQR 65; range 1 minute - 322 minutes). The mean time from naloxone order to administration was 20 minutes (IQR 25), with a range of less than 1 minute to 62 minutes. No significant adverse drug effects were identified.

Conclusions: Despite significant practice variability, there is good response and reversal of toxicity across a wide dose range. The reason for the range in timing administration of naloxone within the PED warrants further evaluation.

Keywords: Naloxone, Pediatric, Opioid

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277. Mistaking Poison Hemlock for Wild Celery Resulted in Rapid Respiratory Arrest

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Background: Poison hemlock (Conium Maculatum) contains several piperidine alkaloids including coniine, γ-coniceine, N-methylconiine... etc. They possess a nicotine-like effect on autonomic receptors and skeletal muscle. After exposure, the toxins produce biphasic nicotinic effects, including salivation, fasciculation, mydriasis and tachycardia followed by bradycardia and muscular paralysis. We report 2 patients who mistakenly ate poison hemlock misidentified as wild celery. One of them rapidly developed respiratory arrest without obvious preceding autonomic stimulation symptoms.

Case Report: A Chinese couple, both 45 years-old, ate "wild celery" picked from a regional park. They felt unwell soon afterward, and were transported to an ED by paramedics. Upon arrival, they complained nausea, dizziness, blurred vision and limb weakness. Vital signs of both patients were stable. Physical examination and laboratory data for both patients were unremarkable. The male patient received a dose of activated charcoal and his symptoms resolved in 8 hours. The female patient developed profound somnolence and respiratory arrest approximately 2 hours after ingestion. She was successfully extubated on the second day, and discharged in 3 days without sequelae. The admission blood specimen of the male patient was sent for liquid chromatography time-of-flight mass spectrometry (AB Sciex Triple TOF 5600), and revealed a positive result for both coniine and γ-coniceine confirming the exposure. A blood sample of the female patient from the second hospital day was also tested, but the result was negative.

Case Discussion: In contrast with previous case reports of poison hemlock exposures, our patients did not present with significant acetylcholine receptor stimulating symptoms. Although the confirmatory test yielded a negative result for the female patient, the clear exposure history and positive laboratory findings on her husband are highly suggestive of poison hemlock exposure in both patients. Absorption, distribution, and elimination of coniine, γ-coniceine and their metabolites are not well studied. It is possible that the female patient's negative result is due to analysis of a later sample and possible short half life of coniine and γ-coniceine.

Conclusions: Poison hemlock is widely distributed, and is easily misidentified as some other edible wild vegetables. Respiratory arrest may rapidly develop without preceding autonomic stimulation symptoms.

Keywords: hemlock, coniine, poisoning

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278. Modeling Poison Control Center Workflow with Health Information Exchange

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Background: A poison control center (PCC) is developing a health information exchange (HIE) process with two emergency departments (EDs) in order to seamlessly and asynchronously interact during poison exposures. The objective of this research is to improve PCC quality and efficiency through simulating this technology integration. For the PCC, a new workflow must be designed and implemented that integrates the new technology and maximizes its utility. We conducted a system dynamics analysis of a PCC's operations in order to understand the underlying factors that drive current workflow and how PCC operations and workload may be effected.

Methods: First, we used multiple methods for collecting data, including relevant literature, five 1:1 interviews with team members knowledgeable about current and proposed processes, and one direct observation session at the PCC. Using that information, we created three system dynamic models that visually depict and

simulate the PCC workflow. The first qualitative model describes current operations and the second qualitative model describes post-HIE integration operations. The quantitative model simulates post-HIE integration operations in terms of case flow through the PCC. We validated model structure during two group sessions.
Results: The first qualitative model of current operations includes 17 factors centered on pathways that relate to time spent by specialists in poison information (SPIs) on the phone. The second qualitative model, describing operations post-HIE integration, includes 19 factors. In this model, many pathways that led to increases in calls from hospitals and outgoing calls from the PCC have transitioned to pathways that lead to increases in SPI time on the computer. Finally, the quantitative model has 20 factors, including two switches labeled "ED to PCC communication" and "PCC to ED communication." During simulation of the HIE-PCC integration, these two entities go from 0 to 1, terminating certain pathways that lead to SPI telephone based cases and opening ones that lead to transitions from phone based cases to computer based cases. Current PCC data were used to generate parameters, including that 15% of calls come from hospitals. Using this value, simulations suggest that workflow is less impacted by the HIE-PCC integration. Variation of this parameter can lead to more drastic changes in the model and lead to a different impact on PCC workflow.
Conclusions: We used system dynamics modeling to gain insight into the underlying aspects of PCC workflow and potential unanticipated consequences of HIE integration. We found that since hospital calls comprise a small number of total PCC cases, that overall PCC workflow may not change substantially.
Keywords: Poison center, Epidemiology, Operations
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279. Mechanisms of Translational Effects of Ethanol on Pulmonary Anti-Microbial Peptides (Cathelicidin/LL-37) and Vitamin D Pathways among Subjects with Alcoholic Use Disorder

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Background: Research has shown that binge and excessive alcohol consumption (>4 drinks /day and 14 drinks/week for men or >3 drinks/day and 7drinks/week for women) have potential adverse health outcomes in the pulmonary system. In the lungs, ethanol has been found to affect alveolar and bronchial cells by interfering with vitamin D metabolism and pulmonary defense mechanism. While association between alcohol and its adverse effects on vitamin D metabolism has been well established in animal model studies, more investigation is needed to understand the effect of ethanol in human pulmonary system. The objective of this study is to investigate the translational mechanism of ethanol's disruptive influence on vitamin D pathway and the downstream inhibition of Cathelicidin, an antimicrobial peptide (LL-37) which protect human pulmonary system.
Methods: We quantified inactive Vitamin D, active vitamin D and LL-37 proteins in the Brochioalveolar Lavage Fluids (BALF) samples of subject with Alcohol Use Disorder using commercial ELISA kits. The BALF samples were obtained from COPARC consortium's databank. We also cultured and used immortalized BEAS-2Bs cells from ATCC resource center. These cells were grown in recommended BEBM media and according to protocols. Following culture and treatment with varying concentration of ethanol, the cells were lysed and the homogenate was prepared for assay. We then quantified the levels of active and inactive vitamin D in the samples using 25(OH) Vitamin D EIA immunodiagnostic-systems (ids) and 1, 25(OH2) Vitamin D EIA immunodiagnostic-systems (ids) respectively. For quantification of LL-37 protein, Human Cathelicidin/LL-37 (Hycult Biotech) was utilized for the assay.
Results: The concentration of 25(OH)D3, were statistically reduced by 70% in the BALF samples and BEAS-2B cells treated with varying concentrations of ethanol and DADS. When compared to 1, 25 (OH)2D3, the concentrations were reduced by 40%. In the same experiment, the levels of LL-37 in the cell samples were statistically reduced ($p < 0.05$) at different doses of ethanol concentrations. With the addition of DADS, the levels of 25(OH)D3 and 1, 25 (OH)2D3, in the samples went up to 78ng/ml/mg more than the concentration of the control samples at 62ng/ml/mg.
Conclusion: Excessive ethanol potentially disrupts the metabolism of vitamin D and downstream activation of LL-37 antimicrobial peptides in the pulmonary system. Though these trends are still being investigated, our preliminary results probably explain the predisposition of AUD subjects to more severe and frequent respiratory infection.
Keywords: Alcohol, Intoxication, Public health
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280. Delayed Toxicity from Unintentional Pediatric Paliperidone Ingestion with Analytical Confirmation

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Background: Paliperidone is an atypical antipsychotic available in an extended release preparation. Delayed toxicity has been reported with intentional ingestions of paliperidone but there are no reports of toxicity from unintentional exposures. We report a case of delayed toxicity from an unintentional pediatric ingestion of paliperidone.
Case Report: A 2 year old boy was found with several 6 mg paliperidone extended release tablets. No ingestion was witnessed and he was initially asymptomatic. Twenty-six hours later family noted him behaving strangely and he was taken to an emergency department. His initial vital signs were pulse of 185 bpm, blood pressure of 108/68 mmHg and a temperature of 37.2 C. Physical exam was notable for disconjugate gaze and nuchal rigidity. Blood counts, basic metabolic panel, CT head and lumbar puncture (LP) were unremarkable. A dystonic reaction was suspected after a pill count revealed a missing paliperidone tablet. His symptoms improved with a total of 15 mg of intravenous diphenhydramine (DPH). He was transferred to a children's hospital and noted to be improved with increased reflexes but no clonus. His heart rate was 114 bpm and QTc 443 ms. He received further doses of DPH (6.25 mg orally and then 5 mg orally q6h). A gas chromatography-mass spectrometry qualitative urine screen identified nicotine, acetaminophen (APAP), DPH, and lidocaine. The lidocaine and APAP were given

during the LP. Paliperidone is not detected on this 310 drug screen but confirmatory tests on samples collected 30 hours from exposure showed serum concentration of 120 ng/mL (normal 4.8-16.5 ng/mL) and urine concentration of > 2000 ng/mL (no normal range). He remained asymptomatic on scheduled DPH and was discharged 36 hours from presentation on DPH 5 mg q6h for 2 days.

Case Discussion: Paliperidone is the active metabolite of risperidone and an antagonist of serotonin-2A and dopamine-2 receptors. It is marketed in an osmotic controlled-release oral delivery system which presents the risk of delayed and prolonged toxicity. There are no prior published reports of unintentional ingestions of paliperidone. The previous reports of intentional paliperidone ingestions resulted in similar delayed toxicity: tachycardia, hypertension and dystonia. There are few paliperidone levels reported in the medical literature. The markedly elevated serum concentration seen in this case is consistent with previously reported intentional ingestions.

Conclusions: This case suggests unintentional pediatric paliperidone ingestions can result in significant and delayed symptoms. Health care providers should be aware of the potential for delayed toxicity when evaluating this population.

Keywords: Antipsychotic, Pediatric, Ingestion

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281. Association between Phthalate Exposure and Eosinophilia

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Background: Previous research has suggested an association between phthalate (PH) exposure and the development of allergies and asthma in both adults and children. Asthma severity has been linked to increased eosinophils in humans. Murine models have demonstrated an increase in eosinophils, and other inflammatory cells, to inhaled phthalates. We seek to determine if urine phthalate concentrations (UPHC) are associated with eosinophilia in humans.

Methods: We analyzed the National Health and Nutritional Examination Survey (NHANES) from 2007-2013 for respondents who had UPHC and peripheral blood eosinophil counts performed. UPHCs were measured for 13 urinary PH metabolites and normalized to urine creatinine. We stratified respondents into two groups, "smokers or respiratory disease," and "non-smokers and no respiratory disease," based on NHANES questionnaire. These groups were further stratified by age with adults ≥ 18 years of age, and children 2- 17 years of age. Regression analysis was performed to assess for an association between eosinophil count and metabolites of high molecular weight PH (HMW-PH), including diethylhexyl phthalates (DEHP), low molecular weight PH (LMW-PH), and individual PH.

Results: 11,627 respondents were smokers or had respiratory disease. Among those respondents there was a significant association between the metabolites mono (carboxyoctyl) phthalate (MCOP), mono-isononyl phthalate (MiNP), the sum of metabolites of HMW-PH, and eosinophil count in children. 16,554 respondents were non-smokers and had no respiratory disease. Among those respondents there was a significant association between the metabolites monobenzyl phthalate (MBzP), mono-isobutyl phthalate (MiBP), and eosinophil count in children (Table 1). Post hoc analysis of respondents who currently smoke (n = 3,073), demonstrated a significant association between eosinophil count and the metabolites mono- 2-ethyl-5-carboxypentyl phthalate (MECPP), mono-n-methyl phthalate (MMP) and mono-(2-ethyl-5-hydroxyhexyl) phthalate (MEHHP), as well as with the sum of metabolites of DEHP (all $p < 0.05$).

Table1. Association between Peripheral Blood Eosinophil Count and Urinary Phthalate Metabolites.

Phtalate metabolites (mcg/g creatinine)	Smokers or respiratory disease (n = 11,627)		Non-Smokers and no respiratory disease (n = 16,554)	
	≥ 18 yrs (n = 9,669)	2–17 yrs (n = 1,958)	≥ 18 yrs (n = 8,375)	2–17 yrs (n = 8,179)
MiBP	–	–	–	β = 6 × 10–4*
ΣHMWPH	–	β = 1 × 10–3*	–	–
MBzP	–	–	–	β = 4 × 10–4*
MCOP	–	β = 2 × 10–3**	–	–
MiNP	–	β = 6.6 × 10–3**	–	–

*p < .05, **p < .001; β = slope of linear regression line

Conclusions: Our findings support an association between eosinophilia and phthalate exposure in humans.

Keywords: Environmental, Epidemiology, Public health

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282. Vinegar Ketoacidosis: The perils of immoderate vinegar ingestion

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Background: Ketoacidosis is associated with ethanol ingestion, diabetes, and starvation; it typically accompanies nausea, vomiting and abdominal pain, and carries significant morbidity and mortality.

Case Report: A 44 year-old female with a history of seizures and chronic abdominal pain presented to the emergency department with abdominal pain and reported seizures. The patient described remaining alert during more than 10 episodes of upper and lower extremity "shaking" over 19 hours. She endorsed abdominal pain, nausea, vomiting, and a frontal headache. Medications: levetiracetam, valarian root extract, passion fruit extract. She endorsed 1-2 vodka drinks per week, daily intake of 5-6 4-ounce (120mL) glasses of vinegar and 1 glass of lemon juice per day. Vital signs: BP 133/93, HR 130, RR 18, temperature 37.7C, oxygen saturation 97% (room air). Exam: slight tremor. Labs: white blood count 13.5 (84.5% neutrophils), normal hemoglobin and elevated MCV (111.6). Basic metabolic panel: sodium 137, potassium 4.7, chloride 98, bicarbonate 10, BUN 10, creatinine 0.58, glucose 114, anion gap 29; calcium 9.8. Ethanol, acetaminophen, aspirin, and volatile alcohols were negative. Serum osmolality 295; osmolar gap 11. Venous blood gas (VBG): pH 6.96, pCO2 38, pO2 25, bicarbonate 8.5, base deficit 23.4, lactate 0.8. Repeat VBG confirmed these findings. Arterial blood gas: 6.94/13/124/2.8/29.5; normal lactate. Urinalysis: 3 + ketones. Beta-hydroxybutyrate (BHB): 9.68

mmol/L (normal: <0.28). The patient received fomepizole, bicarbonate infusion, and was admitted to the intensive care unit. Her heart rate gradually decreased over the next 48 hours; a single dose of lorazepam had no effect on her tachycardia; her pH normalized, and she was discharged without sequelae.
Case Discussion: Alcoholic ketoacidosis occurs via conversion of ethanol to BHB through intermediate structures acetaldehyde, acetate, and acetoacetate. We theorize that significant ingestion of acetic acid could enter this pathway as acetate, resulting in the production of BHB.
Conclusions: We report a case of excessive ingestion of vinegar associated with severe ketoacidosis: vinegar ketoacidosis.
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283. Therapeutic plasma exchange for refractory hemolysis after Brown Recluse bite

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Background: The Brown Recluse spider (BRS) (Loxosceles reclusa) is found in the central and southeastern parts of the United States. BRS envenomation can lead to multiple complications, including hemolysis. We present a case of refractory hemolysis after a BRS bite treated with therapeutic plasma exchange (TPE).
Case Report: A 17 year old female presented with fever, fatigue, and dyspnea. She had a blood pressure of 86/45 mmHg and a heart rate of 110 bpm. Her initial hemoglobin (HGB) was 13.9 g/dL. She was diagnosed with sepsis and received intravenous (IV) fluids, inotropic support, and antibiotics. On hospital day 1 she was noted to have skin lesion consistent with a BRS bite. Signs of hemolysis were present with decreasing HGB and increasing total bilirubin. Systemic loxoscelism with hemolysis was suspected and methylprednisolone 1 mg/kg IV q 8h was initiated. She was discharged on hospital day 3 with HGB of 10.9 g/dL on oral prednisolone. She was re-admitted 24 hours later for signs of worsening hemolysis. Methylprednisolone 1 mg/kg IV q 6 hour was restarted but her HGB dropped to 6.1 g/dL within twelve hours. She was transfused 2 units of packed red blood cells twice and her methylprednisolone dosing changed to 1 gram q24h without improvement. TPE was initiated due to the refractory hemolysis. TPE ran over 100 min and a total of 3L of plasma was removed and replaced with 25% saline and 75% albumin. Shortly after the TPE session, her clinical and laboratory status improved. She required no further transfusions and was discharged on a steroid taper. She developed a necrotic wound at the bite site and required complex wound closure 2 months later but otherwise recovered uneventfully.
Case Discussion: TPE is an extra-corporeal method to remove substances from the blood by separating plasma from cellular blood components and replacing it with physiologic fluids, such as albumin or fresh frozen plasma. Published literature describes the use of TPE for snake envenomation and other poisonings but there are no reports detailing its use for BRS envenomations. This patient's clinical course was felt to be due to BRS envenomation as the wound was typical for a BRS bite, occurred in an endemic area, and had complications associated with BRS bites. Treatment of BRS envenomations remains controversial. Steroids are advocated by some experts but did not seem to be effective in this case. Improvement was associated with TPE initiation and may have been due to removal of complement components activated by BRS venom.
Conclusion: This report suggests that TPE may have benefit as a possible treatment modality for systemic loxoscelism with refractory hemolysis due to BRS envenomation. Further investigation is warranted.
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284. Thujone: It's not all about the absinthe

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Background: Thujone is a GABAA and 5HT3 antagonist frequently associated with wormwood and absinthe, but it is also found in plants in the genus Thuja. Thuja occidentalis, which contains thujone, is used as a homeopathic remedy for a variety of ailments including skin tags. Clinically significant side effects of thujone exposure include seizure activity. We present the case of a toddler with seizure-like activity after ingesting Tag Away® skin tag remover containing Thuja occidentalis.
Case: A 2 y/o male with no history of seizures or febrile illness was found by his family unresponsive, stiff, with teeth clenched and blue lips. He was noted to have a strong odor on him and his grandmother noted an empty 15 mL bottle of Tag Away® (active ingredient Thuja occidentalis 6X HPUS) in the bathroom. The family was moving and minutes prior to the event, the father had noted a full bottle. Prior to emergency medical services (EMS) arrival, he became lethargic with more flaccid tone. On EMS arrival, the patient started crying and vomited once. He was prescribed azithromycin and bromophene pseudophedrine with dextromethorphan the day prior for an upper respiratory infection. His grandmother gave him a dose of cough medication about 2 hours prior to this event. On presentation to the emergency department, he was intermittently somnolent, irritable with a hoarse cry, had truncal ataxia and mydriatic pupils. There were short periods where he would seem confused. His mouth, clothing, and diaper smelled strongly like the Tag Away® brought by family. The patient's clothing was removed, and his skin was washed. His BP was 94/65 mmHg, HR 145 beats/min, RR 24 breaths/min, and rectal temperature 97.5F. Electrolytes and liver function testing were normal except for an initial glucose of 134 mg/dL. He was monitored overnight and returned to baseline by the next morning. Repeat electrolytes were normal with blood sugar of 95 mg/dL, liver function tests unchanged, and he was discharged.
Case Discussion: Thuja occidentalis was the active ingredient reported on the Tag Away® label. Other ingredients included cedar leaf oil, melaleuca leaf oil, and ricinus comminus. Based on the history presented by the family, we suspect the patient had a seizure from ingestion of the Tag Away®, likely related to thujone in the product. This was an isolated seizure, which resolved spontaneously and was followed by a post-ictal period. The patient never

developed signs of pulmonary injury or gastrointestinal symptoms and returned to baseline within about 12 hours from the time of ingestion.
Conclusions: Tag Away® is sold over-the-counter and generally considered safe. This case serves to remind toxicologists that thujone is present in a variety of products, not just absinthe.
Keywords: Thujone, Seizure, Pediatric
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285. Who You Gonna Call: How Do Public Callers Access the Poison Center Phone Number?

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Background: A 2006 study found the telephone book to be the most common source used by callers to access the poison center number. However, the public has increasingly turned from print to electronic information sources.
Methods: This was a survey of public callers to a regional poison center (RPC) by specialists in poison information (SPIs) who asked how the RPC number was obtained. Results were entered on a spreadsheet separate from the RPC call record. Because no identifying information was recorded for the survey, it was determined by the IRB to not constitute human research. This was a convenience sample as callers were queried when the two SPIs conducting the survey were on duty. Data collection occurred during all shifts.
Results: A total of 630 callers from 3 states served by the RPC and 24 outside states were queried. The internet was the source most frequently used (42.5% of callers) to obtain the RPC phone number. Other sources included RPC educational materials, information displayed on product packaging, healthcare professional offices, hospitals, and phone books (used by only 5.9% of callers). Educational materials may have accounted for a higher proportion in state A (30.1%) than in states B (21.8%) and C (8.4%) because the RPC is located in state A.
Conclusions: The internet is the most common source used by public callers to find poison center contact information. Enhancing poison centers' internet presence may increase utilization by the public.
Keywords: Poison center, recognition, awareness
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Source	State A	State B	State C	Outside states	Total (%)
Internet	109	36	97	26	268 (42.5)
Educational materials	96	17	16	9	138 (21.9)
Product packaging	13	6	8	3	30 (4.8)
Physician office	15	1	15	4	35 (5.5)
Hospital	10	2	8	2	22 (3.5)
Pharmacy	11	2	5	0	18 (2.9)
Friend	10	0	2	0	12 (1.9)
Programmed on phone	16	7	18	3	44 (7.0)
911	0	0	3	1	4 (0.6)
Phone book	19	4	11	3	37 (5.9)
Other	11	3	8	0	22 (3.5)
Total	310 (49.2)	78 (12.4)	191 (30.3)	51 (8.1)	630 (100)

286. Kraits Envenomation in Thailand

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Background: Venomous snake bite is one of the major medical problems in Thailand. Three species in genus Bungarus inhabit in this country. Among these, Bungarus candidus is the most common and deadliest Kraits (Bungarus spp.). The clinical manifestations of patients envenomed by kraits have not been well described and the studies are rather limited.
Objectives: To identify the clinical manifestations and medical outcomes of patients bitten by kraits in Thailand for a period of 7 years.
Methods: We performed a retrospective study. The results of all case records of venomous snake bites from three species in genus Bungarus in Thailand from Ramathibodi Poison Center (RPC) Toxic Exposure Surveillance system between 2008 and 2014 were retrieved and analyzed. Kraits bitten cases were identified as patients who had history of Kraits bite and their clinical manifestations of envenomation, either local or systemic effects or both, were analyzed.
Results: During these 7 years, a total of 62 cases of Kraits venom exposure were identified. In these cases, we could specify them as a group, Bungarus candidus 54 cases, Bungarus fasciatus 7 cases and the only one case of Bungarus flaviceps. Most were male (60%) and from Northeastern region (61.3%). The median age of the patients was 29 years (range 2-76). The patients were mostly bitten on extremities (91.9%) and during the night (74.2%). All had minimal local effects and 21.0% of them had dry bites. The median time of onset after the bite to having neurological sign and symptom was 3 hours (0.5-14 hours). Besides neurological effects, high blood pressure (35.5%), hypokalemia (30.6%), abdominal pain (4.8%) and rhabdomyolysis (9.6%) were reported in our patients. Hyponatremia was also found in 3 pediatric patients. Among these, one patient was worked up for the cause, and the syndrome of inappropriate antidiuretic hormone secretion was postulated. The initial severity was mostly moderate (51.6%) and severe effects (25.8%). The mortality rate was 8.1%, all from B. candidus. The causes of death were from complication of systemic effects such as brain anoxia, rhabdomyolysis, acute kidney injury and sepsis. Ninety eight percent of them received the antivenom and the median number given was 15.5 vials (3-50). Most patients (79.0%) were intubated with the median intubation duration of 6 days (1-24 days). The median length of hospital stay was 7 days.
Conclusion: Although Bungarus spp. bite caused minimal local effect, the mortality rate was still high, particularly from B. candidus. Kraits bitten patients showed not only the neurological effects but also had other clinical features such as high blood pressure, hypokalemia and hyponatremia.
Keywords: Kraits, Snake bite, Thailand
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287. The Other Rodenticide: Review of Bromethalin Exposures reported to a Statewide Poison Control System

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Background: Bromethalin is an alternative to long-acting anticoagulant and cholecalciferol rodenticides, however it can be difficult to distinguish from them based on odor or appearance. There are extremely few reports of human exposures, but recent EPA policy changes will favor increased sales of this agent. Animal studies of toxicity describe hyperstimulation effects (tremors, seizures, and hyperthermia) and/or a depressive syndrome causing paralysis, possibly due to mitochondrial dysfunction. This study aims to characterize bromethalin exposures reported to a statewide poison control system.
Methods: Following IRB approval, an electronic statewide database was queried for exposures related to bromethalin over 10 years. Exclusion criteria were co-ingestants and info only calls. Cases of bromethalin exposures were reviewed for demographic, clinical, laboratory, and outcome information.
Results: The query resulted in 451 cases, from which 27 were excluded. The median human age was 2years old (range, <1 to 90 years), and 71 (55%) were males. The majority of all exposures were ingestions, and the effects are shown in Table 1. Human patients were treated with observation only (75 cases; 57%), dermal decontamination or GI dilution (40 cases; 31%), or activated charcoal (8 cases; 6%). Patients were treated at home (60%) or discharged from the ED (38%) in the majority of cases; only 2 patients were admitted to a medical floor. Length of stay for most cases seen in a healthcare facility was less than 12 hours (61%) or 12 to 24 hours (6%). Severity was judged as "no effect" in 118 humans (90%) and as "minor effect" in 10 (8%). There were four major effects in canines, and one feline death.
Conclusion: Bromethalin exposures affect multiple species including young children, but effects are minor for the vast majority of human exposures. We were unable to identify the amount ingested per weight, or confirm the ingestions with laboratory techniques. Future studies should aim to identify a weight based send-in guideline for use by poison centers, as our data suggests that the majority of these exposures can be safely managed at home.

Table 1. Adverse Effects of Bromethalin Exposure.

	Human (N = 136)	Canine (N = 282)	Feline (N = 10)	Rabbit (N = 1)
Gastrointestinal[a]	10	5	0	0
Neruological[b]	7	15	0	0
Cardiac	0	0	0	0
Pulmonary[c]	2	1	0	0
Other Effects[d]	14	10	0	0

[a]nausea, vomiting, diarrhea
[b]HUMANS: headache, agitation, drowsiness CANINE: CNS depression, coma, weakness, ataxia, paralysis, tremors, seizures
[c]HUMANS: shortness of breath, choking; CANINE: labored breathing
[d]HUMANS: Fever, loss of appetite, ocular irritation CANINE: shivering, dermal bumps, decrease appetite, increase drinking, urination on floor

Keywords: Bromethalin, Insecticide, Rodenticide
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288. Calls Misrouted and NOT Misdialed: One Poison Center's Experience

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Background: Poison Control Centers (PC) across the country provide information on a wide variety of exposures. Callers dialing a central number are routed to the PC associated with the area code and exchange of the number from which they are dialing. As many Americans opt to keep their cellular number after moving to a new location, calls are routed to the area code and exchange of their previous location, rather than routing geographically. This has resulted in an increase in out-of-state numbers being misdirected, posing a potential risk for management differing from local practices.
Methods: Based on a preliminary analysis, we identified a need for process improvement in handling these misrouted calls. A formal questionnaire was utilized for 12 days to collect data from lay callers. Callers were asked to provide the number from which they were calling, their actual location, the number dialed to reach the PC, the phone type used to make the call, and the carrier used.
Results: During the study, 856 calls fit the criteria. Of those calls, 735 calls were from a number identified by its in-state area code. However, 84 of those callers were physically located outside the state. Cell phone calls with area codes outside of our state numbered 119. Of these calls, 27 callers were actually in the state at the time of the phone call, with 92 callers routed away from their calling area code as well as physical location. The number of callers that identified dialing the national poison hotline (1-800-222-1222) totaled 768, 47 of which had out-of-state area codes; 35 of these out-of-state callers identified their carrier as T-Mobile/ Metro PCS ($p<.001$, z test for proportions). The misrouted calls originating from locations outside our service area when dialing the 1-800 number equaled 6%. The total number of misrouted calls originating from locations outside of our service area numbered 14%. While this survey identified callers that may have been misrouted to our PC, the number of in-state callers who should have reached our PC but who were misrouted to another PC when dialing is undetermined by this methodology.
Conclusions: Misdirected calls stand the risk of loss of continuum of care, and may delay treatment if that patient has to be referred to a hospital in his/her home state. They unpredictably alter the overall call volume of a specific PC, possibly affecting reimbursement for services rendered and hinder data collection at the regional level. PCs should agree upon a uniform protocol for management of misrouted calls. Further studies on the matter need to be conducted. Improvements to the call routing process should also be explored to decrease the impact of misrouted calls.
Keywords: Poison center, Call routing, Epidemiology
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289. Persistent Methemoglobinemia Due to Occult Vulvar Benzocaine Application

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Background: Methemoglobinemia caused by topical benzocaine from traditional mucosal application is well documented. We report an unusual case of persistent methemoglobinemia from vulvar application of benzocaine.
Case Report: A 47 year old female with history of vulvar carcinoma treated with therapeutic radiation was sent to the ED from an oncology clinic for worsening dyspnea, fatigue and cyanosis with room air oxygen saturation of 78%. Initial vital signs included temperature 37.5C, BP 102/58 mmHg, HR 82 bpm, RR 19, and SpO2 of 87% on non-rebreather mask. The initial arterial methemoglobin (MetHb) was 49%. The patient received methylene blue (1mg/kg IV over 5 minutes). MetHb levels would fall after methylene blue but subsequently increased twice. None of her listed prescription medications were known to cause methemoglobinemia. After additional discussion with the patient she revealed applying over the counter Vagicaine® (20% benzocaine) while hospitalized every two hours to the vulvar area for pain and irritation secondary to radiation and yeast infection. During her hospitalization, she received a total of 6mg/kg methylene blue, and underwent decontamination with soapy water and vaginal lavage with 60mL of normal saline. Cyanosis and dyspnea resolved on hospital day two. On the day of discharge (day 5) the MetHb was 5.4%
Case Discussion: Benzocaine is a common cause of methemoglobinemia, and often due to use in healthcare settings. Occult methemoglobinemia can occur from uncommon uses of topical benzocaine, especially if there is a compromise to skin or mucosal barriers. Aggressive review of medications, including over-the-counter drugs may be helpful to determine the etiology of methemoglobinemia.
Conclusion: This is a case of persistent MetHb with delayed recognition of the causative agent due to occult topical benzocaine use.
Keywords: Methemoglobin, Methylene blue, Benzocaine
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290. The Long-Term Vasculopathy after Acute Acetylcholinesterase Inhibitor Poisoning: A Nationwide Population-Based Cohort Study

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Background: Acetylcholinesterase inhibitors (ACI, frequently noted to be organophosphorus and carbamate insecticides) are widely used throughout the world. Because of their easy availability, these compounds are commonly used for suicide in the developing countries. Their acute toxic effects are well known, but the evidence of chronic effects is unclear. Recent studies suggest that the abnormalities of nervous systems might persist for up to 5 years after a single large dose ACIs exposure acutely. However, the long-term effects on cardiovascular system are less understood.
Methods: An ACI poisoning cohort (N = 7,561) with an age- and gender-matched control cohort (N = 30,244), both taken from the National Health Insurance Research Database, were compared. We performed the multivariable Cox proportional model to estimate the risks of developing arrhythmia, coronary artery disease (CAD) and stroke**.**
Results: The patients with acute ACI poisoning had higher incidence rates of arrhythmia (5.89 vs. 3.61 per 1000 person-years), CAD (9.10 vs. 6.88 per 1000 person-years), and stroke (11.0 vs. 7.20 per 1000 person-years) than the non-ACI poisoning cohort, with a crude HR of 1.63, 1.32, and 1.53. In addition, a significantly higher risk of arrhythmia in the ACI poisoning cohort (HR = 1.55), compared to non-ACI poisoning cohort and particularly in male patients (HR = 1.64) and those under 49 years of age (HR = 3.54). There were higher risk of arrhythmia and CAD during three years follow-up period (HR = 1.79 for arrhythmia; HR = 1.32 for CAD).
Conclusion: Acute ACI poisoning might continuously impact on human cardiovascular system through unclear mechanisms. Any supportive or encouraging measurements to reduce the risk of heart attack or stroke might enthusiastically carry out in cases of surviving from ACI poisoning.
Keywords: Insecticide, Organophosphate, Cardiac toxicity
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291. Organic Copper Algaecide Toxicity: Case Report and Statewide Poison Center Exposures Review

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Introduction: Organically complexed copper compounds are designed to release small amounts of copper ion into solution. Although commonly used as swimming pool algaecides, toxicity from these agents is rarely reported, in contrast to well-documented hazardous effects of inorganic copper compounds.
Methods: After an index case with severe symptoms, we performed an IRB-approved retrospective review of our statewide poison control system's electronic database for organic copper algaecide exposures based on AAPCC code entry and free text search. Demographic and clinical data were captured, and animal or non-copper algaecide exposures were excluded.
Case Report: An 89 year old woman with dementia was discovered by relatives to be vomiting near a bottle of copper ethanolamine complex. In the ED she had normal vital signs with episodes of green colored vomiting and diarrhea. She developed mild dysphagia and pharyngeal erythema, a mixed hyperbilirubinemia (total 3.2 mg/dL, direct 1.1, indirect 2.2) , and pancreatitis. Blood smear demonstrated evidence of oxidative stress with spherocytes and echinocytes, but no hemolysis. Copper levels were found to be elevated at 2002 mcg/dL (reference 70-175). Serial labs did not show significant hepatic injury, renal dysfunction, or methemoglobinemia. Her GI symptoms, pancreatitis, and hyperbilirubinemia improved over three days, and she was discharged.
Poison Control Center Exposures Review: Excluding animal calls, miscoded cases, and the index patient, there were 55 cases

reported to the statewide poison center database over a 12-year period. Most cases (84%) were home calls, involving 29 (52%) males with median age 41 years. There were 12 (22 %) oral exposures, 27 (49%) skin exposures, and 10 (18%) ocular exposures. The vast majority of patients remained asymptomatic and required no interventions or further care; one patient developed nausea/vomiting and diarrhea, while another had a mild leukocytosis. Emergency department observation was done for 8 (30%) patients, and 2 patients required hospitalization. No patients were treated with chelation or other antidotal therapies.

Conclusions: Organic copper-based algaecide exposures are relatively benign. Whereas asymptomatic patients can likely be watched at home, patients with moderate to severe symptoms should be evaluated in a health care setting for evidence of copper-related injury such as hemolysis, hepatitis, corrosive effects, renal injury and pancreatitis. The index case serves as a reminder that older adults with dementia are vulnerable to accidental poisonings. These findings may help guide poison control center education, prevention, and referral efforts.

Keywords: copper, algaecides, Surveillance

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292. Occupational Snake Bites: A Retrospective Cohort of Patients Reported to the ToxIC North American Snakebite Registry

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Background: Occupational exposure has been identified as a risk factor for snake bites. The epidemiology and clinical course of this cohort is not well described.

Methods: Data reported to the ToxIC North American Snakebite Registry (NASBR) between January 1, 2014 and Dec 31, 2014 were reviewed. Inclusion criteria were age > 17 years and occupational exposure. Data collected included patient demographics, occupation, bite location, snake species and clinical course. Descriptive statistics were used.

Results: 10 US states contributed 180 cases. 104 were adults age > 17 years, and 18 (17.3%) of these were occupational exposures represented by 6 states. 17 (94.4%) occurred in the southwest US, with 10 (55.6%) occurring in Arizona. 1 patient (5.6%) was over 65 years. All were male. There were 14 rattlesnake, 2 copperhead, and 2 non-native (Crotalus durissus terrificus and Trimeresurus albolabris) envenomations. 4 (22.2%) were captive snakes. 6 (33.3%) were employed working with snakes and 6 (33%) were employed in landscaping. Table 1 lists occupations. Acute ethanol intoxication was not present in any case. 2 (11.1%) had sustained previous snake bites; this was the 4th envenomation for the venomous animal educator. 14 were upper extremity (11 finger, 2 hand, 1 forearm) and 4 were lower extremity (3 lower leg and 1 foot) bites. 7 (38.9%) involved intentional interaction with the snake, and all of these patients sustained finger bites. All patients working directly with snakes also sustained finger bites. None of the lower extremity bites involved intentional interaction with the snake. Field therapy in the form of ice was performed in one case. Time to presentation was 2 hours or less in all cases. Antivenom was given in 16 (88.9%) cases, with an average of 10 vials (range 2-24 vials). Mean time to antivenom was 2.3 hours (range 1-9 hours). 1 patient received prophylactic antibiotics and one required wound debridement. No patient was treated for late bleeding.

Table 1.

Occupation	Number of Patients
Landscaper	6
Snake handler/caretaker	3
Construction worker	2
Snake remover	1
Venomous animal educator	1
Camp counselor	1
Engineer	1
Mechanic	1
Truck driver	1
Medicine man	1

Conclusions: Occupational exposure represented 17.3% of snake bites in adults reported to the ToxIC registry. Although ethanol use is often considered a risk factor for snake envenomation, it was not associated with this cohort. Occupational snake bites occurred predominantly in the southwestern US. Employment in landscaping or working directly with snakes each represented 33% of occupational envenomations. All patients working directly with snakes sustained finger envenomations.

Keywords: Snake bite, Occupational, Risk factor

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293. Review of cases regarding dietary supplements reported to a statewide poison center network

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Background: In 2007 a national survey reported that Complementary and Alternative Medicine (CAM) is used by approximately 38.3% of the U.S. population. Dietary supplement use was reported as one of the most common CAM practices. Since dietary supplements are not regulated by the FDA, concerns have been raised about the efficacy and safety of these products.

Methods: We retrospectively reviewed an electronic database of poison center statistics regarding human exposures involving agents categorized as dietary supplements reported to a statewide network of poison centers over a 15-year period (1/1/2000 to 12/31/2014). Additionally, we retrospectively reviewed individual patient cases, including case notes, with major or fatal outcomes reported to the same network of poison centers over the past six years.

Results: The incidence of cases involving dietary supplements reported to a statewide poison center network increased by 159% over the past 15 years with a year-to-year increase observed for most of the period. Most exposures were accidental (78.4%), occurred in the home (94.5%), and involved only a single product (84.8%). Most of the exposures were in children between 0-5 years of age (65.7%). Of the 31,879 total cases reported, 13,996 were followed to a known outcome, and of these, 82% had minimal or

no clinical effects reported. Seven fatalities and 185 cases with major outcomes (significant symptoms that required medical interventions) were reported. In our more detailed review of individual patient cases with major or fatal outcomes reported during the last 6 years, we found a trend toward increased frequency with the highest number of cases (31) reported in 2013. In 58.7% of the total number of reported cases, a potential dietary supplement/drug interaction was identified. All of these cases had significant adverse events with cardiovascular and gastrointestinal symptoms as the most common. Single ingredient caffeine supplements were the most common products (15.4%) followed by melatonin (14.4%). Many more combination products contained caffeine and/ or other stimulants (ex. guarana, mate, green tea, etc.). Additionally, some of the products were withdrawn from the market because they contained drug adulterants (ex. Jadera – contains the unapproved drug sibutramine, Extenze – contains tadalafil and/or sildenafil).

Conclusion: While most dietary supplement cases reported to our state's poison centers were not deemed to be serious, a considerable number were associated with increased morbidities and seven cases resulted in death. Additionally, some of the dietary supplements were withdrawn from the market by the FDA because they contained drug adulterants.

Keywords: Alternative medicine, Dietary supplement, Herbals

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294. Fatal Cardiotoxicity after Ingestion of English Yew: A Case Report

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Background: English yew (Taxus baccata) is an evergreen conifer with well-known toxic effects, having been used since ancient times for homicide and suicide. Medically, taxanes such as paclitaxel are used for chemotherapy. The active components are alkaloids or taxanes, notably Taxine B, which is extremely cardiotoxic. It binds calcium and sodium channels in cardiac myocytes, causing QRS prolongation, bradycardia and ventricular dysrhythmias. We report a case of English yew ingestion associated with significant cardiovascular dysrhythmias, resulting in cardiovascular collapse and death.

Case Report: A 19-year-old transgender male, who identified as female, presented to the emergency department (ED) after ingestion of English yew seeds in a suicide attempt. The time and amount of the ingestion were unknown. She was awake and vomiting when EMS arrived on scene. In the ED, she was in respiratory distress with temperature 36.2°C, respiratory rate 26 breaths/min, blood pressure 76/32 mmHg and oxygen saturation 88%. The initial rhythm was a wide complex tachycardia at 146 beats/min. She was immediately intubated and activated charcoal was administered once the airway was secured. Shortly thereafter, she decompensated and went into cardiac arrest. In addition to cardiopulmonary resuscitation (CPR) she received sodium bicarbonate, calcium, amiodarone and electrical defibrillation. She remained pulseless despite these interventions. Labs drawn during the arrest were remarkable for hyperglycemia and mild anemia. Digoxin immune fab fragments (DigiFab) were administered, at which point return of spontaneous circulation (ROSC) occurred. A norepinephrine infusion was initiated and several doses of atropine were given for bradycardia. Levetiracetam was administered because the patient was posturing. The patient did not respond to atropine and was externally paced with capture, but then went into PEA arrest. After several more rounds of CPR and medications, with intermittent episodes of ROSC, the patient was in asystole. Further attempts at resuscitation were unsuccessful.

Case Discussion: Large overdoses of English yew can result in QRS prolongation and significant dysrhythmias, including ventricular tachycardia, ventricular fibrillation and bradycardia, which can lead to cardiovascular collapse. In this case, DigiFab appeared to be helpful in regaining ROSC, but was unable to completely reverse toxicity. We are unable to definitively confirm DigiFab efficacy since this was a single case.

Conclusion: This case suggests that in addition to supportive therapies such as amiodarone and sodium bicarbonate, DigiFab may be helpful in patients that have severe dysrhythmias from English yew ingestion.

Keywords: Plants, Cardiac toxicity, Overdose

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295. Ingestion of Dietary Supplements Containing Beta-Methylphenylethylamine Reported to Poison Centers

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Background: The US Food and Drug Administration has detected the amphetamine isomer beta-methylphenylethylamine (BMPEA) in dietary supplements reported to contain Acacia rigidula. BMPEA has been reported to potentially lead to cardiovascular complications in high doses. A study published in early 2015 found 11 dietary supplements listed to contain Acacia rigidula also contained BMPEA. The intent of this study was to describe ingestions of BMPEA-containing products reported to poison centers.

Methods: The database of a statewide poison center network was searched for any ingestions of 11 dietary supplements (JetFuel T-300™, Fastin-XR™, Yellow Scorpion™, Black Widow™, Lipodrene Hardcore™, Aro Black Series Burn™, Dexaprine XR™, Lipodrene Xtreme™, MX-LS7™, JetFuel Superburn™, Stimerex-ES™) reported during January 2000-March 2015. The distribution of the identified cases were determined for demographic and clinical factors.

Results: There were 14 ingestions of 2 products (7 Fastin-XR™, 7 Stimerex-ES™). The first case was reported in 2006 and half since January 2012. The age distribution was 64% 0-5 years, 14% 6-19 years, and 21% 20 years or more; 64% of the patients were female. 64% of the ingestions were unintentional and 36% were adverse reactions. 86% of the exposures occurred at the patient's own residence, 7% at another residence, and 7% at school. No other coingestants were reported in 93% of the cases. The management site was 50% on site, 36% already at/en route to a healthcare facility, and 14% referred to a healthcare facility. The medical outcome was 43% no effect, 29% moderate effect, and 29% not followed-minimal effects possible; there were no deaths. The reported clinical effects were chest pain (1), tachycardia (3), nausea (1), vomiting (2), drowsiness/lethargy (1), tremor (1), and hyperventilation/tachypnea

(1). The treatments were activated charcoal (4), dilution (4), food (1), benzodiazepines (1), and IV fluids (2).
Conclusions: Few ingestions of these BMPEA-containing supplements were reported to the poison center network. The patients tended to be female and young children. Half were managed on site. Few clinical effects, particularly cardiovascular effects, were reported. A limitation of this study is that reported adverse effects may not be due to BMPEA but may be due to other active ingredients.
Keywords: Poison center, Dietary supplement, Beta-Methylphenylethylamine
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296. Confirmed Envenomation from Scolopendra subspinipes (Vietnamese Centipede)

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Background: Though Scolopendra subspinipes, commonly known as the Vietnamese Centipede, typically uses its venom to incapacitate its prey of insects, small reptiles and mice, it has been known to bite larger animals if frightened or disturbed. Relatively few incidents of S. subspinipes biting humans have been documented and little has been done in terms of research of envenomation mechanics. We report a case of envenomation by a notably venomous Asian centipede species and the subsequent clinical course.
Case: A 20-year old otherwise healthy man presented to the Emergency Department (ED) after having been bitten on his left second distal phalanx by a Vietnamese centipede while he was attempting to feed it a cricket. Upon being bitten the man immediately killed the centipede and rinsed the wound (images available at poster) with hot water before taking 25 mg of diphenhydramine orally, per information he found on the Internet. He reported no relief with hot water. He then communicated with Poison Control en route to the ED, bringing the remains of the centipede with him, which was confirmed to be S. subspinipes. Upon arrival an ice pack was placed on the digit, resulting in reduced pain which he rated a 2/10 in severity. Except for the affected digit, physical exam revealed no abnormal findings. The digit itself had significant erythema and two visible puncture wounds located distally and laterally, and was swollen to twice its normal size. A localized diaphoresis was evident. The patient felt pain at the distal joint when moved, but had sensation distal to the wound. He was observed in the ED and discharged home later the same day. Poison Control followed up daily for three days post envenomation. The affected digit had some minor swelling and pain, which progressively resolved by the fourth day after the bite.
Discussion: Despite their reputation as lethal predators among amateur collectors and Internet sensationalists, Vietnamese centipedes' appearance and sporadic behavior may be far less dangerous to humans. Evolved to provide a sufficient dose (5 μL) of a variety of toxins to incapacitate other insects, stings from S. subspinipes seldom provide more than transient symptoms in humans, most commonly swelling and inflammation, that quickly resolves. It remains unclear if the centipede venom is indeed a heat labile toxin, but application of hot water was ineffective in this case. Complications most often involve secondary infections or hypersensitivity reactions, which may be monitored before discharge.
Conclusion: While painful, Scolopendra subspinipes envenomation usually causes little more than transient symptoms.
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297. Advancing Toward Health Information Exchange for Poison Control Centers

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Background: U.S. poison control centers (PCC) play an essential role in the emergency management of poison exposure. However, emergency departments (EDs) and PCCs use separate information systems and do not routinely share data. PCC communication processes are based almost entirely on telephone communication, with related safety vulnerabilities. As part of a federally funded research study, an interprofessional University of Utah team is developing, implementing, and evaluating a health information exchange process to better support the Utah Poison Control Center operations.
Methods: Using information garnered through multiple preliminary studies, we designed a model for workflow integrated health information exchange. In this model, patient information and poison control center recommendations are shared through bidirectional health information exchange as a poison exposure event unfolds. We are currently developing software and informatics tools to enable bidirectional health information exchange between EDs and PCCs. The tools include dashboard software to facilitate poison center specialist management of incoming and outgoing communications, the establishment of appropriate data standards for information exchange, and modification of the ED electronic tracking system to integrate notifications and information from poison control. The process will be implemented at two Utah EDs and and its impact on processes and patient care will be systematically investigated.
Results: We have completed key preliminary work to enable bidirectional health information exchange between emergency departments and poison control centers, including the establishment of data standards. We conducted iterative usability testing to refine the design of the poison center dashboard, now under development. Our current focus is on software development including vended EHR service integration, and strategies for minimizing burden on personnel.
Conclusions: Health information exchange between emergency departments and PCCs holds great potential to improve safety, efficiency, and quality in the emergency management of poison exposures. We've developed a model process for workflow-integrated health information exchange between emergency departments and PCCs. In ongoing work, we are implementing and evaluating the process in order to determine its effects on workflow,

communication, efficiency, utilization, ease of system integration, and user evaluation of processes and tools.
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298. Trends amongst parents that utilize poison center services based on customer satisfaction surveys

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Background: The poison center surveys callers throughout the year as part of its customer satisfaction process. The purpose of this evaluation of the caller survey results was to determine what trends were apparent over the past ten years amongst parents or caregivers of toddlers and preschoolers that utilized poison center services.
Methodology: We reviewed the aggregate results collected over the past ten years (2005-2014) from the poison center's customer satisfaction surveys. The surveys consisted of a minimum of 100 callers per set and were performed either quarterly or biannually. The surveys were conducted during the exposure's first follow-up call to callers from the poison center's designated service region. The inclusion criteria to complete a survey are: 1) the call is a human poison exposure; 2) the patient is between the ages of 6 months to 48 months; 3) the caller provides their name and phone number; 4) the substance is known; and 5) the patient is managed at home. Questions asked include: 1) "Have you called a poison center previously?"; 2) "How did you obtain the toll-free telephone number to the poison center?"; 3) "What would you do if there were no poison center available?"; and 4) "How satisfied were you with our poison center services?"
Results: The percentage of new callers fluctuated between 29% and 45% with no noticeable pattern. The percent of people that reported getting the phone number from the phone book dropped significantly from 31.5% in 2005 to less than 1% in 2014. Conversely, the number of people that reported getting the number from the internet increased from 4% in 2010, which was the first year that the internet was included as an option, to 55% in 2014. Throughout the ten year period, the most common responses for what callers would do if there were no poison center available were "take the patient to an emergency department or physician" followed by "call an emergency department or physician". Additionally, the percentage of people that would search online increased from 2% in 2010 to 23% in 2014. Finally, there was no significant change in the reported caller satisfaction score on the provided five point scale with 98% reporting being "very satisfied" over the ten-year period.
Conclusions: The results of our Customer Satisfaction Telephone Survey results demonstrate that phonebooks have been largely replaced by the internet by callers searching for the poison center's telephone number. Additionally, parents and caregivers of poisoned patients are increasingly likely to search online for information on pediatric poison exposures.
Keywords: Internet, Pediatric, Poison center
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299. Poison Center Utilization by 911 Communications Centers in a Midwestern State

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Background: Poison center (PC) staff provide quality, cost-effective care by safely managing 85% of calls from the public at home. Management of poisonings by 911 communications centers (911s) instead of PCs has been associated with unnecessary ambulance and hospital referrals and higher healthcare costs. The purpose of this study was to determine the extent of PC utilization by 911s in a Midwestern state, identify PC usage factors, and assess the need for educational outreach to 911s.
Methods: Electronic surveys were emailed to directors of seventy-two 911s in one Midwestern state to determine whether they serve "urban" ($\geq$20,000) or "rural" ($<$20,000) regions, their frequency of PC utilization, types of situations in which they call the PC, how their 911 callers are referred to the PC, and their preferences for PC information.
Results: 24/72 (33.3%) 911 directors responded. The response rate was greater among "urban" (50% of the state's "urban" 911s responded) than "rural" agencies (25% responded). 9/24 (37.5%) said their agencies "always," "frequently," or "occasionally" called the PC. 15/24 (62.5%) of mostly "rural" 911s indicated they "rarely" or "never" called. The most common reasons given for not calling were "no policy for contacting the PC" and "poisoning calls to my agency are rare." Of the 911s that reported utilization of the PC, the most frequent reason for calling was for first responders who requested PC assistance (50%). Only four 911s (16.7%) had policies guiding dispatchers on when to call the PC; all of those agencies indicated that they "always," "frequently," or "occasionally" called. None of the 911s that "rarely" or "never" called had such policies. Most respondents (53.3%) reported giving their callers the PC's number to call directly; only 46.7% transferred calls to the PC. 14/24 (58.3%) 911 directors requested educational information and/or poison management guidelines from the PC.
Conclusions: The data suggest underutilization of the PC by 911s in a Midwestern state, with greater utilization by "urban" 911s and by those with PC referral policies. Over half of the 911 directors indicated an interest in receiving PC information. Our findings suggest that PC and 911 partnerships focusing on the development of customized educational materials and management protocols may enhance PC utilization by 911s.
Keywords: Poison center, Emergency Medical Services, Utilization
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300. Palytoxin Toxicity in a Coral Enthusiast and His Family from Unmanipulated Coral

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Background: Palytoxin is produced by several coral species and works by converting Na-K ATPase from an energy-dependent pump to a nonselective cation channel. Toxicity has been described

after ingestion of fish that bioaccumulate palytoxin and inhalational toxicity from water vapor after boiling water was poured on coral.
Case Report: A 32yo male and his brother moved 70lbs of zoanthid coral out of an aquarium and left it exposed in their small home. 5hrs later, the patient presented to medical care with hyperthermia, dyspnea, severe myalgias, emesis, and an oral metallic taste. His wife and brother awoke with headache, dyspnea, and myalgias and his dog and cat had lethargy and vomiting. He was hyperthermic (39.2C), tachycardic (135bpm), tachypneic (28bpm), and had normal BP and saturation (96%RA). He was ill-appearing, rigoring, and in mild respiratory distress. He had leukocytosis, otherwise a normal CK, troponin, influenza A/B, carboxyhemoglobin, and CXR. He received fluids, ketorolac, and morphine. His vital signs normalized the following day. He continued to report myalgias and dyspnea two days post-discharge.

The patient's coral, and one from his local aquarium, demonstrated high concentrations of palytoxin per FDA laboratory Results.
Case Discussion: Palytoxin alters Na-K ATPase pumps on cardiac, nervous, and muscle cells which explain the dysrhythmias, paresthesias, and rhabdomyolysis that may occur. Our patient demonstrated systemic toxicity and was likely exposed to palytoxin by both dermal and inhalational routes. Inhalational exposures have not been described from unantagonized coral. Our patient's wife (and pets) did not handle the coral, but developed systemic symptoms from the inhalational route simply from having exposed coral in the house.

Our patient is one of many coral hobbyists involved in the lucrative and largely unregulated home aquarium trade. A recent US Coral Reef Task Force report documents a dramatic rise in coral trade with over 90% of pieces bound for the US. Emergency physicians and medical toxicologists are likely to see an increasing incidence of zoanthid and palytoxin exposure in the future.
Conclusion: Dermal and inhalational exposure to unantagonized zoanthid coral may be associated with significant palytoxin toxicity.
Keywords: Marine, Public health, Medical toxicology
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301. Survey Evaluation of Rational and Experiential Decision Making Preferences in Specialists of Poison Information

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Background: Specialists of Poison Information (SPI) are tasked with making important medical decisions based on limited, second-hand information to decide if the patient requires intervention, level of assistance and best treatment. The field of cognitive psychology has demonstrated a multitude of factors influencing the uptake, processing and integration of information. The Cognitive-Experimental Self-Theory describes how individuals use both experiential and rational processing to make decisions. The purpose of this study was to describe SPI preferences for experiential (fast and intuitive) and rational (systematic and rule-based) processing.
Methods: All SPIs registered through the American Association of Poison Control Centers were invited to participate via an emailed survey that collected demographic information and administered the Rational Experiential Inventory (REI), a validated survey tool. The REI is a 40 question survey assessing engagement and ability with rational and experiential styles. Participants rate their agreement with statements using a 5 point scale. The primary outcome was preferred decision-making style of SPIs. Differences in decision making style based on primary profession, years of experience in toxicology, years and type of clinical experience prior to entering into the field of toxicology and Certified-SPI (CSPI) designation were examined. Cronbach's alpha was used to examine REI scale reliabilities, independent t-test to compare two groups, and one-way ANOVA to compare three or more groups.
Results: Of 1005 SPIs, 181 completed the survey (18%). Respondents were primarily female (76%), had a nursing background (66%) and were CSPIs (90%). Total scale reliabilities for each of the REI scales demonstrated acceptable internal consistency ($\alpha > 0.79$). Rational and experiential mean (EM) scores for SPIs were 3.97 ± 0.48 and 3.39 ± 0.49. Nurses had higher EM scores (3.46 ± 0.48) than physicians (3.04 ± 0.21, $p < 0.05$) and "other" (3.03 ± 0.79, $p < 0.05$); while pharmacists (3.32 ± 0.48) did not differ from any other group. SPIs with ≥ 30 years of experience had lower EM scores (3.04 ± 0.47) than all other age groups: 0-9, 10-19 and 20-29 years were 3.40 ± 0.49, 3.46 ± 0.44 and 3.39 ± 0.54, respectively ($p < 0.05$). Females also had higher experiential scores than males. No difference was found based on prior work settings.
Conclusions: Survey results are suggestive of rational processing being the dominant style in all SPIs. Nurses and females are more likely to utilize experiential processing to a greater degree than other subgroups. SPIs with the most experience had the lowest preference for experiential processing.
Keywords: Poison center, Decision making preferences, Specialists of Poison Information
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