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ABSTRACTS

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1. Aluminum Testing in Children: What Do Results and Reference Ranges Mean?

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Background: Some parents of children with developmental issues are raising concerns about their child's aluminum exposure and requesting biological testing from health care providers. Aluminum can be measured in plasma, serum, or urine, but there is scant scientific information about the normal range of aluminum concentrations in the general population, let alone age-related norms. Yet commercial laboratories offering aluminum testing provide reference ranges when reporting results. In this study, we sought to determine what scientific literature has been used to support the reference ranges provided, whether such literature sources specifically studied aluminum levels in otherwise normal infants and children, and how to interpret results of such testing. *Methods:* We obtained the names of 11 commercial laboratories in the United States that perform aluminum testing from texts, published lists, and Internet sources. Either telephone or emailed surveys were conducted with laboratory personnel or Internet searches were performed seeking current information regarding reference ranges and methods of testing for aluminum in biological samples. For a subset of seven laboratories the published scientific reports cited in determining the reference ranges were reviewed for details regarding the ages and health of the population sampled. *Results:* For laboratories using the AAS method, serum aluminum references ranged from <5.41 to <20 mcg/L, plasma from <7 to 0–10 mcg/L and urine 5–30 mcg/L; for those using ICP-MS, serum ranged from 0–6 to <42 mcg/L, plasma from 0–10 to 0–15 mcg/L, and urine from 0–7 to 5–30 mcg/L. Laboratories relied upon studies of small populations of healthy adults, adult dialysis patients, sick children on aluminum-containing parenteral therapy, hospitalized patients, or analogous studies of other metals. *Conclusions:* Commercial laboratories provide normal reference ranges for tissue aluminum assay results that show large variability. These reference ranges are based upon studies that may not be appropriate for either the general population or children. Consequently aluminum testing results are difficult to interpret clinically. Further study of blood and urine aluminum concentrations in healthy populations, which include children, is warranted.

2. Subclinical Nerve Fiber Dysfunction Following Acute Organophosphate (OP) Poisoning

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Background: Following acute OP poisoning patients complain of numbness without objective sensory or features of OP induced delayed polyneuropathy. While animal studies have shown demyelination and axonal degeneration there have been no clinical correlates of this characterized in humans. The aim of this study was to measure nerve conduction after acute exposure to OP. *Methods:* A prospective case-control study was conducted to assess motor nerve conduction velocity (MCV), amplitude and area of motor complexes, sensory nerve conduction velocity (SCV) and F waves following OP poisoning. Assessment was performed around 1 and 6 weeks after the exposure in 70 cases and age, sex and occupation matched controls. Fifty-three out of seventy attended the 6 week assessment. *Results:* All patients received atropine, 54 patients received pralidoxime. The mean (SD) of neurophysiological findings in Table 1 show evidence of statistically significant reductions of SCV, MCV, amplitude, area of motor complexes and F waves. *Conclusion:* Function of sensory and motor nerve fibers were affected by the single episode of acute exposure to OP. Slowing of nerve conduction velocity may reflect demyelinisation. The reduction of amplitude in motor complexes and F waves suggests axonal damage.

Table 1.

	Cases		
	First assessment	Second assessment	Controls
SCV (m/s)			
Median	53.7 (8.1)	52.8 (8.3)$^{\$}$	56.0 (5.9)
Ulnar	55.2 (7.0)*	55.9 (6.7)$^{\$}$	59.6 (5.2)
MCV (m/s)			
Median	55.2 (4.3)*	55.5 (4.5)	56.6 (3.6)
Ulnar	53.9 (4.8)*	54.4 (5.1)$^{\$}$	56.2 (4.4)
Common peroneal	46.6 (4.9)*	48.2 (4.7)$^{@}$	49.4 (5.1)
Amplitude of distal motor nerve conduction complex (mV)			
Median	13.4 (3.6)	14.2 (4.6)	14.3 (4.2)
Ulnar	9.4 (2.5)*	10.0 (2.4)	10.4 (2.1)
Common peroneal	7.7 (3.4)	7.2 (2.7)$^{\$}$	8.6 (3.4)
Area of distal motor nerve conduction complex (mVms)			
Median	32.2 (10.4)	30.9 (9.8)	33.6 (10.0)
Ulnar	18.6 (6.5)	17.1 (5.3)$^{\$}$	19.4 (4.3)
Common peroneal	15.3 (6.8)	13.1 (4.9)$^{\$,@}$	16.1 (6.7)
F wave occurrence (%)			
Median	81.9 (17.2)$^{\#}$	78.4 (22.3)$^{\&}$	90.3 (10.5)
Ulnar	82.8 (20.5)$^{\#}$	83.4 (16.6)$^{\&}$	92.6 (8.8)
Tibial	89.1 (16.3)	91.5 (11.7)	92.8 (11.9)

*$p < 0.05$; controls vs. first assessment, $^{\$}p < 0.05$; controls vs. second assessment (unpaired *T*-test). $^{@}p < 0.05$; first vs. second assessment (paired *T*-test). $^{\#}p < 0.05$; controls vs. first assessment, $^{\&}p < 0.05$; controls vs. second assessment (Mann–Whitney test).

3. A Study Assessing the Content of Legal Highs Purchased from the Internet

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Background: There has been a significant increase in the use of "legal highs" and an associated increase in Emergency Department presentations with acute toxicity related to their use. These products are commonly supplied over the Internet and there is often limited information available on the web-sites and the packaging of the products to inform users of their content. The aim of this study was to determine the drug content of products sold from Internet sites and whether this remained stable over time. *Methods:* We purchased legal high products from five Internet sites over 6 months in 2009 and in 1 month in 2010; the same products were ordered each month. The products were analysed using gas-chromatography mass-spectrometry (GC-MS). The main study was conducted before the December 2009 control of Piperazines in the UK. The follow up study was performed after this Piperazine legislation, but before Mephedrone and related cathinones were controlled. *Results:* In the initial 6 month study, 26 products were ordered each month and 129 (82.7%) products were received in total. One hundred and twenty-six (97.7%) contained an active compound, most commonly the Piperazines (55, 43%) and cathinones (43, 33%). Common active combinations were 4-methylmethcathinone (Mephedrone), Ethcathinone and caffeine (20, 16%); 3-Fluoromethcathinone and caffeine (20, 16%); and 1-benzylpiperazine (BZP), 3-Trifluoromethylphenylpiperazine (TFMPP) and Chlorophenylpiperazine (13, 10%). Seventeen (85%) of the 20 products that were supplied in more than 1 month consistently contained the same compounds, but there was variation in content of 3 (15%) products. All five post-legislation samples contained an active compound with β-keto-*N*-methylbenzodioxolylpropylamine (Butylone), Methylenedioxypyrovalerone (MDPV) and caffeine detected in four products; one product contained BZP, TFMPP and caffeine. *Conclusions:* Most legal highs sold over the Internet in the UK contain active compounds that have the potential for significant acute toxicity with recreational use. The actual drug content cannot be predicted from the name of the product and there is variation in content of the products over time. There was a change towards the sale of legal compounds post-legislation, but one product still contained controlled compounds.

4. Clinical Course of Bark Scorpion Envenomation When Antivenom is Unavailable

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Background: Bark scorpion envenomation is a potentially life-threatening condition in children, traditionally treated with antivenom (AV) in Arizona. In 2004 AV became unavailable. Due to the historic widespread use of AV, there are few reports describing severe scorpion

envenomation without AV treatment. We sought to describe the clinical course, management, complications and outcome of children with severe scorpion envenomation treated with supportive care alone. *Methods:* A retrospective chart review was performed after obtaining IRB approval. All children presenting to a metropolitan tertiary care children's hospital between September 1, 2004 and July 31, 2006 with severe scorpion envenomation, who did not receive AV, were included in the study. Two reviewers performed a chart review using a standardized data abstraction form. Outcomes included time to onset of symptoms, time to healthcare facility (HCF), clinical findings, treatment, complications, and length of stay (LOS). *Results:* Eighty-eight patients were included with a mean age of 3.7 years (range 0.33–12 years). Mean time to symptom onset was 20 min (range 0–130 min) and mean time to HCF was 79 min (range 10–240 min). Incidence of clinical manifestations was as follows: neuromuscular agitation 100%, opsoclonus 97%, hypersalivation 81%, tachycardia 82%, hypertension 49%, vomiting 38%, fever 28%, respiratory distress 33%, and hypoxia 18%. Most episodes of vomiting were early and self-limited, 21 of 33 (64%) resolving prior to arrival at a HCF. Complications included CPK > 1,000 IU/L in 18 (20%) patients (CK measured in 61/88 patients). CXR was obtained in 33% (29/88) of patients, with aspiration noted in 12 (13%). Intubation was required in 24% of patients. The most frequently used agents to control symptoms were benzodiazepines (98%), followed by opioids (69%) and atropine (30%). IVFs were given to 84%. Mean LOS was 29 h (range 6–73 h). There were no deaths, renal failure, or permanent disability. *Conclusion:* This study describes the clinical course of pediatric bark scorpion envenomation without AV. In addition to direct venom effects, children experienced relatively high rates of respiratory failure, rhabdomyolysis, and aspiration. Despite these complications, all children had a good outcome with supportive care alone.

5. Rapid Diagnosis of Poisonous Snakebites

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Background: The clinical diagnosis of snakebite is critical and necessary in the world where poisonous snakebites are important for public health such as in Southeastern Asia. It is difficult to define a poisonous snakebite only by overlapping clinical manifestations. Developing a quick and reliable method to identify the responsible snake seems to be sensible. *Methods:* We develop a kit with immunochromatographic method for the rapid detection of cobra venom *(Naja atra*) in human serum. On nitrocellulose membranes, the test line was made with 1 mg/mL duck polyclonal antibody solution and control lines with goat anti-rabbit immunoglobulin antibody solution 0.5 mg/mL. The colloidal gold was conjugated with rabbit polyclonal anti-cobra antibodies. *Results:* This kit can detect the cobra venom in plasma samples in 20 min. The detection limit of the assay is 5 ng/mL. From July 2007 to June 2008, 15 serum samples of snakebites (seven cobra and eight others) were tested. The sensitivity of strip based on the enzyme-linked immunosorbent assay (ELISA) is 88.9%, and specificity 100%. Negative cross-reactivity with the cobra strip was noted while tested with non-cobra venoms. The strips can be stored at room temperature and available up to 1 year. *Conclusion:* Immunochromatographic strip might be suitable for venom detection and could be used as a rapid assay tool in cases of poisonous snakebite. More investigations are needed for clinical applications.

6. Legislation and Acetaminophen Overdose in a UK Hospital 2000–2008

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Background: Acetaminophen (paracetamol, APAP) continues to be a major drug used in self-harm. The UK government restricted pack size of APAP in 1998 and withdrew APAP-propoxyphene (co-proxamol) in 2005 as harm reduction strategies. We report patterns of self-harm overdose (OD) 2000–2008 for APAP, APAP-opioid combinations and ibuprofen (IBU), for a large UK hospital with a stable catchment of 500,000, a single ED and a consistent admissions policy. *Methods:* Presentations were analysed retrospectively for APAP – containing and IBU ODs between 2000 and 2008. Those for opioid-containing APAP preparations were compared with APAP alone. *Results:* Twenty one thousand six hundred and five OD admissions were recorded, APAP in 9,436, and IBU in 1,967. APAP and IBU ODs increased from 2000 to 2008 (APAP 25–38%, IBU 6–13%). APAP-codeine combinations increased annually (116–336, r = 0.91); APAP-propoxyphene and APAP-dihydrocodeine decreased (154–12, r = -0.96; 57 and 33, r = -0.85 respectively). Females predominated for all APAP drugs (f:m ratio 1.7), particularly under the age of 50 years. Sixty-two percent of APAP-alone ODs were ≤30 years. Over 30 years APAP-opioid combinations predominated (>30 years 63% APAP-codeine; 68% APAP-propoxyphene; 65% APAP-dihydrocodeine) There were 20 APAP-related deaths, of which 17 were attributable to APAP (death rate 0.18%). Patients who died were older (mean 50 vs. 34.3 years for all APAP) and presented late (>24 h). *Discussion:* These data show: 1) increasing APAP use in self-harm despite pack-size restriction; 2) increased IBU admissions indicating the importance of simple analgesic OD; 3) APAP-opioid use increased over time and with age, likely driven by prescriptions. *Conclusion:* APAP-containing ODs in UK remain substantial. In 2008 over 30% of APAP related ODs to our hospital involved compound products with opioids, APAP-codeine predominating. APAP pack-size restriction has not reversed trends in APAP OD in UK. In contrast, restrictions on APAP-propoxyphene prescribing have been effective.

7. Ionized Calcium as a Predictor of Mortality and Severity in Poisoning Patients

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Background: Ionized hypocalcemia is a common finding in critically ill patients, but the relationship between ionized hypocalcemia and mortality risk in poisoning patients has not been well established. The aim of this study was to assess the usefulness of initial ionized calcium (iCa) in predicting mortality in the poisoning population, and evaluate its superiority over the three other triage tools: Base deficit, Glasgow Coma scale (GCS), and Poisoning severity scoring system. *Methods:* A pro- and retrospective study was performed on 154 consecutive poisoning patients admitted to our Emergency Medical Center from July to December 2009, who underwent arterial blood gas analysis. Arterial blood gas, complete blood cell count, GCS score, and vital signs were measured to obtain iCa, base deficit, APACHE II score, and PSS. All the above factors were evaluated to be associated with fatal outcome. *Results:* Multivariate logistic regression analysis confirmed iCa (≤3.9 mg/dL), low Glasgow coma scale score, and a large ingestion amount to be significant risk factors associated with mortality ($p < 0.05$). On ROC curve analysis, the iCa cut-off point for fatality prediction was 3.915 mg/dL. The sensitivities of iCa, GCS, base deficit, and APACHE II were 80.0, 76.4, 73.3, and 76.5%, and their specificities were 68.2, 64.1, 72.7, and 60.9%, respectively. Receiver operating characteristic curve analysis determined the areas under the curves of these parameters to be 0.729 ± 0.094, 0.603 ± 0.100, 0.724 ± 0.090, and 0.826 ± 0.068, respectively (95% confidence interval). *Conclusion:* The initial iCa (≤3.9 mg/dL) was confirmed as a significant risk factor associated with fatal outcome in acute intoxicated patients, it exhibited better for mortality prediction than other predictors.

	Matched (n = 1,769) (95% CI)	Unmatched (n = 5,789) (95% CI)
Mean LOS (days)	2.54 (2.39, 2.69)	3.48 (3.35, 3.62)
Median LOS (days)	2 (1, 2)	2 (1, 2)
Mean charges	$11,385 (10,681, 12,089)	$14,076 (13,515, 14,637)
Median charges	$7,312 (6,994, 7,570)	$8,425 (8,203, 8,626)

8. Poison Center Consultation Decreases Hospital Length of Stay and Inpatient Charges

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Background: The ability of poison centers to greatly reduce health care costs in the outpatient setting is well documented. Patients admitted to health care facilities account for an increasing fraction of the approximately 44,000 annual human exposure calls to the Wisconsin Poison Center (WPC). Our hypothesis was that poison center consultation for hospitalized patients would result in significant decreases in both hospital length of stay (LOS) and charges over a one year period for poisoned or potentially poisoned patients in Wisconsin. *Methods:* Probabilistic matching was completed using cases in the WPC's database and inpatient hospitalization records from the Wisconsin Hospital Association (WHA). Matched cases were those that occurred from October 2007 through September 2008 and had both a consultation with WPC and admission to an inpatient setting with an external cause of injury code (E code) of poisoning. Unmatched cases were those inpatient hospitalizations for poisoning that had no record of WPC consultation. Mean and median LOS and charges were compared between the matched cases and those cases without WPC consultation. *Results:* These differences were consistent within all age groups. The most significant improvement in LOS was in 6–18-year-old patients, and the greatest monetary savings was in adults. The data presented do not include those cases with E codes for adverse drug events (ADEs). Including ADEs resulted in even more profound reduction in LOS and charges, but these do not likely reflect poison center contribution alone.*Conclusion:* Even without including ADEs, significant improvements in LOS and decreased hospital charges were found when the WPC was consulted. Poison center involvement in hospitalized cases would potentially result in a savings of $13.60 in charges for every dollar spent on WPC operations.

9. Prolonged Amitriptyline Toxicity after OD in Previously Undiagnosed Slow CYP2D6 Metabolizer

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A 55-year-old woman was found comatose & intubated. Suicide note claimed ingestion of 99 tabs 25 mg amitriptyline [AMI] & 46 tabs 1 mg alprazolam. In ED, HR normal with SBP's 90s–120s. QRS ranged 118–148 ms with narrowing after IV $NaHCO_3$. GC/MS urine screen positive only for AMI & nortriptyline [NOR]. Total plasma TCA level 7 h after pt found was 1,568 µg/L. Forty-eight hours later, she remained comatose. Brief hypotension with QRS of 130 ms was treated with IV $NaHCO_3$. Serial TCA levels were obtained (Table).

On day 5, she was anticholinergic with delirium & tachycardia after withdrawal of sedation. TCA levels began to decline on day 7; she was extubated on day 11 & discharged on day 13 with a normal ECG & physical

Time from being found	Total plasma TCAs
h (days)	μg/L
7	1,568
59 (2.45)	1,618
132 (5.5)	1,675
149 (6.21)	1,761
173 (7.21)	1,700
197 (8.21)	1,278
221 (9.21)	844

exam. Genetic testing showed her to be a poor CYP2D6 metabolizer, homozygous for the CYP2D6*4 allele. *Discussion:* In pts with large TCA overdoses, neurological & cardiac toxicity generally display rapid onset (within the first 2 h). Total TCA levels peak within the first 24 h in most cases.[1] However, peak levels may be delayed if co-ingestants which delay gastric emptying are present, or in slow hydroxylators. CYP2D6 is partly responsible for metabolism of AMI & NOR. The most common allele responsible for reduced CYP2D6 activity in Caucasians is CYP2D6*4, with homozygotes often lacking CYP2D6 activity. Pts taking TCAs who are homozygous CYP2D6*4 demonstrate >3 times concentration-time curve AUCs & prolonged elimination half-lives. Deficiency of CYP2D6 likely contributed to prolonged elevation of plasma TCA levels in our pt. While CYP2D6-deficient pts have been described who developed toxicity after therapeutic dosing, we couldn't find previous reports describing toxicokinetics after overdose in a deficient pt. *Conclusion:* CYP2D6-deficient pts may experience delayed rise in total [TCA]s & prolonged intoxication. *References:* 1. Spiker DG, Biggs JT. Tricyclic antidepressants: prolonged plasma levels after overdose. JAMA 1976; 236(15):1711–2.

10. Infant Gamma-Hydroxy Butyrate Intoxication: A Case Report

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Background: Gamma-hydroxybutyrate (GHB) is a well-known recreational drug that has also been used for illegal acts of drug-facilitated sexual assault and chemical submission. Unintentional ingestion of GHB has been documented in older children, but intentional GHB poisoning in young infants has not been reported in the literature. We report a case of child abuse in a 2-month-old infant due to intentional GHB poisoning. *Case report:* A 2-month-old female infant presented to the emergency department (ED) with coma and respiratory failure. According to the child's mother, the infant was found to have waxing and waning mental status. She attempted to feed the infant, which resulted in coughing, gagging, and respiratory distress. An ambulance was called and paramedics found the child lethargic, unresponsive, with small pupils. On arrival to the ED, vital signs demonstrated *T* 37.1°C, HR 83/min, BP 83/44 mm HG, RR 4/min, O_2 saturation 97% on RA. The infant had small pupils, absent gag reflex, hypotonia of all extremities, no response to painful stimuli, and a Glasgow Score of 3. Narcan 0.1 mg/kg was administered IV without improvement in mental status or respiratory depression. The infant was intubated without sedatives or paralytics, but received one dose of atropine for bradycardia. Extensive evaluation did not reveal an etiology for the child's condition, including normal head CT scan, lumbar puncture, serum electrolytes, and glucose. Urine drugs of abuse screen, comprehensive toxicology screen, and ethanol were negative. The ED social worker received an anonymous telephone call stating that the infant was given GHB in the bottle to stop her crying. A quantitative serum GHB concentration obtained 5 h from the time of presentation was 240 mcg/mL, consistent with sedation and coma. The infant was admitted to the intensive care unit for mechanical ventilation and supportive care. She awakened and was extubated within 24 h. Child protective services was consulted and the child was removed from the family and placed in protective custody. Further evaluation for child abuse was negative, including a skeletal survey and retinal examination. *Conclusion:* We report a case of child abuse in a 2-month-old infant with an elevated serum GHB concentration due to intentional GHB poisoning.

11. Diethylene Glycol: A Poison Center Review of 10 Years of Pediatric Exposures

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Introduction: Diethylene glycol (DEG), in brake fluid, can cause life threatening renal failure. Less is known about management of DEG as compared to the more commonly encountered toxic alcohols. In 2008, there were 1,292 DEG-related calls to poison centers. One issue that plagues providers is what to recommend for children who ingest small amounts. We report a 10-year poison center review of pediatric DEG exposures. *Methods:* A search was done of poison center cases from January 2000 through January 2010 for patients under 6 years old with oral exposures to DEG of small or unknown volumes. Cases were examined for location, symptoms, labs, treatment, and outcome. *Results:* Eighty-nine cases met initial inclusion criteria; nine were excluded (wrong fluid logged [1]; eye exposure only [2]; amount greater than a taste/mouthful [2]; potentially toxic but follow up not possible due to lack of parent/hospital cooperation [4]). Of the 80 cases left, 49 were observed at home, 23 sent home from the ED and 11 admitted. There were seven transferred to tertiary care. For outcomes, 69 were nontoxic/no effect, 10 minor effects (MiE) and 1 major effect (MaE). Of the MiE five had GI upset alone, one cough/GI upset, two oral irritation, one drowsy, and one eye irritation. The MaE child had cyanosis and AMS, but ingested antifreeze as well. No patients developed renal failure or death. Fomepizole was used in five cases (four no effects, one MiE). Supportive care only was provided in eight cases; the other 67 were observed only. Chem panels were done in 24 cases; all were normal except the anion gap in the MaE case. All 16 serum osmolalities done were normal. The three DEG levels obtained were negative. *Discussion:* Management of children exposed to tastes of DEG is a conundrum for poison centers. It ranges from obs to admission/fomepizole. In 79/80 cases there were no abnormal labs and no more than minor effects. The one variant ingestion included antifreeze. Limits of this data include sample size, retrospective data, and lack of extended follow up. However, this review argues that children with a taste of DEG will suffer no adverse outcomes. A large prospective cohort study would strengthen this conclusion. *Conclusion:* This 80 patient series indicates that children exposed to taste amounts of DEG will not have major adverse effects.

12. Critical Valproate Toxicity Reversed with Hemodialysis in a Toddler

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Background: Traditional teaching is that valproic acid (VPA) is not amenable to extracorporeal removal by hemodialysis (HD), due to its affinity for serum proteins (85–90% bound in therapeutic dosing). However, beyond the therapeutic range, protein binding diminishes (70% when VPA level is 150 μg/mL, 35% at 300 μg/mL). Recent reports suggest that there is a role for HD in VPA poisoning, but few reports document the role of HD for toxicity in children. We report a case of a severely poisoned toddler with multisystem organ failure, who dramatically improved with hemodialysis. *Case report:* A previously healthy 20-month-old female was found unresponsive in her home on the morning after she ingested up to 10 g of VPA. She was endotracheally intubated and brought first to an outside ED, then to our PICU. On arrival, she was hypotensive (BP 68/31 mmHg) with a metabolic acidosis (lactate 4.6 mmol/L) and respiratory acidosis (venous pH 6.99, pCO_2 37 mmHg). Serum VPA was >600 μg/mL. She became hypothermic (34.1°C), hyperammonemic, anemic (Hct 22%), thrombocytopenic (47,000/mm^3), coagulopathic (PT 20 s), hypernatremic (151 mEq/L), and hypocalcemic. Her transaminases (AST 102 U/L), lipase (662 U/L), CK (829 U/L), BUN (31 mg/dL) and Cr (1.06 mg/dL) were all elevated. Approximately 24 h post-ingestion, she underwent 2.5 h of HD, resulting in rapid reduction of her VPA level and improved acid/base status.

	Pre-HD	Immediately post-HD
VPA (μg/mL)	522	227
Arterial pH/serum bicarb (mEq/L)	7.18/10.6	7.29/21
Ammonia (μM/L)	290	20

Pressors were weaned in the hours following HD, and she was awake and extubated 36 h later. All laboratory parameters normalized over the next 48 h. *Case discussion:* This child showed dramatic improvement with removal of VPA in a single session of HD, and prompt resolution of metabolic abnormalities. Her measured VPA half-life of 2 h during HD is comparable with other reports. This is the second documented case of HD for VPA poisoning in a toddler, and the first involving such a gravely ill child. *Conclusion:* Emergent HD should be considered in patients with severe VPA poisoning, especially if associated with acidemia. Whether HD improves outcome more than supportive care alone requires further investigation.

13. Overdose of Rivastigmine Patches Producing DUMBELS Toxicity Treated with Atropine Alone

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Background: Rivastigmine (Exelon™) is a non-competitive, reversible cholinesterase inhibitor approved in patch formulation for the treatment of Alzheimer's and dementia due to Parkinson's disease. The transdermal patch is thought to cause fewer muscarinic side effects and is the first patch treatment approved for dementia. It is a partial agonist at muscarinic receptors, blocks reuptake of 5HT, DA, and NE, inhibits MAO, and may block Na^{2+} and K^+ channels. Toxicity from the application of multiple rivastigmine patches has been described only once and responded to pralidoxime. We report the first case of toxicity from multiple rivastigmine patches requiring atropine for potentially life-threatening muscarinic symptoms. *Case report:* A 71-year-old woman presented to the ED complaining of vomiting, diarrhea, abdominal cramps, weakness and diaphoresis for 1 day. Initial vital signs revealed bradycardia (40–50 bpm) and hypertension (160/105 mmHg). Physical exam revealed an elderly woman who appeared diaphoretic and drowsy, with miotic pupils, hyperactive bowel sounds, generalized 4/5 weakness without fasiculations, and nine rivastigmine patches (4.6 mg/24-h) adherent to her torso. The patches were removed immediately and the skin decontaminated with soap and water. During her evaluation, the patient displayed further decreases in heart rate into the 30s and received atropine 0.2 mg IV, with resultant increase in her heart rate to 100 bpm and improvement in her nausea, vomiting, and diaphoresis. One hour later, the patient developed recurrent cholinergic symptoms as well as bradycardia to the low 40s. A second dose of atropine 0.2 mg IV again increased her heart rate to 70 bpm and improved her GI symptoms and diaphoresis. Plasma cholinesterase was 1,775 IU/L and RBC cholinesterase was 5,936 IU/L; both values were near the lower end of normal reference ranges. The patient was admitted to the ICU for cardiac monitoring, required no further atropine, and was discharged the following day. *Conclusions:* Overuse of transdermal cholinergic medication used to treat dementia may precipitate predominantly muscarinic symptoms that were responsive to

atropine in our patient. Additionally, RBC and plasma cholinesterase levels were not predictive of clinical severity in this case.

14. Massive, Unintentional Pediatric Lamotrigine Overdose Resulting in Seizures

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Background: Lamotrigine (LTG), a phenyltriazine anticonvulsant, has been uncommonly associated with life-threatening toxicity. As its use for bipolar and other off-label use expands however, so does risk for potential poisoning. LTG exposures in patients <5 represent the second largest demographic cohort, yet clinically important overdoses in these patients are infrequently described. We present a rare case of severe LTG toxicity, including multiple seizures, following an unintentional ingestion in a toddler confirmed by LC/MS. We believe this is the highest level reported following an unintentional exposure in a pediatric patient. *Case report:* A 13-month-old female was brought to the ED following a 30 s seizure at home, after ingesting four of her father's 200 mg LTG tablets. Approximately 10 min later she became ataxic and began having tonic-clonic activity. Her medical history was noncontributory. On arrival the child was awake but lethargic. Vital signs were HR 120, BP 92/47, RR 24; O_2 sat of 100%. Physical exam was notable only for nystagmus. Shortly after arrival to the ED, approximately 1.25 h post-ingestion, she was noted to have a 5 min myoclonic seizure that terminated following 1 mg lorazepam. ECG revealed NSR with a QRS interval <100. Labs following the event were all within normal limits with the exception of serum CO_2 18 mmol/L, and glucose, 200 mg/dL. A urine drug screen was negative for all tested substances. CT of the head was normal. The child was admitted to the PICU for observation. The remainder of her stay was uneventful. Serial LTG levels by LC/MS were 31.1 and 18.6 mg/L, drawn 3 and 11.75 h after the ingestion, respectively. *Discussion:* We report the highest LTG level to date following an unintentional exposure in a toddler resulting in serious sequelae. Although LTG was developed as an anti-seizure medication, toxicity has been associated with seizures even in those without underlying seizure disorders, presumably due to its Na-channel effects, although the exact mechanism of toxicity has not been clearly defined. *Conclusion:* Serious LTG toxicity following unintentional exposure may result in seizures even in patients without an underlying seizure disorder.

15. Hypertensive Emergency from Guanfacine Overdose

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Background: Guanfacine is a centrally acting, presynaptic alpha$_2$ agonist that produces decreased central sympathetic outflow. In overdose, guanfacine and drugs in this class usually result in hypotension. In very high doses, all of the centrally acting a_2 agonists may also act at peripheral, postsynaptic alpha$_1$ receptors on vascular smooth muscle, which can result in transient paradoxical hypertension (HTN). *Case report:* A 15-year-old, 72 kg male with ADHD and mild developmental delay ingested 70 tablets of his own medication 5 mg guanfacine but was not suicidal. He had no past history of hypertension and had no other medical conditions. His daily guanfacine dose was 7.5 mg. His mother was certain of the number of tablets in the bottle; he told her he took his medicine "all on his own." He was also on Concerta 36 mg daily but none were missing. He presented within 1 h of ingestion and was found with a BP of 210/111 mmHg. Nitroprusside 1 mcg/kg/min was initiated enroute to a tertiary HCF. The BP normalized in the 100–110 systolic range during transport. After attempting to stop the nitroprusside his BP rose again to 170–180/95 mmHg in the ED. Nitroprusside was restarted at 0.5 mcg/kg/min with BP returning to 144/75 mmHg but this was changed to nicardipine at 0.5 mcg/kg/min in the ICU. On nicardipine his BP was 117/55 mmHg, HR 61 bpm and SpO_2 97% on RA. His CK peaked at 4,057 IU/L; creatinine remained normal at 0.82 mg/dL. The nicardipine infusion ranging from 0.5 to 1.5 mcg/kg/min was used in place of nitroprusside and was required for 17 h for persistent HTN. It was difficult to find a US laboratory to assay for serum guanfacine. A new GC/MS column has been developed; patient samples are being assayed at this time. *Case discussion:* Guanfacine was originally developed as an antihypertensive agent and only rare overdoses have been described. There is an isolated case report of 2-year-old who ingested ~4 × 1 mg guanfacine and developed hypotension (58 mmHg systolic) with a serum level of 39.5 ng/mL. No cases of documented hypertension to this degree have been reported in children. *Conclusions:* Guanfacine in massive overdose may result in significant hypertensive urgency or emergency. Nitroprusside or nicardipine are effective in controlling the hypertension in this setting.

16. Management and Analysis of Insulin Therapeutic Errors Reported to a Poison Center

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Background: Patients with diabetes mellitus now achieve euglycemia with long, short and rapidly acting insulin and home-glucometers. This retrospective study describes Poison Center management and outcomes after therapeutic errors with short/rapid-acting (S/R) insulin. *Method:* Therapeutic insulin errors reported to this Poison Center between January 2000 and September 2009 numbered 718. Of these insulin errors, 404 cases (56%) involved S/R insulin and 216 were identified with adequate documentation. A significant response to insulin in these cases was defined as follows: BG < 70 (N = 39) or a drop of BG > 50 mg/dL (N = 41) or a drop of BG > 58% (N = 77). One hundred and fifty-seven cases met at least one of these criteria. Cases were matched by the initial BG and by the amount of insulin taken, creating seven groups with matching characteristics (~22 in each group). The groups were statistically analyzed for dose-response relationships using Excel®. *Results:* The following table summarizes the S/R insulin doses and blood glucose changes for each of the seven groups. Data includes averages with standard deviation (SD) and r = correlation coefficient (test for linearity).

Outcomes for these 157 cases included 39 (25%) with BG < 70 (range 32–68 mg/dL), nine with BG < 50 and none with coma or seizures. One hundred and thirty-six (87%) were managed at home, usually with food as needed. In 33 cases (21%) other side effects were noted such as irritability, drowsiness, diaphoresis, and nausea. *Discussion:* The linear regression analysis found the best correlation coefficient (r) for the dose of insulin and the magnitude of the BG drop. If this correlation is confirmed in a prospective analysis, the data in this table could be used to estimate the drop of BG from a given S/R insulin dosing error. *Conclusion:* In this series of 157 insulin therapeutic errors with S/R insulin, the poison center successfully managed 87% at home with minimal adverse events, interventions and costs. In this series, dose was linearly related to the absolute drop in blood glucose.

Group	Insulin dose	Lowest BG (mg/dL)	BG drop (mg/dL)	BG < 70
I	75 IU (28)	94 (49) r = 0.56	84 (47) r = 0.72	10
II	50 IU (15)	84 (31) r = 0.72	95 (43) r = 0.67	9
III	55 IU (22)	132 (71) r = 0.69	125 (70) r = 0.65	5
IV	40 IU (16)	115 (58) r = 0.48	130 (73) r = 0.84	6
V	34 IU (10)	118 (57) r = 0.46	139 (71) r = 0.64	5
VI	29 IU (9)	142 (53) r = 0.24	168 (74) r = 0.76	1
VII	14 IU (8)	166 (113) r = 0.70	144 (66) r = -0.05	3

17. Zidovudine-Associated Elevated Lactate Concentration in a Neonate Following a Dosing Error

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A 3-day-old, 3 kg, formula-fed, boy presented from home to the ED 10 h after the most recent of two 10-fold errors in zidovudine administered by his mother. The neonate was born to an HIV-positive mother who has been receiving zidovudine for 9 weeks prior to birth. He was supposed to receive 2 mg/kg zidovudine po q12 h since birth (12 mg/day). Instead, he received a total of 120 mg of zidovudine during the 24 h prior to admission. Initial vital signs were: HR, 161/min; *T*, 99.4F; RR, 48/min; SpO_2, 98% RA, blood pressure was not obtained. The physical examination was normal. Initial laboratory analysis was significant for the following values: venous lactate concentration, 5.6 mg/dL; anion gap of 19 mEq/L; and a venous blood gas, 7.39/47/26/28. The neonate received 12 mL/h of D5 $^1/_4$ NS; repeat venous lactate decreased to 2.3 mg/dL within 12 h, and arterial lactate decreased to 1.5 mg/dL within 24 h. There was a 5-h episode of sinus bradycardia to 90/min during the initial 12 h of hospitalization, which resolved spontaneously. He was restarted on zidovudine within 24 h of discontinuation and continued to be clinically stable on 12 week follow up. Zidovudine is a nucleoside analog reverse transcriptase inhibitor, which inhibits DNA polymerase γ, and decreases production of mitochondrial DNA electron transport proteins. This latter effect leads to energy failure and an accumulation of lactate. There is limited information regarding elevated lactate in neonates with zidovudine administration errors. Case reports of 10-fold zidovudine overdose for 6–20 days in 10–35-day-old neonates/infants demonstrated no sequelae. Although the 3-day-old neonate developed an elevated venous lactate concentration, he remained clinically stable during hospitalization. It is unclear if the episode of sinus bradycardia was related to the ingestion, and it remains a concern. Acute zidovudine overdose in neonates may lead to a transient elevation in lactate.

18. Death and Liver Injury Following Repeated Acetaminophen (APAP) Ingestions by Children

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Background: While death from therapeutic APAP doses has not been reported in prospective studies there are retrospective reports describing fatalities following APAP administration with therapeutic intent, but not necessarily at therapeutic doses. This has resulted in confusion related to the safety of APAP in children. We characterized cases of clinically significant hepatic events following administration of multiple APAP doses. *Methods:* Retrospective cohort study of children <6 years with ALT >100 IU/L or death following >1 APAP dose. We excluded cases with insufficient information to determine dose and outcome (serum ALT, reported liver failure or death). Data sources were NPDS, FDA/AERS, medical literature and manufacturer

internal safety reports. Cases were abstracted and reviewed by a five member expert panel to determine relationship of the hepatic event or death to APAP, the estimated APAP dose based on the reported dose and assessment of objective support for the dosing history (e.g. serum APAP concentration). *Results:* A total of 2,531 cases were reviewed and 146 unique cases met inclusion criteria with sufficient information. One hundred and two (70%) were rated as at least potentially related to APAP; 60 (40%) were <1 year and 37 (36%) were male. There were 26 deaths; 10 (38%) were <1 year and 9 (35%) male. Dose was therapeutic (<75 mg/kg/day) in 6 (6%) cases. Age range for therapeutic cases was 3 months to 4.5 years. The reported range of therapeutic doses was 23 mg/kg/day × 2 days to 60 mg/kg/day × 11 days. The lowest fatal dose where the dose history was consistent with other clinical information was 100 mg/kg/day. *Conclusions:* This study was limited to reported cases with sufficient information and dosing information and may be subject to recall bias. Given the vast experience with APAP in children, reported ALT elevation in children given doses of <75 mg/kg/day of APAP is an extremely rare event. No deaths were attributed to therapeutic APAP doses. While our methodology may fail to detect some cases with asymptomatic ALT elevation, it is unlikely to miss deaths. Safety efforts should be directed at preventing inadvertent APAP overdose in children.

19. Status Epilepticus in a Child Secondary to Ingestion of Skin-Lightening Cream

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Introduction: Hydroquinone (HQ) toxicity has been described most commonly following exposure to photo development chemicals. In this report we describe a rare case of pediatric HQ poisoning after ingestion of a cosmetic product. *Case report:* A 19-month-old African American male was witnessed by his parents drinking from a small container of a skin lightening lotion (active ingredient hydroquinone 2%). Volume ingested was unknown but the 500 mL bottle had minimal contents remaining. Within 15 min the patient exhibited tremors, left gaze deviation and tonic-clonic seizure activity per witnesses. EMS gave 2.5 mg IV diazepam on arrival at the scene. At presentation to the local ED, the child had continuous seizures with a respiratory rate of 80 bpm. The patient underwent rapid sequence intubation and given 20 mg/kg of IV fosphenytoin. He was then transferred to the pediatric ED of a regional, tertiary care center. Immediately after arrival, the patient had an additional tonic-clonic seizure and was given 0.5 mg IV lorazepam. Seizures were successfully terminated following a loading dose of 20 mg/kg IV phenobarbital. Initial labs were unremarkable except for metabolic acidosis and mild transaminitis. A non-contrast head CT was normal. The child was admitted to the pediatric ICU for further management. On hospital day 2, the patient's EEG showed generalized slowing but no seizure activity, and he was extubated. Mental status continued to improve with no further seizures; anticonvulsants were discontinued. Metabolic acidosis and transaminitis resolved and he was transferred to the pediatrics ward on hospital day 3. He was discharged on hospital day 4 with residual incoordination and ataxia. *Discussion:* HQ poisoning is associated with tremor, seizures and coma. Headache, vomiting and tachycardia are also reported. There are no prior reports of HQ toxicity from cosmetic product ingestion. Clinicians should be aware of both the potential toxicity following exposure and the need for aggressive treatment in symptomatic patients.

20. Has One Pill Killed? A Review of AAPCC Pediatric Fatality Data

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Background: According to the 2009 American Association of Poison Control Centers (AAPCC) annual report, 51.8% of all exposures are in children <6 years of age.

Most common pediatric fatalities 1999–2008

Agent	Total (%)
Prescription opioids[a]	21
Carbon monoxide	17
Hydrocarbons	7.5
Analgesics[a]	5.6
Cardiovascular[a]	4.9
Anticholinergics	4.5

[a]On composite list.

Several authors have proposed lists of substances that could be fatal in children at low doses. These lists have not been systematically validated and largely ignore non-pharmaceutical agents. Our aim was to determine which poisons have resulted in deaths in children <6 years of age reported by AAPCC. *Methods:* AAPCC annual reports from 1999 to 2008 were reviewed and all fatalities in children <6 years of age were included in analysis. Age, poison, route of exposure and intent of exposure were abstracted. When more than one class of poison was reported, the published death abstract was reviewed to determine the substance most likely responsible for the death. Agents responsible for deaths were cross-referenced with a composite list of 11 poisons (tricyclic antidepressants, antipsychotics, quinine/quinidine, calcium channel blockers, opioids, oral hypoglycemics, camphor, clonidine/imidazolines, diphenoxylate/atropine, salicylates, and toxic alcohols) gathered from three review articles of agents theoretically able to kill in low doses. *Results:* A total of 267 fatalities were included. The median age was 1.8 years (IQR 1,3). Most (63%) of the fatalities involved pharmaceutical exposures (see Table). Agents on the composite list of deadly poisons were associated with 29% of the deaths. Quinine/quinidine, camphor and oral hypoglycemics were not responsible for any deaths. Hydrocarbons, analgesics and anticholinergics were common, but noticeably absent from the composite list. The most common reasons for exposure were unintentional (65%), therapeutic error (17%) and malicious (13%). *Conclusions:* Prescription opioids and carbon monoxide were the most common reported fatal exposures in children <6 years of age. While it is still important for physicians to recognize which agents can be harmful in children at low doses, those agents are not responsible for the majority of deaths reported to poison centers.

21. What Do You Mean I'm Not Supposed to Swallow SPIRIVA?

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Introduction: SPIRIVA HandiHaler (tiotropium bromide inhalation powder) is indicated for the long-term, once-daily, maintenance treatment of bronchospasm associated with chronic obstructive pulmonary disease (COPD), including chronic bronchitis and emphysema. SPIRIVA HandiHaler consists of a capsule dosage form containing a dry powder formulation of tiotropium intended for oral inhalation only with the HandiHaler device. Each light green hard gelatin SPIRIVA capsule contains 18 mcg tiotropium. The dry powder formulation within the SPIRIVA capsule is intended for oral inhalation only. SPIRIVA was FDA approved for use in February 2004. In 2008 the FDA issued a public health advisory recommending thorough education for patients prescribed SPIRIVA as a result of reports of the capsules being ingested. *Methods:* Five years of Louisiana Poison Center data from 2005 to 2009 were analyzed to determine the number of cases where SPIRIVA capsules were ingested. Cases involving the correct route of administration were excluded. *Results:* Four hundred and eleven cases were identified during the period 2005–2009. In 334 cases the caller stated they knew how to use the medication correctly but had become confused or distracted and ingested the capsule, often at the same time as their other medications. In the remaining 77 cases the caller stated that they thought the medication was intended to be ingested. The average age in these cases was 62. In 392 cases there were no effects noted. In 19 cases minor effects were noted including nausea, vomiting, tachycardia, agitation, dry mouth, abdominal pain, and anxiety. No effects were coded as lasting longer than 8 h. *Conclusion:* The number of cases of ingestion of SPIRIVA capsules reported to the Louisiana Poison Center has increased each year since it was approved for use. While ingestion of a SPIRIVA capsule is of minor consequence, healthcare providers need to provide education to patients to make sure that they understand and can demonstrate proper use of SPIRIVA capsules and the HandiHaler delivery device. The makers of SPIRIVA capsules might consider designing the capsule to make it much more conspicuous, possibly alerting the patient that the capsule is unique and should not be ingested.

22. Pediatric Chewing Tobacco & Snuff Exposures: 2000–2009

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Background: Tobacco exposures in the pediatric population pose a poison center (PC) management dilemma. These highly accessible adult products often come in attractive non-child resistant packaging. Little data is available on outcomes of children exposed to chewing tobacco or snuff. We sought to characterize the frequency of these exposures and the associated morbidity. *Methods:* We accessed National Poison Data System (NPDS) aggregate data human single substance exposures by year from 2000 to 2009 using AAPCC Generic Codes 0201057 (chewing tobacco) and 0201058 (snuff). Case counts for all human exposures and for children <6 years were obtained. Further descriptive data for children <6 years were examined (route, reason, healthcare facility management and medical outcomes). Calls over time for each measure were examined using regression (versus time) for linear and logarithmic (proportional) models to calculate % increase/year and 95% confidence intervals using SAS JMP v 6.0.0. *Results:* Ten thousand eight hundred and thirteen human exposures were identified and 9,610 (88.9%) of these were children <6 years old. Ingestion was the most common exposure route for both substances in all years (99.2%). Almost all exposures (99.8%) were unintentional. Over a quarter of cases (26.9%) were managed in a healthcare facility.

There were no deaths. The most common reported outcome was "No Effect" (34.9%). Chewing tobacco exposures are increasing at >5%/year and accounts for most of the 3.48%/year increase in the total. The

Table. Tobacco exposures for children <6 years old from 2000 to 2009

	Outcome							Increase [95% confidence interval] (%/year)
	No effect	Minor	Moderate	Major	Death	Other	Total cases	
Chewing tobacco	2,065	1,911	141	2	0	1,880	5,999	5.05 [1.97, 8.13]
Snuff	1,288	1,145	91	2	0	1,085	3,611	0.895 [-1.71, 3.50]
Totals	3,353	3,056	232	4	0	2,965	9,610	3.48 [1.78, 5.18]

number of exposures in 2009 were 785 for chewing tobacco and 423 for snuff. *Conclusion:* Ten years of NPDS chewing tobacco and snuff exposure data revealed these nicotine products as a predominately pediatric exposure phenomenon. No deaths and very few major outcomes were observed. PCs may use this data to conclude that home management is usually appropriate. Further study is indicated to determine dose response.

23. Amoxicillin Renal Toxicity: How Often Does It Occur?

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Background: Although considered a relatively safe antibiotic when taken in supratherapeutic amounts, there are isolated pediatric overdose cases associated with renal complications. Reported symptoms include anuria, hematuria and dysuria. To determine the incidence of renal symptoms associated with amoxicillin, a retrospective review of exposures to amoxicillin in children less than 6 years of age as reported to National Poison Data System (NPDS) over a 5 year period was done. *Methods:* All ingestions involving amoxicillin without co-ingestants in humans less than 6 years of age reported to the NPDS from 2004 to 2008 were analyzed. Data included age, gender, management site, outcome, symptoms, amount ingested, certainty of amount, chronicity, weight and therapy. The study was IRB approved. Descriptive statistics were used to characterize the data. *Results:* Fourteen thousand seven hundred and seventeen cases were identified. Ages ranged from 2 days to 5 years. Related renal symptoms occurred in five patients (0.03%). These included urine color change in four patients, oxalate crystals in one, and an increased serum creatinine in one. Thirteen thousand six hundred and fifteen (92.5%) of the patients were managed at home, 815 (5.5%) were treated in a health care facility (HCF), 86 (0.6%) were treated at other sites and 201 (1.4%) were treated at an unknown location. In 1,687 (9.6%) patients the total mg amount was documented and the median amount ingested was 1,000 mg. In patients where a known mg amount was documented along with the child's weight (1,356), the median amount ingested was 82.6 mg/kg. In this group 213 ingested greater than 250 mg/kg (R 251.4–1,531.1 mg/kg; median 366.5 mg/kg). Treatment sites for this group included: managed at home 129 (60.6%), 63 (29.6%) treated and released from a HCF, 2 (0.9%) were admitted to non critical care, 7 (3.3%) of the patients refused a referral to a HCF, 9 (4.2%) were lost to follow-up and 3 (1.4%) patients were managed at other sites. Only one patient in this group developed renal symptoms (urine color change and oxalate crystals) with an ingested amount of 8 g (588 mg/kg). Within this group, 94 patients (44.1%) were followed to a definitive outcome: 77 (81.9%) had no effect, 15 (16.0%) had minor symptoms and 2 (2.1%) had moderate symptoms. *Conclusion:* Although renal toxicity may occur with amoxicillin ingestions, it is rare and does not appear to be dose-related.

24. Asymptomatic Acute Aspirin Overdose

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Background: Acute aspirin overdose presents initially often with diaphoresis, nausea, vomiting, hyperventilation, and tinnitus and may progress towards lethargy and coma.[1] Hyperpyrexia, cardiovascular collapse, renal failure and respiratory failure can occur in severe cases.[2] Common laboratory abnormalities include respiratory alkalosis, anion gap metabolic acidosis and hypoglycemia.[2] *Case summary:* We present a case of an asymptomatic aspirin overdose with substantially elevated salicylate levels. A 71-year-old man reported ingesting 100 tablets of 325 mg of aspirin intentionally. About 3 h after ingestion, his salicylate level was 38.8 mg/dL. At 5 h post-ingestion, his peak salicylate level was 59.5 mg/dL. The salicylate level remained supratherapeutic for 33 h post-ingestion. During that time, the patient did not develop diaphoresis, nausea, vomiting, tachypnea, or tinnitus. The patient did not develop laboratory abnormalities consistent with salicylate toxicity. He was treated with a sodium bicarbonate infusion and subsequently transferred to inpatient psychiatric care. *Results:*

Time since ingestion	Salicylate level (mg/dL)	Anion gap
2 h 45 min	38.8	15
5 h 15 min	59.5	12
7 h	56.8	11
13 h	53.1	
18 h	47.1	
20 h 15 min	47.0	
22 h 15 min	42.9	
24 h 15 min	40.4	16
27 h 30 min	34.6	
30 h	32.8	14
33 h 30 min	29.8	

Conclusion: This case exemplifies the need to perform serial salicylate levels in cases of intentional overdose of aspirin. Clinical symptoms may not correlate with salicylate levels. Our patient did not exhibit any clinical or laboratory signs of toxicity. Aspirin also may have delayed absorption by the development of bezoars.[3] Salicylate levels that do not trend downward after peaking, such as the levels in our patient, may reflect ongoing absorption from a bezoar. For these reasons, serial salicylate levels should be followed in cases of intentional overdose with aspirin until the levels are therapeutic and the patient is not exhibiting signs of toxicity.

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25. Negligible Initial Salicylate Concentrations: Are They Inconsequential?

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Background: Patients with salicylate (ASA) poisoning require serial concentrations to determine ongoing absorption and monitor toxicity. Initial ASA levels which are "negligible" are not always repeated due to the belief that an ingestion has been excluded or is unlikely to become clinically relevant. We report 13 cases where initial (ASA) concentrations of 10 mg/dL or less (considered "undetectable" in many institutions) eventually rose to levels necessitating toxicologic attention. *Methods:* Illinois Poison Center charts for the period July 1, 2004 through December 31, 2009 were reviewed to identify cases with ASA concentrations greater than 30 mg/dL at any time. Cases with initial ASA concentrations of 10 mg/dL or less were further examined to detail the highest ASA concentration recorded, coingestions, treatments [activated charcoal (AC), urinary alkalinization (HCO_3), and/or hemodialysis (HD)], and outcome. *Results:* Of 351 total ASA cases, 13 cases had an initial ASA concentration of 10 mg/dL or less which increased to >30 mg/dL during the hospital course. One patient with two negative ASA levels developed tinnitus and vomiting after being transferred to the psychiatric ward and had an ASA level of 54.8 mg/dL. Two were hemodialyzed, one of whom was intubated and died. Characteristics of the remaining 10 cases are shown in Table. *Discussion/conclusions:* Due to erratic absorption, a rise in serum concentration may be delayed following negligible initial ASA levels. Repeated measurements may be necessary, depending on presentation time, history and suspicion for poisoning, and coingestions. Salicylate poisoning, like carbamazepine and valproic acid, warrants timely reassessment including repeat laboratory analyses to assess ongoing absorption. Although uncommon, "negligible" initial levels have the potential to rise to concentrations high enough to require intervention and to even result in mortality.

Table for Abstract 25

No	Age/Sex	First [ASA] mg/dL	Highest [ASA]	Coingestions	Treatments	Lived
1	45 F	10	36.6	N	AC/HCO_3	Y
2	38 M	8.1	39	Y	MDAC/HCO_3	Y
3	19 M	10	45	N	HCO_3	Y
4	14 F	<4	43	Y	AC/HCO_3	Y
5	15 F	Neg × 2	54.8	N	MDAC/HCO_3	Y
6	46 F	4.3	36	N	MDAC	Y
7	30 F	9.8	44.3	N	MDAC/HCO_3	Y
8	14 F	<4	99.1	Y	AC/HCO3/HD	Y
9	27 F	4	76	N	MDAC/HCO_3	Y
10	21 F	8.1	56.3	Y	HCO_3	Y
11	57 F	<4	39.2	Y	AC/HCO_3	Y
12	42 M	1.5	123	Y	MDAC/HCO_3/HD/Intubation	N
13	15 M	6.1	40	N	HCO_3	Y

MDAC, multiple dose AC.

26. Baclofen Overdose Mimicking Brain Death

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Background: Guidelines for the determination of brain death have been promulgated. Their use in patients with coma from drug overdose must be done cautiously. We report a case of baclofen overdose that appeared to fulfill criteria for brain death and who subsequently aroused as organ procurement plans were in progress. *Case report:* A 40-year-old female was found by her family unresponsive after a reported overdose of baclofen. After no response to naloxone she was intubated. Upon hospital arrival vitals signs were; BP 113/85, *P* 68, no spontaneous respirations, and *T* 94.1°F rectally. Glasgow Coma Scale was 3 with fixed dilated pupils, absent corneal and ocular reflexes and flaccid extremities. Cardiac, lung and abdominal examination was normal. Laboratory testing showed no anion gap, a normal glucose and no ethanol or acetaminophen. Urine toxicology screening was positive for opioids and benzodiazepines. EKG was sinus. CT of the brain was normal. The patient was rewarmed with a Bair Hugger. An EEG on hospital day (HD) 3 showed occasional disorganized activity on an otherwise flat background. On HD 4 the patient remained comatose and neurology consultation found the patient to have weak inspiratory effort after 5 min of apnea. Although brain death criteria

were not met, the prognosis was felt poor and plans were made for withdrawal of support and organ donation. The next day, with organ procurement imminent, the patient spontaneously opened her eyes. There was progressive improvement and her recovery was uncomplicated other than a period of delirium. *Case discussion:* This case highlights the perils of brain death determination after drug overdose. In overdose, uncomplicated by cardiorespiratory arrest, the potential for recovery despite (near) fulfillment of brain death criteria is highlighted by this case. Baclofen, a γ-amino butyric acid agonist, may result in profound coma and has previously been reported to mimic brain death. Additionally, strict adherence to brain death guidelines were not followed with this patient and she came perilously close to organ harvest. *Conclusion:* Brain death criteria should be applied cautiously in cases of drug intoxication uncomplicated by trauma or hypoxia. An adequate period of supportive care to allow clearance of the suspected drug should be provided.

27. Large APAP OD with Fixed Pupils, Optic Pallor, Massive Lactic Acidosis, Elevated Lactate/Pyruvate Ratio, and Hyperalaninemia with Full Recovery and Minimal Hypertransaminasemia

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Background: Massive APAP overdoses cause early lactic acidosis and coma that are poorly understood. We present a large APAP ingestion with early fixed, dilated pupils, optic pallor, and refractory lactic acidosis in whom we measured organic and amino acids to characterize the acidosis. *Case report:* A 19-year-old man was found comatose & later volunteered ingestion of APAP ~7 h before being found. BP 105/50, *P* 80, *T* 33°C, RR 18, Sat 98% on 100% NRB, GCS 3, fixed mydriasis. Glucose 350 mg/dL; anion gap >45; Cr 1.5 mg/dL; EtOH 0.148%; APAP 600 µg/mL (~8 h post ingestion); & after 100 mEq $NaHCO_3$ IV, art pH 6.86, pCO_2 18, PO_2 244. NAC & $NaHCO_3$ drips were begun before transfer to us, and hypotension was treated with a NE drip. On arrival ~13.5 h post ingestion: BP 108/35; *P* 98; on vent, sats 100%; pupils fixed at 9 mm with optic pallor and only one small vessel branch seen in one eye; APAP 602 mg/L. Urine GC & GCMS showed only APAP, EtOH, nicotine, and caffeine; no quinine. MeOH, EG, & salicylate were negative. Echo showed good LV function; ECG with sinus rhythm, QRS 110 ms. Repeat boluses of $NaHCO_3$ and $NaHCO_3$ drip were given for severe acidosis, and after 13 amps (50 mEq each) over ~4 h, pH 6.86, PCO_2 36. Plasma organic & amino acids: lactate 35,801 µmol/L, pyruvate 784 µmol/L, & alanine 853 µmol/L (nl 200–483), with L/P ratio = 45.7. CVVH was begun for refractory acidosis. Twenty-eight hours post ingestion while on CVVH, acidosis had resolved, he had awakened, was extubated and conversed appropriately. IV NAC was given for 2 days with peak AST 65. He was discharged with full recovery and normal funduscopic exam. *Discussion:* Fixed mydriasis with optic pallor were unexplained by a temp of 33°C and have not been previously reported in this setting. The extremely elevated L/P ratio suggests impaired mitochondrial oxidative function, and the elevated alanine level suggests possible induced inhibition of the pyruvate dehydrogenase/decarboxylase complex. 5-oxoproline was not detected, but urine testing is more sensitive. *Conclusion:* Lactic acidosis after massive APAP ODs may represent mitochondrial toxicity, and possible impairment of the PDH/PDC complex. Previously unreported fixed mydriasis with optic pallor associated with APAP toxicity were reversible.

28. Georgia Awash in "Detergent Suicides:" A Case Series of Hydrogen Sulfide Suicides

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Background: Hydrogen sulfide (H_2S) is a somewhat rare but well recognized occupational and industrial hazard and is a cause of substantial morbidity and mortality. Typical occupational scenarios involve exposure to high concentrations of H_2S gas released from petrochemical plants, sewers, volcanoes, or manure pits. Fatalities of workers and rescuers involved in these incidents have been reported. Fatal intentional exposures have not been described in the US; however, suicides utilizing H_2S have been described in Japan since 2007. These suicides have been dubbed "detergent suicides" by the media because they are carried out by mixing household chemicals (often toilet bowl cleaner as a source of hydrogen and insecticides as a sulfur source) to produce toxic concentrations of H_2S gas. We report the first two cases of suicide by inhalation of H_2S gas in the US. *Case series:* The first case was a 23-year-old male found deceased in his car December 23, 2008. He was wearing goggles and left a note on the window warning first responders of a chemical suicide within the vehicle. Two buckets of yellow substances were found on the rear seat and later identified as household products (muriatic acid and lime sulfur spray) that when mixed produced fatal concentrations of H_2S gas. Autopsy revealed no signs of foul play, but noted that the victim's brain was discolored dark green. The second case was a 22-year-old male found deceased in his car December 15, 2009. A note on the window warned rescuers, "H_2S Suicide. Do not open!" Containers of lime sulfur spray and toilet bowl cleaner were identified in the vehicle. HazMat teams were activated in both instances to assist in the extrication of the victims and assess air quality at the scene. *Discussion:* H_2S suicides are relatively common in Japan following their popularization as a means of suicide on websites (which include a printable sign to notify first responders of the toxic atmosphere inside). This "detergent suicide" trend may be catching on in the US, and fatalities may increase as H_2S suicides are popularized in media coverage of these deaths. Furthermore, suicide by means of homemade H_2S gas may represent a novel risk to first responders attempting to extricate patients from a toxic environment.

29. A Case Report of Intentional Cevimeline Ingestion

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Background: Cevimeline (Evoxac®) is an oral muscarinic agent recently approved for the treatment of xerostomia in Sjogren's syndrome. Its toxicity in overdose has not been previously reported. We describe a patient who intentionally ingested approximately 10 mg/kg of cevimeline. *Case description*: A 47-year-old female presented to the ED nausea and vomiting. Her past medical history was significant for depression. She admitted to ingesting twenty 30 mg cevimeline tablets (10 mg/kg) 1 h prior to arrival to the ED. The patient obtained cevimeline from her friend. On presentation to the ED, her vital signs revealed a heart rate of 94 beats/minute; blood pressure of 102/60 mmHg; respiratory rate of 20 breaths/minute; temperature 98.6; and a oxygen saturation on room air of 98%. She was somnolent, but arousable to voice and commands. She was extremely diaphoretic, but had no sialorrhea, lacrimation, or bladder or bowel incontinence. The patient's laboratories were significant only for a mild leukocytosis and hypokalemia. Her salicylic acid and acetaminophen levels were undetectable. In the ED, the patient received ondansetron and activated charcoal. She was admitted to telemetry, where she remained normotensive and never exhibited any dysrhythmias. Her symptoms fully resolved during her inpatient hospitalization. She did not exhibit any delayed effects of the ingestion. *Discussion:* Cevimeline is a quinuclidine derivative of acetylcholine that directly stimulates muscarinic M_3 receptors in the salivary glands. It is currently indicated for the treatment of symptoms of dry mouth in patients with Sjogren's syndrome. The presentation of this patient is likely due to cevimeline's direct stimulation of M_3 receptors located at effector organs of the parasympathetic system. Signs and symptoms of an acute intoxication may include vomiting, diarrhea and abdominal cramping due to increased peristalsis, bronchorrhea, wheezing, excessive salivation, sweating, and urinary incontinence. Bradycardia, hypotension, bronchospasm, and miosis have also been observed. Because cevimeline has specificity for M_3 receptors on salivary glands, it is likely to exhibit fewer cardiac side effects, usually associated with M_2 receptors. *Conclusions:* We describe the first documented cevimeline overdose.

30. Delayed Peak Salicylate Level Following Intentional Overdose

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Background: Because of potential delayed absorption after aspirin ingestion, it is common to obtain more than one screening blood level to rule out significant overdose. We report a case with peak salicylate level 28 h post-ingestion (PI) and delayed, severe toxicity despite two initial sub-toxic levels. *Case report:* A 13-year-old male ingested unknown amounts of 81 mg enteric-coated aspirin, ibuprofen-diphenhydramine combination and losartan. Initial salicylate level 2 h PI was undetectable (<4 mg/dL). Electrolytes, glucose, renal function and blood gas analysis were normal. Approximately 2.5 h PI, he became agitated and hypotensive (62/40 mmHg) requiring intubation, fluid resuscitation, vasopressor therapy and transfer to an ICU. Salicylate on arrival to the ICU (6.5 h PI) was 6.7 mg/dL. Acid-base status was normal. Vasopressors were weaned rapidly and he was extubated 15 h PI. After extubation, vital signs were normal and he was oriented and ambulatory, allowing transfer to a ward bed with regular diet. Twenty-four hours PI, he became acutely confused and diaphoretic. Vital signs: temp – 100.6°F; pulse – 112 bpm; blood pressure – 65/41 mmHg; and respiratory rate – 33 bpm. Repeat salicylate 24 h PI was 95.1 mg/dL. Blood gas showed a mixed acid-base disorder (pH – 7.49; pCO_2 – 19 mmHg; and bicarbonate – 15 mEq/L). Alkalinization and emergent hemodialysis (HD) were recommended. Immediately prior to HD (28 h PI), salicylate was 101.5 mg/dL and fell to 58 mg/dL after 3 h of HD. Additional HD (3 h) reduced salicylate to 30 mg/dL. Subsequent levels continued to decrease and was undetectable at 70 h PI. Mental status and vital signs improved as serum levels declined. The patient was discharged without sequelae. He admitted to ingesting 500 enteric aspirin tablets. *Conclusion:* We believe that enteric product formulation along with depressed gut function caused delayed aspirin absorption, resulting in failure of routine screening measures to alert providers to impending toxicity. Gut function was depressed due to the combination of anticholinergic drug co-ingestion, transient hypotension, and intubation drugs. Enhanced vigilance and more frequent monitoring of serum salicylate beyond normal recommendations may be required in similar cases.

31. QTc Interval Prolongation After Atomoxetine Overdose

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Background: Atomoxetine overdose has been associated with QTc prolongation, but all prior cases involved possible coingestants known to have this effect. Our patient developed dynamic ECG changes with reversible QTc interval prolongation after atomoxetine overdose. *Case report:* A 49-year-old woman with history of anxiety presented to the ED with nausea 2 h after ingestion of 1,600 mg of her son's atomoxetine in a suicidal gesture. Her prescribed medications were zolpidem and alprazolam, but she denied any co-ingestions other than alcohol. Her vitals were normal and she was awake, alert, oriented, with a resting tremor and otherwise normal physical exam. Her initial ECG, showed sinus tachycardia and QTc of 495 ms. Her serum potassium, calcium and magnesium were normal. A serum ethanol concentration was 216 mg/dL. During

the first 24 h of observation in the CCU, serial ECGs revealed gradually increasing QTc intervals: 495, 510, 537 ms, peaking at 555 ms. Subsequent ECGs at 48, 72, 96 h showed decreasing QTc interval at 519, 486 and 471 ms respectively. During this period no dysrhythmias occurred. The patient was then transferred to psychiatry. *Discussion:* Two prior reports have suggested a correlation between atomoxetine overdose and QTc prolongation, however the possible co-ingestion of other medications like quetiapine, risperidone and bupropion confounded any conclusions. In our patient, despite an initially elevated ethanol concentration, all ethanol would have been metabolized before the observed QTc peak. Although serum concentrations of prescribed and ingested medications were not obtained, no other medications known to prolong the QTc interval were available to the patient. Supra-therapeutic concentrations of atomoxetine have recently been shown to block hERG channels, thus elucidating the mechanism by which atomoxetine may prolong QTc intervals. *Conclusion:* Atomoxetine overdose may cause QTc prolongation. Since this can cause torsades des pointes, serial ECG and telemetry monitoring after atomoxetine overdose are reasonable precautions against potentially lethal dysrhythmias.

32. Recurrent Seizures Due to Tramadol Intoxication: A Review of 100 Cases

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Background: Tramadol is an atypical opioid with analgesic effects used in the treatment of mild to moderate pain. Seizure is one of the complications of tramadol use, both therapeutically and in overdose. *Objective:* The rate of tramadol poisoning is increasing in Iran. We studied the frequency of recurrent seizures in tramadol intoxicated cases admitted to the Loghman Hakim Hospital Poison Center (LHHPC). *Methods:* This is a case series of patients admitted to LHHPC from March to June 2008 with a tramadol-induced seizure. Age, sex, marital status, causes of intoxication, route of poisoning, dose and/or number of drug that were taken, vital signs, other signs and symptoms, number of seizures, admission periods and co-ingestants were recorded and extracted from the patients files. Patients were excluded if they were at risk for seizures from other neurological conditions or co-ingestants. *Results:* Exactly 100 patients met the above criteria. The majority of cases were single (75%) and 82% were male. Fifty percent of the patients were in the age group of 21–30 years old and the average age was 23.3 ± 7.7 years. In all patients the route of intoxication was oral and 93% of them ingested tramadol intentionally. The average number of tablets that were ingested by the patients was 17 ± 14 (range 1–70). The average time between ingestion and admission to the hospital, and the length of stay, were 4.7 ± 3.3 h (range 1–19 h) and 19.3 ± 16.4 h (range 6 h–7 days), respectively. The majority of cases had stable vital signs. Sixty-seven percent were alert. Thirteen and ten percent of the patients had nausea and vomiting respectively. Four percent complained of headache. Only 7% of the patients had recurrent seizures during their admission. All patients recovered. *Conclusion:* Due to the low risk, and low morbidity, of recurrent seizures in tramadol poisoning, it may not be necessary to use anticonvulsant medications prophylactically, even after an initial seizure.

33. Two Cases of Severe Neonicotinoid Intoxication

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Background: We report two cases of severe neonicotinoid (clothianidine, imidacloprid) intoxication. *Case report:* A 77-year-old male presented to emergency services about 3 h after the ingestion of 80 mL of clothianidine insecticide (8% solution) in a suicide attempt. At the time of admission, he was comatose. HR and Sat on monitor was 120/min, 60%. He was intubated and sudden bradycardia & asystole occurred. Five minutes of CPR, IV epi & atropine resulted in HR 89 & BP 63/29. Labs: ABG showed a pH 6.93, pCO_2 44.6, pO_2 85.2, HCO_3 9.4, Sat 86.8%; WBC 24.95 K/mm^3; lactate 18.1 mmol/L, glucose 214 mg/dL, amylase 151 U/L, creatinine 2.5 mg/dL. Mechanical ventilation and administration of inotropics were done. Because of persistent pulmonary edema, elevated creatinine and low urine output, CRRT was performed. He awoke and pressors were withdrawn on day 5. After CRRT for 1 week, HD for 1 week was performed. Mechanical ventilation was maintained for 2 weeks due to pneumonia which is developed during admission. Then, he clinically improved and discharged over 1 month. A 82-year-old male presented about 1 h after ingestion of 100 mL of imidacloprid insecticide (4% solution) in a suicide attempt. On arriving in the emergency room, his GCS score was 12. Vital signs was BP 59/36, HR 60/min, RR 16/min. After intubation, gastric lavage and administration of activated charcoal were performed. BP supported with isotonic saline and pressors. Labs: ABG showed a pH 7.307, pCO_2 26.7, pO_2 88.9, HCO_3 13.5, Sat 95.8%; WBC 10.28 K/mm^3, lactate 10.9 mmol/L, glucose 194 mg/dL, amylase 102.0 U/L, creatinine 1.2 mg/dL. After initial management, BP was 116/59. Over 8 h, acidosis became worse and didn't respond to bicarbonate injection. On day 2, ABG was pH 7.09, pCO_2 24, pO_2 127, HCO_3 7.4, Sat 97.8%, and creatinine was 2.6 mg/dL. CRRT was planed, but the patient's family refused it because of his age. He was pronounced dead at 48 h after intoxication. *Case discussion:* These two cases presented with CNS depression, hypotension, ongoing acidosis, pulmonary edema and acute renal failure. In the first case, renal replace therapy was helpful to patient's improvement. *Conclusion:* It appears that neonicotinoid insecticides show lower toxicity when compared to older classes of insecticides. But, severe toxic effects and even death is possible as the cases we mentioned.

34. Delayed Time to Peak Acetaminophen & Death Despite Early Treatment in a Massive Tylenol PM Exposure

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Case: A healthy 25-year-old female presented 1.5 h after ingesting 100 tablets of Tylenol PM + ethanol. Upon arrival she was A&A & had a RR of 18/min, BP 121/56 mmHg, & HR 87/min. Her skin was warm and dry and her mouth was dry. Her HR was 122/min by 3-hours after exposure. The EKG was normal. Her initial acetaminophen (APAP) level at 3.5 h after exposure was 368 mcg/mL. Salicylate was not detectable & ethanol level was 49 mg/dL. Her initial liver function tests, coagulation testing, and electrolytes were normal & a UDS was negative. She was given activated charcoal 30 g & acetadote was started 3.25 h after exposure. Repeat APAP levels included 610 mcg/mL at 13.5 h & 42 mcg/mL at 94 h. Her AST was 583 U/L at 38 h & peaked at 13,056 at 83 h. Her total tBili was 1.8 mg/dL at 38 h & continued to rise. Her INR was 7.3 at 62 h & peaked at 12 at 89 h. Serum bicarbonate was 16 mmol/L at 14 h with a nadir of 6 at 38 h. Her creatinine peaked at 1.7 mg/dL. Her mental status waxed & waned during the first 24 h, she became obtunded by the 3rd day, & she died on the 5th day due to liver failure. *Discussion:* To the best of our knowledge, a delay in peak APAP associated with diphenhydramine has been reported in only five cases. Four of these peaked at 8–10.5 h; one at 76 h. These cases all had non-toxic levels at 4-h but had crossed the toxic line between 5 and 8 h from exposure. Our pt had a toxic level at 4-h but did not peak until 14-h from exposure. Our case supports these cases in that high-dose diphenhydramine may delay the peak of the APAP level. Of note is that only one of the five reported cases had anticholinergic toxicity; casting some question as to the presence of diphenhydramine in the others. Our patient clearly was anticholinergic. In addition, like one of the above cases, our patient died despite early IV NAC; further supporting that the optimal therapy in the setting of very large APAP + diphenhydramine exposures is not clear. *Conclusion:* Patients with large APAP + diphenhydramine exposures may have delayed peak APAP levels. The best treatment regimen with IV NAC in this situation is not clear because patients can die despite early treatment; this is only the second such case reported.

35. Low-Molecular-Weight-Heparin Overdose: Intervention or Observation?

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Background: Low-molecular-weight-heparins (LMWH) are commonly used in both inpatient and outpatient settings. Overdose of LMWH has rarely been reported and optimal treatment has not been established. *Methods:* We present three episodes of LMWH overdose in two patients and discuss clinical presentation, laboratory evaluation, therapeutic options, and patient outcomes. *Results:* Case 1: A 35-year-old female with systemic lupus erythematosus complicated by antiphospholipid syndrome and multiple thromboembolic events injected 72,000 units of dalteparin. Anti-Xa activity peaked at 6.2 U/mL (therapeutic 0.6–1.1 U/mL) 7.5 h post-injection and returned to the therapeutic range within 20 h. The patient had a similar overdose 20 days later, again 72,000 units of dalteparin was injected. Anti-Xa activity was 4.5 U/mL 2 h post-injection. The patient was discharged without clinical effects on both occasions. Case 2: A 29-year-old male with past medical history of antiphospholipid syndrome and pulmonary emboli presented after injection of 480 mg of enoxaparin. Anti-Xa activity 2 h post-injection was 1.9 U/mL and decreased to 1.4 U/mL 14 h post-injection. The patient was discharged without clinical effects from the overdose. Neither patient received agents to reverse anticoagulation and no clinical bleeding was observed. *Discussion:* Literature regarding the efficacy of LMWH reversal agents was reviewed and revealed that protamine is inefficient at neutralizing LMWH. High dose protamine: LMWH (5:1 mass ratio) neutralized only 54.2% of anti-Xa activity for enoxaparin and 74% for dalteparin. An *in-vitro* study found that recombinant activated Factor VIIa (rFVIIa) effectively reversed anticoagulation effects of enoxaparin. *Conclusions:* Given the benign clinical course in these three reported episodes, withholding aggressive interventions, such as blood product transfusion, protamine administration, or hemodialysis may be advisable in absence of clinically relevant bleeding. However, in patients with clinically significant bleeding, use of protamine sulfate is reasonable and a trial of recombinant factor VIIa (rFVIIa) may be warranted for refractory cases.

36. Severe Metformin Toxicity: Role of Methylene Blue and CVVHD as Therapeutic Adjuncts

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Metformin toxicity carries a significant mortality. The lactic acidemia may contribute to vasodilation, cardiovascular collapse, and multi-system organ dysfunction. Although best managed with hemodialysis, continuous veno-venous hemodialysis (CVVHD) serves as an alternative method for an unstable patient. The amount of metformin removed via CVVHD is not well defined. In the presence of profound vasodilation, methylene blue, a guanylate cyclase inhibitor, may serve as a potential therapeutic adjunct. It has

improved hemodynamics in patients with sepsis, post-cardiac surgery vasoplegia, and anaphylactic shock. We report the case of a man with metformin-associated lactic acidemia, managed with CVVHD and methylene blue. A 60-year-old man, with a history of DM, HTN, and depression, was found unresponsive at home. He had persistent hypotension necessitating maximization of four vasopressor agents, acidemia with serum pH 6.08; serum lactate concentrations, >15 mg/dL; and acute renal failure with oliguria. The bedside echocardiogram showed a hyperdynamic left ventricle. After trials of glucagon and high dose insulin euglycemia therapy with minimal improvement, a methylene blue bolus of 1–2 mg/kg resulted in an improvement in MAP by 10 mmHg. This was followed by a methylene blue infusion of 0.1 mg/kg/h. CVVHD was initiated. The patient's initial serum metformin concentration was 80 µg/mL (therapeutic: 1–2 µg/mL), and the urine metformin concentration was 760 µg/mL. Total estimated amount of metformin removed via CVVHD was 305 mg in 15,000 mL of dialysate fluid. Despite maximal efforts, the patient expired on Day 4 of hospitalization. Although CVVHD removed a small amount of metformin, and methylene blue transiently increased the MAP, it is challenging to ascribe a therapeutic benefit due to the patient's subsequent demise. If extrapolated to 24 h, CVVHD extraction could potentially remove 960 mg of metformin. Methylene blue may be considered as an adjunct in patients with refractory vasodilatory shock unresponsive to conventional therapy. Further studies are needed to assess clinical efficacy.

37. Randomized Controlled Study on the Use of Multiple-Dose Activated Charcoal in Patients with Supratherapeutic Phenytoin Levels

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Background: We conducted a prospective randomized controlled study on the influence of multiple doses of activated charcoal (MDAC) in patients with supratherapeutic serum phenytoin levels. *Methods:* Patients were recruited from three urban teaching hospitals that had serum phenytoin levels greater than 30 mg/L upon presentation to the ED. Patients enrolled were older than 18, nonpregnant, able to tolerate activated charcoal by mouth, and able to give written consent. They were randomized to receive 50 g activated charcoal by mouth every 4 h or no activated charcoal. They continued in the study until the patient was discharged or the serum level was <25 mg/L. Serum levels were drawn every 6 h initially then every 24 h after the first day. The presence of gait abnormalities and nystagmus was recorded and mini-mental status exam (MMSE) scores were collected from each patient enrolled. Half-lives were calculated using regression-time analysis. Student's *t*-test was used to compare means between controls and MDAC groups. *Results:* Seventeen total patients were enrolled in the study. Seven patients received MDAC, eight patients served as controls, and two patients who were initially enrolled as controls inadvertently received one dose of activated charcoal and were excluded from the analysis. Both groups were comparable in mean age and all were male except for one female in the single-dose charcoal group. The mean serum half life was (mean ± SD) 31.8 ± 13.3 h in the charcoal group and 95.2 ± 75.8 h in the control group (p-value = 0.049). The mean peak serum level was 40.7 and 36.0 (p = 0.054) in the control and charcoal groups, respectively. Patients with steady, unsteady, and ataxic gait were 11.8, 29.4, and 52.9%, respectively. 76.5% had only horizontal nystagmus and 11.7% had horizontal and vertical nystagmus. The mean MMSE score was 21.9 in the 15 patients who completed the exam. *Conclusions:* MDAC appears to decrease the serum half-life of phenytoin in patients with supratherapeutic phenytoin levels. This may have an impact on patient time in hospital and length of symptoms from toxicity.

38. Overdose of Diltiazem, Metoprolol, and Amiodarone Treated Successfully with Intravenous Fat Emulsion and High Dose Insulin in an Awake Patient

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Introduction: Intravenous fat emulsion (IFE) and high dose insulin (HDI) have been reported in treatment of overdoses, although rarely in combination. We report a life-threatening overdose of diltiazem, metoprolol and amiodarone, successfully treated with IFE and HDI. *Case report:* A 30-year-old woman presented to the ED for abdominal pain. Medical history included hypertrophic cardiomyopathy (HCM) with CHF and an AICD. Initial vital signs were BP 89/46 and HR 73. Over 3 h the BP and HR dropped to 64/41 and 70, respectively, and she became confused. ECG showed a paced rhythm. Normal saline (NS) was given (2 L IV) during a negative workup for her pain. She then admitted to taking all of her diltiazem, metoprolol, and amiodarone 6 h prior to arrival, and that she never had abdominal pain. She was given another 2 L NS, 27 mEq IV Ca^{2+}, and an HDI bolus of 0.5 U/kg with an HDI infusion escalated over an hour to 10 U/kg/h. She remained hypotensive, confused, and anuric. The CVP was 20 and an Echo showed low EF. IFE (20%) was given as a 100 mL bolus and an infusion of 1.5 L over 1 h. Within 15 min of the bolus the BP was 110/60 and confusion improved. After 5 days she went from the ICU to psychiatry with no sequelae. Serum levels from the ED were diltiazem: 1,449 ng/mL (nl 130–190), metoprolol: 388 ng/mL (30–300), and amiodarone: 2.7 mg/L (0.5–2). *Discussion:* Reports of combined IFE/HDI use are rare, as are reports of IFE use in awake patients. Further, IFE use with these specific overdoses has not been reported. HDI may have been ineffective in the setting of HCM as the inotropic and vasodilatory mechanisms of HDI may have been counter-productive. IFE was associated with rapid improvement. A drug's log *P* octanol/water partition coefficient may correlate with the effectiveness of IFE. The log *P* for diltiazem, metoprolol, and amiodarone are 2.7, 1.88, and 7.8, respectively. These are similar to log *P* for drugs reportedly treated effectively with IFE. *Conclusion:* This is the initial report of the use of IFE for diltiazem, metoprolol, or amiodarone overdose and represents an addition to the rare reports of the combination of IFE/HDI therapy. This combination was successful for this patient in reversing severe drug-induced cardiogenic shock.

39. 5-Fluorouracil Overdose: A Case of Potential Fatal Toxicity Treated with a Unique Investigational Oral Antidote

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Background: 5-Fluorouracil (5-FU) is a widely used antineoplastic agent with a very narrow therapeutic index that is typically delivered via infusion pumps. In an overdose, 5-FU causes cardiotoxicity and the accumulated metabolites cause delayed effects, such as mucositis and myelosupression, which can lead to death. Fatalities have resulted from a single dose of 20–25 mg/kg. We present a case in which a patient inadvertently received a potentially lethal dose of 5-FU and survived with the administration of an investigational oral antidote. *Case report:* A 43-year-old male with colorectal adenocarcinoma received a 72-hour course of 5-FU (38 mg/kg, total amount 3,700 mg) IV over 2 h due to a CADD pump malfunction. Soon after discovering the failure, the asymptomatic patient was admitted to an ICU and received a 3-h session of hemodialysis at 7 h post overdose. The poison center was consulted and the patient received triacetyluridine (WellStat Therapeutics Corporation, Gaithersburg, MD) which is an investigational drug with an orphan designation indicated for 5-FU toxicity. Within 22 h post overdose, the antidote was delivered and the patient received 11 g by mouth every 6 h for a total of 20 doses along with a daily filgrastim regimen. He was discharged on ICU day 6 without apparent toxicity and continued his outpatient oncology clinic visits. He missed one cycle of his chemotherapy, returning to his scheduled regimen one month post 5-FU overdose, with no major hematologic sequela. *Discussion:* Triacetyluridine is an oral prodrug of uridine. Upon converting to uridine triphosphate, it competes with the incorporation of 5-FU into RNA. Hemodialysis may be beneficial early in 5-FU toxicity, however there is little evidence that hemodialysis alone affects survival. The 5-FU dose in this case predicted mortality, which supports the importance of survival with triacetyluridine in prior overdoses. *Conclusion:* Poison centers and toxicologists need to be aware that triacetyluridine is a new and potentially life-saving oral antidote for 5-FU overdoses, and it is believed to have minimal side effects.

40. Case Series of Severe TCA Toxicity Treated with Intravenous Fat Emulsion

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Background: Intravenous fat emulsion (IFE) is accepted therapy for severe cardiac toxicity from bupivacaine and has been successful in animal models of tricyclic antidepressant (TCA) toxicity. The use of IFE for lipophilic drug intoxication has been suggested, but human reports are scarce. The proposed IFE mechanism is transient relief of the toxin burden through intravascular sequestration. *Methods:* We describe a series of two cases of severe TCA toxicity managed through a poison center and associated consult service that were inadequately responsive to conventional therapy and stabilized with IFE therapy. *Results:* Case #1*:* A 52-year-old female ingested 6,000 mg of imipramine and developed pronounced cardiotoxicity. Her initial QRS was 140 ms. She was treated with endotracheal intubation, sodium bicarbonate, vasopressors, and 200 mL of hypertonic saline (3%). Despite this, she developed seizures, ventricular tachycardia and complete heart block. When her serum sodium reached 166 mmol/L, she was given two boluses of 100 mL IFE (20%) followed by an infusion at 0.25 mL/kg/min and stabilized over the next 6 h. She had complete neurologic recovery following 17-day hospital stay. Case #2: A 44-year-old female with a reported ingestion of doxepin presented with frequent seizure activity. Her initial QRS was 162 ms. She was treated with endotracheal intubation, 28 amps of sodium bicarbonate, multiple rounds of benzodiazepines, and 100 mL of hypertonic saline (3%). She continued to have frequent seizures and a QRS persistently greater than 120 ms. When her serum sodium reached 166 mmol/L and serum pH reached 7.68, she was given two boluses of 100 mL IFE (20%) followed by an infusion at 0.25 mcg/kg/min. Over the next 4 h, her QRS interval narrowed and her seizure activity stopped. Intralipid was continued for 6 h, bicarbonate infusion was continued for 3 days, and successfully extubated on day 8 with complete neurologic recovery. Her initial doxepin and *N*-desmethyldoxepin concentrations were 757 and 81 mcg/L (upper range of therapeutic is 250 mcg/L), respectively. *Conclusion:* Intravenous fat emulsion (IFE) was a successful rescue therapy in two cases of severe TCA intoxication. Further systematic study of IFE for lipophilic drug toxicity is warranted.

41. Life-Threatening Flecainide Overdose Treated with Intravenous Fat Emulsion

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Introduction: Flecainide, a class 1 c antiarrhythmic, is used to treat supraventricular tachycardias. Sodium

bicarbonate (bicarb) is used in overdose (OD) treatment. Intravenous fat emulsion (IFE) is an uncommon/unreported treatment for flecainide OD. We report a case of a life-threatening flecainide OD, treated with IFE, with serum drug levels pre/post IFE administration. *Case report:* A 51-year-old man ingested 2 g of flecainide, and presented to the ED 90 min post-ingestion (PI). He had HR 44 and BP 140 systolic (SBP). ECG showed sinus rhythm, QRS 162 ms and QTc 427 ms. Within 45 min his HR was 40 and SBP 60; a repeat ECG showed 1° AV block with QRS 150 ms and QTc 524 ms. He had already received 1 L normal saline (NS), 100 mEq bicarb and activated charcoal. Over the next hour in the ED he received another 1 L NS, 100 mEq bicarb, 1 mg atropine, 2 g Mg, and a 100 mL bolus of 20% IFE. He was admitted to the ICU with HR 55 and SBP 90. Five hours into his ICU stay the bicarb infusion was stopped, he had received a 1 L infusion of 20% IFE, and his HR/BP/QRS/QTc had all normalized. He went to psychiatry on day 5 with no end-organ effects. Flecainide levels were 1.8 mcg/mL (nml 0.2–1.0) 100 min PI (pre-IFE), 2.76 mcg/mL 7 h PI (post-IFE), and 0.27 mcg/mL 3.5 days PI. *Discussion:* This case is unique in that the patient received IFE for a flecainide OD, and drug levels are reported. The AV block, ↓HR, ↓BP, and ↑QRS/QTC are all expected from this OD; they occur due to Na^+-channel blockade, but also K^+-channel blockade. The bicarb, NS, and Mg are standard, but the IFE is not. Flecainide has a similar profile to drugs for which IFE has been used successfully for OD. It has a high V_d (10 L/kg) and a high log *P* octanol/water coefficient (3.8). The standard therapy and IFE helped normalize the patient's hemodynamics and cardiac conduction. No conclusion can be drawn from the serum levels, other than they were high. The initial level may have been before the serum peak, which can occur as late as 6 h PI. The first post-IFE level is not interpreted easily because not enough is known about drug levels after IFE administration. *Conclusion:* We present a case of a life-threatening flecainide overdose successfully treated with standard therapy and intravenous fat emulsion bolus and infusion.

42. Prolonged Resuscitation for Massive Amlodipine Overdose with Maximal Vasopressors, Intralipids and Veno Arterial-Extracorporeal Membrane Oxygenation (VA ECMO)

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Background: Calcium Channel Blocker (CCB) overdoses remain among the most lethal ingestions. We report a case of massive amlodipine overdose with quantitative confirmation, refractory to maximum pressors and various salvage therapies, ultimately requiring 9 days of veno-arterial extracorporeal membrane oxygenation (VA ECMO) for hemodynamic support. *Case report:* A 50-year-old man with depression, HTN and ETOH abuse was bought to the ED 4 h following a suicidal ingestion of amlodipine (500 mg), HCTZ (625 mg) and lisinopril (1 g). On arrival VS were BP 120/60 mmHg and HR 107 bpm. Over the next 14 h his BP continued to drop despite aggressive crystalloid resuscitation and maximal doses of vasopressors including: NE, DA, Epi, vasopressin, phenylephrine, glucagon, calcium and high dose insulin euglycemia (1.5 U/kg/h). Salvage therapy with methylene blue 1% (total 3 mg/kg) produced no effect. Bolus injection of intravenous fat emulsion (IFE) (100 mL of 20% intralipid) yielded a transient increase in SBP from 99 to 120 mmHg. An IFE infusion was continued at 0.25 mL/kg/min × 1 h, without sustained improvement. He was simultaneously started on VA ECMO for profound vasodilatory shock and worsening hypoxic respiratory failure. Although there was no immediate significant hemodynamic change after initiation of VA ECMO, there was marked improvement in oxygenation and the ability to decrease the ventilator FiO_2 from 100 to 40%, maintaining an adequate PaO_2. Over the next 9 days he was gradually weaned off vasopressors and finally off VA ECMO. His course was complicated by ARF requiring CVVHD, decreased cardiac output (LVEF 11%), and sepsis. He ultimately recovered ventricular function and mental status. Amlodipine levels 5 and 20 h post ingestion were markedly elevated 260 and 460 ng/mL* (post IFE) respectively (therapeutic 5–18 ng/mL). *Conclusion:* Severe CCB overdose may be refractory to pharmacologic intervention. In the setting of failing cardiac output and impaired pulmonary function VA ECMO in combination with aggressive ICU care should be considered.

43. Outcomes of Acute Acetaminophen Overdose Patients Treated with Less than 20 Hours of Intravenous *N*-Acetylcysteine

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Background: While the intravenous *N*-acetylcysteine (IV NAC) protocol for acute acetaminophen (APAP) overdose mandates at least 20.25–21 h of therapy, not all patients receive the full infusion, possibly due to risk reassessment, adverse reactions or physician preference. This practice is not widely studied, and often against poison centre advice, so we sought to describe outcomes for patients treated with fewer than 20 h of IV NAC following acute APAP poisoning. *Methods:* We utilized data collected as part of a structured medical record review of patients hospitalized for APAP poisoning at one of 34 Canadian hospitals from 1980 to 2005. We selected patients with a history of an acute (over less than an 8-h period), single ingestion with a potentially toxic serum APAP concentration (>150 µg/mL at 4 h) measured between 4 and 24 h postingestion who were started on the 20-h IV NAC protocol within 24 h of ingestion but received less than 20 h of IV NAC. Patients in whom aminotransferases were not measured at least 24 h postingestion were excluded. Hepatotoxicity was defined as peak serum aminotransferases >1,000 IU/L. *Results:* Sixty-two patients met our inclusion criteria. The median age was 21 years, and 41 patients (66%) were female. Fifteen (24%) co-ingested ethanol, and 7 (11%) were described as chronic alcoholics. Median time to treatment with IV NAC was 11.4 h [Interquartile range (IQR) 7.5–18.1] and median duration of treatment was 11.0 h (IQR 3.3–15.0). The median peak INR was 1.1 (IQR 1.0–1.2). Hepatotoxicity occurred in two patients (3.2%; 95% confidence interval 1.2–14.0). Anaphylactoid reactions were reported in 18 (29%) patients, of which 83% were cutaneous (facial flushing, urticaria, or pruritus). There were no deaths. *Conclusions:* In this cohort of patients receiving less than 20 h of IV NAC for acute APAP overdose, hepatotoxicity was infrequent. Anaphylactoid reactions were common and may have been a reason for discontinuation of IV NAC in some patients. Further research is required to identify patients at low-risk of hepatotoxicity who may benefit from a shortened course of IV NAC.

44. Lipid Emulsion in the Treatment of Diphenhydramine Toxicity

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Background: Lipid emulsion therapy after cardiovascular collapse has been documented in multiple case reports with lipophilic drugs. We present a case of diphenhydramine cardiotoxicity in which a patient, refractory to standard ACLS, resumed effective circulation after IV lipid emulsion. *Case report:* A 42-year-old female presented in PEA after taking 50–100 acetaminophen 500 mg/diphenhydramine 25 mg tablets in the last 24 h. The patient was found by EMS with a serum glucose of 28 mg/dL. EMS started ACLS and the patient received 50 mL of 50% dextrose, epinephrine 2 mg, atropine 1 mg and sodium bicarbonate 50 meq IV en route to the ED. In the ED the patient was intubated and the bedside cardiac ultrasound showed no cardiac motion so ACLS was continued. One hour after EMS scene arrival, 60 mL of a 20% lipid emulsion IV was given. Within 1 min of the bolus, the patient had a palpable pulse and a repeat cardiac ultrasound showed cardiac valve and wall motion activity. The patient was then started on dopamine and the subsequent blood pressure was 107/83 with sinus tachycardia on the monitor. A lipid emulsion infusion was then started and intravenous n-acetylcysteine was initiated for the acetaminophen overdose. Two hours after the lipid emulsion was started, the patient was able to maintain a blood pressure off of dopamine and the lipid emulsion was stopped. In the ICU, the patient was changed to a "Do Not Resuscitate" status by her family and she went back into PEA and died approximately 7 h after the lipid emulsion was started. The post-mortem subclavian blood sample showed a diphenhydramine level of 0.80 µg/mL and an acetaminophen level of 28 µg/mL. *Discussion:* This patient had a return of pulse, blood pressure and cardiac activity shortly after administration of lipid emulsion, in addition to standard ACLS protocols. Multiple case reports have described lipid emulsion's use in the treatment of cardiotoxicity from lipophilic drugs. This is the first case to describe its use in cardiac toxicity from diphenhydramine overdose. Lipid emulsion may be an effective therapy in diphenhydramine overdose with cardiotoxicity.

45. High Dose Insulin: A Consecutive Case Series

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Background: To examine the effectiveness and adverse events of High Dose Insulin (HDI) therapy in consecutive overdose patients in cardiogenic shock after implementation of an HDI guideline (1–10 units/kg/h, while avoiding or tapering off vasopressors). *Methods:* This is an observational consecutive case series of patients with toxin-induced cardiogenic shock treated by our toxicology service from February 2007 to March 2010. *Results:* Twelve patients (pts) were treated with HDI. The age range was 19–65 years (mean 43). Seven pts failed pre-existing vasopressor therapy, and six of these were tapered off vasopressors while on HDI; one completed therapy with HDI and a vasopressor. Two pts had pulseless electrical activity (PEA) cardiac arrest prior to HDI therapy. Intravenous fat emulsion was administered to two pts; in one with initiation of HDI during cardiac arrest, and in one who appeared to be unresponsive to HDI at 10 units/kg/hr with known hypertrophic cardiomyopathy (a condition that may worsen with inotropic/vasodilator therapy). An initial HDI bolus was used in 11 of 12 pts. The mean maximum HDI infusion rate was 8.7 units/kg/h (range = 1–21). The mean duration of HDI was 28.8 h (range = 3–60). The mean duration of glucose infusion post-HDI was 21.0 h. The primary toxins were β-blocker (BB) in five, Ca^{++} channel blocker (CCB) in one, combined BB/CCB in four, TCA in one, and polydrug in one. *Clinical outcomes:* Eleven of twelve pts survived. One pt expired 9 h into HDI therapy from cardiac arrest shortly after the HDI infusion was stopped and a vasopressor re-initiated (guideline deviation). *Adverse events*: Overall, five pts experienced a total of 11 hypoglycemic events. Hypokalemia (<3.0 mEq/L) developed in seven pts (minimum 2.3 mEq/L). KCl was infused in these pts. *Adverse sequelae:* Necrotic digits occurred in one pt with a prior clotting disorder after receiving high dose norepinephrine and INR reversal with FFP and subsequent HDI. One patient was discharged with mild anoxic injury thought due to prolonged PEA arrest prior to HDI therapy. *Conclusion:* HDI therapy, based on a 1–10 units/kg/h dosing guideline and recommending avoidance of vasopressors, was highly effective in the

treatment of toxin-induced cardogenic shock. HDI related adverse events were mild and infrequent. Known adverse sequelae were not related to HDI therapy.

46. Fomepizole for Severe Disulfiram-Ethanol Reactions

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Background: When ethanol (EtOH) is consumed with disulfiram (DSM), acetaldehyde accumulates and an unpleasant histamine-like reaction occurs. Severe DSM-EtOH reactions result in hypotension, tachycardia and angioedema. Fomepizole (4-MP), an inhibitor of alcohol dehydrogenase, may halt progression of this reaction by blocking EtOH metabolism to acetaldehyde. *Methods:* We present two cases of DSM and EtOH overdose leading to severe reactions unresponsive to fluid resuscitation and treated with 4-MP. Serial blood ethanol concentrations (BAC) were used to determine kinetics of EtOH elimination following 4-MP blockade. *Results:* Case 1: A 20-year-old female presented after ingestion of vodka and 7,500 mg DSM. Presenting HR was 125 bpm and BP 119/83 mmHg. BAC was 448 mg/dL, drugs of abuse screen and laboratory tests were otherwise normal. After 11 h of observation and 2 L of normal saline, she developed skin flushing, lip swelling, tachycardia (166 bpm) and hypotension; systolic blood pressure (SBP) 88 mmHg. Antihistamines, steroids and an additional 2 L of normal saline were given without improvement of hypotension or tachycardia. One dose of 4-MP 15 mg/kg was given with improvement within 1.5 h; BP 117/44 mmHg and HR 98 bpm. No additional doses of 4-MP were given and there was no recurrence of tachycardia or hypotension. Mental status normalized over 16 h and she was discharged with no clinical sequelae. Serial BACs demonstrated first order elimination kinetics, even after blockade. Case 2: A 47-year-old female presented after overdose of vodka and 6,250 mg DSM. She was tachycardic and hypotensive upon presentation. After administration of 3 L normal saline, she remained hypotensive and tachycardic. BAC was 221 mg/dL, drug of abuse screen and laboratory tests were within normal limits. One dose of 4-MP 15 mg/kg was given with improvement within 1 h: blood pressure and heart rate normalized. There was no recurrence of hypotension and her mental status cleared over 12 h. As in Case 1, BACs declined rapidly and appeared to follow first order elimination kinetics. *Conclusions:* 4-MP is effective for the treatment of severe DSM-EtOH reactions. Analysis of BACs following blockade with 4-MP in both cases demonstrated first order elimination kinetics.

47. Severe Metformin-Associated Lactic Acidosis From Acute Ingestion Without Renal Failure

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Introduction: Metformin-associated lactic acidosis (MALA) is a rare but serious complication of biguanide therapy. MALA from acute intoxication is rare; it usually occurs when a precipitant induces renal failure (RF) in the setting of metformin use. Hemodialysis (HD) is occasionally required to treat severe acidemia. We describe a case of severe MALA from acute ingestion without RF treated with HD. *Case:* Our patient was a 27-year-old female prescribed metformin for polycystic ovarian syndrome who presented to our ED complaining of a chronic pelvic pain exacerbation. She stated that she ingested metformin (20 g by history) 2 h prior and denied coingestants. Initial vital signs were normal. Arterial blood gas (ABG) displayed pH 7.40, pCO_2 28, HCO_3^- 17, and BE -6. Initial creatinine was 1.3 mg/dL. Lactate was 7.8 mmol/L. She was aggressively hydrated and admitted. Six hours post-admission, she displayed tachycardia and severe tachypnea. She was confused and complained of worsening abdominal pain. Repeat ABG revealed pH 6.74, pCO_2 14, and HCO_3^- 2. Lactate was 37 mmol/L and creatinine was 1.7 mg/dL. Metformin concentration was 90 µg/mL. Toxic alcohol panel and urine GC/MS were otherwise negative. One hundred and fifty milliequivalent sodium bicarbonate were administered, followed by continuous bicarbonate infusion with minimal response (pH 7.12, pCO_2 21, bicarbonate 6). She underwent emergent HD for 5 h, which was complicated by norepinephrine-responsive hypotension. Her mental status cleared and acidemia improved 2 h after HD initiation. During HD, metformin clearance was 10.6 L/h (hematocrit 36%) and extraction ratio was 92% based upon pre- and post-cartridge concentrations of 70 and 5.6 µg. Metformin concentration was 14 µg/mL upon cessation of HD. Vasopressors were rapidly weaned. She was discharged after psychiatric evaluation. *Discussion/conclusion:* We report severe MALA without significant RF resulting from acute ingestion and treated with HD. MALA occurs almost exclusively in patients who are at high risk for developing lactate-associated acidosis apart from metformin therapy. Our patient developed severe MALA while having no other risk factors for its development or significant RF. Our experience is that while severe MALA resulting from acute ingestion is rarely reported, it can be effectively treated with hemodialysis.

48. Emergency-Department Preparedness for the Evaluation and Management of Mass Casualties from Anticholinesterase Compounds

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Background: Anticholinesterases include carbamate and organophosphorus (OP) insecticides and nerve agents. The terrorist use of sarin (a G-series nerve agent) in Tokyo in 1994 and 1995 demonstrated the ability of these compounds to flood emergency departments (EDs) with large numbers of poisoned victims and worried individuals. However, no recent study has examined ED preparedness for mass-casualty incidents (MCIs) involving these compounds. *Methods:* We created a secure 30-item online survey for the physician directors of the 220 continuously staffed EDs in the 12 most populous incorporated cities in the United States to allow the directors to report their perceptions of the preparedness of their individual EDs for MCIs from anticholinesterases. *Results:* One hundred and ten directors responded, for a 50% response rate. Two-thirds had received at least 1 h of formal training regarding anticholinesterases in the past 3 years, but fewer than 20% were very confident in the effectiveness of their training. Only 40% had participated in an anticholinesterase-related disaster drill within the past 3 years, and only 6% were very confident that these drills had given them the preparation that they needed. One-third of respondents could not estimate how many severely exposed casualties could be treated from existing hospital supplies of antidotes, and 20 and 36% of physician directors had never heard of the Division of Strategic National Stockpile (DSNS) or of the CHEMPACK program, respectively. Fewer than half of reporting hospitals had a board-certified medical toxicologist to help in such an emergency. Nearly half of respondents had never heard of the online Radiation Event Medical Management (REMM) module from the National Library of Medicine and the National Institutes of Health, but the same proportion thought that a chemical counterpart (Chemical Hazard Emergency Medical Management, or CHEMM) to REMM would be either moderately or very helpful for MCIs involving anticholinesterases. *Conclusions:* This study demonstrates that physician ED directors perceive marked deficiencies in their abilities to respond to this kind of toxicological emergency and suggests critical directions for remediation of these deficiencies.

49. Forensic Analysis of Potassium Cyanide Stored in Gelatin Capsules

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Background: Cases of surreptitious criminal poisoning utilizing cyanide are rare, yet continue to be reported. The potent and rapid toxic effects of cyanide ingestion are desired characteristics for use as a poisoning agent. Although the clinical symptoms and metabolic effects of cyanide have been well documented, the stability of cyanide salts utilized in criminal poisonings has not been well documented. The present study describes stability studies performed on potassium cyanide (KCN) when placed in gelatin (gel) capsules. *Methods*: Gel capsules were purchased from Capsuline®. The gel capsules were filled with 200 mg KCN, assembled, then stored in humidity (64.5 ± 2.3%) and temperature (21.2 ± 0.7°C) controlled environment under two conditions: 1) open-air exchange, or 2) capped plastic bottle. The capsule weight, appearance were monitored weekly for 6 weeks. The amount of cyanide was determined by colorimetric analysis. *Results*: Physical appearance of the KCN salts and gel capsules demonstrated hygroscopic changes after as little as 1 week when stored in open-air environment within the temperature and humidity controlled environment. The changes in appearance were accompanied by decreased CN recovery, 77% week 1. After 6 weeks CN recovery was 52%. Gel capsules stored in a capped plastic bottle within a temperature and humidity controlled environment were more resistant to degradation. No obvious changes in the KCN salt or gel capsule were apparent after 6 weeks of observation. Similarly, the CN recovery rates were ≥95% between weeks 1–4 and ≥86% for weeks 5 and 6. *Conclusions*: Our study of the KCN degradation in gel capsules demonstrates that direct exposure to moderate humid temperatures will significantly alter the integrity of KCN stored in gel capsules. This chemical decomposition is minimized by storing gel capsules containing KCN in a tightly capped plastic bottle. Storage conditions of KCN significantly affect the recovery of lethal concentrations of cyanide.

50. Accidental Unsupervised Ingestions (AUI) Most Common Type of Exposures Detected During Surveillance of Pediatric Exposures to Cough and Cold Medications

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Background: Safety concerns surrounding the use of cough/cold medications in children prompted the development of an ongoing surveillance system to monitor adverse events (AE) associated with these drugs. *Methods:* Using established methods, pediatric (age < 12 years) cases with AEs associated with the use of cough/cold medications were collected from English language medical literature, National Poison Data System (NPDS), manufacturer safety records, FDA AERS and media reports from 2008 to 2009. The Pediatric Cough/Cold Medication Safety Surveillance Team determined causal relationship between each reported drug and AE using predetermined definitions and then judged exposure dose, intent of administration and potential contributing factors for each case. *Results:* A total of 1,208 cases were reviewed by the Team, of which 916 were judged to have AEs at least potentially related to a cough/cold ingredient. Of the related cases, 552 (60%) were accidental unsupervised ingestions (AUI), 24% related to administration with therapeutic intent, 6% non-therapeutic intent and 10% unknown intent. Supratherapeutic dose was estimated in 88% of cases. Dose was unable to be determined in the remaining 12%. Age distribution of AUIs: 16% <2 years, 60% 2 to <4 years, 17% 4 to <6 years, 7% 6 to <12 years. Diphenhydramine was involved in 355 reports, including 3 deaths. These accounted for 64% of all AUIs (13% involved more than one product). Single substance exposures to single-agent diphenhydramine products accounted for 46% of all AUIs. AUI following therapeutic use of the product by a caregiver was reported in 5% of cases. *Conclusions:* AUIs account for the majority (60%) of all AE cases associated with cough/cold medication pediatric exposures detected in our system, perhaps due to the nature of the largest data source NPDS. These exposures primarily involve diphenhydramine products, likely because these products are widely used and available in

homes throughout the US. Targeted interventions, such as proper storage of medication immediately after therapeutic use, are needed to reduce these preventable exposures that result in AEs in children.

51. School Evacuations in the United States Due to Hazardous Chemical Incidents

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Background: Every year, unintentional and intentional releases of chemicals, or related fires or explosions, occur in schools, causing injuries, costly cleanups, and lost school days. *Methods:* Data from the Hazardous Substances Emergency Events Surveillance (HSEES) system for 2002–2008 was used to conduct a secondary analysis to identify school-related hazardous incidents and elucidate their causes and consequences to highlight the need for intervention. Information about acute events involving hazardous substances was collected, including the substance(s) released, number of victims, number and types of injuries, and number of school evacuations. Descriptive statistics (frequency tables, confidence intervals) were used to summarize the data. *Results:* During 2002–2008, a total of 50,018 events involving a chemical incident were reported to HSEES by 15 participating states. Of these, 488 occurred in elementary and secondary schools. Among these 488 chemical incidents, 33% resulted in at least one acute injury and 53% resulted in an evacuation. Of the 83 incidents caused by intentional acts, 45% were associated with an injury. Overall, 64% of reported chemical incidents at elementary and secondary schools resulted from human error (i.e., mistakes in the use or handling of a substance), and 31% of incidents resulted in at least one acute injury. A total of 1,032 persons were injured in the 488 school-related incidents. No injuries were fatal, but 15 persons were admitted to a hospital. Most (84%) HSEES school incidents involved the release of only one chemical. Although mercury was the most common hazardous substance released (29%), only 3% of mercury-related incidents caused an injury. Conversely, although 5% of releases were mace or pepper spray by students, these incidents were associated with a high rate of injury (86%) and evacuation (90%). Releases (usually spills) of hydrochloric acid, commonly found in chemistry classrooms, also resulted in a significant rate of injury (59%). *Conclusions:* Most school-related chemical incidents are the result of mistakes in the handling or use of a substance. These data suggest that school staff members might benefit from additional training on how to use and handle hazardous chemicals to reduce injuries occurring at schools.

52. Illicit Drug Exposures in Children

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Background: The epidemiology of illicit drug exposures in children is largely unknown. We sought to describe illicit drug exposures in children reported to US poison centers. *Methods:* The National Poison Data System was queried for all cases of illicit drug exposures in children <13 years of age from January 1, 2000 to July 31, 2009. Illicit drugs included the following American Association of Poison Control Center major categories: amyl nitrate, cocaine, gamma-hydroxybutyric acid (GHB), heroin, ketamine, methamphetamine, marijuana, hallucinogenic amphetamines, lysergic acid diethylamide (LSD), phenylcyclohexylpiperidine (PCP), other street drugs, unknown hallucinogens, other hallucinogens, unknown stimulants or street drugs. Cases were excluded if the exposure site was designated as a health care facility. Logistic regression was used to determine risk factors for a poor outcome (defined as death or major). Risk factors were exposure to each substance, exposure to >1 substance, intent, and age, which were adjusted against each other. *Results:* We identified 5,345 cases reporting 5,483 illicit drug mentions. The annual average was 552 cases (range 507–629). Median age was 2 years (IQR 1.1, 5). Exposures primarily occurred at a residence (93%) and were coded as unintentional (78%). Marijuana (32%), methamphetamine (23%) and cocaine (21%) were the most commonly reported exposures: all other categories had less than 6.5% of exposures. Four percent of exposures resulted in death (n = 7) or major (n = 222) outcomes. An additional 805 cases were moderate exposures. The table shows factors significantly associated with death or major outcomes.

Factor	Adjusted odds ratio	95% confidence interval
GHB	4.6	2.6, 8.0
Hallucinogenic amphetamines	3.4	2.1, 5.4
Cocaine	3.1	2.2, 4.3
PCP	3.1	1.8, 5.3
Age < 6	2.0	1.3, 3.0
Exposure to >1 substance	1.7	1.2, 2.4
Marijuana	0.5	0.3, 0.8

Discussion: Abundant evidence exists to suggest children living in homes where drug abuse occurs are at risk for future drug use and psychological disorders. Since these exposures were largely unintentional and occurred in residences, this provides further evidence that an environment conducive to accidental illicit drug exposure is markedly unsafe for children and interventions reducing exposures to illicit drugs are needed.

53. Characterization of Acute Kidney Injury in Toxic Exposures

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Background: Exposure-associated acute kidney injury (AKI) has not been systematically characterized. *Methods:* This was a retrospective, case-control study of exposures reported to the American Association of Poison Ccontrol Centers (AAPCC) database between 2001 and 2007 and coded with a related renal effect (RRE). AKI was defined as elevated serum creatinine, oliguria/anuria, and/or renal failure. A chi-square analysis identified single-substance (SS) exposures associated with AKI. *Results:* Between 2001 and 2007 there were 33,843 human exposures coded with RRE. Most exposures (56%) were acute. Intentional exposures with RRE were more common in adults (70 vs. 52%) while unintentional exposures were more common in children (39 vs. 15%). Comparing cases with RRE to the overall database: There were higher percentages of acute-on-chronic (23 vs. 6%) and chronic (11 vs. 2%) exposures; increased rates of adverse reactions (8 vs. 3%) and of substance abuse/misuse (13 vs. 2%); a far greater likelihood of being admitted to an ICU (65 vs. 4%); and the RRE case-fatality rate was 11 vs. 0.05% for all human exposures. The highest mortality rate (13%) was in those >75 years old. Hemodialysis was performed in 14% of cases with RRE vs. 0.09% of all human exposures. Overall, there were 20,203 (62%) exposures which had AKI. Of 12,066 SS exposures, the highest incidence of AKI (73%) was in 45–64 year olds. Of the 20 most common SS exposures with RRE, the highest rates of AKI occurred with cardiac drugs (98%), acetaminophen (89%), lithium (86%), salicylates (86%), ethylene glycol (84%), ibuprofen (81%), opiate agonists (62%), amphetamines (59%), and antiinfectives (51%). *Conclusions:* The incidence of a RRE being coded in an exposure is less than 1%. However, the demographics, managements, and outcomes of such cases differ significantly from other exposures and the case-fatality rate is over 200 times higher. Substances associated with high rates of AKI in the database are known nephrotoxins. However, the AAPCC database offers a unique perspective on toxic nephropathies. Prior work has demonstrated dose-response relationships in this database that may be used for triage decisions and are predictive of clinical effects and outcomes. This database can also be used to direct future areas of research aimed at prevention and early intervention of AKI as a result of toxic exposures.

54. Comparison of Perimortem Blood Alcohol Levels with Postmortem Alcohol Levels: A Retrospective Cohort Study

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Background: The measurement of postmortem alcohol (ethanol) levels in blood (BAL) and vitreous humour (VAL) is often used as evidence in legal cases. Unfortunately, the intrinsic properties of a corpse, along with its progressing state of decay, may impede obtaining accurate measurements. For this reason a *perimortem* BAL drawn near, but before, time of death could be preferred. *Methods:* This is a retrospective cohort study based on chart review. Our subjects are patients who died in the Emergency Department (ED) from August 2002 to August 2009, had a perimortem BAL drawn within 4 h *prior* to death, with a subsequent autopsy BAL or VAL drawn. We identified 21 subjects who met inclusion criteria. Two groups were identified; those presenting to the ED with a measurable perimortem BAL and those without. Perimortem BAL was extrapolated to a presumed BAL at time of death based on a metabolism rate of 20 mg/dL/h. Assay results were assessed by Pearson correlation coefficient (r) with derivation of a regression equation. *Results:* In patients presenting to the ED with a measurable BAL, perimortem BAL correlated extremely well with both postmortem BAL ($r = 0.99$, $p < 0.001$) and postmortem VAL ($r = 0.99$, $p < 0.001$). In those patients presenting with an unmeasurable BAL, correlation was perfect for both postmortem BAL and VAL $r = 1.0$ ($p < 0.001$). Postmortem BAL also correlated well with postmortem VAL with $r = 0.97$ ($p < 0.001$). *Conclusions:* In general, our study demonstrates excellent correlation between perimortem and postmortem alcohol levels. We chose not to convert plasma perimortem BAL values to whole blood postmortem BAL values, as we wanted a simple comparison in this study. Importantly, no patient that died with a perimortem BAL < 5 mg/dL had a measurable postmortem level. A single subject had a significant discrepancy between obtained levels, with a perimortem BAL of 66 mg/dL compared to a postmortem BAL of 28 mg/dL and VAL of 99 mg/dL. In this subject, significant legal implications could be raised, as many states consider a BAL >0.8 mg/dL to imply intoxication. Caution should be exhibited in interpreting alcohol levels around legally sensitive cutoff ranges. A larger, prospective study comparing whole blood perimortem and postmortem BAL values is needed.

55. Counterterrorism Planning Using the Michigan Hazardous Substances Events Surveillance System (HSEES)

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Background: The Agency for Toxic Substance and Disease Registry (ATSDR) has worked since 2005 with several states to collect and analyze information about releases of hazardous substances. Data is entered into the Hazardous Substances Emergency Events Surveillance (HSEES) system and is intended to assist federal, state, and local public health agencies to develop strategies to prepare and respond to activities involving hazardous substances. *Methods:* Over a 4-year period (2005–2008), we analyzed HSEES data collected by the Michigan Department of Community Health (MDCH). Information about acute events involving hazardous substances is collected, including the substance(s) released, number of victims, number and types of injuries, and number of evacuations. Descriptive statistics (frequency tables, confidence intervals) were used to summarize the data. *Results:* Data on the 1,372 non-petroleum

chemical releases from 2005 to 2008 in Michigan comprise the full 4 years of MI-HSEES operation. Counties with the most frequent number of events were Wayne with 254 (18.5%) events, Midland with 159 (11.6%) events and Kalamazoo with 134 (9.8%) events. Carbon monoxide has been the most frequently released substance in the 4 years of MI-HSEES data collection, followed by ammonia and hydrochloric acid. Twenty-one percent of these releases resulted in injury to 702 individuals, and evacuations were ordered in approximately 13% of the events. Decontamination took place in 35 events (2.6% of all events), including 17 events in which 71 injured people were decontaminated and 31 uninjured were decontaminated and 18 events in which there were no injuries and 359 uninjured people were decontaminated. Overall, there were more HSEES-qualifying events in 2008 than 2007. Overall increase can be attributed mostly to the increase in methamphetamine events. *Conclusions:* The MIHSEES data is useful in characterizing the variety of hazardous substances releases in Michigan and identifying appropriate follow-up public health actions. The MIHSEES project is part of a larger program in the MDCH that addresses chemical terrorism and chemical emergency events preparedness and response. In 2008, MI-HSEES alerted local public health departments to 14 incidents and provided assistance in 10 others.

56. The Impact of Federal Pseudoephedrine Regulations on Methamphetamine Exposures

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Background: Methamphetamine abuse is a nationwide public health epidemic and is believed to be due to the inexpensive manufacturing process which requires only household chemicals and the readily accessible key ingredient, pseudoephedrine. Effective September 30, 2006, under the Combat Methamphetamine Act of 2005, all products containing the ingredient pseudoephedrine are required to be kept behind the pharmacy counter and can only be sold in limited quantities after identification is verified and a logbook is signed. To date, there is no information as to what impact this major drug enforcement policy has had on the number of methamphetamine exposures reported to poison centers nationally. *Methods:* An IRB approved, retrospective review of all methamphetamine exposures that were reported to the AAPCC National Poison Data System from October 1, 2006 to September 30, 2009 compared to those reported from October 1, 2003 to September 30, 2006 was conducted. Data collected included date of report, patient age, gender, substances ingested, formulation, route, reason for exposure, management, and outcome. Descriptive statistics were used to profile the data. *Results:* From October 1, 2003 through September 30, 2006 there were 8,001 methamphetamine exposures reported to poison centers compared to 4,703 reported exposures in the subsequent 3 year period after enactment of the law. In both groups the majority of exposures occurred in males who were 20–29 years of age. The most frequently documented reasons for exposure in both groups were intentional abuse (55.7% pre- vs. 44.3% post-regulation) followed by intentional-suspected suicide which was 14.6% both pre- and post-regulation. The largest change in the number of exposures included a 72% decrease from August 2005 to February 2006 and a 52% decrease from February 2007 to May 2007. Since the implementation of the final phase of the Combat Methamphetamine Act in September of 2006, reported exposures to methamphetamine have increased by 62%. *Conclusions:* Pseudophedrine regulations which restrict access and impose quantity limitations are short-term solutions for decreasing methamphetamine abuse.

57. Acute Toxicity by Hair Dye in Upper Egypt

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Background: Hair-dye containing paraphenylenediamine is widely used in Middle East and some Asian countries. Many cases of toxicity and mortality either due to accidental or deliberate ingestion of hair dyes were reported. The aim of the present work was the chemical analysis of the black hair dye, to analyze the various aspects of acute poisoning through a retrospective study of fatalities reported in seven governorates in Upper in Egypt as a result of its ingestion and if there is dose-affect relationship. *Methods:* The records of acute poisoning cases of seven governorates in Upper Egypt investigated by Assiut Forensic Chemical Laboratory in the period from Junuary 2002 to Decmber 2009 were examined for type of poison, pattern, incidence, age, sex, geograhical distribution and mode of poisoning. The studying of the systemic effects on ingestion of hair dye was conducted by oral administration of hair dye in different doses (500, 200, 100, 50 mg/kg) to four groups of albino rats. The clinical mainfestation was observed and the light microscopical examination of sections of vital organs was done. *Results:* Eight cases of acute poisoning fatalities investigated by Assiut Forensic Chemical Laboratory were due to ingestion of hair dye. The highest majority of these were suicide cases particularly in Qena, Sohag and Aswan Governorates respectively, with a female predominace. The highest percentage was found in the age group (31–40) years, followed by (21–30) years. Death occurred within 5 min in the first group, within 10 min in the second and within an hour in the third group. The animals of the fourth group survived until sacrificed after 1 week. The most common histopathological changes in all studied organs were vascular congestion and lymphocyte infiltration, with degeneration changes in the hepatocytes and destruction of renal tubules. *Conclusion:* Deliberate self-poisoning by hair dye is a major problem in Upper Egypt particularly in females. The main toxic effects were directed to the liver and kidneys while the other studied organs were affected to a mild extend. Also there was a well established dose-effect relationship.

58. Are Children the Unintended Victims of Changes in Buprenorphine Prescribing Practices?

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Background: Buprenorphine is an alternative to methadone for the out-patient management of opiate dependence. When used for this indication, methadone prescribing is limited to opioid addition clinics; usually in single doses and take-home weekend doses. The Drug Addiction Treatment Act of 2000 allowed practitioners not affiliated with FDA approved opioid addiction clinics the ability to prescribe buprenorphine and to allow retail pharmacies to dispense multiple day quantities. Since the Treatment Act was signed into law, the number of providers in WV that can prescribe buprenorphine has been increasing. In WV, 81 private physicians and 18 treatment centers can now prescribe this drug. The purpose of this study was to determine if the change in prescription practices for buprenorphine increased the number of pediatric exposures reported to the WV poison center. For comparison, as methadone laws were unchanged, the number of methadone-related exposures was reviewed. *Methods:* A retrospective review of the number of reported exposures to buprenorphine and methadone in children ≤5 years between 2001 and 2009. *Results:* In 2008 and 2009, approx. 50 vs. <10% of unintentional ingestions in children ≤5 years were to burprenorphine and methadone respectively. *Conclusions:* Pediatric buprenorphine exposures rose during the period the number of physicians in WV that could prescribe buprenorphine increased. Poison prevention education should accompany information provided when buprenorphine is dispensed.

59. Plant Food and Bath Salts – How Harmful is Mephedrone?

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Background: Mephedrone is one of a number of synthetic cathinones, which are increasingly being used as legal recreational drugs and are widely available for purchase through the Internet (often sold as "plant food" or "bath salts"). The majority of information currently available on the toxicity of Mephedrone comes from user forums, with only two published cases to date. There is increasing concern by legislative authorities regarding the fact that Mephedrone is currently legally available in most countries. We report here a case series of acute toxicity related to self-reported Mephedrone use. *Case series:* Since January 2009, there have been 47 presentations to our large inner-city Emergency Department with self-reported Mephedrone use. Their mean ± SD age was 27.6 ± 8.5, range 15–60 years and 80.9% male. Baseline physiological parameters (mean ± SD) were: heart rate 93 ± 27.3 bpm (range 50–158); systolic blood pressure 141.6 ± 21.9 mmHg (range 99–192); temperature 36.0 ± 1.2°C (range 33–38.1). 21.3% had a significant tachycardia (HR ≥ 120 bpm), 12.8% had significant hypertension (systolic BP ≥ 160 mmHg); no patients had a significant hyperpyrexia (>39°C). The most common clinical feature on presentation was agitation (42.6%); other features included palpitations (23.4%), vomiting (14.9%), chest pain (10.6%), self-limiting seizures (8.5%) and headache (4.3%). Serum sodium was measured in 22 (46.8%), there was only one case of hyponatraemia (sodium concentration of 125 mEq/L). Creatinine kinase was measured in 11 (23.4%), and was raised above the upper limit of normal (229 IU/L) in 7 (63.6%) of these. Thirty-six (76.6%) patients were discharged either directly from the ED or the short-stay ward after a brief period of observation. Benzodiazepines were needed for the management of acute agitation in 7 (14.9%) patients. *Conclusions:* This case series demonstrates that the toxicological profile of acute Mephedrone toxicity appears to be similar to that seen with other stimulant recreational drugs such as MDMA and amphetamines. The recent recommendation for classification of Mephedrone in the UK, along with other European countries such as Sweden, is appropriate based on the toxicity seen in these cases. The overall toxicokinetic and toxicodynamic profile of Mephedrone and the other cathinones needs further work, including greater analytical confirmation of drugs used.

60. A Case Series of Recreational Pregabalin Overdose Resulting in Generalized Seizures

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Background: Pregabalin (Lyrica™) is a GABA analogue with structural similarity and action similar to gabapentin. Pregabalin is known to have antiepileptic, analgesic, and anxiolytic activity via non-competitive GABA agonism and reduced release of glutamate, norepinephrine, and substance-P. Myoclonus and somnolence have been described in patients using pregabalin as adjunctive therapy for neuropathic pain and epilepsy; however, data is scarce on pregabalin toxicity after

	Reported exposures children ≤5 years							
	2001–2002	2003	2004	2005	2006	2007	2008	2009
Buprenorphine	0	0	0	1	5	7	32	39
Methadone	0	6	4	5	7	6	5	2

overdose or recreational use. To our knowledge, we present the first recreational overdoses of pregabalin resulting in generalized seizures in otherwise healthy patients. *Case 1:* A 16-year-old boy ingested and insufflated as much as nine 300 mg tabs of pregabalin attempting to "get high." He had found the pregabalin in the house where his family had recently moved. He had also shared the medication with his friend (see Case 2). One hour after use, he developed generalized tonic-clonic seizure activity. Though seizures abated prior to EMS arrival, the patient was slow to arouse and was taken to the ED. Extended UDS, EtOH level, CMP, CBC, and EKG were all within normal limits. Plasma pregabalin level was 27 µg/mL. The patient was observed inpatient and discharged the following day. *Case 2:* A 17-year-old boy ingested and insufflated an unknown amount of pregabalin obtained as in case 1. The patient developed generalized tonic-clonic seizures while EMS was placing his friend in the ambulance. His first seizure resolved without intervention, but a second seizure while in the ED led to PICU admission for neurological observation. Extended UDS was positive for THC, but EtOH level, CMP, CBC, and EKG were all within normal limits. Plasma pregabalin level was 43 µg/mL. The patient had no events overnight and was discharged the next morning. *Discussion:* We present two patients who experienced generalized seizures and required hospitalization after recreational abuse of pregabalin. The implication of a GABA-ergic AED causing seizures in overdose is intriguing and deserves further inquiry. Furthermore, the fact that pregabalin, a schedule V drug, is being abused by minors highlights the abuse potential of prescription drugs.

61. Parachuting of Water-Extracted Detromethorphan

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Introduction: Dextromethorphan (DXM) is the active ingredient in many over-the-counter antitussives. There have been reports of recreational ingestion of this drug since its introduction in the late 1950s, and this phenomenon, in teenagers especially, has been increasing. Reports of use with special extraction techniques are exceedingly rare, and water extraction specifically has not been reported. We report a 17-year-old boy who became symptomatic after exposure to DXM that he had concentrated by a water extraction technique he learned about via forums on the Internet. *Case report:* A previously healthy 17-year-old boy was brought in for evaluation from school after being found stumbling around with slurred speech, and reported dizziness. Upon questioning in the emergency department (ED), the patient admitted to DXM abuse. He had found a method on the Internet to extract the drug from the liquid of Delsym® (DXM polistirex) and used it to make purified powdered DXM. He wrapped that powder in a tissue and swallowed it in an attempt to get high. Physical exam revealed altered mental status and hypertension. The patient was monitored in the ED, and symptoms resolved in several hours. *Case discussion:* DXM and its main metabolite, dextrorphan, cause a hallucinogenic high through NMDA receptor antagonism, serotonin and dopamine reuptake inhibition, and opioid receptor agonism. DXM polistirex uses the Pennkinetic™ delivery system, which allows DXM hydrobromide (HBr) to be released over time. When water is added and the mixture is shaken and allowed to settle, the DXM HBr separates from the liquid. This is a simple method in comparison to the previously reported 1-phase acid/base extraction resulting in "Crystal Dex" powder and the 2-phase acid/base extraction resulting in the "DXemon juice" liquid. By extracting the powder, abusers can easily yield purified/concentrated forms of DXM, making it easy to consume large amounts of DXM. Toxicologists should be aware of this method, and the subsequent possibility of larger than usual DXM ingestions. *Conclusion:* The creation and ingestion of water-extracted powdered DXM illustrates a drug-concentrating technique found on the Internet that poison center providers and toxicologists should be aware of.

62. Administration Routes Involved in Non-Medical Use of Long-Acting Opioids in the RADARS(R) System College Survey and Poison Center Programs

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Background: Among young-adult, non-medical opioid users, experimentation with alternate administration routes is frequently reported and used as a proxy for assessing escalation toward increasing use and drug dependence. The objective was to classify administration routes among college-aged non-medical users of long-acting opioids (LAO) across two data collection systems. *Methods:* College students completed an online questionnaire (December 2009) for the RADARS System College Survey Program (CS), and were sampled equally from four US regions. Respondents answered questions about non-medical use and administration routes. The RADARS System Poison Center Program (PC) collects quality reviewed data weekly on acute drug intentional exposures from 48 of 60 US Poison Centers. CS and PC LAO cases (age 18–23) were identified. Of 1,936 CS cases, 2% (n = 41) involved at least one LAO. Acute LAO cases in CS were defined as those reporting past-month use less than or equal to 4 days (n = 31) and were compared to PC LAO intentional exposures (n = 264) as PC cases are acute in nature. *Results:* Forty-two percent of CS LAO cases reported two routes, and 34% reported three or more (n = 14). CS respondents can report multiple routes; swallowing whole (66% of cases), chewing (71%), inhalation (61%) and injection (24%). In PC LAO acute intentional exposures, only 0.8% involved two or more routes; the majority of cases involved swallowing whole (56%), with chewing, inhalation and injection comprising 16%. An independent samples Mann–Whitney *U* test revealed a significant difference between CS and PC LAO cases for the number of administration routes involved in acute cases ($p < 0.001$). *Conclusions:* Larger percentages of alternate administration routes (chewing, inhaling and injecting) reported for CS LAO cases suggests that CS may better capture experimental aberrant non-medical LAO use behaviors in this age group. A significant difference between the number of administration routes reported in CS and PC suggest these programs capture opioid use behaviors differently. An examination of both datasets provides better understanding of these behaviors than any one dataset alone.

63. Severe GHB Withdrawal Treated with Baclofen

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Background: Gamma-hydroxybutyrate (GHB) and its precursors such as 1,4 butanediol (1,4 BD) are popular drugs of abuse. GHB is thought to have agonist effects at GABA-A, GABA-B, and specific GHB receptors. Withdrawal is similar in clinical presentation to other sedative hypnotic withdrawal syndromes. Because of its short duration of action, GHB withdrawal symptoms can appear rapidly. Severe, prolonged symptoms have been reported. Standard therapy for GHB withdrawal includes GABA-A agonists such as benzodiazepines. Baclofen, a GABA-B agonist, has been suggested for benzodiazepine-resistant GHB withdrawal. We report a case of severe GHB withdrawal treated with lorazepam infusion which demonstrated clinical improvement after the addition of oral baclofen. *Case report:* A 34-year-old male presented to the ED with hallucinations and insomnia. He had been abusing both GHB and 1,4 BD for the last 7 years. Previous attempts to discontinue use had been unsuccessful due to withdrawal symptoms. Anticipating the need to enter a treatment program, he kept a detailed record of his use which revealed that he used between 1 and 4 mL of 1,4 BD every hour around the clock (photo available). On presentation to the ED the patient was awake and alert. Vital signs were: HR 103 BP 120/95 RR 16 SpO_2 98% *T* 99.1°F. Over the next 4 h his HR increased to 163 and his BP increased to a high of 196/76. His temperature rose to 101.1°F. He also became more confused. He was given 8 mg of IV lorazepam in the ED and then started on a continuous infusion at 8 mg/h. Over the next 3 days, the lorazepam infusion was titrated up to 14 mg/h for persistent autonomic dysfunction, agitation and hallucinations. He had some myoclonic jerking but no seizure activity was noted. On the third day he was started on oral baclofen at 10 mg TID. After the addition of baclofen, we were able to significantly decrease his lorazepam infusion over the next 12–24 h. His lorazepam infusion was stopped on hospital day 12. The patient recovered completely and was discharged after 14 days on a scheduled oral benzodiazepine taper. At his 1 month follow up, the patient had not relapsed his 1,4 BD abuse. *Conclusion:* Baclofen may be a useful adjunct for the treatment of GHB withdrawal due to its GABA-B effects.

64. Testing the Pipe; Neutropenia from Levamisole-Adulterated Cocaine

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Background: A 38-year-old female with a history of regular cocaine use was transferred to Harborview Medical Center (Seattle, WA) for a laryngeal mass and neutropenia. The neutropenia had been present intermittently for approximately 2 years and had defied diagnosis. *Methods:* Upon presentation to the emergency department at Harborview, blood, urine and imaging were obtained. She was then taken to the OR for biopsy of the laryngeal mass and intubation. The steel wool filter from her crack pipe was acquired and its residue was tested using gas chromatography-mass spectrometry (GCMS). *Results:* Her admission white blood cell (WBC) count was normal at 8.97 thousand/microliter, but the absolute neutrophil count (ANC) was low at 1.35 thousand/microliter. Her neutropenia began to remit at the end of her admission. The patient's laryngeal mass was found to be due to cellulitis and phlegmon formation. Urine obtained approximately 36 h after her last exposure tested positive for cocaine metabolites, but negative for levamisole. However, her paraphernalia was positive for both cocaine parent drug and levamisole. She was treated initially with broad-spectrum antibiotics and Granulocyte-Colony-Stimulating-Factor and progressively recovered without further intervention. *Conclusions:* This patient demonstrated neutropenia likely due to levamisole exposure. Harborview Medical Center has begun routine testing for levamisole in the urine of patients suspected of substance abuse. Levamisole is found at our institution strictly in association with cocaine. Providers should be aware of the prevalence of cocaine adulterated with levamisole, the risk of levamisole-associated neutropenia in cocaine users, and the opportunity to test residual in paraphernalia in patients with a suspicious clinical picture for confirmation of exposure to levamisole-adulterated cocaine.

65. Severe Polyneuropathy Secondary to Nitrous Oxide Abuse with Good Clinical Outcome after B12 Treatment

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Introduction: Nitrous oxide (N_2O) is used as an anesthetic during dental procedures, however it is used recreationally to achieve short-lived euphoria and hallucinations. Users acquire whipped cream canisters to inhale the gas. Biochemically, N_2O interferes with B12 action in the nervous system, and its abuse can present

as subacute combined degeneration (SCD). We report a case of N_2O abuse presenting with significant neurological deficits, medical complications and eventual good clinical outcome. *Case:* A 29-year-old man presented to the ED with inability to walk, clumsiness, slow thinking. He reported that initially he had numbness/tingling in all extremities that progressed to weakness. He was unable to walk because he did "not know where (his) feet are." He reported using about four boxes (24 cans/box) of aerosal cans of N_2O on a daily basis for 3–4 months PTA. On exam, he had temp of 102, CNs intact, 3/5 truncal weakness, 5/5 strength in UE, 4/5 in BLE, 3+ reflexes in BLE and 2+ in BUE, decreased vibration sense, absent proprioception in BL feet; he was slow to respond when spoken to and had both fine/gross motor clumsiness. Labs were remarkable for macrocytosis, B12 of 204, normal CSF, CT and MRI brain were normal. He was treated with B12 200 mg IM daily. On hospital day 5, he developed hemoptysis and respiratory distress, and was intubated due to a large saddle pulmonary embolus (PE). Following resolution of acute medical problems he went to inpatient rehab where mobility drastically improved. He continued to get 1 g B12 IM monthly. Five months after initial presentation patient is walking without a walker and doing all ADLs. *Discussion:* This patient presented with impairment of posterior columns (loss of position/vibration sense), damage to the corticospinal tracts (weakness/spasticity) as well as slight dementia. This is consistent with SCD caused by N_2O. These deficits left him immobile and he subsequently developed a life-threatening PE. In addition to immobility, N_2O may interact to augment homocysteine increasing hypercoagulability. *Conclusion:* We present a patient with massive N_2O abuse with a clinical picture similar to SCD. With rigorous physical therapy, B12 repletion, and abstinence, the patient returned to his baseline condition.

66. Severe GI Distress After Smoking JWH-018

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Background: JWH-018 is a synthetic cannabinoid receptor agonist that has been isolated from various herbal products such as "Spice," "Smoke," and "K2." We report a case of acute intoxication from one of these products complicated by severe GI distress. *Case report:* A healthy 18-year-old man smoked about 1 oz of a dried herbal substance, "K2 Summit," through a hookah waterpipe. This was his first exposure to the product. Thirty minutes after exposure, he developed tremors, blurred peripheral vision, nausea, and persistent vomiting with retching. Friends, who were exposed to a similar amount of the same product and reported marijuana-like intoxication but no GI distress, said the patient was "mumbling" and having "difficulty walking." His symptoms persisted for 4.5 h until receipt of antiemetics and IVF in the ED, where $T = 36.3°C$, HR = 93, BP = 120/65, RR = 18. Labs were normal except for $K = 3.4$ mmol/L and glucose = 174 mg/dL. ETOH was negative, as was urine test for drugs of abuse including THC. The substance was found by GCMS to contain JWH-018. LCMS/MS of serum obtained 4.5 h after exposure revealed 0.5 ng/mL JWH-018. GCMS of urine was negative for JWH-018, and no other substances were identified. *Discussion:* In most states and in many countries outside the US, herbal substances containing the cannabinoid-agonist JWH-018 may be legally smoked and purchased via the internet or in "headshops." JWH-018 binds CB1 (psychotropic) and peripheral CB2 cannabinoid receptors with equal or higher affinity than THC. There are no published studies of JWH-018 effects in humans and the incidence of adverse events is unknown. GCMS analyses of similar herbal products have demonstrated presence of other cannabimimetics such as HU-210, CP-47-497 and JWH-073 thought to be used as a substitute for JWH-018 to evade prohibition. In addition, adulterants such as vitamin E and possibly sympathomimetics have been reported. It is unclear whether adverse effects in this case were due to an unidentified adulterant or to JWH-018 itself. *Conclusion:* Recreational use of JWH-018 may result in persistent emesis necessitating medical intervention.

67. Adverse Effects Associated with Smoking Damiana Incense Product

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Background: Aromatherapy incense is not for human consumption. A trend of smoking damiana (*Turnera diffusa*) incense was noted and adverse effects are unknown. The study objective was to examine clinical effects and outcomes of smoking damiana incense. *Methods:* An observational case series of inhalation abuse of damiana from a US poison center over a 5-month period ending March 31, 2010. Cases were identified retrospectively using "inhalation" and "abuse" search terms. *Inclusion criteria:* Inhalation route, abuse intent, product damiana, and an outcome recorded. Cases with co-ingestants excluded. Records reviewed for clinical effects, initial caller, duration of effect, outcome, and calls per month. *Results:* A total of 73 inhalation abuse cases were identified over 5 months beginning November 2009. Of these, 21 (29%) were damiana inhalation abuse. Eighteen (86%) damiana products were identified as the brand Black Mamba by the caller. Patient mean age was 24 years (range 13–50 years), 76% were male. Six patients were referred to a health care facility (HCF), 14 already in a HCF, and 1 was managed at home. Damiana represented 20 of 38 (53%) inhalation abuse cases treated in a HCF. Clinical effects: chest pain (5), palpitations (2), drowsiness/lethargy (7), agitation (6), nausea/vomiting (5), tremor (2). Eight of eleven cases with vital signs reported had tachycardia (range 102–150 bpm). One patient had two seizures and a GCS of three. Seven HCF cases obtained a urine drug of abuse screen and all were negative. Duration of effects was less than 8 h in 11 and up to 24 h in 4 cases. Medical outcomes: 6 lost to follow-up, 11 "minor effect," 3 "moderate effect," 1 "major effect." Cases by month: November (1), December (1), January (3), February (10), March (6). *Discussion:* Damiana is reported to have a calming effect similar to cannabis when smoked. A recent trend is for some incense products to be smoked as marijuana alternatives (e.g. "spice"). It is unknown if the adverse effects associated with smoking damiana or Black Mamba incense are related to a synthetic THC homolog or alkaloids naturally present in damiana. *Conclusion:* Smoking damiana incense was associated with adverse effects resulting in visits to HCFs.

68. Heroin-Induced Sensorineural Hearing Loss

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Introduction: Acute sensorineural hearing loss due to opioid toxicity has rarely been reported. Theorized mechanisms have included adulteration with ototoxic substance (e.g. quinine), direct opioid toxicity, isolated hypoperfusion or hypoxemia. We present a patient with significant hearing loss following use of IV heroin. *Case:* Twenty-six-year-old woman with a history of substance abuse presented to the ED complaining of bilateral hearing loss following use of IV heroin. She claimed that she had been abstinent from IV heroin for 14 months prior to this episode though she had been abusing oral oxycodone for the previous 2 months. Following use, the patient had been very somnolent and awoke with incomplete hearing loss. Serum salicylate was undetectable. Urine drug screen by GC/MS confirmed heroin and oxycodone without the presence of ototoxic drugs. Audiology testing revealed sensorineural hearing loss to 44% of expected function with worsened function in higher frequencies. MRI of the brain did not reveal any acute abnormalities. The patient had subjective improvement in hearing over 24 h of observation but was lost to follow up. *Discussion:* This patient presents with acute sensorineural hearing loss following use of IV heroin. There was no evidence of ototoxic co-ingestion or adulterant. MRI did not reveal ischemic or demyelinating changes. Previous cases have also described hearing loss after periods of abstinence which may indicate autoimmune-mediated hearing loss. Direct toxicity is also possible though the mechanism remains unclear. *Conclusion:* Clinicians should be aware of potential sensorineural hearing loss in patients abusing opioids though it rarely occurs. Further investigation is needed to identify the etiology of hearing loss.

69. Suspected Fluorosis Following Chronic Inhalant Abuse

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Background: Inhalation abuse is common most frequently seen in adolescents but also in adults. We present a case of suspected fluorosis resulting from long term inhalant abuse. *Case:* Fifty-six-year-old male presented to the emergency department (ED) by paramedics after being found "passed out" by friends 2 h earlier. Patient was alert and awake in the ED without complaints. The patient states he has abusing a computer dust removal product "Dust Off" daily for the past 2 years. Patient states on day of presentation he had inhaled a total of 10 cans. He abuses for hallucinatory effects but also "to go to sleep." He denies any other drugs or methods of abuse. He has a negative past medical history other than remote ethanol abuse but none for more than 10 years. His ethanol level was negative in the ED. A full 10 system review of systems was negative. Initial vital signs in ED: 140/70 mmHg, 102 bpm, afebrile, 20 bpm, O_2 sat 98% on room air. Physical examination was normal including lung and cardiovascular examination. Twelve lead electrocardiogram showed normal sinus rhythm rate 94 and normal intervals without acute ST changes. A urine toxicology screen was negative. Serum chemistries and complete blood count were normal except alkaline phosphatase 280 IU/L (normal 30–130 IU/L). A two view chest X-ray identified normal lungs and cardiomediastinal silhouette. However, there was diffuse sclerosis and increased density of the entire visualized osseous skeleton consistent with fluorosis. The patient has no history of prostate cancer and a normal PSA. *Conclusions:* We present a case of suspected fluorosis secondary to chronic inhalant abuse. The poison center identified the product brought to the ED as a fluorocarbon containing product. Fluoride ions chelate calcium and stimulate uptake into the bone as flouroapatite. Chronic exposure to fluoride can result in increased bone density as noted in this patient.

70. Refractory Hypotension Due to Rogaine Ingestion

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Background: Minoxidil (Rogaine®) belongs to the class of antihypertensives known as direct vasodilators. These agents control blood pressure by promoting release of nitric oxide in the vascular endothelium ultimately producing peripheral vasodilation with reflex tachycardia. Toxicity can result from dermal exposure, but significant toxicity may occur when minoxidil is ingested. *Case report:* We present the case of a 48-year-old male who ingested an entire 8 oz. bottle of Rogaine®, unknown strength, for its alcohol content. Patient presented 1 h and 20 min later with a blood pressure of 57/45 mmHg and a pulse of 84 bpm. He received 2 L IV fluids and dopamine was started at 5 mcg/kg/min. Dopamine was then increased to 20 mcg/kg/min when levophed was started at 5 mcg/min and titrated up to 25 mcg/min. Blood pressure was maintained around 77/47 mmHg with a pulse of 102 bpm. Approximately 3 h post ingestion, the patient developed tremor-like movement, which was controlled with lorazepam. Phenylephrine was eventually added, starting at 100 mcg/min as dopamine was weaned off. Dopamine was stopped approximately 6 h post ingestion as phenylephrine maintained a steady blood pressure at a rate of 140 mcg/min for 24 h. Midodrine, an oral alpha-1 vasopressor, was added as vasopressors were weaned off. His blood pressure stabilized with a systolic

BP in the 110s and a diastolic BP in the 60–70s. Over the next 2 days, midodrine was weaned off as his blood pressure returned to baseline. The patient was medically cleared 3 days after ingestion once his hypotension and mental status returned to baseline. *Discussion:* Ingestion of minoxidil, a direct vasodilator found in Rogaine®, can produce significant hypotension requiring the use of multiple vasopressors at high doses as seen in our patient. To date, it is unknown if there are any anecdotal reports regarding the use of midodrine in minoxidil toxicity. *Conclusion:* We present a case of minoxidil ingestion in a man who developed severe and refractory hypotension responsive only to multiple high-dose vasopressors. Midodrine is a novel agent that could be used in the treatment of refractory hypotension secondary to minoxidil ingestion. This uncommon ingestion required aggressive pharmacologic treatment due to the rapid onset of action.

71. In Vitro Study of Acetadote on Coagulation Factors in Plasma Samples from Healthy Subjects

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Introduction: In the treatment of acetaminophen toxicity, clinicians believe that *N*-acetylcysteine (NAC) artificially elevates prothrombin time (PT). However, the effect of NAC on human blood coagulation remains unverified. In a previous study, we show that NAC had a dose-dependent effect on PT. To our knowledge, there are no studies that specifically examine the mechanism by which NAC affects PT. This study evaluates the effect from a therapeutic NAC dose on the concentration of coagulation factors II, VII, IX, and X in human plasma. *Method:* We obtained blood samples from 10 volunteer subjects. After centrifugation of each volunteer's blood sample, the plasma was pipetted and divided into two 1 mL aliquots. We used the first 1 mL sample as a control. The second 1 mL plasma sample had 5 mL of 20% NAC, as Acetadote, added to make a final concentration of 1,000 mg of NAC per L of plasma. This concentration of NAC approximates the plasma levels achieved after a 150 mg/kg dose. We incubated the two samples for each subject (control and 1,000 mg/L) at 37°C for 1 h and measured the concentration of coagulation factors II, VII, IX, and X. We compared factor level concentration using the paired student *t*-test. *Results:* Mean values of the control samples for factors II, VII, IX, and X were 1.34 (CI 1.19–1.49), 1.26 (CI 0.90–1.63), 1.37 (CI 1.17–1.57), 1.70 (CI 1.44–1.96) U/mL, respectively. Mean values of the NAC-containing samples for factors II, VII, IX, and X were 0.90 (CI 0.79–1.00), 0.66 (CI 0.51–0.80), 0.74 (CI 0.63–0.85), 0.81 (CI 0.71–0.90) U/mL, respectively. All samples containing NAC had significantly lower coagulation factor concentrations than their controls with a $p < 0.001$. *Discussion:* In a previous study, we were able to demonstrate NAC had a dose-dependent effect on PT. In this study, we compared concentrations of factors II, VII, IX, and X at baseline and for samples that received NAC. All factor concentrations had a significant decrease with the addition of NAC. This fall in factor concentration is not explained by the dilution of adding NAC to the test samples. *Conclusion:* We are able to demonstrate a significant decrease in the concentration of coagulation factors II, VII, IX, and X with the addition of NAC. This may be the mechanism by which PT increased in our previous study.

72. Influence of Different Antidotal Treatments on Amatoxin-Induced Hepatotoxicity in $HepG_2$ Cells

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Background: In a retrospective study in 388 patients with amatoxin poisoning 258 were treated with silibinin plus penicillin, 130 with silibinin alone. The death rate/LTx in the combination group was higher than in the monotherapy group (8.5 vs. 4.6%). Therefore we tested the influence of silibinin alone and of the combination silibinin plus penicillin on apoptosis and necrosis in $HepG_2$ (human hepatocellular carcinoma cells) at 48 h after incubation with alpha-amanitin for 1 and 24 h and after coincubation. *Methods:* $HepG_2$-cells were cultivated in culture medium (DMFM). The degree of necrosis was measured by the release of adenylate kinase an enzyme that is leaking out of necrotic cells only (Tox Light, Lonza). Apoptosis was determined by fluorenscens microscopy using the Live/Dead reagent and the TUNES reagent which is staining apoptosis specific DNA fragments. 1 µM alpha-amanitin was used in all experiments. Silibinin alone (3 and 10 µM) and penicillin (20 and 30 µM) and the combination of the two were cointubated or given for 1 and 24 h to the medium and the rate of apoptosis and necrosis determined. Controls without antidote and without alpha-amanitin were run in parallel. *Results:* The coincubation of alpha-amanitin plus penicillin decreased the rate of apoptosis. If the medicamentous intervention was done 1 h after the alpha-amanitin admixture the rate of apoptosis was significantly higher whereas the rate of necrosis was significantly lower only in the silibinin group. The rate of necrosis was highest in the combination group. The same result came true if the cells were exposed to alpha-amanitin for 24 h before treatment. *Conclusion:* The treatment with silibinin increases apoptosis but decreases necrosis significantly in alpha-amanitin poisoned $HepG_2$ cells even after 24 h. Possibly this leads to less inflammatory reaction of the liver tissue limiting the damage done by amatoxin.

73. Effect of Glycolate on Measured Lactate Using Three Analyzers

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Background: Ethylene glycol poisoning results in metabolic acidosis, renal failure and death. Case reports and in-vitro studies show that glycolate, a metabolite of ethylene glycol can cross-react with the L-lactate oxidase enzyme used in lactate assays. Previous reports suffer from an inconsistent accounting of baseline lactate concentration. We sought to determine the degree of glycolate interference on lactate concentration, accounting for baseline lactate. *Methods:* Three different analyzers (Radiometer ABL 725, Siemens Advia 1650, and Vitros 5.1) were selected from three hospitals where we provide bedside medical toxicology consultation. Using human fresh frozen plasma (FFP) seven blinded samples were prepared for analysis: control (plasma alone); FFP plus 2.78 mmol/L of lactic acid; plasma plus increasing concentrations of glycolic acid 1.31, 2.63, 5.26, 7.89, and 10.52 mmol/L. This range was selected based on reported glycolate concentration in confirmed cases of ethylene glycol poisoning. Samples were prepared in triplicate and analyzed during a single batched analysis. Statistical means, standard errors, conversion factors, and correlation coefficients were determined using SPSS software (version 18: Chicago, IL, USA). *Results:* Control lactate concentrations using the Radiometer ABL 725, Siemens Advia 1650, and Vitros 5.1; were 2.0, 1.79, and 2.2 mmol/L respectively, which are consistent with reported FFP lactates. Figure 1 demonstrates glycolate's interference with reported lactate concentrations. Assuming linear interference over the experimental range, the derived glycolic acid:lactic acid conversion factors with correlation coefficients (R^2) were 0.719 (0.958), 0.101 (0.820), 0.147 (0.964) for the Radiometer ABL 725, Siemens Advia 1650, and Vitros 5.1 respectively. *Conclusion:* The Radiometer ABL 725 produced the most interference, while the Siemens Advia 1650 and Vitros 5.1 displayed minimal interference. A falsely elevated lactate might prove to be a useful clinical marker of ethylene glycol poisoning when serum ethylene glycol concentrations are not rapidly available.

74. Acetaminophen Levels Drawn Prior to 4 Hours Post Ingestion as Predictors of Levels at 4 Hours Post Ingestion

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Background: Acetaminophen (APAP) levels drawn prior to 4 h prior to time of ingestion (TOI) have been felt to be of limited value in predicting the need for treatment using the Matthew-Rumack Nomogram. Clinicians often start NAC based on high pre-4 h levels or withhold it based on low pre-4 h levels. This pilot study was developed to determine a range of min and max serum APAP levels drawn prior to 4 h associated with treatable and non-treatable levels on the Nomogram. *Methods:* This was a retrospective chart review. Data was gathered by reviewing the notes section of each chart using a standardized template and trained personnel. Kappa values were obtained among recorders. Cases were included if they were found to have two APAP levels, one drawn prior to 4 h and another drawn *at 4 h* from the time of ingestion (TOI). All cases were acute ingestions. Cases were divided into treatable and non-treatable based on the 4 h level using the nomogram. Cases were excluded if the time of ingestion was unknown, levels were not recorded, the second level was not at 4 h, if only one level was recorded, or if pts presented later than 4 h from TOI. *Results:* One thousand and seventeen charts of pts presenting for APAP toxicity were reviewed. One hundred and eight cases met inclusion criteria. Of these cases, 91 cases had non-treatable 4 h APAP levels (NT4Ls) and 17 had treatable 4 h APAP levels (T4Ls). Of the patients with NT4Ls the range of pre-4 h APAP levels was from 0 to 300 mg/L (Mean 87, SD 70); of the patients with the T4Ls, pre-4 h levels ranged from 127 to 459 mg/L (Mean 223, SD 32); The lowest APAP level associated with treatable levels was 127 mg/L, the highest level correlating to a non-treatable level was 300 mg/L. An initial APAP level of 0 did not always correlate with a non-detectable 4 h level. *Conclusions:* This pilot study suggests a wide range of APAP values in both treatable and non-treatable groups. This wide range makes predicting a "threshold" pre-4 h level correlating with T4Ls or NT4Ls difficult. While values less than 127 mg/L were always associated with nontreatable levels, larger or prospective studies with more patients are necessary. For patients with non-treatable 4 h APAP levels, early levels may exceed 300 mg/L.

75. Investigating the Metabolite Responsible for the Renal Toxicity of Diethylene Glycol in Vitro

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Mass epidemics of diethylene glycol (DEG) poisoning have occurred worldwide when it is mistakenly used as a solvent in liquid drug formulations such as cough syrups/elixirs. DEG poisoning produces metabolic acidosis, renal failure, and neuropathy that can lead to death without treatment. Recent studies in rats *in vivo* demonstrated that DEG is non-toxic when the alcohol dehydrogenase inhibitor, fomepizole, is dosed to prevent the metabolism of DEG. The two major urinary metabolites of DEG in the rats are 2-hydroxyethoxyacetic acid (2-HEAA) and diglycolic acid (DGA). The goal of the present studies was to assess the relative cytotoxicity of the two metabolites towards human proximal tubule (HPT) cells in culture. Initial experiments with increasing concentrations of the parent compound or both metabolites, separately, at 6 h showed no cytotoxicity at this early time point. Subsequent time course experiments demonstrated that at 48 h both HEAA and DGA appeared to produce necrotic damage to HPT cells, with not much difference in relative potency. DEG itself at concentrations up to 100 mmol/L for 48 h produced no cytotoxicity. These results suggest that a moderately prolonged exposure to the DEG metabolites is necessary to produce cytotoxic damage. The necrotic damage to the HPT cells may explain DEG's toxic renal pathology. This work is supported by the American Chemistry Council.

Table 1. Analysis results with spikes glycolic acid

Glycolic acid spike (mmol/L)	Lactic oxidase I (mmol/L)	Lactic oxidase II (mmol/L)	LDH (mmol/L)
0	1.9	3	3
3.9	2	4.97	2.9
7.9	2.1	6.32	2.9
11.8	2.2	7.33	2.9
15.8	2.3	8.03	2.9
23.7	2.5	8.99	2.9
31.6	2.7	9.53	2.9

76. Lack of Glycolic Acid Interference with Lactate Measurement Using the Lactic Dehydrogenase Method: A Methodology Based Analysis

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Introduction: Cross-reactivity of glycolic acid in lactate analyzers has been previously reported. We sought to compare the stability of these findings under differing enzymatic methodologies. *Methodology:* Three spiked serum specimen sets were prepared to contain 0, 3.9, 7.9, 11.8, 15.8, 23.7, 31.6 mmol/L respectively of glycolic acid in each set. Two sets were analyzed using the Roche/Hitachi 904/911/917MODULAR P analyzer lactic oxidase (LO) enzymatic method. One analysis set employed a lactate dehydrogenase (LDH) enzymatic assay, adapted to the Siemens Dimension Vista System. All samples were run twice with the mean of the two runs at each concentration used for analysis. Resultant curves were fitted utilizing least squares regression and a determination of regression line was made in each case (when possible), Differences were considered significant at $p < 0.05$. *Results:* No linear regression line was possible for the LDH methodology as no apparent interference was seen. The interference curves for the identical LO dependent methods at the two different laboratories were both linear, but differed clinically and statistically ($p < 0.05$). *Discussion:* False elevations in lactate measurement are common after exposure to significant amounts of ethylene glycol. *Conclusion:* Our study is consistent with the currently available literature in that lactate oxidase methods yield cross-reactivity that is unpredictable and with the LDH method yielding no cross reactivity. This is an important finding especially in areas of a high indigenous occurrence of ethylene glycol poisoning (Table 1).

77. Monitoring the Progress of Acute Valproic Acid (VPA) Intoxication Using LC-MS/TOF Analysis

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Background: In rare cases of reported acute VPA intoxication in adults, a careful documentation of relevant metabolites is lacking. VPA toxicity has been suggested to be a consequence of mitochondrial beta oxidation inhibition resulting from VPA-induced carnitine deficiency. We report a study on an acute VPA overdose in which we measure serial levels of VPA and its metabolites (2en/4en-VPA, valproylcarnitine), carnitine, acetylcarnitine (measure of beta oxidation), and suberic and adipic acid (measures of omega oxidation) using liquid chromatography-time-of-flight mass spectrometry (LC-MS/TOF). *Case:* A 25-year-old female ingested an unknown quantity of VPA in a suicide attempt. She presented to the ED with a GCS of 3 and profound hypotension and hypothermia. The patient was intubated and admitted to the ICU for further care. *Methods:* Serial serum and urine samples were analyzed using Agilent LC1200/MS-TOF 6230. The chromatograms obtained for the samples were analyzed using Agilent's MassHunter Qualitative Analysis and Quantitative Analysis software to determine the presence and levels of valproylcarnitine, 2en/4en-VPA, carnitine, acetylcarnitine, suberic and adipic acid. Levels of VPA and other relevant metabolites and electrolytes were also measured using the Centaur Advia and Advia 1800 Autoanalyzers. *Results:* The patient initially presented with a very high level of VPA (1,009 µg/mL) which did not normalize to the therapeutic range until 42 h after admission. The elevated levels of VPA were accompanied by hyperammonemia, hypernatremia and hypocalcemia. During the progress of her VPA intoxication, carnitine and acetylcarnitine levels were initially markedly decreased which coincided with dramatic increases in suberic and adipic acid levels. These metabolites then started normalizing as soon as her VPA levels rebounded to the therapeutic range. Spikes in the levels of toxic VPA metabolites, 2en/4en-VPA and valproylcarnitine, were observed within the first 24 h of the patient's admission. *Conclusions:* Careful monitoring of VPA intoxication using LC-MS/TOF analysis in an adult female showed that acute VPA overdose induced carnitine deficiency and resulted to mitochondrial beta oxidation inhibition. Toxic metabolites of VPA are increased early on in VPA intoxication.

78. Prolonged Elimination of Ethylene Glycol in a Patient Receiving Fomepizole with Normal Renal Function

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Background: Ethylene glycol (EG) ingestion can cause serious morbidity and mortality if untreated. Fomepizole (4MP), a competitive inhibitor of alcohol dehydrogenase, is effective in preventing formation of adverse metabolites. The half-life ($t_{1/2}$) of EG in the presence of 4MP has previously been investigated, and ranges from 11 to 20 h in those without renal impairment. We report a case of EG ingestion with a prolonged $t_{1/2}$ of 99 h in a patient with normal renal function. *Case report:* A 27-year-old male presented to the emergency room 30 min after the sole ingestion of a half-gallon of radiator antifreeze containing EG. The patient admitted to one episode of emesis shortly after ingestion. At the time of arrival he was asymptomatic. Physical examination, vital signs, EKG and initial chemistries were normal including a creatinine of 0.7 mg/dL, an anion gap of 10, a serum ethanol of 9.4 mg/dL and an osmolar gap of 9.4. Blood gas analysis showed no abnormalities. The UA was negative for oxalate crystals. Based on the history, 4MP was initiated. Definitive testing showed an initial EG level of 36 mg/dL. Subsequent levels approximately 24 h apart were 28 and 26 mg/dL before becoming undetectable. Subsequent testing failed to show worsening creatinine, presence of elevated anion or osmolar gaps, or development of acidosis.

Case discussion: This case illustrates an extremely prolonged t1/2 of elimination of EG during treatment with 4MP in a patient with normal renal function. EG has previously been shown to undergo first-order elimination kinetics, with t1/2 ranging from 11 to 20 h in similar patients.1,2 The t1/2 in our patient was 99 h, a substantial difference from previously reported values. Conclusions: Clinicians should be aware of the possibility of prolonged elimination of EG, as this may make hemodialysis a more attractive option for timely and efficient elimination of EG.

79. Single Verses Multiple Hyperbaric Sessions for Carbon Monoxide Poisoning: Is More Better?

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Background: Hyperbaric oxygen (HBO) treatment has been advocated for treatment of acute carbon monoxide poisoning and the prevention of resultant delayed neurological sequelae (DNS). The purpose of this study was to determine in a mouse model whether there is a dose-response relationship between number of hyperbaric oxygen sessions and the prevention of DNS. *Methods:* Mice were randomized to five treatment groups: 1) Control, receiving no CO exposure or treatment; 2) CO poisoned, receiving no treatment (CO Group); 3) CO poisoned, receiving normobaric oxygen for 45 min following the end of exposure (CO + NBO Group); 4) CO poisoned, followed by one session of hyperbaric oxygen (CO + HBO1); 5) CO poisoned, followed by three HBO treatment sessions, one every 6 h (CO + HBO3). Prior to poisoning, all animals were trained in step-down latency (SDL) and step-up latency (SUL) tasks. One week after exposure and treatment all five groups were tested to evaluate the retention of this training. *Results:* In SDL there was a trend for each treatment group towards improvement over the CO Only Group, however due to large variation between subjects this did not reach statistical significance. In the SUL task the CO, CO + NBO, and CO + HBO3 Groups all had statistically significantly prolonged times compared to controls. Only the CO + HBO1 Group had an insignificant increase in SUL compared to Control Group, 6.26 s [Interquartile Range (IQR) 3, 10] compared to 4.25 s (1.9, 5.4) respectively (Table 1).
Conclusions: A single session of hyperbaric oxygen prevented neurologic sequelae in our murine model as measured by step up latency. Both normobaric and multiple HBO treatments were inferior to a single HBO treatment. It may be that HBO sessions administered some time after a CO exposure may enhance the lipid peroxidation cascade, and worsen neurologic outcomes.

Table for Abstract 79

	Step down IQR				Step up IQR			
	Median	25	75	p-Value	Median	25	75	p-Value
Control	151	59	238	–	4.25	1.9	5.4	–
CO	97	65	126	0.212	7.56	6.4	10	0.012
NBO	114	95	198	0.393	9.7	8	10	0.014
HBO1	122.6	19	208	0.470	6.26	3	10	0.176
HBO3	166	36	300	0.818	10	6.9	10	0.006

80. Association of Caffeine Consumption and Smoking Status with Serum Concentrations of Polychlorinated Biphenyls (PCBs) in the General US Population

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Purpose: To evaluate the effects of smoking and caffeine consumption on serum concentrations of PCBs. *Methods:* We used cross-sectional survey data consisting of 1,071 adults (>19 years) participating in National Health and Nutrition Examination Survey (2003–2004). PCBs were measured in serum by HRGC/IDHRMS. Specifically, we used the sum of 33 PCB congeners, including 22 non-dioxin-like PCBs and 10 mono-ortho PCBs, as indices of these PCBs. We evaluated the association of smoking and caffeinated beverage consumption with these PCBs. Whole weight and lipid-adjusted concentrations of PCBs were fitted in separate regression models, which included age, sex, and race/ethnicity. *Results:* Six regression models were fitted and the R2 varied from 41.6 to 64.5%. New to this study, we found an interaction between caffeine consumption and smoking for lipid-adjusted total PCBs ($p = 0.03$) and both whole weight and lipid-adjusted mono-ortho PCBs ($p \leq 0.01$). Smokers had lower concentrations of total PCBs and of mono-ortho PCBs than non-smokers when caffeine was consumed at least once a day, but not when the consumption was less than this amount. Also, the effects of caffeine consumption and smoking on the concentration of PCBs appeared to be age-dependent. We found an interaction between age and caffeine consumption for whole weight and lipid-adjusted concentrations of mono-ortho PCBs ($p = 0.01$). For age 20–29 years, those who consumed caffeine for at least once a day had lower mono-ortho PCBs than those who did not. This relation between mono-ortho PCBs and daily caffeine consumption was reversed for age 50+ years. Similar to the above, we observed an effect with increasing age and smoking for whole weight concentrations of total PCBs ($p = 0.01$) and of non-dioxin-like PCBs ($p = 0.05$). Smokers had lower concentrations of total PCBs and non-dioxin-like PCBs than non-smokers for age 20–29 years, but not at older age categories. *Conclusion:* Smoking and caffeine consumption need to be considered in the interpretation of human biomonitoring data for PCBs because they appear to affect the serum concentrations of these chemicals.

81. Efficacy of Cytoflavine in Acute CO Poisoning

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Background: Cytoflavine, a Russian pharmaceutical consisting of nicotinamide, inosine, riboflavin, sodium succinate and glucamine has been associated with neuroprotective effects in hypoxic states. The capacity of cytoflavin to improve clinical outcome in acute carbon monoxide (CO) intoxication was investigated in a controlled retrospective clinical study of 409 subjects treated from 1999 to 2009. *Methods:* The intervention (CYT) group consisted of 205 patients (146 males, 59 females) with acute carbon monoxide intoxication from home heaters (n = 140) or exhaust gases (n = 65) classified according to the Lujnikov scale as either light (n = 38), moderate (n = 92) or severe (n = 75). Controls consisted of 204 cases with acute CO poisoning from home heaters (n = 161) or exhaust gases (n = 43) classified as either light (n = 42), moderate (n = 84), or severe (n = 78). All patients were treated with 100% oxygen and standard supportive care beginning in the prehospital period; the intervention group also received IV cytoflavine 10 cc in D5W b.i.d. Clinical outcome was assessed in terms of mortality, and duration of CNS signs and symptoms. *Results:* In patients with light CO poisoning (COHb = 26 ± 1.7%), headache and nausea resolved after 1 day in the CYT group versus 3 days in controls. In patients with moderate CO poisoning (COHb = 45 ± 3.1%, or short-term unconsciousness), somnolence and obnubilation resolved twice as fast in the CYT group than in the control group. In severe poisonings (COHb = 55 ± 3.5%, with coma and myonecrosis) CYT was associated with more rapid recovery of consciousness and diminished retrograde amnesia, except for the subgroups with COHb >70% or a duration of coma of >6 h, in whom there was no benefit associated with treatment. Averaged across all severity levels, hospital stay was 3.5 ± 0.5 days in the CYT group versus 4.6 ± 0.8 days in controls. Overall mortality was 2.0% in CYT group and 4.3% in controls. *Discussion:* Cytoflavine administration was associated with accelerated improvement in the neurological signs and symptoms of CO poisoning, except in patients with extremely high COHb levels or prolonged coma.

82. Urinary Cadmium in Smoking and Non-smoking US Adults, 1999–2006

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Tobacco smoke is the major source of cadmium (Cd) exposure for US adults without occupational exposure. Accumulated Cd body burden is reflected by urinary Cd levels. In the *Fourth Report on Human Exposure to Environmental Chemicals,* approximately 5% of the US population of adults exceeded 1.0 µg Cd/g creatinine, a level associated with microproteinuria. To examine the relationship between urinary Cd and cigarette smoking in adults, we calculated the odds ratio of exceeding several risk-associated cadmium concentrations (1.0, 0.7, and 0.5 µg Cd/g creatinine) according to smoking status, stratified by age and gender using National Health and Nutrition Examination Survey data from four survey periods (1999–2006). We also calculated least square geometric means of uncorrected urinary Cd adjusted for age, gender, smoking status, and log urinary creatinine. Current and former cigarette smokers were approximately 4–7 and 3–4 times more likely to have urinary Cd levels exceeding the three thresholds than were non-smokers. Adjusted geometric mean urinary Cd increased with age in all smoking groups. Current smokers had higher adjusted mean urinary Cd than former smokers, who had higher levels than non-smokers at any age. Exceeding risk-associated urinary Cd levels is more likely in current cigarette smokers, and former smokers retain some of this risk. Cd accumulation with age is faster in smokers compared to non-smokers. Cd should be considered in tobacco-related regulatory and policy actions.

83. An Idiopathic Environmental Illness-like Syndrome in Children

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Background: Idiopathic environmental illness (IEI) syndrome is a controversial condition described in adults. Patients develop a broad constellation of symptoms and signs provoked by a range of chemicals. Often the condition is heralded by an inadvertent exposure to a chemical in the workplace. The condition is not well described in children. *Objective:* To describe cases of IEI seen in a Pediatric Environmental Health Center (PEHC). *Methods:* All medical records of patients referred to the PEHC between 1997 and 2010 were reviewed for the diagnosis of "multiple chemical sensitivities" or "idiopathic environmental illness." Patients whose symptoms seemed related predominately to one environment or were readily explained by a single illness, such as sinusitis, were excluded. We defined IEI: symptoms involved >1 body system, involved multiple precipitants, occurred in >1 environment. Charts were reviewed for the patient's age, gender, symptoms, environmental triggers, diagnostics, and management. *Results:* Sixteen patients met criteria for IEI: 9 males, 7 females. Mean age was 11.1 years old (range 3.5–21.75 years). Precipitants included paints, oil, gasoline, fumes, ammonia, cleansers, perfumes, lawn chemicals, pesticides, foods, preservatives, food dyes, carpets, tobacco smoke, wood stoves, polyester, molds, toothpaste, detergents, deodorizers, hair gel, shampoos, and solvents. Symptoms included detecting objectionable odors (12), bronchospasm (6), rash (6), cough or shortness of breath (7), fatigue or weakness (9), dizziness (8), abdominal pain (8) and behavioral changes (3). Normal or negative diagnostic studies included: complete blood count, liver and renal function, immunoglobulins, skin testing, RAST tests, sweat tests, and pulmonary function tests. Therapies included dietary restrictions (11), dietary supplements/herbs (8), home modifications or relocation (8), home schooling (7), social isolation (8), homeopathy (6), counseling (2), chelation, and sublingual extracts. Eight children also used inhaled steroids, bronchodilators, decongestants, and/or antihistamines. *Conclusion:* There are children whose illness resembles that of the "idiopathic environmental illness" described in adults. Like the adult condition, the circumstances surrounding the illness are varied, and the approach to management should be individualized.

84. Undiagnosed Hereditary Hemochromatosis Presenting as Occupational Environmental Illness: A Review

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Background: Medical Toxicologists may encounter genetic and metabolic illnesses in routine practice. Disorders of iron or copper overload, plumboporphyria, and aceruloplasminemia all involve environmental toxicological exposures which cause disease in patients with an underlying genetic or metabolic predisposition. These metabolic diseases: i) involve chronic exposure to metals with which we should be familiar, ii) may require antidotal therapy with which we are experienced, and iii) may initially present in the acute care or clinic setting when their protean signs and symptoms are attributed to a putative toxicological exposure. The recognition and management of these disorders falls within the practice realm of medical toxicology. *Case report:* A 50-year-old male presented to our toxicology clinic for evaluation of fatigue, arthralgias, chronic hepatitis and cirrhosis and a photosensitive rash following alleged exposure to dioxins, polychlorinated biphenyls (PCBs), lead, and organic solvents at a Superfund (CERCLA) site clean-up. Serum Dioxin/PCB testing was below the unexposed population mean (NHANES) and his rash was noted to be photosensitive and not consistent with chloracne. A urinary porphyrin profile was consistent with porphyria cutanea tarda (PCT) and our initial diagnostic impression was chemically-induced PCT due to organic solvent exposure. While evaluating his liver function we found elevations of ferritin and TIBC at 10 times normal. Following genetic testing, the diagnosis of hereditary hemochromatosis was confirmed. *Case discussion:* The interface of toxicology with certain metabolic and genetic disorders is expanding. As in our patient, important clinical entities may initially be missed if a strictly exposure-based approach to medical toxicology evaluation and diagnosis is pursued. Undiagnosed heritable disorders of iron and copper metabolism undoubtedly present to us in clinic and as acute toxidromes even if we do not recognize them as such. *Conclusion:* Undiagnosed clinical disease resulting from heavy metal and metal overload syndromes such as Wilson's disease, hemochromatosis, acquired ALA Dehydratase deficiency (plumboporphyria), and aceruloplasminemia may initially present to medical toxicologists and occupational medicine specialists.

85. Burns Associated with Industrial Mustard Seed Exposure

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Background: Purified raw mustard seed is used throughout the food service industry. Little is known about exposures to persons working with "Mustard #1 Seed" (MS1) at the industrial level. We present a case of partial-thickness burns seen after exposure to pulverized raw MS1. *Case report:* A 43-year-old male employee at a food production company was transferred to the mustard-seed blending room where he lifted and poured bags of raw MS1 into an industrial blender. While working, he removed his personal protective equipment (coveralls) due to profuse sweating during his shift. Initially, the patient experienced redness and irritation when aerosolized mustard seed made contact with his skin, so he left the environment after 5–6 h of his shift to change his clothes and leave for the day. The second day he returned and worked a complete 8 h shift without PPE in the same area, and stayed to help rinse and squeegee the blender with water. While driving home, he began to suffer from pain and swelling of his forearms, so he drove to the nearest hospital. He had no respiratory symptoms, but had 18% TBSA partial-thickness burns that involved his torso and forearms, so he was transferred to a regional burn center. He was treated with debridement and Silvadene™ cream, spent 2 days in the Burn ICU, and was eventually discharged home with routine wound care. *Discussion:* Mustard oil contains substances such as allyl-isothiocyanate which can cause pain and irritation when they come into contact with skin, similar to capsaicin's effects. Allyl-isothiocyanate is the substance that gives mustard its pungent odor and is known to activate transient receptor potential (TRP) channels (TRPA and TRPV1). TRP channels are involved with nociceptors which are involved with the pain and noxious response. Also, substance P and CGRP may be released when these channels are activated, leading to vascular leakage and vasodilatation. This patient's delayed burn injury may have resulted through this mechanism. *Conclusion:* This patient developed 18% TBSA partial thickness burns in a delayed fashion after industrial exposure of pulverized mustard seed.

86. Ingestion of One Lead Fishing Sinker Resulting in Toxic Lead Levels Within Hours

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Background: Poison centers are commonly consulted on cases of ingested lead foreign bodies (LFBs), particularly fishing sinkers. Often they are managed expectantly and the foreign bodies are allowed to pass in the stool. We present a case of an ingested LFB that developed toxic lead levels after only hours of exposure. *Case report:* An asymptomatic 4-year-old boy presented 20 min after ingesting a lead fishing sinker. An X-ray revealed the sinker to be in the stomach, and no other foreign bodies (FBs) were identified. Expectant management was planned. The next morning the boy returned complaining of abdominal pain. A repeat X-ray revealed the FB remained in the stomach. After transfer to a regional specialty center the FB was removed via endoscopy 19 h after ingestion. A venous blood lead level (BLL) returned elevated at 68 mcg/dL. The boy's home was built in the 1980s and he had no history of pica. A BLL from 1 year prior was <5 mcg/dL. The boy was hospitalized and chelated with succimer. A BLL 2 days later was 38 mcg/dL. The child was discharged home. Final BLL 76 days after ingestion was 14 mcg/dL. Nine months later the boy had no sequelae. *Discussion:* Pediatric fishing sinker ingestions are commonly called to poison centers. However, literature on this topic is quite sparse, with only three previous pediatric cases reported. In one case the sinker was removed within 3 h of ingestion and the child had nontoxic lead levels. The other two cases were children who were found to have multiple sinkers present on X-ray and likely acute on chronic ingestions. Previously it was generally accepted that poisoning from ingested LFBs requires the FB to be present for an extended period of time. Cases have been reported of toxic lead levels within hours of ingestion; however, many of these cases were likely acute on chronic ingestions. Our case is unique in that this boy had an isolated exposure to one lead fishing sinker that resulted in a toxic lead level in a matter of hours. In light of this case, the practice of expectant management in LFB ingestions may result in lead toxicity, and may no longer be appropriate. *Conclusion:* Toxic lead levels can occur from ingested lead foreign bodies within hours of ingestion, and expectant management may be inadequate.

87. Environmental Mercury Assessment in a Hospitalized Mercury Poisoned Patient

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Background: The risk of mercury vapor exposure in health care workers caring for a critically ill patient who aspirated elemental mercury is not known. The purpose of this study is to determine whether a patient who ingested and aspirated mercury is a health risk to healthcare workers in the ICU. *Methods:* A LUMEX RA-915+ mercury analyzer and Jerome 431-X mercury vapor analyzer were used to measure mercury concentrations eight days after a patient who ingested and aspirated mercury was admitted to the ICU. The LUMEX has a sensitivity detection of 2 ng/m^3 mercury. Readings were obtained after holding the device in place for approximately 1 min. Three mercury vapor readings were obtained and averaged. The instrument was calibrated prior to obtaining measurements. The Jerome readings were obtained the day following the LUMEX. The Jerome analyzer has a sensitivity of 0.003–0.999 mg/m^3 mercury. *Results:* LUMEX measured the highest mercury concentration in the area immediately surrounding the patient's head (1,500–11,000 ng/m^3). Mercury vapor concentrations near the cardiac monitor and ventilator were 800 ng/m^3. The ambient air in the ICU room measured 120 ng/m^3 mercury. All other mercury concentrations detected were 100 ng/m^3 or less. *Discussion:* The current ACGIH airborne mercury exposure limit for an 8-h shift is 25,000 ng/m^3. The recommended mercury breathing zone limit in a home after a spill is 1,000 ng/m^3. *Conclusion:* Mercury was detected in a hospital room of a patient who aspirated elemental mercury. The concentrations were below workplace exposure limits but approached limits established for homes following a mercury spill. While these concentrations were not high enough to pose immediate health risks to hospital workers, air monitoring for patients with mercury aspiration may be prudent.

88. Lead Poisoning in the Elderly: Toxicosurveillance of Geriatric Patients Visiting an Inner City Emergency Department

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Background: Lead is known to be incorporated into bone and remain in the bony matrix unless physiologically disturbed. Elderly individuals may be at risk for the development of elevated blood lead levels (BLLs) because lead stored in bone is expected to be released into the circulation as bony resorption occurs with aging. Individuals with bony stores of lead may thus be at risk for endogenous (secondary) lead exposure as they age. We investigated the incidence of elevated BLLs in a population of elderly individuals presenting to an inner city emergency department in order to determine if this population is at risk for secondary lead exposure from presumptive release of lead from pre-existing bony stores. *Methods:* Following informed consent, a single BLL was collected from a convenience sample of individuals aged 80 years and older presenting to an inner city emergency department. The study was approved by an institutional review board. Relevant demographic data was recorded for each individual including date of birth, gender, predominant residential zip code, and occupational history. An *a priori* BLL of 10 mcg/dL was selected as an elevated BLL for the purposes of this study. *Results:* A total of 60 subjects were enrolled. Data obtained is reported Table 1 below. Using our *a priori* definition, no subjects had an elevated BLL. *Conclusions:* Using the statistical rule of three, we conclude that the prevalence of elevated BLLs in this population is no greater than 5%. Routine BLL screening for the elderly population with regard to secondary lead exposure is not indicated. Limitations of our study include the use of a convenience sample and the enrollment of patients at only one clinical site.

Table 1.

Age	
Minimum	80
25th percentile	82
Median	85
Mean	85.5
75th percentile	88.25
Maximum	96
Gender	
Female	37
Male	23
Race	
Asian	2
Black	35
Hispanic	2
White	21
BLL	
Minimum	Below reporting limit (1.1 mcg/dL)
25th percentile	1.2 mcg/dL
Median	2.0 mcg/dL
Arithmetic mean	2.1 mcg/dL
Geometric mean	1.9 mcg/dL
75th percentile	2.8 mcg/dL
Maximum	6.3 mcg/dL

89. Is There a Standard of Care? Clinical Variability in Hyperbaric Oxygen Treatment for Carbon Monoxide Poisonings among Midwest Centers

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Background: The use of hyperbaric oxygen (HBO) for the treatment of carbon monoxide (CO) poisoning has proven to be controversial. As a group, we have experienced wide clinical variability in both criteria for treatment as well as treatment regimens for patients with acute CO poisoning. Our aim was to survey Midwest hyperbaric centers for insight into specific criteria and protocols for treating CO with HBO. *Methods:* Hyperbaric centers were identified from the published list of the Undersea and Hyperbaric Medical Society. Ninety-one centers from nine Midwestern states (IA, IL, IN, KS, KY, MI, MN, OH, & WI) were contacted via telephone. A standard script [1) At your center, do you have specific criteria for which CO poisoned patients are treated with hyperbarics? 2) Do you have a protocol for treating CO poisoned patients?] was used to minimize surveyor bias. No patient information was collected. Responses were tallied and compared. *Results:* Thirty-one centers that treat CO poisonings were identified. Three did not participate in the study. Eighteen reported a specific level of carboxyhemoglobin (COHb) which served as an independent indication for treatment (range 10–40%, mode 25%, median 21.5%). Two centers used the COHb level as the exclusive indication for diving. Nine centers relied solely on referring physicians' descriptions of "symptoms," primarily neurologic in nature, while the remaining centers used a combination of

symptoms plus COHb levels. Diving protocols yielded 21 different approaches varying from local institutional profiles to established protocols. *Number* of sessions ranged from 1 to indefinite (median 1, mode 1, mean 1.88), *depth* ranged from 1 to 3 ATA (median 2.5, mode 2.5, mean 2.49), and *duration* at depth ranged from 23 to 150 min (median 90, mode 90, mean 93.3). *Discussion:* Despite controversy, HBO is an approved therapy for CO poisoning, with Weaver et al. showing benefit from three dives in 24 h. Our results demonstrate significant variability in treatment, with most clinicians following a largely empiric approach. *Conclusion:* A standard of care for both the initiation and implementation of HBO therapy for CO poisoning does not exist among US Midwest Hyperbaric Centers.

90. Refusing Referral: Are Workers Getting the Poisoning Treatment They Need?

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Background/purpose: Adults are at risk for poisonings at the workplace and do not always follow medical guidelines. *Methods:* Occupational poisoning data from the Northern New England Poison Center for 2005–2008 were analyzed by site of caller, caller type, and referral pattern. *Results/outcome:* Three hundred cases were analyzed. Thirty-one percent (n = 92) of the occupational exposures reported to the Poison Center were placed from the home or a location other than the workplace or a health care facility. Additionally, 47% (n = 136) were not reported by a health care professional or workplace health/safety officer, but by the patient (22%, n = 63) or other, such as a spouse (25%, n = 73). More than half (52%, n = 17) of patients refused the referral to a health care facility or left against medical advice (AMA) after referral by the Poison Center. Ninety-four percent (n = 16) of occupational-related patients who refused referral or left AMA had some health effects. Patients suffered health effects such as burns (many 2–3rd degree), ocular pain, or muscle weakness. Known medical outcomes ranged from minor to moderate. Some patients volunteered explanations for refusing referral, such as lack of insurance. Often calls were placed by a spouse, who were unable to convince their significant other that their exposure merited medical intervention. *Conclusion:* Some occupational poisonings were reported from outside the workplace, suggesting that employers are under-informed of incidents at their work site. Poisoned patients refusing referral are not receiving the medical care they need. Employers and employees need to be encouraged to call the Poison Center and follow the advice given.

91. Pediatric Monosodium Methylarsonate Exposure with Significantly Elevated Urinary Arsenic Levels

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Introduction: Literature concerning ingestion of organic arsenic is rare, and reports of pediatric exposures are even more sparse. We present a case of ingestion of monosodium methylarsonate in a pediatric patient. *Case report:* A 16-year-old female presented to an ED after a suicide attempt by drinking between a few gulps or up to 8 oz of crabgrass killer. The crabgrass killer is available in concentrations of 17 and 40% monosodium methylarsonate but neither the patient nor the family could confirm the exact concentration. In the ED, she vomited and was acutely agitated. Although she was never hemodynamically unstable, she was intubated for airway protection and transferred to Children's hospital (CH) for further management. Upon arrival to CH, she was given one dose of BAL and extubated that night. She was then started on succimer. She had nausea without vomiting, abdominal pain, myalgias, and mild hyperreflexia during her hospitalization. No other signs of neurological toxicity developed. Upon transfer to a psychiatric institution, her symptoms had improved. She had a normal gait and was able to eat and drink without difficulty. A 24-h urine collection revealed an arsenic level of 746,866.8 µg/L. Speciation of the arsenic revealed that all the arsenic was present as methylated arsenic (MMA, DMA) at 931,645 µg/L (dilution required to obtain may have affected quantitative results). She was kept on succimer for 19 days. At 1 month follow-up, she was a healthy adolescent with a normal exam. She admitted to having sharp, cramping pains in her fingers and toes with numbness 1 week after being discharged. She still reported having rare episodes of pain in her fingers. She did not have any hair loss, rash, or mees lines on exam. A neurological exam was normal. A repeat 24 h urine specimen was not ordered due to her being in inpatient psychiatric treatment. EMGs and nerve conduction studies were also not ordered. *Discussion:* Reports of patients exposed to organic arsenic report urinary levels in the lower thousands of micrograms/L. Exposure to monosodium methylarsonate has been reported to cause neuropathy. Our patient had significantly higher urinary arsenic levels without the development of significant clinical sequella.

92. Glufosinate Poisoning

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Background: Glufosinate is a commonly used herbicide. However, data on acute human intoxication are scarce. We retrospectively analyzed data of human glufosinate poisoning from two medical centers in Taiwan. *Methods:* The study period ran from August 1993 through September 2009. One hundred and thirty-six cases have been enrolled, including 113 were reported to the Taiwan National Poison Center while 23 patients were hospitalized in Taichung Veterans General Hospital during study period. Clinical data were reviewed and analyzed. *Results:* Most patients intentionally ingested the herbicide. Twenty-eight (23.9%) out of 117 patients with oral exposure were asymptomatic, while the others developed gastrointestinal (52.1%), respiratory (29.9%), neurological symptoms (35%) and other outcomes (5.1%). Seven patients died after manifestation of profound shock and/or coma following glufosinate ingestion. *Conclusion:* Glufosinate was thought to be low toxicity to humans but severe neurologic and cardiopulmonary outcomes dose occur and resulted in long-tern neurologic disabilities. Medical management of such poisoning is primarily supportive.

93. Death from Elemental Mercury Aspiration Following Intentional Ingestion: A Case Report

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Background: Aspiration of elemental mercury (Hg) is a rare occurrence. A review of literature revealed few case reports of elemental mercury aspiration and only one fatality reported in 1969. We report a case of elemental mercury ingestion followed by pulmonary aspiration of Hg that resulted in death. *Case report:* A 23-year-old male intentionally ingested an unknown amount of elemental mercury. There was no history or evidence that Hg was heated in the home. He vomited after ingestion and presented to a hospital 3 h later with abdominal pain, cough, chest pain, headache, vomiting, and body aches. On presentation his vital signs were BP 116/65 mmHg, HR 145, RR 14, *T* 37.7°C, SaO_2 96% on room air. Admission blood Hg was 838 µg/L and random urine Hg was 9,998 µg/L and he was started on succimer. Three days after admission blood Hg was 546 µg/L and random urine Hg was 3,951 µg/L. Serial chest and abdominal X-rays revealed diffuse distribution of radiopaque substance in bilateral lung bases and throughout small intestine. Whole bowel irrigation was initiated with a polyethylene glycol solution but was unsuccessful clearing Hg from his bowel. A bronchoscopy with bronchial lavage was performed and a small amount of Hg was recovered but the majority of Hg remained in the lungs. The patient developed worsening ARDS and became more difficult to oxygenate. Despite FiO_2 of 100% and maximum ventilator support his SaO_2 declined to less than 50%. The patient developed hypotension that was refractory to multiple vasopressors and IV fluids. The last reported ABG revealed a pH of 7.15, pO_2 35, pCO_2 75, HCO_3 35 and lactate of 4 mmol/L. The patient died 11 days after admission. *Conclusion:* Elemental mercury ingestion and subsequent Hg aspiration resulted in systemic absorption, respiratory failure and death.

94. Heating Pad Ingestion with Significant Iron Level Elevation

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Background: Instant hand warmers and disposable heating pads are commonly used over-the-counter products. The active ingredient is reduced iron which oxidizes when exposed to oxygen, causing an exothermic reaction. Reduced iron is not expected to cause significant toxicity when ingested orally. This supposition, however, is based on a very limited number of human cases. We report a case of accidental heating pad ingestion that resulted in significantly elevated serum iron levels. *Case report:* A 52-year-old man opened a "Heat Treat" disposable heating pad thinking it was instant coffee, placed the contents into a cup, added water and drank it. After realizing his mistake the patient was referred to the emergency department (ED) by poison control. A serum iron level 3 h post-ingestion was 308 mcg/dL (normal range 40–150). Coincidentally the patient had an iron level 1 week prior of 142 mcg/dL in a work-up for chronic mild pancytopenia. Plain films revealed high density material within the stomach. Whole bowel irrigation was performed. The patient had a history of chronic abdominal pain, and reported it was worse than baseline. He also complained of nausea but did not vomit. The serum iron level peaked at 373 mcg/dL 6.75 h post-ingestion. Two days post-ingestion the iron level was still elevated at 280 mcg/dL but fell to 91 mcg/dL the next day. The patient's abdominal pain returned to baseline 2 days post-ingestion and the remainder of his symptoms resolved. The patient was discharged on hospital day 3 with no sequelae after receiving supportive care only. *Case discussion:* Reduced iron has been reported to cause little to minimal effects. There have been reports of accidental ingestions of reduced iron with minimal elevations of serum iron, however the elevated levels all returned to normal range within the first 24 h. This case demonstrates it is possible to cause significant elevation of serum iron levels from accidental reduced iron ingestions. *Conclusion:* Instant hand warmers and disposable heating pads, when ingested, can result in toxic iron levels. Poison center personnel and emergency physicians should be aware of this effect and patients should be monitored until symptoms resolve and serum iron levels are normal or trending downward.

95. Non-Fatal Attempted Suicide with Orpiment (Arsenic Trisulfide) Ingestion

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Background: Arsenic trisulfide (As_2S_3), orpiment, is a mineral found near/in volcanic structures, coal combustion and herbal remedies. Minimal literature exists on orpiment ingestion. *Case report:* A 57-year-old male jeweler presented to an ED 13 h after he crushed and

ingested an egg-size rock of orpiment in a self-harm attempt. The patient also took four acetaminophen/diphenhydramine tablets and three melatonin pills. His only symptom prior to arrival was nausea. The patient was asymptomatic except for minor bleeding from a self-inflicted neck wound. Initial vital signs were HR 126 bpm, BP 162/105 mmHg, RR 18/min, RA Sat 98% and oral temperature 36.5°C. Physical examination revealed a clinically sober male with a 1.5 cm slash wound to his neck and was otherwise unremarkable. An ECG revealed a sinus tachycardia, HR 129 bpm with a QTc interval of 387 ms. A flat-plate X-ray showed hyperdense material throughout the bowel. Laboratory studies revealed normal LFTs, basic metabolic panel and an elevated white blood count of 20,700/µL. The patient was started on polyethylene glycol and observed in the telemetry unit. On Hospital Day 1, the patient remained asymptomatic and a random spot urine arsenic level was 1,489.5 µg/L (background range <30 µg/L). On HD 8, the urine arsenic level decreased to 800.2 µg/L. One month later he returned with a sample of the mineral and was asymptomatic. *Discussion:* We describe a case of As_2S_3 ingestion that resulted in minimal symptoms. The exposure was confirmed by an elevated urine arsenic concentration, an abdominal X-ray with radiopaque material and the product ingested was subsequently identified by a mineralogist with diffractometer and CuK_a radiation. The LD50 of in rats and mice is approximately 10 times less than for arsenic trioxide (As_2O_3) and As_2S_3 is considered relatively non-toxic as it is comparatively insoluble with low bioavailability. As_2S_3 can oxidize to As_2O_3 on surface crystals which could lead to increased toxicity. *Conclusion:* We report a case of non-fatal As_2S_3 ingestion.

96. Unintentional Ingestion of Octane Booster with Methylcyclopentadienyl Manganese Tricarbonyl: Case with Chelation, Blood and Urine Manganese Levels

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Case report: EMS called the PCC about a 45-year-old woman who accidentally drank an octane booster. She vomited spontaneously and had two witnessed tonic-clonic seizures. The one ounce bottle of octane booster had methylcyclopentadienyl manganese tricarbonyl (MMT) listed as its main ingredient, but the percentage was not listed. The exact composition of the product was not determined for several days. Despite an extensive literature search, absolutely no human data could be found on ingestion of MMT or the effect of organic Mn via any route. Given that Mn is a known neurotoxin and the patient had two seizures, it was decided to chelate the patient with both EDTA and BAL. While there is no proven benefit of chelation in this circumstance, chelation may help hasten the elimination of Mn. The recommended chelation was EDTA 50 mg/kg/day (up to 3 g) over 24 h × 3 days along with BAL 5 mg/kg q4 × 24 h then 3 mg/kg q4 × 48 h. Serial whole blood Mn levels and 24-h urines for Mn were collected (see table). Eventually, we learned that the total octane booster is 3% of the product and the MMT is 62% of the octane booster. If the patient retained the entire 1 oz, the she would have ingested 139 mg (2.53 mmol) of elemental Mn. The patient received only 24 h of EDTA and BAL (8.02 mmol EDTA and 17.39 mmol BAL). The patient did very well clinically, was discharged home 3 days after the ingestion, but was lost to follow-up. *Discussion:* While the etiology of the two seizures is uncertain, she did not appear to suffer any other acute effects from the ingestion. Chelation appears to have removed a large amount of Mn via the urine; normally, <6% of an absorbed dose is eliminated in the urine, and the feces are the major route of elimination (up to 99%). Mn whole blood half-life for normal individuals (after IV injection) is 1.28 min; the patient's data gives a half-life of about 17.5 h. *Conclusion:* Ingestion of MMT did not appear to have a major clinical effect and chelation removed approximately 33.9 mg of Mn.

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		Whole blood Mn	24-h urine		
Date	**Time**	**(nl 4.7–18.3)**	**Total Mn (mcg) (nl < 2)**	**Volume (mL)**	**[Mn] (mcg/L)**
27 Jun	18:28	92.8 ng/mL			
28 Jun	23:00		26,075.7	4,250	6,135.5
29 Jun	04:16	24.3 ng/mL			
29 Jun	23:00		4,002.4	5,625	711.5
30 Jun	22:55		2,161.7	2,925	739.0
1 Jul	23:00		1,662.9	2,800	593.9

97. Lead Chelation Therapy in a Patient on Dialysis

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Background: Treatment of lead poisoning in patients with end-stage renal disease on dialysis is a major concern. Most of the available chelating agents and their transformation products are renally eliminated. *Case report:* A 51-year-old Hispanic male with a history of diabetes, hypertension, and end-stage renal disease on chronic dialysis, who had been in and out of the hospital for several months presented to the ER with complaints of abdominal pain, anorexia and diarrhea. He later developed profound weakness and ascending paralysis. Cholelthiasis and Guillen Barre Syndrome were ruled out. On Day 16, a heavy metal screen was done, and revealed elevated lead levels (84 mcg/dL). It was later ascertained that the patient was cooking from a clay pot purchased in Mexico. It is believed that the pot was the source of his lead toxicity. The Poison Center Medical Toxicologist recommended a reduced dose of oral meso-2, 3-dimercaptosuccinic acid (DMSA) followed by dialysis. The patient was given an oral dose of DMSA followed by dialysis, the lead level before and after dialysis was 56 and 47 mcg/dL respectively. There was a concern that the lead-DMSA complex was highly protein bound and would be difficult to dialyze. DMSA was discontinued and a 3-day course of edetate calcium disodium (CaEDTA) and dimercaprol, two other chelating agents, were initiated despite concerns for nephrotoxicity. The patient was started on continuous dialysis. On Day 3 of chelation the lead level was 25 mcg/dL. On Day 4, the lead level was 34 mcg/dL due to the release of lead from stored bone and tissue. The therapy was repeated and the levels fell to 10 mcg/dL. After 10 days of chelation therapy the patient was transferred to a long-term rehab facility for treatment of neurological sequelae as a result of chronic lead toxicity. *Discussion:* Treating a patient with lead toxicity requires the use of agents that are known to be nephrotoxic. In this case it was challenge because the patient was in renal failure on dialysis. Although DMSA is the preferred chelator, CaEDTA is dialyzable and a better choice for this patient. *Conclusion:* There are risks and benefits associated with each chelating agent; choice of an agent should be patient specific and situation dependent.

98. An Old Toxin Resurfaces: Carbon Tetrachloride Induced Hepatotoxicity and Nephrotoxicity

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Carbon tetrachloride (CCl^4) was once a commonly used solvent, refrigerant, and fire extinguisher. Due to its toxicity profile, production of CCl^4 has steeply declined. We present a case of a man who developed hepatotoxicity and nephrotoxicity after inhalation and dermal exposure to CCl^4 from an antique fire extinguisher. A 60-year-old man with no significant past medical history presented to the emergency department with vomiting and decreased urine output. Vitals signs were BP 185/110 mmHg; pulse: 83 beats/minute; respirations: 20 breaths/minute; normal temperature; oxygen saturation 99%. Physical examination was unremarkable. Serum electrolytes were: Na^+ 118, K^+ 3.4, Cl^- 76, CO_2 20 (units in mmol/L), blood urea nitrogen 52 and creatinine 14.5 (units in mg/dL). Aspartate (AST) and alanine (ALT) aminotransferases were elevated at 640 and 1,588 U/L, respectively. Upon further questioning, the patient revealed that while handling an antique fire extinguisher from 1,949 at his home, he unintentionally dropped it and spilled the contents over himself including his face. For the following 3 days, the patient developed nausea and abdominal pain. He decided to come to the hospital after noticing a decrease in urine output. The local poison control center identified the extinguisher as containing CCl^4 and recommended treating with *N*-acetylcystine (NAC). The patient was started on intravenous NAC in the ED and oral silymarin, which was obtained from a local health care store, was added the next day. The patient had quick resolution of his hepatotoxicity during his hospital stay but ended requiring regularly scheduled hemodialysis (HD) for renal failure. After 2 weeks on HD, the patient's renal function slowly started to recover with increased urine production. This case demonstrates how once common toxins may still exist in antique collections and importance of obtaining a thorough history. Although there is no known antidote for CCl^4, agents such as NAC and silymarin have been advocated due to their safety profile and a potential benefit may exist.

99. Elemental Mercury Toxicity from a Traditional Vietnamese Remedy

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Background: Traditional remedies are commonly used in East Asian cultures for treatment of various ailments. These medicinal compounds are increasingly being used in the United States. *Case report:* A 41-year-old female obtained a traditional remedy from Vietnam to treat sinus congestion. The pellets were placed on an electric stove and the patient inhaled the fumes that were produced. After using the remedy for 2 days she developed generalized malaise, dry skin and poor appetite. She was informed by a family member in Vietnam that the remedy may contain mercury and lead. She presented to a primary care clinic where an initial blood mercury and lead level was found to be 409 and 1 mcg/dL, respectively. She was subsequently evaluated in our toxicology clinic approximately 4 weeks after her exposure and prior to any treatment. A repeat blood mercury level in our clinic was found to be 61 mcg/L with a coinciding urine mercury level of 497 mcg/g creatinine. The patient was started on chelation therapy with oral DMSA for 20 days and 4 weeks after treatment, mercury levels in blood and urine decreased to 32 mcg/L and 97 mcg/g creatinine, respectively. The patient underwent a second round of chelation therapy with oral succimer for 20 days and a blood mercury level following treatment was 23.9 mcg/L. The patient's symptoms of generalized malaise were improving, but a third round of chelation was initiated with oral succimer. An analysis of the remedy by a commercial lab revealed a mercury content of 18%. *Discussion:* Traditional Vietnamese remedies or

homeopathic treatments may contain toxic amounts of heavy metals including mercury and lead. We report the first case of elemental mercury toxicity from a Vietnamese sinus remedy. Mercury poisoning can result in generalized symptoms of fatigue and arthralgias or more classic symptoms such as erethism and memory impairment. As public use of non-traditional medications, supplements and remedies increases, more awareness is needed amongst health care providers regarding the potentially hazardous side effects and toxicities that may result from these un-regulated products.

100. Pink Disease: Fading but Hopefully not Forgotten

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Background: Hg, a naturally occurring metal, has several commercial applications, and human poisoning, while infrequent, may occur from exposure to three distinct forms: elemental, inorganic and organic. Pink disease is an idiosyncratic hypersensitivity reaction to chronic exposure to mercury ions. *Case:* A previously healthy, 16MO boy, was referred to a tertiary clinic for evaluation of elevated liver function tests (LFTs). His mother noted several months of intermittent purple discoloration of the fingertips, finger swelling, poor appetite, diaphoresis, irritability, poor energy, rash on his arms and reluctance to walk, though he was able to walk previously. Exam noted BP of 140/112, desquamation in the web spaces of his hand, and irritability. He was admitted to the PICU for emergent blood pressure control. Initial evaluation revealed AST 333, ALT 567, proteinuria, hematuria, hypoalbuminemia (2.9), low compliment levels (C3 80, C4 < 8) and an elevated blood Hg level (117 mcg/L). Spot urine Hg levels were 1,293 mcg/gCr. The child was chelated with succimer for 19 days, and on follow up evaluation was free from the presenting symptoms. The father, pregnant mother, and older brother all had elevated mercury levels, though none were symptomatic. *Discussion:* Despite an exhaustive interview, a source of mercury exposure could not be found. Our presumptive source was from prior spilled elemental mercury in the household where this child likely had contact via crawling on the carpet. *Conclusion:* We describe a case of Pink disease within a familial cluster of mercury poisoning treated with succimer.

101. Modification of Poison Control Center Software to Identify Agricultural Pesticide Exposures

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Background: Information documented in poison control center (PCC) records is often insufficient to differentiate agricultural pesticide exposures from those caused during non-agricultural activities. The purpose of this NIOSH funded study was to develop, implement, and evaluate a modification to PCC standardized surveillance protocol to gain knowledge about pesticide exposures of agricultural origin. *Methods:* Six PCCs serving Alabama, Kentucky, Virginia, and West Virginia modified their Toxicall® software used to enter reports into the Toxic Exposure Surveillance System (TESS©) database of the American Association of Poison Control Centers (AAPCC). The Toxicall® modification ensured that information linking a reported exposure to production agriculture was documented in the free-text portion of the PCC electronic medical record. For 24-months (September 2008–August 2009), three pre-formatted questions were incorporated into the screen-based data entry forms used during PCC telephone consultations. The modified software recognized 39 predetermined agriculture-related pesticide codes in the TESS database. A text box triggered by the entry of one of these codes prompted specialists to ask the study questions and document answers. *Results:* Seven thousand three hundred and fifteen calls involving study pesticides included sufficient evidence for non-agriculture classification without asking the study questions. Questions to clarify the exposure's link to agriculture were asked of 207 callers; 30 (14.5%) of the calls were directly linked to agriculture and 85.6% were not agriculture related. *Conclusions:* This study used an innovative approach to gather PCC information on pesticide exposures associated with production agriculture. The enhanced surveillance enabled determination of agricultural status and produced comprehensive documentation of agricultural pesticide exposures. Use of the PCC network should be encouraged in agricultural communities. The modification offers an agricultural pesticide exposure surveillance opportunity to states with limited resources. The technology can also be used by PCCs to enhance documentation of other poisonings of eminent interest.

102. Aluminum Toxicity from Dialysis Treatment With and Without Deferoxamine

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Background: Outbreaks of acute aluminum (Al) poisoning have been reported at dialysis centers due to contaminated water supplies. There is little data establishing/supporting methods for Al elimination. We report two patients who became Al poisoned, despite water quality monitoring, due an Al object that fell into an acid bath used for dialysis. *Case report:* Patient A presented with rapidly progressive alteration in mental status. Serum Al level was 386 mcg/L (normal 0–6). Over the course of 11 days in the hospital, she received five dialysis treats with the last augmented with (DFO). Length of dialysis was variable and either 3 or 6 h. Her mental status improved after 5 days and three dialysis treatments. The elimination half life was calculated at 63 h. Patient B presented with an Al level of 163 mcg/L. He recieved daily 6 h treatments for 3 days resulting in an elimination half life of 74.9 h. The contaminated acid tank was replaced. Further testing of all patients at the affected center showed no abnormal Al levels. *Discussion:* Aluminum toxicity manifests itself in as mental status changes or osteomalacia. Previous reports demonstrate DFO leads to rapid mobilization of Al from the bone and soft tissue. Literature suggests that dialysis should be performed 8 h post DFO administration. Our patients had elimination times which were similar regardless of treatment with DFO.

103. Lead Intoxication: Coffee Laced with Lead Filings

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Introduction: We are reporting a case of deliberate ingestion of coffee laced with lead filings over a period of 6 months with a whole blood level (BLL) of 456 mcg/dL. *Case report:* Fifty-eight-year-old man was referred to our service by his general practitioner (GP) with an incidental BLL of 456 mcg/dL. On admission to our service he was asymptomatic. We elected to commence him on oral DMSA (succimer) for 2 weeks. At day 4 post admission, he became unwell with symptoms suggestive of lead encephalopathy and changed to parenteral chelation with BAL and EDTA. He received this for 24 h, however developed severe side effects from the IMI BAL including pain at the injection sites, chest pains, paraesthesias, diaphoresis, nausea and vomiting. His neurological symptoms resolved after 24 h. It was unclear if this was a side effect of succimer or early lead encephalopathy. He refused any further parenteral treatment. We recommenced oral DMSA. Two weeks after chelation therapy, his level was 84 mcg/dL and oral DMSA was ceased. He had his BLL monitored every month to confirm no further exposure and his lead levels initially declined to 34 mcg/dL in 6 months but his levels have plateaued since. It is now 12 months post chelation therapy, his most recent BLL is 27 mg/dL. His only complaints now are poorly controlled hypertension. He has had formal neurology service follow up with no apparent neurological injury. *Discussion:* This case is of a man who had an exposure history of at least 6 months and was relatively asymptomatic with a very high BLL. He presented a dilemma on what chelating agent we should use and for how long, as well as his apparently normal neurological status despite of extremely high BLL, and a prolonged period of ingestion. Most of the literature describes occupational exposure of lead and the effects on children. The pattern and the dose of exposure are important in determining toxicity. It appears that high cumulative lead levels over a period of years are associated with neuropsychiatric impairment in adults. In children, the threshold to chelate is much lower as their developing brains appear to be more susceptible to the effects of lead.

104. Suspected Mass Sociogenic Illness Reported as Carbon Monoxide Poisoning

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Background: Suspected mass sociogenic illness (MSI) initially attributed to carbon monoxide (CO) poisoning. *Case series:* Over 100 people at church on hot day when child fainted followed by another. No seizure activity and awoke normal and removed. Others then had various complaints and building evacuated. The fire department evaluated patients including: COHb and O_2 sat with Masimo® oximeter, several COHb reported up to 19%. Paramedics and Haz Mat to scene. After ambulances more children and two adults became symptomatic outside. No cyanosis at any time. Seventeen of twenty-two taken to tertiary hospital with HBO chamber and other five to local ED. All other attendees asymptomatic. All asymptomatic in ED after 15 min transport time with normal exams. Majority not treated with O_2 en route. Mean age 13-year-old (7–50), seven males, complaints at scene: nine dizziness, six headache, three paresthesia, three loss of consciousness, seven nausea. All treated in ED 100% O_2 at 15 L/min. VBG COHb immediately sent and different Masimo® oximeter repeated. Mean blood COHb 0.6 (0.2–1.2), O_2 sat 99.8 (99–100), Masimo® COHb 0.2 (0–3), MetHb 1.5 (0–0.4). *Discussion:* MSI challenging diagnosis. Primarily seen in children, rapid onset and resolution, visual cues trigger, no illness in other persons sharing environment, no clinical or laboratory evidence of illness, hyperventilation and syncope common. None had elevated COHb. Haz Mat did not measure CO or other toxic gases. No heater or air conditioner on at time. Haz Mat reproduced scenario, including running heater, over several hours and no toxic gases. Heater evaluated and operating normally. Other potential etiology includes simple asphyxiant. Unlikely as affected persons sitting in various areas and majority unaffected sitting near affected persons. Furthermore, several became symptomatic after leaving church. Escalation and increased persons affected with increasing ambulance presence is common in MSI. We suspect field COHb aberrant from inexperienced operator error. *Conclusion:* Clinicians should consider MSI following mass outbreaks of illness, particularly with the rapid onset and rapid resolution of symptoms coupled with normal physical examination and laboratory analysis.However, MSI should only be entertained after potential toxicologic etiologies have been excluded.

105. Infant Botulism and Chamomile Tea: A Case Series

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Background: Infant botulism is thought to be caused by consumption of honey; however, the source of exposure is most often indeterminate. It is common in Spanish speaking communities to treat infant colic with chamomile. Botulinum spores have been identified as contamination of chamomile preparations. We report three cases temporally associated with consumption of chamomile tea. *Case 1:* A 5-month-old male presented with 5 days of constipation, 1 day of poor feeding and decreased strength. The mother treated his constipation with suppositories and chamomile tea prepared from a product obtained from a local grocery store. On the day of admission, the infant was flaccid, hyporeflexic, with poor suck, no withdrawal to pain, and a weak cry. Stool tested positive for *C. botulinum* toxin type B. *Case 2:* A 1-month-old female presented with constipation and poor feeding. Her parents had given her chamomile tea made from commercial tea bags sweetened with honey for her symptoms. On physical examination, she was hypotonic with no Moro reflex and nonreactive pupils. Stool was positive for *C. botulinum* toxin type A. *Case 3:* A 1-month-old male with constipation and poor feeding developed respiratory arrest. He had been given chamomile flower and star anise tea prepared by his mother from commercial star anise and chamomile from her back yard prior to development of symptoms. Stool was positive for Botulism toxin type A. *Discussion:* The frustrating nature of the colicky infant has prompted the development of many home remedies, including chamomile tea. This is a common practice in some ethnic populations. The presence of botulinum spores has been reported in samples of chamomile in Argentina, at a greater frequency than that found contaminating commercially prepared honey, resulting in a warning to not feed chamomile preparations to infants under a year of age. While we were unable to prove an etiological connection between the tea and our cases, the temporal association is compelling. Analysis of the tea products in these cases is pending. *Conclusion:* The association between chamomile tea and infant botulism warrants further study. This seemingly benign treatment may in fact be dangerous to the infant. Practitioners should be aware of this and advise against it.

106. Prospective Evaluation of Duration of Pain, Swelling, and Functional Deficits in Patients after Crotalid Envenomation

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Introduction: There is limited information about the duration of symptoms in patients who have experienced crotalid envenomation, particularly agkistrodon species. Often copperhead and water moccasin bites are thought to be minor. Clinical experience and previous research suggest that local effects predominate although the persistence and duration of these effects are poorly characterized. Previous studies have been retrospective and relied on patient recall, sometimes years after the bite. Clinicians and patients often contact the poison center with questions regarding the duration of expected pain, swelling, and functional deficits. *Methods:* Prospective case series of patients contacting the poison center because of crotaline envenomation. Patients were included if they, or a clinician, contacted the poison center and agreed to daily telephone interviews scheduled approximately 24 h apart starting the day after the initial bite. Patients were contacted by poison specialists on a daily basis until they denied the presence of pain, swelling, and disability. Each variable was graded according to standardized scales and recorded until scores were reported as zero or none. *Results:* Twenty-one bites were identified. Three were lost to follow up and two were thought to be dry bites. Average duration of pain was 10.1 days (range 1–37 days, median 8.5 days, SD 8.9 days); average duration of swelling was 11.7 days (range 1–55 days, median 9.5 days, SD 12.6 days); average duration of functional deficit was 12.1 days (range 1–52 days, median 9.0 days, SD 12.2 days). An average of 7.8 vials (range 4–18 vials) was administered to 10 patients. Of the 16 envenomations 14 were thought to be due to Agkistrodon contortrix, while the other two were from Crotalus species. *Discussion:* This prospective pilot study suggests that the duration of disability for pain, swelling, and dysfunction persists for approximately 10–12 days. One patient in the study accounted for the upper limits of all three variables greatly increasing the reported range. This information may be helpful in counseling patients and clinicians contacting poison centers for advise regarding the duration of expected symptomatology.

107. Diethylene Glycol in Over-the-Counter Health Products Imported from China and Other Asian Countries

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Background: Diethylene glycol (DEG) has been implicated in many medication-associated mass poisonings (MPs). If ingested, it can result in renal and neurological toxicity. Three previous MPs implicated China as the origin of contaminated ingredients. No literature exists on potential DEG or triethylene glycol (TEG), a related compound, contamination of health products imported from Asian countries to the United States (US). Our primary objective was to quantitatively assess the amount of DEG present in a convenience sampling of these health products. Secondary objectives were to: 1) assess the amount of TEG in samples if present; 2) compare results directly to DEG and TEG levels in medications implicated in previous similar MPs; 3) compare DEG results to the US Pharmacopeia's limits of DEG contamination in different monographs such as glycerin; and 4) to estimate DEG dose based on the manufacturer's instructions and compare values to past toxic and non-toxic doses. *Methods:* A quantitative assessment of DEG and TEG was performed in a convenience sampling of over-the-counter health products imported from Asian countries. Results were converted to volume to volume (v/v) % and compared to DEG levels in medications implicated in previous MPs and to the threshold for permissible DEG contamination of pharmaceutical ingredients such as glycerin. Estimated doses of each product for a 70 kg adult were compared to toxic doses of DEG reported in the literature. *Results:* Fifteen of 85 (18%) samples had detectable levels of DEG [mean, 18.8 μg/mL; range, 0.791–110.1 μg/mL; and volume to volume (v/v) range, 0.00007–0.01%]. Two of 85 (2%) samples had TEG levels of 12.8 and 20.2 μg/mL or 0.0012 and 0.0018% TEG (v/v). The product with the highest DEG % by (v/v) was 810 times less than the Panama DEG mass poisoning (8.1%). All samples were at least 10 times lower than the maximum threshold for DEG contamination of glycerin. The lowest reported toxic dose from a past DEG mass poisoning (14 mg/kg) was more than 150 times higher than the highest daily dose estimated in our study (0.09 mg/kg). *Conclusion:* DEG and TEG were detectable in 15/85 and 2/85 product samples. These levels probably do not represent an acute public health threat.

108. Angioedema Associated with Canebrake and Timber Rattlesnake Envenomation

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Background: Angioedema is a rare clinical manifestation following North American crotaline envenomation. We report the largest series of *Crotalus horridus atricaudatus* (canebrake rattlesnake) and *Crotalus horridus horridus (*timber rattlesnake) envenomations resulting in angioedema. *Methods:* Cases of non-*Akistrodon*, crotaline envenomation between January 2000 and January 2010 were identified from the records of two southeastern US poison centers. All cases were manually reviewed to identify timber or canebrake bites and the presence of angioedema (defined as swelling localized to the oropharynx). Hospital records were reviewed when possible. *Results:* In the last 10 years, 1,061 rattlesnake bites were reported to both poison centers. Of these, seven were from timber and eight from canebrake rattlesnakes. Medical records from three confirmed cases were reviewed. Ten of the fifteen cases developed angioedema, eight of whom required intubation (Table 1). Five cases were intubated for 1 day; two cases for 3 days; and one for >21 days that subsequently required tracheostomy. Development of angioedema was not predicted by the severity of limb envenomation (Table 2). Most cases received epinephrine, antihistamines and steroids prior to intubation. No cases with angioedema prior to antivenin (AV) responded to epinephrine, steroids or antihistamines alone; all were subsequently intubated. *Conclusion:* We report a series of *C. horridus* envenomations resulting in angioedema. Patient characteristics and manifestations suggest that angioedema is a direct venom effect rather than an IgE-mediated allergic response. Aggressive airway management and antivenin may be necessary in *C. horridus* envenomations that otherwise appear to be mild or moderate in severity.

Table 1. Patient characteristics (Table for Abstract 108)

	Confirmed bites	Angioedema	Angioedema prior to AV	Intubated	Oropharyngeal wound contact	Prior bites	Prior AV
Timber rattler	7	4	4	4	1	1	1
Canebrake	8	6	3	4	2	1	0

Table 2. Limb severity grade at time of intubation

	Mild	Moderate	Severe
Timber	1	3	0
Canebrake	2	2	0

109. Pediatric Lantana Camara Ingestions: No Need to Worry

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Background: Ingestion of the plant *Lantana camara* (particularly the unripe berries) by children has been reported to cause antimuscarinic toxicity and even death, but evidence in the medical literature to support this is scant at best. We sought to identify characteristics

Plant part eaten	Number of patients
Berry	351
Ripe	123
Unripe	83
Unknown	145
Flower	145
Leaf	108
Stem/branch	7
Seed	3
Unknown	38

of children who were reported to have ingested *Lantana camara*. *Methods:* We performed a retrospective review of the California Poison Control System (CPCS) database for all pediatric ingestions of *Lantana camara* for the time period 1997–2008. Data collected included age, gender, clinical effects, duration of effects, medical interventions and outcomes. *Results:* There were a total of 641 patients, 341 (53%) of which were male. Patient ages ranged from 1 to 16 years with a mean of 2.5 years (ages 0–3, n = 547; ages 4–6, n = 66; ages 7–9, n = 18, ages 10–12, n = 7; ages 13–16, n = 3). Plant parts eaten are shown in Table 1 (some patients ate more than one plant part):
Reported effects among all patients and among patients who ingested ripe and unripe berries are shown in Table 2:

51 (8%) patients were managed in a healthcare facility and 2 (0.3%) were admitted, despite the fact that both were asymptomatic. Therapies administered were activated charcoal (n = 32), ipecac (n = 10), intravenous fluids (n = 3), and gastric lavage (n = 1). No significant effects and no deaths were recorded. *Conclusions:* In this case series, ingestion of *Lantana camara* (including unripe berries) was not associated with significant toxicity; patients ingesting unripe berries did not exhibit more frequent or severe symptoms than those who ingested ripe berries or other plant parts. The vast majority of patients were asymptomatic or displayed minimal symptoms. Patients were not noted to exhibit signs of antimuscarinic toxidrome. Children with asymptomatic ingestions or those with mild symptoms can be managed at home.

110. Retrospective Review of Black Widow Antivenom Use

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Background: Black widow spider (BWS) (*Lactrodectus sp.*) envenomation is common. Following envenomation local pain, erythema, abdominal pain, rigidity, hypertension, and diaphoresis can be seen. While an effective specific antivenom, (AV) is available, *Lactrodectus mactans* (equine-derived) (Merck), its use is limited due to concern of possible severe allergic reaction. We performed current study to determine rate of adverse effects and the efficacy of AV in patients treated for BWS envenomation. *Methods:* Retrospective review of poison system electronic database from January 1999 to December 2009. All cases of BWS envenomation treated with AV were included. Age, gender, signs and symptoms, adjunctive therapy, number of vials of AV given, response to AV, and adverse reaction to AV were recorded. Descriptive statistical methods were used. *Results:* Ninety-six patients were treated with AV with mean age 27-year-old (0–74-year-old), 76% were male. Following envenomation generalized pain was reported in 91%, erythema at site 57%, hypertension (≥140/90) 43%, abdominal pain 41%, muscle rigidity/cramping 30%, tachycardia (≥100 bpm) 23% and diaphoresis in 21%. No patient required more than one vial of AV. One patient developed urticaria to AV halfway through infusion which was immediately discontinued. Another patient developed generalized erythema following completion of infusion but no other effects. There were no deaths in any patients receiving AV. There was no shortness of breath or respiratory distress, no hypotension or chest pain following AV administration. All patients reported pain relief with AV and did not require additional AV doses. Adjunctive therapies included opioids 69%, benzodiazepines 64%, calcium 21%, NSAIDs 17%, and other muscle relaxants 11%. No cases of serum sickness were reported. *Conclusion:* Treatment for BWS envenomation includes opioid pain control and muscle relaxants. Whilst these medications can provide symptomatic relief they do not neutralize venom. In addition, adequate pain control is often difficult to achieve. Definitive treatment includes administration of AV. Although the AV available in the U.S. is derived from horse serum, hypersentivity reactions appear to be mild and rare occurrences. Further prospective studies are required to further elucidate.

111. Rattlesnake Envenomations in Patients on Anticoagulants and Antiplatelet Agents

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Background: Rattlesnake bites (RSB) frequently result in thrombocytopenia and coagulopathy. Despite impressive hematologic abnormalities, systemic bleeding is rare. Previous RSB studies have demonstrated <1% of patients develop clinically significant bleeding or require transfusions. Little is known about RSB in patients who take anticoagulants or antiplatelet agents (AAA). *Methods:* After IRB approval, we conducted a retrospective chart review of all RSB patients admitted to an urban teaching hospital in AZ between July 1, 2000 and March 31, 2010. Data were abstracted on a pre-designed data abstract sheet. For patients with multiple envenomations during the study period, only the first was included in the analysis. Only patients who took AAA daily were included. *Results:* Thirty-two unique encounters of patients taking AAA were identified. Medications included ASA (n = 24), clopidogrel (n = 7), and warfarin (n = 7). Mean age was 62.5 years. Of the 32 patients, 24 were male, and 19 had bites to the upper extremity. Mean length of stay was 3.84 (±2.42) days, and median (IQR) number of antivenom vials given was 12 (10–20). A decline in hemoglobin (Hgb) of >25% during the initial hospitalization was noted in 7/32 (21.9%) patients. Clinically significant gastrointestinal bleeding (GIB) occurred in 2/32 (6.25%) patients on arrival (1 on ASA, 1 on clopidogrel). Follow up data were available for 23/32 (72%) patients. Late bleeding occurred in 2/23 (8.7%), including 1 patient on ASA who had a GIB, and another on both ASA and clopidogrel who had retroperitoneal hematomas. Hematologic recurrence after antivenom was identified in 7/23 (30.4%). Three of these seven were retreated with antivenom, including both of the patients with delayed bleeding. The overall incidence of bleeding in this study was 12.5% (4/32). Five (15.6%) patients were transfused (three with early bleeds, two with late bleeds). A sixth patient, on ASA, developed a GIB associated with hematologic recurrence. Her Hgb fell to 4.9 g/dL, but she refused transfusion. *Conclusion:* Patients taking AAA are at risk of early bleeding associated with initial envenomation, as well as late bleeding associated with hematological recurrence after treatment with antivenom.

112. Pediatric Poisoning from Baptisia Australis

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Background: Animal poisoning from cytisine-containing plants have been reported in the literature. We report what is believed to be the first human poisoning to the cytisine-containing plant, *Baptisia australis. Case report:* Twin six-year-old females presented to the Emergency Department with complaints of abdominal pain and multiple episodes of vomiting. Both were noted to be tachycardic in the 110s, diaphoretic, dizzy and ataxic. Initially attributed to heat exertion, both admitted hours later to ingestion of seeds from a *Baptisia australis* plant growing in the yard. The parent positively identified the plant by botanical name. Both patients were treated with intravenous hydration and support, and symptoms fully resolved after 12 h. *Discussion: Baptisia australis* contains the quinolizidine alkaloids cytisine, lupanine, d-sparteine, and *N*-methylcytisine. Cytisine has nicotinic-receptor agonist effects and produces similar CNS and gastrointestinal effects as nicotine. Animal poisoning from other cytisine-containing plants such as *Laburnum*, *Cytisus*, *Genista*, and *Sophora sp*. has been reported, and produces a clinical nicotinic poisoning picture consistent with those seen in our patients. Cytisine poisoning from *Laburnum sp*. have caused at least one documented fatality. *Conclusion:* In severe poisoning, the initial nicotinic cholinergic symptoms of nausea, vomiting, tachycardia, and hypertension may progress to hypotension, bradycardia, coma, and finally respiratory failure. The treatment is early gastrointestinal decontamination if appropriate, with good supportive care of hydration and cardio-respiratory support as needed. Exposure to cytisine-containing plants, and other nicotine-like alkaloids can lead to severe poisoning but with prompt supportive care patients should make a full recovery.

113. Non-Pharmaceutical Cardioactive Steroid Poisoning: Bufotoxins are Associated with More Severe Toxicity

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Background: Cardioactive steroids are steroids molecule with pharmacological and toxicological effects on cardiac tissue. Most cardioactive steroids from plants and pharmaceutical digoxin are cardenolides, while cardioactive steroids from *Bufo* toads (bufotoxins) are bufadienolides. Non-pharmaceutical cardioactive steroids have been used as therapeutic agents, herbal tonic, and aphrodisiac. The effects of these toxicants can range from minor to severe toxicity, including death, and is of grave public health concern in some parts of the world. Reports of poisoning of these agents however remain limited. *Methods:* We conducted a retrospective analysis of all non-pharmaceutical cardioactive steroid exposures reported to the Taiwan National Poison Control Center between 1987 and 2008 to better understand the toxicity profile and factors associated with severe cardioactive steroid poisoning. *Results:* A total of 64 patients were analyzed. *Bufo* toads or Chan Su were involved in 36 cases, *Aponcynaceae* plants (*Nerium* and *Thevetia* species) in 13 patients, *Digitalis* species in 11 patients and unidentified plants in 4 patients. Unintentional exposure was the most common reason for exposure, especially taking the herb or toad for a mistaken therapeutic reason. Eighteen patients manifested severe effects and seven patients died. All the patients who died ingested parts of *Bufo* toads or Chan Su. Serum potassium level was significantly higher among patients who died compared to those survivors (6.1 vs. 4.5 mmol/L, p = 0.01). *Conclusions:* Non-pharmaceutical source of cardioactive steroid poisoning is uncommon. Clinical features of such poisonings are similar to pharmaceutical digoxin poisoning. However, poisoning from bufotoxins is frequently associated with severe/fatal effects and is more toxic compared to poisoning from plant cardenolides. Serum potassium level has prognostic significance in such poisonings.

114. Milkweed Induced Cardiac Glycoside Poisoning

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Introduction: Milkweed (*Asclepias spp*.) is ubiquitous within North America and many varieties are known to contain cardiac glycosides. Several insects, including the monarch butterfly (*Danaus plexippus*), feed on the plant and retain glycosides as a natural defense. Many published resources list common milkweed as an edible plant, although with the caveat that it must be boiled twice before consumption. *Case report:* A 69-year-old male presented with nausea, vomiting, abdominal pain and diaphoresis. Symptoms began 2 h after consumption of approximately 1 cup of common milkweed (*Asclepias syriaca*) he had picked on his property. Medications included only a statin; he had no prior cardiac history. Initial vital signs: heart rate 43, blood pressure 113/48, afebrile, oxygen saturation 100%. An electrocardiogram (ECG) showed a junctional escape rhythm. Initial laboratory values were significant for: digoxin level 2.6 ng/mL; potassium 5.7 mmol/L. He received four

vials of digoxin Fab fragments. Six hours later a repeat potassium was 7.2 mmol/L and he remained in a junctional rhythm, prompting administration of 10 units of regular insulin IV and 25 g of 50% dextrose solution along with an additional four vials of digoxin Fab fragments. Symptoms and ECG findings improved following repeat dosing and the patient was discharged without further sequelae. The peak free digoxin level was 4.79 ng/mL as determined by a digoxin turbidometric immunoassay (Architect 8000, Abbott). *Discussion:* Digoxin and other cardiac glycosides demonstrating similar chemical characteristics can be detected in human blood using a variety of immunologic techniques. Antibody reagents utilized in clinical tests purchased from different vendors will display varied affinities for digoxin as well as other cardiac glycosides. Therefore, test results acquired from different hospitals may not be compared directly. Similarly, therapeutic immunoglobulin fragments are highly specific for digoxin compared to other cross reacting cardiac glycosides. *Conclusion: Asclepias spp.* ingestion may result in cardiac glycoside poisoning. Dosing of digoxin Fab fragments cannot be deduced directly from the digoxin level following *Asclepias spp*. poisoning and larger doses of digoxin Fab fragments may be needed in treatment.

115. A Comprehensive Review of Anticholinergic Plant Exposures in California, 1997–2008

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Introduction: There exist a variety of plants with anticholinergic properties; many of these are consumed both intentionally and unintentionally. To date, there have been no comprehensive reviews of human exposure to these plants. *Objectives:* We sought to identify characteristics of patients with reported exposures to anticholinergic plants. *Methods:* We performed a retrospective review of the California Poison Control System (CPCS) database for all cases of human exposure to anticholinergic plants for the time period 1997–2008. Data collected included age, gender, route of exposure, reason for exposure, clinical effects, duration of effects, medical interventions and outcomes. *Results:* There were a total of 1,786 patients, 1,273 (71%) of which were male. Patient ages ranged from 1 to 84 years with a mean of 18 years. One thousand four hundred and twenty-eight (80%) exposures were in patients age 18 or younger (ages 1–6, n = 234; ages 7–12, n = 179; ages 13–18, n = 1,015). One thousand two hundred and ninety-three (72%) exposures were intentional; of these, 1,081 (84%) were between the ages of 12 and 19. The vast majority of exposures were to *Datura* (n = 1,240) and *Brugmansia* (n = 307) species, but other exposures included *Atropa* (belladonna) (n = 118), *Cestrum* (n = 83), henbane (n = 2), mandrake (n = 1), and unknown (n = 38). Commonly reported effects included mydriasis (n = 866), hallucinations (n = 744), agitation (n = 629), tachycardia (n = 615), confusion (n = 398), hypertension (n = 217), flushed skin (n = 140), and hyperthermia (n = 84). One thousand three hundred and six (73%) patients were managed in a healthcare facility. Most-commonly administered therapies were benzodiazepines (n = 443), activated charcoal (n = 394), intravenous fluids (n = 354), physical restraint (n = 170), antipsychotics (n = 77), and physostigmine (n = 64). In the 39 cases where physostigmine dose was recorded, average dose was 1.3 mg. One patient (an 18-year-old male with jimsonweed ingestion) who received physostigmine had a generalized tonic-clonic seizure. Five hundred and thirty (30%) patients were admitted, with an average length of stay of 1.9 days. No deaths were recorded. *Conclusions:* In this case series, many patients exhibited classic antimuscarinic symptoms. The majority of intentional exposures occurred in adolescents and young adults. Most intoxications did not result in life-threatening events and symptoms usually resolved within 2 days.

116. Herbal Body Building Supplement – Get Big or Die Trying

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Background: Clenbuterol is a potent $beta_2$ and $beta_3$ agonist. It is abused by body builders as an anabolic and lipolytic agent. Recent literature reports describe clenbuterol-contaminated heroin leading to adverse cardiovascular effects. We report an herbal body building supplement imported from China adulterated with clenbuterol. *Case report:* Two male owners of an herbal supplement business tried one pill of a new formulation provided by their Chinese supplier. The compound, "Scorch," reportedly contained caffeine, yohimbe, willow bark, and sida cordifolia (ephedrine alkaloids). Within 15 min each patient had palpitations. Vital signs 1.5 h post-ingestion were BP 79/27, *P* 131, RR 27, *T* 36.7, 98% RA in patient A. He developed a peak lactate of 9.7 mmol/L at 8 h, CPK of 11,803 U/L at 14 h, and troponin of 10.5 ng/mL at 31 h. His lowest K^+ was 2.4 mmol/L at 4 h. Esmolol and phenylephrine drips were used to control HR and BP. His echocardiogram on day 2 showed impaired relaxation but a normal ejection fraction. Vital signs 1.5 h post-ingestion in patient B were: BP 100/54, *P* 158, RR 24, *T* 36.7, 100% RA. He developed a peak lactate of 10.4 mmol/L at 4 h, CPK of 3,153 U/L at 43 h, and troponin of 2.13 ng/mL at 43 h. His lowest K^+ was 3.0 mmol/L at 4 h. Despite denying co-ingestants, his theophylline level was 0.8 mcg/L and caffeine was 6.8 mcg/L. He was treated with metoprolol for HR control. Both patients tested positive for urinary clenbuterol and tests on the pills confirmed clenbuterol. *Discussion:* Both patients had rapid development of tachycardia, hypokalemia, NSTEMIs, and lactic acidosis consistent with other reports of clenbuterol ingestion. Non-invasive monitoring showed low systemic vascular resistances with high cardiac outputs. Both were successfully treated with beta blockade. Pt A had an abnormal echocardiogram showing impaired myocardial relaxation that resolved. Pt B has had persistent tinnitus for 6 months after the ingestion. *Conclusion:* Clenbuterol is a long acting potent oral $beta_{2/3}$ agonist that leads to peripheral vasodilation and tachycardia. Our report supports the use of physiologic parameter based treatment with beta blockers in these cases. Physicians should be aware of the variety of compounds which may be present unexpectedly in herbal body building products.

117. Heavy Metal Contaminants in Yerberia Shop Products

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Background: Yerberias, found in many large urban centers, specialize in the sale of Hispanic herbal remedies. Products sold often contain unknown ingredients at unknown concentrations. Lead (Pb) and arsenic (As), which may be associated with health risks when ingested, have been identified in some herbal products. We analyzed medicinal products sold at regional Yerberias for presence of Pb and As. *Methods:* Eleven Yerberias were randomly selected from an internet search-engine using the term "yerberia phoenix arizona." A single investigator entered the stores, stated that his "friend had a cold" and asked for recommendations. Twenty-two products were purchased, de-identified and delivered to the state laboratory for testing. Previous studies have reported health risk associated with the oral lead consumption of >0.9 mg/kg product, or arsenic >12,000 mg/kg product. *Results:* One product was pure camphor and deemed unsafe for testing; therefore 21 samples were analyzed. Pb was detected in 4/21 (19%), with levels ranging from 0.54–1.6 mg Pb/kg product [detection limit (DL) ≥ 0.5]. As was detected in 1/21 (5%) at 0.54 mg As/kg product (DL ≥ 0.5). Three products (14%) had Pb concentrations above 0.9 mg/kg product, which has been previously cited as a potential health hazard. *Conclusion:* Yerberia medications may be contaminated with heavy metals, including Pb at potentially hazardous levels.

118. New Comprehensive Amatoxin Mushroom Poisoning (AMP) Treatment Protocol

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Background: Mild AMP cases often die in developing countries where presentation is late, diagnosis easily missed & access to intravenous fluid replacement (IFR) is limited. Severe AMPs anywhere lead to death or liver transplant. There is no reliable strategy to prevent or reverse AMP induced fulminant liver failure (FLF). Intravenous silibinin (IS) has been used for AMP in Europe for two decades. Uncontrolled data suggests significant efficacy, yet some still do not use it. IS was unavailable in USA until FDA granted Emergency INDs in 2007 & 2009. *Methods:* 1) Comprehensive literature review. 2) Medical record review of severe AMPs. 3) Experience with AMP and IS gained from IND cohorts. *Results:* 1) Dogs with surgical biliary fistulas survived fatal amatoxin doses, as did dogs receiving IS several hours after a fatal dose. Two case reports of AMP recovery after nasobiliary drainage were uncovered. Removed bile from one contained >4 mg amatoxin. 2) The critical importance of preventing early renal failure is under-appreciated. The kidneys effectively clear circulating amatoxin if urine output is maintained. If not, early ATN may lead to ARF & metabolic acidosis. Multiorgan failure can follow. After aggressive IFR some still develop FLF later. 3) All IND patients recovered liver function, including four with FLF prior to initiation of IS. All survived except for an 83-year-old with anuric renal failure. *Conclusions:* FDA has approved a nationwide AMP trial. IS is available at no charge with same day delivery. Physicians obtain IS via 24 h hot-line. The AMP protocol has three essential components. 1) *Aggressive IFR* to completely reverse prerenal azotemia, prevent ATN & protect kidneys. 2) *IS* to inhibit uptake of amatoxin by OATP1B3 into hepatocyte & to inhibit TNF mediated apoptosis. IS is well tolerated. Flushing during initial loading dose is milder than oral niacin. 3) *Biliary drainage* by ERCP (nasobiliary) or Interventional Radiology (percutaneous) to remove amatoxin reconcentrated in bile following mushroom absorption. All removed bile samples will undergo quantitative analysis of amatoxin content by HPLC/mass spectrometry.

119. Evaluation of Duration of Morbidity Post Snake Envenomation

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Background: The morbidity associated with snakebite envenomation has not been well documented. *Method:* Using a standardized questionnaire all patients with snakebite reported to three regional poison centers during the year 2009 were followed after hospital discharge by telephone until resolution of symptoms. Data points such as days to return to work were only assessed in patients that had a job. *Results:* Two hundred and twenty-seven snake bites. Mean and median age were 34 and 31 years, respectively, with a range from 2 to 80 years. One hundred and fifty-three patients (67%) were male. The snakes were identified as copperhead (n = 108); unidentified venomous (n = 69); cottonmouth (n = 35) and timber rattlesnake (n = 15). One hundred and six (47%) received antivenin. One hundred and eighty-two (80%) patients continued to have subjective (e.g. pain) or objective (e.g. edema) symptoms post discharge. See Table. There were no deaths. *Discussion:* Antivenin administration reduced edema, but patients continued to experience significant

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Antivenin administration time	Mean (SD) and median days to return to work	Mean (SD) and median duration in days of pain	Mean (SD) and median duration in days of accommodation	Mean (SD) and median duration in days of edema
≤4 h	5.4 (5.8), 4 n = 63	11.3 (13.4), 8, n = 78	16.1 (15.8), 10 n = 14	6.0 (5.7), 4, n = 31
≥5	11.1 (11.5), 5.5, n = 14	30.9 (44.5), 14, n = 19	48 (70.9), 17.5, n = 6	27 (53), 7, n = 12
No antivenin	6.1 days (6.4), 3, n = 45	13.1 days (21.6), 5, n = 85	12.6 (14.2), 9, n = 27	11.3 days (14.9), 5.5, n = 44

morbidity. *Conclusion:* Use of antivenin <4 h post bite significantly reduced duration of edema versus no antivenin or late administration.

120. Tarantula Bites Are No Big Deal. Really?

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Background: The Cobalt Blue Tarantula *(Haplopelma lividum)* is a species native to Thailand and Myanmar. These "Old-world" tarantulas (from Europe, Africa, Asia and Australia) can be quite aggressive and are more likely to attack when disturbed. While the bites of many species of tarantula are known to be no worse than a wasp sting, accounts of bites by some species are reported to be very painful. Old world tarantulas often have more potent, medically significant venom. *Case report:* An 18-year-old male pet store worker was bitten on the middle finger of his right hand while feeding a Cobalt Blue tarantula. He noted immediate pain near the fang puncture site and soon began to experience redness and localized swelling. He presented to a local ED within 1 h of the bite where he was treated with diphenhydramine, prednisone, sterile dressing and released. Later that evening the patient began to experience muscle spasm, described as cramping to fingers and toes bilaterally. After contact with the Poison Center the next morning he was referred to another local HCF for evaluation. His vital signs were within normal limits and no significant laboratory abnormalities were noted but the patient appeared anxious and in obvious mild to moderate distress with muscular cramping spreading to larger muscle groups. After consultation with the treating physician, it was determined to treat the muscular symptoms with hydration and benzodiazepines and the addition of opiates as needed. Overnight in the hospital the patient required several doses if IV diazepam for muscular cramping of his back and other large muscle groups. By the next day his symptoms had largely resolved and he was discharged with prescriptions for diazepam and oxycodone/APAP as needed. On follow-up, no further complications or symptoms were reported. *Conclusion:* While most tarantulas common in North America are thought to be relatively harmless and their venom of no consequence to humans, certain "Old World" species are known to have medically significant venom. We report a case of envenomation by a Cobalt Blue tarantula responsible for 48 h of painful symptoms requiring medical treatment. With exotic pets becoming more common and desired, Poison Centers should be aware of the potential of these creatures to cause significant symptoms that require medical management.

121. Severe Digit Injury Following Puff Adder Envenomation

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Background: The puff adder (*Bitis arietans*) is indigenous to sub-Saharan Africa and is responsible for more fatalities than any other African snake. Envenomation outside of this region is rare. We report a bite with severe local effects despite antivenom. *Case report:* A 43-year-old male exotic snake breeder sustained a bite to his right index finger while feeding an imported puff adder. He developed immediate digit pain and swelling that quickly spread to the hand. He denied prior snake bites or antivenom treatment. EMS transported the patient and notified the regional poison center of the symptoms and species. The regional poison center staff made arrangements for helicopter retrieval and delivery of SAIMR polyvalent snake antivenom (South African Vaccine Producers, LTD) from the nearest zoo (90 miles). On examination, the patient was in distress secondary to pain at the bite site. Vital signs were: temperature 98.3°F, heart rate 101 bpm, blood pressure 139/117 mmHg, and respirations 14 bpm. There was a 3 mm linear abrasion laterally on the finger between the PIP and DIP joints. The other digits were swollen and had pain with movement, but normal capillary refill. Swelling progressed from the hand to the shoulder over the next hour. Initial laboratory tests demonstrated thrombocytopenia (48,000/mm^3) and mildly elevated prothrombin time (13.2 s; reference range 9.4–11.9), but otherwise normal hemoglobin, INR, fibrinogen, renal function, and creatinine phosphokinase. Five vials of antivenom were administered 4 and 12 h post-envenomation. They were tolerated without allergic reaction. Proximal swelling halted and platelet count normalized following the initial antivenom. PT normalized over 36 h. Although swelling of the arm and hand improved over the next 2 days, it persisted in the digit. Necrosis of the finger was evident by day 5 and amputation at the PIP joint was performed on day 11. *Conclusions:* SAIMR antivenom rapidly reversed systemic effects (thrombocytopenia), but not local tissue effects. Surgical decompression is typically unnecessary following North American viper bites. However, based on this case and prior report (Clin Toxicol 2002; 40:911), early surgical intervention (dermotomy) may be beneficial for puff adder bites to the digit.

122. Fatality from Intentional Ingestion of Datura Sauveolens

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Background: Solanaceae plants contain the belladonna alkaloids (atropine, hyoscyamine, and scopolamine). Ingestion of these agents causes the anti-cholinergic toxidrome with both central and peripheral manifestations. Peripheral effects include skin flushing, dry mouth, mydriasis and hyperpyrexia and central effects include altered mental status and seizures. *Case report:* A 28-year-old male was found unresponsive after ingesting an unknown amount of Angel's trumpet *(Datura Sauveolens)*. Paramedics found the patient in asystole with no spontaneous respirations. He was intubated at the scene and cardiopulmonary resuscitation was initiated. Upon arrival to the emergency department, he was noted to have flushed skin, decreased bowel sounds and pupils that were fixed and dilated. As the patient was in extremis, and not responding to resuscitation, intravenous physostigmine (1 mg) was administered with no improvement in his condition. The patient was pronounced dead shortly afterwards. Autopsy results revealed a heart blood scopolamine level of 13 ng/mL and atropine level of 150 ng/mL. *Discussion: Datura Sauveolens* is a well known toxic plant with anti-cholinergic effects. It is ubiquitous in the Southeastern United States, Caribbean and South America. The evergreen bush consists of trumpet-shaped purplish flowers that contain varying amounts of tropane alkaloids. The different ratio of belladonna alkaloids in these plants accounts for the variability of clinical manifestations observed in toxicity. Amongst Solanaceae plants, the scopolamine content is highest in *Datura Sauveolens* with approximately 0.65 mg per blossom. Scopolamine is known to penetrate the blood brain barrier more readily than atropine and therefore may contribute to more severe central nervous system manifestations. Death due to this plant ingestion has been reported but is extremely rare and may be secondary to hyperpyrexia, ventricular arrhythmias and cardiovascular compromise. We report the second case fatality by *Datura Sauveolens* from intentional overdose with this species.

123. Prolonged Ketoacidosis with Normoglycemia in a 2-year-old Following Ingestion of Meizitang Herbal Weight Loss Supplement Containing Illicit Sibutramine

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Background: Meizitang is a Chinese herbal weight loss supplement sold over the internet. Illicit Sibutramine has been detected in the supplement on multiple occasions. Sibutramine is a monoamine reputake inhibitor with noradrenergic and serotonergic effects. Previous reports of sibutramine exposure have primarily documented hyperadrenergic, serotonergic, gastrointestinal, and neuropsychiatric effects. *Case report:* A 2-year-old healthy female ingested an unknown quantity of Meizitang herbal supplements. She vomited once, was taken to an ED, and discharged after 4 h of observation with Poison Control Center consultation. At home she refused to take PO, became tremulous, and was taken to another ED 12 h after ingestion. She was found to be tachycardic, ketonuric, and mildly acidotic with an AG 17. She was given IV fluid and transferred to our hospital. Despite aggressive hydration she remained tachycardic with a slowly worsening acidosis to a serum pH of 7.15 and AG of 24 at 40 h post ingestion. Workup revealed a marked elevation of beta-hydroxybutyrate to 4.6 mmol/L (nl < 0.4) and a mild lactic acidosis at 3.8 mmol/L (nl < 2.4). The patient remained normoglycemic. Treatment with a high dextrose containing solution resulted in resolution of her ketoacidosis and symptoms. Additional workup including T3/T4, salicylate level, and a serum amino acid profile were normal. The capsule was sent to NMS labs for a qualitative drug analysis which revealed presence of sibutramine. *Case discussion:* To our knowledge this is the first reported case of prolonged ketoacidosis after sibutramine or herbal weight loss supplements. Except for alcoholic ketoacidosis there are few reports of drug induced normoglycemic ketoacidosis in the literature. No clear mechanism exists to explain ketoacidosis from Sibutramine. *Conclusion:* We report the first case of a normoglycemic ketoacidosis in a child following ingestion of a weight loss supplement containing Sibutramine. Physicians and Specialists in Poison Information should be alert to the possibility of illicit pharmaceuticals in herbal supplements and their potential for adverse effects, particularly in young children.

124. Potentially Lethal Ingestion of DMT and Syrian Rue

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Introduction: Tryptamines and harmala alkaloids have been used individually and in combination for years for their abuse potential, as herbal remedies, and in religious ceremonies. Their abuse can be dangerous, and should be recognized by medical toxicologists. We present an ingestion of *N*,*N*-dimethyltryptamine (DMT) and Peganum harmala (Syrian rue), with the DMT dose over 10 times the LD50. *Case report:* A 24-year-old male presented with altered mental status and dizziness. His initial presentation was 4 h after ingesting 10 g of DMT and 4.5 g of Syrian rue. Physical exam included heart rate (HR) 120, blood pressure (BP) 145/84, normal skin, and reactive dilated pupils bilaterally. One hour after arrival his signs and symptoms worsened, with a HR in the 130s and significant confusion and hallucinations. The patient was admitted to a telemetry unit for monitoring and supportive care including IV fluids and benzodiazepines. Over the subsequent 8 h the patient's hallucinations cleared, his mental status improved to near baseline, his HR declined to normal, and his BP stayed at roughly 140 systolic. He was discharged uneventfully at that time. *Discussion:* This patient ingested a potentially fatal amount of DMT, which is a hallucinogenic tryptamine. Tryptamines can be found in many plants and animals. DMT in particular can be found in a number of different plants and is produced endogenously as well. Syrian rue belongs to a class of plants that produces harmala alkaloids. Harmala alkaloids produce monoamine oxidase (MAO) inhibition. DMT is orally active when used in conjunction with an MAOI. This combination also causes the effects of the DMT to last much longer than if smoked or injected on its own. The patient above took the DMT and Syrian rue to experience a long-lasting hallucinogenic high. He achieved this goal, and the course of the altered mental status lasted a total of 12 h, which is many times longer than the typical high would have lasted with DMT alone. The dose of the DMT this patient reported using is well above the estimated 8 mg/kg LD50. *Conclusion:* The presentation of this patient, with tachycardia and altered mental status, is consistent with the ingestion of DMT and Syrian rue that he reported. This combined ingestion should be recognized by the medical toxicologist.

125. Scombroid Toxicity in a Patient Taking Isoniazid

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Background: When inadequately preserved or refrigerated, the musculature of dark-fleshed fish of the Scombridae family (mackerels, tunas, and bonitos) may undergo bacterial decomposition. During this process, the amino acid L-histidine in the fish decarboxylates to histamine. Histamine is a vasoactive amine, and consumption of histamine-toxic fish may produce a constellation of allergy-like symptoms that include flushing, pruritus, urticaria, bronchospasm, nausea, vomiting, diarrhea, headache, tachycardia, hypotension, and, rarely, transient loss of vision. This reaction, known commonly as Scombroid toxicity, can be exacerbated in individuals taking the anti-tuberculosis drug isoniazid (INH), a potent inhibitor of the histaminases monoamine oxidase (MAO) and diamine oxidase (DAO). *Case:* We report the case of a 23-year-old medical student who presented to our emergency department with symptoms suspicious for Scombroid toxicity following ingestion of sushi that contained raw tuna. The patient reported onset of headache within 20 min of eating of the fish, followed by a "pulsatile" sensation in the veins of his neck, dizziness, palpitations, nausea, "tunnel vision," and the discovery that his face, neck, and upper extremities had become "magenta" in color. The patient arrived at the hospital 1.5 h after onset of symptoms with improvement in his flushing, headache, and nausea, but vital signs notable for a heart rate of 119 bpm. The patient received 25 mg of diphenhydramine leading to complete resolution of all symptoms. The patient was currently taking INH for treatment of a positive PPD test. We speculate that the severity of symptoms reported by the patient resulted from an interaction between this environmental toxin and the patient's tuberculosis therapy with INH. *Discussion:* Toxic levels of histamine are thought to be 25–50 mg histamine/100 g of food or more, but lower levels have been reported to induce symptoms in patients with reduced levels of histaminase activity. The severity of our patient's Scombroid-type reaction following ingestion of a relatively small quantity of raw tuna suggests that the anti-histaminase effect of his INH therapy contributed to his illness. While the adverse hematologic, hepatic, and neurologic effects of INH are well documented, the drug's potential to compound Scombroid toxicity is less well appreciated.

126. Bradycardia Resistant to Atropine Following Monkshood Ingestion

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Background: Monkshood (Aconitum napellus), commonly known as wolf's bane, is a wild flowering plant native to the Northern Hemisphere which can also be cultivated. The plant has a long and well documented history as a poison, being used for hunting and homicide. Aconitine and other alkaloids found in all parts of the plant are responsible for the toxicity of monkshood. Many fatalities have been reported following ingestion and patients commonly present with gastrointestinal, neurological and cardiovascular symptoms. *Case report:* We report the case of a 45-year-old male patient who was hospitalised following an intentional ingestion of a 3–4 inch piece of monkshood root from his garden. The patient began to vomit and complain of dizziness within 2 h of ingestion. He was found collapsed and his heart rate, blood pressure and level of consciousness all dropped en route to hospital. Bradycardia (46 beats per minute) and hypotension (blood pressure 90/50 mmHg) were recorded on admission. An ECG revealed flattened T waves and bigeminy. The patient was moved into the Trendelenburg position and given 500 mL of normal saline. At this point the National Poisons Information Service (NPIS) were contacted for advice. Atropine and colloid administration were recommended in accordance with ToxBase (The primary clinical toxicology database of the NPIS). It was also suggested that transfer to an intensive care unit and administration of an inotrope would be required should the patient's pulse and blood pressure not improve. Atropine (3 mg) was given intravenously but no increase in heart rate was evidenced. At approximately 12 h post ingestion the patient's blood pressure dropped to 60/40 mmHg and he was given one litre of gelofusine intravenously over a 30 min period. Following this intervention the patient's blood pressure began to improve and continued to do so until he had made a full recovery. He was discharged from hospital 2 days later. *Conclusion:* Severe bradycardia and hypotension may occur when monkshood is ingested and bradycardia may, as in this case, be resistant to atropine. Supportive therapy with close monitoring of blood pressure and ECG is recommended for patients who have been poisoned by monkshood.

127. Bok Choy Hypothyroidism

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Background: Brassica spp. inhibit thyroid function in animals. We present a case of severe hypothyroidism believed to be secondary to subchronic ingestion of large quantities of raw bok choy (*Brassica rapa*).
Case report: An 88-year-old Chinese born woman living in the US for 30 years presented with increasing lethargy, shortness of breath, inability to walk, and difficulty swallowing for 3 days. Her family also noted 1 month of facial swelling. PMH included a stroke without residual weakness and recently diagnosed type II diabetes; she was on no prescription or herbal medications; 1 year previously her TSH was normal. Initial vital signs were: BP, 141/79 mmHg; HR, 46/min; RR, 16/min; *T*, 95.2°F; SpO_2, 99% on NRB mask; and capillary glucose, 91 mg/dL. Physical exam was notable for somnolence with dry skin and mucous membranes and nonpitting edema of her face, neck and extremities. Marked glossal edema was noted. There was no stridor, exophthalmos, or goiter. Tendon reflexes were absent throughout. ECG showed sinus bradycardia with normal intervals. Serum chemistry panel revealed: sodium, 118 mEq/L; potassium, 4.7 mEq/L; chloride, 81 mEq/L; bicarbonate, 30 mEq/L; BUN, 32 mg/dL; creatinine, 1.6 mg/dL; normal liver function tests. TSH was 74 mIU/L (normal < 5) while free thyroxine was undetectable. She received levothyroxine 100 mcg daily, stress-dose hydrocortisone, and broad spectrum antibiotics. A family member later disclosed that the patient had been eating two bowls of raw bok choy daily for 2 months for glucose control. She was discharged 2 weeks later clinically well with improving thyroid function tests. We are unable to measure or confirm a goitrin concentration in a sample of the patient's serum. *Discussion:* The genus *Brassica* includes broccoli, cabbage, canola, cauliflower, and turnips. All species contain various glucosinolates, presumably as defense against herbivores. Progoitrin is a glucosinolate found in several *Brassica* spp., including bok choy. Upon hydrolysis it yields two goitrogenic compounds: thiocyanate (which inhibits thyroid uptake of iodine) and goitrin (an analog of methimazole, which inhibits thyroperoxidase decreasing synthesis of thyroid hormones). *Conclusion:* Ingestion of supranormal quantities of raw bok choy may be associated with severe hypothyroidism.

128. Hold the Anchovies? A Presumptive Diagnosis of Clupeotoxism in West Michigan

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Background: Clupeotoxin poisoning occurs in humans who eat fish contaminated with the toxin. This toxin occurs in clupeoid fish, such as herring, anchovies, and sardines. The toxin is concentrated in fish organs and is tasteless and odorless. The identity of the toxin is unknown. The poison does not break down when the fish is cooked. Few documented ingestions have been reported in the literature. *Case report:* Forty-year-old male presented with progressive nausea, fatigue, and a metallic taste in his mouth hours after eating a pizza with anchovies. The patient called his friend who ate the same pizza, and experienced similar, but more severe symptoms, including vomiting. The patient then used the Internet to search for causes of metallic taste and noted "clupeotoxism" associated with anchovies and proceeded to the ED. On physical examination, the patient was afebrile, hemodynamically stable, and had no localizing signs of toxicity. Symptoms at the time of presentation were resolving except for the metallic taste in his mouth. *Results:* Given patient's symptoms and history of ingestion of anchovies, patient was given the presumptive diagnosis of mild clupeotoxicity. Toxicology consultation confirmed the likely diagnosis. Nausea was controlled with antiemetics. After several hours of observation, the patient was discharged on promethazine. His friend apparently recovered within 24 h as well without medical treatment. The local public health department was notified. *Discussion:* The diagnosis of clupeotoxism is based on history of eating clupeoid fish with development of characteristic symptoms within hours. Symptoms begin with a sharp, metallic taste in the mouth, followed by abdominal upset, diffuse vomiting, and diarrhea. This then progresses to hemodynamic instability, vertigo, and then neurological manifestations such as nervousness, dilated pupils, hypersalivation, headaches, cramps, respiratory distress, coma, and ultimately death. No specific antidote is available for clupeotoxism. Treatment is largely supportive. *Conclusions:* The diagnosis of clupeotoxism is based on history of eating clupeoid fish, such as

anchovies, with development of characteristic symptoms within hours. The case presented is the first known occurrence of clupeotoxism in the continental United States.

129. Venomous Snakebites in Oregon, 2004–2008

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Objective: Describe the characteristics of venomous snakebite patterns in Oregon over a 5-year period. *Methods:* Toxicall was reviewed from 2004 to 2008. Three hundred and eighty-two calls were received regarding snakes, of which 108 were concerning a bite from a potentially venomous snake. Seventy-nine bites occurred within Oregon or required treatment in Oregon and were included. A phone survey of inpatient pharmacies was conducted on a single day in July 2009 to determine Crofab stocks in all hospitals in the state. *Results:* Yearly bite averages remained constant over 5 years, with most occurring in July. Of the 79 snakebites recorded, 76 were presumed genus Crotalinae, 3 were genus Bitis. Seventy-five presented to hospitals. Of these, 51 (68%) received antivenom (48 Crofab, 2 Wyeth antivenom, 1 SAIMR polyvalent). Fourteen patients (19%) were transferred from the initial health care facility for ongoing care. Of those receiving Crofab, mean requirement was 17 vials. Fifty-eight patients had measured coagulation studies, of which 6 (10%) had abnormalities in coagulation (INR > 3, fibrinogen < 50, platelets < 25) during their hospitalization. One patient received platelet transfusion and one underwent fasciotomy. No deaths were reported. Only 8/36 counties had enough antivenom to meet the median requirement. *Discussion:* We noted that Oregon counties are not uniformly stocked with adequate antivenom to treat the average snake bite victim. The majority of patients did not have a significant coagulopathy. *Conclusion:* Venomous snakebites in Oregon are a relatively infrequent occurrence with no fatalities reported in the 5 years studied.

130. Liberty and Death

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Background: Psilocybin is the tryptamine constituent in the mushroom genus Psilocybe. Several species are found in the Pacific Northwest. Injury and death are rare from recreational use but typically stem from the consequences of abnormal behavior. *Case:* A healthy 20-year-old male reportedly ingested as much as 4 g of hallucinogenic mushrooms one evening (typical single ingestion is 1/8 g) prior to entering a sleeping woman's apartment. Upon awakening, she demanded he leave and a struggle ensued. Police were summoned to the home but the man became increasingly violent and failed to comply with their commands. He did not submit to multiple Taser discharges. Instead, he managed to pull out or break the wires and continued to struggle and attempted to grab the officer's pistol. After fleeing outdoors, additional attempts to subdue the man included nine beanbag rounds and additional Taser applications, all without effect. After attempting entry into a police vehicle containing a loaded rifle, the man was shot and killed. Autopsy report confirmed the lethal gunshot wound to the head. Toxicology screening revealed a urine psilocin concentration of 4,200 ng/mL, while an organic base screen (including PCP), mescaline, cocaine and methamphetamine screen were all negative. *Discussion:* Psilocybin acts a serotonin agonist, particularly at 5HT-2a receptors. The hallucinogenic effects manifest by perceptual distortion, a sense of unreality and depersonalization can lead to bizarre but seemingly purposeful behavior resulting in violence and apparent unresponsiveness to painful stimuli. *Conclusion:* We describe a case of acute psilocybin intoxication associated with violent behavior resulting in a tragic shooting death.

131. A Bittersweet Symphony

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Background: Ingestion of large quantities of amygdalin-containing seeds has been linked to symptoms of inhibition of cellular respiration. Apricot kernels have usually a pleasantly bitter aftertaste and they are used in confectionery as essence, as an ingredient in the macaroons, in syrups or liqueurs and generally in conjunction with sweet almond to spice up the taste. *Case report:* A 35-year-old mentally disturbed woman was admitted to our ED. She was found in her living room surrounded by apricots in which the pits had been extracted. EMS stated the woman had swallowed 40–60 pits 30 min prior to ED arrival. Her inital vital signs: BP 120/70, HR 120, RR 20, *T* 37.5°C, O_2 sat 98%. A slight metabolic acidosis was present on ABG. Decontamination included gastric lavage and 70 g of activated charcoal. She was placed on monitors and given IV fluids and magnesium. Ninety minutes after ingestion, she reported headache, nausea and dyspnea. Vital signs: BP 75/50, HR 145, RR 28, sat O_2 94%, acidemia was present. Two vials of amyl nitrite were administered via inhalation with 50 mL sodium thiosulfate 25% IV (infusion rate: 5 mL/min). After such therapy, a methemoglobinemia of 10% was measured. The vital signs slightly improved, allowing the intravenous administration of 5 g of hydroxocobalamin IV in 30 min, with clinical improvement in a short time. During treatment no significant ECG changes were noted. The patient underwent clinical observation, maintaining levels of methemoglobinemia around 10% through the inhalation of ampoules of amyl nitrite for 4 h after hydroxocobalamin administration. After a 24 h stay in the Clinical Toxicology Unit, the woman was transferred to psychiatry department for further observation and treatment. *Conclusion:* However, their consumption is limited to use as aromatic as apricot leaves and flowers contain a cyanide derivative, amygdalin, which, at high doses, would be highly toxic.

132. Hypertensive Crisis from a MAOI/Supplement Interaction Leading to Myocardial Infarction and Acute Heart Failure

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Background: Cardiac complications, and supplement interactions with MAOIs have only rarely been reported. We report a case of a hypertensive crisis leading to MI and acute heart failure in a pt on phenelzine who ingested the supplement Atro-Phex®. *Case report:* Twenty-four-year-old male on phenelzine w/o hx of HTN presented after the first time ingestion of Atro-Phex®. List of ingredients includes ß-phenylethylamine and synephrine. Soon after ingestion he had chest tightness, SOB, and HA. He had been educated on food restrictions and denied ingesting CIed foods or using other supplements or illicit drugs. Vitals were: BP-157/102, P-78, R-30, *T*-96.0°F, and Pox 99% (RA). He was diffusely diaphoretic, but had a nl CV and neuro exam. He was txed with diazepam (total 15 mg) and became rapidly asymptomatic (peak BP 160/111). He was DCed after 3 h with a BP of 104/70. He returned 13 h later after awakening with SOB and hemoptysis. He had felt well up until that point and denied the use of any other agent/CIed food/additional phenelzine. He was afebrile, BP-94/47, P-106, R-17 with a pulse ox of 84% (RA). PExam was significant for bilateral crackles. CXRY revealed nl heart size with pulm edema and ecg demonstrated only sinus tach. Routine chemistry and CBC were unremarkable and TSH was nl. Trop was 0.54 ng/mL which was peak, total CK was 296 IU/L (MB fraction 8%), and BNP was 1,140 pg/mL. Urine drug screen was positive for benzos (negative for amphetamines, benzoylecgonine, and pcp). Echo demonstrated global LV hypokinesis (EF 32%), which when repeated 2 days later after tx with diuretics, an ace inhibitor, and carvedilol demonstrated improvement to 46%. Myocardial perfusion scan was negative for inducible ischemia and chest CT scan excluded PE. He was DCed after 5 days and lost to follow up. *Case discussion:* The case is one of only a few detailing cardiac complications from the hypertensive crisis associated with an MAOI interaction. Of the listed ingredients both the beta-phenylethylamine (a biogenic amine similar to tryptamine), and synephrine may have been contributory. *Conclusion:* Cardiac complications from an MAOI/supplement interaction can be significant. The case supports aggressive blood pressure management in those suffering from the hypertensive crisis associated with an MAOI interaction.

133. Nicotine Toxicity from Multiple Routes of Exposure After use of Nasvai an Uzbekistani Smokeless Tobacco

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Nicotine toxicity causes a wide spectrum of symptoms, thus diagnosis may be difficult when the history is lacking. We report nicotine toxicity from multiple routes of exposure due to a previously unreported nicotine-containing product called "Nasvai." A 32-year-old man presented with acute confusion, tremulousness, emesis, diarrhea and altered sensorium. He had syncope with seizure-like activity. Upon arrival he was responsive only to painful stimuli. Vital signs were: *T* 96.8°F, pulse 84 bpm, RR 19, BP 155/78 mmHg, O_2 Sat 100% on room air, glucose 127 mg/dL. Pupils were pinpoint but reactive. Neurologic exam was nonfocal. The ECG was notable only for a QRS of 108 ms. Head CT, basic labs and chest X-ray were unremarkable. Urine toxicology showed cannabinoids. A bottle containing a dark green colored powder was found in his pocket which a coworker identified it as Nasvai, a homemade smokeless tobacco. Sodium bicarbonate did not alter the ECG, the patient was treated supportively and returned to baseline in 2 h. He admitted to use of oral Nasvai, had unintentionally swallowed some and had smoked a cigarette simultaneously 1 h prior to arrival. Nasvai is widely available in central Asia and primarily contains tobacco. The composition is variable and may contain slaked lime, dung, diphenhydramine and other substances. It is placed on the oral mucosa for sublingual absorption; users are advised to avoid swallowing it and to avoid simultaneous smoking of cigarettes. The combination of oral buccal absorption, gastrointestinal ingestion, and inhalation in this case highlights the potential for toxicity via several routes of exposure. Typically cigarette smoking results in delivery 1 mg of nicotine into the blood, though peak levels depend on the amount of nicotine which may be variable. Slightly slower absorption occurs with smokeless tobacco, however peak nicotine levels are generally equivalent to inhalational exposure. *Conclusion:* This is the first case report of toxicity from Nasvai, a smokeless tobacco product from central Asia. It also highlights the potential for toxicity from multiple, simultaneous routes of exposure to nicotine.

134. Characterization of Prescription Stimulant Exposures Using RADARS(R) System Poison Center Program Data

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Background: Stimulant prescriptions for the treatment of attention-deficit/hyperactivity disorder have increased in recent years. Consequently, stimulant misuse and abuse is now a recognized problem in all ages. We describe stimulant exposures and associated medical outcomes

as reported to the RADARS System Poison Center (PC) Program and compare to prescription opioid exposures. *Methods:* The PC Program captures weekly acute drug exposure data from 48 of 60 US PCs. These PCs cover 44 states (84% of US population). PCs use a standard electronic system to record calls from the public and the coordinating center performs quality control checks to verify coding accuracy. Stimulant (prescription amphetamine and methylphenidate) and opioid (buprenorphine, fentanyl, hydrocodone, hydromorphone, morphine, oxycodone, oxymorphone, tramadol) exposures from third quarter 2007 through third quarter 2009 were analyzed. *Results:* Thirty four thousand five hundred and forty (17 cases per 100,000 population) stimulant exposures (53% amphetamine; 47% methylphenidate) were reported over the study period. Mean age was 16.5 years (SD 13.5) and 57% were male. Site of ingestion was at own residence in most exposures (91%). The median number of substances ingested was one (range 2–26) while 31% (n = 10,379) involved two or more substances. Of known associated outcomes, 57% were no, minor or moderate effects, 2% (n = 524) were major effects and 0.06% (n = 21) were deaths. 119,475 opioid exposures (59 cases per 100,000 population) were reported over the study period; 5% (n = 5,878) were major effects and 0.5% (n = 572) were deaths. Thirty-two percent of stimulant exposures were intentional, compared with 57% of opioid exposures. Thirty-nine percent of stimulant exposures were therapeutic errors, compared with 22% of opioid exposures. *Conclusion:* Although fewer stimulant exposures were reported and were associated with fewer poor outcomes compared to opioid exposures, stimulant exposures still resulted in a significant number of poor outcomes. In addition, more therapeutic errors occurred with stimulants, reflecting the use of these drugs and associated dosing errors in young children. Our conclusions are limited to cases reported to PCs, which often under represent exposures.

135. Glyburide Overdose from Ingestion of "Valium"

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Background: Glyburide is anecdotally known to be sold on the street as "valium" because of its similar appearance. A 57-year-old male, with a documented history of polysubstance abuse, including valium, was found unresponsive at a rehabilitation facility. Paramedics at the scene recorded a fingerstick glucose of 41 mg/dL. Brief improvement in mental status occurred after administration of one ampule of intravenous dextrose 50% and naloxone. After arrival to the emergency department, the patient was intubated for recredecense of obtundation refractory to repeated naloxone. Because of persistent hypoglycemia, the patient was administered a continuous dextrose infusion. Octreotide and glucagon were also administered. By hospital day #2, the patient's serum glucose levels remained in the normal range without supplemental intravenous glucose and he was extubated with full return of his mental status. *Methods:* Time-of-Flight Liquid Chromatography/Mass Spectroscopy (TOF LC/MS) was used to analyze the patient's serum. *Results:* TOF LC/MS qualitatively confirmed the presence of glyburide in the patient's serum. *Conclusions:* This is the first case of a glyburide overdose from ingestion of "valium" purchased on the street that has been confirmed by laboratory testing. Review of pill pictures of both drugs demonstrates the similarities of glyburide and diazepam pills. Clinicians need to remain aware of the possibility of sulfonylurea toxicity in the patient who presents with altered mental status and hypoglycemia after an overdose of "valium."

136. Cardiac Arrest due to MDMA/MDEA Intoxicat[ion: Serum, Urine, and Drug Specimen Analysis

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Background: We report a case of cardiac arrest after phenylethylamine ingestion with quantitative levels of MDMA/MDEA in serum, urine and pill specimens. *Case Report:* A previously healthy 15-year-old male suffered a ventricular fibrillation arrest shortly after smoking marijuana. Bystander CPR was immediately performed by his brother and EMS successfully defibrillated him on the scene. Upon arrival, he was tachycardic and hypertensive to 190/120 mmHg with inferolateral ST elevations. Emergent cardiac catheterization showed clean coronary arteries. He was intubated and entered into a therapeutic hypothermia protocol. His parents performed a bedroom search and found a green tablet with a puma imprint and two plastic vials with white powdery residue. Half of the tablet contained 2.3 mg MDMA and 438 ng MDEA. A serum specimen obtained about 12 h after ingestion was positive for MDMA (87 ng/mL), MDEA (61 ng/mL) and MDA (18.8 ng/mL). The first vial contained MDMA and trimethoxyamphetamine (TMA). The second vial contained codeine, TMA and trimethoxymethamphetamine; codeine was not found in the patient's serum. Urine from day 3 contained MDMA (3.95 ng/mL), MDEA (4.6 ng/mL) and MDA (12.3 ng/mL). On day 6, the amphetamines were no longer detected in his serum. He was extubated on day 5 and discharged on day 11 neurologically intact. He later described having chest pain radiating to his back, shortness of breath, diaphoresis and seeing "an irregular heart beat through my chest" shortly after ingesting the green pill. *Methods:* The serum, urine and pill samples along with extracts from the tubes were analyzed using Agilent Liquid Chromotaograph(LC)-Time-of-Flight Mass Spectrometer (LC1200-MS/TOF 6230). The chromatograms obtained were analyzed using Agilent's MassHunter Qualitative Analysis software to determine the presence of potential drugs in the samples. For drugs confirmed to have both formula and retention time matches, Agilent's MassHunter Quantitative Analysis software was used to determine their levels. *Conclusion:* Ingestion of MDMA/MDEA resulted in cardiac arrest and ischemic ECG changes without evidence of atherosclerosis, possibly due to transient coronary vasospasm. This is the first published case of premortem MDEA level in an intoxicated patient.

137. Spice Ain't So Nice

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Background: Spice, an incense product, is sold in the US and other countries. It may contain a variety of cannabinoid agonists like JWH 018 and JWH 073 that lack the classic cannabinoid structure and are therefore not controlled by the DEA or recognized as designer drugs. Recently, cases of Spice exposure via smoking have been under DEA, FDA, and CDC review. With the growing interest in the illicit use of Spice, poison centers have identified multiple cases of this emerging drug of abuse. We studied the incidence of Spice exposures in our five-state service region. *Methods:* Using NPDS, we queried for Spice cases using AAPCC Temporary Code #39 from September 2009 to April 2010. Audio review was performed on all cases except one. We used descriptive statistics to analyze the distribution of state, age, gender, clinical effects, and therapies. *Results:* Nine exposures and one information call were identified. Spice exposures were reported in three of our five states and 66.7% of exposures occurred in Colorado. All patients were male, median [min, max] age was 19 [13, 27] years. The most frequent clinical effect was tachycardia followed by the suggestion of anticholinergic toxidrome as described by the treating physician (Table).

Most frequent clinical effects

Symptom	*N* (%)
Tachycardia	6 (66.7)
Anticholinergic toxidrome	4 (44.4)
Agitation/irritability	4 (44.4)
Tremor	4 (44.4)
Confusion	3 (33.3)
Pallor	2 (22.2)
Mydriasis	2 (22.2)
Hypertension	2 (22.2)

Seven (77.8%) patients received medical evaluation (six were in the hospital ED at the time of the call and one was referred by our center). Eight out of nine patients admitted to using Spice only. All symptoms resolved with symptomatic and supportive care including benzodiazepine administration (n = 3). Three patients had urine drug screens that were negative for THC. *Conclusion:* Spice appears to be an emerging public health problem among young males. The clinical picture is similar to THC exposure with some anticholinergic clinical effects. The incense's availability and legal status make it easy for young people to acquire. This may burden health care facilities as most patients in our small sample required medical evaluation. Further characterization is needed with a larger sample size to better understand the toxicity of these THC homologs.

138. Spice: A New "Legal" Herbal Mixture Abused by Young Active Duty Military Personnel

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Background: Spice is a herbal mixture smoked for euphoria. The herbal blends are mixed with synthetic cannabinoids that are undetected on urine drug screens. Spice use has increased in the military because it was considered legal and is not detected on urine drug screens. We describe three cases of Spice use in active duty military personnel. *Case 1:* Nineteen-year-old male presented with paranoia, agitation, and visual hallucinations after smoking the "Space" brand of Spice. He arrived to the emergency department (ED) in restraints, pulse 114, and blood pressure 146/78. He did not have nystagmus or fever. He received lorazepam for agitation. His serum glucose was 197 mg/dL. Head CT, urine drug screen, serum white cell count (WBC), serum creatine kinase (CK) and ethanol (ETOH) levels were unremarkable. He did not have rigidity or fasciculations. Urine TLC was negative. Urine GCMS detected DHEA. *Case 2:* Nineteen-year-old female presented with sedation, amnesia, and mild agitation. She smoked the "Space" brand. Pulse and temperature were normal. Blood pressure was 138/70. She was alert within 3 h of arrival. Her CK, ETOH, and urine drug screen were unremarkable. Her serum WBC was 14 K and glucose 220. She had a mild acidosis that resolved. Urine TLC detected acetaminophen, dextromethorphan, and doxylamine. Urine GCMS detected also detected levorphanol and DHEA. *Case 3:* Twenty-three-year-old male presented with delusions and paranoia. He complained of "monsters on his back." Lorazepam 4 mg was administered. His pulse was 110. His blood pressure and temperature were normal. Serum WBC was 13 K. Urine drug screen, creatinine, ETOH level, and glucose were unremarkable. He did not have an acidosis. His symptoms improved in the ED. He recalled all events. His urine TLC and GCMS were negative. *Discussion:* TLC and GCMS in all three cases excluded ingestants with similar symptoms. All cases were admitted and evaluated by a toxicologist. Mild tachycardia was common. Two cases had hyperglycemia. Two cases had paranoia and hallucinations requiring sedation. *Conclusion:* Spice is a new herbal mixture that is increasingly used in the military. Expected effects are similar to cannabis, but may include more paranoia and hallucinations, and may differ for each brand.

139. A Prescription Drug Abuse Marker for Military Bases – Poison Center Drug Identification Calls

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Background: Prescription opioid use in military members has risen because of increased war injuries. A concern of prescription opioid abuse or misuse has developed, leading to congressional inquiries and military investigations. Military prescription drug abuse studies are limited and no study has used poison center data to evaluate military drug abuse. In civilian studies, telephone calls to PCs requesting identification (ID) of drugs of abuse have been shown to be a drug abuse marker. *Objective:* Our goal was to evaluate PC drugs of abuse identification calls from military bases over an 8 year period. *Methods:* This is a retrospective, observational study of calls to all certified PCs in one state from 2002 to 2009. The five-digit zip codes from the three largest military bases in the state and areas adjacent to the bases were identified (10 total zip codes). Drug ID calls were included for hydrocodone combination tablets (HC), benzodiazepines (BZ). tramadol, propoxyphene, and other acetaminophen combinations (not including hydrocodone). *Results:* There were 9,437 drug ID calls from three military bases. The calls increased 105% over the study period. Among all drugs evaluated, HC calls increased more since 2002 than the other drugs in the study (460%, range 450–800%, $p < 0.03$). It made up the greatest proportion of calls from 2004 to 2009 range (2.8–5.2% of cases), expect for year 2008. The total number of calls and proportion of drug ID calls for HC was statistically greater than the other drugs studied ($p < 0.02$). Since 2002, BZ calls rose 188%, range 106–233%. The proportion of total drug ID calls for BZ was significantly greater than tramadol, propoxyphene, and APAP combinations ($p < 0.05$). *Conclusion:* Poison center calls for hydrocodone drug IDs from military bases were more common and rising faster than any other abused drugs. Since drug IDs may be a surrogate of drug abuse, our results suggest hydrocodone abuse may be rising in the military.

140. Drug Identification Calls for Drugs of Abuse: Is There a Difference Between Military and Non-Military Counties?

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Background: Congressional leaders and military commanders have raised a concern that prescription opioid abuse may be rising in military communities (active duty, families, retirees). Studies evaluating military prescription drug abuse studies are sparse and no study has used poison center (PC) data to evaluate military drug abuse. In civilian studies, drug identification (ID) calls made to PCs have been shown to be a drug abuse marker. *Objective:* We sought to compare the incidence of PC Drug ID calls from counties with large military bases with the rates of the entire state. *Methods:* This was retrospective, observational study of calls to all certified PCs in one state from 2002 to 2009. We identified counties with the three largest military bases in the state. We obtained the rates of PC drug ID calls for hydrocodone (HC) and other commonly abused prescription drugs (benzodiazepines (BZ), tramadol, propoxyphene, and acetaminophen (APAP) combinations [not including hydrocodone]). *Results:* The three counties had 22,201 drug ID calls and the entire state had 181,704 calls in 2009. All Drug ID calls rose 159% for the state. HC was the most common drug identified in all three military counties. Since 2002, HC drug ID calls rose 260% (range 190–318%) in the military counties. HC drug ID calls increased 339% in the entire state ($p > 0.05$). We corrected these rates for total drug ID calls. Among all drugs evaluated in our study in military counties, HC calls increased more since 2002 than the other abused drugs ($p < 0.03$). BZ calls were stable or decreased, tramadol decreased significantly, and propoxyphene and APAP combinations were unchanged ($p > 0.05$). The state's call patterns were similar ($p > 0.05$). HC made up the greatest proportion of calls from 2002 to 2009, expect for year 2008. The total number of drug ID calls for HC was greater than the other drugs studied ($p < 0.02$). *Conclusion:* Hydrocodone drug ID calls in military counties are common and rose faster than other abused drugs. However, this pattern is similar to the entire state, thus military counties and their communities may not be different from non-military counties. Military counties have a high prevalence of hydrocodone drug ID calls and that may reflect an increase in abuse.

141.

WITHDRAWN

142. Death Initially and Wrongly Attributed to Buprenorphine

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Background: Buprenorphine only overdoses may result in severe respiratory and central nervous system depression but have not been shown conclusively to cause death. *Case report*: A 29-year-old woman with a history of injection drug use, asthma and severe allergies including anaphylaxis, injected herself with one crushed purported buprenorphine tablet purchased from an online pharmacy. She immediately gasped for breath and collapsed on her bed. Her live-in boyfriend administered two puffs of her albuterol inhaler and called 911. EMS found her in cardiac arrest and administered naloxone, epinephrine and performed intubation/CPR. She was pronounced dead in the ED. The victim and boyfriend had extensive knowledge of opioid pharmacology, as they were both post-doctoral fellows in pharmacology actively conducting research on opioid addiction and compulsive behaviors. The boyfriend explained that they routinely purchased tablets on-line from pharmacies located overseas and, that day, used a never-before-opened shipment of #20 tablets of buprenorphine (without naloxone) purchased from a pharmacy based in the Philippines. They had crushed and dissolved one 2 mg tablet of buprenorphine and separated the solution into two syringes, each containing 1 mg buprenorphine in 3 mL of solution, purging the air from the syringes before use. They each intended to use only one of the syringes. No other drugs/ETOH were consumed prior to the injection. *Case discussion*: The police confiscated what remained of the syringe and analysis revealed no buprenorphine. The medical examiner reported hyperinflated lungs with mucus plugs, eosinophilic infiltration and peribronchial hypertrophy. Post mortem comprehensive toxicology screening was positive for naloxone 22 ng/mL only. Heart blood buprenorphine was negative. Heart blood tryptase was markedly elevated at 179 ng/mL (normal value < 10 ng/mL). Elevation of tryptase is useful in confirming the diagnosis of anaphylaxis triggered by medications or agents, especially if they were injected. The cause of death was anaphylactic reaction complicating asthma. The manner of death was accident. *Conclusion*: This case report underscores the importance of thorough investigation and complete autopsy including toxicology in determining the cause and manner of death.

143. Place of Use in Those Presenting with Acute Recreational Drug Toxicity – An International Comparison

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Background: Self-reported use of recreational drugs is higher amongst those who frequent night-time related venues, which include pubs/bars and discos/nightclubs. Additionally, use may occur in the home environment either prior to or after attending a late-night venue. There are cultural differences in the types of night-time venues between different geographical regions. *Methods:* Data was collected on all presentations to the Emergency Department (ED) relating to acute recreational drug toxicity at a large inner-city hospital in London, UK and Palma, Mallorca, Spain from January 1 to December 31, 2009 inclusive. The following data was extracted from the ED notes for each presentation: age; sex; and place of use [home, public place, pub/bar, nightclub, sauna (gay-sex related venue), police custody/prison or other]. Data was compared between the two centres appropriate statistical analyses. *Results:* There were 126 presentations at the Mallorca centre and 602 at the London centre. Individuals were older in Mallorca (33.5 ± 9.5 years) compared to London (30.6 ± 8.1 years), $p = 0.0003$, with a greater proportion of males in London (83.9%) compared to Mallorca (73.0%), $p = 0.004$. There was no difference between London and Mallorca in the proportion of individuals having used the drugs at home (36.8 vs. 34.4%, $p = 0.6$) or in police custody/prison (2.2 vs. 4.4%, $p = 0.28$). However there were significantly more individuals in Mallorca presenting from public places (38.9 vs. 16.2%, $p < 0.0001$) and pubs/bars (16.7 vs. 4.8%, $p = 0.0005$). Conversely, there were more presentations in London relating to drug use in nightclubs (29.8 vs. 3.3%, $p < 0.0001$). There were no presentations in Mallorca from saunas,

whereas 11.4% of presentations in London related to use within this environment (p = 0.0008). *Discussion:* There are differences in place of recreational drug use prior to presentation between the two centres, which may reflect differences in culture between them (e.g. more late-night bars in Mallorca compared to London where there are more discos/nightclubs). An interesting phenomenon shown here is the relatively high prevalence of toxicity associated with drug use in gay sex saunas in London. This information needs to be considered when planning of provision of pre-hospital healthcare services for the management of acute recreational drug toxicity.

144. Cocaine Associated Oculomotor Nerve (CN III) Palsy With Pupil Involvement

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Background: We report a case of acute cocaine-associated unilateral oculomotor nerve (CN III) palsy, with involvement of the pupil in a hypertensive 53-year-old female presenting with double vision, ptosis and mydriasis of the left eye. *Case report:* The patient was hypertensive, alert, orientated, and neurologically normal except for isolated left oculomotor nerve palsy resulting in passive deviation of the eye downward and outward with an ipsilateral dilated, unreactive pupil. Symptoms began the morning after a cocaine binge. CT scan, MRI/MRA and cerebral angiography were negative for infarct or aneurysm. All serum lab tests were unremarkable and negative for other causes of isolated oculomotor nerve palsy. After several days in hospital the pupil paralysis improved but the ptosis remained significant and she was discharged home. Follow-up several weeks later noted continued subjective improvement but persistent double vision and ptosis requiring the patient to wear an eye patch for comfort and to ameliorate the diplopia. Patient consented to be photographed in hospital and at follow-up. *Discussion:* CN III palsies involving the pupil are usually secondary to direct trauma or compression although pupillary involvement in diabetes-associated (ischemic) oculomotor nerve palsy occurs 38% of the time. *Conclusion:* In this patient, cocaine coupled with her uncontrolled hypertension likely caused ischemic oculomotor nerve palsy. We identified only one other case of cocaine-associated oculomotor nerve palsy with involvement of the pupil in the medical literature.

145. Methylphenidate Toxicity from Intravenous Injection of Oral Tablets

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Introduction: Methylphenidate is a central nervous system (CNS) stimulant widely used for the treatment of attention-deficit hyperactivity disorder (ADHD) in both children and adults. Methylphenidate is structurally related to methamphetamine. Intravenous use can cause euphoria, which has led to a long history as a drug of abuse. Serious toxicity can result leading to death. Though methylphenidate abuse is widespread, there are few published case reports of IV toxicity from oral tablets. *Case report:* A 29-year-old male patient with a history of hepatitis C presented to the emergency department (ED) with a chief complaint of chest pain, shortness of breath, and loss of sensation in the extremities. The patient reported that 7–8 h prior to presentation, he crushed 35 methylphenidate 20 mg tablets, suspended the tablets in water, and injected the suspension into an antecubital vein. The tablets were verified by the pharmacist as methylphenidate hydrochloride 20 mg. The patient's affect was extremely agitated and fearful. Initial vital signs included a blood pressure of 147/69 mmHg, pulse 158 beats per minute, 26 respirations per minute, and an oral temperature of 101.2°F. The initial electrocardiogram revealed sinus tachycardia. Reported labs showed a methylphenidate level of 45.5 ng/mL, total creatine kinase 1,483 U/L, creatine kinase-MB 8.8 ng/mL, myoglobin 108 ng/mL and lactic acid 2.8 mmol/L. Ice packs and a cooling blanket were applied, and the patient received lorazepam 2 mg and isotonic fluid resuscitation with reported improvement. The patient was admitted to the intensive care unit for monitoring, treatment and evaluation. He remained hospitalized for 48 h, and was discharged without further complication. *Case discussion:* This patient presented classic signs of methylphenidate toxicity, including rhabdomyolysis. Based on methylphenidate kinetics, a calculated peak plasma level of methylphenidate was estimated to be 1,456–1,878.9 ng/mL. This peak plasma level is approximately 73–93 times the therapeutic plasma level. Supportive therapy and close monitoring aided in this patient's complete recovery. *Conclusion:* Clinicians should be aware of the lethal toxicity associated with methylphenidate abuse. Rapid identification of ingested toxin and aggressive supportive treatment are essential in the recovery of the patient.

146. Relationship of Acetaminophen Psi Parameter and Hepatotoxicity Secondary to Acute Acetaminophen Overdose in Thai Population

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Background: Psi (Greek letter Ψ) – parameter (Ψ), a toxicokinetic parameter that takes the acetaminophen level ([APAP]) and onset of NAC therapy into account and quantifies the pretreatment exposure to supratherapeutic paracetamol level, is proposed and found to be predictive of hepatotoxicity in acute acetaminophen overdose patients treated with intravenous NAC [Ann Emerg Med 2005; 46(3):263–71.]. The purpose of this study is ascertaining the relationship of Ψ to predict hepatotoxicity in Thai population with acute acetaminophen overdose. *Method:* This is a retrospective study of patients who presented to Siriraj Hospital with acute paracetamol overdose during January 2004 to June 2009. The inclusion criteria included [APAP] analyses within 4–24 h post-ingestion, [APAP] above the treatment line of Rumack–Matthew Nomogram and treatment with intravenous NAC. Acetaminophen concentrations that were drawn after 4 h post-ingestion were calculated into the level at 4 h using the 4 h half-life value. Ψ was calculated using the Ψ-calculator provided with original publication. Hepatotoxicity signified AST or ALT levels higher than 1,000 IU/L. Univariate analyses were performed with *t*-test or chi-square test when appropriate. Multivariate analyses were performed with backward stepwise logistic regression. *Result:* One hundred and forty-six patients, aged 13–64 years [mean 24.31 and standard deviation (SD) 8.02], were enrolled. The mean (SD) of [APAP] at 4 h post-ingestion was 312.04 (161.43) mg/L. Mean (SD) of NAC onset was 9.96 (5.68) h. Mean (SD) of Ψ was 2.75 (3.49) (mmol/L × h). Univariate analysis revealed [APAP], onset of NAC therapy and Ψ as statistically significant predictors of hepatotoxicity. From backward stepwise logistic regression of dependent variable, hepatotoxicity, on independent variables [APAP], NAC onset and Ψ, Ψ gave the best predicting model. *Conclusion:* Psi-parameter is a reliable prognostic tool to predict hepatotoxicity secondary to acute acetaminophen overdose treated with intravenous NAC in the Thai population, in addition to the Canadian population in the original work.

147. The Elimination of Medicare Consult Codes and the Impact on Bedside Toxicology Consult Services in the United States as of January 1, 2010

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Background: Medicare Current Procedural Terminology (CPT) billing codes are a list of identifying codes and descriptive terms used for reporting medical services. They are used in conjunction with specific diagnosis codes (International Classification of Disease – ICD) in preparing reimbursement claims for insurers. As of January 1, 2010 Medicare will not reimburse CPT consult codes. Subspecialty services such as bedside toxicology consults have to implement replacement codes in order to receive reimbursement for Medicare patients. *Methods:* In the table below 2009 and 2010 CPT codes are compared in a crosswalk technique. We also compare reimbursement rates and relative value units (RVU) affected by the Medicare changes. *Results:* Move horizontally across rows to compare. Inpatient consult codes (99251-992555) crosswalk to subsequent visit codes (99221-99222) for the first two levels of service and then initial visit codes for the next three levels (99221-99223). The initial admitting service uses a modifier with their code. Outpatient (99241-99245) ED consult codes crosswalk to ED codes (99281-99285). *Conclusions:* It is anticipated that private insurance groups will also eliminate CPT consult

Table for Abstract 147

Inpatient consult codes: 2009					Inpatient replacement codes: 2010			
CPT code	**Key components & time**	**Work RVU**	**Full RVU**	**Medicare Reimb**	**CPT code**	**Key components & time**	**Work RVU**	**Full RVU**	**Medicare Reimb**
99251	PPS/20	1	1.37	48.04	99231	PPS/L/15	0.76	1.08	37.2
99252	EES/40	1.5	2.11	74.55	99232	EEM/25	1.39	1.98	67.04
99253	DDL/55	2.27	3.22	113.4	99221	DDS/L/30	1.92	2.76	92.03
99254	CCM/80	3.29	4.65	164.22	99222	CCM/50	2.61	3.75	125.29
99255	CCH/110	4	5.62	199.96	99223	CCH/70	3.06	5.51	184.44
	ED-outpatient codes-2009					ED-replacement codes-2010			
CPT code	Key components & time	Work RVU	Full RVU	Medicare Reimb	CPT code	Key components & time	Work RVU	Full RVU	Medicare Reimb
99241	PPS/15	0.64	1.35	48.37	99281	PPS	0.45	0.6	20.14
99242	EES/30	1.34	2.54	90.03	99282	EEL	0.88	1.16	39.03
99243	DDL/40	1.88	3.47	123.72	99283	EEM	1.34	1.75	59.53
99244	CCM/60	3.02	5.14	183.11	99284	DDM	2.56	3.27	111.69
99245	CCH/80	3.77	6.28	224.72	99285	CCH	3.8	4.78	164.92

codes and subspecialty services that perform primarily consult services will need to adapt to these changes. Additionally, reimbursement rates decreased with changes in Medicare coding by a mean of 17% for inpatient consults and 47% for ED-outpatient consults.

148. Wikipedia Information for Toxicologic Emergencies: How Reliable Is It?

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Background: Online resources such as wikis have become increasingly popular sources of information. Wikis allow users to enter and edit content. Wikipedia is an unrestricted general information wiki. Wikipedia is often among top results returned from web search engines. Lay public and healthcare professionals may utilize this resource for toxicologic information. No current literature compares the information in Wikipedia with traditional subscription toxicology references and no literature evaluating how often toxicologic information in Wikipedia is updated. *Methods:* NPDS 2007 data was used to determine the medications involved in exposures and fatalities. Twenty-two specific medications most commonly involved in exposures were selected for review. Toxicologic information was divided into four categories: Mechanism of Toxicity, Toxic Dose, Symptoms of Toxicity, and Treatment. A grading scale was developed that would allow objective grading by each investigator. Content was compared between Wikipedia and Poisindex on a single date in 2009 and repeated 12 months later in 2010 to check for updates or corrections. Poisindex was selected as a common professionally updated subscription reference utilized by healthcare professionals. The purpose was to compare the wiki content with a traditional database, not to determine appropriateness of Poisindex information. Each substance selected was reviewed by both authors to reach agreement. Only information in Poisindex that was directly related to the substance was included for comparison. *Results:* Wikipedia did not provide significant toxicologic information. Only 1 of 22 substances had information in all four categories. There was one instance of incorrect information found in Wikipedia (phenytoin to treat refractory dysrhythmias due to amitriptyline toxicity). No entries mentioned Poison Centers or provided the national 800 number. Digoxin was the only entry that had been changed in 12 months. Additional symptoms of toxicity and a recommendation not to administer Digoxin to patients with heartrate <60 bpm were added. *Conclusion:* Wikipedia contains limited toxicologic information and in one case had erroneous information. Wikipedia was not significantly updated or corrected during a 12 month period.

149. Transplant of Multiple Organs After Suicide by Acetaminophen Overdose and Self-Inflicted Gunshot Wound

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Background: There are a shortage of organs available for transplant, and therefore many transplant centers are including poison related deaths. Few reports of organ donation after acetaminophen overdose exist. We describe the case of a 17-year-old male who had a simultaneous gunshot wound to the head in association with an acetaminophen overdose. *Case report:* A 17-year-old male was brought to the emergency department after a self inflicted gunshot wound to the head. His mother noted he had access to a recently purchased bottle of acetaminophen, which was missing 20 g. Upon arrival to the hospital, the patient was intubated without medication. He had a systolic blood pressure of 130 mmHg, a pulse of 111 beats per minute, a respiratory rate of 16 via bag assisted respirations and a temperature of 36.5°C. Physical exam showed a single penetrating wound to the right temporal bone. The remainder of his physical exam was consistent with brain death. CT scan of his brain demonstrated a non-survivable head injury. Initial laboratories showed a hemoglobin, 11 g/dL; platelets $218 \times 10^3/mm^3$; sodium 138 mEq/L; potassium 2.9 mEq/L; chloride 104 mEq/L; bicarbonate 22 mEq/L; blood urea nitrogen 12 mg/dL; and creatinine 0.96 mg/dL. AST was mildly elevated at 50 IU/L and ALT was normal at 20 IU/L. INR was 1.26. Acetaminophen level drawn at arrival was 134 mg/L with unknown time of ingestion. *N*-acetylcysteine (NAC) therapy was initiated. Institutional policy for pediatric brain deaths required two exams on different days. Family expressed their interest in organ donation. Over the next 2 days his acetaminophen level declined to <10 mg/L. His AST and ALT never significantly increased. On day 2 organs were recovered and transplanted into six different recipients. The heart, lung, pancreas, liver and both kidneys were functioning well at 6 months. *Discussion:* Limited information exits on organ donation after acetaminophen ingestion. The patient's transaminases failed to change over the first 24 h. Surrogate markers such as acetaminophen half-lives were utilized to assess the risk of the donor organs while balancing optimal time of organ procurement without jeopardizing the other organs. Further prognostic testing needs investigation.

150. Ultrasound Visualization of Ingested Tablets in Human Volunteers

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Background: Currently, no reliable technique exists to visualize tablets in the stomach following acute ingestions. X-rays and CT scans do not show many types of medications. In addition, both modalities involve radiation exposure. Ultrasound (US) can be performed at bedside and does not emit radiation. We performed a study to evaluate the ability of US to visualize ingested tablets in human volunteers. *Methods:* Two emergency physicians (EM) with US experience were blinded to subjects. Fasted volunteer subjects over 18 y/o were randomly assigned to either: 1) ingested tablet group with 500 mL water (4 OTC APAP, 2 MVI, 4 OTC ibuprofen) or 2) 500 mL water only. Both physicians used the same US machine at different times with a 1.5–4 MHz transducer. Tablet presence or not was recorded. Neither physician knew the other's interpretation. Video images were also stored for later review. Descriptive statistics used for demographics and Cohen's Kappa analysis for inter observer agreement. *Results:* Fifteen subjects, 12 male and 3 female, participated with mean age 35.5 y/o (21–53) and mean weight 75.6 kg (54.6–97.7). Nine randomized to ingest tablets and six to ingest water only. One physician was correct in 14/15 subjects (93%), while the other was correct in 9/15 (40%). Kappa –0.25 failed to show agreement between two EM physicians. *Conclusions:* The ability to visualize ingested medications may be of clinical benefit in certain acute poisonings. A previous *in vitro* US model was able to evaluate tablets however we were unable to consistently have both EM physicians correctly identify ingested tablets. We suspect this is from the presence of gas in the stomach in volunteers. Interestingly, one EM physician was able to correctly identify all but one subject. Our results suggest that US may be useful in detecting ingested medications in the stomach.

151. Use of Daily Plasma Insulin Levels to Manage Insulin Overdose

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Introduction: Intentional insulin overdose is rarely encountered; however, hypoglycemia can be unpredictable and thus difficult to manage. Recently, the ability to readily obtain plasma insulin levels on a daily basis has been developed. We present a case of a significant insulin overdose that was managed using daily plasma insulin levels. *Case report:* A 39-year-old male with poorly controlled diabetes mellitus presented to the ED via EMS following an attempted suicide by insulin overdose. In an attempted suicide, he injected 800 units of insulin lispro and 3,800 units of insulin glargine subcutaneously over several parts of his abdomen. The patient was conscious upon arrival to emergency department. Vitals were within normal range. The abdominal exam in particular was non-focal and showed no evidence of hematomas. He was awake, alert, conversant, tearful and without any focal deficits. An infusion of dextrose 10% was begun at 100 mL/h with hourly blood glucose (BG) checks. The patient was transferred to the ICU where his BG began to lower between 50 and 80 mg/dL and the rate of dextrose 10% was increased to 200 mL/h where it was maintained for the next 48 h. The initial plasma insulin level was found to be 3,712.6 uU/mL (reference range 2.6–31.1 uU/mL). At 10 h, this had decreased to 1,582.1 uU/mL. On five occasions, supplemental dextrose was needed for BG below 70 mg/dL. Thirty-four hours following admission, the plasma insulin level was 724.8 uU/mL. Fifty-eight hours following admission the plasma insulin level was 321.2 uU/mL and the dextrose 10% infusion was changed to dextrose 5% solution at 200 mL/h. The plasma insulin levels continued to fall daily with levels of 112.7 uU/mL at 80 h and 30.4 uU/mL at 108 h. He was transferred to an inpatient psychiatric facility 109 h after initial presentation. *Discussion:* Following daily plasma insulin levels and adjusting treatment on a daily basis in terms of basal glucose infusions provides fewer opportunities for episodic hypoglycemia. Furthermore, it was easier to predict daily BG requirements and eventual medical clearance based on the plasma insulin levels.

152. Toxic Deaths by DNR?

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Background: DNR (*Do Not Resuscitate*) orders become complicated in the overdose setting. This series reports controversial DNR statuses in the context of poisonings. *Case series:* 1) A 66-year-old DNR male presented with an acetaminophen (APAP) overdose (OD) (219 mcg/mL). IV NAC was administered however he expired of a respiratory arrest (without intubation). 2) An 89-year-old female presented >24 h after an APAP OD (88 mcg/mL). She became hepatotoxic with an INR of 3.6 but had a normal pH. Pressors successfully reversed hypotension but she wasn't intubated in light of a family decision to make her DNR on day 2. She expired that night. 3) A 60-year-old female ingested 40 naproxen & unknown amounts of metoprolol and amlodipine at noon. She was intubated & was hypotensive (SBP 66 mmHg) which responded to saline & dopamine infusions. At 0700 the next day, she had a SBP of 90 mmHg. Her course was complicated by a pH of 7.13 [ethylene glycol (EG), methanol, & salicylates undetectable]. A naproxen level was 660 mcg/mL (30–90). At 1,510 support was withdrawn & hemodialysis (HD) withheld after her husband made her DNR. She expired at 1,654. 4) An 89-year-old male presented after an APAP OD (257 mcg/mL). Because the family "refused all treatment," his physician called the PC to ask the effect of discontinuing NAC. The patient became hypotensive & hypoxic, but in light of an existing DNR status, he expired without attempts at resuscitation. 5) A 54-year-old female presented with EtOH withdrawal. She had a pH of 7.26, lactate 7.2 mmol/L, & HCO_3 12.4 mEq/L. The PC was contacted 2 days later (pH 6.91, HCO_3 was <10 mEq/L) & HD was recommended (plus EG & methanol levels). The family refused in light of making her DNR and she expired that evening. 6) A 75-year-old male with an initial pH of 6.9 & EG level of 44.8 mg/dL was intubated. HD was done & a follow up EG was 11 mg/dL. On hospital day 2, HD was initiated for renal insufficiency but discontinued after the family made the patient DNR. He expired later that evening. *Discussion:* Applying existing DNR statuses or advocating for new DNR orders in poisoned patients presents ethical dilemmas. A DNR wish in such patients has proven to be controversial. *Conclusion:* We report six cases of DNR orders related to poisoned patients which highlights the challenge & debate concerning an important topic.

153. Which *N*-acetylcysteine Protocol is Associated with Better Outcomes?

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Background: The three *N*-acetylcysteine (N-AC) protocols in widest use differ with regards to route (iv vs. po), dosing intensity (300 vs. 490 mg/kg during the first 24 h) and pattern (continuous vs. q4 h dosing). It remains unclear whether any of these differences affect efficacy. *Methods:* Using a large, structured medical records review of patients hospitalized for APAP poisoning in 34 Canadian hospitals from 1980 to 2005, we studied the association between initial N-AC protocol administered and peak INR, classified as ≤2, 2–4 and >4. Logistic regression was used to model coagulopathy with adjustment for age, alcoholism, and ethanol coingestion. We also corrected for overdose severity at baseline using the serum APAP multiplied by AST or ALT at the time of N-AC initiation, a predictor relatively independent of time or duration of ingestion. Subjects were classified based on the first N-AC protocol initiated (20 h IV, 72 h PO, 48 h IV) even if the protocol was extended, abbreviated, or altered. *Results:* Of 11,987 hospitalizations, 4,075 were treated with N-AC and had sufficient laboratory data to model outcomes (peak INR >4 in 177, and 2–4 in 247 cases). There was a mild imbalance between groups in favour of the 72 h PO group, which had slightly younger patients and lower APAP × AT risk scores. After adjustment, the more dose intensive but intermittent protocols were associated with developing more severe coagulopathy, with the following cumulative odds ratios [95% CI]: 72 h PO 2.7 [1.4, 5.1]; 48 h IV 2.9 [1.5, 5.6] when compared with the 20 h IV group. The model fit was satisfactory (AUC 0.86), and the findings were similar using generalized logistic regression without assuming proportional odds. *Conclusions:* Initiating the 20 h IV protocol was associated with lower peak INR among all overdose types. While we cannot preclude confounding by severity, it appears unlikely that higher risk patients were systematically started on the higher dose protocols. Continuous rather than intermittent N-AC dosing may also account for the difference. These findings provide some reassurance to clinicians who continue to use the 150 mg/kg/day dosing of the terminal phase of the 20 h IV protocol, even for late presenting and chronic overdoses.

154. Acetaminophen-Cysteine (APAP-CYS) Protein Adducts Can Be Detected After Repeated Supratherapeutic Ingestion Of Acetaminophen (APAP) Even In The Absence of Hepatotoxicity

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Background: Detection of APAP-CYS protein adducts have been reported following overdose as well as following ingestion of labeled doses of APAP (≤4 g/day). There are limited data on APAP-CYS protein adducts following repeated supratherapeutic ingestion (RSTI), >4 g/day, of APAP. *Methods:* In this IRB-approved cohort study using a structured history we prospectively interviewed patients in a chronic pain management clinic regarding the details of their APAP consumption. To be included patients had to report ingesting >4/day of APAP for at least 14 consecutive days prior to presentation. Subjects provided informed consent and blood was drawn for testing (see Table). APAP-CYS protein adducts were measured using GC/MS. *Results:* Eight of nine (88%) subjects enrolled had detectable APAP-CYS protein adducts. However, none of the subjects had clinical or laboratory evidence of hepatotoxicity. *Conclusions:* APAP-CYS protein adducts can be detected following RSTI of APAP. In our study APAP-CYS protein adduct values from asymptomatic patients without evidence of liver injury were similar to APAP-CYS protein adduct values previously reported from patients with suspected APAP-induced hepatotoxicity. APAP-CYS protein adducts are not specific markers for APAP-induced hepatotoxicity. There appears to be overlap of APAP-CYS protein adduct values following overdose (acute and RSTI) and ingestion of labelled doses of APAP.

Table for Abstract 154

Subject	APAP dose in (g/day)	APAP serum (mcg/mL)	AST (IU/L)	ALT (IU/L)	APAP-CYS (ng/mL)
1	4.225	<1	23	43	0.218
2	5–7	4.9	20	39	0.230
3	8.65	<1	19	34	0.030
4	8	<1	13	34	0.047
5	5.95–7.95	19.1	17	31	0.062
6	5.5–9.1	<1	15	51	<LOQ
7	5.85	26.5	15	31	0.401
8	4–4.5	30.2	40	61	0.818
9	4.5	<1	17	35	0.025

LOQ, Limit of quantification.

155. Revisiting Flumazenil Use Among Poisoned Patients

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Background: The safety of flumazenil for use in poisoned patients has been controversial. Concerns about precipitating seizures have limited its use. *Objective:* To determine the incidence of adverse events, specifically seizures, among a poison center population administered flumazenil. *Methods:* The California Poison Control System database was retrospectively searched from 2000 to 2009 for all cases involving flumazenil use. Data collected included: patient age and sex, adverse reactions (defined as tremor, agitation, seizure or death), substances ingested, and mental status (unresponsive, drowsy, or alert) before and after flumazenil. Two toxicologists determined if the ingested substances were pro-convulsive. *Results:* One thousand one hundred and sixty patients were identified. One hundred and twenty-three were excluded due to miscoding or missing data. Data for 1,037 patients were analyzed. Mean patient age was 39 years (range 3 months–92 years). Fifty-six patients (5.4%) had an adverse event including: tremors (n = 4, 0.04%), agitation (n = 38, 3.7%), and seizures (n = 14, 1.4%). One patient died after ingestion of propoxyphene-APAP and diazepam and subsequent development of intractable seizures. Three seizures occurred in patients who had ingested benzodiazepines without concomitant ingestion of pro-convulsant drugs (1 patient < 6 years of age, 2 patients > 18 years of age). Three hundred and eighteen patients ingested a pro-convulsant drug. Three hundred and ten of these did not have a seizure while eight did. Development of seizures was significantly increased with the ingestion of pro-convulsant drugs (OR 3.01, 95%CI 1.03–8.74). Four hundred and twenty-four (41%) of the patients who received flumazenil had an improvement in their mental status (improved from unresponsive or drowsy to alert). Of the 1,037 patients, 71 of these were <6 years of age and 1 of these had a seizure. Sixty-two patients were >6 years and <18 years. One of these developed agitation and none developed seizures. *Conclusion:* Flumazenil administration among a poison center population resulted in improved mental status in >40% of patients while resulting in few, although concerning, adverse effects. Use of flumazenil in patients who had ingested a pro-convulsant drug was associated with a three-fold increased incidence of seizures, and flumazenil administration in this population is cautioned.

156. Incomplete Recovery of Cognitive Functions in Patients Discharged Following Sedative Drug Overdose

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Background: Overdose with sedative drugs accounts for the majority of deliberate self poisonings. In Australia, the majority of these patients are discharged from hospitals within the first 24 h following overdose. There is no evidence on the cognitive status of these patients even though residual impairment may potentially affect their daily functioning. The objective of this study was to examine whether sedative drug overdose is associated with cognitive impairment which is still evident at the time of discharge. *Methods:* Seventy-four patients with sedative drug overdoses (benzodiazepines, opioids or antipsychotics) and 43 with non-sedative overdoses (SSRIs, SNRIs or paracetamol) were assessed on discharge from hospital on a variety of cognitive domains underlying daily activities: executive functions (trail-making B and Stockings of Cambridge task), decision-making and impulsivity (information sampling task), working memory (letter-number sequencing), attention and psychomotor functions (trail-making A, reaction time). *Results:* The time between overdose and testing, prevalence of cognitively impairing psychiatric illnesses, premorbid IQ and years of education were similar in the two groups, but the Non-sedative Group was younger. Outcome measures of the two groups were compared in multiple linear regression models adjusting for these potential confounders. The Sedative Group had poor executive functions and was more impulsive in decision-making. Drug group significantly interacted with age in predicting measures of psychomotor speed and working memory, indicating that sedative drugs may affect these functions in older adults but not in the young. The presence of a cognitively impairing psychiatric illness and younger age also emerged as significant predictors of executive impairment and impulsivity, respectively. *Conclusions:* Patients with sedative drug overdose are likely to be impaired in multiple cognitive domains important for daily functioning, even after being declared clinically recovered. These effects are very likely to wear off eventually; however, it remains to be investigated whether the residual cognitive impairment adversely affects their daily functions (e.g. driving) in the immediate post-discharge period.

157. Therapeutic Errors Detected During Safety Surveillance of Over-the-Counter (OTC) Cough and Cold Medications in Children

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Background: Concerns have arisen regarding the safety of OTC cough/cold medication use in children. An ongoing multi-system surveillance model was developed to monitor adverse events (AE) associated with cough/cold drugs. *Methods:* Cases were identified from five sources: NPDS, FDA/AERS, English medical

literature, news/media reports and manufacturer internal safety reports. Case inclusion criteria: age <12 years, exposure to ≥1 cough/cold ingredient, ≥1 AE which occurred in the US. The Pediatric Cough/Cold Medication Safety Surveillance Team met quarterly to determine causal relationship of each AE to each reported ingredient, to estimate dose and therapeutic intent, and to identify contributing factors. Analysis started in 3Q08 when all detection systems were active. *Results:* The Team reviewed 879 cases with event dates of 3Q08–4Q09. A total of 711 (81%) cases were determined as at least potentially related to a cough/cold ingredient: 707 non-fatal and 4 fatal (2 deaths in 3Q08, 1 in 4Q08 and 1 in 1Q09). 48% of children were age 2 to <4 years. While the majority of related cases were accidental unsupervised ingestions (66%), 146 (21%) of related cases involved therapeutic intent (drug administered to treat an illness). Of the therapeutic intent cases, 51% were estimated at supratherapeutic dose, 41% therapeutic dose and 8% unknown dose. Most adverse events were not serious and none resulted in death. Most common reported root causes for therapeutic intent exposure were wrong dose administered, exposure to combination products and exposure to multiple cough/cold products. *Conclusions:* Surveillance of AEs associated with cough/cold ingredient exposures in children indicates 1 in 10 AE reports involve therapeutic error. This suggests that interventions targeting prevention of unintentional overdose may be effective in reducing preventable dosing errors involving OTC cough/cold products.

158. Integrating Poison Center Operations to Facilitate a Statewide H1N1 Flu Hotline

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Background: The FL Department of Health, Office of Emergency Operations (FDOH-EO) requested FPICN's assistance in providing H1N1 vaccine information to healthcare professionals through a dedicated statewide H1N1 hotline. Subsequently, FDOH-EO tasked FPCIN with managing all public and health professional calls reporting vaccine adverse effects (ADE). *Methods:* FDOH-EO outsourced the hotline to a commercial vendor that handled calls from the lay public. Health professional callers seeking vaccine information selected a hotline option that routed the call to FPICN and directed the questions to ancillary non-SPI staff. A DOH approved script was used to answer these queries from health professionals. Questions not found in the script were triaged to PCC administrative staff. FPICN's Call Tracking System was updated with new fields, codes and reports to track and analyze questions from the hotline. Once the H1N1 vaccine was released, FPICN began triaging and managing all ADEs arising from vaccine administration through a new public hotline option. These public and health professional calls were directed to, and managed by regular SPI staff. FPICN then provided data access and information for state and county health department (CHD) VAERS reporting efforts. FDOH-EO was able to log into FPICNs web-based reporting/VAERS module, run reports and forward ADE's by county to the CHDs daily. CHDs had access to view their own ADE cases with full access to FPICN case records, allowing follow-up and appropriate VAERS reporting. FPICN generated GIS maps (total call and ADE) for weekly reports to the State. *Results:* FPICN handled 1,729 questions from health professionals and managed/reported 425 vaccine ADEs in a 6 month period. *Discussion:* The integration of the FDOH-EO and FPICN operations allowed for effective and efficient management of the State's H1N1 flu hotline. There was no apparent impact on the FPICNs ability to handle normal poison calls. *Conclusion:* Poison centers have abilities that integrate into public health operations to provide effective and efficient utilization of statewide resources during a statewide public health event.

159. Building Advocacy Support Through Technology

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Background: The Poison Center needed to engage and maintain support and build advocacy with the general public and healthcare professionals that use the services of the poison center to sustain its funding stream when the state legislators/governor made significant cuts in the state funding. *Methods:* The Poison Center used a strategic integration of traditional communication tools with emerging technology which included blogging, Facebook, econtacting, and most significantly, an online tool that generates instant, customized messaging to key stakeholders (federal and state elected officials). All other communication methods helped mobilize our advocacy efforts and directed supporters to take action using the online tool (CapWiz). Constituents simply needed to enter their email contact information, voting district, and home address for verification, to initiate a call to action letter. Each letter was e-mailed to both the elected state legislator and the governor requesting reinstatement of funding for our Poison Center. The letter identified the value of the Poison Center to taxpayers making note of the history, quality of service, and the savings generated by callers using the Poison Center. The effort was originally executed to stop further reductions on the FY2010 budget and has been continued to sustain funding for the FY2011 budget. *Results:* In just over 10 weeks, more than 2,000 Fans joined our Facebook page; more than 1,000 weekly readers see our information blog; and most significantly, over 2,500 total letters to date have been electronically sent to the desks of state legislators urging them to maintain the funding for the Poison Center. This exceeds by 200% the number of hand-written/mailed letters mailed by our support groups. The use of multiple communication tools built an army of energetic advocates who generated a 50% increase in the number of online responses sent in any previous year. *Conclusion:* The use of technology to educate and bring the force of an advocate movement to benefit a cause increased the likelihood that positive results will occur. Based on previous and continued use of these tools along with our approach to rally our advocates in an on-going manner, our Poison Center has been able to sustain its funding for the current year, and is garnering active support for the next fiscal year budget vote.

160. My Baby Drank Bleach LOL:) NF:(WCUTM??

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Background: The telephone has been the mainstay method of contact for poison centers. Advances in technology now provide us with a myriad of methods to access information and stay in "real-time" contact. Text messaging is one method that has exploded in poluparity. As poison centers seek new avenues to communicate we wanted to determine if text messaging was a viable way to interact with people requesting assistance. *Methods:* We compared the time required to manage an initial call using two seperate call scenarios by telephone and then by text messaging utilizing smart phones over a 3G network. The first scenario involved a parent calling in reference to a child who had ingested a silica gel pack. Three seperate calls to three different specialits in poison information in our center were made on three different days. The same scenario was repeated in the same manner using smart telephones and text messaging. A second, slightly more complicated case was also used for comparison. In the second scenario a parent was calling to inquire about a child who was found with an open bottle of a combination cough/cold medication. The same methods were used to compare average management time of the initial call by telephone and by text messaging. *Results:* In the first scenario involving a silica gel pack the average time to manage the case by telephone was 3 min and 48 s. The average time to manage the case by text messaging was 11 min and 16 s. For the second scenario involving the cold medication the average management time by telephone was 5 min and 59 s. The average time to manage the second scenario by text messaging was 33 min and 2 s. *Conclusion:* There are times during natural disasters and other situations when telephone communications, both landline and cellular, are not functional but text messaging is still possible. Poison Centers should be prepared to communicate by text message during those times. Utilizing text messaging on a daily basis will require an increase in manpower to accommodate the tremendous increase in time required to manage calls by this method.

161. Development of a Poison Center Based European Union Alerting System for Deliberate Chemical Release Detection

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Background: Episodic health events may be due to isolated illnesses or part of a larger incident involving accidental or deliberate chemical release. Poison centers (PCs) receive information first hand involving both human and animal exposure data on suspected and confirmed poisonings. To date no standardized alerting system was available to communicate information on chemical health threats throughout the European Union (EU). In Europe, the European Commission (EC) has partially funded a consortium of six EU PCs (in six countries) to develop an Alerting System for the detection of chemical Health Threats (ASHT). The project developed from the Rapid Alert System for CHEMical health threats (RAS-CHEM). *Methods:* RAS-CHEM, a web-based system, has evolved over the last 30 months. RAS-CHEM is able to collect and analyze 19 data and free text fields, enabling EU PCs and other users to share information such as time, location, chemical substance, clinical effects (CEs) and event alert level. *Results:* RAS-CHEM was evaluated by entering 37 historical and simulated events from 14 countries: scenarios (n = 29) and historical mass intoxications (n = 8) that included the Bhopal release, the Halabdja Kurd attacks in Iraq and the Tokyo subway sarin attacks. The chemical classes included: gaseous (n = 10), liquid (n = 9), solid (n = 4), radioactive material (n = 9) and unknown (n = 5). Symptoms associated with these events included: respiratory (n = 13), neurological (n = 6), gastrointestinal (n = 4), local effects (n = 3) and miscellaneous (n = 11). The alert level was "for information" (n = 21), "urgent" (n = 6) and "very urgent" (n = 10). *Conclusion:* Testing demonstrated that PC case data can be entered into RAS-CHEM and shared with a variety of users across the EU to aid the detection, management and response to potential chemical public health threats. CEs can be readily categorized and events ranked by public health threat. RAS-CHEM has been specifically designed to be integrated into other EU Rapid Alert Systems [i.e. rapid alert system for dangerous consumer products (RAPEX)] and other international systems. The further development of RAS-CHEM has demonstrated the importance of PCs, and that they can play a key role as sentinels for the detection of chemical health threats.

162. Reduction over Time in RADARS(R) System Poison Center Opioid Abuse/Misuse Rates Associated with Prescription Monitoring Programs

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Background: Most states have implemented Prescription Monitoring Programs (PMPs) in an attempt to curb

prescription drug abuse and diversion; however assessment of possible impact is only beginning. PMPs are statewide databases, containing patient-level prescription data on select drugs, intended for clinicians or other officials to use in identifying patients or providers engaging in abuse related illegal activities. Long acting opioids (which include extended release drugs) are preferred among prescription drug abusers, and PMPs' impact on this type of abuse is of special interest. This analysis evaluated the association between PMPs and abuse and misuse rates over time for immediate release (IRO) versus long acting (LAO) formulations. *Methods:* Data (2003–2009) are from the RADARS® System Poison Center Program (PC) which collects quality reviewed intentional exposure (IE) events from participating US poison centers. PC IEs are considered surrogates of abuse and misuse. Formulations of oxycodone, fentanyl, hydrocodone, hydromorphone, morphine, and methadone were selected and summarized according to whether they were LAO or IRO. Information on states' PMPs was compiled using public documents. Unique recipient of dispensed drug (URDD) data were used as a measure for drug availability in calculating IE rates. Repeated measures negative binomial regression was applied to predict states' intentional exposure URDD rates. PMP presence was modeled as a time varying covariate for each state, and interactions of time, PMP status and LAO drug type were examined. *Results:* Both IRO and LAO results support that PMPs have an impact on IE rates over time. Model results display when states do not have a PMP in place, state IE rates increase on average 0.8% per quarter, where as rates decrease 1.2% ($p = 0.0004$) per quarter in those states with a PMP in place. However, results did not support that PMPs differentially influence LAO IE rates compared to IRO IE rates. *Conclusions:* PC observational data offer preliminary support that PMPs are effective, but do not support a difference in impact across long acting and immediate release opioid IE rates.

163. Development of a Poison Center Surveillance Definition for Ionizing Radiation Injury

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Background: We sought to objectively develop Poison Center (PC) surveillance definitions for acute radiation sickness (ARS) or local radiation injury (LRI) based on clinical effect (CE) coding. *Methods:* Cases of confirmed ARS, LRI and ARS and LRI from International Atomic Energy Association (IAEA) reports and the peer reviewed medical literature were converted to PC cases with National Poison Data System (NPDS) specific coding of CEs. Controls were a random sample ($n = 10{,}000$) of non-ionizing radiation exposures reported over one year to a single PC. Classification and Regression Trees (CART) software was used to objectively determine binary decision trees by partitioning based on case CEs. Additionally, all NPDS cases of possible ionizing radiation exposure from January 1, 2000 to April 10, 2009 were obtained. After excluding inappropriate cases (non-ionizing exposure, multiple exposures, inconsistent CEs), PCs were contacted for further individual case information. The CART decision trees were then tested with all NPDS cases determined to be definitely or possible due to ionizing radiation. *Results:* A total of 67 IAEA and medical literature cases were abstracted and used to produce nine decision trees; three of increasing specificity for each category (ARS, LRI and ARS or LRI). See Table for the sensitivities and specificities of the most specific definitions. The definitions increased in complexity with increasing specificity; e.g. the least specific LRI definition involved a combination of three CEs; the most specific ARS definition involved 15 CEs. Screening 3,223 NPDS cases yielded 17 cases of possible or definite LRI and/or ARS. The sensitivity of the nine decision tree definitions for these cases ranged from 11 to 80% (see Table). *Conclusion:* Based on this preliminary study, PC surveillance for ionizing radiation injury may be possible in NPDS. However, the sensitivity was poor with previously reported NPDS cases possibly because case characteristics or coding made them dissimilar to the better documented, confirmed IAEA and literature cases. Prospective testing is necessary with a sufficiently large population.

164. Coming Soon to a Poison Center Near You!

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Background: Picking up a telephone to call for poison advise is the way business has been conducted for over 50 years. The traditional call center model has worked well for our past three generation of care-takers; however, times are a changing. Ask any parent of a "tween," and they'll tell you (pardon me . . . *IM* you, *text* you, *Tweet* you, or *Facebook* you) that no one calls anymore just to say hello! How are we as a network of pc's addressing these communication opportunities? Our PC decided to take this challenge head on by introducing "Live Chat" to our website and allow patients to securely and safely chat with a SPI in real time. *Methods:* As part of our on-going QA activities, daily Customer Satisfaction surveys are administered to gain invaluable insight as to the services we provide. Monthly, roughly 200 such surveys are completed on topics ranging from how well we performed on the call to how we can improve delivery of our service. From the period March 1–April 1, we added two questions to the survey to find out the following: a) If you needed to contact us again, and the technology was available, which would be your preferred method of contacting us and b) How likely would you be to use that method? *Results:* During the 1 month survey period, 313 patients agreed to participate in the survey, 197 (63%) were completed. When asked which method care-takers preferred using to contact us again, 146 (74%) chose to recall our pc by phoning in their concerns. Surprisingly, over 25% of respondents chose an emerging technology (texting, email, live chat, video chat) and were either VERY LIKELY/LIKELY, 44 (86%) to use that method in the event a new call were to be placed to the center. *Conclusion:* In addition to the traditional "call-in" model which our poison center has relied upon for the past 40 years, we've added the nation's first "Live Chat" option for both health care professionals and the lay public. We believe that this option complements our current way of how people get a hold of us and keeps up within striking distance of emerging technologies and trends. A summary of our Live Chat activities as well as the technology behind it, call types and patient satisfaction will be shared.

165. Tennessee Poison Center Response to TVA Fly Ash Spill

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Background: On December 22, 2008 one of the retaining walls on the fly ash ponds at the Kingston TVA fossil fuel power plants gave way releasing approximately 5 million cubic yards of fly ash into nearby neighborhoods and waterways. An estimated 200 people were living in the area and may have been exposed to the fly ash. The Tennessee Department of Health did a health assessment which demonstrated little to no risk. However, local residents still had many questions and concerns that the health assessment did not answer. A medical toxicology evaluation process was needed for this disaster. *Methods:* TVA contracted with Oak Ridge Associated Universities (ORAU) to develop a medical toxicology evaluation process for the affected residents. ORAU then contracted with the poison center to develop the actual process. Three medical toxicologists through a literature review and consensus process developed an evaluation process to address the need for history, physical exam, and laboratory evaluation that addressed the potential high risk exposures present at the spill site. *Results:* A history and physical form was developed; the history form was published online so patients could download and complete the form prior to evaluation. The physical exam form was used in clinic by the examining medical toxicologist. A chest radiograph and pulmonary function tests were included. Basic laboratory evaluation included complete blood count, basic metabolic profile, and urinalysis. Screening for components of the fly ash was performed by obtaining urine tests for arsenic, barium, beryllium, thallium, and vanadium and serum/blood tests for aluminum, arsenic, chromium, cobalt, copper, nickel, and selenium. *Conclusions:* Successful partnering with statewide institutions allowed the poison center to develop health screening tools for victims of a regional disaster. These tools will help provide for individualized medical evaluation of victims and allow for group data analysis as a public health assessment.

166. Sudden Bovine Deaths in a Farming Community: State Public Health and a Regional Poison Center Looking for Answers

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Background: Our poison center (PC) has served a key role in state public health with services such as animal bite triage for rabies, surveillance for food poisoning, and an H1N1 hotline. This long standing relationship was put to the test when our PC was called about a cluster of bovine deaths in a farming community. *Case report:* A local farmer discovered 17 of 20 previously healthy cows dead on the same day. Because of a mysterious unlabeled blue bottle found nearby, the farmer thought this was a malicious act. Frustrated by the lack of response from local county agents, he called the state Dept of Agriculture (Ag) and the PC. The farmer reported no change in the source of water, feed or grazing pasture. Later in the week, Ag initially attributed the deaths to Coffee Weed (*Cassia obtusifolia*), an indigenous anthraquinone, found in the cattle pasture. The farmer was unsatisfied with this explanation from Ag. The PC recommended that state officials take samples of water, hay, soil, and wood from the pasture, samples from the remains of an old barn where the cows had access, and necropsy the cows. Routine results from the samples usually take 12 months. The PC and the state veterinarian requested the lab to expedite the testing in order to identify a potential public health emergency. A week later, the results revealed arsenic in the soil near the old barn remains at 3,335 ppm. Plywood samples taken around the old barn also detected arsenic at 14,196 ppm. Water, feed, and hay samples detected no arsenic. Necropsy results from only one cow were available, with a toxic liver arsenic concentration of 3.71 ppm. Arsenic speciation was not performed. *Discussion:* No human arsenic toxicity was reported from this situation. The vet believes the cows were attracted to the barn's soil by the salt in the arsenic

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Surveillance definition	IAEA cases	Sensitivity (%)	Specificity (%)	Sensitivity with NPDS cases (%)
LRI #3	49	85.7	99.4	80
ARS #3	62	95.2	99.9	11
ARS or LRI #3	67	94.0	99.9	12

source. The lab results from the blue bottle have not been reported. *Conclusion:* The PC's relationship with our state public health department and a state Ag veterinarian allowed the appropriate agencies to quickly address this concern, averting a potential public health scare and providing answers to a farmer in need.

167. Correlation Between Availability of Ethylene Glycol/Methanol Levels and Increased Utilization of Medical Services

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Background: A previously published abstract found that 39 and 25% of teaching hospitals polled in the U.S. could measure MEOH and EG levels respectively. In WV, only two hospitals can measure one or both. The purpose of this study was to determine the number of EG and MEOH exposed patients who incurred an increase in utilization of medical services because levels could not be obtained in timely manner. *Methods:* All cases of EG and/or MEOH ingestion reported to the WVPC that were managed in a hospital between January 1, 2003 and December 31, 2009 were reviewed simultaneously by two investigators to ensure 100% agreement. Excluded cases: victim left AMA, substance/route coding error, non-toxic ingestions. Definition of increased utilization of services = patient admission or transfer when admission level later determined to be <20 mg/dL, >1 dose fomepizole, >4 h empiric ethanol, empiric dialysis therapy in absence of renal compromise or pH < 7.30, dialysis > 8 h in absence of renal compromise/visual changes/or pH < 7.30. *Results:* One hundred and ninety-one cases were reviewed; 117 met inclusion criteria. Thirty-nine cases (33.3%) met definition for increased utilization of medical services. Most common reasons: admission 10 cases, transfer 5 cases, transfer & admission 6 cases, >1 dose fomepizole 10 cases, >4 h ethanol & transfer 2 cases, >1 dose fomepizole & transfer 1 case. One asymptomatic patient with a level later determined to be non-toxic received empiric dialysis and, in error, intravenous denatured ethanol. Thirteen patients not meeting the definition for increased utilization of services were discharged from the ED without levels despite a history of a toxic ingestion. *Conclusions:* Increased utilization of medical services occurs when hospitals cannot measure EG/MEOH levels; this occured in 1/3 of cases in this study. Hospitals that cannot measure levels in house need pre-established procedures for obtaining levels in a timely manner.

168. A Tale of Two Gas Leaks: A Teleworking Poison Center Maintains Operation During a Crisis

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Background: Teleworking employees have the ability to work from a remote location without having to travel into a central location. For our regional poison center (PC), teleworking qualified, certified specialists in poison information (SPIs) offer alternative work arrangements to meet various staffing needs. Our teleworking abilities were put to the test during two recent PC evacuations. *Report:* One morning, the PC received word from the building's security director that an evacuation would take place due to an underground gas leak within the building. The PC complied with the evacuation by releasing all non-essential employees to home, sending all SPIs with teleworking privileges home, and directing all non-teleworking SPIs to the hospital's cafeteria to standby until the building reopened. Administration set up a command center within the cafeteria, using our laptops, access to the hospital's secure WiFi, and communicating with other SPIs via email and instant messaging. We allotted 1.5 h for our teleworking SPIs to travel home, while all calls into our PC were divided by area code and diverted to 3 surrounding, cooperating PCs. Quick scheduling changes were made, requesting later teleworking SPIs to start early and an extra teleworker to increase coverage. Once the teleworkers were in place, all calls were transferred back to our PC, where teleworkers were able to answer all incoming poison emergencies remotely for 6 h until we were allowed back into the building. Two months later, a second gas leak required another building evacuation. Similar actions were taken. The time in which calls were transferred to surrounding PCs decreased by 30 min, mainly due to better emergency planning learned from the first evacuation. *Discussion:* Our PC's teleworking capability minimized stress on our neighboring PCs and maintained response to incoming calls. These events proved the ability to have 6 teleworkers at a time of peak call volume. Minor changes to our teleworking policy occurred post-crisis. *Conclusions:* Providing the ability to telework qualified, certified SPIs minimized the impact on a PC's ability to answer incoming calls during a crisis.

169. A PCC Phone System: Who Is Abandoning Who?

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Background: It is optimal for a PCC to look at abandoned calls and the amount of time callers will wait before they abandon, to determine the true level of service being provided. There are no PCC industry abandon rate standards although accreditation criteria is <5%. HRSA monthly reports identify the percentage of "incomplete" calls (ours were consistently <2%) and does not represent what many refer to as "dropped" calls. Our PCC's high telephone abandonment rate (AR), calculated from ACD reports, raised substantial concerns as to the adequacy of our telephone system and/or the PCC not properly managing resources such as personnel and phone lines. In 2005, an initial recorded greeting message was installed to improve efficiency through skill-based routing. This added functionality unexpectedly coincided with an increase in our call AR. The objective of this study was to reduce call AR to <5% of offered calls. *Methods:* An extensive retrospective evaluation of our telephone system and analyzing reports, staffing patterns, and call metrics (wait time, average speed of answer), was conducted over a twelve-month period. Call data reports showed the majority of people hung up within 10–12 s which, according to the vendor, indicated either the greeting was too long or the caller objected to a recorded greeting (vendor noted a 2–4 s peak in abandoned calls indicated the caller most likely had the wrong number or needed 911). *Results:* Changes to our telephone system were made to minimize abandoned calls and improve caller retention. The most dramatic reduction in the AR occurred when we eliminated the recorded greeting. A "live SPI" now answers all calls and our AR immediately decreased from >10 to <3%, and weekly ARs have remained constant. *Conclusion:* Evaluating our current phone system and analyzing call metrics provided an opportunity for engagement with our telephone vendor and redesign of our telephone system to improve performance and achieve a higher service level. One of the many lessons learned from this experience is no matter how impressive telephone technology has become, the callers in our state prefer the *human element* when calling about a perceived poison emergency.

170. Responsibility of Hopsitals/Physicians to Report Body Pakcers: A Survey

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Background: Body packers, or mules, are individuals who ingest large quantities of illegal drugs to transport them. Many seek medical care for abdominal pain, inability to pass packets, side effects from drugs, etc. Recently, questions arose regarding a hospital's/physician's legal responsibility for reporting such individuals. Further, if drug is removed during surgery or naturally expelled, is the physician/hospital legally required to inform police, etc? Importantly, as well is the method to dispose of such contraband. *Methods:* A survey was sent to the Attorney General and Director of each Board of Medical Examiners of every state in the US. Questions focused on the legal responsibility of hospitals/physicians as pertains to the reporting of body packers. *Results:* Surveys (full or partial responses) were received from 28/51 (54.9%) Attorney Generals and 35/68 (51.4%) Board of Medical Examiners. Of Attorney Generals, 6 noted physicians/hospital s are legally obligated to report body packers and 13 noted there was no obligation to report. When not an obligation to report, 3 indicated it would be a HIPAA violation to report and 7 indicated it would not be. When notification of authorities was not required, 10 noted that there is no guidance on how the drugs should be disposed of and no one indicated there was guidance. Of the Board of Medical Examiners, no one noted that the physician/hospital was legally obligated to report body packers and 8 indicated there was no obligation to report. When not an obligation to report, 2 indicated it would be a violation of HIPAA to report it and 1 indicated it would not be. When notification was not required 8 indicated that there is no guidance on how the drugs should be disposed of and no one indicated there was guidance. *Conclusions:* It is important for Attorney Generals/ Board of Medical Examiners to develop laws/guidelines to assist physicians/hospitals in dealing with the legal and regulatory issues that arise in treating body packers.

171. A Scribe by Any Other Name

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Background: Poison Centers are vital to real-time surveillance. In past crises, charting might occur after calls decreased, resulting in reporting delays and demonstrating surge capacity needs. Using a model of Emergency Department scribe use, the Florida Poison Information Center-Tampa developed a program using Real-Time Disease Detection funds. *Methods:* The position was designated "data coordinator," and salary set by similar medical data positions. Health care professional students were recruited. Training included practice charting, transcribing recordings and using the recording software. Data coordinators were specifically prohibited from providing information. Work flow testing led to SPIs opening charts, after which data coordinators listened to recordings, completed fields and drafted notes. SPIs reviewed and pasted permanent notes into charts. SPIs were surveyed for satisfaction. Chart times and quality parameters were assessed. SPI-only charts were compared with SPI/data coordinator charts. SPI- only charts from 2009 were compared with the 2010 sample. Charted times were compared with recorded times. Quality was assessed by completion of mental status, vital signs, age, gender, health care facility and substance. A value of 1 was assigned for documentation and 0 for lack of documentation. Scores were summed, and a percentage score assigned for completeness. *Results:* In 2010, the mean chart initiation time for SPI-only charts was 6.15 min, with a range of 0–60 min. The mean time to chart initiation for SPI/data coordinators was 0.95 min, with a range of 0–7 min. In 2009, the mean SPI chart initiation time was 10 min, with a range of 0–174 min. Mean SPI-only time to note completion was 36 min in 2010 compared to 51 min in 2009. Mean note completion time for SPI/data coordinators was 65 min. SPI data completeness was 83% in 2009 and 89% in 2010. SPIs/data coordinators achieved an 88%. Most SPIs (58%) were satisfied with the program and 72% supported continuation. *Conclusion:* A preliminary assessment showed that using scribes may successfully decrease the time to initiate charts, while improving documentation and SPI satisfaction. They provide an economical, well-trained surge capacity.

172. Trends in Healthcare Utilization of PCC Services

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Background: Technological changes over the last ten years have greatly increased the availability and accessibility of toxicological resources to healthcare professionals (HCPs) for the management of their poisoned patients. Internet medical information sites, including access to MICROMEDEX® (Healthcare series), have grown exponentially. Smartphones may be downloaded with applications that enable healthcare professionals to virtually have toxicology resources at their fingertips. How these changes have affected the utilization of PCC services by HCPs remains unknown. The aim of our study is to examine, retrospectively, changes in healthcare professional utilization of our PCC services. Our null hypothesis: Utilization of PCC services by HCPs has not changed over the last ten years. *Methods:* Toxicall® (Version 4.6.58) data from our archived cases was analyzed from the years 2000 to 2009. Defined data searches for each month of each year included the following parameters: Call type – Exposure, Species – Human, Relationship to Patient – (MD, OHP, RN, RPh), and Medical Outcome – (Moderate, Major, and Death). Defined data searches were also performed for each year and normalized to determine the percentage change in HCP exposure calls involving children less than 5 years of age. ANOVA and Post Hoc testing were utilized to analyze the data adjusted for total human exposure call volume. *Results:* The ANOVA analysis showed a highly significant increase over time; Post Hoc testing showed that the numbers of HCP calls in 2009 was greater than all previous years with the exception of 2008. Results showed significant increases in HCP calls, as well as increases in non- adjusted exposures resulting in more severe medical outcomes; however, calls from HCPs were not found to be of any worse outcome. Changes in HCP calls involving children less than 5 years of age were not found to be significant. *Conclusions:* Despite the availability of alternative sources of information, our PCC continues to be consulted on the increasing number of intentional poisonings presenting for care.

173. Hazard Factor Analysis of US National Poison Center Data 2006–2008

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Background: The vast majority of exposures reported to U.S. poison centers result in no or only minor effects. However, it is extremely important to know which substances are most likely to result in poor outcomes. The purpose of the study is: 1) To identify the top hazardous substances reported to poison centers in the U.S., and 2) To explore trends of reported hazardous substances. *Methods:* Retrospective analysis of the American Association of Poison Control Center's (AAPCC) National Poison Data System (NPDS) published Annual Reports between 2006 and 2008 was performed. Data from each generic substance category listed in Table 22 of the NPDS Reports was analyzed. Hazard factor was used to assess substance hazard/toxicity. Hazard factor was calculated using the following formula: Hazard factor = $[(M + D)/t]$/NF, where M is the count of major effects, D is the count of deaths, and t is the count of single exposures in each generic substance category listed in Table 22. Data were then normalized (NF) from the overall rate of events and deaths during the 3 year study period. Some generic substance category names listed in Table 22 changed over time. Generic substance categories that differed over the study period were reviewed manually for best match. After manual review, those generic substance categories that were not present throughout the study period were excluded. *Results:* There were seven drugs and three non-drugs in the top 10 most hazardous substances. The seven drug categoriess were: neuromuscular blocking agents, isoniazid, GHB and analog/precursor, heroin, methadone, nitroprusside, and other antidepressants. The three non-drug categories were: ethylene glycol, cyclopeptide mushrooms and ibotenic acid mushrooms. Overall, hazard factors of three categories of substances (sedative/hypnotics/antipsychotics; chemicals/ethylene glycol; and stimulants/street drugs) have been increasing over the past three years. More than 55.10% of calls in the study period represented exposures to non-drug substances but non-drug substances accounted for only 26.25% of the major effects and deaths. This proportion remained steady over the 3 year study period. *Conclusions:* Hazard factor analysis of national poison center data provides an effective way of identifying categories of substances that have a high likelihood for poor outcomes.

174. Poison Center Reporting of H1N1 Vaccine Exposures to a State Department of Health

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Background: Prior to its distribution, there was concern about the safety of the H1N1 vaccine. In an attempt to identify as many adverse reactions after H1N1 vaccination as possible, the Texas Department of State Health Services (DSHS) sought to identify H1N1 vaccine exposures reported to the Texas Poison Center Network (TPCN). *Methods:* The DSHS and TPCN met and created a protocol where poison center staff would assign the American Association of Poison Control Centers recommended PoisIndex codes 6540789 or 6540797 to all H1N1 vaccine calls. An automated anomaly alert was created in the National Poison Data System that would report all TPCN human exposures with PoisIndex code 6540789 or 6540797 or Generic code 0077983 (serum, toxoid, vaccine) to TPCN staff. The TPCN staff would review the alerts and report all influenza vaccine exposures to the DSHS Immunization Branch. In addition, a DSHS epidemiologist would periodically review the TPCN database for all records with mention of H1N1, swine flu, or influenza vaccine and report all influenza vaccine exposures to the Immunization Branch. *Results:* During October 2009–January 2010, 24 H1N1 vaccine exposures were reported to the DSHS Immunization Branch. Twenty (83.3%) were identified through the automated alerts while 2 (8.3%) were missed because they were assigned the PoisIndex code 5304095 (symptomatic parenteral exposure) and 2 (8.3%) because they were coded as information calls. Seventeen (70.8%) were managed on site, 5 (20.8%) were already at/en route to a healthcare facility, 1 (4.2%) was referred to a healthcare facility, and 1 (4.2%) the management site was unknown. The medical outcome was 3 (12.5%) no effect, 8 (33.3%) minor effect, 7 (29.2%) not followed but minimal effects possible, 2 (8.3%) unable to follow but potentially toxic, 2 (8.3%) exposure probably not responsible for effects, and 2 (8.3%) unknown. *Discussion:* The TPCN was able to report H1N1 vaccine exposures to the DSHS. Most of the cases were managed on site without serious outcome. *Conclusion:* Poison centers may serve as a useful source for monitoring adverse reactions after vaccination for state health departments.

175. International Comparison of Poisons Information Computer Support Systems: Toxbase and Poisindex

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Introduction: Poisons Centers internationally have separately developed computer support systems to assist their poisons information specialists. These systems are often also used by frontline health professionals. This small study compares two such systems in the context of a US Poisons Centre. *Methods:* A US Poison Center was provided with access to the UK data base TOXBASE (TB), SPIs were asked to use the system and compare it to other methodologies used (Poisindex, PI) when answering inquiries for a five month period of time. A simple on line questionnaire was used to assess the ease of use, comprehensiveness, and alignment with the standard advice protocols used in the US. *Results:* In the period of study 296 different exposure inquiries were compared. These represented a wide range of pharmaceutical and non-pharmaceutical exposure calls. Despite no formal training SPIs found information on the two systems (PI 89.5%, TB 65.5%; a 24% difference, 95% CI: 17.51–30.49), but a higher proportion found TB easy to use (TB 70.6%, PI 51.7%, an 18.9% difference, 95% CI: 11.2–26.6). Unsurprisingly issues such as spelling and brand name caused problems, and some products were missing from TB. Minor differences in clinical management approach were also identified, principally around use of simple treatments (e.g. milk) and intervention dose. *Discussion:* There were far more similarities than differences in the approach to clinical care in the system studied. Presentation on TB was noted to be far simpler and shorter as this system is designed primarily for use by non-experts in primary care and emergency departments. TB primarily fails to meet US requirements by not aligning with NPDS. *Conclusion:* There appears to be significant duplication of effort in producing similar systems across the world and scope for international collaboration. Internationally there appeared more similarities than differences in approaches to advice. This study suggests that international mobility of both information staff and support systems would be readily possible.

176. Determining Triage Guidelines for Pediatric Exposures to Ondansetron

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Introduction: 5-HT_3 receptor antagonists are widely regarded as first-line agents for the treatment and prevention of nausea and vomiting because of efficacy and favorable safety profile. Adverse events after overdoses are typically mild, however, no threshold-dose exists to guide the management of these cases, particularly in large overdoses – even though obtundation, seizures, and serotonin syndrome have been reported at ingestions of 5.6–6.4 mg/kg. *Methods:* A 10-year retrospective chart review of the California Poison Control System was performed indexing ondansetron exposures in children less than 6-years-old. Patient age, sex, weight, 5-HT_3 antagonist, route, maximum exposure, reported symptoms, interventions, and outcome were recorded. The interventions recorded included dilution, single-dose activated charcoal, observation, or no intervention necessary. The outcomes examined were home observation, ED observation, or hospital admission. *Results:* Of the 118 cases identified, we were able to estimate the doses in 71 cases, which ranged from 0.08 to 4.84 mg/kg; two children with co-ingestions were removed from the analysis. Of the remaining 69 cases, only 3 developed symptoms, which were vomiting, diarrhea, and drowsiness; none of whom required hospital evaluation. *Conclusion:* Ingestions of up to 3.5 mg/kg of ondansetron in children less than 6-years-old produced either mild or no symptoms in our study. Ingestions less than this amount may not require hospital evaluation.

177. Changes to Antiviral Medications for Influenza Reported to Poison Centers Associated with Treatment Guidelines

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Background: In January 2006, the US Centers for Disease Control and Prevention (CDC) recommended that physicians stop using adamantanes (amantadine

and rimantadine) for influenza treatment or prophylaxis and use neuraminidase inhibitors (oseltamivir and zanamivir) instead. This investigation examined whether the pattern of adamantane and neuraminidase inhibitor exposures reported to poison centers changed after the CDC treatment recommendation guidelines were released. *Methods:* A retrospective analysis of exposures to six regional poison centers during 2000–2008 was conducted. Cases were all reported adamantane and neuraminidase inhibitor exposures. The distribution of exposures was determined for each year and then the distribution during 2000–2005 was compared to that during 2007–2008. *Results:* Adamantanes decreased from 84.6% of total exposures in 2000 to 17.3% in 2008 while neuraminidase inhibitor exposures increased from 15.4% in 2000 to 82.7% in 2008. Adamantanes accounted for 65.7% of the exposures during 2000–2005 but 17.5% of the exposures during 2007–2008 (rate ratio 0.27, 95% confidence interval 0.18–0.39). *Discussion:* Poison center data demonstrated a decrease in the proportion of antivirals prescribed for influenza represented by adamantanes after 2006. This would suggest that the CDC health alert was effective in disseminating treatment recommendations for influenza to physicians. *Conclusion:* Trends in antiviral medication exposures reported to poison centers is consistent with recommendations released by the CDC on preferred treatment. This study provides evidence of the important role that poison centers may serve in evaluating the utility of public health recommendations in changing healthcare practices.

178. In-House Communication: Importance of Interpersonal Communication in Poison Centers

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Background: Poison Control Center (PCC) personnel face many challenges in communicating with callers, the public, and each other. The purpose of this study was to identify interpersonal communication issues that affect the work environment within PCCs. *Methods*: As part of a larger questionnaire study distributed electronically to members of the AAPCC to assess communication training needs for PCCs, three questions were included to assess interpersonal communication within the work environment: 1) How important is interpersonal communication within your center to a positive work environment? (1–7, not at all to extremely important); 2) How disruptive is interpersonal communication to your work? (1–7 = not at all to extremely disruptive) and 3) What communication issues do you find most disruptive to your work? (free text response). Descriptive and qualitative content analyses were used to identify themes in responses. *Results*: A total of 539 responses were received, from SPIs, directors, medical directors and other PCC staff. Interpersonal communication within the PCC center was rated as extremely important to a positive work environment (mean = 6.37, SD = 1.02; 62.3% rated as "extremely important"). Interpersonal communication was rated as less than moderately disruptive on average with a great deal of variability (mean = 3.33, SD = 1.74). Free-text responses were received from 335 (62%) respondents. Categories were poor interpersonal communication (n = 104; 31%) background noise (n = 96; 29%); poor work procedures (n = 51; 15%); poor management communication (n = 38; 11%); gossip (n = 26; 8%); lack of communication (n = 17; 5%); rude to callers (n = 15; 5%); and non-cooperating professionals (n = 11; 3%). *Conclusion*: Several types of interpersonal communication issues were identified by PCC personnel as disrupting their ability to do their jobs at PCCs. Increasing awareness to interpersonal communication issues that are potentially disruptive and developing strategies to improve the communicative environment may enhance job satisfaction and performance of PCC personnel.

179. Communication Patterns at a Poison Control Center During Surge vs. Non-Surge Periods

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Background: One challenge Specialists in Poison Information (SPIs) face is to maintain effective communication during stressful circumstances – such as periods of high call volume. Surge conditions may evoke dropped calls, longer wait times, errors in triage, and evaluation or recommendations, which may relate to SPI communication. SPIs may become stressed by the pressure of high call volume which may influence call interactions and subsequently affect the health outcomes of callers. The objective of this study was to examine how communication patterns change under surge conditions. *Methods:* A sample of human exposure calls from 1 year was selected from a PCC database. Call data was collected via a call logger and an electronic case database. Surge periods were defined *a priori* as busier than 99% of all other 30 min periods and non-surge periods as slower than 70% of all other 30 min periods resulting in a sample of 42 surge and 1,430 non-surge cases. Digitized phone recordings for these cases were downloaded and call communication was coded using the Roter Interaction Analysis System (inter-coder reliability $r > 0.80$). *Results:* Preliminary analyses confirmed case characteristics for the study sample did not significantly differ from the larger call population. Regression analyses revealed a trend for fewer statements made by both SPIs and callers during surge periods ($p = 0.10$). There were no significant differences in caller communication behaviors for calls occurring during surge vs. nonsurge periods. SPIs asked more closed-ended questions during surge ($p < 0.01$), but SPI emotional responsiveness, relationship statements, open-ended questions, clinical information and recommendations did not differ. Post-hoc power analyses revealed adequate power to detect differences. *Conclusions:* Our results indicate SPI tendency to be economical with speech during surge times. A positive aspect of our null results is that despite demands of surge, SPIs are maintaining relationship-building communication behaviors such as partnering and emotional responsiveness. This suggests that SPIs are able to maintain quality communication in time-pressured circumstances.

180. Efforts to Improve SPI Coding Accuracy

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Background: The quality and validity of data generated by poison centers has been questioned due to limitations in how the data is passively collected and not being able to quantify or verify its accuracy. Another limitation is that specialists of poison information (SPIs) are generally more concerned with managing an exposure and providing the appropriate recommendations and information to callers while placing less importance on the accuracy of their coding. In order to improve the accuracy of the SPI's data entry, we instituted a new measure to our quality assurance program. *Methods:* Each month 100 closed exposure cases are randomly selected for review with an equal distribution as to the initial SPI handling the case. The selected Toxicall® charts are printed and cut in half to separate the formatted "dotted fields section" from the "notes section." The exposure route, reason, clinical effects and therapies from the "notes section" is documented by the SPI reviewer. The reviewer's findings are then compared to the original "dotted fields section." Any inconsistencies are noted as an error/omission. *Results:* During Year 1, there was inconsistent improvement amongst the SPI staff despite repeated efforts to improve awareness and education on NPDS coding guidelines in each staff meeting. In addition, the individual errors for each SPI were identified and reported to the staff during the last quarter of the year to improve SPI compliance. Many errors were due to inattentiveness and carelessness during the data entry. In Year 2 it was decided to include the SPI's error rate as a part of their annual evaluation. This led to significant improvement which has persisted. The monthly average and range for each field are noted in the table below. *Conclusions:* Previous efforts to improve compliance by increasing SPI education and awareness were ineffective. In order to improve the quality and accuracy of coding by our SPI staff, it was necessary to make this facet of our quality assurance program a part of the SPI annual evaluation.

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Type of error/omission	Exposure reason (range)	Exposure route (range)	Clinical effects (range)	Therapies (range)	Average number of charts with errors (range)
Year 1	8.67 (4, 15)	5.83 (1, 16)	10.83 (5, 16)	11.25 (4, 15)	30.75 (17, 42)
Year 2	2.75 (0, 8)	1 (0, 6)	3.08 (0, 11)	3.75 (0, 11)	8.75 (3, 26)

181. Changes in Exposures Reported to Poison Centers in Response to H1N1 Influenza Outbreak

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Background: As a consequence of the H1N1 influenza outbreak first reported in April 2009, numerous recommendations were made to reduce the risk of or manage infection such as frequent washing of hands with soap and water or hand sanitizers and use of antiviral drugs as prophylaxis and treatment of infections. This investigation examined whether the H1N1 outbreak changed the pattern of exposures reported to poison centers. *Methods:* This retrospective study use data collected by a statewide poison center system. The monthly number of exposures during 2006–2009 was determined for the following exposures: total exposures, cough/cold medications, neuraminidase inhibitor drugs, adamantane drugs, influenza vaccines, and hand sanitizers. The monthly number of exposures in 2009 was then compared to that reported in 2006–2008. *Results:* Monthly total exposures reported in 2009 were similar to previous years. Monthly cough/cold medication exposures in 2009 were lower than in previous years for every month except August–October. Monthly adamantane exposures in 2009 were similar to 2006–2008. Monthly neuraminidase inhibitors in 2009 were higher than previous years for April–December. Monthly influenza vaccine exposures were higher in 2009 in September–December. Although hand sanitizer exposures were higher in every month in 2009 than previous years, the difference was greater during April–December. *Discussion:* After the H1N1 outbreak was first reported, the number of neuraminidase inhibitor, influenza vaccine, and hand sanitizer exposures reported to poison centers increased. A similar trend was not observed for total exposures, cough/cold medications, and adamantanes. These exposures might be of limited use as surrogates for conducting influenza surveillance because even those exposures that increased would likely only do so after an influenza outbreak is already recognized. *Conclusion:* A public health emergency such as an influenza outbreak might affect the types of calls poison centers receive beyond the primary focus of the emergency.

182. Pattern of Novel Influenza A (H1N1) Virus Calls Received by Texas Poison Centers

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Background: On April 24, 2009, the media reported an outbreak of a novel Influenza A (H1N1) virus. Since then, H1N1 has sickened millions and resulted in thousands of deaths in the US. This investigation describes the pattern of H1N1 calls received by Texas poison centers during the initial weeks of the outbreak. *Methods:* All H1N1 calls added to the six Texas poison centers' common database during April 24–May 31, 2009, were identified, and the distribution of cases by selected factors was determined. *Results:* A total of 183 H1N1 calls were identified. Of these calls, 168 (91.8%) were handled in English and 15 (8.2%) were handled in Spanish. Ninety-eight (53.6%) involved mention of individuals with symptoms that made the caller think they might have H1N1; 85 (46.4%) of the calls were information only calls. The poison centers began to receive H1N1 calls on April 24, with the number of calls increasing to a peak of 25 calls on April 30. The number of calls decreased over the next several days and once again increased on May 5–6 before resuming the decreasing trend. The region with the highest H1N1 call rate was West Texas followed by South Texas and the Rio Grande Valley, the regions with the highest rates of confirmed and probable H1N1 cases. *Discussion:* The majority of H1N1 calls were handled in English, and most involved symptoms that made the caller suspect they might have H1N1. The poison centers began to receive calls on April 24, the day the outbreak was announced, with the number of calls increasing over the next few days before declining. The observed increase in the number of calls seen on May 5 coincided with the day the state health department altered its H1N1 hotline automated message telling callers to contact Texas poison centers when the hotline was not available. The highest call rates came from those regions reporting the highest rates of H1N1 cases. *Conclusion:* It is not unusual for poison centers to receive calls during a disease outbreak such as influenza; thus, it is important that they anticipate these calls and plan accordingly by coordinating with public health agencies on appropriate messaging and disease management options. The majority of calls are likely to come from those areas most heavily affected by the outbreak.

183. Residential Use of Carbon Monoxide Detectors

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Background: Unintentional carbon monoxide (CO) poisoning results in thousands of calls to poison centers and hundreds of fatalities each year. Many of these exposures may be preventable through the correct use and placement of CO detectors (CO-Ds) in the home. The Consumer Product Safety Commission (CPSC) recommends that CO-Ds powered by battery or with battery back-up be installed near the bedrooms in each sleeping area of the home. The National Fire Protection Association (NFPA) recommends that CO-Ds be installed in a central location outside of each sleeping area and on every level of the home. Manufacturer's manuals contain additional product specific recommendations on placement and maintenance. The purpose of this study was to assess the residential use of CO-Ds in two neighboring states that have not mandated their use. *Method:* Residential telephone numbers were randomly selected throughout Nebraska (NE) and Wyoming (WY). An adult resident in each home was surveyed regarding the use of CO-Ds in their home. At least partial responses were obtained from 261 NE residences and 210 WY residences. At the end of the survey respondents were offered educational literature on CO poisoning and CO-Ds. Analyses were performed to estimate the proportion of households within each given state that were equipped with CO-Ds, met CPSC and NFPA guidelines for residential use of CO-Ds, and had their CO-D manual(s). Estimated 95% confidence intervals (95% CI) were calculated for these proportions. *Results:* In NE 56.8% (95% CI 50.7, 62.7) of homes and in WY 53.3% (46.6, 60.0) of homes were equipped with at least one CO-D. However, in NE only 39.7% (32.1, 47.8) of equipped homes met CPSC and 20% (14.3, 27.2) met NFPA guidelines. Similarly in WY 44.5% (35.6, 53.9) of equipped homes met CPSC and 34.5% (26.3, 43.8) met NFPA guidelines. More than 81% of homes in both states had their CO-D product literature. When offered, 28.4% of NE respondents and 28.3% of WY respondents wanted educational literature mailed to them. *Conclusion:* More than half of the homes surveyed in both states were equipped with CO-Ds, however less than half of these homes complied with CPSC guidelines and less than one third complied with NFPA guidelines. This indicates a potential educational need that can be addressed by poison centers, which in turn may help reduce the overall incidence of unintentional CO poisoning.

184. SPI Perceived Case Severity Impacts Poison Center Communication

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Background: Health care provider communication impacts patient satisfaction and outcomes. Provider perceptions of case severity have been found to influence communication and care recommendations. Perception of case severity may be particularly influential for Specialists in Poison Information (SPIs) whose assessments are based on one-time, brief phone interactions. The objective of this study was to determine how SPIs' initial perceptions of case severity impact their call communication. *Methods:* SPIs rated perceived clinical severity at the time of call on a 1–5 Likert scale (89% completion rate). Human exposure calls from 1 year were selected from a PCC database based on SPI severity ratings (n = 1,198 high/moderately; n = 258 low severity calls). High severity calls were oversampled to ensure adequate numbers for a parent study. Descriptive call data was collected via a call logger and an electronic case database. Digitized phone recordings for each case were downloaded and call communication was coded using the Roter Interaction Analysis System (coder reliability $r > 0.80$). *Results:* Preliminary analyses confirmed that case characteristics (caller age, sex, relation to patient, intentionality of exposure) for the study sample did not significantly differ from the larger case population. Call length did not significantly vary based on SPI severity ratings. Regression analyses showed no difference in caller communication based on SPI perceived severity ratings; however, differences were found for SPI communication behaviors. For higher perceived severity ratings, SPIs exhibited more emotionally responsive talk ($p < 0.001$), more closed-ended questions ($p = 0.05$), made more care recommendations ($p = 0.02$), provided less clinical information ($p < 0.001$), and showed lower SPI verbal dominance ($p = 0.01$). *Conclusions:* Initial perceived severity is related to SPI communication differences. For high severity cases, findings suggest that SPIs are more interested in gathering information and giving specific advice than providing information. SPIs may also be more emotionally responsive in these situations. Our results show that SPIs modify their approach, but do not increase call length to resolve cases they perceive as more severe.

185. Copper Sulfate Toxicity: Young Teenagers Identified as a Significant Risk Group

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Background: Copper compounds are widely available as fungicides, fertilisers, and animal supplements, however some salts such as the sulfate can be corrosive and systemically toxic. Given this concern, calls received by the New Zealand National Poisons Centre (NZNPC) regarding copper sulfate were evaluated to identify sectors of the population who may be at greater risk. *Methods*: A retrospective analysis of all copper sulfate poisoning inquiries to the NPC was undertaken for a ten year period between 1999 and 2009. *Results*: From a total of 262,976 calls, the NPC received 334 enquiries (~0.13%) related to acute human exposures to copper sulfate; 30% involved adults, 44% adolescents and 26% children. Of these, 25% were a result of child exploratory behavior, 66% unintentional exposure and 4% attempted self-harm, with 5% unknown cause. Medical attention was advised in 65% of the calls. General sites of exposure were schools (44.3%), homes (41.3%), workplaces (11.4%) and other undisclosed sites (3%). In contrast, analysis of total enquiries regarding all types of acute human exposures over this time indicated contact occurred predominantly at home (90%), with smaller fractions associated with the workplace (5%) or other sites (3%), and only 2% at schools. With copper sulphate, exposure-related concerns appeared greatest with young teenagers (mean 13.6 years) attending school at the seventh or eighth grade. Ingestion was a more common exposure route than eye contact in schools, while in workplaces the reverse applied. *Conclusion*: While such Poisons Center call statistics can be subject to reporting bias, this study suggests the greatest risk of potentially significant copper sulfate exposure is for children attending certain grades at school. Further analysis should be undertaken to identify specific causes including behavioral issues. More attention should be given to minimizing risks, such as enforcing use of appropriate protection and education on the potential consequences of such exposures.

186. Recommendations for Structured Activities in Major Industrial Accidents Involving Chemicals

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Background: Since 1990, more than 60 chemical accidents with more than 2,000 victims have been recorded based on the cases of poisonings reported by physicians in Germany. Experience from and analysis of these accidents has shown that in addition to a systematic documentation and analysis, the activities in major industrial accidents involving chemicals should be coordinated and structured from the very beginning. *Method:* All major accidents reported to the BfR-Documentation Centre for Poisonings and Products (§16e Chem Law) since 1990 were analysed retrospectively. Occupational health practitioners, policemen, firemen, staff of poison centres and others were asked to suggest structured action steps in case of major industrial accidents. *Results:* Following a major escape of chemical substances it is important for the responsible persons to get, as soon as possible, an overview of the situation, initiate rescue and protective measures and inform the population affected. Decisions on the approach in cases of major industrial accidents are made by a crisis committee. Rapidly available and proper medical care and the protection of the neighbouring population, immediate and responsible (risk) communication between the various institutions and responsible bodies involved have to take place. The experience has led to a structured action time table with five phases: I) Rescue Phase: As early as possible, II) First inventory/first measures: Within the first hour/hours, III) Detailed recording of the situation/exposure monitoring: Start on the first day, IVa) Measures to reduce exposure/ IVb) Standardized documentation of sequelae: Start as early as possible, within the first days, V) Detailed evaluation/ long term examinations, if required: Months, years with accompanying risk communication. *Conclusions:* The recommendations for structured activities in major industrial accidents involving chemicals and forms to document cases of poisoning and exposure have been published for widely-use in the BfR Annual Report 2008 "Cases of Poisoning Reported by Physicians."

187. Diphenhydramine Ingestion in the Pediatric Population: A Certified Regional Poison Information Center Experience

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Introduction: The current consensus guideline for prehospital management of diphenhydramine ingestions in children younger than 6 years of age include referral to the ED in those who ingest 7.5 mg/kg or 300 mg or greater. A definitive minimum toxic dose is unknown. We report our experience with diphenhydramine in this age group to further elucidate outcome based on these criteria. *Methods:* Data were collected from an AAPCC Certified Regional Poison Information Center. The study was IRB approved. All diphenhydramine ingestions in patients younger than 6 years of age reported over a 10 year period (2000–2009) were analyzed. Only cases with documented, known amounts of diphenhydramine were included. Medical outcome and patient weight, if available, were recorded. Descriptive statistics were used to characterize the data. *Results:* A total of 873 cases were identified, and 636 cases met the inclusion criteria. There were no moderate, severe or fatal outcomes associated with the exposures. In patients with definitive clinical outcomes, the mean weight-based ingestion was 7.98 mg/kg, with a median amount of 6.32 mg/kg. The mean total ingestion amount was 108.8 mg, with a median amount of 75 mg. The maximum ingestion in the study was 300 mg, with a mg/kg dose of 27.52. *Conclusion:* These data demonstrate that even with wide ranges of diphenhydramine ingestion, clinical effects were negligible. The current consensus based guidelines recommend referral to the ED for ingestions of 7.5 mg/kg or greater. Our analysis of 10 years of data indicate that the toxic dose per kg is likely much larger than the current guidelines recommend.

188. Investigating the Reliability of Substance Toxicity Information Found on the Internet in Pediatric Poisonings

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Background: The popularity of the internet makes it an ideal tool for the search and dissemination of mass amounts of information. This information could be used to guide medical decisions in potentially life-threatening situations, including pediatric poisonings. The purpose is to determine the reliability of the internet as a resource for information about a potentially toxic ingestion for children less than or equal to 5 years old. *Methods:* We surveyed parents of pediatric patients at UCSF Children's Hospital and UCSF pediatric urgent care as to their internet access and use, as well as the search engines and terms that they would use in possible poisoning scenarios. This information was used to emulate parent performed internet searches for the 11 most common substances involved in pediatric poisonings. A panel of poison control experts evaluated and assessed the research results for accuracy and reliability of the website information. The websites were deemed reliable on two standards. First standard was based on if they recommended to call the poison center with the proper 800 number. The second standard was if the website provided adequate and appropriate information to manage the poisoning without outside consultation from a healthcare provider or poison center. *Results:* The results of 21 parent surveys were included. The majority, 15 (71%) used the internet daily, with Google and Yahoo being the most commonly used search engines. Seven (39%) parents were somewhat to very likely to utilize the internet during a poisoning scenario with prescription medications involving their child. Overall, 27 (38%) of the websites met the first standard and no websites met the second standard. The majority of websites provided information on the toxic potential (67%), ingredients (71%), and symptoms (75%) for a poisoning. However, very few provided information on the toxic dose (13%), management site of home vs. hospital (22%), or first aid (28%). *Conclusion:* Some parents are likely to use the internet to obtain information in the event of a poisoning involving their child. The information provided on the internet for substances involved in poisonings is variable and often incomplete.

189. Impact of Pill Identification Calls on Poison Control Center Volume: Influence of a Policy on Controlled Substances

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Background: The impact of pill identification calls (pill IDs) on Poison Centers has increased significantly in the past 5–10 years. Poison Centers have devised a variety of approaches for dealing with this increased workload. We examined 8 years of Poison Center data from a rural state to determine the impact of pill IDs. In addition, a new policy was implemented whereby public calls for pill IDs that involved controlled substances were identified only general use categories, such as "pain medications," "nerve pills," and not with a specific name or dose. The impact of this policy on Poison Center calls over a 1-year period was evaluated. *Methods:* Data on types of calls and pill IDs from 2002 to 2007 were extracted from CasePro® database and data from 2008 through March 2010 were extracted from Toxicall® database using Microsoft Access®. Since the overall Poison Center call volume varied by less than 2.5% between 2002 and 2004, results from these 3 years were averaged and used as a baseline. Potential abuse calls are defined as pill ID request calls originating from the public where the identification was a controlled substance. Call data were compared between the 12-months prior to and 12-months after the policy implementation. *Results:* By 2008, the overall call volume for the Poison Center increased by 69%. Over this period exposure calls increased by 16% while information calls increased by 188%. Pill ID calls increased by 298% and all other types of information calls increased by only 12%. Over the same time period, potential abuse calls increased by 453%. Information calls increased from 31% of the total call volume to 53%. For the 1-year following the policy implementation for handling pill IDs, potential abuse calls decreased by 56% and by 68% for the final 6-months. During this time other types of pill IDs decreased by 11% and exposures increased by 3%. Pill IDs calls for controlled substances from schools or law enforcement decreased by 3%. *Conclusions:* Pill IDs showed a dramatic rise over this 8-year study period. This increase was a significant impact on Poison Center workload. The new policy decreased potential abuse calls by nearly 70% while similar calls from law enforcement and schools remained constant.

190. Health Care Facility Use of Poison Centers: 2000–2009

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Introduction: The last decade has seen a dramatic increase in easy access to medical and toxicological information on the internet. We hypothesized health care facility (HCF) users of poison centers (PCs) might be using alternate information sources for managing poisonings. *Methods:* We examined HCF Human Exposure Calls (HCF-HECs) and HCF Information Calls (HCF-ICs) by day for the last decade (2000 through 2009) for secular trends (over Time) after accounting for Day of the week to account for weekly patterns (Day), Month of the year to account for seasonal patterns (Month), and 20 US holidays (Holiday). We compared these results). Increase and doubling time (DT = ln-2/ln-slope) and 95% confidence interval (CI) were calculated from logarithmic (proportional) models for the same parameters (Day, Month, Holiday and Time) using SAS JMP 6.0.0. *Results:* Day, Month, Holiday, as well as Time exhibited highly statistically significant (HSS, $p < 0.0001$) relations to both for HECs and ICs. The same was true for HFC-HECs. HFC-ICs, however, did not show a steady increase over the last decade, rather a clear "inverted U shape" (second order) relation with Time with the peak occurring during 2005. These relations were likewise HSS. *Conclusion:* After accounting for the variation from Day, Month and Holiday, HCF-HECs (14.8% of HECs) are increasing more than twice as fast as all HECs (3.52 vs. 1.57% per year). This does not support our hypothesis that HCF staff are seeking alternative sources for poison management information. In contrast, HCF-ICs (2.88% of all ICs) are declining since about 2005. Thus, although HCF folks are calling more frequently for exposures, they may well be seeking alternative sources of information for the less frequent non-exposure queries. These results illustrate the use of a multivariate statistical model of the NPDS call data to answer a specific question. This approach may have application to PC surveillance, staffing, and funding.

191. Poison Center Call Time Metrics

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Background: Poison Center (PC) calls have been shown to save health care dollars. There is little published data on the time required to manage a call. We studied call time for four call types: Exposure (E), Health Care Facility Exposure (HCFE), Information (I) and Drug Identification (DID). *Methods:* Talk Time and After Call Time were measured for 654 calls in April 2009 by eight non-clinical staff using stopwatches (Total Time = Talk Time + After Call Time). Six hundred and fifteen met quality criteria and formed the convenience sample. Timing was done by live observation or recordings (L-R). Calls were taken by Agents: specialists in poison information (SPIs) and poison information providers (PIPs). The process was validated by comparing Time of Day (ToD) and Talk Time to call time obtained from our Avaya Call Management System v14.0. Call time measures (Type, Agent, Timer, ToD, Date, L-R) were examined using bivariate and multivariate least squares methods applied to linear or logarithmic (proportional) models as appropriate. For log models, geometric means [95% CI] provided point estimates and statistical analyses used SAS JMP v6.0.0. *Results:* Of the 615 cases, 21 SPIs handled 470 (76%) and 7 PIPs handled 145 (24%). Most, 557 (91%) were from live timings and 58 (9%) from recordings. Both Talk Time and Total Time were log-normally distributed and statistical analyses were carried out using the log models. Final models for both Talk and Total Times included only Call

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Type of call	Total calls (calls/decade)	Average (calls/day)	Percent of all calls	Increase [95% CI] (%/year)	Doubling time [95% CI] (years)
HCF exposure calls	3,532,458	967	14.8%	3.52 [3.59, 3.45]%	19.7 [19.3, 20.1]
HCF info calls	363,085	99.4	2.88%	–	–
All exposure calls	23,805,706	6,517	–	1.57 [1.52, 1.62]%	44.2 [42.8, 45.7]
All info calls	12,601,737	3,450	–	9.74 [9.65, 9.84]%	7.11 [7.05, 7.18]

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Type of call	Number	Arithmetic median (min, max)		Geometric least squares mean [95% CI]	
		Talk time (min)	Total time (min)	Talk time (min)	Total time (min)
HCFE	99	7.22 (0.88, 25.7)	9.47 (1.88, 29.8)	7.51 [6.43, 8.78]	9.59 [8.3, 11.1]
E	363	3.6 (0.43, 23.3)	5.42 (1.03, 33.5)	4.01 [3.52, 4.55]	5.87 [5.21, 6.6]
I	75	2.48 (0.53, 15.9)	4.18 (0.93, 22.4)	2.87 [2.37, 3.47]	4.02 [3.38, 4.79]
DID	78	1.16 (0.42, 6.22)	1.38 (0.42, 7.2)	1.46 [1.2, 1.79]	1.61 [1.34, 1.94]
Total	615				

Type and Agent. Distinguishing between SPI-PIP did not improve the model fit, but differences among the 28 Agents were statistically significant ($p < 0.0001$). *Conclusion:* As expected, HCFE calls took the most time, followed by E, I, and DID. A limitation was that our SPIs manage multiple calls simultaneously and cannot always chart after each call. Call timing data is valuable to PC managers to build staffing models, evaluate performance and determine service cost and pricing.

192. Antidote Stocking in Denver Metro Hospitals

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Background: Poisonings and drug overdoses can be successfully treated when antidotes are administered in a timely fashion. The Antidote Summit Authorship Group published updated guidelines for stocking of antidotes in 2009. The objective was to examine whether hospitals in metropolitan Denver possess adequate antidote stocks according to these new guidelines. *Methods:* Fourteen antidotes were selected for evaluation from 24 recommended for stocking: 10 antidotes were excluded from our survey because they were multi-purpose medications and likely universally stocked. For crotalid envenomation and cyanide toxicity, 2 antidotes were listed but stocking only one was recommended. Surveys were sent to pharmacists at 28 local hospitals between January and February 2010 asking for their current stocks of the 14 selected antidotes. *Results:* Eleven of 28 (39%) hospitals responded to the survey. A fully stocked pharmacy would have adequate supplies of 12 antidotes since 2 were redundant. None had adequate stocks of 12 recommended antidotes. The 11 respondents had adequate stocks for an 8-h treatment course for a mean of 7 of 12 antidotes (58%) and for a 24-h treatment course for a mean of 6 of 12 antidotes (50%). The most commonly stocked antidote was the cyanide antidote kit (amyl nitrite, sodium nitrite, sodium thiosulfate) and all hospitals had adequate supplies for 24-h courses. *N*-acetylcysteine was the second most stocked antidote, with all hospitals possessing supplies for an 8-h course and 10 of 11 (91%) possessing supplies for a 24-h course. The least commonly stocked antidotes were crotalidae antivenin (Wyeth Pharmaceuticals, no longer in production) and calcium trisodium pentetate (calcium DTPA), both of which were not stocked by any hospitals. *Discussion:* The sample of hospitals responding to this survey represented a broad spectrum of institutions and thus their stocking practices are likely representative of hospitals in the area. Though local hospitals did not meet recommended guidelines for antidote stocking, commonly used antidotes such as *N*-acetylcysteine were available. *Conclusion:* We suggest pharmacy directors, emergency physicians and hospital administrators review the Antidote Summit Authorship Group recommendations and update antidote stocks accordingly and considering local needs and hazards.

193. Is Quetiapine Really QTiapine or Ktiapine?

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Background: Case reports suggest patients presenting after an overdose of quetiapine may have a prolonged corrected QT interval (QTc). A large retrospective study could not determine a correlation due to insufficient data. *Hypothesis:* Quetiapine in overdose causes a lengthening of the QTc interval. *Methods:* We retrospectively reviewed all overdoses presenting to our hospital system from January 2002 to August 2007. Patients presenting with an acute single agent overdose of quetiapine were identified and the charts abstracted. ECG data, including QTc, serum potassium concentration (K), serum magnesium, and estimated quetiapine doses were recorded. Serum quetiapine concentrates were not obtained. Pearson correlations between dose-QTc, and K-QTc were attempted with K-QTc linear regression. SAS was used for statistical calculations. *Results:* Seventy-six patients (39 male) were identified who met inclusion criteria. *K* at presentation was available for 69 (36 male). Age ranged from 6 months to 61 years. Estimated dose information was available for 43, with 37 having both dose and *K* recorded. Twenty-eight patients (36.8%) presented with a QTc > 450 ms. Correlation with Mg was not performed due to missing data. There was no difference in QTc or *K* between males and females ($p = 0.195$). Pearson correlation shows association between QTc and *K* ($p = 0.0003$) but not QTc and dose ($p = 0.75$), with an inverse linear relationship between *K* and QTc ($p = 0.0003$). No association between *K* and dose was noted ($p = 0.7$). *Conclusion:* Patients presenting after quetiapine overdose may have a lengthened QTc. Our data show an inverse linear relationship between potassium and QTc. The association between QTc and quetiapine dose may be calculated by a future study with a more complete data set. The contribution of magnesium could not be evaluated.

194. Fatal Lamotrigine Overdose

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Background: Lamotrigine is a phenyltriazine used for the treatment of epilepsy and bipolar disorder, and in overdose may lead to sedation, seizures, and QRS widening, though no previous reports of high degree AV block have been reported. *Case:* A 19-year-old male with a history of bipolar disorder ingested an entire bottle of lamotrigine, witnessed by his mother. He was delivered to the hospital 15 min later. Initial vital signs were: BP 139/77, HR 123, SaO_2 100%. He was awake and alert on arrival and received one dose of activated charcoal. Thirty minutes after ingestion he had a seizure with witnessed aspiration followed by another seizure. His initial EKG demonstrated a LBBB. He was intubated and treated with gastric lavage. He then developed pulseless arrest treated with epi, atropine and CPR with subsequent return of spontaneous circulation. He was transferred to a referral center for ongoing care where he developed complete heart block. A transvenous pacemaker was placed and hemodialysis was started on day two for renal failure. The initial lamotrigine level drawn at 19 h post ingestion was 35.7 µg/mL (3–14.0). He remained hypotensive and developed multiorgan failure and DIC. He died 10 days after his ingestion. *Discussion:* Our case illustrates that rapid prolongation of the QRS and seizures can occur after lamotrigine overdose. To our knowledge, there is no previous report of complete heart block associated with isolated lamotrigine exposure. With daily dialysis, the half life of lamotrigine was 55 h. *Conclusion:* We describe a case of a fatal overdose of lamotrigine associated with complete heart block and cardiogenic shock.

195. Venlafaxine Overdose Leading to Delayed Cardiotoxicity

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Background: Venlafaxine is a nontricyclic antidepressant that inhibits serotonin and norepinephrine reuptake with weak inhibition of dopamine reuptake. Toxicity from venlafaxine is lower than that occurring with tricyclic antidepressants, although higher than SSRIs, and likely due to sodium channel blockade. *Case report:* A 52-year old male presented to the ED after acutely ingesting an unknown quantity of his extended-release venlafaxine tablets (75 mg tablets) and cutting his wrists. On initial exam, his temperature was 36.6°C, HR 122 bpm, BP 144/100 mmHg, RR 20, and O_2 saturation 100% on a non-rebreather facemask. He was confused and had multiple superficial lacerations to the volar aspect of his right forearm, which were not actively bleeding. His neurologic exam was significant for clonus and hyperreflexia without rigidity. ECG demonstrated sinus tachycardia with a rate of 114 bpm, QRS interval 104 ms and QTc interval 471 ms. His serum acetaminophen concentration was 1.8 mcg/mL and he had no measurable salicylate or ethanol. A rapid urine drugs of abuse immunoassay screen was positive for THC, opiates and acetaminophen, but was negative for cyclic antidepressants. He was monitored in the ED while his lacerations were repaired. Seven hours after his presentation, his mental status quickly deteriorated, he developed convulsions and required endotracheal intubation. Following the seizure he developed a wide-complex rhythm on the monitor. A repeat ECG at that time demonstrated a sinusoidal rhythm. CPR was initiated for a PEA arrest. He was successfully resuscitated however expired later that evening. Premortem serum O-desmethylvenlafaxine and venlafaxine levels drawn post-resuscitation were 2,800 and 32,000 ng/mL respectively. *Case discussion:* Previous reports suggest venlafaxine may not have the same potential for sodium channel toxicity manifested by the TCAs. However in animal models, venlafaxine reduces the sodium channel conduction rate. Prolongation of the QTc interval has also been demonstrated in human series. It is likely that the ingestion of extended-release tablets in this case led to delayed toxicity. *Conclusion:* Clinicians need to be aware of the potential for serious cardiotoxicity with venlafaxine overdose and the potential for delayed toxicity with extended-release products.

196. Massive Venlafaxine Overdose Resulting in Abdominal Compartment Syndrome

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Introduction: Venlafaxine is an anti-depressant known to cause cardiotoxicity. We present a case of a massive venlafaxine overdose (OD) resulting in cardiogenic shock and subsequent abdominal compartment syndrome. *Case report:* A 25-year-old woman presented to the ED 4 h after taking 210 tabs of 75 mg venlafaxine extended release (total ingestion 15,750 mg) and 9 tabs of bupropion 150 mg. She was intubated on arrival. Phenylephrine and vasopressin infusions were started for hypotension. Her HR was 150 and her QTc was 588 ms, which was treated with 2 g of Magnesium sulfate. Hypotension persisted despite 7 L of normal saline and the above pressors. She then developed a wide-complex tachycardia (QRS 160 ms) which was treated with sodium bicarbonate. An echocardiogram revealed an ejection fraction less than 20%; subsequently epinephrine and norepinephrine were added. Intra-aortic balloon pump therapy was added to the four pressors, yet her cardiogenic shock did not improve. She also developed fulminant hepatic failure, DIC, and a GI bleed. An abdominal ultrasound showed low flow in the inferior vena cava, portal veins, and mesenteric veins. An abdominal CT scan revealed diffuse bowel wall edema. Because of markedly elevated bladder pressures and concern for ischemic bowel and abdominal compartment syndrome, laparotomy was performed

confirming the diagnosis of abdominal compartment syndrome. The patient then developed ARDS and acute renal failure. Dialysis was initiated. The patient's family withdraw care shortly thereafter, and the patient died. *Discussion:* Venlafaxine OD results in dose-dependant cardiotoxicity. In this case, cardiotoxicity manifested as QTc and QRS prolongation, as well as an overall cardiodepressant effect leading to cardiogenic shock. This patient did ingest bupropion, however it is likely the massive venlafaxine ingestion was responsible for the majority of the clinical effects. In this case the cardiogenic shock lead to both poor perfusion of the mesenteric vasculature as well as venous congestion of the liver, resulting in abdominal compartment syndrome. This phenomenon is possible with any toxin that results in cardiogenic shock. *Conclusion:* Abdominal compartment syndrome resulting from liver congestion and cardiogenic shock is a potential complication of large venlafaxine overdose.

197. Perineal Dermatitis after Citronella Lamp Oil Ingestion

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Background: Dermal exposure to hydrocarbons can result in defatting dermatitis. We report an intentional hydrocarbon ingestion resulting in perineal desquamating dermatitis. *Case report:* A 42-year-old female with a history of bipolar disorder was witnessed ingesting approximately 600 mL of citronella lamp oil. She was brought immediately to the emergency department where she was awake and conversant. She reported that she drank the citronella because she thought she was a torch. She was admitted for observation and monitoring of respiratory status. On hospital day 2 she developed diarrhea smelling strongly of citronella. She developed erythema over the perineum with blistering and desquamation (photo available). Burn and Dermatology services were consulted. A rectal tube was placed and her dermatitis was treated with soft soap washes, zinc oxide and desonide ointment. This was replaced by bacitracin ointment as the lesions improved. The rectal tube was removed once her diarrhea resolved. The patient's hospital course was complicated by aspiration pneumonitis requiring ventilator support for 12 days. She was transferred to a psychiatric facility on hospital day 24, at which time the dermatitis had largely healed. *Conclusion:* Large volume hydrocarbon ingestion may result in diarrhea and subsequent desquamating dermatitis in the perineal region. Close and early skin monitoring is warranted. If diarrhea develops, limiting dermal contact with early rectal tube placement should be considered.

198. Neurologic Recovery Following 7 Days of Coma from Baclofen Overdose

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Background: Baclofen overdose has been reported to produce coma lasting several days. We report a case of exceptionally prolonged coma lasting a full 7 days following baclofen ingestion. *Case report:* A 51-year-old female was found unresponsive by her family with a suicide note nearby. She had access to clorazepate, paroxetine, baclofen, digoxin, isosorbide dinitrite, furosemide, phenytoin, and phenobarbital. On presentation to the emergency department, she was comatose, flaccid, and hypotensive. Her pupils were fixed and dilated. The patient was intubated and mechanically ventilated. Dopamine was started. Laboratory values including phenobarbital and phenytoin levels and a CT of the brain were unremarkable. Because baclofen overdose was suspected, a serum baclofen concentration (approximately 15 h post ingestion) was sent. EEG showed diffuse slowing without seizure activity. Dopamine was weaned off after 24 h. No sedatives or paralytics were administered. After 5 days of flaccidity and coma, the possibility of brain death was discussed with the family. On hospital day 7 the patient began to withdraw to noxious stimuli. On day 8 she was following commands. By day 10 she was extubated but amnestic to events preceding her hospitalization. The baclofen level returned extremely elevated at 2.7 mcg/mL (therapeutic 0.08–0.4 mcg/mL). The patient was discharged home on hospital day 24 at her baseline mental status. *Conclusion:* We report a case of full neurologic recovery following exceptionally prolonged baclofen-induced coma. Baclofen levels may be useful in confirming the diagnosis. Maintaining supportive care is imperative in the comatose patient if baclofen overdose is suspected.

199. Incidence of Rising Acetaminophen Levels after Acute Overdose with Anticholinergic or Opioid Coingestants

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Background: The Rumack-Matthew nomogram has long been used to determine the need for acetylcysteine therapy based on a single acetaminophen (APAP) level drawn 4 or more hours after acute overdose. In recent years, a number of published case reports have documented late rises in APAP level after overdose with xenobiotics that slow GI motility. Some poison centers routinely recommend that a 4 h level below the treatment line be followed by a 7–8 h level if opioid or anticholinergic coingestants are involved. *Methods:* A retrospective review of records from a single poison center between January 1, 2003 and February 28, 2010 was undertaken to estimate the incidence of delayed peak APAP levels. Inclusion criteria were acute APAP overdose with anticholinergic or opioid coingestants for which multiple APAP levels were available. The end point was rising APAP level, or a level below the treatment line followed by one above the line. *Results:* One hundred and ninety cases were included. Twelve were exposed to APAP-opioid combinations; 178 were APAP-anticholinergic exposures (some with opioids as well). Nine of the 190 (4.7%) had rising APAP levels. One of these remained below the treatment line; the other eight were treated with acetylcysteine (3 IV, 5 po), and none developed hepatotoxicity. All nine had taken APAP-diphenhydramine combination pills, and none of these had known opioid coingestants. *Conclusions:* In patients with anticholinergic coingestants, the incidence of delayed APAP peak after acute overdose may approach 5%. When these patients have a 4 h APAP level that is detectable but below the treatment line, a repeat level should be considered before final disposition.

200. Severe Prolonged Encephalopathy from an Intentional Lamotrigine Overdose with Significantly Elevated and Prolonged Serum Concentrations

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Background: Lamotrigine (LTG) is well-tolerated in therapeutic doses, undergoes first order kinetics with a $t^{1}/_{2}$ of 22–36 h, and is hepatically metabolized mainly via UGT1A4. At 2.5 mg/kg/day, steady-state serum LTG concentrations are approximately 2.5 µg/mL. However, the toxicodynamics and toxicokinetics are poorly appreciated. We describe the toxicokinetics in massive extended-release (XR) LTG overdose with exceedingly high concentrations and prolonged encephalopathy. *Case report:* A 40-year-old woman ingested 6 g of XR-LTG. PMH included glioblastoma multiforme, seizures, and depression. She was recently admitted for a clonazepam and quetiapine overdose; both drugs were subsequently discontinued. On the afternoon of discharge a prescription was filled for 30 (200 mg) XR-LTG, 21 (2 mg) dexamethasone, and 30 (20 mg) famotidine. Within 24 h after discharge she presented to the ED, arousable to voice, answering questions appropriately, and admitting to ingesting 30 XR-LTG. Vitals signs were: BP, 109/67 mmHg; HR, 82/min; RR, 15/min; 100% SpO_2 RA; T, 97.0°F orally. Physical exam and initial laboratory studies, including urine drug of abuse screen, and an ECG were unremarkable. A head CT was consistent with her previous surgery. Within 6 h of observation she developed agitated delirium, mutism and was unable to follow commands. Nystagmus and muscle rigidity were absent. Tremor was noted, lower extremity reflexes were hyperactive, and rectal temp was 99.1ºF. Lorazepam controlled her agitation. Although all meds were discontinued except dexamethasone, she developed catatonia. Lab values and vital signs remained unchanged, and a video EEG was unremarkable. A serum LTG concentration collected 5 days post ingestion was 49.5, 40.5 µg/mL at 6 days, 29.3 µg/mL at 7 days, and 16.5 µg/mL at 9 days (apparent $t^{1}/_{2}$ of 60.6 h); she gradually improved returning to baseline by day 9. *Discussion:* In this patient with a solitary XR-LTG overdose the serial concentrations confirmed apparent first order elimination with a prolonged $t^{1}/_{2}$ that correlated with clinical toxicity. *Conclusion:* Significant prolonged encephalopathy can occur with XR-LTG overdose. The apparent $t^{1}/_{2}$ may be as long as 60 h.

201. Reversible Partial Parinaud's Syndrome Caused by Carisoprodol Overdose

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Background: Parinaud's syndrome is characterized by upward gaze paresis, mid position pupils, near-light dissociation, lack of convergence and eyelid retraction. These ocular findings are seen in patients with dorsal midbrain pathology. We describe a patient with ocular abnormalities seen in Parinaud's syndrome after overdose with carisoprodol. *Case report:* Thirty-year-old female with epilepsy, bipolar disorder and fibromyalgia on phenobarbital, clonazepam, quetiapine, carisoprodol, methadone, and promethazine was found unresponsive by her family members 2 h after she was witnessed to be well. Family witnessed a generalized tonic-clonic seizure prior to EMS arrival. Patient had been seizure free for 2 years. In the Emergency Department she was unresponsive (GCS = 3), afebrile, tachycardic, tachypneic and hypoxic. Her physical examination was significant for fixed downward gaze with absent oculocephalic reflex, pupils 5 mm bilaterally, sluggishly responsive to light. The patient had another generalized tonic-clonic seizure in the ED, received lorazepam and levetiracetam and was endotracheally intubated for airway protection. Brain MRI did not reveal any pathology. After 17 h the patient was extubated. Her neurological exam was intact and non-focal with normal extraocular muscular movement. The patient admitted ingestion of 60 tablets of carisoprodol (350 mg ea). She made a full recovery and was admitted to a psychiatric unit for the treatment of her depression. *Case discussion:* Parinaud's syndrome has been reported in patients with dorsal midbrain pathology from pineal tumor, CVA, hydrocephalus, and also in encephalitis and barbiturate overdose. Meprobamate is the principal metabolite of carisoprodol. Animal studies suggest that meprobamate causes dose dependent depression of neuronal activity in the midbrain tegmentum which is anatomically adjacent to the tectum, the neuronal center of the midbrain affected in Parinaud's syndrome. *Conclusion:* Our patient likely developed the ocular findings described in Parinaud's syndrome secondary to suppression of neuronal elements in the midbrain from a combination of phenobarbital and overdose of carisoprodol. This is the first reported case of partial Parinaud's syndrome caused by carisoprodol overdose.

202. Amitriptyline Overdose in a Patient with a Pacemaker

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Background: After a tricyclic antidepressant (TCA) ingestion, serial EKGs are monitored for cardiotoxicity via QRS prolongation. Since morbidity best correlates with QRS duration, EKG monitoring is standard practice for TCA toxicity evaluation. In this case report, we describe the difficulty in monitoring a patient with a ventricular pacemaker after a witnessed amitriptyline overdose. *Case report:* A 55-year-old man with a history of CABG and AICD/pacemaker was witnessed by police to have ingested about 30 × 25 mg tabs of amitriptyline as they broke down the door at his home. Due to his decreased mental status and episodes of desaturation, he requiring intubation and was transferred to our hospital. In our emergency department, initial vital signs were temp 37.0°C, HR 81/min, BP 140/72 mmHg, RR 16/min SaO_2 100% on 100% FiO_2. Electrolytes, BUN, creatinine, complete blood count, and chest X-ray were unremarkable. He had a serum ethanol level of 203 mg/dL, but undetectable salicylate and acetaminophen levels. An EKG displayed a ventricular paced rhythm with a QRS of 162 ms and QTc of 518 ms. A drug screen (via gas chromatography/mass spectroscopy) demonstrated amitriptyline and a small trazodone peak. Three hours after ingestion, the patient's heart rate fell to 61/min and blood pressure dropped to 66/52 mmHg. EKG showed a QRS of 162 ms and QTc of 568 ms. He was treated with IV sodium bicarbonate boluses with immediate improvement of his blood pressure and heart-rate. He was placed on a IV sodium bicarbonate and norepinephrine infusion. The next day the norepinephrine and bicarbonate infusion were stopped with no signs of cardiac instability. His QTc improved as the patient improved. The patient's hospital stay was complicated by aspiration pneumonitis, but he was transferred to psychiatry on hospital day 6. *Case discussion:* To our knowledge, there are no reported case reports of TCA toxicity in a patient with an implanted pacemaker. Looking at the QRS and QTc trends, it appears that hemodynamic instability correlated best with the QTc rather than the QRS duration. *Conclusions:* In addition to monitoring the clinical status, this case describes the importance in monitoring the QTc, rather than the QRS, in patients with ventricular pacing after TCA toxicity.

203. Severe Iron Poisoning Resulting in Successful Liver Transplantation in a Teenager

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Background: A 15-year-old girl with fulminant hepatic failure requiring liver transplantation after with suicidal overdose of iron pills. *Case report*: Fifteen-year-old female intentionally ingested #60 ferrous sulfate 325 mg enteric-coated tablets starting 5 h and ending and 1 h before arriving to ED. Estimated elemental iron ingestion was 30 mg/kg. Vomiting started within 1 h. Initial vital signs were normal. KUB showed radio-opacities. Serum iron level was 48 mcg/dL (ref range 60–170 mcg/dL) and INR 1.1 at 3–4 h after overdose. Poison center recommended whole bowel irrigation with PEG-ELS titrated up to 2 L/h. Urine toxicology and pregnancy screen were negative. Acetaminophen and salicylate levels were no measurable amount. 8 h later, labs revealed repeat serum iron level 739 mcg/dL; serum bicarbonate 9, with anion gap of 33. See Table for additional labs. Poison Center recommended deferoxamine at 10–15 mg/kg/h, aggressive IVF hydration, and repeat iron level, electrolytes, coagulation measurements, and blood gas. Bicarbonate drip with KCl was started for acidemia. IVF 1/2 NS was running at only 100 mL/h for 4 days. She continued with intermittent vomiting, without hematemesis. Urine was "brick red" after starting deferoxamine. On day 3 she was transferred to a tertiary pediatric ICU, developed altered mental status, hepatorenal syndrome, coma, and increased intracranial pressure necessitating intubation and ventriculostomy. Hepatic biopsy revealed necrosis in all hepatic zones, most significantly in the peri-portal regions. On day 9, mental status improved, and she received a cadaveric liver transplant. One year out of transplantation, she remains stable. *Case discussion:* This case represents the lowest reported peak serum iron level resulting in fulminant hepatic failure with successful liver transplantation. Aggressive IV hydration was not performed adequately in this case. *Conclusion:* High mortality rate of severe iron poisoning necessitates aggressive supportive care. Hepatic failure obviates early consideration of liver transplantation.

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	HR	BP	Fe	AST	ALT	Bili	INR	Hgb	Gap
8 h	125	142/81	739			1.1	1.1	17	
24 h	114	112/58	332	79	89	2.3	3.4	12	33
48 h	120	109/60	69	1,176	1,433	4.1			
72 h	91	119/55	250	2,082	3,414		11.4		15
96 h	118	70/54	291	705	877	10.1	2.4*		
8 days			119	106	34	48.9	1.6*		

*On continuous FFP infusion.

204. Utilization of Intravenous Levocarnitine: Retrospective Evaluation and Comparison in Acute Valproic Acid Toxicity

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Background: Intravenous levocarnitine has been shown to reactivate the urea cycle; thereby, correcting valproic acid (VPA)-induced hyperammonemia and improving mental status. To date, there are no known human studies other than anecdotal reports that suggest favorable outcomes with the use of IV levocarnitine in the setting of acute VPA toxicity. *Methods:* A retrospective cohort analysis was conducted to evaluate all consecutive reports captured from a statewide poison center database of acute and acute-on-chronic VPA exposures with mental status changes from 2002 through 2009. For this study, patients who received IV levocarnitine were compared to a control group that had at least two serum VPA and ammonia (NH_3) levels greater than 100 µg/mL and 35 µg/dL respectively. *Results:* A total of 86 patients were evaluated, 43 who received IV levocarnitine compared to 43 cohort controls. The median time-to-discharge was 84 h for IV levocarnitine versus 37 h for the control; in addition, the median time-to-mental status resolution was 45 h for IV levocarnitine group versus 24 h. A confounding variable of higher NH_3 levels was detected in the IV Levocarnitine group; consequently, after adjustment no statistical difference was found in either time-to-discharge ($p = 0.287$) or time-to-mental status resolution ($p = 0.108$). It was noticed that the mean time to initiate IV levocarnitine was 28 h. Interestingly, time-to-peak NH_3 levels was consistent in both groups ($p = 0.935$) with a median of 24 h (95% confidence interval 21–34 h). Correlation of increase VPA or NH_3 levels with mental status derangement was not found ($r = 0.0$ and 0.15 correspondingly). A modest correlation was found with increased VPA and NH_3 levels ($r = 0.38$). *Conclusion:* This study did not show a difference in medical clearance or mental status outcomes between groups. However, limitations of recording bias, inconsistent or unknown dosing methods of IV levocarnitine should be considered. These results warrant a prospective evaluation of IV levocarnitine and its place in therapy; in addition, continued characterization of hyperammonemia relative to acute VPA toxicity.

205. Prolonged Absorption from a Sustained-Release Verapamil Preparation with Documentation of Serum Levels and Their Response to Intralipid

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Background: We report a case of severe verapamil toxicity, with documentation of serum verapamil levels before and after Intralipid (IL) administration. *Case Report:* A 47-year-old male presented to the ED with hypotension and complete heart block 3 h. after intentional overdose of 6 g sustained-release verapamil. He was intubated but gut decontamination was not done. He was treated with atropine, glucagon, calcium, multiple vasopressors (norepinephrine, dopamine, epinephrine, vasopressin, and neosynephrine) and hyperinsulinemia euglycemia (HIE) therapy. Twelve hours after ingestion, transvenous pacing was initiated, with mild improvement in hemodynamics. Nineteen hours after ingestion, two 100-mL boluses of IL were given followed by a 500 mL IV drip over 30 min. The contribution of IL to improved hemodynamics was unclear due to multiple other drugs being administered at the same time. Twenty-eight hours after ingestion, hypotension reoccurred as the insulin infusion was being tapered, and another 100 mL IL bolus was given followed by a 150 mL IV drip over 15 min. At the same time, the insulin drip was increased with improvement in the mean arterial pressure. On Day 5, the patient became hypotensive when weaning the insulin and calcium drips. On Day 6, the insulin drip was discontinued and on Day 7, the calcium drip was stopped. By Day 10 he had fully recovered. Verapamil concentrations and triglycerides (TG) were measured in 19 serum samples taken between admission and 8 days post-ingestion. After the initial administration of IL, there was an increase in TG concentration from 65 to 2,113 mg/dL, and a corresponding decrease in verapamil concentration from 2.0 to 0.04 µg/mL (therapeutic range 0.05–0.20 µg/mL). The patient showed a delayed rise in serum verapamil levels at 30 h, probably due to prolonged absorption from the sustained-release formulation. After the second dose of IL, the serum TG increased from 177 to 326 mg/dL with verapamil concentration decreasing from 9.18 to 7.21 µg/mL. *Conclusion:* IL administration decreased serum verapamil concentrations, but because of co-administration of multiple other vasoactive treatments (HIE, calcium, vasopressors) it is not possible to determine its clinical contribution to the patient's recovery.

206. Gastric Lavage – An Audit of Current UK Practice

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Background: Gastric Lavage (GL) has been used for over 200 years as a form of gastro-intestinal decontamination following ingestion of poisons and much has been written on its efficacy and safety. Does it still have a role to play in modern emergency medicine? This study was undertaken as an audit of current practice and belief regarding GL in UK hospitals. *Methods:* A questionnaire was sent to all UK hospitals and those having Accident and Emergency departments were invited to respond. Six standard questions and a free-text box for comments

sought to establish whether departments believed they had appropriate equipment available to perform GL, whether adequately skilled personnel were available on a 24/7 basis, how often GL was performed in their department, when was the last time it took place and finally, have they encountered any adverse events that were attributed to GL? *Results:* Of 362 questionnaires sent, 183 (50%) replies were received. Of the responders, 91 (50%) stated that their department did not have the necessary equipment readily available to perform GL. Seventy (38%) said they did not have skilled personnel available at any time and a further 53 (29%) hospitals did not have these personnel available 24/7. One hundred and sixty-nine (95%) departments responding have never or rarely performed GL, only five departments were doing GL once a year and a further three peformed it once a month. Forty-three departments stated that GL had not been performed for at least 5 years, only 27 GL's have been performed in the UK within the last 5 years, 19 of these within the last year and only two within the last month of the survey. Adverse events reported included trauma in two cases and death in one patient as a result of tension pneumothorax. *Conclusion:* From this audit it is clear that gastric lavage is rarely used in managing patients with overdose in modern emergency medicine and consequently a significant proportion of emergency departments no longer maintain adequate equipment or have staff with the necessary skills available on a 24/7 basis. Poisons Centres may need to take into account the availability of skilled staff and equipment when providing management advice on poisoning.

207. Pharmacokinetic Modeling of Lithium Elimination During 67 Continuous Hours of High Flux Hemodialysis

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Background: We report a case of a patient who underwent 67.25 h of continuous traditional hemodialysis (HD) after an intentional overdose of extended-release lithium (ERLi), and provide pharmacokinetic (PK) data on the same. *Case report:* A 38-year-old bipolar female on chronic lithium therapy arrived in the emergency department (ED) approximately 1 h after an acute intentional ingestion of 200 tablets of 300 mg ERLi; initially slightly sedated, she was intubated and underwent orogastric lavage with removal of few pill fragments prior to contact with our regional poison center. Her initial lithium level was 3.1 mEq/L, and so HD was initiated. The patient was continued on HD for 67.25 uninterrupted hours, with serum lithium determinations every 2–4 h. The only adverse reaction to HD was a drop in hemoglobin from 14.2 to 11.6 mg/dL. After two consecutive lithium levels <1.0 mEq/L, HD was terminated and the patient extubated with discharge to inpatient psychiatry without any neurologic deficits. *Case discussion:* We present a case of acute-on-chronic ERLi poisoning which was treated with 67.25 h of traditional high-flux HD. Typical HD sessions last from 4 to 8 h, which is standard practice for HD in the setting of poisoning. Given this prolonged duration, we also sought to calculate the PK parameters of half-life and elimination, and compare them to previously published standards. From the peak level of 5.5 mEq/L at approximately 4 h post-ingestion to the trough of 0.8 mEq/L, a total of 45 h of HD had elapsed. This results in an elimination constant of 0.043, and a calculated half-life of 16.23 h. Compared to previous studies, the K_e is similar; however, our patient had a shorter half-life. *Conclusion:* We report a case of 67.25 h of continuous high-flux HD in the treatment of ERLi poisoning. To our knowledge, this is the longest reported HD session for management of this scenario. Given the uneventful outcome, a single long-duration HD session may be as safe as intermittent HD, and merits further investigation.

208. Methylene Blue (MB) in the Treatment of Refractory Shock from an Amlodipine Overdose

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Background: Amlodipine is a potent vasodilator with a long half-life and delayed onset of action which is particularly concerning following an overdose. Vasodilation occurs through stimulation of nitric oxide (NO) release with increased cGMP production. MB inhibits guanylate cyclase (GC). This enzyme is responsible for the production cGMP. MB also has the ability to scavenge NO as well as inhibit NOS. We report the use of MB for refractory shock in amlodipine toxicity. *Case report:* A 25-year-old woman presented to the ED following ingestion of 30 tablets of amlodipine (10 mg). Vital signs were: BP, 120/86 mmHg; P, 110/min; R, 13/min; *T*, 98°F; pulse oximetry, 98% on RA. Physical examination was unremarkable, and an ECG demonstrated sinus tachycardia with normal intervals. All laboratory studies were normal including negative acetaminophen and salicylate concentrations. Approximately 2–3 h after ingestion, her vital signs were: BP 75/40 mmHg; P, 120 beats/min. Three liters of NS, 40 mL of 10% calcium gluconate, and 10 mg of glucagon were given without improvement. Dopamine and norepinephrine were added, additional calcium, and high-dose insulin-euglycemia therapy were initiated without benefit. Cardiac ultrasound demonstrated a hyperdynamic left ventricle, and a right heart catheterization showed a high pulmonary capillary wedge pressure (16 mmHg), high cardiac index (5.1 L/min/m^2), and low systemic vascular resistance (400 dynes/s/cm^5). Intravenous MB (2 mg/kg over 20 min followed by 1 mg/kg/h) was given. Vital signs: BP, 90/75 mmHg and HR, 90 beats/min within 1 h of administration. Patient was discharged in good condition 6 days later. Her amlodipine concentration later returned at 36 ng/mL (3–11 ng/mL). *Case discussion:* MB has been used for the treatment of refractory vasodilatory shock caused by sepsis and cardiac bypass. Inhibition of excessive production and activity of both NO and cGMP may be critical in the treatment of refractory vasodilatory shock. Despite many therapeutic options such as high-insulin euglycemic therapy, there are still reported deaths. Methylene blue may be a potential new antidotal treatment for refractory vasodilatory shock from an amlodipine overdose. *Conclusion:* Methylene blue appeared to have beneficial hemodynamic effects following amlodipine poisoning.

209. Comparison of Digoxin-Specific Fab Fragment Use Based on Calculated Dose

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Background: Though digoxin (dig) use has declined, poisoning remains common due to narrow therapeutic range and drug interactions. In health care minimizing cost is important. While empiric dosing of digoxin-specific Fab fragments (Fab) exists, there is a standardized formula if concentration known. Often empiric dosing is used based on chronicity of poisoning. This can result in more Fab than needed and increase cost. Current study evaluated number of vials given in dig poisoned patients compared to calculated dose. *Methods:* Retrospective review of poison system database from January 2000 to December 2009 where Fab given or recommended. Only cases of digoxin were included. Other cardiac glycoside containing medications or plants were excluded. Age, gender, weight, dig concentration ng/mL, serum potassium (K) mEq/L, serum creatinine (Cr) mg/dL, number of vials given, number of vials calculated based on formula and whether acute/acute on chronic (Group 1) or chronic (Group 2) poisoning. Descriptive statistical methods were used. *Results:* One hundred and seven cases in Group 1 of which 56 female (52%). Mean: age 60.8 y/o, wt: 67.1 kg, dig 9.1, K 5.2, Cr 2. Calculated dose too low in 12 (11%) and too high (i.e. ≥2 vials more than calculated) in 35 (33%) (range 2–21 vials). In Group 2, 171 patients, 110 (64%) were female. Mean: age 75.6 y/o, wt 67 kg, dig 4.4, K 5.2, Cr 2.8. Calculated dose too low in 28 (16%) and too high in 19 (12%) (range 2–7 vials). Of note in nine cases (5%) Fab recommended by PCC but not given. There were five deaths in each group but all received the "correct" calculated dose of Fab. *Conclusion:* Majority of cases received appropriate doses of Fab. It is difficult to comment on doses being "too low" as clinically more vials may not have been indicated. Also some clinicians prefer to "partially reverse" rather than "fully reverse." We found 33% of Group 1 received 2 or more vials than "needed" based on calculated dose. As a retrospective study it is difficult to determine if these actually were too high. Current Fab AWP ranges $576.00–$727.91/vial (US dollars). One patient in Group 1 received 21 "extra" vials (i.e. $15,286 AWP cost). Clinician education on formula may decrease over utilization and decrease costs. Further prospective studies are needed to further elucidate.

210. Empiric Digoxin-Specific Antibody Fragment Dosing Regimens Overestimate the Amount of Drug Necessary for Treatment of Digoxin Poisoning

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Background: Empiric dosing recommendations for the use of digoxin-specific antibody fragments (digoxin-specific Fab) advise regimens of 10–20 vials for acute digoxin toxicity and 3–6 vials for chronic toxicity. We sought to compare these regimens to cases of digoxin poisoning where specific digoxin-specific Fab doses, based on serum levels, were able to be calculated. *Methods:* We conducted a retrospective analysis of all Illinois Poison Center (IPC) cases in an 8-year period (November 2002–November 2010) of digoxin poisoning where digoxin-specific Fab use was recommended. Cases were included for study if patient weight and pretreatment digoxin levels were available to the IPC for calculation of appropriate Fab dosing. These were further divided into acute and chronic poisoning groups. Cases of acute-on-chronic poisoning were included in the acute group. Cases with incomplete data were excluded. *Results:* Digoxin-specific Fab dosing was available in 18 cases of acute/acute-on-chronic poisoning and 76 cases of chronic digoxin poisoning. Average recommended dosing of Fab was 5.05 (range 1–13, SD 3.09) vials for the acute group and 2.83 (range 1.25–7.5, SD 1.05) vials for the chronic group. *Conclusion:* Empiric dosing regimens for digoxin-specific Fab suggest using doses of 10–20 vials for acute toxicity and 3–6 vials for chronic toxicity. Our results show that calculated doses of this antidote are frequently below those advised in these regimens and that they overestimate the amount of drug necessary for treatment of digoxin poisoning. We feel this is a clinically relevant finding, given the antidote's cost and the risk of depleting hospital Fab stores.

211. Successful Treatment of Iron Bezoar with Syrup of Ipecac

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Background: Iron overdose can be associated with significant morbidity and mortality. Even though unproven, effective gastric decontamination may prevent or reduce the development of toxic sequelae. Iron tablets have been described to clump and form pharmacological "bezoars" when ingested in significant quantities. We report a case of intentional iron overdose in an adult with radiographic evidence of failure to remove the tablets via gastric lavage. Subsequent use of syrup of ipecac showed near complete removal of the tablets and likely prevented toxic sequelae and the need for more costly interventions. *Case report:* A family member called the Poison Center to report a female with a recent intentional ingestion of 50 iron tablets (Ferrous Sulfate 324 mg). The patient was referred to a hospital Emergency Department and arrived within 1 h of the ingestion. A radiograph showed the stomach filled with radiopaque tablets. Gastric

lavage was accomplished with 4 L of saline and only a few fragments were recovered. A second radiograph showed a clump of tablets near the gastro-esophageal junction and three tablets in the duodenum. Syrup of Ipecac (SOI) was on hand and the Poison Center recommended its use. One ounce (30 mL) of SOI was given and vomiting quickly ensued. Recovered were 38 iron tablets in clumps. A third radiograph showed an additional six tablets in the duodenum (total nine) and whole bowel irrigation was performed. A fourth and final radiograph showed the bowel clear of any tablets. The serum iron level peaked at 49 mcg/dL. The patient remained asymptomatic and was discharged about 18 h post ingestion. *Case discussion:* A patient presented with a significant likelihood of developing iron toxicity. Syrup of Ipecac was used after gastric lavage failed to remove a large clump of iron tablets. The patient required less than 24 h of treatment and monitoring. The serum iron level remained well below the toxic level. *Conclusions:* Although no longer endorsed by several medical groups, Syrup of Ipecac remains a potential tool for use in the health care setting for the decontamination of potentially toxic ingestions when other decontamination modalities are either ineffective or not indicated.

212. Flumazenil Use in Benzodiazepine Overdose in the UK: A Retrospective Survey of NPIS Data

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Flumazenil is an effective benzodiazepine (BDZ) antagonist, but its usefulness in managing BDZ overdose (OD) is limited by its potential to precipitate seizure. The approach of UK clinicians to the use of flumazenil has not been systematically studied or reported so far. Complicated cases of poisoning in the UK are referred to the National Poisons Information Service (NPIS) for advice. Details of enquiries to the NPIS are recorded in the UK poisons information database (UKPID). Using UKPID, we present data on 2 years of UK experience with the use of flumazenil in the management of BDZ OD. Between 2007 and 2009 there were 4,504 enquiries to the NPIS relating to overdoses involving BDZ. Sixty-five of these patients were definitely administered flumazenil (60 prior to enquiry and 5 others on toxicologists' recommendation), including many patients who had also ingested proconvulsant drugs. Of 40 patients for whom information on response to flumazenil was available, 32 demonstrated rapid improvement in GCS/airway/breathing and 8 demonstrated no benefit. One patient developed brief convulsions after a second dose of flumazenil after an ineffective first dose in one mixed OD involving BDZ and a proconvulsant drug (seizure rate 1.5%). The only other adverse reaction recorded was one case of agitation following flumazenil administration. The indications for flumazenil use were not clear in a significant proportion of cases. Seizures also occurred in 0.25% of BDZ OD patients in the absence of flumazenil therapy (due to co-ingestion of proconvulsant drugs). There is evidence of uncertainty/disagreement about the use of flumazenil in relation to: indications for use, safety in a mixed OD or when there is a past history of seizures, dose escalation after partial response or no response, and role in late-onset compromise of airway/breathing. Further research should aim to address these issues through a systematic review of the use of flumazenil in BDZ OD, and through a well designed prospective study using standardised data collection and better follow-up for NPIS enquiries.

213. Early Use of High Dose Insulin-Glucose Euglycemia Prevents Hemodynamic Instability After Metoprolol Overdose

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Background: High dose insulin-glucose euglycemia (HIE) has been described in the literature as a successful rescue therapy for calcium channel blocker (CCB) and mixed CCB/beta blocker ingestions when usual resuscitative measures fail. One case of metoprolol ingestion with successful use of HIE after hemodynamic collapse has been described. We present a case of large metoprolol ingestion successfully treated with early use of HIE and no significant hemodynamic compromise. *Case:* Seventy-two-year-old female with a history of hypertension presented to ED 60 min post ingestion of her own medications: 3.75 g of metoprolol and 1.5 g of HCTZ. GCS was 14, HR 40 bpm, and systolic BP 90 mmHg. ECG showed sinus bradycardia with normal intervals. Activated charcoal 150 g was given orally upon arrival. Glucagon 5 mg IV bolus followed by 5 mg/h was given simultaneously with regular insulin 85 units and 50 mL of dextrose 50% IV bolus. This was followed by an infusion of insulin 40 units/h with dextrose 10% at 100 mL/h. Systolic BP immediately improved to 120 mmHg. Calcium chloride was given once within the following hour for a drop in BP to 96/22 mmHg. The patient was then intubated for transfer to ICU in a nearby facility. In ICU, the lowest BP recorded was on arrival at 88/42 but improved within 6 h to ~120/50 mmHg and remained stable throughout the admission with good urine output. Heart rate remained between 48 and 54 for 36 h, at which time it improved to 60–76 bpm. Both antidotal infusions were weaned off by 24 h post ingestion. Extubation occurred on day 2 of admission. Potassium levels were 3.0–3.2 mmol/L initially, but normalized within 6 h of admission. APAP, ASA, and EtOH levels were negative. No hypoglycemia, myocardial ischemia or renal injury occurred. A metoprolol level 90 min post ingestion was 10.7 mg/L (150 times the peak concentration after therapeutic dose). For comparison, a level of 13.57 mg/L was associated with severe hemodynamic instability requiring use of isoprenaline boluses and very high dose HIE in a 45-year-old female. *Conclusion:* Early use, rather than rescue use, of HIE in beta blocker overdose may prevent cardiovascular collapse and its attendant complications.

214. A Review of Bedside Toxicologic Experience with Physostigmine and Flumazenil

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Background: Expertise in medical toxicology affords opportunities for targeted interventions to ameliorate effects of poisons above simply delivering supportive care with tincture of time. Unfortunately, reliance upon clinical lore and case reports of adverse events engenders fearful avoidance and misuse of therapeutic antidotes. *Methods:* The study involves systematic review of cases employing the reversal agents physostigmine and flumazenil in emergency and inpatient critical care toxicology practice. *Results:* From 2003 to 2010, our service cared for over 5,000 adult, pediatric, and geriatric patients; more than 1/3 received at least one of these antidotes with response rates ranging between 50 and 90%, depending upon the toxins involved. Therapeutic benefits included clearing of cognition that allowed further gathering of history, partnership in care, and reduced need for aggressive interventions such as intubation and mechanical ventilation, physical restraint, urinary catheter placement, and administration of sedative medications. Physostigmine was given to patients exhibiting anticholinergic syndrome with delirium secondary to a variety of suspected and unknown compounds from diphenhydramine to *Datura spp*. toxins to tricyclic antidepressants. Fewer than 5% experienced adverse effects, the most common being diaphoresis, nausea, and vomiting. The rate of seizures was under 1%. There were no cardiac arrhythmias; one patient had self-limited, asymptomatic bradycardia after two doses of 2 mg were given 20 min apart. Flumazenil was used to treat obtundation of sufficient severity to threaten pulmonary complications or delirium suspected secondary to benzodiazepines and related sedatives. It produced no arrhythmias or seizures, even in chronic users of benzodiazepines. The most common side effect was anxiety, which emerged in fewer than 10% of patients. They responded sufficiently to psychobehavioral support in each case and never displayed other signs of withdrawal. *Conclusion:* On the basis of these results, we conclude that physostigmine and flumazenil are safe and potentially effective (though underutilized) antidotes when administered to patients presenting with psychosomatic features consistent with anticholinergic and sedative toxicities.

215. Lipid Therapy for Severe Bromadiolone Toxicity

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Background: Bromodialone is a lipophilic, vitamin K antagonist, superwarfarin that produces prolonged coagulopathy. Lipid therapy (LT) has been used as a new antidote for severe cardiotoxicity and CNS toxicity from lipophilic agents. This is the first report of LT for superwarfarin or other anticoagulant toxicity. *Case report:* A 76 kg man ingested 12.5 mg of bromadiolone in a suicide attempt. One day (D) later he ingested an additional 8.75 mg bromadiolone and 48 g acetaminophen. He presented on D2 with fulminant hepatic failure, renal injury and coagulopathy. He had DKA due to noncompliance for known diabetes. Initial data included Factor V 6%, Factor VII <2%, INR 8. Management included acetylcysteine, vitamin K, fresh frozen plasma, insulin and other critical care measures. By D7 he had marked hepatic improvement (Factor V 103%) but ongoing bromadiolone-induced coagulopathy (Factor VII <2%, INR 7.7) despite vitamin K total dose 510 mg since D3. LT was administered on D7 (1.5 mL/kg over 30 min, repeated 4 h later.) Vitamin K total dose for the next 4.5D was 225 mg. No additional blood product was given. Subsequent daily Factor VII were 9, 33, 12, 70%; serial INR were 1.2–2.3. Evaluation of odynophagia (ongoing from D1) identified esophageal necrosis. Standard TPN including lipids was provided D9–D14. Further decrease of vitamin K dose was unsuccessful. LT was repeated on D18 with subsequent daily Factor VII 61, 127, 85, 90% and INR 1–1.1.) Vitamin K was discontinued on D22. Bromadiolone concentrations by LC-MS/MS available later were 604 ng/mL (D7, preLT) & 604, 531, 290 ng/mL (D8, 9, 10 respectively); 47 ng/mL (D18, preLT) & 38 ng/mL (D18, post LT); 6.7 ng/mL (D27). *Case discussion:* Bromadiolone concentrations over 10 ng/mL are associated with coagulopathy. This 0.28 mg/kg bromadiolone exposure produced severe toxicity with a concentration of 604 ng/mL and esophageal necrosis requiring blood products and high vitamin K doses. Reported cases with lower total toxin doses/concentrations were associated with worse coagulopathy. Use of LT appears to have shortened bromadiolone half life and decreased clinical toxicity. *Conclusion:* In this case of severe bromadiolone toxicity, LT appeared to reduce coagulopathy without apparent adverse effects. Further study of LT as an antidote for lipophilic anticoagulant toxicity is needed.

216. Mining Social Media for Trends and Sentiments about Poisoning and Poison Control Services

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Background: Increasingly, consumers get and give advice about health through social media. Social media offers volumes of rapid, real-time, self-reported and unfiltered information about the public's health. Topics pop up, gain momentum and fade away, engaging thousands of participants in multiple real-time conversations. Our objective was to determine if such discussions could provide information on how consumers view poisoning and discuss their experience of a PCC, and if social media could provide an entry point for public health interventions or opportunities to promote poison control services. *Methods:* With the help of a service that specializes in aggregating multiple streams

of information from the social and traditional web for brands and marketers, we monitored, aggregated and sorted hundreds of thousands of blog sites, online discussion forums, Twitter feeds and news articles for terms related to PCCs. Words used in conjunction with PC were also sorted and ranked to determine context and yield information about sentiment. *Results:* In a 3 month period, including National Poison Prevention Week, the term "poison control" appeared in 1,100 blog posts, 428 comments on blog sites, 860 forums, ~160 Twitter feeds, and 91 news articles. The week prior to NPPW, "PCC" appeared in 73 blogs, 77 forums, 7 Twitter feeds and 11 news articles. During NPPW there were 140 blog posts, 72 forum discussions, ~100 Twitter feeds and 20 news articles. *Conclusion:* Nearly a third of social media "mentions" were irrelevant references (rock band, lyrics, humorous remarks about bad cooking). Remaining mentions skewed neutral or negative in sentiment, revealing that people's experience with a PCC was generally positive, but needing the service produced a negative sentiment. Terms such as "parenting fail" and "bad parent" were common. The social media "space" offers significant opportunities for understanding how consumers consider and relate to poisoning and the experience of using a PCC. Such insights can help identify marketing strategies and shape efforts.

217. Efficacy of a Poison Prevention Educational Program for Preschool Children

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Background: This study aimed at assessing the effectiveness of a school-based poison prevention educational program for preschool children. *Methods:* One hundred and thirty-six preschool children (70 boys and 66 girls) regularly attending el Maadi national school, Maadi, Cairo, Egypt, (representing 6 classes – 3 classes Kg-1 & 3 classes Kg-2), were included as research subjects. A 5 day program was designed and applied to fulfill the following objectives: identification of the common Poisons/non-Poisons items, identification of the common forms of poisons (solids-liquids-sprays-gases), identification of dangers of poisons on our bodies and role of a trustable person (parents-teachers-doctors), identification of the role of ambulance and poison control centers (PCC) and identification of how to act in unsafe emergency situations. *Results:* The present study proved the efficacy of an educational poison prevention program for preschool children as shown by the ability of children to significantly fulfill the all objectives of the research by the end of program. *Conclusion:* It is recommended that such program is to be generalized nationwide to help to prevent or minimize the risk of poisoning of such vulnerable group of age (preschool children).

218. Poison Center-Directed Medication Take Back Event

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Background: Medications are a common source of both intentional and unintentional poisonings. As a source for abuse, misuse, and poisonings, unused medications should be removed from homes immediately upon discontinuation. Unfortunately, many residents elect to store medications in the home for prolonged periods of time; particularly if they are concerned about the environmental consequences of disposal by flushing or placing in the garbage. Our poison center organized a community-wide take-back event as a poison prevention and education effort. We describe the results of this event. *Methods:* The poison center collaborated with our school district for volunteer support, planning and marketing to parents through school-distributed flyers. A proposal was presented to our city commission to facilitate participation of our police department. Safety officers from our host institution were recruited to assist with development of a site safety plan and to coordinate waste disposal through our host's existing waste management contractor. The Drug Enforcement Administration and the State Board of Pharmacy were consulted regarding legal aspects of the event. Ninety volunteers were recruited through the School of Pharmacy and through the School District. A mandatory 1-h training session was provided for all volunteers. A 4-h, drive-through event was conducted at two sites on opposite sides of our city. *Results:* Two hundred and ninety-six households participated in the event. Nine hundred and sixty-three pounds of medications were collected, logged, and disposed of with 59% consisting of non-controlled substances, 30% OTC medications, 8.5% controlled substances, and 2.5% unknown. Surveys revealed that had the event not been available to participants, 55% would have kept the medications, 16% would have thrown them in the trash, 9% would have flushed them, and 20% would have done "other" (taken to pharmacy, doctor's office, etc.). *Conclusion:* Conduction of this medication take back event resulted in the removal of medications from homes, thus removing these as a source for intentional and unintentional poisonings. Participation of various community partners with common goals resulted in conduction of a successful medication take-back event. Future events and alternate models for event-conduction are in development and will be expanded to include events throughout our poison center service region.

219. A Poison Center's Development of a Media Campaign to Address Trends of Herbal Incense Abuse

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Background: Multiple media outlets routinely contact regional poison centers for their toxicology expertise when preparing a report on current events dealing with poisonings. This report describes a successful collaboration between a poison center and multiple mass media outlets that created a real-time release of this poison information to the public, health care professionals, and policy makers who would be treating patients with this toxic exposure. *Case report:* In late 2009 and early 2010 this regional poison center had noticed a increase in calls about symptomatic patients presenting to ED's after smoking various herbal incense products labeled "not for human consumption" (Table 1). After SPI's and toxicologists recognized the epidemiologic implications of this toxic trend, the poison center contacted the media in an attempt to increase awareness of the public, government, and health care professionals. These public relations efforts also highlighted the information for legislators, permitting them to introduce state legislation to ban the sale of this toxic analog to the public. *Case discussion:* This illustrates the proactive role that the poison center can take in the event that a toxic trend is discovered. By rapidly developing a mass media campaign, the poison center was able to reach a large population and ensure that the correct information was released.
Conclusion: This public relations effort increased the awareness involving a dangerous new trend in illicit substance abuse, highlighted the information for legislators to ban the sale of this toxic substance to the public, and increased the number of calls to this poison center related to this issue.

Table 1.

Date 2009/2010	Number of calls
Dec 1–15	1
Dec 16–31	0
Jan 1–15	0
Jan 16–31	1
Feb 1–15	4
Feb 16–28	7
Mar 1–15	3
Mar 16–31	15

220. Assessment of Toxicology Knowledge in Fourth Year Medical Students

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Background: Pharmacology and toxicology are core content knowledge for physicians. Medical students should demonstrate understanding of general pharmacology and basic treatment of poisoning. The objective of this study was to measure the knowledge of fourth year medical students (MS4) on these topics. *Methods:* A multiple-choice survey (15 questions) was administered to MS4. Questions were grouped into three categories: treatment of poisoning, pharmacokinetics and pharmacologic effects. Students were grouped in by intended specialties: pharmacologic intense (anesthesia, emergency medicine, internal medicine, pediatrics and psychiatry); less pharmacologic intense (dermatology, OB/GYN, ophthalmology, pathology, physical medicine/rehabilitation, radiology and surgery); or no specialty recorded. Students were also grouped by completion of a clinical pharmacology and/or toxicology elective or neither elective. Groups were compared using ANOVA. *Results:* A total of 108 of 136 students completed the survey. Students completing the toxicology elective had higher mean scores than those taking neither elective; however, the scores for pharmacology intense specialties were not different from less pharmacology intense specialties.
Discussion: Performance on this test appears to be improved by completing a toxicology vtelective. Performance was not clearly higher for students planning on a pharmacologic intense specialty. A limitation is that the study sampled a small population and covered minimal material. *Conclusion:* Data from this study suggests MS4 are lacking in core content knowledge related to toxicology. Implementation of required courses focused on toxicology may improve performance.

221. Prescription for Change. Training Evaluation Paving the Way to Success

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Background: The feedback received from survey evaluations can be used to help target community outreach and strengthen community partnerships. Evaluations can determine unmet needs and guide future program development. *Methods:* The Poison Center used postcards, e-mail list servers and website postings to promote a 3-h training on poison center services and medication abuse for community partners. The training addressed the scope of the prescription medication abuse problem, national and local data, teaching guidelines, prevention strategies and available resources. The participant survey consisted of open-ended questions and a 5-point Likert scale rating. A certificate of completion was given to participants after the evaluation was submitted. The evaluation data were analyzed

Group	n	Mean score	95% CI
All students	108	10.2	9.7, 10.6
Intended specialty grouping			
Pharmacologic intensive	70	10.4	10.1, 10.9
Less pharmacologic intensive	34	9.6	8.8, 10.4
No specialty recorded	4	9.3	3.5, 14.9
Elective completed grouping			
Toxicology & clinical pharmacology	5	12.8	11.8, 13.8
Toxicology	11	11.4	10.1, 12.7
Clinical pharmacology	45	10.3	9.7, 10.3
Neither	47	9.4	8.9, 10.0

after 6 months (nine trainings). *Results:* There were 149 participants from seven Vermont counties, 94 of whom completed the evaluation. Selected results from those who answered survey questions follow. Twenty-seven percent stated they were very aware of medication abuse before the training, while 73% were very aware afterward. The percentage that were very aware of poison center services increased from 9 before the training to 69 afterward. Seventy-eight percent planned to recommend the training to other agencies or colleagues. Forty-six percent reported more time was needed for training. *Conclusion:* A survey evaluation can be an effective tool to assess participants' knowledge before and after a training. The evaluation provided valuable information about the effectiveness of the training and necessary changes. The results show that the training was effective in educating community partners about prescription drug abuse prevention in Vermont and about Poison Center services. *Discussion:* The effectiveness of these trainings will be determined by the number of outreaches community partners conduct over the next few years. An increase in Poison Center call volume may also indicate effectiveness of the program. Comments can be addressed and future trainings can be modified to improve satisfaction evaluation scores.

222. Consideration of Methadone-Induced Syncope in the Emergency Department

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Background: Methadone (MTD) is used to treat heroin addiction and chronic pain. With increasing doses being used clinically, QT prolongation and torsades de pointes related to MTD use has been observed with greater frequency. Patients (pts) on MTD report a higher incidence of syncope and are at increased risk for sudden cardiac death. We investigated whether pts on MTD reported syncope like symptoms (SLS): syncope, seizure, dizziness, weakness, and if the treating Emergency Physician (EP) ordered an ECG. *Methods:* A retrospective Emergency Deptartment (ED) chart review was performed for the year 2007. All charts identifying pts on MTD were reviewed by two blinded EPs to identify any SLS. A third reviewer with knowledge of the study eliminated all charts with SLS that were clearly explained by another cause. The cases where an ECG was ordered in this setting were noted. If an ECG was performed, the QTc was calculated by two EPs (one blinded) using the Bazett formula. If a discrepancy of more than 5% was noted between the physicians and the computer, it was resolved by a third physician. *Results:* Of the 123,510 pts seen in the ED, 54 reported MTD use. Twenty pts were identified with possible SLS but 13 were eliminated due to other etiologies causing these symptoms. Of the remaining 7 pts (13% of MTD pts), 4 (57%) received an ECG. The other 3 (43%) pts had complaints of weakness (2 in MTD overdoses) but no ECGs were performed. The ECGs showed prolonged QTc's in three patients. Upon further chart review, two pts with no history of seizures, presented to ED with SLS and were subsequently discharged home. One pt arrived via Emergency Medical Services after he became unresponsive at a dialysis center, he was admitted for MTD overdose. Finally, the last patient had a RBBB that was unchanged from a previous ECG, and this person was discharged.
Conclusion: Only 7 (13%) of patients with a history of methadone use exhibited SLS. ECGs were obtained in over half of these patients, with 75% exhibiting prolonged QTc's. The discharge of two of patients with prolonged QTc's and the absence of ECG ordering on patients with SLS suggest a lack of awareness of QT prolongation due to MTD by ED physicians.

SLS	QTc
Syncope/seizure (male)	460
Syncope/seizure (female)	443
Syncope (male)	506
Pre-syncope (male)	RBBB

223. Cybersuicide with "Homemade Valium"

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Background: The use of the internet to research methods to commit suicide ("cybersuicide") has been well described. Many websites advocate the use of a variety of medications ranging from ubiquitous compounds like acetaminophen to more esoteric substances. We report a cybersuicide involving "homemade Valium." *Case report:* A previously healthy 30 year-old female graduate chemistry student text-messaged a friend that she had taken 40 g of "homemade Valium" in a suicide attempt. By the time emergency services had responded, the patient was found to be unresponsive at home. Upon arrival to the hospital, she experienced cardiopulmonary arrest and was successfully resuscitated. Flumazenil was not administered. The patient was treated with aggressive supportive care including mechanical ventilation, fluid resuscitation, multiple vasopressors, however, expired on hospital day 2. Postmortem blood was analyzed for acidic, basic and neutral drugs as well as volatiles and cyanide. The results revealed the presence of bromisovalum and lorazepam. Quantitative measurements were not determined. *Results:* Upon examination of the decedent's computer, she appears to have been influenced by an online Chinese translation of the book *The Complete Manual of Suicide*. In this text, the suggested lethal dose of bromisovalum is 20 g. Bromisovalum is a sedative-hypnotic agent that has been used outside of the United States since its development in 1908. While fatal self-poisonings have rarely been described in countries where this drug is sold, none have been reported in the United States. The decedent was not taking any medications and there was no record on the decedent's computer or in her laboratory of her obtaining either the drugs or their precursors. It is unclear whether the two medications were purchased or synthesized by the patient. Of note, the precipitating event for the decedent's suicide might have been the suicide of her laboratory partner 6 months prior with cyanide obtained from their laboratory. *Conclusion:* This case is a sad reminder that internet suicide resources with detailed instructions are readily accessible. Clinicians need to be aware of these suicide resources, as they may be faced with managing an unusual poisoning.

224. Coalition Building Aimed to Increase Poison Center Awareness Among Elementary School Nurses

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Background: In 2009, the South Texas Poisoning Prevention Coalition was developed with a focus on educating elementary school nurses about poisonings, and how to distribute poison prevention information to students and parents on utilizing their local poison center (PC). *Methods:* A coalition membership form was completed by 108 school nurses which contained questions on school demographics, and knowledge regarding PC awareness and PC phone number. Nurses were able to indicate how they had heard about the PC by checking all of following eight categories that applied: this letter is the first time, 911, phone book, pharmacy, phone sticker, magnet, newspaper, or other. *Results:* Out of 108 school nurses, 82% were aware of the national phone number used to contact their local PC; whereas, 18% were unaware. When evaluating the type of communities these elementary schools represent, this coalition currently consists of 49% rural, 26% suburban, and 25% urban. Fifteen school nurses indicated that they heard about the PC for the first time through the coalition letter, 44 from a phone sticker, 35 from a magnet, 20 from the phone book, 12 by their pharmacy, 7 from the newspaper, 6 through 911 services, and 42 indicated Other. Of those who indicated Other; 8 were aware of PC due to prior use, 7 by word of mouth, 6 through their job, 6 from a workshop or conference, 4 by previous mail-out, 4 by a hospital, 4 while in nursing school, and 1 on the internet. *Discussion:* School nurses have the opportunity to educate students at a very young age about when and how to contact their local PC. This analysis serves as a reminder to PCs that even those individuals in our communities that we believe are aware of the services that PCs provide may still be unaware. Since regional PCs encompass large areas, it is important that networks such as this coalition be developed to reach people in high-risk communities. *Conclusion:* This study highlights the need for targeted development of more effective educational strategies to inform school nurses about PCs. In an effort to increase utilization of PC services, PCs must expand on innovative ideas to reach targeted groups of professionals such as school nurses to use as a means of disseminating information to their local community.

225. Poison Center Awareness in the Community: A Survey Among the Parents in a Primary Care Pediatric Practice

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Background: It has been shown that increased Poison Center (PC) awareness fosters increased calls to PC and hence facilitates healthcare savings, by decreasing Emergency department crowding. *Aim:* We intended to determine PC awareness among the parents/guardians of children who were seen in a primary care practice. *Study methods:* Five questions were asked via survey to parents who had brought their children to a well child visit during the period of November 15, 2008 to January 28, 2009 to determine their awareness of poison control services. *Results:* A total of 215 parents were surveyed. One hundred and sixty-nine parents/guardians (169/215) or 78% reported that they were aware of the Poison Center services (PC aware). Forty-six (46/215) or 21.4% parents said they had never heard of Poison Center services (Non PC aware). None of the caregivers could reproduce the poison control number (1-800-222-1222) from memory. Most of the parents who were PC aware reported that they kept the poison control number either on their refrigerator and/or in their phone book. One hundred and forty-two parents/guardians spoke English as their primary language (142/215) with the remaining speaking a language other than English (73/215). Depending on the primary language they spoke, PC awareness differed between the groups; with 75% of the PC aware parents who spoke English as their primary language (128/169), and 69% of PC unaware parents using a primary language other than English (34/46). The PC aware parents had an average of 2.1 children aged below 18 in the household where as PC unaware parents had an average of 3.0 children below 18 years. *Conclusion:* Most of the parents in a suburban population are aware of the PC services, however, none of the parents could reproduce the toll free poison center number from memory. There were significant differences in PC awareness depending on the primary language parents spoke (English vs. non-English).

226. A Poison Prevention Medication Take Back Program: What Do People Bring?

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Background: Unused medications are a source for poisonings that could be prevented. As a poison prevention initiative, this Center conducted Medication Cleanout, a medication take back program. One of the objectives of this program was to log items that were brought to the take back event in an effort to identify medications that are likely to go unused and remain in the homes of residents. The resulting information could then be used to identify targets for policy change or prescribing practice change that could ultimately result in the reduction of unused medications. *Methods:* An Access database was created to log all items collected at the program. Volunteers were trained on the entry of this data. Following the removal of patient identifiers and the sorting of items as controlled substances or

non-controlled substances, all items were logged into the database. Entries consisted of a unique identifier (item ID), classification (control, non-control, OTC, etc.), formulation (liquid, solid, etc.), strength, original quantity, collected quantity, dispensation date, expiration date, and whether the item was identified as a sample. Medications were then categorized using the Drug Abuse Warning Network (DAWN) categories. *Results:* By pill count, or milliter count for liquids, the most commonly collected over the counter medications were vitamins and vitamin/mineral combinations, analgesics, and dermatological agents. The most commonly collected non-controlled prescriptions were cardiovascular agents, analgesics, and antidepressants. The most commonly collected controlled substances were analgesics, upper respiratory combinations, and anxiolytics/sedatives/hypnotics. *Conclusions:* Logging of items collected at a medication take back event provided information regarding unused medications. Analgesics ranked highly as collected medications in all three categories (OTC, non-controls, controls). This information may now be used to consider possible policy change and prescribing practice changes. For instance, perhaps analgesics should be prescribed at lower quantities with refill options and it appears that cardiovascular agents often remain unused. This information also might be utilized in the development of studies to further investigate the underlying reasons for unused medications.

227. EpiPen® Accidental Injection – 134 Cases over 10 Years

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Background: Over the past 10 years, various treatment approaches for EpiPen® accidental injection have been proposed. To discover a viable protocol for therapy based on outcome, we reviewed 134 cases of accidental EpiPen® injection from a 10-year period. *Case series:* Areas reviewed were: site of injection, symptoms; treatment; management site, and outcome. The following data was tabulated: location of injection: thumb – 73 (55%), finger – 34 (25%), hand – 17 (13%), thigh – 7 (5%), deltoid – 1 (0.7%), foot – 1 (0.7%), ankle – 1 (0.7%); Symptoms (at the injection site): blanching – 66 (49%), pain – 52 (39%), numbness – 21 (16%), cold – 19 (14%), ecchymosis – 17 (13%), edema – 14 (10%), bleeding – 12 (9%), pallor – 10 (7%), erythema – 10 (7%), tingling – 6 (0.4%), cyanosis – 2 (0.1%); Treatment: observation only – 41 (30%), massage – 13 (10%), warm soak/compress – 46 (34%), nitroglycerin paste – 17 (13%), phentolamine – 27 (20%), ice – 4 (2%), unknown – 16 (12%); Management site: HCF – 87 (65%), home – 36 (27%), unknown – 11 (8%); and Outcome: resolution without sequelae – 123 (92%), unknown – 11 (8%). *Discussion:* The most common site was the thumb (55%), the most prominent symptoms were blanching (49%) and pain (39%), the most common treatments rendered were warm soaks/compresses (34%) and observation only (30%), and the most common management site was HCF (65%). *Conclusion:* Despite the lack of severe symptoms (blanching 49%, pain 39%) and the tendency toward delivery of less invasive therapies (warm soaks/compresses 34%, observation only 30%), the majority (65%) of cases were managed in a HCF. Cases with known outcomes (92%) had 100% resolution of symptoms without sequelae, regardless of the treatment rendered with most resolving within 2–3 h of injection; while all resolved within 8 h of injection. It appears prudent from this case review that home observation with minimally invasive therapy is appropriate and that HCF referral is rarely indicated for EpiPen® accidental injection.

228. Acute THC Poisoning from Pot Brownies: Joint Law Enforcement and Public Health Investigation

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Background: The Los Angeles County Public Health Department was notified by the Los Angeles Police Department of a food-borne illness cluster associated with brownies purchased 1 day ago from a church bake-sale. The brownies were purchased by a teacher, who brought them to work to share with co-workers at a preschool. *Case report:* Five teachers at the preschool ate the brownies. The purchaser did not partake in the brownies, because she "did not like chocolate"; however, her adult son ate one brownie. All six victims experienced symptoms. The principal at the school notified the pastor at the church, where the brownies were allegedly purchased. The pastor called LAPD, noting that the church never held a bake-sale. LAPD was sent to the school, and interviewed the victims and the purchaser. Public health officials used a standard food-borne illness questionnaire to interview the six exposed persons. Two preschool teachers sought medical attention on the day of symptoms. Both were asymptomatic by the time they were seen by their physicians. One teacher had serum and urine toxicology screening sent to an outside laboratory. Leftover brownies at the school were sent to both Public Health and LAPD for potential additional testing. Serum, urine, and food testing were all positive for THC/marijuana. *Case discussion:* Reported symptoms and targeted laboratory studies swiftly concluded marijuana-laced brownies as the cause of these symptoms. Joint investigation by law enforcement and public health resulted in a prompt response to an unusual food-borne illness cluster. *Conclusion:* Multi-agency response to toxicological cluster illnesses is an efficient use of resources and enhances inter-agency lines of communication that may benefit future public health & epidemiological investigations.

Symptoms	n	Percent
Drowsiness	6	100
Fatigue	6	100
Unbalanced/ataxia	5	83
Dizziness	5	83
Weakness	4	67
Numbness	4	67
Headache	3	50
Anxiety	3	50
Tingling	3	50
Altered taste	3	50
Dry mouth/throat	3	50
Agitation	2	33
Giddiness	2	33
Muscle twitching	2	33
Increased appetite	2	33
Nausea	2	33
Shortness of breath	2	33
Palpitations	2	33
Altered mood	1	17
Chills	1	17
Excess sweating	1	17
Vomiting	1	17
Loss of appetite	1	17
Mouth irritation	1	17
Itching	1	17
Burning eyes	1	17
Itching eyes	1	17

Average duration = 6.25 h (range: 3–10 h); Average onset = 93 min (range: 30 min–3 h).

229. Evaluation of a Plasma GC/MS Toxicology Screen in an Emergency Department

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Background: Qualitative toxicology screening tests in the emergency department (ED) are of limited utility. We investigate the potential utility of a rapid turnaround, comprehensive, qualitative/quantitative plasma gas chromatography/mass spectrometry (GCMS) assay, in the ED setting. *Methods:* Retrospective chart review of GCMS determined in a undifferentiated group of 170 patients over 1 year (November 1, 2008–Ocotber 31, 2009) in the ED. Patients less than 18 years and those who did not authorize research consent were excluded. ED and hospital records were screened for suspected overdose agent, timing of lab posting of GCMS results in the electronic medical record (EMR relative to ED discharge), ED disposition and ultimate clinical outcome. Instances where 1) the test identified a previously unsuspected agent and 2) the test ruled out a previously suspected agent were also recorded. *Results:* The median time from lab ordered to result presented was 1 h 54 min. Sixty-nine percent of patients had a result available in the EMR prior to being discharged from the ED. The majority of patients had a benign clinical course: 81/170 were discharged home from the ED, 52/170 were medically cleared and transferred to a psychiatric facility. Of the patients (37/170) who were admitted for medical reasons, most (34/37) were admitted to general medical floors and a minority were ICU admissions (3/37). There were no deaths or other serious adverse outcomes identified in any patient encounter. In all patients who received the test, there were 17 instances where the GCMS was able to effectively exclude a suspected agent and 25 instances where an unanticipated drug was found. Of those, 5/17 of the exclusion results and 11/25 of the unanticipated drug results were available to providers while the patient was in the ED. *Conclusion:* Although accurate and relatively rapid, the GCMS failed to provide information that would likely be associated with a change in ED management in the majority of patients in this cohort.

230. The Toxicology Investigators Consortium (ToxIC) Registry – Establishing Its Viability

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Background: In 2009, ACMT's ToxIC group established that 10–15,000 patients are directly evaluated each year by medical toxicologists; either at the bedside or in the clinic. It may be feasible to obtain a large amount of data on exposed patients based on this experience. Therefore, starting in January 2010, a trial registry of direct consultations was intitiated. *Objective:* To determine if a national ToxIC case registry that includes cases cared for directly by medical toxicologists is viable. *Methods:* A password protected, online, HIPAA compliant database was created that is accessible via the ACMT website. The database balances sufficient data collection to allow case insight with minimal time for case upload. Data elements include: Location of encounter (ED, inpt, ICU, outpt.), Age, Encounter type (ADR, Pharm vs. NonPharm agent exposure, Environmental, Occupational, Envenomation, Lab data interpretation, Organ failure), Agent classes (ex antipsychotics, metals, pesticides), Specific agent names, Clinical syndromes (ex acute lung injury, agitation, hyperthermia, rash), & Treatment (e.g. albuterol, dialysis, Chelation, pyridoxine, liver transplant, pacemaker). Complete case information is maintained on the investigators' institutional computers and is deidentified other than a unique code that facilitates later identification. *Results:* On January 15, 2010, four centers began pilot data collection. On March 1, 2010, seven more centers were added. As of April 5, 2010, 309 cases are in the database. Time required to enter data is ~1 min/pt. The data elements continue to evolve. *Conclusions:* The ToxIC registry is a viable tool to identify cases that medical toxicologists see in direct consultation at multiple sites across the country. Following identification in the database, access to the case details will provide complete clinical records of consultations seen by medical toxicologists. The development of this registry provides a potential new toxicosurveillance source for research, education, healthcare, and public health.

231. Postmortem Redistribution of delta-9-tetrahydrocannabinol (THC), 11-hydroxy-THC (11-OH-THC), and 11-nor-9-carboxy-THC (THCCOOH)

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Introduction: Post-Mortem Redistribution (PMR) is a well-described phenomenon in forensic toxicology for drugs with lethal effects in overdose amounts. THC is commonly implicated in driving under the influence of drugs (DUID) cases and in fatally injured drivers. Since THC is rarely if ever a cause of drug OD death, no investigation of potential PMR of Δ9-THC and metabolites THC-OH and THC-COOH (THCA) in human blood has been reported to date. *Methods:* Nineteen consecutive cases from the Onondaga County Medical Examiner's Office (Syracuse, NY) with positive urine drug screen for THCA were sampled with matched heart and femoral postmortem bloods. Free THC, THC-OH and THCA were analyzed by GCMS from the cases; In addition, antemortem specimens were available for testing in three cases. *Results:* Ten cases had quantifiable concentrations of THC and THC-OH; all 19 were quantifiable for THCA. Heart: femoral blood ratios averaged 1.54 for THC (range: 0.3–3.1); 1.63 for THC-OH (range: 0.3–2.7); and 1.78 for THCA (range: 0.5–3.0). These results suggest modest postmortem redistribution to the central blood following death for all three cannabinoids. These ratios were not statistically significant, although there was a significant difference for THCA ($p < 0.05$). Antemortem (AM) serum was available for three cases; AM values exceeded PM values regardless of sampling site. *Discussion:* THC and its metabolites exhibit some PMR, with a trend toward more PMR in proportion to hours since death when sampled. Two cases varied from the overall trend, as they showed relatively high concentrations of all analytes in peripheral blood as compared to central blood. Ratios, which did not vary by sex, age, race, or cause/manner of death, were remarkably similar between analytes. Given the high Vd of THC (4–14 L/kg), high pKa, and lipophilicity, increased PMR was expected compared to the more polar metabolites; however, this was not observed in these specimens. To our knowledge, this is the first report of THC PMR, providing a scientific basis for interpretation of postmortem cannabinoid concentrations in medico-legal investigations.

232. The Acidosis From Diethylene Glycol Toxicity Results from Hydroxyethoxyacetic Acid Accumulation

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Diethylene glycol (DEG) poisoning, mostly through use of adulterated pharmaceuticals in unregulated countries, is linked with metabolic acidosis and acute renal kidney failure. Recent studies in rats used fomepizole to block ADH-mediated metabolism and to confirm that a metabolite of DEG is responsible for the acidosis and the kidney toxicity. The two major metabolites of DEG in the urine are hydroxyethoxyacetic acid (HEAA) and diglycolic acid (DGA). The purpose of this study was to relate the kinetics of DEG metabolites with the development of the acidosis to determine the responsible toxic agent. Wistar rats were treated in four groups: water (control), low dose DEG (2 g/kg), high dose DEG (10 g/kg), or high dose DEG + fomepizole. In the high dose animals, blood HEAA concentrations peaked at 8 h at 4.2 ± 0.6 mmol/L, while blood DGA concentrations at 8 h were 0.02 ± 0.01 mmol/L. After the high dose of DEG, blood bicarbonate concentrations and pH reached their nadir at 8 h at 17.7 ± 0.6 mmol/L and 7.28 ± 0.02, respectively. The anion gap in these animals was 17.5 ± 1.4 and 22.3 ± 0.8 at 0 and 8 h, respectively. Correlational analysis showed that blood HEAA concentrations correlated strongly with the decrease in blood bicarbonate concentrations ($r = 0.88$) and with the anion gap ($r = 0.71$). These results indicate that the acidosis observed with DEG toxicity is not as severe as that produced by ethylene glycol or by methanol. These studies have demonstrated unequivocally for the first time that the acidosis produced by DEG results from the accumulation of HEAA in the blood. This project is supported by the American Chemistry Council.

233. Partition Constant of a Drug May Help Predict the Clinical Efficacy of Lipid Rescue for Toxicological Emergencies

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Background: Intralipid® infusion is useful in reversing cardiac and central nervous system toxicity of anesthetic drugs, and recent reports suggest utility for other drug overdoses. Although the mechanism of action is poorly understood, its predominant effect likely results from extraction of lipophilic toxins from aqueous plasma and affected tissues. The lipophilicity of a drug is determined by its partition constant (Log *P*), a measure that estimates the distribution of a drug to hydrophobic compartments such as lipids relative to hydrophilic compartments such as plasma. We hypothesized that the efficacy of Intralipid® treatment in reversing drug toxicity may be dependent upon the partition constant of the drug. This information could be used to determine whether Intralipid® would be efficacious in an emergent toxicological setting. *Methods:* Each drug was spiked into drug-free-serum at 2 µg/mL, followed by the addition of Intralipid® at 1, 2 or 4%. After incubation at 37°C, serum samples were ultracentrifuged (Airfuge®) to separate serum from Intralipid®. Solid phase extraction was performed (Oasis® MCX) in the presence of an internal standard. High pressure liquid chromatography (HPLC) on a 1090 Hewlett-Packard system was performed using an Agilent Eclipse XDB-C18 column in conjunction with appropriate mobile phases. Detection was accomplished using diode array detection at proper wavelengths. *Results:* Spiked anesthetic drug concentrations before and after Intralipid® (1, 2 or 4%) were compared. For most drugs, including Lamotrigine, Mepivacaine, Quetiapine, Verapamil and Amitriptyline, there was a linear correlation between the partition constant (Log P) and the percentage reduction in concentration. However, Bupivacaine and Bupropion deviated significantly from this linear curve. Since the Log P value is traditionally based on the ratio of H_2O/Octanol, it is possible that the solubility of Bupivacaine and Bupropion in Intralipid® differs significantly from their solubility in Octanol. *Conclusions:* The partition constant (log P) largely reflects the efficiency of Intralipid at reducing drug concentration in serum in an *in vitro* model and would be used to predict its clinical efficacy in reversing drug toxicity.

234. In Vitro Testing of Plasma Protein Binding of Carbamazepine in Relation to Serum Concentration

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Introduction: The mainstay of treatment of carbamazepine poisoning is supportive care and administration of multiple doses of activated charcoal. However, in rare cases of massive overdose, hemodialysis for enhanced elimination has been used, postulating that protein binding decreases with high carbamazepine levels. The aim of our study was to test this hypothesis in an in vitro setting. *Methods:* Nine hundred and fifty microliter serum from donors were mixed with a definite dose of carbamazepine solutions in ethanol/water (50:50) to obtain samples of 1,000 µL with carbamazepine concentrations of 5, 10, 16, 20, 26, 50, 75, 100, 126 and 150 µg/mL. All samples were mixed and incubated for 1 h at room temperature. Two hundred microliter were used for confirmation of the total serum carbamazepine concentration. Then the samples were centrifuged (2,000 G, 25°C) using a filter with a molecular weight cut-off of 30,000 Da for 1 h. The carbamazepine concentration in the ultrafiltrates corresponded to the unbound carbamazepine concentrations. The total and unbound serum concentrations of carbamazepine were measured in triplicate by fluorescence polarisation immunoassay and the mean and standard deviation were calculated. *Results:* The free fraction of carbamazepine in relation to the total serum concentration is shown in the table. The free fraction increased from 10.1% in the sample with the lowest serum carbamazepine concentration (5.2 µg/mL) to 78.5% in the sample with the highest concentration (165.4 µg/mL).
Discussion: In severely poisoned patients, serum carbamazepine concentrations are usually >40 µg/mL. We demonstrated that at this concentration, the free fraction of carbamazepine is already considerably increased as compared to therapeutic concentrations. *Conclusion:* As this in vitro analysis demonstrated a decrease in protein binding from 89.9 to 21.5% with increasing carbamazepine serum concentrations, patients with massive carbamazepine overdose might benefit from hemodialysis for enhanced elimination. In vivo measurements are needed to confirm our observations.

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Total carbamazepine concentration (µg/mL)	5.2	10.6	16.2	20.5	27.6	61.4	85.8	121.3	161.4	165.4
Unbound carbamazepine concentration (µg/mL)	0.5	3.3	5.8	7.4	10.6	34.7	55.1	78.8	107.1	130.0
Free carbamazepine fraction (%)	10.1	31.1	36.2	36.4	39.7	56.4	64.2	64.8	66.4	78.5

235. Coma After Intentional Ingestion of a Hand Sanitizer in a Child

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Background: Alcohol-based hand sanitizers (ABHS) have found increased use as alternatives to hand washing. They are generally considered benign ingestions in children and have only been reported to cause major toxicity in adults who have intentionally ingested them. *Case report:* A 3-year-old girl was playing unsupervised at home when she was noted to have difficulty walking and slurred speech. The child fell to the floor and her mother believed that she saw the child's eye roll back in her head. The girl became unconscious in route to the ED. On initial evaluation, the child was obtunded, cyanotic and unresponsive. Vital signs: HR-119 R-29 T-35.2 BP-109/91. Physical exam was notable for eyes deviated upward to the right and cool extremities with poor peripheral pulses. Otherwise it was unremarkable. Initial VBG: pH = 7.34 pCO_2 = 46 torr. Electrolytes were WNL. Head CT and CSF were normal. A blood EtOH level was 164 mg/dL. Investigation of the home revealed an empty bottle of ABHS (65% EtOH). As her mental status improved, she was able to respond to questions and confessed to ingesting the ABHS. Repeat EtOH level in 2 h was127 mg/dL. The patient was discharged the next day at baseline. *Case discussion:* This case is the first reported case of an intentional ingestion in a child of an ABHS resulting in severe toxicity and the highest blood EtOH level from an ABHS exposure in a child. Several published reports describe the abuse of ABHS's by adults intentionally seeking a substitute for

their usual sources of EtOH. However, children generally ingest these products unintentionally and rarely have any significant effects. Miller et al., described 1,846 exposures to these products reported to the Texas Poison Center Network in children <6 years old. Of these exposures covering a 2-year period, 93% had no effects and 6% had minor effects. Only 20 cases had moderate effects and none reported a major effect such as coma or death. *Conclusion:* This case illustrates that intentional ingestions in young children can occur and a blood EtOH level may be an appropriate screening test for children presenting with altered mental status consistent with an ingestion of a sedative-hypnotic agent.

236. Accidental Lamotrigine Overdose in a 20-Month Old

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Background: Approved as an adjunctive agent for epilepsy starting at age 2, severe toxic effects from lamotrigine have been limited to a few case reports. There is only one prior case report of seizure-like activity in a child (a 19-month old with a 1-h level of 20.3 mcg/mL). To our knowledge, our case is the highest confirmed accidental pediatric ingestion to date. *Case report:* A previously healthy 20-month-old boy presented to the emergency department 30 min after his mother noted the child had an ataxic gait and altered mental status. She found her lamotrigine bottle spilled on the bathroom floor with 10 × 150 mg tablets missing. En route to the ED, the child had two episodes of emesis and a "seizure" lasting 15 s with "whole body" jerking and inconsolable crying. Initial vital signs were Temp 36.6°C, HR 105–112/min, BP 112/57 mmHg, RR 22/min, SaO_2 99% on RA. He was treated with serial IV lorazepam doses. Venous blood gases, EKG, head CT, abdominal X-ray, lytes, BUN and creatinine were unremarkable. A drug screen (via gas chromatography/mass spectroscopy) revealed no coingestants. He was admitted to the PICU where his symptoms worsened. He would suddenly sit up from a prone position, develop tonic-clonic activity in his legs and arms for 10–15 s, and then suddenly fall back asleep. He would avoid eye contact and cry inconsolably during these episodes. He was treated with additional doses of lorazepam and rehydration. A lamotrigine level 11 h after admission was 30.5 mcg/mL (therapeutic < 4 mcg/mL). His symptoms improved overnight and resolved by morning. The child was transferred to the general floor the next day. The child was discharged home with no complications. *Case discussion:* In-depth review of lamotrigine toxicity reveals that seizure-like activity is rare, but reported. Toxicity and blood levels correlate poorly. Base on our findings and the findings of the one other pediatric case report, children may be more susceptible to the toxicity at lower doses. *Case conclusions:* Our case report describes this unique toxidrome in a child. From our experience, toxicity rapidly improves after good supportive care with benzodiazepines and IV fluids.

237. A Case of Accidental Life Threatening Sodium Azide Exposure

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Background: Sodium azide is a highly toxic derivative of hydrazoic acid, commonly used in air bags. It is also used in the production of metallic azide explosives & as a preservative in science laboratories. Serious or fatal poisonings have been reported via ingestion of a few grams of sodium azide. Effects include potent vasodilation (possibly because it produces nitric oxide) leading to severe hypotension & bradycardia. We report a presumed unintentional minimal exposure resulting in life threatening signs & symptoms. *Case report:* A graduate student in a university science lab was working ungloved with sodium azide. Later, at home, he ate a sandwich with unwashed hands. Within 20 min, he became nauseated & vomited. He presented to ED at 90 min post exposure tachycardic, tachypneic & hypotensive, initial BP 80/40, HR 165. His condition deteriorated, despite treatment with vasopressors & IV fluids. ECG showed signs of cardiogenic shock & he developed pulmonary edema. He exhibited hypocalcemia, hypomagnesemia, & hypokalemia & remained on a ventilator overnight. An intraaortic balloon pump was inserted & his condition improved. Hydroxocobalamin was also administered. He was discharged 2 days post exposure with no residual effects. *Case discussion:* Sodium azide poisoning has occurred following accidental or intentional ingestion of colorless, tasteless laboratory solutions. Hypotension is the most common clinical effect due to vasodilation of the peripheral blood vessels. Symptoms include nausea, vomiting, diarrhea, headache, dizziness, vision loss, dyspnea, seizures, coma, hypothermia, cardiac dysrhythmias, tachypnea, cyanosis, pulmonary edema, acidosis, & cardiorespiratory arrest. It is also a cellular poison, inhibiting cytochrome oxidase & interfering with energy generation in mitochondria. Therefore, it is somewhat similar to cyanide. Sodium azide poisoning can be difficult to treat. The traditional antidotes for cyanide toxicity, nitrites & sodium thiosulfate, have not proven to be efficacious. Hydroxocobalamin may be of theoretical benefit. *Conclusion:* Hydroxocobalamin may decrease the inhibition of the mitochondrial enzyme cytochrome-*c* oxidase caused by sodium azide. Hydroxocobalamin could be of potential benefit in patients with life-threatening sodium azide poisoning.

238. Severe Hypermagnesemia from Acute Epsom Salt Administration

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Background: Hypermagnesemia is a potentially lethal condition affecting cardiovascular and nervous systems. Loss of deep tendon reflexes (DTR), respiratory depression, paralysis, coma, electrocardiographic (EKG) changes, hypotension, heart block, and asystole can be seen. Hypermagnesemia is rare following acute ingestions. We present a case of acute hypermagnesemia following Epsom salt (magnesium sulfate) administration. *Case:* Eleven-year-old 45 kg male with laryngealmalacia, obstructive sleep apnea and Freeman-Shelden syndrome (mental retardation, craniofacial abnormalities, myopathy, and autism) given 175 mEq (22 g) Epsom salt in G-tube for constipation by mother instead of Miralax®. Thirty minutes later patient reported "not feeling well" and began vomiting. At 45 min he "slumped over" and became unresponsive. Paramedics found "lethargic with vomiting" and transferred to emergency department (ED). In ED unresponsive and emergently intubated. Initial magnesium level (Mg) 10.1 mEq/L. Transferred to local children's hospital and admitted to PICU. Peak Mg 13.8 mEq/L 3 h later. BUN/Cr 21 and 0.8 respectively. Ionized calcium normal 1.32 mmol/L. EKG sinus 111 bpm, normal PR and QRS with prolonged QTc 527. Physical exam dysmorphic child on mechanical ventilator with normal vitals on sedation but no paralytics. DTR absent and decreased muscle tone. Exam otherwise unremarkable. Normal saline 20 mL/kg boluses twice and calcium gluconate 1 g given followed by furosemide 20 mg IV. Observed in PICU and extubated the following day, Mg 2.3 mEq/L, BUN/Cr 9/0.6 with return to baseline of mental and neurologic status. Discharged to home without sequelae. *Discussion:* Epsom salt has been used for numerous ailments including enterically for abdominal pain, constipation and topically for sprains and strains. Mg blocks neuromuscular transmission by inhibiting acetylcholine release at motor end plates and antagonizes calcium release impairing muscle contraction and conduction. Unknown what role Freeman-Shelden syndrome had in this patient but may have predisposed to more severe clinical effects. *Conclusion:* This case raises question whether Epsom salt for enteric use as cathartic should be discontinued.

239. ED Referral is Unnecessary After Unintentional Pediatric Ingestion of Common Topical Liniments

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Background: Topical liniments such as Ben Gay®, Icy Hot®, Thera-gesic®, and Flexall® contain up to 30% methyl salicylate. Unintentional pediatric ingestion of less than 5 mL could theoretically result in toxicity (>150 mg/kg of ingested salicylate) assuming 100% bioavailability and using an aspirin conversion factor of 1.3978. There are no previous reports of severe pediatric poisoning from ingestion of such topical balms. We attempted, using our poison center database, to assess the value in ED referral and serum salicylate levels after such exposures. *Methods:* Descriptive analysis of one poison center's Toxicall® database, queried for all unintentional ingestions of topical liniments in children (<6 years) from December 1999 through February 2010. We excluded cases involving Oil of Wintergreen (98% methyl salicylate) due to its known significant toxicity. Subgroups included those referred to an emergency department (ED) and those for whom a serum salicylate level was drawn. *Results:* Our search yielded 727 actual or potential ingestions involving children. Standard poison center follow up guidelines were followed. No outcome more serious than "minor effect" was noted in any. The most frequently coded outcome (310 cases) was "nontoxic." There were 89 children evaluated in an ED: age range 6 months–4 years (mean 2 years). All were asymptomatic at discharge. Of these, 48 had serum salicylate levels drawn. Only five had detectable salicylate levels: range 2.8–11 mg/dL. None of the 727 children required specific treatment, and no negative outcomes were identified. *Conclusion:* In our review of over 10 years of experience from a single poison center, unintentional pediatric ingestion of liniments containing methyl salicylate did not lead to salicylate toxicity. ED referral and serum levels are unlikely to be necessary. These findings are likely attributed to the drug's poor palatability and low oral bioavailability.

240. Seizures from Lidocaine Poisoning in Two Patients Resulting from Medication Dosing Error

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Background: The Los Angeles County Public Health Department (LADPH) was notified about two patients who experienced generalized tonic-clonic convulsions when visiting a local clinic for therapeutic abortion. *Case report*: Pt #1 was a 19-year-old female. Anesthesia was given at 14:43 – fentanyl 100 mcg IV; propofol 120 mg IV; and lidocaine 0.5% 10 cc × 4 paracervical injections (40 cc total). Pt #2 was a 26-year-old female who received identical anesthesia at 16:00. Within 3 min, each patient developed nystagmus for <5 s, followed by generalized tonic-clonic convulsions. Both patients were given 8LO2 by FM and midazolam 2 mg IV with resolution of convulsions. EMS was called. Both patients were taken to local ED and recovered with observation. Pt #1 had a blood lidocaine level of 4.2 mcg/mL, drawn 88 min after lidocaine injection. Pharmacological extrapolation corresponded to an estimated lidocaine peak level of 8–12 mcg/mL. Convulsions occur at blood lidocaine levels of 6 mcg/mL or greater in published case reports. *Case discussion:* Lidocaine levels did not correlate with recorded dose given to the patient. Public health toxicologist and nurses coordinated a site visit, with local clinic regulatory officials and representatives of the L.A. office of the FDA. Faulty procedures were noted: inadequate record-keeping for lidocaine stocking, dispensation, Lot#, and syringe labeling. Both patients were inadvertently given 2% lidocaine instead of the intended 0.5% concentration, resulting in fourfold overdoses. Medication dosing error correlated with the lidocaine level of 4.2 mcg/mL drawn from Pt #1. Past case reports of fatal overdoses occurred in the 1970s, with hematomas noted at the paracervical injection sites, resulting in communication

with the vascular system. These patients may have experienced similar a phenomenon. USFDA confirmed 1.98–2.03% lidocaine concentrations in syringe residuals. Local health facilities shut down anesthesia-related procedures at the clinic until completion of audit and overhaul of pharmacy practices. *Conclusion:* Case illustrates high risk of medication error in local facilities lacking formal protocols for anesthesia, and the benefit of multi-agency intervention to correct these problems.

241. Two Cases of Intoxication in Children after Accidental Ingestion of Alcohol-Based Liquid Hand Sanitizer

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Background: Alcohol-based liquid hand sanitizers (LHS) are widely used by adults and children to disinfect hands. Containing a high percentage of ethanol, many popular brands have an ethanol content of 62–65%. Accidental ingestion in children has been found to rarely cause clinical symptoms other than mild gastrointestinal effects or oropharyngeal irritation. There have been no reported cases of intoxication with serious complications following accidental ingestion in children. We report two cases of intoxication in two 4-year-old patients. *Case Report*: Case One: A 4-year-old female presented to an urgent care center with a history of ingesting an estimated 6 ounces of alcohol-based LHS. The physician described the child as "floppy" but responsive. Approximately 60–90 min after ingestion, the patient's blood glucose was 107 mg/dL and blood ethanol level was 221 mg/dL. The patient was transferred to a tertiary care facility and admitted to a pediatric ICU. The child recovered after overnight observation in the PICU. Case Two: A father called the Regional Poison Center (RPC) after his child ingested an unknown amount of alcohol-based LHS. Although the father stated the ingestion had occurred 15 min prior to calling the RPC, the patient "could not walk" and had slurred speech. The caller was instructed to take the child to the closest ED. Labs drawn in the ED approximately one hour after contacting the RPC revealed a blood glucose of 121 mg/dL and blood ethanol level of 200 mg/dL. Repeat blood ethanol an hour later was 190 mg/dL. The patient received intravenous fluids and ondansetron 2 mg IV due to vomiting while in the ED. The child was admitted for overnight observation and discharged the following day. *Case discussion*: The two cases presented are the first to report intoxication in children after accidental ingestion of alcohol-based hand sanitizer. Fortunately, typical exposures in small children are minimal due to the harsh taste and mouth irritation resulting in little or no clinical effects. However, if larger exposures occur there is potential for more serious effects. *Conclusion*: Children exhibiting mental status changes or any neurologic symptoms following LHS ingestion should receive prompt medical attention.

242. Clinical Effects and Outcomes Following Unintentional Double Dose of Lisdexamfetamine (Vyvanse®) in Pediatrics

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Background: Lisdexamfetamine (Vyvanse®) (LDA) is a prodrug of dextroamphetamine approved in 2007 for the treatment of attention deficit hyperactivity disorder. LDA is long acting and is usually dosed once a day with a range of 30–70 mg/day. Double dose frequently results in an amount ingested greater than any published maximum or studied dose. No published study has analyzed the clinical effects of LDA following an overdose. *Objective:* To determine the clinical effects of LDA in children following a double dose. *Methods:* This was a retrospective, observational study of telephone calls to one state's poison center from January 1, 2007 to March 31, 2010. Inclusion criteria were single agent ingestion of LDA, documentation of a double dose, a follow-up to a known outcome and age less than 18 years. *Results:* Twenty-seven patients met the inclusion criteria. Age ranged from 3–17 years (mean 10.2). Weight was recorded in 15 (55.5%) patients and ranged from 22.7 to 90.9 kg (mean 25.4). Ten (37.0%) children were treated in an emergency department and 17 were observed at home. The dose of LDA ingested was between 40 and 140 mg with a range of 1.05–4.13 mg/kg. Follow-up and outcome were recorded in all 27 patients. Outcome was recorded as "no effect" in 21 patients (77.8%) and "minor effect" in six patients (22.2%). The 21 children with no symptoms ingested from 40 to 140 mg (mean 100). The six children with mild symptoms ingested from 60 to 100 mg (mean 80). The clinical effects included drowsiness/lethargy (three children) and dry mouth, hypertension, tachycardia and shakiness (one child each). There were no deaths or major effects (0%; 95% CI: 0–12.5%). About half (52.3%) were managed at home with minimal or no effects. No patients were admitted to the hospital. *Conclusion:* This is the first study of the toxic effects of LDA overdose by children and the first study of the toxicity of a double dose. No child had a moderate, severe, or fatal effect (0%; 95% CI: 0–12.5%). Children who ingest a double dose of LDA may be safely observed at home. More research is needed to determine an appropriate referral dose.

243. Ingestion of Model Fuel Containing Nitromethane and Methanol

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Background: In the absence of a rapid methanol blood level, it is difficult to assess the risk from unintentional childhood ingestion of model fuels containing methanol and nitromethane (MFNM). Previous reports have documented false elevations of serum creatinine from the nitromethane in these fuels, suggesting this as a readily available marker of significant methanol ingestion. Method: We performed a 2 year retrospective chart review of cases of ingestion of MFNM in children. *Results:* Six children, ages 19 months to 3 years, ingested MFNM. All six children were seen in a HCF and had measured methanol and creatinine levels (see Table 1). All blood samples for methanol and creatinine were drawn within 3 h of ingestion. Fomepizole was initiated empirically in two patients due to delay in obtaining methanol analysis results. *Discussion:* Transient elevations of creatinine occurred in four of the six patients. BUN was normal and there was no history of renal impairment in these children, suggesting the elevated creatinine was related to nitromethane ingestion. No child had an elevated methanol level. *Conclusion:* Elevated creatinine levels are not a reliable marker for elevated methanol levels after unintentional ingestion of MFNM.

244. Euglycemia after Late Octreotide Use in Pediatric Glipizide Toxicity

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Background: Octreotide is a useful antidote indicated when more than one dextrose bolus or an infusion is needed to regain euglycemia from sulfonylurea poisoning. We report the efficacy of late octreotide use in a child with life-threatening hypoglycemia from glipizide ingestion. *Case report:* A 20-month-old boy was found with GM's glipizide 10 mg (IR) and metformin 1,000 mg at 22:00. He became diaphoretic and irritable and was put to bed. Next AM he was lethargic, syncopal, and had a 10–15 min tonic/clonic seizure. EMS arrived to an unresponsive child with Accucheck of 37 mg/dL; D50% was given IV. In the ED at 15:35, he was poorly responsive; HR 132, R 26, BP 139/86, core T 97.8°F with a BG of 7 mg/dL. BG increased to 122 mg/dL with a second IV dextrose bolus. PE showed a diminished neurological status, but no additional seizures. Labs:! pH 7.30, PCO_2 42 mmHg, total HCO_3^- 19.8 mEq/L; albumin 4.4 g/dL; Cr 0.3 mg/dL, UDS negative. During transfer to a tertiary care facility the Accucheck dropped to 30 mg/dL. Despite D15%NS infusion at 60 mL/h, a D25%W bolus (60 mL) was required at 15:46 which resulted in Glucose (mg/dL)/time (h) pairs of 321/15:53; 148/16:19. Toxicology advised octreotide 15 mcg IV (1 mcg/kg), administered at 16:47 h, ~19 h postexposure. Euglycemia maintained (90/16:53; 92/17:13; 130/18:10) without further dextrose bolus. During PICU admission, the D5%1/2NS + 2 mEq KCl/100 mL at 70 mL/h was gradually tapered. The child was discharged euglycemic on day 3. *Discussion:* Children have minimal glucose reserves, increasing their sensitivity to sulfonylureas. IR Glipizide onset is 1–1.5 h; duration 10–16 h; though delayed and prolonged hypoglycemia in children is possible, necessitating prolonged dextrose therapy. Octreotide is a synthetic analogue of endogenous somatostatin which inhibits insulin secretion to stabilize blood glucose and prevent rebound hypoglycemia. There are no prospective randomized control trials in pediatrics. Dosing is based on its use in prevention of pediatric hypothalamic obesity: 5 mcg/kg/day in three divided doses. *Conclusion:* Our case lends efficacy to the use of octreotide in children. Even with delayed administration; octreotide can safely re-establish and maintain euglycemia after glipizide ingestion, thus reducing the need for repeated dextrose bolus/infusion and the labile glucose levels that follow.

245. Pediatric Methadone Overdose with Seizure

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Background: Methadone has rarely been reported to cause seizures, but human reports are poorly documented. We present a case of seizure activity that developed after methadone exposure in a child. *Case report:* A 4-year-old became sleepy while watching TV with her family. Twenty minutes later she was blue, unresponsive, and her grandmother started CPR. Paramedics found the girl grayish, with RR 4, HR 114 and finger stick glucose 285 mg/dL. High flow O_2 and 0.5 mg IN naloxone were given with good response. Containers of lisinopril, diphenhydramine and methadone were found at the home. In the ED she had miosis, CNS and respiratory depression, which responded to 7 mg naloxone (4 mg IN/3 mg IV). The ECG was normal. She was transferred to a secondary HCF PICU. Overnight she had miosis, pruritis, tongue thrusting movements, mild fever. She required naloxone for a drop in SpO_2 twice with full recovery of SpO_2 and mental status after each dose. About 16 h after index symptom, during a neurology consultation, she developed rhythmic tongue movements and became unresponsive. She was clinically diagnosed with status epilepticus. She received lorazepam IV with no response, followed by phenobarbital IV, fosphenytoin, then levetiracetam IV with response and was intubated. Evaluation included a

Table for Abstract 244

Age	Methanol level	Creatinine	BUN	Fomepizole	Outcome
2 years	Negative	0.39	NA	No	No effect
2 years	Negative	1.7	12	No	No effect
2 years	Negative	3.6	12	Yes	No effect
19 months	Negative	0.3	17	No	No effect
2 years	Negative	2.6	13	No	No effect
3 years	Less than 10	10.7	11	Yes	No effect

negative initial urine drug screen, LP and MRI. Patient's hospital course was protracted by continued seizure activity on EEG requiring additional antiseizure medications. MRI on HD 23 showed slightly increased ventricular and sulci size, likely caused by global brain anoxia. Discharge medications include trileptal 360 mg po bid, topiramate 25 mg po bid, and phenobarbital 150 mg po hs. There have been no episodes of clinical or subclinical seizures since HD 20. Laboratory analysis included an LC-MS TOF seizure panel for common causes of drug-induced seizures, which was negative. Analysis was only positive for methadone. Serum methadone and EDDP metabolite levels 20 h after presentation were 30 and 33 ng/mL. She was discharged home on HD 35. *Discussion:* Seizures caused by methadone are rarely reported in toxicology references. The mechanism by which seizures occur could be due to hypoxia, but animal data suggest a direct mechanism. *Conclusion:* This report clearly illustrates that methadone intoxication can cause seizure activity.

246. Insulin Glargine Unintentional Overdose: Monitored Successfully at Home

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Background: Glargine (Gg) (Lantus®) insulin is one of the first long-acting insulin analogues, available in the US since 2000. Gg's favorable kinetic profile has resulted in its wide use. Once subcutaneously injected, it forms micro-precipitates with prolonged duration of action but without prominent peaks. A plateau level is achieved within 4 h, continuing for at least 24 h. *Case report:* A 60-year-old, 110-kg man with type 2 diabetes mellitus, maintained on Humalog® 70/30 (100 U/twice daily) and insulin Gg (20 U/day) accidentally injected 100 units (five times his usual daily dose) of insulin Gg by mistaking it for his Humalog dose. Fifteen minutes later, he realized his mistake and contacted the poison center. His blood glucose level at that time, measured with his glucose meter, was 141 mg/dL. Based on the patient's ability to recognize the symptoms of hypoglycemia, the presence of his wife to observe him, and the availability of his glucose meter, he remained at home to monitor serial blood glucose levels throughout the day and to observe for symptoms. He was advised also to omit all of his insulin doses for 24 h. He ate a normal diet. Throughout the following 24-h follow-up period, he experienced no episodes of hypoglycemia. There have been only six case reports in the literature of insulin Gg OD; 5/6 cases required dextrose. *Conclusion:* An unintentional OD of insulin Gg may be monitored at home in some circumstances. Onset of hypoglycemia may present as early as 2.5 h post OD. Prolonged hypoglycemic effect of insulin Gg in overdose seems to be dose dependent. In the case reports reviewed, the highest dose resulted in the longest effect of 106 h.

247. Methadone Associated Cerebellitis

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Case report: A 2-year-old male with a pmh of asthma presented to the ED with altered mental status and respiratory distress. On arrival he had shallow respirations with low sats, wheezing, and a pulse of 140 with BP of 88/58. He received xopenex and saturations improved. The hypotension was treated with a 200 cc bolus of NS. A UDS was positive for methadone. He received a ½ amp of narcan. Despite a reported response, he was intubated. A head CT was normal. Serum ethanol was 1.0 mg/dL. Post intubation ABG was 7.25/38/258. Lytes were reported with an AG of 20, CO_2 of 14, and BUN/Cr of 19/1.52. After another 100 mL of NS and ½ amp of narcan his BP was 79/43. He was transported and en route was started on dopamine 10 µg/kg/min. On arrival to our facility his BP was 73/25 with miotic pupils and flaccid tone. Narcan 1.46 mg IV was given with no reported response. He was reported as having a seizure immediately afterwards. He was given ativan and started on a narcan infusion at 2 µg/kg/min. Antibiotics were started for aspiration pneumonia. The toxicology service was consulted. The narcan infusion was stopped. Repeat CT scan on hospital day #1 showed cerebellitis. The next few days his acidosis and mental status improved. MRI on hospital day #4 showed watershed infarcts in the basal ganglia and the cerebellum. At that time he had normal pupils, was moving all his extremities, and was extubated. Repeat UDS was positive for methadone and caffeine. At the time of discharge 16 days later, his truncal ataxia had improved and he was able to walk unassisted but still had decreased language skills. *Discussion:* Two case reports in the literature suggest an association between methadone overdose in children and cerebellitis. In both the children were found unresponsive, as was this patient. In both cases the patients were hypotensive and acidotic (pH < 7.0). While methadone may have directly caused these findings, severe hypotension and hypoxia may have been responsible for the radiologic/clinical findings. Literature concerning patients with neonatal abstinence syndrome who were treated with methadone does not mention this association. *Conclusion:* Cerebellitis has been associated with pediatric methadone exposures. It should be considered in those found with hypoventilation, hypotension, and metablic acidosis.

248. Do Multiple Products Raise the Risk of Adverse Outcome from Pediatric Therapeutic Errors with OTC Products?

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Background: Based on case reports, there has been speculation that the simultaneous therapeutic use of multiple products in children, particularly multiple OTC cough and cold products or multiple products containing acetaminophen (APAP), raises the risk of adverse events. Large datasets have not been used to analyze this. We sought to compare the outcome of single product therapeutic errors (TE) with those involving multiple products using the National Poison Data System (NPDS). *Methods:* We used the NPDS database for the years 2001–2008 and looked specifically at children less than 6 years who ingested a pharmaceutical and were seen in an HCF and followed to HCF Level of Care outcome. *Results:* Of 10,164 TE cases with only a single product, 4,738 cases involved an OTC cough and cold medication (CCM) or OTC antihistamine and 2,028 cases involved an OTC product containing APAP. Of these 2,028 APAP containing cases, 245 (12.1%) received NAC, 91 (37.1%) had some AST elevation >100 IU/L of which 53 (21.6%) had AST >1,000 IU/L–7 died. Of the 4,738 cases involving a CCM or antihistamine, 1,778 (37.5%) had some neurological symptom and 226 (12.7%) of these were admitted to hospital. One died. Of 1,858 TE cases with multiple products, 627 cases involved an OTC CCM or OTC antihistamine and 328 cases involving at least one product containing OTC APAP. Of these 328 cases, 34 (10.4%) received NAC, 11 (32.3) had some AST elevation >100 IU/L of which 5 (14.7%) had AST >1,000 IU/L – none died. Of 616 involving a CCM or antihistamine, 279 (45.2%) had some neurological symptom and 48 (17.2%) of these were admitted to hospital. Between groups, only the rate of APAP deaths and rate of CCM neurological symptoms were different at the 95% CI. *Conclusions:* Based on this database, APAP related TE involving more than one substance is less consequential than a TE with one substance alone. In contrast TE involving at least one antihistamine or CCM with another product is more likely to produce neurological symptoms than a TE involving a CCM or antihistamine product alone.

249. Wide Complex Tachycardia in a Pediatric Diphenhydramine Overdose Treated with Sodium Bicarbonate

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Introduction: Diphenhydramine is an antihistamine commonly implicated in overdose. It has many pharmacologic effects, including sodium-channel blockade. Overdoses in adults have been associated with the typical manifestations of sodium-channel blockade, including wide-complex tachycardia (WCT) and Brugada pattern ECG changes. No cases of isolated diphenhydramine ingestion causing WCT in children exist in the literature. We report such a case. *Case report:* An otherwise healthy 13 month-old was brought in by EMS for a witnessed tonic-clonic seizure. Two hours prior to arrival the child had been found with an open bottle of 25 mg diphenhydramine tabs, 24 of which were missing. Maximum possible ingestion was 50 mg/kg. Midazolam was administered en route with seizure resolution. Exam revealed 4 mm pupils, nystagmus, warm, dry, flushed skin, and altered mental status. ECG revealed a WCT at a rate of 180 with a measured QRS duration of 130 ms. The child was treated with a bolus of 1 mEq/kg of hypertonic sodium bicarbonate. Ninety-eight minutes later a repeat ECG revealed sinus tachycardia at a rate of 188 with a narrow QRS complex. The home was searched and no other medications were found. The child's symptoms resolved and she was discharged home the following day with no sequelae. *Discussion:* Diphenhydramine toxicity is a common poisoning in children. Toxicity typically presents with signs and symptoms of the anti-muscarinic toxidrome. Diphenhydramine also has sodium-channel blocking properties, and therefore it is not surprising it may also cause WCT via fast cardiac sodium channel blockade. The QRS prolongation in a child this age is of particular note because of the normally short QRS of roughly 80 ms. One case of WCT in a child from dimenhydrinate exists in the literature, however dimenhydrinate contains, in addition to diphenhydramine, 9-chlorotheophylline, a methylxanthine. Methylxanthine toxicity has been described to cause WCT. Thus the above case is unique in that it is the first case of WCT in a child from isolated diphenhydramine ingestion. *Conclusion:* Wide-complex tachycardia should be recognized as a complication of pediatric diphenhydramine overdose, and it appears responsive to hypertonic sodium bicarbonate.

250. Massive Hydroxyurea Overdose in a Child Treated with Gastric Lavage and Activated Charcoal

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Introduction: Hydroxyurea (HU) is used in the treatment of sickle cell disease to increase fetal hemoglobin. This mechanism of action is unknown, however the drug is a known mitotic inhibitor and has been used as an antineoplastic. Pediatric overdoses are extremely rare. We present a case of a child with a massive HU ingestion treated with aggressive GI decontamination. *Case report:* The mother of a 3-year-old boy with Hemoglobin S disease called her clinic requesting a refill of HU. She wanted the refill because the child had just ingested the entire bottle of the suspension, containing 9 g, though a small amount was spilled. Poison control was contacted and the child was taken to the ED. Gastric lavage was performed and 25 g of activated charcoal was administered. Lavage was completed within 1 h of ingestion. Baseline labs were drawn, including a white blood-cell count (WBC) of 27,000 cells/mL^3. Of note, this child had a baseline leukocytosis between 15,000 and 27,000 cells/mL^3. The child was discharged after 6 h with no symptoms. Labs were drawn twice weekly for a period of 4 weeks. In 2 weeks the WBC fell to 10,100 cells/mL^3, but returned to baseline 14 days later. At no time did the child develop symptoms. *Discussion:* HU is a mitotic inhibitor, inhibiting the enzyme ribonucleoside diphosphate reductase. This enzyme is a crucial rate-limiting step in the synthesis of DNA, and thus HU causes cell-cycle arrest at the G1-S interface. Myelosuppression occurs in adults ingesting 0.8 g/m^2. This child had a BSA of 0.61 m^2 and ingested 9 g for a maximum ingestion of 14.8 g/m^2 of HU. HU is rapidly absorbed

within 90 min. If GI decontamination is to be successful, it must be performed early, as in this case. The spilled drug and the preparation of HU may have resulted in a smaller ingestion. HU is compounded because it is not available as a liquid, and patients are instructed to shake the bottle before using. It is likely some drug was out of suspension and thus not ingested. The fall in WBC could represent a mild myelosuppression, so it is possible the GI decontamination prevented absorption of a toxic amount of drug. *Conclusion:* GI decontamination should be considered in early presenting overdoses of hydroxyurea.

251. Lead Poisoning from Use of Bronze Drinking Vessels During the Late Chinese Shang Dynasty: An In Vitro Experiment

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Introduction: Bronze drinking vessels famous for their intricate carvings and used by aristocracy in the Chinese Shang dynasty (1555–1145 BCE) are known to have been fabricated with alloys containing soft metallic lead. For example the famous Shang-period warrior princess Fu Hao was said to be a heavy drinker of wine in bronze cups. However, the contribution of lead leaching from such vessels into the fermented grain wines drunk by the Chinese nobility in ancient times has not been estimated. *Methods:* Three bronze vessels containing 8% lead by weight were fabricated to resemble late Shang bronze drinking vessels. Shaoxing drinking rice wine was purchased locally and placed in the vessels, using a dry white grape-sourced wine and water as comparisons. Lead concentrations in the liquid matrix were measured using atomic absorption spectrometry (AAS) techniques. *Results:* Significant amounts of lead had leached into the liquid within 1 day in the vessels (>3,000 mg/L in water and >20,000 mg/L in rice wine and white wine). Table 1 shows results of the first experiment.

The amount of leaching appeared to plateau after 7 days and was correlated with the acidic pH of the liquid. Vessels were washed; the experiment repeated; and it showed similar results. *Discussion:* Significant lead contamination of Shaoxing rice wine was detected when it was left in bronze drinking vessels fabricated to resemble late Shang dynasty bronze vessels. If a liter of contaminated wine was drunk daily, the daily intake of lead could have been as high as 85 mg. By contrast the current EPA action level for lead in water is 15 µg/L. Such a high degree of contamination could likely cause chronic lead poisoning, affecting the health of ancient Chinese Shang era nobility who used bronze beverage containers, before lead was excluded from the manufacture of bronze. Fu Hao could have suffered chronic lead poisoning.

252. First Seizure After Consumption of 5-Hour Energy

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Background: Energy drinks represent a 3.5 billion dollar annual industry that specifically targets adolescents and young adults with aggressive marketing campaigns. The health consequences of energy drink use in adolescence are unknown. We report an adverse event in a teenager after consumption of 5-Hour Energy®. *Case report:* A 15-year-old boy presented to the ED for new-onset seizure activity. Two hours after drinking two bottles of 5-Hour Energy® in rapid succession, the patient experienced a witnessed, generalized, tonic-clonic seizure. His past medical history was negative for prior seizures, or head trauma. This was his first exposure to 5-Hour Energy®. In the ED, he became post-progressively more responsive, and vomited repeatedly. On return to a normal senosorium, the patient described a persistent headache. His vital signs were significant for a pulse of 120 beats/min, and a blood pressure of 128/69 mmHg. CT of the brain was unremarkable. The patient's serum chemistries were notable for a potassium of 3.3 mEq/L®®. Urine drug testing with chromatography/mass spectrometry was positive for caffeine and metabolites, but negative for other stimulants or epileptogenic medications. The patient described drinking the energy drinks in an attempt to modify his sleep schedule before the start of the school year. *Case discussion:* This patient experienced his first seizure in the setting of energy drink use, and sleep deprivation. He also displayed typical symptoms of caffeine toxicity, including vomiting, tachycardia, and hypokalemia. While causality cannot be established in this single case, the criteria of temporal relationship and plausibility are satisfied; more data on the adverse effects of energy drinks in adolescents is urgently needed. *Conclusions:* Reporting of energy drink-related adverse events is haphazard. We encourage the communication of all potential energy products adverse events to the Food and Drug Administration via MedWatch. Without these data, the FDA will be hard-pressed to take action, if necessary, in limiting or recalling energy products. Medwatch reporting can be accomplished online at the following website: http://www.fda.gov/safety/MedWatch/default.htm.

253. Massive Acetaminophen Ingestion Resulting in Hepatic Injury Despite Early use of *N*-Acetylcysteine

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Background: Very large overdoses of acetaminophen (APAP) have been associated with coma and acidosis in the absence of hepatic failure. Treatment with *N*-acetylcysteine (NAC) within 8 h of APAP ingestion is generally effective in preventing severe liver injury. We present a case of massive APAP overdose treated with NAC within 4 h with subsequent hepatic injury. *Case presentation:* A 39-year-old woman overdosed 20 min after a fight with her husband, with the time confirmed by a text message and a purchase receipt for the APAP. Paramedics found her unresponsive, with a BS = 105 mg/dL, BP = 101/76 mmHg and HR = 100 bpm. Empty bottles of APAP, alprazolam, and citalopram were found. Four hours APAP = 237 mcg/mL and ETOH = 127 mg/dL. LFTs and PT were normal. CNS depression was attributed to ETOH and alprazolam. She was intubated 3 h post ingestion, and started on IV NAC 4 h post ingestion. She was transferred to our hospital. Arrival ABG revealed pH = 7.44 and pCO_2 = 25, she was more responsive, and following some commands. Urine GCMS showed APAP, caffeine, citalopram, and benzodiazepine. On re-evaluation 18 h after the OD, she was deeply comatose, prompting a laboratory reassessment. At 18 h: APAP = 748 mcg/mL, serum CO_2 = 16 mmol/L, lactate = 5.5 mmol/L and PT = 18.5 s. AST, ALT, and lipase remained normal. Over the next 3 days, PT rose to 33.6 s, AST to 6,665 IU/L and ALT to 6,789 IU/L, before returning to normal values. NAC was continued until recovery was noted. *Discussion:* NAC is considered effective in preventing acute APAP-induced liver injury if administered within 8 h of ingestion, regardless of the dose of APAP ingested. In this case, recurrence of coma and late onset of acidosis without clear etiology lead to discovery of the extremely high APAP level. Despite the massive OD, the development of hepatic injury in this patient was unexpected. *Conclusion:* In rare cases, APAP overdose may result in acute hepatic injury despite early and continued use of NAC.

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Time (in bronze vessel)	Water pH 6.0 (µg/L)	Chenin blanc white wine pH 3.3 (µg/L)	Shaoxing rice wine pH 4.1 (µg/L)
Pre-decanting	0	0	0
2 min	397	2,480	2,590
1 day	13,900	116,000	45,900
2 days	23,200	103,000	76,700
4 days	25,600	95,000	80,000
7 days	13,400	113,000	85,000

254. Transient Regional ST Elevation Mimicking Acute Myocardial Infarction Following Intentional Ibuprofen Overdose

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Background: Life threatening complications from ibuprofen overdose are infrequent. CNS and GI complications are the most common clinical findings. We describe a case of a large ibuprofen overdose associated with transient regional ST segment elevations. *Case:* A 56-year-old female with no known cardiac disease presented 5 h after ingesting up to 200 tabs of 200 mg ibuprofen and alcohol. She became progressively more lethargic and was intubated for airway protection. Initial vital signs were: *T* 35.5, HR 110 BP 89/43, RR 8. ABG after intubation was: 7.30/42/136/20/-6. A urine drug screen was negative for cocaine and methamphetamine. An ECG, as interpreted by the consulting cardiologist, revealed sinus tachycardia with concave up ST elevation and J point elevation in the inferior leads and diffuse J point elevation throughout. A comparison ECG was not available. Transthoracic echocardiogram was negative for wall motion abnormalities. Three sets of troponins were also negative. The patient recovered by the next day and was extubated. Repeat ECG 16 h later showed resolved ST segment elevation. *Discussion:* In addition to acute myocardial infarction, ST elevation can be seen in acute pericarditis and myocarditis, hyperkalemia, Brugada syndrome, pulmonary embolism, and Printzmetal's angina. Except in rare cases of multisystem organ failure, isolated cardiovascular effects from ibuprofen overdose have not been reported. *Conclusion:* To our knowledge, we describe the first case of transient regional ST segment elevations in a patient with an ibuprofen overdose.

255. Delayed Hyperglycemia Following Verapamil Overdose

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Objective: To describe a case of verapamil overdose where hemodynamic instability preceded hyperglycemia by several hours. *Case report:* A 44-year-old nondiabetic female presented to the emergency department (ED) following suspected overdose of verapamil, clonazepam, ethanol and oxycodone-acetaminophen. Doses and time of ingestion were unknown. On arrival her vital signs were blood pressure (BP) 102/52 mmHg, heart rate (HR) 88 bpm, respiratory rate 22 bpm, temperature 35.3°C; initial serum glucose was 136 mg/dL. Physical exam was significant for somnolence, non-focal neurological exam, dilated and sluggish pupils bilaterally, and normal lung and cardiovascular exams. Laboratory tests were normal except for a serum lipase of 330 U/L and an elevated white blood cell count of $18.9 \times 10^3/mm^3$. Initial ECG showed an accelerated junctional rhythm at 73 bpm. Serum glucose 2 h after presentation was 100 mg/dL. Her BP dropped to 88/55 mmHg with a HR of 71 bpm 4½ h after presentation; after 2 more hours she had a glucose of

128 mg/dL, BP of 67/38, and HR of 60 bpm. Eight hours after presentation and 4 h after onset of hypotension, serum glucose rose to 402 mg/dL. Her hypotension was treated with calcium gluconate, calcium chloride, glucagon, dopamine, and norepinephrine; she did not require pacing or high-dose insulin therapy. She was intubated due to depressed mental status. Within 24 h of presentation she was normoglycemic, extubated and weaned from pressors. Serum verapamil concentration 8 h after presentation was 1,400 ng/mL. *Discussion:* Multiple case reposts and animal studies describe hyperglycemia following calcium channel blocker (CCB) overdose. Proposed mechanisms include impaired insulin secretion and increased peripheral insulin resistance. Elevated serum glucose (>140 mg/dL) can be predictive of more severe CCB poisoning. However, our case indicates hyperglycemia can be a late finding in CCB poisoning, after the development of hemodynamic instability. *Conclusion:* Clinicians should note that normoglycemia in an unstable patient does not necessarily rule out the possibility of CCB poisoning.

256. Cardiac Insufficiency Monitored by NT-proBNP Following Colchicine Induced Cardiomyopathy

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Case report: A 46-year-old man ingested 75 tablets of Colchicum dispert equivalent to 37.5 mg of colchicine in a suicidal attempt. He developed severe gastroenteritis, leucocytosis (9.43 G/L), elevated transaminases (ALT 98 U/L, AST 326 U/L), thrombocytopenia (67 G/L), hypophosphataemia (1.3 mg/dL), and hypocalcaemia (1.71 mmol/L). Thirty-six hours after the intake, concentration of colchicine in serum was 3.7 µg/L. On day 3 leucopenia (1.82 G/L) and thrombozytopenia (22 G/L) were observed which improved under G-CSF treatment. A rebound leucocytosis was seen on day 7 (14.77 G/L). The patient underwent calculated antibiotic management. Intensive care treatment lasted 8 days before the patient was transferred to our psychiatric clinic where he developed alopecia and polyneuropathy. Haemodynamic profile of cardiac failure was seen. It appeared in low blood pressure (90/60 mmHg), negative T-waves (V2–V6), elevation of Troponin T, CK and NT-pro BNP (N-terminal pro-Brain Natriuretic Peptide). Echocardiography showed a dilatation of the right ventricle. The patient needed inotropic support for 72 h. NT-pro BNP was 3,627 pg/mL on day 1 (normal < 88 pg/mL). It decreased to near normal on day 8 (118 pg/mL). *Discussion:* Colchicine induced cardiomyopathy is a rare but lifethreatening event in colchicine poisoning. How long and how much the myocard is involved can be assessed by determining NT-pro BNP.

257. Oxcarbazepine Overdose Causing an Accelerated Junctional Rhythm with Atrioventricular Dissociation

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Background: Oxcarbazepine (Trileptal) is a drug that is structurally and functionally similar to carbamazepine. Cardiac conduction abnormalities have not been reported in oxcarbazepine ingestion. We report a case of accelerated junctional rhythm with atrioventricular dissociation following intentional oxcarbazepine overdose. *Case report:* Forty-one-year-old female presented with altered mental status after a self reported ingestion of 90,300 mg tabs of oxcarbazepine and mouthwash 2 h prior. She arrived with the pill bottle and a pill in her mouth. She was disoriented, slurring her speech, and combative. She had a regular heart rate at 72 beats per minute, blood pressure 111/68, and adequate respirations. Two liters of normal saline were given intravenously with 1 g magnesium, 100 mg of thiamine, 1 mg of folate and 5 mg of droperidol. EKG showed AV dissociation with an accelerated ventricular rhythm at 86 beats per minute. Serum ethanol was 0.64 g/dL, and potassium was 3.4 meq/L, which was treated. At 5 h post ingestion, she spontaneously regained sinus rythm. The initial oxcarbazepine metabolite level returned at 33.3 mcg/mL. *Case discussion:* Oxcarbazepine is a newer drug approved for treatment of partial seizures, and also used in bipolar affective disorders and trigeminal neuralgia. It is a structural derivative of the antiepileptic carbamazepine (Tegretol), and similarly exerts its clinical effect by blockade of voltage-sensitive sodium channels. Oxcarbazepine is a prodrug that is reduced by hepatic enzymes to a pharmacologically active metabolite 10-monohydroxy derivate. Sinus bradycardia and hypotension have been reported following accidental oxcarbazepine overdose. This is the first reported case of atrioventricular dissociation in oxcarbazepine overdose. However, cardiac conduction abnormalities, from AV conduction delay to complete heart block, have been well-documented in carbamazepine exposure, suggesting similar mechanisms. Urine was positive for oxcarbazepine and prescribed medications-venlafaxine and cetirizine. *Conclusion:* This is the first report of AV dissociation and accelerated junctional rhythm with oxcarbazepine exposure. Cardiac conduction abnormalities should be considered in oxcarbazepine overdose.

258. Strychnine Poisoning with Cholinergic Features After Exposure to Cambodian Pesticide

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Background: Strychnine poisoning typically presents with generalized muscular contractions with intact mental status. We report a case of strychnine poisoning presenting with an initial cholinergic clinical picture after exposure to a Cambodian pesticide. *Case report:* A 36-year-old Cambodian man ingested a handful of a ground plant-like substance 30 min prior to arrival in the ED. His symptoms were vomiting, drooling, muscle twitching, and difficulty opening mouth due to spasms. Vital signs were HR: 118 bpm; BP: 137/87 mmHg; RR: 18/min and O_2sat: 98% RA. On exam, pupils were 4 mm B/L and reactive. He had weakness in upper extremities and increased rigidity in lower extremities. The patient reported ingestion of a substance from Cambodia called "kroup slang" that "kills everything." We presumed cholinergic poisoning based on symptoms and the geographic origin of the substance. After administration of atropine, the drooling subsided, the patient was able to open his mouth, and upper extremity strength improved. The clinical course supported our initial diagnosis. PAM was started after a total of 6 mg of atropine was given. Further investigation via Cambodian interpreter suggested this to be a strychnine containing compound known as "slang nut." This prompted elective intubation, OG lavage and administration of AC. Pertinent labs included negative serum and urine tox screen, lactate: 2.7 mmol/L, bicarbonate 19.6 mmol/L and CK: 1,580 U/L. The patient was sedated and admitted to the ICU for combined strychnine and cholinergic poisoning. In the ICU, rigidity improved and sedation was titrated off. The CPK peaked at 4,200 U/L. Patient recovered and was extubated on hospital day #3. LC/MS analysis identified strychnine 3,200 ppm and propoxur 0.270 ppm. *Case discussion:* This is a case of strychnine poisoning where the presence of a carbamate compound masked the clinical picture potentially leading to a delay in appropriate diagnosis and treatment. Difficulties in this case include the mixed clinical presentation and inability to identify substance upon patient presentation. *Conclusion:* We alert clinicians to the possibility of combined cholinergic and strychnine toxicity from exposure to pesticides from Southeast Asia.

259. Prolonged, Refractory Hypoglycemia After Insulin Glargine Overdose Treated with Continuous D50 Infusion and Confirmed with Insulin and C-peptide Levels

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Objective: We report a case of massive insulin glargine overdose confirmed by serum insulin and C-peptide levels requiring prolonged, concentrated dextrose infusions. *Case report:* A 76-year-old woman with history of type II DM, pancreatic cancer, HTN and CAD was found obtunded and diaphoretic following administration of 960 units (U) of insulin glargine in a suicide attempt. She adamantly denied coingestants and the reported amount of insulin injected remained constant. Initial capillary blood glucose was 30 mg/dL. Due to persistent, recurrent hypoglycemia, the patient received a total of 10 D_{50} boluses, as well as 3 h of D_{10}W, and 66 h of D_{25}0.45NS infusions (see graph). Due to volume overload, D_{50}0.45NS was utilized and infused for 39 h. Pertinent initial laboratory studies included WBC 16.9 k/mm^3, K 2.7 mmol/L, and Mg 2.0 mg/dL. Serum insulin and c-peptide levels drawn 30 h after time of injection were 349 µIU/mL (reference 2–25 µIU/mL) and <0.5 ng/mL (reference 1.1–4.4 ng/mL), respectively. Persistent hypokalemia during therapy required aggressive supplementation. After a total 108 h of therapy and 1,686.25 g of glucose infused, the patient's hypoglycemia resolved and sliding scale insulin was restarted. *Conclusion:* Insulin glargine (Lantus) is a long-acting human insulin analog desirable for its predictable pharmacokinetics and lack of significant peak effect. We present a case of intentional overdose confirmed by serum insulin and c-peptide levels resulting in hypokalemia and prolonged, refractory hypoglycemia requiring over 1,680 g of glucose. Prolonged, continuous glucose infusions may be required in significant insulin glargine overdose and in this case a solution of D_{50} was necessary due to volume overload. In addition to a protracted course, clinicians must also be aware of issues such as electrolyte abnormalities, hypertonicity of fluids, and volume overload when treating these patients.

260. Ingestions of Prescription Cough and Cold Medications in Children Under 2 Years Reported to Poison Centers

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Background: In October 2007, over-the-counter (OTC) cough and cold medications (CCMs) labeled for use in children under 2 years of age were voluntarily withdrawn. A pre-publication AAPCC NPDS

Table 1. Ingestions of prescription cough and cold medications in children under age 2 years over time (Table for Abstract 260)

Year	Number of therapeutic errors	Rate of therapeutic errors/100,000 children	Number of unintentional general	Rate of unintentional general/100,000 children
2005	447	5.5	141	1.7
2006	457	5.5	159	1.9
2007	345	4.1	127	1.5
2008	328	3.8	111	1.3

data analysis concluded that, in children under age 2 years, rates of therapeutic errors and unintentional general ingestions involving OTC CCMs declined by 54 and 16% respectively following the withdrawal. Concerns exist that parents with newly-limited options may have obtained prescription CCMs to treat their children, leading to increases in exposures to these products. *Methods:* The AAPCC NPDS was queried for exposures to all CCMs in children under the age of 2 years. Prescription CCMs exposures were identified using specific product codes. Therapeutic errors and unintentional general ingestions from January 1, 2005 to December 31st, 2008 were included. Rates per 100,000 children were calculated using U.S. Census Bureau data. Annual rates are reported as number of cases per 100,000 person-years. For secular comparison, the total number of therapeutic errors reported to the AAPCC NPDS during the same time frame was obtained. *Results:* For comparison, rates of therapeutic errors involving drugs/products not affected by the 2007 withdrawal remained constant at approximately 5% of total exposures in children under 2 years of age.
Discussion: A 31% decrease in rates of therapeutic errors involving prescription CCMs from 5.5 in 2006 (year immediately prior to withdrawal) to 3.8 per 100,000 children in 2008 (year immediately post withdrawal). Additionally, a 32% decrease in rates of unintentional general ingestions of prescription CCMs from 1.9 in 2006 to 1.3 per 100,000 children in 2008. *Conclusion:* The voluntary withdrawal of OTC CCMs did not lead to an increase in therapeutic errors or unintentional general ingestions of prescription CCMs ingestions reported to poison centers.

261. Unintentional Victims: Children at Clandestine Methamphetamine Labs

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Background: A growing concern for child protective agencies is children of methamphetamine users. It is estimated that children are present at 20% of clandestine drug laboratories and are sometimes forced to assist in methamphetamine production. *Methods:* Over a 5-year period (2004–2008), we analyzed Hazardous Substances Emergency Events Surveillance (HSEES) data collected by the Agency for Toxic Substances and Disease Registry. Information about acute events involving hazardous substances was collected, including the substance(s) released, number of victims, number and types of injuries, and number of evacuations. Another source of information was the Clandestine Laboratory Seizure System (CLSS). The records contained in the CLSS are under the control and custody of the Drug Enforcement Administration (DEA). The El Paso Intelligence Center (EPIC) is the central repository for these data. Frequency tables were constructed using descriptive statistics and confidence intervals. *Results:* According to EPIC, there were 47,986 methamphetamine lab incidents during the 5 year study period. This includes labs (58%), dumpsites (22%), and/or chemical and glassware seizures (20%). Approximately 20% of methamphetamine labs seized by law enforcement have children living in them. There were an estimated 7,797 children injured at or affected by methamphetamine labs during the 5-year study period. A child affected by methamphetamine labs includes children who were residing at the labs but may not have been present at the time of the lab seizure as well as children who were visiting the site. The 2004 data set showed that 66% (589 of 893) of the children reported present at seized methamphetamine laboratory sites subsequently tested positive for toxic levels of chemicals in their bodies. *Conclusions:* In increasing numbers, children of methamphetamine producers have become victimized by their parents' illegal manufacture and use of this substance. These parents neglect their children's development and place them in hazardous living conditions that can cause serious health problems, even death. It is vital for clinicians of all specialties to become aware of medical and social considerations in treating children affected by methamphetamine abuse.

262. Analysis of Acute Pesticide Poisoning Cases Reported to the Poison Control and Drug Information Center in Palestine

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Background and objective: Pesticide poisoning is a worldwide and fatal problem. Palestine is an agricultural country with extensive and unregulated use of pesticides. However, no epidemiological data are available regarding pesticide poisoning in Palestine. Thus, the objective of this study was to analyze pesticide poisoning cases received by the Poison Control and Drug Information Center (PCDIC) in Palestinian National Authority area. *Methods:* all calls received by the PCDIC since its establishment in the year 2006 till now were analyzed. Focus of analysis was made on cases that involved pesticides poisoning. *Results:* a total of 176 calls regarding acute poisoning with pesticides were received, compromising about 15% of the total cases of poisoning during the study period. The average age of poisoned people was 18.9 ± 14.7 years old. Most calls were made by medical doctors (84.1%) followed by governmental agencies (8.5%). Acute poisoning occurred mostly in males (57.4%). The pattern of poisoning was as follows: suicidal (48.3%), accidental (46%), and some cases were not identified. Only 15.9% of the cases had been exposed to a single pesticide, the remaining took a mixture or was unidentified. Calls were made through out all the times and all the days of the week, but more calls were received on weekends and during spring and summer seasons. Most patients (85.1%) have been exposed to the pesticide through oral route; however the amounts were mostly undetermined. Patients had all types of symptoms ranging from nausea and vomiting and leading to coma and death. However, 32.9% of them had symptoms consistent with organophosphate poisoning. Before the establishment of PCDIC, gastric lavage (55.6%) was the major decontamination method used, while charcoal was only utilized in 0.7% of the cases. After calling, the PCDIC guided the treatment based on the micromedex protocols. Follow up was performed in 45.5% of the cases, two patients died, and one entered into coma. *Conclusion:* Pesticides is a major health problem in Palestinian Authority area, and the PCDIC is a powerful tool in guiding therapy and gathering information about pesticides. The management protocols at hospitals need to be updated, and pesticide sale in Palestine should be restricted to trained individuals only.

263. Annual Trends in Zolpidem Exposures Reported to Poison Centers

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Background: Zolpidem is a non-benzodiazepine sedative approved for the short term treatment of insomnia. According to a news article, zolpidem prescriptions increased 53% during 2001–2005. This study examined whether any similar annual trends were observed in zolpidem exposures reported to poison centers. *Methods:* Cases for this retrospective study were all zolpidem exposures reported to a statewide poison center system during 1998–2009. Distributions for selected demographic and clinical factors were calculated for each year and examined for annual trends. *Results:* The number of zolpidem exposures increased each year from 428 (0.29% of total exposures) in 1998 to 1,861 (1.05% of total exposures) in 2009, an increase of 334.8% with a mean annual increase of 14.8%. The proportion of patients aged 0–5 years increased from 6.2% in 1998 to 10.2% in 2009 (mean annual increase of 7.5%). The proportion of exposures that were intentional decreased from 74.9 to 69.9% (mean annual decrease of 0.5%) while the proportion that were unintentional increased from 22.9 to 28.3% (mean annual increase of 2.6%). The proportion of patients already at/en route to a healthcare facility increased from 50.7 to 65.4% (mean annual increase of 2.6%) while the proportion of patients referred to a healthcare facility decreased from 29.2 to 13.8% (mean annual decline of 5.6%). Of the exposures with a known medical outcome, the proportion with no-minor effects decreased from 81.8 to 68.4% (mean annual decrease of 1.6%) while the proportion with moderate-major effects or death increased from 18.2 to 31.6% (mean annual increase of 5.8%). *Discussion:* Zolpidem exposures increased over 300% during 1998–2009 and came to represent over 1% of total reported exposures. The exposures were increasingly more likely to involve young children, be unintentional, involve patients already at/en route to a healthcare facility, and result in more serious outcomes. *Conclusion:* Poison centers need to plan for an increasing number and changing pattern of zolpidem exposures. This may include updating medical guidelines for managing such exposures and increasing public education. Poison centers need to keep abreast of trends in use of medications, since increases in medication use may result in increases in reported exposures.

264. Acute Poisonings in Azerbaijan: A 5-Year Prospective Study

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Background: This pilot study aims to present the toxic-epidemiological and clinical characteristics of acute chemical poisonings in Azerbaijan Republic, where no similar studies have been performed before. *Methods:* In this prospective study the data was obtained from patients admitted to the Republican Clinical Toxicology Center of the Ministry of Health of Azerbaijan in capital Baku city between January 1st, 2005 and December 31st, 2009. *Results:* A total of 6,723 patients were admitted in the Republican Toxicology Center's intensive care unit. The male/female ratio was 1:1.2. Suicidal poisonings were 46% of the total number of hospitalizations. Pediatric group (age under 15 years) amounted to 970 patients or 14.4%. Two thousand three hundred and eighty-five patients or 35.5% of total admissions were poisonings by various pharmaceuticals. 47.8% of this cohort were patients with poisoning by antiepileptic, sedative-hypnotic, antiparkinsonism and psychotropic drugs (rubrics T42/T43 of ICD-10). Overdose by narcotics and psychodysleptics (mostly by heroin) amounted to 254 patients or 3.8% of the total number of hospitalizations. Poisonings by various corrosive substances amounted to 988 patients or 14.7%. 52.4% of this cohort (518 persons) were patients with poisonings by concentrated acetic acid (vinegar essence). A significant part of admissions (13.9%) were chemically conditioned acute toxic-allergic and other adverse drug reaction (including Lyell's and Stevens-Johnson's syndromes). A large number of carbon monoxide poisoning (934 person or 13.9%) mostly due to violation of safety requirements in using the domestic water and other heating devices. Among the other cases snakes, spiders and scorpions venom (6.3%); alcohol (5.1%); organophosphates (2.6%); mushrooms and noxious plants (1.9%) were the agents of poisonings. The mean length of hospitalization was 3 ± 0.22 days. The mortality rate was 3.0% (200 patients). The most frequent cause of fatalities were intoxications by corrosive liquids and especially – concentrated acetic acid poisonings. *Conclusion:* The result of this pilot prospective study enables to identify the main characteristics of toxic-epidemiological situation in Azerbaijan and gives an opportunity to develop national program of poisonings prevention.

265. Fatal Outcome of a Propoxyphene/Acetaminophen (Darvocet) Overdose: Should It Still Be Legal in the United States?

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Background: Propoxyphene, an opioid structurally similar to methadone is marketed in combination with acetaminophen or salicylates. Propoxyphene is also a sodium

channel blocker. Death from propoxyphene overdose may result from respiratory depression or wide-complex dysrhythmias. We report a death from wide-complex dysrhythmia following an intentional propoxyphene/acetaminophen overdose. *Case report:* A 37-year-old agitated woman was brought to the ED by EMS. Vital signs: BP, 150/106 mmHg; pulse, 120 beats/min; respirations, 30 breaths/min; room air O_2 saturation, 99%. She rapidly became bradycardic with a HR of 40 beats/min and unresponsive with no measurable blood pressure. CPR and endotracheal intubation were performed, and atropine and epinephrine were given with electrical defibrillation. The systolic BP returned to 40–65 mmHg with a pulse of 30 beats/min. The ECG showed a QRS interval of 180 ms. Sodium bicarbonate, calcium chloride, a glucagon infusion (5 mg/h) and high-dose insulin was administrated without improvement. A transcutaneous pacer was applied but could not capture. Despite high dose infusion of norepinephrine and vasopressin she expired about 4 h later. Tablets of propoxyphene/acetaminophen were brought in by family and her serum propoxyphene concentration was subsequently reported as 615 ng/mL (200–400 ng/mL). *Case discussion:* Propoxyphene overdoses are characterized by respiratory depression and sodium channel blockade. Despite significant toxicity, several studies show that propoxyphene's analgesic effect is no better than acetaminophen alone. In 2005, British authorities initiated phased withdrawal of propoxyphene as a result of over 300 deaths/year. In the US since the 1980s, there have been over 2,000 deaths from propoxyphene. At an FDA meeting to determine if propoxyphene should be withdrawn, 14 members voted to withdraw the drug and 12 against withdrawal. Despite this vote, the FDA ultimately decided against withdrawal and recommended a boxed warning about the potential cardiotoxicity. *Conclusion:* Propoxyphene overdose and fatalities continues to occur in the US. This raises questions about the risk/benefit of this combination product.

266. Epidemiology of Ethylene Glycol Poisoning and Treatment Trends Reported to US Poison Centers 2000–2007

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Background: Ethylene glycol (EG) is used in industrial and home settings and exposure often results in evaluation at a health care facility. The objective of this study is to describe the epidemiology, clinical effects, outcomes and trends in treatments for EG exposures reported to US poison centers over an 8 year period. *Methods:* This is an observational case series of human exposures to EG reported to US poison centers. Data are collected prospectively using a standard electronic medical record format. Cases were retrospectively identified by substance codes for "ethylene glycol" (chemical and automotive products) for the years 2000–2007 from the national database. Frequencies and cross tabulations were used to describe the data. *Results:* A total of 48,478 EG exposures were reported. EG was the sole substance in 44,730 cases (92%). A bimodal exposure peak for age occurred at 0–5 years (5,663, 13%) and 20–49 years (25,007, 58%). The rate of evaluation in a health care facility was similar for both adults and children (37 vs. 35%). The route of exposure was ingestion in 15,210 cases, of which 12% resulted in a moderate or major outcome and 1% in death. Other routes of exposure included inhalation (n = 3,824), dermal (n = 3,096), and ocular (n = 1,981). These routes resulted in local effects only with no reports of metabolic acidosis or renal injury. The frequency of ethanol therapy decreased and fomepizole therapy increased over time in both adults and children. Fomepizole (n = 361) surpassed ethanol (n = 252) use in 2002. The rate of fomepizole over ethanol use increased through 2007. The rates of hemodialysis remained comparatively constant for both adults (range 15–26%) and children (range 3–6%) over the 8 years. *Conclusions:* EG continues to be an important substance involved in exposures in children and adults. Moderate and major effects are more likely to occur after ingestion. There were no deaths or systemic toxicity associated with inhalation, dermal, or ocular exposure. Fomepizole replaced ethanol as the most common antidote and the use of hemodialysis remained relatively constant.

267. A Descriptive Study of Poison Exposure Calls from Pregnant Females in Alabama

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Background: There is a paucity of literature describing poison exposures (exp) during pregnancy in Alabama (AL) and the entire U.S. This study is a retrospective review of poison exp in pregnant females (PF) reported to our Regional Poison Control Center (RPCC) from 2006–2008. The study objectives include: 1) comparing the reasons for poison exp calls – RPCC (AL, n = 158) vs. nationally (NPDS, n = 26,412); 2) identifying the five top substances involved in poison exp in AL PF; 3) evaluating the accuracy and internal validity of study data. *Methods:* Data was collected from Toxicall® reports – reason/term of pregnancy and substance category in PF exp and the National Poison Data System (NPDS) enterprise report reason/term of pregnancy. Epi Info™ was used to analyze rates by reason for AL vs. National data using a 95% CI to evaluate rate differences between the two groups. Case progress notes were reviewed to evaluate accuracy of data entry for reason, substance and trimester. A *z*-test for concordance evaluated the rate of accuracy of data entry vs. a standard of 95%. *Results:* Five categories and 19 subcategories for reasons of exposure in PF were compared between Alabama and nationally, and only four of the categories/subcategories were found to be significantly different.

The top five substances for pregnancy exp were: analgesics, cleaning products, insecticides, food, and sleep aids. The data entered by SPIs for substance and trimester had a 100% and a 99.4% accuracy rate, respectively; both with a $p < 0.001$. The data entry by SPIs for the reason of exp had 84.8% accuracy rate and was significantly lower than the standard of 95%, $p < 0.0001$. *Conclusion:* Unintentional exp were under reported in PF from AL. This lower reporting may indicate that PF call their prenatal care provider with questions about unintentional poison exp (e.g. therapeutic errors) instead of the poison center. The higher reporting of intentional exp among PF in AL vs. the U.S. may be due to SPI miscoding nationally. RPCC SPIs' accuracy rates are high for substance and trimester, but could improve on data entry for reason of exposures.

268. Unintentional Oral Misuse of Methanol Products – Incidence and Health-Care Costs

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Background: Many methanol (MeOH) ingestions called to PCCs are referred to EDs. Many of these avoidable events result from transferring of MeOH from its original child-resistant container or oral siphoning of these products. This study reports the incidence and health-care cost of these product misuses. *Methods:* All MeOH cases for 2008–2009 recorded by the Illinois Poison Center were evaluated for type of product, age/sex, reason for exposure, treatment/disposition and outcome. *Results:* Two hundred and eighty-one MeOH cases were identified of which 148 (52.7%) were ingestions. 63/148 (42.6%) ingestions were due to oral siphoning (18), or secondary to transfer and storage into another container (45). The median age was 37 years (1–83 years). 44/63 were male. Products involved windshield washer solvent/de-icer (49), model car fuel (11), and other (3). Containers involved in transfers: water bottle (22), Gatorade® bottle (3), glass/cup (4), soda bottle (3), shot glass (2), squeeze bottle (1), and other (11). Forty-five patients (Pts) received Tx in an ED. Five were transported by EMS. Thirty-three were treated/released from the ED, seven admitted to GMF, and five admitted to ICU. Thirty had basic chemistries drawn, 29 had measured MeOH levels [0 mg/dL (10), 1–19 mg/dL (9), 23 mg/dL (1), unknown (9)]. Eighteen received one dose of 4-MP, 3 received 2 doses, and 1 received IV EtOH. No Pt became acidotic or was dialyzed. *Discussion:* Over 40% of all MeOH ingestions occurred as a result of careless handling and storage of MeOH products. The estimated cost of 1 Pt receiving ED Tx, initial labs including MeOH level, IV placement, and 1 dose of 4-MP is $3,173. Costs are higher for cases requiring admission and additional doses of 4-MP. The estimated cost of HCF Tx for these 63 patients is $132,754. *Conclusion:* MeOH poisonings associated with oral siphoning or transferring to other containers are avoidable. Although the cases in this study were generally benign, the cost of evaluation is considerable. Most of these product labels do list warnings such as "danger . . . poison . . . contains methyl alcohol . . . cannot be made non-poisonous," etc. Additional preventative measures such as stronger product warnings and public education against these practices should be implemented in order to lower their incidence and associated health-care costs.

269. And the Survey Said! Use of Web-Based Survey as Education Tool in a Poison Center

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Background: During routine case review, we identified several cases with extended antidote therapy. Although patients had good outcomes, the reasons for the therapy extensions were unclear. When the Specialists in Poison Information (SPI) were asked about their treatment decisions, a variety of answers was returned. Recognizing an educational opportunity, we decided we needed a simple way to characterize our baseline (current) state. Instead of a formal lecture, we opted to poll the SPIs on their current management understanding using a standard internet survey tool. *Methods:* We selected www.zoomerang.com as our survey platform based on ease of use, functionality, and expense (no cost associated with basic membership). A hypothetical teaching case involving a situation where the antidote was extended inappropriately was created with seven survey questions. SPIs were guided through the case and asked to select the action which most closely resembled their own case management practices. Specialists were given 1 month to complete the survey. Time off the phone to complete the survey was not given to the SPIs. The survey link was emailed to staff and a reminder email was sent 2 weeks before the deadline. Individual results were kept anonymous as they were not required to "sign in." A post-survey analysis was presented to the SPIs. *Results:* A total of 25/33 (76%) SPIs completed the survey by the deadline and 1 SPI after the deadline. Half of SPIs agreed with the original course and management of the case and the other half answered they would have managed the case differently. 17/26 (65%) of SPIs wrote comments which helped explain their rationale

Categories/subcategories	Number of calls AL (%)	Number of calls national (%)	p Value
Unintentional exposures	60.83	73.54	$p < 0.0001$
Unintentional misuse	5.07	10.35	$p = 0.02$
Intentional exposures	31.80	19.83	$p < 0.0001$
Intentional suspected suicide	25.80	13.85	$p < 0.0001$

for the decisions they made. Estimated time to complete survey was 5–10 min. We presented a formal lecture on the findings and reviewed management rationale. Changes to our current management guidelines were made as a result of the survey findings. *Conclusion:* Web-based tools are frequently utilized in many work environments. The use of a web-based survey in a poison center can provide a valuable platform for educational and practice-based applications. Our survey results showed that re-education was needed on some key management issues. Surveys can be non-threatening, cost-effective and fun for participants.

270. Blogging for Poison Centers: The Utilization of Blog Sites to Increase Awareness of Poison Center Services

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Background: Poison Centers (PC) have recently utilized social networking sites such as Facebook and Twitter to provide information about PC services. Followers on these sites are easily reached due to internet accessibility on computers and hand held mobile devices. To increase traffic to Poison Center web sites, popular web pages and blogs can be utilized as a tool for referral. *Case report:* The Palmetto Poison Center (PPC) collaborated with a popular couponing blog, Southern Savers, in South Carolina to promote the PPC during Poison Prevention Week (PPW). This popular blog site traditionally posts information about available product coupons, various department store sales, and information about obtaining free items. The site agreed to post a story regarding one mother's experience of her twins ingesting a medication and the mother's use of PPC services. Visitors to the blog site were provided with a link to the PPC website and Facebook fan page. Southern Savers agreed to distribute a giveaway item for every hundred persons that joined the PPC Facebook fan page. Blog visitors had the ability to comment on the PPC post and share additional experiences. *Case discussion:* The post launched the Monday of PPW with 167,000 visitors to Southern Savers on day 1. The post was run for the rest of PPW. On average there are 1 million visits per week to the blog. The PPC's website visits increased over 50% during PPW. Additionally, requests for materials increased 100%. The PPC Facebook fan page gained an additional 400+ fans with over 170 positive comments posted to the Southern Savers blog in support of the PPC and Poison Centers in general. *Conclusion:* Partnerships with popular blog sites can increase traffic to Poison Center websites and social networking sites such as Facebook. Outreach efforts such as these can target a large population at no cost. This partnership has the ability to expand to other popular blog sites throughout the US and increase awareness of Poison Center services.

271. Unit Dose Packaging May Decrease Amount of Over-the-Counter (OTC) Medicine Ingested Following Accidental Unsupervised Ingestions (AUIs)

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Objective: AUIs occur when children self-ingest medicines that are not kept out of their reach. The effect of unit dose packaging on AUIs with OTC medicines hasn't been studied. After the 2008 introduction of Children's Benadryl® Perfect Measure™, liquid diphenhydramine packaged as unit dose spoons, we evaluated the effect of new packaging on AUIs. *Methods:* Search of McNeil postmarketing database over 1 $^{3}/_{4}$ years (1Q08–3Q09) for US reports in children <12 years with single ingredient diphenhydramine & MedDRA terms: accidental drug intake by child, accidental exposure, accidental overdose & failure of child resistant (CR) mechanism. Data on formulation, packaging, & mean amount of diphenhydramine ingested were reviewed. *Results:* McNeil pediatric diphenhydramine products have CR packaging. Two hundred and sixteen reports were identified; 91% reports occurred in children <6 years. *Formulation (% of reports):* 12.5 mg/5 mL liquid packaged in 120 or 240 mL bottles (61%), 12.5 mg/5 mL liquid packaged as ten 5 mL unit dose spoons (6%), 12.5 mg pediatric chewable tablets packaged as 18 count blister card (9%), 12.5 mg pediatric strips packaged as 10 count (1%), 25 mg adult tablets packaged as 24–48 count blister card or 100–148 count bottle, 25 mg strips packaged as 10 count (14%), unspecified (9%). *Reported Mean Amount Ingested (range):* liquid in bottles: 109 mg (6.25–600 mg), liquid in unit dose spoon 33 mg (6.25–50 mg), pediatric chewable tablets 57 mg (12.5–112.5 mg), pediatric strips 42 mg (12.5–62.5 mg), adult tablets/strips 73 mg (12.5–750 mg). *Conclusion:* Pediatric formulations of diphenhydramine are more commonly involved in AUIs than adult forms. Packaging may impact the amount of medicine exposure involved in AUIs. Although the number of AUIs was generally consistent with amount of product distributed, the reported magnitude of pediatric liquid diphenhydramine exposures was lower in reports involving unit dose packaging compared with bottle packaging. These data are supportive evidence that packaging changes may have a significant impact on AUIs. When evaluating the public health impact of packaging innovations, it is important to consider not only the number of exposures but also the magnitude of exposures.

272. Childproof Oil Lamps Are Possible! New Design Burners Can Effectively Protect Children from Poisoning

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Background: For more than 10 years the Federal Institute for Risk Assessment (BfR) and its predecessor institutes have been striving to reduce the risk of poisoning from lamp oil by raising awareness of the hazards. In most of these accidents children drank directly from the unsafe oil lamps, which are mostly in the reach of the children. Therefore, a European standard was published in 2003 (DIN EN 14059: Decorative oil lamps – Safety requirements and test methods) on the initiative of BfR, which stipulates safety requirements and test methods for safe oil lamps for ornamental purposes. However, manufacturers and distributors have so far failed to develop childproof oil lamps for use in homes and gardens or place such lamps on the European market. To protect the children, proposals have been made for an easy construction of child-safe burners. *Method:* Out of concern for children's health the BAM Federal Institute for Materials Research and Testing (BAM), with the support of BfR, has come up with a design study for a childproof burner for lamp oils. This is a very simple and low-cost design that can be constructed without any major technical outlay. Existing lamps can be retrofitted. The burners are designed in such a way that children can no longer open and drink from the oil lamps. It is also much more difficult for them to access the wick. The BAM, the responsible public agency, makes this design available to manufacturers and distributors free of charge on the Internet. Manufacturers can then incorporate it into their own marketable products thereby considerably increasing the safety of their products in line with the Product Safety Act. *Results:* The BAM and BfR activities should be seen more particularly against the backdrop that the actual share of less dangerous substitutes for lamp oils containing biodiesel, mineral oil or coconut oil is quite small, but will increase in the future with a new legislation. *Conclusion:* The still existing gap between dangerous paraffin lamp oils and their safe substitutes can be tightened by constructive measures. The suggested "public open" low-cost design for ornamental lamps can effectively protect children from poisoning.

273. Preferred Methods for Future Contact with Poison Centers: 2-Year Results of a Web-based Survey

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Background: The development of the Internet has impacted and may very well change our way of life. This study was conducted to document the perceived preference for methods of communication with our poison center based on a 2-year, web-based, survey from the residents of our state who access our services via the Internet. *Methods:* Residents of our state can request educational materials or poison prevention programs on our website. The process requires individuals to complete a survey before requesting either educational materials or a poison prevention program. Preference for current and future methods of contact for the five services provided by our center were surveyed, compared, and analyzed between 2008 and 2009. SAS was used for all data management and analysis. *Results:* A total of 3,108 surveys were completed between 2008 and 2009. Nearly one-half of the responders were between the ages of 41 and 55 years old; race/ethnicity consisted of 79% whites; 8% blacks, and 6% Hispanics; approximately 85% were females and more than 95% of the responders reported English as their primary language. Over the 2 years, a marked increase in preference to use email or our website as a means of communication with the poison center was revealed. *Discussion:* The percent increase among the methods of communication between 2008 and 2009 suggests that poison centers should plan using Internet based communication in the future. *Conclusion:* In our "Internet Era," we continue to see the increased use of email, website, or texting to communicate. Surprisingly, this study reveals the public's desire to use Internet-based methods to contact the poison center regarding poison-related issues, rather than using voice communications (hotline or staff contact), even in an emergency. Poison centers nationwide should take this opportunity to both acknowledge the public's preference in using non-verbal communication methods to contact their local poison center and develop a solution to address their needs.

274. Education Project on Risks of Kerosene Focusing on Amish Community

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Background: The Amish communities lead an existence largely separate from normal American culture. Importantly to poison centers, they do not have or use telephones, the primary method of contacting a poison center. The majority, if not all, standard poison prevention materials, including prevention/information pamphlets, phone stickers or magnets with the toll free telephone number or Radio and TV PSAs have no connection or impact in the Amish community. Our poison center noted a number of significant pediatric kerosene, lamp oil and lye ingestions, including two fatalities involving Amish patients. *Method:* Direct consultation with elders in the Amish and Mennonite communities over a year's time on possible ways to educate these communities on the dangers to children from hydrocarbons and lye. *Results:* A series of face-to-face community based meetings was ruled out by the elders as logistically too problematic due to the difficulty in travel (horse and buggy) and resistance to outside influences. We were unlikely to get any significant attendance due to the long hours of travel required to and from such a community meeting. The elders suggested a pamphlet to be distributed at the country stores where the kerosene and lye are sold. A pamphlet was designed to conform to the Amish community standards. Collaboration with local county health departments serving the Amish and Mennonite communities helped identify a distribution method including midwives, clinics, schools, and stores. *Discussion:* Previous educational materials did not address the special needs of a specific

ethnic/social population. Direct involvement of the target community in the educational process will improve likelihood of success. We created a specific pamphlet to meet one community's educational needs. *Conclusion:* Collaboration and flexibility can help bridge gaps to reach underserved ethnic communities.

275. High Fidelity Patient Simulations Enhance Clinical Toxicology Educational Experiences

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Background: Toxicology specific curriculum in Emergency Medicine (EM) Residency Programs is often didactic without actual hands-on experience. The integration of computer enhanced simulation mannequins into the curriculum allows for repetitive and consistent experiences especially with rare exposures and experiences of severe complications of common exposures. This may be the only way physicians can practice the bedside management of these scenarios. *Methods:* All PGY-2 EM Residents have a required toxicology rotation at the Upstate New York Poison Center. Two days per week are spent at the Emergency Medicine Simulation and Training Center (EMSTAT) participating in toxicology simulations which employ Laerdal SimMan® high fidelity mannequins. Seventeen different simulations are currently in use representing common critical poisoning cases as well as rare toxicological scenarios: a tricyclic antidepressant poisoning; calcium channel blocker overdose in an adult and pediatric patient; dermal hydrofluoric acid exposure; a smoke inhalation patient; pediatric hydrocarbon aspiration; an unknown and unresponsive overdose patient. For each scenario, demonstration of both cognitive and psychomotor competencies is required. Because of the computer support for each mannequin, the level of difficulty for each simulation can be varied. Following each scenario, a debriefing session is held. *Results:* The residents note that even though there is a high likelihood of their encountering toxic exposures in the emergency department, the simulations enhance their abilities to treat these patients successfully because of their repeated "real-life" experiences in the simulation center. *Conclusions:* It is clear that high fidelity patient simulations enhance clinical toxicology educational experiences. Residents are able to both learn to identify and appropriately address rare toxicology scenarios as well as become better prepared to manage toxicology patients of all types in the ED. The addition of actual case-based scenarios to the simulation "library" will reduce the likelihood of "practice effect" to assure continued learning improvement in residents' knowledge and skills.

276. What Is a Handful of Pills?

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Background: It is common for patients to present with intentional ingestions which are quantified only as a "handful of pills." Vague descriptions lead to errors in assessing the amount ingested, anticipating toxic effects, and ultimately the appropriate treatment. Our hypothesis was that a handful of medication is a variable amount with no correlation with age or hand size. Secondarily, we believe that physical size of the pill makes a difference, and that smaller pills would lead to larger pill counts in a handful. *Methods:* A convenience sample of healthcare providers, blinded to the intent, participated in the study. After obtaining consent and demographic information, they were asked to take a bottle of acetaminophen (APAP) 500 mg tablets and pour out a "handful." This was then repeated with a bottle of aspirin (ASA) 81 mg enteric-coated tablets. The subjects' palm were measured from the palmer-thumb crease to the palmer-fifth finger crease. Descriptive statistics were used to summarize the data, and correlations between meaningful variables were determined. *Results:* Fifty-five subjects (female 26, male 29) aged 25–61 years (mean 36.8, std 11.2) were enrolled. Pill counts for ASA (mean 84, range 15–230) were larger than that for APAP (mean 28, range 6–63). Poor correlation was found between age and pill counts for ASA ($r = -1.87$, $p = 0.171$) and APAP ($r = -0.15$, $p = 0.916$). Similar poor correlation was found for hand size and pill counts for both ASA ($r = 0.302$, $p = 0.25$) and APAP ($r = 0.193$, $p = 0.159$). Correlation of pill counts for ASA vs. APAP was $r = 0.781$, $p < 0.01$. *Conclusion:* We used two common intentionally ingested pills of small (ASA 81 mg) and large (APAP 500 mg) size in this study. Our hypothesis that neither age nor hand size would correlate well with a "handful of pills," turned out to be correct. While hand size vs. ASA did have a technically significant correlation, it was extremely poor at $r = 0.302$. Pill size mattered, with pill counts higher for ASA than APAP. Subjects were quite consistent, with relatively good correlation between pill counts for ASA vs. APAP. This manifested as subjects that poured out "small handfuls" of ASA, also poured out "small handfuls" of APAP. In conclusion, there is no standard number that constitutes a "handful of pills," but it is instead a subjective amount to each person dependent on pill size.

277. How to Prepare for Unusual Toxic Outbreaks

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Background: Good preparedness is essential to successful management of outbreaks, whatever their nature. Preparing for unusual toxic outbreaks poses extra demands on rapid detection, diagnosis, and communication. As there is much uncertainty with unusual outbreaks, communication at all levels (first responders, public, media) demands special skills. Unusual outbreaks may be patients presenting with symptoms not fitting clinical pictures, or an unusual number of cases, higher than expected over a given time period. *Rapid detection and diagnosis:* Poisons center's surveillance systems contribute to the early detection of such deviations. Poisons center specialists and clinical toxicologists are frequently consulted for unrecognized symptoms in patients. Computer-based differential diagnostic systems for chemicals contribute to establishing possible causative agents. These systems are time-saving and increase diagnostic accuracy, although they can never be a replacement for sound clinical judgment. A third key factor is rapid sharing of information between various (governmental) organizations. In the Netherlands, a national multidisciplinary assessment team for chemical incidents has been established. Information collected by one institute, is rapidly distributed to all others. This team then provides first responders and authorities with coherent advice on the adverse effects for public health and the environment. Possible actions to reduce the number of human casualties and the size of environmental pollution are proposed. This expertise is available 24 h a day. Likewise, a Laboratory Network of specialized reference laboratories has been established, so no time is lost in finding laboratory expertise. *Risk communication:* Thorough knowledge of the information needs of all groups involved (first responders, local and national authorities, public, media), and their behavior in circumstances with high uncertainty is essential. At all stages of the outbreak it is vital to keep an open mind. For instance: is it truly or totally a toxic outbreak or does mass psychogenic illness creep in? In this latter case, suppressing turmoil by good communication is equally important as providing all resources for adequate first response. Using a multidisciplinary approach will improve communication.

278. Poison Control: A Community Education Program

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Children in developing nations, particularly those in the 0–6 age group, are at an increased risk of accidental poisoning and often have limited access to live-saving emergency medical care. Together household chemicals and drugs are responsible for the majority of reported childhood poisonings (68%). Fortunately, community education coupled with the effective use of poison control stickers can be implemented at minimal cost. Here we outline the program implemented by Unified for Global Healing (UFGH) and in six villages outside Gurgaon, India. We found that educating families about accidental ingestion of poisons, particularly prescription medication, was easily incorporated into the medical portion of our three week mission. While their parents were being seen in the clinic, the children were taught to identify hazards and the meaning of the poison sticker through art. Young families left the clinic with stickers to use at home and a thorough understanding of the dangers of accidental ingestion of kerosene, mothballs and medications, as well as risks of exposed electrical wires. Further, Anganwadi (maternal and child health) centers were provided with illustrated pamphlets and a poster to reinforce poison prevention in the future. In total, we served an estimated 1,000 individuals in about 6 days. Small global health organizations often face difficulty when designing both low cost and sustainable community interventions, but here we present a successful project design to reduce childhood morbidity and mortality associated with accidental poisoning in resource-poor settings.

279. Developing and Launching the First Free, Bilingual Text Messaging Service for Poisoning Prevention Tips, Facts and News

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Background: In the US 88% of people own a mobile phone, nearly 60% carry a cell phone "at all times," including inside the home. Ninety-eight percent of cell phones can send and receive text messages, 2.5 billion text messages are sent daily. In 2009, more text messages where sent per phone than phone calls made in the U.S. Of wireless users 13+, 57% are considered regular text message users. Goal was to develop free, opt-in service for the public with tips, facts and news about poisoning prevention as part of a larger marketing strategy in English and Spanish. *Methods:* Inventoried public health campaigns using text, investigated purchasing vs. leasing "short code," identified and vetted mobile providers, services and managing, tracking and monitoring systems. Instituted double opt-in where initial text message was followed by request for caller's zip code. Dashboard showed time, date, zip code and number of opt-ins for English and Spanish. Identified appropriate keywords, developed messages, including daily message for National Poison Prevention Week. Using self-serve dashboard, programmed dates and times for messages, considering topics based on seasonal and topical relevance. Promoted through press release and targeted pitches to health, tech and parenting reporters, across social media platforms, on home page of website and through email blasts. Although callers could opt-in from anywhere in the U.S., marketing efforts were concentrated within the poison center's service area. *Results:* Dashboard aggregated results for op-ins and showed noticeable uptick on days where the service was in the local news. An average of 70 opt-ins were received daily, with English opt-ins numbering 10 times those for Spanish. As the campaign progressed, distinguishable peaks were noticeable in specific localities after mentions on news programs. Opt-outs were infrequent, with 3 of every 70 callers opting out. *Conclusion:* SMS is a valuable complement to poison center marketing which, unlike many other outreach efforts, can be measured. It is possible to further engage consumers with additional text-back messages, i.e. callers can be asked if they wish additional

information texted back or emailed. Well-placed, targeted advertising is essential in driving consumer opt-ins.

280. Serial Anti-Factor Xa Levels After Large Intentional Enoxaparin Overdose

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Background: We present a case of intentional enoxaparin overdose (OD), complicated by concomitant warfarin therapy, followed by serial anti-factor Xa (anti-Xa) levels. Based on our review, this appears to be the largest and only intentional overdose reported. *Case report:* A 58-year-old man with prior CVAs and chronic anticoagulation for aortic valve replacement presented to the ED after suicidal injection of 960–1,600 mg (12.8–21 mg/kg) of enoxaparin. He reported injecting his abdomen with 12–20 preloaded enoxaparin 80 mg syringes 5 h prior to arrival. In addition to chronic warfarin therapy, he was on enoxaparin for 1 month after a recent CVA. He denied warfarin OD, and complained of headache and left flank pain on presentation. Vital signs were normal. Physical exam was remarkable for mild, diffuse tenderness of the abdominal wall. There were numerous puncture wounds with minimal bleeding noted. CT head, abdomen & pelvis showed no acute hemorrhage, but demonstrated small subcutaneous (SC) air at injection sites. Initial labs: Hb 13.0 g/dL, Plt 365 K/mm^3, PT 28.5 s, INR 2.5, PTT 173 s, anti-Xa >2.0 IU/mL (therapeutic 0.6–1.0), Cr 0.7 mg/dL, UA no RBCs. Warfarin & enoxaparin were held, no antidotes were administered, and serial neurologic exams and labs were obtained. Hb remained stable. Over the next 2 days anti-Xa decreased from >2.0 IU/mL at 5 h to 1.0 at 20 h, 0.4 at 29 h, and finally 0.2 at 39 h after injection. Warfarin was restarted on day 2, and he was transferred to inpatient psychiatry without evidence of bleeding.
Discussion: Management of enoxaparin OD is complicated by patients' underlying need for anticoagulation and lack of an effective reversal agent if bleeding complications arise. Protamine has limited efficacy, and appropriate dosing is unknown in cases of LMWH toxicity. Despite massive OD and concomitant warfarin therapy our patient did not develop significant bleeding. Serial anti-Xa levels were compatible with maintenance of first order elimination kinetics for enoxaparin with a reported mean $T_{1/2}$ of 4.5–7 h. *Conclusion:* Serial anti-Xa levels help monitor clinical course following SC enoxaparin OD. In this massive, intentional OD anti-Xa levels approximated anticipated therapeutic enoxaparin pharmacokinetics.

281. Evaluation of a Method for Analysis of Hydrocodone and Metabolites in Urine by Tandem Mass Spectrometry

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Background: For pain management and primary care clinics, monitoring patient compliance of hydrocodone (HC) is a significant problem. Quantitative analysis of HC and its primary metabolites, hydromorphone (HM) and norhydrocodone (NHC), can aid in monitoring pain management, distinguishing prescribed from unauthorized drug use, and reduce drug diversion. Following the metabolism and excretion profile of an individual with a sensitive and specific drug test can help in determining time since last dose and expected peak concentrations. *Objective:* We sought to develop and evaluate a simple, rapid and sensitive method to detect and quantitate HC and metabolites in urine by liquid chromatography tandem mass spectrometry (LC/MS/MS). *Methods:* Standards spiked with concentrations of HC, HM and NHC ranging from 1 to 5,000 ng/mL were prepared in mobile phase and in opioid negative urine. On line extraction was performed followed by separation on a Phenomenex Kinetex analytical column. Five hundred microliter of urine was mixed with 25 µL of internal standard solution. The samples were analyzed on Applied Biosystems 4000 QTrap LC/MS/MS system. The mass spectrometer was performed using two multiple reaction monitoring (MRM) transitions per analyte. The linear range was determined for this procedure on concentrations ranging from 1 to 5,000 ng/mL of each analyte prepared in mobile phase and in urine. Values were considered within acceptable range if the measured amount was within ±20% of target concentration and ±20% of ion ratio calculation. *Results:* The linear range was shown to be 5–5,000 ng/mL with r value > 0.99 for all compounds. The limit of detection (LOD) for samples prepared in mobile phase was 1 ng/mL (signal to noise ≥3) for all analytes with the exception of HM transition 2 which did not meet acceptance criteria at 2.5 ng/mL. For urine standards, the LOD was 2.5 ng/mL and LOQ of 5 ng/mL for all analytes. The method yielded good precision for both urine and mobile phase prepared samples with RSDs of <5%. *Conclusion:* This study provides a simple and rapid validated LC/MS/MS method for quantitation of hydrocodone and its metabolites in urine spiked samples. Additional method and LC/MS/MS evaluation is needed on urine obtained from individuals administrated hydrocodone.

Time from enoxaparin injection (h)	Anti-Xa level (IU/mL)
5	>2.0
20	1.0
29	0.4
39	0.2

282. Study of Paraoxonase-1 Function on Tissue Damage of Dichlorvos

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Background: Paraoxonase-1 (PON1) is an A-esterase capable hydrolyzing various organophosphates to protect tissue damage in animals by detecting acetylcholinesterase inhibition level after organophosphates exposure, but no investigation was designed to study the ultrastructure changes after PON1 pretreatment which is a direct evidence for tissue protection of PON1. *Methods:* Purified rabbit PON1 were injected intravenously into rats 30 min before they were given dichlorvos, while rats with dichlorvos administration as control group. Blood was collected at 30 min, 1, 2, 4, 6, 24, 48 and 72 h after dichlorvos administration to examine the acetyl cholinesterase (AChE) inhibition level and poisoning signs were observed. Seventy-two hours later, animals were anesthetized and the hippocampus, liver, lung and kidney were removed for observation of ultrastructure. *Results:* AChE activities in PON1 pretreament group were statistically significant from dichlorvos administration group ($p < 0.01$). The clinical signs were alleviated by PON1 ($p < 0.05$). The most common change of organophosphorus poisoning damage to liver was small lipid-liked structures could be seen through out the liver structure. In kidney, dense bodies were seen. The most significant changes in lung was lost of lamellar structure of lamellar bodies in type II alveolar epithelial cell. As for changes of hippocampus, demyaliation take place after acute oraganophosphorus, but neural edema was not improved significantly in our study. *Conclusions:* PON1 can decrease the AChE inhibition, relieve poisoning signs and alleviate tissue damage of dichlorvos.

283. Real-Time LC-MS/TOF Analysis Guiding Treatment in Diphenhydramine-Induced Seizure and Delirium

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Background: Our institution developed an LC-MS/MS seizure panel for common drugs involved in drug-induced seizures. We report a case of seizure and delirium due to diphenhydramine (DPH) ingestion with real-time serum and pill analysis to guide treatment. *Case report:* A 40-year-old female with history of alcohol abuse had a tonic seizure an unknown time after ingesting 60 pills of an herbal supplement called "Sound Sleep" and possibly other medications. Upon arrival she was awake but confused, afebrile, tachycardic, hypertensive and had a resting tremor. Five hours later, she became agitated with incomprehensible speech, delirium, mydriasis and was placed in 4-pt restraints. Her ECG showed sinus tachycardia and urine drug screen was positive for cocaine. Lorazepam 2 mg IV and haloperidol 5 mg IV were given with good effect. At this time, we requested serum and "Sound Sleep" pill specimens. Over the next 4 h her agitated delirium worsened, requiring frequent lorazepam dosing. During this 4-h window, we analyzed the serum and pill samples and obtained a serum DPH level of 550 ng/mL (therapeutic range 20–50 ng/mL). The pill was negative for DPH or any other drug among 7,000 drugs/pesticides in our LC-MS/TOF database. Based on this data, we recommended a trial of physostigmine. The treating physicians chose to continue lorazepam instead of physostigmine. Twelve hours later she was confused without agitation and was discharged on day 4. *Methods:* Serum and pill samples were analyzed using Agilent Liquid Chromatograph Time-of-Flight Mass Spectrometer (LC1200-MS/TOF 6230). The chromatograms obtained were analyzed using Agilent's MassHunter Qualitative analysis software to determine the presence of potential drugs. For the drug confirmed to have both formula and retention time matches, Agilent's MassHunter Quantitative Analysis software was used to determine its level. *Discussion:* Emergency patient management requires quick laboratory results. A seizure panel utilizing LC-MS/TOF identified DPH in a patient with seizure and agitated delirium, within a time frame that allowed recommendation of a specific intervention (physostigmine). *Conclusion:* This shows the potential utility of rapid turnaround directed toxicology analysis in the treatment of the acutely poisoned patient.

284. Caffeine in pre-pre-Teens: Emergency Department Pediatric GC/MS Urine Toxicology Screens

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Introduction: In our pediatric Emergency Department, the consulted Medical Toxicology service typically recommends comprehensive GC/MS toxicology screening tests in cases of unknown or suspected ingestions or overdoses. We have anecdotally noticed increasing numbers of positive caffeine and nicotine results over the last 5 years. Caffeine and nicotine use and abuse continue to increase in people <18 years old. Therefore, we performed this study to find out the actual prevalence of caffeine and nicotine in the pediatric Emergency Department population described above. *Methods:* We performed a retrospective chart review of pediatric (less than 18 years old) Emergency Department records at an urban tertiary care hospital, with GC/MS urine toxicology testing (UTOX) between January 2009 and December 2009. We collected information on age, sex, and xenobiotics found on UTOX. *Results:* Of the 162 cases that met our inclusion criteria, 49% were male, and the median age was 16 (range 11 months to 17 years). Drugs (and % of cases) were as follows: caffeine (81%), nicotine/cotinine (25%), citalopram (12%), diphenhydramine (11%), acetaminophen (8%), ibuprofen (6%), dextromethorphan (6%), fluoxetine (5%), quetiapine (5%), bupropion (5%), and oxcarbazepine (5%). Other agents found in <5% of cases included: amitryptiline, amphetamine, benztropine, carbamazepine, chlorpheniramine, chlorpromazine, cocaine, clonidine, dihydrocodeine, doxylamine, ephedrine, hydrocodone, lamotrigine, levorphanol, lidocaine, MDA, MDMA, methylphenidate, metoclopromide, mirtazapine, morphine, naproxen, nortriptyline, ondansetron, oxycodone, oxymorphone, paroxetine, phenylpropanolamine, sertraline, topiramate, tramadol, trazadone, and zolpidem. Caffeine was

found in: 17/26 (65%) of children <10 years old; 4/15 (27%) of children <5 years old; and 4/7 (57%) of children <2 years old. *Conclusion:* Caffeine and nicotine are prevalent in the pediatric population presenting to the Emergency Department. Caffeine was present in over 80% of pediatric patients included in this study. Further screening in the pediatric Emergency Department is required to detect the true incidence of caffeine and nicotine use, but this study suggests a marked prevalence of caffeine and nicotine use or exposure.

285. Malignant Hyperthermia Followed by Acute Inferior Myocardial Infarction and Negative Cardiac Catheterization: Variant Takotsubo Cardiomyopathy?

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Background: Malignant hyperthermia is a disease of calcium regulation in skeletal muscle. The resulting hypermetabolic state causes cardiovascular disturbances such as tachycardia and hypotension. Takotsubo cardiomyopathy, also known as "broken heart syndrome," mimics acute myocardial infarction and occurs in patients following a stressful event who have no angiographic coronary disease and classically transient akinesis of the cardiac apex, although variants have been described. Takotsubo cardiomyopathy has not previously been reported in association with malignant hyperthermia to our knowledge. *Case report:* A 29-year-old previously healthy female underwent elective breast reduction. Operative anesthesia was achieved with propofol, succinylcholine, and isoflurane. Two hours into the procedure, her end-tidal CO_2 and temperature began to rise. They peaked respectively at 156.4 mmHg and 42.0°C (107.6°F) over the next hour. Her heart rate rose from 110 to 130 bpm and her systolic blood pressure fell from 120 to 95 mmHg. Dantrolene was administered (2 mg/kg IV) resulting in resolution of symptoms over the next hour. Surgery was aborted and the patient was admitted to the intensive care unit. Upon arrival, bradyarrythmia was noted. An ECG revealed 3 mm of ST elevation in the inferior leads with reciprocal changes. Emergent cardiac catheterization was negative for coronary artery disease but revealed a hyperdynamic left ventricle and an akinetic inferior wall. Dantrolene was continued at 1 mg/kg every 6 h for 48 h. Her maximum creatine kinase was 8,590 U/L with borderline MB fractions and an index of 1.7. Troponin was 0.6 ng/mL (normal < 0.2). Her EKG abnormalities resolved and she remained hemodynamically stable. An echocardiogram 10 days later revealed slight basal septal hypokinesis with normal ejection fraction. *Conclusion:* We report a case of malignant hyperthermia associated with acute inferior myocardial infarction in a 29 year old with no angiographic coronary disease and transient cardiac wall motion abnormalities. Her clinical picture may represent a variant of Takotsubo cardiomyopathy.

286. Hyperkalemia As a Complication of Chronic Digoxin Poisoning

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Background: Hyperkalemia is a frequently cited complication of digoxin poisoning. This process, via cardioactive steroid inhibition of the Na^+-K^+-ATPase pump, has been used as predictor of mortality in acute poisoning; some authors even write that hyperkalemia suggests acute toxicity. We sought to compare the frequency of hyperkalemia in patients with acute and chronic digoxin poisoning. *Methods:* We conducted a retrospective analysis of all Illinois Poison Center digoxin poisoning cases in an 8-year period (November 2002–November 2010) where antidotal therapy was considered. Cases were defined as acute or chronic poisoning based on clinical history. Cases without a measured potassium level were excluded. Hyperkalemia was defined as a serum potassium >5.0 mEq/L. Hypokalemia was defined as a serum potassium of <3.5 mEq/L. Serum creatinine levels, when available, were also collected. If hemolysis was noted to be present, and a repeat potassium level was obtained, the second potassium level was used. *Results:* Serum potassium levels were available in 27 acute cases and 94 chronic cases of digoxin poisoning. Hyperkalemia was present in 26% (7/27) of acute cases and 66% (62/94) of chronic cases. Hypokalemia was only present in 4% (1/27) of acute cases and 2% (2/94) of chronic cases. Of cases with hyperkalemia and available serum creatinine levels, 43% (3/7) of patients in the acute group and 61% (35/57) of patients in the chronic group had creatinine of 2.0 or greater. *Conclusion:* Although hyperkalemia is often described as a complication of acute digoxin toxicity, our results found hyperkalemia was present in 66% of patients with chronic digoxin poisoning. This is likely due to a high prevalence of renal failure in patients presenting with chronic toxicity. Conversely, only 26% of acute cases had hyperkalemia. Very low rates of hypokalemia were observed. Hyperkalemia may be a more frequent characteristic of chronic digoxin poisoning than previously observed.

287. Extreme Metabolic Alkalosis Associated with Alternative Cancer Therapy

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Background: Bicarbonate therapy is used by some alternative practitioners to treat cancer patients despite lack of evidence supporting its use. We present a case of severe metabolic alkalosis following IV bicarbonate. *Case report:* A 64-year-old female with cancer was given IV sodium bicarbonate ($NaHCO_3$) at a naturopathic cancer center. She got 350 meq $NaHCO_3$/250 mL D_5W daily × 4 days. On day 5, her sister found her confused and falling out of bed. In the ED she was confused and a VBG showed pH = 8.09, pCO_2 = 26 mmol/L, bicarbonate = 80 mmol/L, base excess >30 mmol/L. Vitals were: HR = 94, BP = 162/87, RR = 16. Labs were Na = 134 mmol/L, *K* = 1.7 mmol/L, Cl = 58 mmol/L, CO_2 = 54 mmol/L, Cr = 2.09 mg/dL, lactate 3.9 mmol/L. Urine pH = 6.5. Head CT and UA were normal. ECG was sinus rhythm with a QT_c = 519 ms. IV NS + 20 meq KCl/L at 200 mL/h was begun, with K and Mg supplementation. ABG 1 h later showed pH = 7.74, pCO_2 = 56, pO_2 = 74, bicarbonate = 74, base excess > 30. Mental status and lytes normalized with supportive care. She left AMA 48 h after presentation with K = 3.8, Cl = 100, CO_2 = 34, Cr = 0.91, and VBG with pH = 7.45, pCO_2 = 47, bicarbonate = 33, base excess = 9. *Discussion:* Human studies of $NaHCO_3$ for cancer therapy have not been reported. Such use of $NaHCO_3$ may stem from evidence in some animal models that increasing the pH of some tumors may decrease metastases.[1] Despite internet testimonials advocating oral baking soda to treat tumors and use of IV $NaHCO_3$ by some naturopaths in the US, we did not find reports of adverse effects after $NaHCO_3$ cancer therapy in the medical literature. We also did not find reports of survival with pH of 8.09. Metabolic alkalosis is poorly tolerated in humans, with reported mortality of 45% with pH of 7.55 and 80% with pH > 7.65.[2] Mortality may vary based on the manner and rate of development of alkalosis. In this case, factors including volume contraction from poor intake and vomiting and decreased renal excretion of bicarbonate likely worsened alkalosis caused by exogenous $NaHCO_3$. *Conclusion:* We describe a patient with a venous pH of 8.09 associated with IV bicarbonate cancer therapy. *References:* 1. Robey IF, Baggett BK, Kirkpatrick ND, et al. Bicarbonate increases tumor pH and inhibits spontaneous metastases. Cancer Res 2009; 69(6):2260–8. 2. Galla JH. Metabolic alkalosis. J Am Soc Nephrol 2000; 11:369–75.

288. Adverse Events Associated with Clevidipine

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Background: Dihydropyridine calcium channel blockers (DCCBs) are often used clinically to reduce systemic vascular resistance and arterial pressure. Further, in hypertensive emergencies, parenteral (DCCBs) do not depress left ventricular function nor do they significantly increase intracranial pressure but due to longer effect than other parenteral agents, titration of effect is challenging. In August 2008, The United States Food and Drug Administration (FDA) had approved clevidipine, a new parenteral DCCB, that is indicated for the reduction of blood pressure when oral therapy is not feasible or desirable. Using data from the FDA Adverse Events Reporting System (AERS), we investigated adverse events (AEs) associated with clevidipine (Cleviprex®). *Methods:* A retrospective review of the AERS database was performed from October 1, 2008 to September 30, 2009. Patients and their associate AEs were evaluated using the terms "Cleviprex" and "clevidipine." Patients entered into the AERS database that did not include an event date of the AE were excluded. The three most common AEs and outcomes were extracted from the database. *Results:* There were 30 patients with 77 AEs that met our inclusion criteria. There were 9 (30%) patients with ileus, 7 (23%) with hypotension and 4 (13%) with mental status changes. Death was associated in 12 (40%) patients. There were no deaths associated in the ileus patient group, 2 (0.07%) in the hypotension group and 1 (0.03%) in a patient with mental status changes. *Discussion:* Using the self-reporting FDA AERS database, the newly approved DCCB clevedipine (Cleviprex®), was most commonly associated with ileus, hypotension and mental status changes. Of these AEs, there were two reported deaths. *Conclusion:* By using the FDA AERS database, we present our finding associated with the newly approved DCCB clevedipine (Cleviprex®).

289. Adverse Drug Reactions in Pediatric Patients Receiving a Single Dose of Lisdexamfetamine

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Background: Lisdexamfetamine mesylate (LDX, Vyvanse®, L-lysine-D-amphetamine) is a long-acting prodrug of dextroamphetamine. It was FDA-approved in 2007 for the treatment of attention-deficit/hyperactivity disorder in 6–12-year-old children and later for adults, but not for adolescents. *Methods:* A retrospective analysis of exposures reported in 2009 to one state's regional poison centers identified a total of 16 cases involving pediatric patients' first dose of LDX. *Results:* Of the 16 patients identified, seven were between 6 and 12 years-old, three were 4-years-old, two were 5-years-old and four were adolescents. The FDA has not approved use of this drug for 9 out of the 16 patients this analysis represents. Dosages administered ranged from 30 mg up to100 mg and all presented to local emergency departments with moderate to severe adverse reactions after receiving their first dose. Reported signs and symptoms are similar to those produced by other amphetamines, including agitation, confusion, logorrhea, tremors, twitching movements, nystagmus, rocking, weakness, hallucinations, phonic tics, extreme hyperactivity, extrapyramidal effects, tachypnea, tachycardia and hypertension. Prolonged use of LDX can lead to dependency and symptoms similar to that of obsessive disorders, panic disorders, and phobic disorders. All patients were treated with supportive care, benzodiazepines, IV fluids and, in two cases, diphenhydramine. In all cases symptoms resolved and recommendations were given to discontinue the drug and to consult with their personal physicians. *Conclusions:* In this limited study, our data suggests that adverse effects due to LDX are similar to other related analeptic drugs used in the management of ADHD. However, clinicians should note that in all 16 cases reported, the use of LDX produced moderate to severe effects after a single dose. Although the total number of cases is small, the existence of unapproved use of LDX in adolescents leading to significant toxicity is notable. Clinicians should be alerted to the potential for significant toxicity associated with the use of this new drug in the pediatric age group.

290. Akathisia in Two Patients Following Newly Compounded 4-Aminopyridine

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Background: 4-Aminopyridine (4AP) is used for treatment of multiple sclerosis (MS). Typically, 4AP is produced for individual patients in a compounding pharmacy. Each time it is compounded, the product may vary. 4AP cause seizures in overdose. We report 2 cases of a self-limited movement disorder following the first dose of newly compounded 4AP in MS patients on longstanding 4AP. *Case report 1:* A 47-year-old man presented with normal VS, diaphoresis, rigors and akathisia soon after taking the first dose of a newly compounded 4AP prescription. He noted that a similar problem occurred in the past and progressed to seizure after beginning a new bottle of 4AP. *Case report 2:* A 57-year-old woman presented with flushing, akathisia, tachycardia, transient confusion, ocular dystonia, and clonus after taking the first tablet from a newly compounded bottle of slow-release 4AP. Serum glucose, sodium, neuroimaging, EEG and CSF cultures were unremarkable. Both patients were treated successfully with benzodiazepines and returned to baseline within 8 h. Both discontinued their newly compounded formulations. Tablet analysis in case 2 suggested normal drug concentration with a possible impaired release mechanism. Tablet analysis was unavailable in case 1. The patients obtained their medications from different compounding pharmacies. *Case Discussion:* 4AP can cause neuroexcitation, akathisia and dystonia in overdose. Previous case reports commonly describe patients with seizures due to ingestion of excess drug or improperly compounded drug. This is the first series of patients experiencing akathisia following ingestion of an apparent appropriate dose of newly compounded 4AP. We postulate the mechanism of altered in drug concentration and/or release mechanisms that occur during compounding. *Conclusion:* Patients taking 4AP may be vulnerable to adverse drug effects, such as akathisia, secondary to variations that occur during specialized drug compounding.

291. Pediatric Adverse Reaction to Pramoxine: "My Imagination's Acting Funny"

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Background: Significant adverse reactions due to the misuse of topical anti-itch and anesthetic products are well-known. Pramoxine, a local anesthetic chemically unrelated to the ester or amide classes of local anesthetics, has replaced other local anesthetics as well as diphenhydramine in many topical preparations for itching and pain. Pramoxine has an excellent safety profile; a review of the literature revealed no more than minor symptoms in any exposed patient. We report the first case of significant toxicity, characterized by prolonged visual hallucinations, related to the excessive use of topical pramoxine. *Case report:* A 4-year-old female presented to the ED with complaints of her "imagination acting funny." The child was quite agitated, had vomited, and described significant visual hallucinations. It was discovered the child's mother had applied a topical cream containing pramoxine 1% for symptomatic relief of eczema over a significant percentage of the child's body and had been doing so for several weeks. No other active ingredients were listed on the label. It was verified that this was the only product she had been using over that period of time and had avoided other products due to possible side effects. No other medications, either topical or oral, were being administered and the child's skin was intact with no excoriation. A CT of the brain revealed no evidence of acute intracranial pathology. The child was admitted for observation, IV fluids were administered, and a conservative approach to treatment was employed. On the second day of hospitalization the child's demeanor was significantly improved but she continued to report seeing bugs, germs, and animals. All symptoms resolved by the end of the second day and the child was discharged to home in satisfactory condition. *Case discussion:* A Naranjo Score of 6 was calculated for this patient, signifying a probable adverse drug reaction to pramoxine. There is little in the way of pharmacokinetic data regarding this medication, but the extended duration of hallucinations indicates a possible depot effect with prolonged dermal application. *Conclusion:* Though pramoxine has an excellent safety record, significant adverse reactions may occur with excessive use.

292. Adverse Events of Desvenlafaxine Using FDA Adverse Events Reporting System

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Background: In March 2008, the US Food and Drug Administration (FDA) approved desvenlafaxine (Pristiq®) for the treatment of major depressive disorder. Desvenlafaxine, the active metabolite of venlafaxine, is a selective serotonin and norepinephrine reuptake inhibitor (SNRI). Due to the norepinephrine reupatake inhibition, SNRIs may be associated with hypertension and dizziness. Using data from the FDA Adverse Events Reporting System (AERS), we investigated these adverse events (AEs) that may be contributory with desvenlafaxine (Pristiq®). *Methods*: A retrospective review of the AERS database was performed from May 1, 2008 to March 31, 2009. Patients and their associated AEs were evaluated using the terms "desvenlafaxine" and "Pristiq." AEs were further stratified using the terms "increased blood pressure" and "dizziness." Patients entered into the AERS database that did not include an event date of the AE were excluded. *Results:* During May 1, 2008 to March 31, 2009, there were 297 patients with 1,532 AEs that met our inclusion criteria. There were 26 AEs associated with increased blood pressure and 31 AEs associated with dizziness. *Discussion:* In contrast to selective serotonin reuptake inhibitors (SSRIs), the SNRIs have been associated with AEs due to the elevation of norepinephrine levels. Using the FDA AERS we highlight two common AEs that may be contributory with desvenlafaxine (Pristiq®), a new SNRI approved for major depressive disorder.

293. Serotonin Syndrome Precipitated by Methylene Blue

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Introduction: Methylene blue is used to localize parathyroid glands during parathyroidectomies at doses of 5–7.5 mg/kg. Methylene blue possesses monoamine oxidase inhibition activity that could lead to drug-drug interactions and adverse effects. We report two cases of methylene blue-facilitated parathyroidectomy that were complicated by neurologic symptoms consistent with serotonin syndrome. *Case reports: Case #1:* A 33-year-old woman taking sertraline for depression received methylene blue (7 mg/kg). Three hours following the procedure, she became confused, lethargic, and experienced clonus and nystagmus. Vital signs were blood pressure 138/78 mmHg, pulse 117, respirations 24, temperature 36.4°C, and oxygen saturation 98%. She later developed rigidity of extremities and tremors requiring treatment with lorazepam. Symptoms resolved within 3 days and the patient was discharged to home. *Case #2:* A 42-year-old female taking venlafaxine for depression received an unspecified dose of methylene blue. Approximately 1 h following the surgery, the patient became agitated, confused, hypereflexic and developed clonus. The patient received a dose of lorazepam followed by initiation of a midazolam infusion and was intubated. Vital signs were blood pressure 88/45 mmHg, pulse 75, respirations 16, temperature 36.8°C, and oxygen saturation 95%. The patient received a fluid bolus for her low blood pressure. Eight hours later, the patient was extubated, the midazolam infusion was discontinued and the patient's blood pressure improved (110/68 mmHg). Her confusion resolved completely within 2 days of onset. *Conclusion:* Administration of high dose methylene blue for parathyroidectomy was associated with serotonin syndrome in patients taking serotonergic drugs before surgery. Whether this interaction can be expected to occur at methylene blue doses which are used to treat methemoglobinemia (1 mg/kg) remains to be seen but should be considered.

294. Methylene Blue: A Strong, but Poorly-Appreciated, MAOI

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Background: A 45-year-old male underwent cardiac bypass for coronary artery disease. During surgery, he was given methylene blue as a cardioplegic agent. During recovery, he developed hyperthermia, agitated delerium, severe myoclonus, ocular clonus, wide swings in blood pressure, metabolic acidosis, respiratory failure, and rhabdomyolysis. *Methods:* The patient met clinical criteria for severe Serotonin Syndrome. He required on-going sedation, neuromuscular paralysis, and intensive care for 9 days after surgery. His pre-operative medications had included Ecitalopram and he was given fentanyl post-operatively. Both medications have been impicated as causative agents for Serotonin Syndrome when combined with mono-amine oxidase (MAO) inhibitors. The patient was not taking MAO inhibitors, but was given Methylene Blue during surgery. Methylene Blue has been most commonly used clinically to manage significant methemoglobinemia. It has gained recent popularity as an agent to reduce the incidence and severity of the vasoplegic syndrome in patients undergoing cardiac surgery. This syndrome is characterized by hypotension from reduced systemic vascular resistance and requires prolonged vasopressor use for treatment. It carries a mortality rate of 10%. Methylene blue is also being used to stain parathyroid tissue for parathyroidectomy. Cases reporting altered mental status, hyperthermia, hemodynamic instability, and muscle rigidity with Methylene Blue use in patients on serotonergic medications are accumulating. *Results:* The patient recovered with routine, but prolonged, intensive care (9 days). He developed mild renal failure, but did not require dialysis. *Conclusions:* This patient demonstrated severe Serotonin Syndrome likely due to the concomitant use of Escitalopram and Methylene Blue. Methylene Blue is gaining increased use in cardiac and parathyroid surgery, but the risk of concomitant use of serotonergic agents and Methylene Blue is not well appreciated. Methylene Blue should be considered a strong MAO inhibitor and patients should be screened for the use of serotonergic agents prior to undergoing administration of Methylene Blue.

295. A Decade of National Poison Data System (NPDS) Call Data – Baseline Statistical Models

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Introduction: NPDS call volume data exhibits repeated patterns by year, by week and, changes with some holidays. Understanding these patterns is critical to interpretating NPDS call volume over time. We developed a baseline statistical model to support the quantitative analyses of NPDS call data. *Methods:* We examined all Human Exposure Calls (HECs, N = 23,805,706) and all Information Calls (ICs, N = 12,601,737) by day for the last decade (2000–2009) for both linear and log relationship to: Day of the week to account for weekly patterns (Day), Month of the year to account for seasonal patterns (Month), 20 US holidays (Holiday), as well as

Time to account for overall secular trends. Day, Month, and Holiday were each treated as nominal (not ordinal or continuous) variables to avoid assumptions about their relative contributions. via SAS JMP v 6.0.0. *Results:* Linear were better than log models for both HES and IC so subsequent results refer to the linear models, though doubling times were based on log models. Day, Month, Holiday and Time exhibited highly statistically significant (HSS, $p < 0.0001$) relations to both HES and IC. Most of the individual Days, Months and Holidays (elements) were statistically significant (SS, $p < 0.05$). All but one of the elements which were not SS in the HES model were SS for IC, and vice versa. Thus all elements were included in both models.
The slope [95% confidence interval] and associated doubling time (DT) were:
EC slope = 98.7 [95.5, 102] calls/day/year, DT = 44.2 [42.8, 45.7] years
IC slope = 314 [312, 317] calls/day/year, DT = 7.11 [7.05, 7.18] years
Conclusions: Even after accounting for the variation from Day, Month and Holiday, the secular trend (Time) remained HSS for both HESs and ICs, with a greater rate of increase for the ICs. We have not included singular events (disasters or public health issues). Our findings may have application to PC surveillance, staffing, and funding. These initial results underscore the importance of considering all "statistically important" contributors in any quantitative analyses of NPDS call data.

296. Predictors of Toxic Alcohol Ingestion in Cases Called to a Regional Poison Control Center

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Background: Poison Centers are consulted on cases where the differential diagnosis includes ethylene glycol (EG) ingestion. Blood levels of EG are typically not available to assist with initial treatment decisions, which makes rapid diagnosis of EG ingestion difficult. The primary objective of this study is to see if readily obtained basic laboratory values could be used to build a predictive model that accurately and rapidly diagnose poisonings due to EG in the absence of blood EG levels. *Methods:* Over a 24 month period calls received by our poison center that involved patients who ingested EG or had a metabolic acidosis (pH < 7.30 or serum bicarb < 18) were enrolled. A standardized data sheet was used to collect data. A predictive logistic regression model was used to assess the combined ability of pH, serum calcium, osmolar gap, and anion gap (independent variables) to predict a final diagnosis of EG poisoning (dependent variable). *Results:* There were 102 patients included in the analysis. A total of 45 (44%) of the 102 patients had a final diagnosis of EG poisoning. Results indicated that higher levels of calcium (continuous), osmol gap (continuous), and anion gap (dichotomous ≥13) were each associated with statistically significant or marginally significant increases in the odds of having a final diagnosis of EG poisoning. pH levels were not independently related to the EG poisoning outcome, and were not included in the final model. The c-index was estimated at.81, indicating that the model showed reasonable ability to discriminate between EG poison cases and non EG cases. Based on a linear predictor cutpoint that maximized the sum of sensitivity and specificity, the final model had a sensitivity and specificity of 78 and 89% and positive and negative predictive values of 84 and 83% respectively. *Conclusion:* The combination of elevated calcium, osmolar and anion gap were associated with the higher likelihood of being diagnosed with EG poisoning. While the sensitivity and specificity are decent some cases would still be missed. Further refinement of the model is required and until then clinician gestalt must still play a role.

297. DNR Orders and the Suicidal Patient: An Ethical Dilemma

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Background: Advance directives and DNR orders are increasingly used to facilitate patient autonomy. DNR orders are generally written for patients with terminal conditions. The suicidal patient with a prior advance directive or DNR presents an ethical dilemma. We present a case where a pre-hospital DNR was honored in a patient with a suicidal ingestion. *Case report:* A 48-year-old female presents to the ED after being found at home unresponsive with a suicide note and an empty bottle of antifreeze (ethylene glycol). On arrival, she was unresponsive. Vital signs included BP 140/90 mmHg; HR 114; RR 30; O_2 sat 80–95%. Initial ABG: pH 6.92; pCO_2 18; pO_2 195. Her past medical history was significant for remote TBI and numerous suicide attempts. Shortly after arrival, the patient's health care proxy arrived with a pre-hospital DNR order and an advance directive along with the suicide note. Toxicology was consulted and recommended ethics and legal consults as the patient was potentially incompetent with a potentially reversible condition. The attending MD honored the DNR, but 6 h later, family members questioned the advance directive and treatment with fomepizole and $NaHCO_3$ was started. Despite this, the patient's condition deteriorated. Palliative care-only was begun on day 3; she died on day 5. *Conclusion:* As this case highlights, pre-existing DNR orders in the setting of an acutely poisoned patient raise controversy. Does the advance directive reflect a competent patient's wish, given her subsequent suicide attempt? Does forgoing treatment in such a case mean the clinicians become complicit with the patient's suicide? In this case, the ethics and legal team deemed that the patient was mentally competent when she previously executed the advance directives and recommended they be followed despite a clearly suicidal act. Poison Centers commonly confront cases similar to this. Our approach has been to uniformly recommend full treatment of the overdose until hospital ethics committee and legal counsel have consulted. A recent physician group's code of ethics only minimally addresses this issue. Consensus guidelines are warranted to provide consistency in the approach.

298. Acute Chest Syndrome Following Gasoline Inhalation in a Pediatric Patient with Sickle Cell Disease

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Background: Acute chest syndrome (ACS) is an acute complication of sickle cell disease resulting in rapidly progressive pulmonary infiltrates. The most common known causes of ACS are infection and fat embolism. The underlying cause is unknown in nearly half of cases. We report a case of ACS following inhalation of gasoline fumes in an 11 year old boy. *Case report:* An 11 year old male with sickle cell disease presented with acute chest pain a few hours after sniffing fumes from a gasoline can. Initial chest radiographs was normal, WBC count was 12,100/mm^3, with differential of 40% neutrophils, 50% lymphocytes, and 8% monocytes; hemoglobin was 8.3 g/dL. C-reactive protein was <0.3 mg/dL. The child was admitted to hospital, started on vancomycin, ceftriaxone and clarithromycin, and treated with inhaled bronchodilators. The following day, his respiratory distress worsened, with increasing oxygen requirement, and CXR showed bibasilar infiltrates. The child was transfused with PRBCs. Respiratory distress and pulmonary infiltrates progressed despite transfusion, and bilevel positive airway pressure (BIPAP) via mask was initiated. Exchange transfusion was then performed, with rapid improvement in his respiratory function and oxygen requirement. Pulmonary infiltrates gradually resolved. He was discharged home on the seventh hospital day. *Case discussion:* Acute chest syndrome develops in circumstances of low oxygen tension, such as pneumonia, fat embolism with vascular obstruction, and acute pain with hypoventilation and atelectasis. Inhalation of hydrocarbons may produce similar alveolar hypoxia by displacing oxygen in inspired alveolar gases, thus initiating the sickling and microvascular obstruction necessary for development of acute chest syndrome. This patient's acute chest syndrome was temporally associated with inhalation of gasoline, and not associated with signs of infection or other known risk factors for acute chest syndrome. *Conclusion:* Intentional inhalation of volatile hydrocarbons such as gasoline may be a risk factor for the development of acute chest syndrome in patients with sickle cell disease.

299. Impact of Toxicologists upon Patient Care – An Evaluation of Toxicology Service Quality & Selected Core Competencies for Training via a Survey of Internal Customers

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Background: Unlike external customers (patients), internal customers (who belong to the same organization as the service provider) for a toxicology service include emergency medicine (EM) & internal medicine (IM) doctors & pediatricians. The Accreditation Council for Graduate Medical Education's Outcome Project uses six general competencies for fellow development; some of which are difficult to evaluate. *Purpose:* Determine the impact of the tox service upon patient care & evaluate other aspects of our service delivery & the achievement of core competencies by the fellows. *Method:* A survey was created on surveymonkey.com. Through the use of email lists; 411 residents & faculty in EM, IM, & Pediatrics were asked to do the survey. They had a 12-day period to do the survey & were given a reminder email 6-days into the period. The 14 survey questions addressed: why providers did & did not ask for toxicology consults on their toxic patients; service parameters including ease of access to toxicologists, timeliness, impact upon patient care, & education for the consultees; & two of the core competencies. *Results:* A total of 104 surveys were completed (24%). Responses came from 44% of the EM docs, 24% of the Peds docs, & 11% of the IM docs. 56% of respondents had used the tox service 1–5 times while 30% had used it >5 times. The #1 reason to NOT use the tox service was the respondent "generally knew what she was doing." The #1 reason to get a consult was the respondent "thought he knew what to do but wanted confirmation." 98% said there was "never" or "rarely" a problem in reaching a toxicologist & 100% said the service was "often" or "always" timely. Thirty-three percent felt the education provided by the tox service to the consultees was "always better" than from other services. Members of the service acted "professionally" (95% always & 5% usually) & used good interpersonal skills (82% always & 18% usually). Importantly, respondents felt care was "always" (54%) or "usually" (42%) improved by the toxicologists. *Conclusion:* While response rate to the on-line survey was low, the respondents strongly felt that toxicologists improved patient care.

300. A Toxic Dose of Oral Phenylephrine?

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Background: Oral PE exposures increased following the Combat Methamphetamine Epidemic Act of 2005 when manufacturers reformulated many pseudoephrine cold/cough products with PE. PE is a sympathomimetic amine and directly stimulates α-1 receptors which can lead to agitation, dizziness, tremor, and hypertension in overdose. Many PE-containing products are combined with an antihistamine, dextromethorphan and/or an opioid,

increasing the risk for side effects. An increase in oral PE exposure calls to the Poison Center was noted and re-evaluation of current pediatric toxic referral doses ensued. *Methods:* A retrospective analysis of oral PE exposures in children (≤13 years) in 2008 was performed. Five milligram (3–6 months), 8 mg (6–12 months), 15 mg (1–6 years), 60 mg (6–12 years), 120 mg (>12 years) were used as referral amounts. Patients with coingestants/multi-ingredient products were included. *Results:* Four hundred and ninety-four patients were identified. Four hundred and fifteen were observed at home; 79 were evaluated in a HCF. Of the 415 at home, 337 ingested a subtoxic PE dose; 78 ingested a potentially toxic dose. Subtoxic exposures: no effect (n = 203), 41 with symptoms (39 minor, 2 unrelated), lost to follow-up (n = 93). Potentially toxic exposures: no effect (n = 55), minor symptoms (n = 14), lost to follow-up (n = 9). Minor effects in subtoxic group: drowsiness (n = 26), irritability (n = 4), vomiting (n = 4), mydriasis (n = 3), ataxia (n = 2), insomnia (n = 2), cough (n = 1), diarrhea (n = 1), dry mouth (n = 1), miosis (n = 1), nausea (n = 1). Minor effects in potentially toxic group: drowsiness (n = 9), vomiting (n = 6), diarrhea (n = 2), diaphoresis (n = 1), mydriasis (n = 1). Of patients observed at home, none ingested a PE-only product. HCF evaluated patients: 28 experienced symptoms (20 minor, 1 moderate, 6 unrelated, 1 lost to follow-up), no effect (n = 49), lost to follow-up (n = 2). Minor symptoms in HCF group: drowsiness (n = 16), vomiting (n = 3), ataxia (n = 1), tachycardia (n = 1); moderate effect: hypertension (n = 1). Of the 20 patients with minor effects, 6 ingested a subtoxic dose of PE, and 5 received AC. Of the HCF patients, none ingested a PE-only product, and none were admitted. *Discussion:* Patients that experienced symptoms did not ingest a PE-only product. In addition, the majority of symptoms documented were more consistent with other active ingredients in the product formulation. *Conclusion:* The lack of significant symptoms from the ingestion of oral PE products may suggest the current PC's referral amounts are too conservative.

301. Chronic Methanol Inhalation Without Retinal Toxicity or Metabolic Acidosis: A Case Report and Analysis of Inhaled Carburetor Cleaner

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Background: Methanol (MeOH) exposure produces toxicity by two-step conversion to formic acid, causing blindness, severe acidosis, and death. Ingestion is the most common route of methanol poisoning, but inhalation is becoming more common. There are conflicting published reports with some suggesting that inhaled MeOH is less toxic and can be treated with expectant management, while others report similar toxicity with inhalation and ingestion and recommend standard treatment. *Case report:* A 36-year-old male presented to our hospital 5 times over 9 days after repeatedly "huffing" a MeOH containing carburetor cleaner. His [MeOH] ranged from 31 to 188 mg/dL over 8.5 days with no visual deficit on repeated ophthalmologic exam and no significant acidosis. His lowest [HCO_3^-] and highest anion gap were 17 and 15 mmol/L, respectively. He identified the specific product, which contains MeOH, toluene, and methylene chloride in a ratio of 1.3:2.6:1 respectively by weight. Out of concern for possible laboratory interference producing falsely elevated [MeOH] results, we analyzed the product using gas chromatography. This found MeOH, toluene, and methylene chloride in concentrations and proportions consistent with product information supplied by the manufacturer and validated the measurement of [MeOH] in clinical specimens. *Discussion:* "Huffing" carburetor cleaner produces [MeOH] in the toxic range. The absence of expected toxic effects may have multiple explanations. Toluene is also a substrate for alcohol dehydrogenase (ADH) and so may act as a competitive inhibitor of MeOH metabolism to formaldehyde and subsequently to formic acid. Inhalation may produce higher [MeOH] than ingestion due to the absence of first-pass hepatic metabolism. *Conclusion:* Inhalation of a MeOH-containing carburetor cleaner repeatedly caused significantly elevated [MeOH] without metabolic acidosis or retinal toxicity. Reasons for the observed lack of toxicity likely include competitive inhibition of ADH by toluene and the absence of first-pass metabolism to formic acid, a compound which causes retinal toxicity.

302. Does Measured Serum Osmolality Alone Predict Ethylene Glycol Toxicity?

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Background: Calculating an osmol gap (OG) is problematic in identifying ethylene glycol (EG) poisoning. We hypothesized that a measured serum osmolality (msOsm) alone would predict toxic concentrations of EG. *Methods:* We searched 8 years of EG cases (January 1, 2002 through January 1, 2010) from our poison center (PC) database. Only cases with both an EG concentration and a msOsm were included for analysis. Cases were evaluated for measured EG concentrations (with toxic defined as >20 mg/dL) in relation to an arbitrary msOsm cutoff value of 350 mOsm/kg. *Results:* A total of 418 EG exposures were reported to the PC during the 8 year period. Mean EG and msOsm were 100 mg/dL and 339 mOsm/kg respectively and the EG concentrations ranged from 0 to 1,450 mg/dL. Fifty-eight cases had both values recorded in the chart and 34 were of interest (i.e. recorded an EG > 20 mg/dL). Eighteen had a msOsm < 350 mOsm/Kg with 7 yielding an EG > 100 mg/dL. Even in the 16 of 19 patients with msOsm > 349 (range 350–716), EG concentrations ranged from 0 to 1,450 mg/dL. The lowest msOsm associated with an EG > 20 mg/dL was 285 mOsm/kg (associated EG was 58.1). A minority of the cases (44%) were those with EG > 20 mg/dL and msOsm > 350 mOsm/kg. *Conclusions:* Historically, the OG has been challenging in the assessment of EG poisoning but using the absolute msOsm alone has not yet been studied. Our results from this retrospective PC database review indicate that the msOsm alone appears to be a poor indicator of EG toxicity. This analysis suffers from all the limitation of poison center data review. Significantly, we did not address time of ingestion and the presence of other alcohols or acetone. Only 110/418 cases had both msOsm and EG determinations as it may have been impractical to expect clinicians to routinely use of msOsm in EG poisoning. A prospective study is warranted to re-evaluate the usefulness of mOsm alone as a screening tool for EG poisoning.

303. The Practice of Medical Toxicology in the US

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Background: The ACMT's ToxIC Registry is a national database early in its existence, consisting of data on cases seen at the bedside by toxicologists. It began with four centers on January 15, 2010 & was at 11 centers by March 1, 2010. The registry will provide a source for research, education, healthcare, and public health. *Objective:* Describe the initial cases entered into the ToxIC registry. *Methods:* Registry data is uploaded to a secure on-line database. The data was downloaded into an Excel spreadsheet and then was queried to establish a description of the initial patient data. We summarize data regarding the location and type of encounter, agents involved, clinical syndromes, and treatments provided. *Results:* As of March 27, 2010, there were 268 patients in the ToxIC registry; the tables reflect this population.
Conclusion: The most common population seen at bedside by medical toxicologists are pts in hospitals

Table for Abstract 303

Initial encounter (267)	Encounter type (275)
ED – 120 (45%)	Medication overdose, intentional – 146 (50%)
ICU – 66 (25%)	Medication overdose unintentional – 54 (18%)
Non-Icu Inp – 67 (25%)	Drug abuse – 21 (7%)
Occ. eval – 7 (3%)	Chemical exposure intentional – 6 (2%)
Surveillance – 2 (1%)	Chemical exposure unintentional – 10 (3%)
Unknown – 5 (2%)	ADR – 15 (5%)
	Withdrawal – 6 (2%)
	Organ system dysfunction 10 (3%)
	Interpretation of lab data – 5 (2%)
	Environmental evaluation – 2 (1%)
Clinical syndromes – 397	
Abd pain N/V – 31 (8%)	
Acute kidney Injury – 13 (3%)	
Hypotension – 27 (6%)	
Metabolic acidosis – 18 (5%)	Agent class – 362
Rhabdomyolyisis/muscle injury – 6 (2%)	Alcohols – 40 (12%)
Hepatotoxicity – 20 (5%)	Analgesic + opioid combo – 22 (7%)
AMS – 63 (16%)	Analgesics – 52 (15%)
CNS depression – 30 (8%)	Sedative hypnotics – 34 (10%)
Resp. depression/failure – 30 (8%)	Opioids – 28 (8%)
Hyperreflexia/tremor – 6 (1%)	Antidepressants – 38 (11%)
Psychosis/delirium/agitation – 34 (9%)	Antipsychotics – 29 (9%)
Tachycardia – 21 (5)%	Cardiovascular – 31 (9%)
Seizure – 7 (2%)	Antihistamines – 10 (3%)
Bradycardia – 13 (3%)	Analgesic + antihistamine – 8 (2%)
Hypoglycemia – 2(1%)	Metals – 7 (2%)
Asymptomatic – 19 (5%)	Psychoactives – 4 (1%)
Dystonia – 4 (1%)	Diabetic medications – 4 (1%)
Serotonin syndrome – 4(1%)	Sympathomimetics – 8 (2%)
NMS – 1 (1%)	Anticonvulsants – 5 (1%)
Pneumonitis – 7 (2%)	Gases – cellular asphyxiants – 2 (1%)
Other – 41 (10%)	Hydrocarbons – 2 (1%)
	Lithium – 4 (1%)
	Others – 34 (9%)

who OD'd on alcohols or analgesics & who have diverse clinical syndromes.

304. Does Measured Serum Osmolality Predict Methanol Toxicity?

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Background: Screening for methanol poisoning using an osmol gap (OG) is controversial among clinicians and only assists if the number is very high. In light of this, we question the usefulness of a measured serum osmolality (msOsm) in methanol poisoning. The aim of this study is to test an arbitrary msOsm of 350 mOsm/kg or greater (alone) as a predictor of methanol toxicity (>20 mg/dL). *Methods:* Eight years of methanol cases (January 1, 2002 through January 1, 2010) were searched from our poison center (PC) database. Only those cases including both a recorded methanol concentration and a msOsm within the chart were analyzed. Further scrutiny of those cases yielding methanol concentrations >20 mg/dL were inspected in relation to their specific msOsm. *Results:* A total of 374 exposures to methanol were reported to the PC during the 8 year period. Methanol concentrations (mean 83 mg/dL) and msOsm (mean 328 mOsm/kg) ranged from 0 to 665 mg/dL and 273–571 mOsm/kg respectively. While 52 cases met inclusion criteria for study, 21 were noted to be of interest (methanol > 20 mg/dL). A majority of the cases (67%) yielded both a methanol > 20 mg/dL and msOsm > 350 mOsm/kg. Conversely 76% of patients with a msOsm < 350 had a methanol concentration <20 mg/dL, fully 22 had no detectable methanol. Strikingly, one patient with a msOsm of 280 mOsm/kg had an associated methanol concentration of 450 mg/dL (the timing of these values relatable to each other is indeterminate). *Conclusions:* Our results indicate that a msOsm > 350 mOsm/kg was present in two thirds of methanol toxic cases (>20 mg/dL). These data suffer from the standard limitations related to all retrospective poison center reviews. Significantly, we could not address time of ingestion, account for coding and documentation errors, or appreciate the presence of other disease states (e.g. pancreatitis), alcohols or acetone being present. While only 21 cases met our inclusion criteria, many more would have if every patient had "both" methanol and msOsm reported (impractical to assume all clinicians work up methanol poisoning identically). A prospective study is warranted to re-evaluate the usefulness of msOsm alone as a screening tool for methanol poisoning.