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Abstracts of the 2006 North American Congress of Clinical Toxicology Annual Meeting

1. Liver Injury from Repeated Dosing of Acetaminophen (APAP) in Adults

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Background: Controversy exists regarding APAP toxicity at therapeutic (≤4g/d) and supratherapeutic doses. Medical literature describing APAP dosing ≥ 24h in adults was systematically reviewed. *Methods:* MEDLINE (1966–2003) and EMBASE (1980–2003) articles with the keywords APAP, acetaminophen, paracetamol or APAP CAS registry number and AAPCC death reports (1983–2004) were screened manually. Articles with APAP dosing for ≥ 24h in adults were abstracted using a structured data collection tool. *Result*: 791 articles (47,410 adult patients) reported dosing ≥ 24h: 455 (35,061) prospective; 336 (12,349) retrospective. Patient outcomes (injury=ALT ≥120IU/L or elevated AST/ALT [level unknown]; death=liver transplant or death from APAP) are in the table. *Discussion:* Prospective studies reported few cases of injury and no transplants/deaths related to APAP. Twenty patients treated with a therapeutic dose in prospective studies had an increased LFT: 1 developed an ALT of 220 IU/L during 28d of dosing; 1 developed an allergic reaction to APAP with a 5–10x increase in ALT. The remaining 18 had minor transient elevated AST/ALT levels. In contrast, retrospective reports had nearly all adverse effects: 9 deaths/transplants occurred after APAP use with therapeutic intent. Each had concomitant illness or conflicting information indicating another cause or much larger dose than reported. *Conclusion:* Therapeutic APAP doses have not been associated with liver injury in prospective studies of over 35,000 patients. Small increases in serum AST/ALT occur rarely but return to baseline, and have not evolved into acute liver failure. Retrospective reports of liver injury appear to be caused by APAP overdosage despite therapeutic intent.

	Prospective outcome N (%)			Retrospective outcome N (%)		
Dose	Injury	Death	No injury/death	Injury	Death	No injury/death
Therap.	20 (0.1)	0 (0)	30,954 (99.9)	57 (0.6)	9 (0.1)	9,245 (99.3)
Suprather.	12 (1.0)	0 (0)	1,164 (99.0)	57 (19.5)	35 (11.9)	201 (68.6)
Unknown	0 (0)	0 (0)	2,911 (100.0)	14 (0.5)	23 (0.8)	2,708 (98.7)
Total	32 (0.1)	0 (0)	35,029 (99.9)	128 (1.0)	67 (0.5)	12,154 (98.4)

2. Acute Fatal Aluminum Toxicity Secondary to Bladder Rupture during Alum Irrigation

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Background: Life threatening encephalopathy secondary to acute aluminum toxicity has been reported with alum bladder irrigation. Signs and symptoms of toxicity usually occur gradually after several days to weeks of treatment. We report a sudden fatal case of acute aluminum toxicity occurring within hours after a bladder rupture during alum irrigation. *Case Report:* A 68-year-old female with a history of myeloma and renal insufficiency developed hemorrhagic cystitis secondary to prior cytoxan treatments and persistent thrombocytopenia. She was started on alum (1% ammoniated alum, AlNH4(SO4)) bladder irrigation. On the second day, her abdomen became distended and there was no return of her irrigation fluid. The patient quickly became obtunded and hypotensive and required vasopressor support. CT scan of her abdomen revealed a bladder rupture. Up to 3.4 liters of alum irrigation fluid was unaccounted for, which represented 194 mg of aluminum. The initial serum aluminum level was 226 mcg/L. She was started on, daily

dialysis and deferoxamine was considered. She expired on day 11 after bladder rupture of multi-system organ failure. *Case Discussion:* Acute increases in serum aluminum levels are poorly tolerated. In acute exposures, transferrin and other binding proteins are quickly saturated. In this patient, sudden fluid shifts and aluminum absorption secondary to bladder wall rupture caused a rapid decline in CNS and cardiac function. *Conclusion:* Aluminum toxicity can occur rapidly (within hours) in patients undergoing alum treatment.

3. Medication Error — Overdose of Intravenous N-Acetylcysteine

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Background: N-acetylcysteine (NAC) is used as antidotal therapy for acetaminophen poisoning, and is also administered as a supportive adjunct for other hepatic inflammatory illnesses. In addition to being associated with a higher incidence of anaphylactoid reaction, the intravenous administration of NAC may carry a greater risk for medication administration error than the oral route. *Case Report:* A 2-year-old boy (14 kg) with stage-IV neuroblastoma developed hepatic veno-occlusive disease following autologous peripheral stem cell transplant. He was treated with the investigational drug, defibrotide, for 14 days. Due to progressive liver injury, intravenous NAC was prescribed. An overdose of NAC was delivered: first infusion – 14000 mg (1000 mg/kg) of 20% NAC over 1 hour; second infusion – 4667 mg (333 mg/kg) of 20% NAC to run over 4 hours. Near the end of the second infusion the patient developed tachycardia, diminished responsiveness, and seizures. Laboratory analysis demonstrated hypoglycemia, which was corrected with intravenous dextrose. Computed tomography of the brain at the time of the overdose was normal; however, imaging 96 hours after the overdose demonstrated cerebral edema and infarction. The boy expired 4 days after the NAC overdose. The overdose of NAC was disclosed to the family. *Case Discussion:* The manufacturer's specifications for intravenous administration of NAC call for several different dilutions to be made, and suggest special calculations be made for children less than 40 kg body weight. These instructions can be confusing to health care workers. We describe an overdose of intravenous NAC in a child that is similar to a recent, previous report. *Conclusion:* The potential for drug administration error should be accounted for when risk-benefit analyses of oral versus intravenous routes for NAC administration are considered.

4. Supraventricular Tachycardia and Atrial Fibrillation following Acute Clenbuterol Overdose in a Bodybuilder

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Background: Clenbuterol is a long-acting U.S. veterinary β_2-adrenergic agonist. It is abused in competitive weight training because of its anabolic and lipolytic properties. We report the case of a competitive bodybuilder using clenbuterol who developed significant electrolyte and cardiac manifestations. *Case Report:* A 31-year-old-man presented to the emergency department 30 minutes after ingesting 1.5 ml (10:1 dosing error) of Ventipulmin® syrup (72.5 μg/ml clenbuterol HCl). He reported no concurrent use of anabolic steroids. He was anxious with complaints of palpitations and shortness of breath. Vital signs were BP 122/77 mmHg, HR 254 bpm, RR 22 bpm, Temp 97.1, and oxygen saturation 100% on ambient air. His ECG demonstrated supraventricular tachycardia (SVT) with a ventricular response of 254 bpm. Laboratory studies revealed potassium 2.1 mEq/l, magnesium 1.3 mg/dl, phosphorus 1.0 mg/dl, glucose 209 mg/dl, creatinine 0.8 mg/dl, and troponin I 0.23 ng/ml. His SVT was treated with an esmolol infusion after failing IV adenosine and diltiazem. Repeat ECG 16 hours post-ingestion reflected atrial fibrillation (AF) with a rapid ventricular response of 125–147 bpm. He was electively cardioverted and discharged on oral metoprolol with a normal heart rate and rhythm. *Case Discussion:* Clenbuterol is approved for use in countries outside the U.S. as a bronchodilator for the treatment of acute asthma exacerbations in humans. Its prolonged duration of action with a high peak level make it a desired agent for weight training. Although clenbuterol is not a steroid hormone, it possesses anabolic properties with β_2-adrenergic agonist activity on striated skeletal muscles. In addition, clenbuterol promotes lipolysis through adipocyte β_3-adrenoreceptors. The cause of AF is multifactorial and likely resides as a combination of adrenergic agonism and electrolyte abnormalities. *Conclusion:* Considering the large number of weight-training enthusiasts, clenbuterol abuse is expected to be an intoxication physicians will continue to encounter in their clinical practice.

5. Bronchiolitis Obliterans Organizing Pneumonia (BOOP) in an Elderly Female after Inhalation of Sodium Hydroxide with Isobutane Propellant Oven Cleaner

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Background: Chemical pneumonitis is well reported after inhalation of a variety of chemicals, including isobutane and sodium hydroxide. Inhalation of either isobutane or alkaline caustic agents have not previously been reported to cause bronchiolitis obliterans organizing pneumonia (BOOP). *Case Report:* An 88-year-old non-smoking woman with past history of hypertension, atrial fibrillation and congestive heart failure developed cough, fever and flu-like symptoms after several minutes of exposure to oven cleaner containing sodium hydroxide with isobutane propellant sprayed into a heated oven (200 °F). Three days after exposure she developed worsening dyspnea and was treated with inhaled beta agonists, steroids, and antibiotics and was discharged. She was admitted 10 days later for worsening dyspnea, fatigue and confusion. She was hypoxic with oxygen saturation of 84% on 2 L O_2 by nasal cannula. She had crackles on lung exam. Heart rhythm was irregularly irregular. She had bilateral pitting pedal edema. The remainder of her exam was unremarkable. A chest CT showed extensive bilateral infiltrates and small bilateral pleural effusions. A diagnosis of BOOP was made by a pulmonary specialist. The patient also had significant hyponatremia (116–124mEq/L). She was placed on steroids, antibiotics and fluid restriction. She was discharged 6 days later with resolution of her hypoxia and normalization of her serum sodium. She continued prednisone on a one month taper and antibiotics for an additional week. *Case Discussion:* Following this exposure, a patient without previous lung disease developed chemical pneumonitis that progressed to BOOP. Either component could have caused her pneumonitis. BOOP has not been previously reported in patients exposed to these compounds. Spraying the product into a heated oven potentially increased vaporization and exposure to the sodium hydroxide. *Conclusion:* Chemical pneumonitis and bronchiolitis obliterans organizing pneumonia (BOOP) developed after a short exposure to sodium hydroxide and isobutane-containing oven cleaner. She responded well to steroids, inhaled beta agonists and supportive care.

6. Syndrome of Inappropriate Secretion of Antidiuretic Hormone Following Chronic Theophylline Intoxication

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Background: The Syndrome of Inappropriate Secretion of Antidiuretic Hormone (SIADH) is of paramount concern to toxicologists given the extensive list of drug-related causes. Theophylline is well-known to cause hyponatremia through its effect on the proximal convoluted tubule but is rarely associated with the development of SIADH. *Case Report:* A 60-year-old woman with COPD and chronic alcohol abuse presented with severe nausea, tremors, and abdominal cramping. A history of excessive, chronic theophylline dosing was obtained. Physical findings included tachycardia, tachypnea, and mild abdominal tenderness. Laboratory findings were: serum sodium, 118 mmol/L; serum potassium, 2.6 mmol/L; serum chloride, 87 mmol/L; serum bicarbonate, 23 mmol/L; urine sodium 108, mg/dL; plasma osmolality, 262 mOsm/kg H_20; urine osmolality, 273 mOsm/kg H_20; and theophylline, 63.7 mg/ml. Cortisol, free thyroxine, and creatinine were normal. Treatment included anti-seizure prophylaxis with phenobarbital and multi-dose charcoal. Normalization of hyponatremia mirrored declining theophylline levels. *Case Discussion:* Theophylline is a potent adenosine receptor antagonist. Murine models demonstrate that agonism at adenosine receptors (subtype A1) in the neurohypophysis reversibly inhibit the release of arginine vasopressin (AVP) and oxytocin (OT) in a dose-dependent fashion. Disinhibition of adenosine-mediated AVP suppression through theophylline's antagonism at neurohypophysial A1 receptors is a potential mechanism for theophylline-induced SIADH. Both risk factors for the condition and the contribution of other established pharmacologic effects of theophylline (phosphodiesterase inhibition) are unknown. *Conclusion:* We report a rare case of theophylline-induced SIADH. While hyponatremia in the face of theophylline intoxication is most often due to its thiazide-like effect on renal tubule cells, SIADH should also be considered. In this setting, a likely mechanism involves theophylline antagonism of adenosine A1 receptors in the neurohypophysis.

7. Acute Penile Angioedema after Irbesartan Addition to Lisinopril

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Background: Angioedema occurs after use of angiotensin converting enzyme inhibitors (ACEI) and is reported after angiotensin II antagonists (ARB). Atypical sites of angioedema are rare after ACEI or ARB use. We report a patient who acutely developed

penile angioedema when irbesastan was added to long-standing lisinopril therapy. *Case Report:* This is a 68-year-old male with a past medical history of erectile dysfunction, coronary artery disease, hypertension, hyperlipidemia, deep vein thrombosis and osteoarthritis who presented to the emergency department with a complaint of non-painful penile swelling that developed over the past 2–12 hours. Physical examination was only significant for swelling of the penile shaft skin that did not involve the corpora. There was no history of trauma. There were no skin lesions, and no evidence of any infectious process. The penis was soft and non-tender and the testes were descended and not involved. Medications included amlodipine 10 mg daily, cyanocobalamin 1000 mcg monthly, folic acid 1 mg daily, gemfibrozil 200 mg twice daily, lisinopril 30 mg daily, metoprolol 200 mg daily, nitroglycerin 0.4 mg/hr applied daily, ranitidine 150 mg twice daily, and irbesartan 75 mg daily (started two days prior to presentation). Lisinopril and irbesartan were discontinued and symptoms resolved. The patient was seen again one month later without complaints. *Case Discussion:* We report an adult male maintained on an ACEI who acutely developed penile angioema upon addition of an ARB. There is one prior report of penile angioedema after ACEI use and ours is the only reported case of penile angioedema with ARB use or upon addition of concurrent therapy. No alternative explanation for the swelling was obvious. Currently known risk factors for the development of angioedema include advanced age and African American race. The mechanism of ACEI-induced angiodema is Unclear. Despite the pharmacologic difference in ACEI and ARB, angioedema is associated with ARB therapy. The true mechanism of angioedema is poorly understood and likely not solely the result of elevated bradykinin levels. *Conclusion:* Atypical sites of angioedema associated with ACEI and ARB use may occur. Care should be taken when initiating ARB therapy concurrent with ACEI therapy.

8. Accidental Acitretin (Soriatane) Overdose

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Background: Acitretin (Soriatane) is a systemic antipsoriatic, keratinization stabilizer. It is used in the treatment of severe psoriasis, keratinization disorders, as well as other related disorders. Acitretin is a second generation retinoid and a synthetic aromatic analog of vitamin A. The drug is thought to alter gene expression through nuclear retinoic acid receptors and binding to DNA causing transcription or transrepression changes in protein synthesis. It affects immune response, epidermal proliferation and glycoprotein synthesis in skin, normalizing cell differentiation and thinning the cornified layer by reducing proliferation of keratinocytes. Acitretin is highly protein bound, metabolized to active metabolites and has a long elimination half life of 49 hours. While chronic administration has resulted in hepatotoxicity, acute overdose of Acitretin has not been reported to date. *Case Report:* A 55-year-old male contacted the Poison Control Center after inadvertently taking 15 tablets of his Acitretin 25mg instead of the prescribed one tablet while talking on the phone with a friend. He was referred to the emergency department and he was given 50 grams of activated charcoal approximately two hours after the ingestion. He was observed and discharged at six hours after ingestion without symptoms. Initial laboratory studies showed normal liver function; total protein 7.7g/L (6.3–8.2), albumin 4.3g/L(3.8–5.1), Bilirubin total 0.5mg/dL(0.1–1.3), ALP 74IU/L(38–126), ALT 37IU/L(7–56), AST 34IU/L(5–40). Reevaluation of laboratory studies eleven days later showed no significant changes; total protein 7.6g/L, albumin 4.0g/L, bilirubin total 0.4mg/dL, ALP 72IU/L, ALT 37IU/L, AST 35IU/L. *Conclusion:* Acute on chronic ingestion of 375mg of Acitretin did not worsen liver function. Acute hepatotoxicity from Acitretin overdose may be minimal as exhibited by our case. No other cases of acute overdose have been reported.

9. Pharmacokinetics of Intravenous Fomepizole Versus Oral Fomepizole in Healthy Humans

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Background: Fomepizole is available intravenously (IV) for the treatment of toxic alcohol poisoning. Studies demonstrate that fomepizole achieves effective serum concentrations after IV or oral (PO) use. However, supportive pharmacokinetic data are limited. The objective was to determine the pharmacokinetics of fomepizole after a single PO and IV dose. *Methods:* This was a prospective, randomized, crossover trial in 10 healthy volunteers. Each received 15 mg/kg fomepizole, PO and by 30 minute IV infusion. Serum was collected at 0, 0.25, 0.5, 1, 2, 4, 7, 12, 24, 36 and 48 hours(h) and stored at −70 °C. Candidate models were fit to the IV and PO data, simultaneously, using iterative 2-stage analysis weighted by the estimated

inverse observation variance. Model discrimination was by Akaike's Information Criterion. Time above the MEC (T>MEC) was determined by numeric integration of the fitted functions using 10 μmoles/L as the presumed minimum effective concentration (MEC). *Results:* 7 females and 3 males were enrolled. Sole complaints included headache and dizziness in 3 subjects and 10/10 reported an unpleasant taste orally. The final PK model was 2-compartment with 0-order IV and 1st-order PO input (following a fitted TLag) and Michaelis-Menton elimination. PO fomepizole was rapidly absorbed with a fitted bioavailability of ~100%. The Km was 0.935 ± 0.98 μmoles/L and the Vmax was 18.57 ± 9.58 μmoles/L/hr. T>MEC was 41 h, (range 34–48 h) with agreement between PO and IV dosing. Precision plots for observed versus fitted concentrations yielded an overall r^2 of 0.99 and 0.96 for PO and IV data, respectively. *Discussion:* This is the first study that effectively determines a human Vmax and Km for PO and IV fomepizole. We found a long T>MEC of 41 hours, in healthy humans. *Conclusion:* PO and IV administration, of fomepizole in therapeutic doses, result in similar pharmacokinetic parameters. Further study in poisoned patients is warranted to conclusively determine the MEC, T>MEC and any changes to current fomepizole dosing.

10. Intravenous N-Acetylcyteine Increases INR in the Absence of Significant Acetaminophen Hepatotoxicity

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Background: Acetaminophen poisoning is common. The INR is one of the most sensitive markers of acetaminophen related hepatotoxicity and is is used to guide the need for continuing antidotal treatment with intravenous N-acetylcysteine (IV NAC), as an early marker of hepatotoxicity and as one of the criteria for liver transplantation. However, prevous studies have suggested that both acetaminophen and NAC could have an effect on the INR independent of the development of hepatotoxicity. *Methods:* Data was collected prospectively on patients presenting to an inner city ED following acetaminophen overdose from May 2005 – February 2006 using an electronic clinical toxicology database (Microsoft Access®). Inclusion criteria: INR measured within 4 hours of commencement and completion of IV NAC (150mg/kg over 15 minutes, 50mg/kg over 4 hours, 100mg/kg over 16 hours, total 20.25 hour infusion), normal baseline liver and renal function tests. Patients with an initial INR > 1.05, and those with derranged renal or liver function tests following the completion of NAC infusion were excluded. *Results:* 39 patients met the inclusion criteria. All patients were administered the complete 20.25 hour IV NAC infusion. Mean ± SD INR values pre and post IV NAC therapy were 0.99 ± 0.04 (range 0.86–1.05) and 1.07 ± 0.06 (range 0.96–1.24) ($p < 0.01$). *Discussion:* There was a statistically significant but clinically insignificant increase in INR in this group of patients administered IV NAC for acetaminophen poisoning. *Conclusion:* This study suggests that the effect of IV NAC on INR may not be as great as previously reported. Further studies are required to examine the relationship between both acetaminophen and INR and IV NAC and INR in patients with acetaminophen poisoning.

11. Detection of Flunitrazepam Following Ingestion of 1 mg in Healthy Volunteers

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Background: Flunitrazepam (Rohypnol®) is one of a number of drugs that have been reported to be used in drug-facilitated sexual assault ("date rape") cases, since it is easily dissolved in water and is then colorless and odorless. Currently there is no data available on how long it remains detectable in blood following ingestion. We therefore designed an open-label study to determine whether flunitrazepam could be detected up to 24 hours post-ingestion in healthy volunteers. *Methods:* Following an overnight fast, healthy male volunteers ingested 1 mg flunitrazepam with 100 ml water. Blood samples were collected at 2, 4, 6, 8 and 24 hours post-ingestion. Plasma concentrations of flunitrazepam were measured using an established gas chromatography method. All subjects provided written informed consent and the research protocol was approved by the local Institutional Review Board. *Results:* Six healthy male subjects (age 25.0 ± 6.1 years [mean ± std dev] and body mass index 24.9 ± 3.5 kg/m^2) were recruited. Plasma flunitrazepam concentrations fell from 8.73 ± 2.1mg/L at 2 hours to 3.67 ± 1.24 at 8 hours and 1.76 ± 0.77mg/L at 24 hours post-ingestion. *Discussion:* We have demonstrated that flunitrazepam was detected in plasma samples from healthy volunteers up to 24 hours post-ingestion of a therapeutic dose of 1 mg. *Conclusion:* Clinicians treating suspected cases of either spiked drinks and/or alleged drug-facilitated sexual assault

should be aware that blood samples collected within 24 hours of the incident will be useful in confirming whether flunitrazepam may have been involved.

12. Blood Cyanide and Plasma Cyanocobalamin Concentrations after Treatment of Acute Cyanide Poisoning with Hydroxocobalamin or Vehicle in a Canine Model

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Background: The cyanide antidote hydroxocobalamin traps cyanide ions and thereby forms cyanocobalamin on a molar-to-molar basis. This investigation assessed blood cyanide and plasma cyanocobalamin concentrations during and after infusion of hydroxocobalamin for the treatment of acute cyanide poisoning in a canine model. *Methods:* Isoflurane-anesthetized, intubated adult beagle dogs were administered potassium cyanide (2.3 ± 0.2 mg/kg, IV; time of start of infusion = –0.1 h) until 3 min after the onset of apnea. Beginning at time = 0 h, hydroxocobalamin (75 mg/kg [n = 19] or 150 mg/kg [n = 18], IV) or saline vehicle (n = 17) was then infused over 7.5 min while animals were mechanically ventilated with 100% oxygen. Mechanical ventilation was stopped after 15 min. Blood samples were collected during the first 24 h after initiation of cyanide infusion for determination of whole-blood concentrations of cyanide and plasma concentration of cyanocobalamin. *Results:* Mortality rate was 0% and 21% in animals treated with hydroxocobalamin 150 mg/kg and 75 mg/kg, respectively, compared with 82% in vehicle-treated animals. Across groups, mean whole-blood maximum concentration (C_{max}) of cyanide at the end of cyanide infusion, but before antidote or vehicle treatment, ranged from 114 to 128 nmol/mL. At the end of antidote or vehicle infusion, blood cyanide concentrations in hydroxocobalamin-treated dogs were approximately 50% lower than those in control dogs and declined slowly thereafter. The mean area under the cyanide concentration-time curve (AUC) through 2 h after the end of cyanide infusion was reduced by 59% to 73% in hydroxocobalamin-treated dogs compared with vehicle-treated dogs. Cyanocobalamin concentration was high in the blood of hydroxocobalamin-treated dogs and increased with increasing hydroxocobalamin dose. *Discussion:* Rapid reduction in blood cyanide concentration was observed in hydroxocobalamin-treated animals. *Conclusion:* Prevention of mortality by hydroxocobalamin in a canine model of acute cyanide poisoning was associated with rapid reduction in blood cyanide concentration in hydroxocobalamin-treated animals compared with vehicle-treated animals and with formation of cyanocobalamin.

13. Impact of RBC Cholinesterase Determination on Decision-Making for Low Normal Plasma Cholinesterase Measurements

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Background: Plasma or Butyrylcholinesterase (BChE) has a wider range of normal than does RBC cholinesterase (AChE) because of the impact of genetic variability, diet, medications, and underlying hepatic function on plasma concentrations of the former. This can complicate interpretation of low or low normal BChE measurements. We postulate that patients with low BChE results and no evidence of cholinesterase inhibitor exposure will have AChE values in the normal range. *Methods:* A convenience sample of patients presenting to an urban teaching Emergency Department completed interviews and provided blood samples after informed consent in an IRB-approved study. BChE (using a butyrylthiocholine substrate) and AChE (using acetylthiocholine as a substrate) measurements were made on the Cobas Integra-800 Chemistry Analyzer (Roche Diagnostics, Basel, Switzerland), with adjustment for the plasma contribution of AChE in whole blood specimens to yield RBC AChE activity. *Results:* AChE measurements were determined for the lowest 12.5% BChE results (2–5.6 U/mL) and represented 34 of 350 patient samples. These were compared with AChE results from a representative sample from the upper 3 quartiles of BChE activity (15 patients with BChE of 6.3–12 U/mL). AChE measurements for the lowest BChE-activity samples ranged from 11.6–20.6 U/mL (mean 14.8, SD 2.3), while the range of AChE for the highest 75% BChE samples was 10.4–14.7 U/mL (mean 12.6, SD 1.4). *Discussion:* In our sample of ED patients, AChE was normal across the entire range of BChE values. Unexpectedly, the AChE was more variable among the population with the lowest BChE activity, compared with the population that had higher BChE values. AChE activity for those with the lowest BChE activity demonstrated twice the variability of that of the population with the highest BChE activity (80% vs. 40%). *Conclusion:* AChE is normal in those patients with low BChE and no known cholinesterase exposure. The availability of rapid throughput chemistry analyzers for AChE allows greater certainty in the interpretation of cholinesterase activity in patients without a clear cholinergic toxidrome.

14. Preparation of Crotaline F-ab Antivenom (CroFab) with Automated Mixing Methods

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Background: Crotaline F-ab antivenom (Crofab™, Savage Labs and Protherics Inc, USA) therapy requires that the lyophilized powder be manually reconstituted before use. We investigated the protein yield from different methods for driving the product into solution. *Methods:* Normal saline (NS, 10 mLs) was added to twelve vials of expired Crofab. One pair of vials was swirled by hand; the other vials were assigned in pairs to each of 5 automated mixing methods. Gentle swirling was briefly done after the mixing step to collect any residue from the vial walls. 5 mL of solution were transferred into a NS IV bag. The protein concentration was then measured (10 specimens per vial). The fluid left in each vial was removed. NS (10 mL) was then added to each vial and gently mixed to dissolve any foamy residue. After 15 minutes, protein concentration was measured. (5 specimens per vial). *Results:* Total protein yield from each step was calculated. Results are shown in the table.

In vitro CroFab yield (grams/vial) with various mixing methods

Mixing method*	Initial recovery	Residual in vial	Calculated yield after 2 extractions
manual	0.78	0.39	1.17
manual	0.80	0.37	1.18
rocking (30 min)	0.77	0.39	1.16
rocking (30 min)	0.76	0.37	1.13
lateral motion	0.78	0.38	1.15
lateral motion	0.73	0.36	1.09
rotatory mixer	0.70	0.35	1.06
rotatory mixer	0.68	0.38	1.06
lateral/rocking combo	0.72	0.38	1.10
lateral/rocking combo	0.81	0.27	1.08
rocking (60 minutes)	0.64	N/A	N/A
rocking (60 minutes)	0.68	N/A	N/A

*Each vial was mixed for 30 minutes unless otherwise noted. N/A: Not tested.

Discussion: Manually mixing antivenom for a snakebite victim can be labor-intensive. We found slightly lower protein yields with automated methods compared to manual mixing. However, for all methods tested, the addition of a second rinsing and recovery step increased the amount of protein recovered considerably. Prolonged or combined mixing methods did not increase the initial recovery in our study. *Conclusion:* These in vitro observations may help refine the preparation of Crofab in clinical practice.

15. A Randomized, Placebo-Controlled Comparison of Ziprasidone, Diazepam or both for Prevention of Cocaine Toxicity in a Mouse Model

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Background: Benzodiazepines are the first-line therapy for acute cocaine toxicity. One recent study found that ziprasidone, an atypical antipsychotic, also attenuates the effect of acute cocaine poisoning, but no studies have evaluated the effect of combination therapy. We hypothesize that the combination of ziprasidone and diazepam will increase survival in cocaine-poisoned mice more than either treatment alone. *Methods:* This was a randomized, placebo controlled blinded study using 40 male CF-1 mice per treatment arm. The treatment arms were: Saline/saline (P), ziprasidone/saline (Z), diazepam/saline (D), and diazepam/ziprasidone

(DZ). All medications were administered as 0.1 ml IP injections. The dose of ziprasidone was 4 mg/kg and the dose of diazepam as 2 mg/kg. Fifteen minutes after the medications, we administered 105 mg/kg of cocaine (an LD70). We observed the mice for seizures and predefined criteria for apparent lethality (per our local IACUC). The proportion of animals with seizures and apparent lethality for each treatment group were compared to placebo with Chi-square. *Results:* The proportion of mice with seizures for the treatment groups was: P 95% (83 to 99%), Z 35% (20 to 52%), D 45% (29 to 62%), and DZ 2.5% (0 to 13%). D and Z decreased seizures and DZ was more effective than either treatment alone. The mortality (with 95% CI) for the treatment groups were: P 73% (56 to 85%), Z 35% (21 to 52%), D 30% (17 to 47%), and DZ 20% (9 to 37%). All treatments decreased mortality and there was no difference between the treatments. *Discussion:* Combination therapy was more effective for seizures but did not change mortality. This suggests that seizures and mortality may respond differently to therapy or be due to different effects of cocaine. *Conclusion:* We conclude that both ziprasidone and diazepam reduce mortality in cocaine poisoning. The combination dramatically reduces seizures but offers no more than a modest effect on mortality over monotherapy.

16. Urine Kinetics of Acephate and Its Metabolite Methamidophos after Acute Ingestion

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Background: Acephate (AP) is a widely available organophosphate (OP) insecticide considered to have low human toxicity. In plants and insects, AP is preferentially metabolized to methamidophos (MMP), a more potent OP. Mammalian metabolism of AP to MMP has been studied with quantitative and kinetic data in rat models but not following acute human ingestion. *Case Report:* A 4-year-old male with a history of diabetes insipidus was found unresponsive. He presented with severe weakness requiring mechanical ventilation, hypotension and acute renal failure; cervical injury or head trauma was originally suspected. He was transferred to a tertiary care pediatric center where he developed bradycardia, miosis, muscle fasciculations, and hypersalivation, for which he received multiple doses of atropine. Trauma workup was unremarkable. 2-PAM and a continuous infusion of atropine were initiated. Additional history revealed that a "jug" of AP solution had been accessible at home. Ingestion was confirmed by presence of urinary AP, MMP and depressed plasma and RBC cholinesterases. He had a complicated ICU course which included mechanical ventilation and additional atropine for 20 days, but eventually recovered to baseline health. *Case Discussion:* Urinary levels of AP and MP were analyzed using HPLC-atmospheric pressure chemical ionization mass spectrometry. Calculated urine K_{elim} and urine $t_{1/2}$ were 0.065 and 10.62 hr, respectively. The ratio of AP to MMP remained constant throughout its elimination, which may support the presence of product inhibition of carboxyamidase (the enzyme that catalyzes AP to MMP). This has only been previously reported in rat models. *Conclusion:* After acute ingestion of AP, MMP is formed and can cause potentially life-threatening effects despite its low toxicity classification. The reported kinetic data may support carboxyamidase inhibition by its own product, MMP.

Results

Time (hrs)	AP (μg/mL)	MMP (μg/mL)	AP to MP ratio
0	607.400	13.170	46.11
14.48	206.200	4.087	50.45
28.66	9.370	0.196	47.80
57.88	13.920	0.260	53.53

17. Normative Distributions of Plasma Cholinesterase Activity in a Tertiary Care Emergency Department, for use as a Rule-Out Screen for Significant Nerve Agent Toxicity

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Background: Nerve agents suppress both plasma (BChE) and erythrocyte (AChE) cholinesterase. It is unknown if such assays may be used to mass-screen victims of a nerve agent attack. A screening cholinesterase assay would be a valuable triage tool for ruling out exposure. However, interpretation of results requires knowledge of the normative distribution of cholinesterase within the

population. *Methods:* IRB approval was obtained. Any patient who presented to the Emergency Department at Hartford Hospital was eligible for enrollment. Following informed consent, patients were questioned about their demographics, medical condition(s), exposures to pesticides, and current medications. A single 3 mL green-top tube and a single 3 mL purple-top tube of whole blood were obtained and processed by the Clinical Chemistry Laboratory. Specimens were stored at −70°C until transported to 8 participating hospitals. BChE determinations were made on four different instruments: the Vitros® 950 (Ortho-Clinical Diagnostics, Raritan, NJ), the portable Vitros® DT-60 (Ortho-Clinical Diagnostics, Raritan, NJ), the Integra®-800 (Roche Diagnostics, Basel, Switzerland), and the Beckman (Beckman Instruments Inc., Berkley, CA). A total of 340 specimens have been obtained. After the first 250 patients were enrolled, an interim demographic analysis was performed. *Results:* BChE values ranged from 1.85 U/mL to 13.4 U/mL with a mean of 6.09 U/mL across all hospital laboratories. The study population ranged in age from 19 to 95 years with mean of 56 and standard deviation of 20. The demographics of the sample varied significantly from that of the adult population of the state, with the prevalence of chronic illness and medication use higher than that of the general population (DM 21.2% v, 5.9%, HTN 39.4% v, 24.2%, CVD 21.8% v, 6.9%). *Discussion:* This data describes the normal distribution of BChE in a large ED population sample. *Conclusion:* Comparison of this database of BChE results to other healthy population controls and correlation with AChE will indicate the relevance of this test as a rapidly available rule-out screen for nerve agent exposure.

18. Presence of Calcium Oxalate Crystals inside Renal Tubular Cells: Assessment by Transmission Electron Microscope

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Background: Ethylene glycol can produce renal failure due to its metabolite oxalate. The exact mechanism for the renal failure is not known, but oxalate binds to calcium and forms calcium monohydrate (COM) crystals. COM can damage the plasma membrane and is also thought to interfere with mitochondrial function, both of which could lead to tubular cell necrosis. Earlier studies have suggested that COM crystals are bound to the surface of kidney cells and taken into the cells. The present studies were designed to look for visual evidence of crystals inside the human proximal tubule (HPT) cell cytoplasm by the use of transmission electron microscopy. We also looked for changes in mitochondrial structure or other cell structures. *Methods:* Confluent cultures of HPT cells were grown on Thermanox plastic cover slips, and exposed to four different COM suspensions (74, 147, 441, and 735mg/mL) for different time courses in duplicate, in addition to a duplicate control. After treatment, the cells were rinsed with PBS and fixed in Karnovsky's fixative agent. The cells were further fixed and dehydrated, removed from the coverslips, and sliced in 1 μm thin slices. *Results:* In a large number of treated cells, structures likely to be COM crystals were found, but not so in the controls. At higher COM concentrations and longer treatment times, the cells seemed to be more affected. Cells treated with COM appeared to have structural alterations that increased in severity and frequency with time and COM concentration. There were more areas of disrupted cytoplasm in the treated cells compared to the controls. Mitochondrial structure seemed altered in several of the treated cells. *Conclusion:* These studies indicated the likely presence of COM crystals inside the cells, supporting our earlier data which showed significant uptake of radioactive labeled COM-crystals. Cells appeared to have more structural damage with the higher COM concentrations and the longer times of treatment.

19. Hand Sanitizer Abuse

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Background: Hand sanitizers are often gel-like emulsions, containing high concentrations (>60%) of ethanol. We became aware of correctional facility (CF) inmates using table salt (NaCl) to "break" these emulsions, to generate consumable ethanol. Therefore, a potential for abuse of these products by inmates and others exists. We sought to recreate this procedure and analyzed the resultant liquid for its alcohol concentration. We also surveyed the medical staff and corrections officers (staff) of the state's eighteen correctional facilities to assess their awareness of this practice. *Methods:* A) Following the method used by CF inmates, four ounces of hand sanitizer was added to a clean cotton sock that was placed over a glass graduated beaker. One teaspoon of NaCl was sprinkled on the gel-like material and within seconds a cloudy liquid filtered into the beaker. The resultant liquid was sent to an independent lab for alcohol analysis using a gas chromatography headspace technique. B) A telephone survey queried the CF

staff of each facility (correctional officer (CO) supervisor and nurse) as to: 1) their awareness of this practice in their facility; 2) product availability to inmates, and 3) the value of this information towards changing their institution's policy regarding product availability. *Results:* A) Laboratory analysis revealed that the submitted liquid contained: ethanol 69.9% v/v; Isopropyl 2.1% v/v. B) Survey Results: 94% (17/18) of the CF staff were not aware of the potential abuse of these products. Inmates had direct access to product in 22% (4/18) of CFs. In one CF, product was removed from the cell blocks as a result of our survey. In 100% (18/18) of CFs, product is used in all medical areas as well as carried by correction officers. *Discussion:* CF staff found this information both enlightening and beneficial. Surveyed nurses planned on notifying their supervisors and the CO supervisors relayed that they would notify their staff. *Conclusion:* We discovered the potential for abuse of hand sanitizers in a number of state correctional facilities. More importantly we educated CF staff on the need to control product accessibility to inmates.

20. Is there an Association between Human Opioid Exposures and Drug Identification Calls Reported to a Regional Poison Control Center and Prohibited Alcohol-Sales Counties?

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Background: There are 26 prohibited alcohol-sales counties ("dry") compared to 41 legal-alcohol- sales counties ("wet") counties in Alabama. Opioids are popular drugs of abuse, misuse, and diversion. The objective is to determine if there is a difference in the proportion of opioid drug identification and exposure calls in dry versus wet counties in AL. *Methods:* Retrospective study using RADARS™ (Researched Abuse, Diversion, and Addiction-Related Surveillance System) search criteria for the year 2005, identifying all exposure and drug information cases involving oxycodone, hydrocodone, morphine, hydromorphone, and methadone at the Regional Poison Control Center (RPCC)/ Birmingham, AL. Cases were sorted and analyzed by the 67 counties. The proportion of calls was determined by taking the number of calls divided by the individual county populations and multiplying by a factor of 10,000. Proportions between wet and dry counties were compared. *Results:* In 2005, there were a total of 3,936 human exposures/drug identification calls for the 5 opioid drugs searched—2,833 in wet counties and 1,103 in dry counties.

Comparison of opioid proportions between dry and wet counties*

	Human exposures N = 492	All pill identifications N = 3,444	Oxycodone pill ids N = 718	Hydrocodone pill ids N = 2,070
Dry N = 26	0.68	3.58	0.86	2.68
Wet N = 41	0.61	1.29	0.09	0.65
P value	0.62	<0.01	0.02	0.01

*median proportions.

There was a statistically significant higher proportion of opioid pill identification calls coming from dry versus wet counties. Oxycodone and hydrocodone were the only opioids whose proportions were significantly greater. *Discussion:* Those residents of dry counties that have a propensity for substance abuse appear to find substitutes for alcohol. This association has never been published. *Conclusion:* In Alabama, there was a significantly higher proportion of opioid pill identification calls requested by prohibited alcohol-sales counties. This data has significant public health implications for drug diversion/abuse and law enforcement.

21. The Influence of Passive Smoking on Birth Parameters of an Newborn

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Background: Presently among non-smoking persons 66% of women are exposed each day to passive smoking; 35% at home, 27% at workplace, and 44% during recreation. An essential problem is the exposure of the developing fetus to the tobacco smoke.

The aim of this study was the evaluation of the influence of passive smoking on a mother upon pregnancy completion, a newborn's birth body weight and body length. *Methods:* The tested group was 45 pregnant women giving birth at the Gynecological-Obstetric Clinic in Poznan and their newborns. The control group was 43 nonsmoking and non-exposure to ETS women and their newborns. A questionnaire method for the evaluation of the passive smoking of the patients, as well as measurement of the cotinine in the urine of mothers was applied. The evaluations of prenatal exposure to smoke were carried out through the measurement of cotinine in the placenta and in the first urine of an newborn. *Results:* Among the newborns of the passive smokers, there were 72% of newborns born on time compared to the 93% of nonsmoking women. Eight percent of newborns constituted the group of hypotrophic newborns of ETS exposed mothers, and in the case of nonsmoking mothers, 4.7%. *Discussion:* The birth body weights of newborns of ETS exposed mothers was 3250.4 ± 838.9 g and was statistically lower by 280.3 g than the body weight of newborns of the nonsmoking mothers. The body length of the newborns of passively smoking mothers was 52.68 ± 4.39 cm and was 2.34 cm shorter than the body length of newborns of the nonsmoking mothers. Within the group of the tested passively smoking women, the concentration of cotinine in the urine was 53.2 ± 58.03 ng/mg of creatinine and in the placenta, 19.45 ± 12.09 ng/mg. The level of cotinine in the first urine of newborns was 26.03 ± 10.69 ng/mg of creatinine. *Conclusion:* Among the tested women, the passive exposure to tobacco smoke had an essential impact on the birth parameters of newborns. Financed by the State Committee for Scientific Research, grant no. 2 P05E 103 26.

22. Cocaine Base Paste: The Experience of Montevideo Poison Control Centre

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Background: In Uruguay, coca base paste *(*CBP, *pasta base)* is a widely used form of cocaine. It is an intermediate product of cocaine hydrochloride, which contains 40 to 85% of cocaine sulphate and several impurities and adulterants. Beside that, the inhalation of base paste from burning tins and pipes potentially adds the inhalation of heat and combustion products, causing a particular clinical picture that needs characterisation. *Case Report:* The aim of our study is to determine the main clinical characteristics of patients who use CBP. *Method:* This is a retrospective, single-centre study of the physician consultations to the Montevideo PCC between January 1, 2004 and December 31, 2005 referred to acute exposure to CBP in the last 48 hours. *Case Discussion:* One hundred and thirteen consultations were included with an average age of 22 years (+ – 0.5 years) and a female-male sex ratio of 1:4.3. The consultations were about drug overdose (77%), suicidal attempt (16.8%), and a desire to interrupt the CBP use (6.2%). In 48.1 % time-elapsed since inhalation of CBP was lower than 6 hours. Doses consumed were only reported in 30 cases and varied between 0.5 gr. to 25 gr. of CBP. The simultaneous intake of other drugs was common (51 cases). In 33.3 % of patients, CBP was associated with alcohol, marijuana (5.9%), and benzodiazepines (21.6%). The most frequent symptoms observed were neuropsyquiatric (32.7%) and cardiovascular (31.4%). Respiratory findings were noticed in 8.6%, including wheezing and dyspnea. Taquicardia, euphoria, mydriasis, and hypertension were the most prevalent findings. In 16.8 % of the patients, the motives of consultation were an intentional acute ingestion of drugs considered suicidal attempt that occurred a few hours after drug consumption. *Conclusion:* Patients who consume CBP are young and mostly males. Although clinical findings are compatible with cocaine abuse, euphoria is a major clinical feature in CBP abusers as have been described in other smokable forms of cocaine. The presence of respiratory symptoms suggests the effects of contaminants associated with heat. The significant number of suicidal attempts a few hours after CBP use confirms the high prevalence of suicidal ideation reported by other authors.

23. Incarceration-Induced Opiate Withdrawal

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Background: Incarceration-induced opiate withdrawal is a significant problem in the jail population. Few studies have addressed the magnitude of the problem and the best treatment of this entity. Our objective is to report the magnitude of the problem and treatments provided to these individuals presenting to an Emergency Department (ED) of a large metropolitan jail. *Methods:* Data was retrospectively collected from the ED log book of the jail from 3/2001 to 12/2001. The study was approved by the IRB at our institution. Parameters analyzed included: age, sex, vital signs, treatment, length of stay, and disposition. Data was abstracted and analyzed using descriptive statistics via an Excel spreadsheet. *Results:* There were a total of 648 individuals presenting to the jail ED with a history of heroin, opioid, or methadone withdrawal. The patient population consisted of 243 (38%) females and 404

Results

Parameter	Mean	Range	SD
Age (years)	39	18–68	8.8
Temperature °f	97.9	95.4–100	0.8
Systolic BP (mmHg)	134.5	216–70	21.6
Diastolic BP (mmHg)	87.4	142–40	14.4
Heart rate (beats/min)	82.7	164–42	16.4
Length of stay (HR:Min)	01:47	00:01–20:05	00:08

(62%) males (See table for vital signs and length of stay). Treatments administered are as follows: hydroxyzine/Donnatol® 460(71%), prochlorperazine 332(51%), loperimide 302(47%), clonidine 121(19%), and IV fluids 81(13%). Disposition: 24 (4%) transferred to hospital, 137 (21%) admited to jail medical unit, 476 (74%) discharged to cell. *Discussion:* 15,158 patients were seen in this jail-based ED during the study period. This gives a rate of 4.3% of patients seen in the ED for incarceration-induced opiate withdrawal. There are approximately 100,000 admissions to the jail annually with an average daily jail census of approximately 10,000. *Conclusion:* Incarceration-induced opiate withdrawal places a significant burden on the jail Emergency Department. Further studies should focus on determing the optimal therapy for this inevitable consequence of incarceration.

24. Effect of Liquor "Blue Laws" Repeal on Alcohol Consumption Patterns

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Background: Liquor "Blue Laws" (LBLs) prohibit the sale of alcoholic beverages by liquor stores on Sunday. Dating back to Puritan times, LBLs are being repealed in states across the US. We examined the effect of LBLs repeal on alcohol consumption (ALC) patterns in two states. Hypotheses: 1) Patterns of ALC would change after the repeal of LBLs; and 2) No changes in ALC would be noted in the adjacent state, which did not contemporaneously change its LBLs. *Methods:* We reviewed all cases of ALC reported to a regional poison center (PCC) serving two states, 2 years before and after the repeal of LBLs. The time period Sunday morning 2 AM to Monday morning 9 AM was surveyed. Database integrity was assured by secondary and tertiary review of imputed variables. *Results:* Over the 4-year period, 694 cases of ALC were reported by the 2 states. Mean age of victims was 37.0 ± 10.9 yrs; 49.4 % were female. Substances included ethanol (642), isopropyl alcohol (28), methanol (15), and ethylene glycol (9). Within the ethanol group, 124 (19%) of substances were non-liquor, consisting of cough/cold products (88), mouthwash (22), hairspray (6), cologne (5) and extract (3). While there was no inter-period difference in the % liquor consumption by males (30.5 vs. 29.5, p = NS), there was a significant fall in the ingestion of non-liquor alcohol in women (13.8% vs. 5.6%, p = .049); women were 2.7 times more likely to ingest non-liquor alcohol, e.g., mouthwash, methanol, when LBLs were in effect compared to the period after their repeal. In the adjacent state served by the PCC, where LBLs were repealed later, there were no differences in ALC consumpion patterns in either gender. *Discussion:* The repeal of LBLs is associated with a reduction in consumption of non-liquor alcohols among women. This may result from: 1) easy access to alcohol products in the home, 2) the affordability of non-liquor products, 3) real or perceived barriers to women entering taverns, and 4) fear that ALC will be discovered by peers and family members. *Conclusion:* Additional research into ALC patterns as LBLs are repealed may provide valuable public health data. These findings may also have implications for state policy about LBLs.

25. Trends in Teenage Abuse of Coricidin™

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Background: Coricidin HBP™ is a cough and cold medication containing 4 mg of chlorpheniramine and 10 mg of dextromethorphan per tablet. This specific formulation remains a popular drug of abuse among teenagers. Many teenage-oriented websites

recommend this product. Teenagers can easily obtain this over-the-counter medication at most pharmacies and grocery stores. *Methods:* All Coricidin™ cases from our PCC over a 38-month period, from 2003 through early 2006, were reviewed. Only cases coded as intentional abuse in the age group between 13 and 18 years were included. Cases were reviewed to determine any identifiable trends. *Results:* A total of 224 cases fit our criteria. Both sexes are represented almost equally, with females comprising 108 cases, or 48.2%, and males comprising 116 cases, or 51.8%. Fifteen-year-old females had the highest rate of abuse at 35 cases, or 15.6%. The male age group with the highest abuse rate was 17-year-olds, with a total of 28 cases, or 12.5%. We found that 24.1% of the time, more than one teenager took this medication at the same time. Females ingested this in a group most often, representing 15.2% of cases; male multiple exposure cases totaled 8.9%. Of all cases, 97.7% were referred to a healthcare facility. Of these, 9.4% were admitted to either an ICU, medical floor, or to a behavioral health facility. A total of 66.5% of these cases were noted to have minor effects, consisting mostly of CNS effects and tachycardia. Moderate effects, including hypertension, were seen in 19.2% of cases. Only 1.8% were coded as having no effect. There were no deaths reported. *Discussion:* Coricidin™ abuse remains a popular trend with teenagers, in part due to easy access. Most patients develop at least minor effects and require referral to a health care facility. Nearly one quarter of the time, teenagers abused these pills in a group with fellow teenagers. *Conclusion:* Consideration should be given to restricting access to this medication for this age group.

26. Lack of Influence of Alcohol Abuse on Carbamazepine Poisoning

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Background: Medicines and alcohol are the major cause of poisoning among Kracows inhabitants. Carbamazepine is a medicine that is often used in cases of people who are addicted to alcohol, especially those who suffer from epilepsy. The poisoning caused by the mixture of carbamazepine and alcohol is common in this group of patients. The goal of the research was to evaluate the influence of alcohol addiction on toxicokinetic, and the severity of carbamazepine poisoning. *Methods:* 158 poisoned patients (61 women, 97 men) treated at the Rydygers Hospital in Krakow constituted the studied group. Within the studied group, there were 76 patients acutely poisoned with carbamazepine who were not addicted to alcohol, and 82 patients acutely poisoned with carbamazepine and addicted to alcohol. Within the group of patients addicted to alcohol, 47 patients were intoxicated with alcohol and in 35 patients the ethanol was not present in blood during admision to hospital. In blood of all the patients the level of alcohol and carbamazepine was measured during the admission and several times during hospitalization. *Results:* The concentrations of carbamazepine were similar in the studied groups. The activity of liver enzymes was increased among the alcohol addicts. The average time of hospitalization was 6.8 days for the group of epileptics, 5.8 days for sober alcoholics, and 7.5 days for drunken alcoholics. Also the systolic, diastolic blood pressure, as well as number of heartbeats, was higher among the carbamazepine poisoned addicts. *Discussion:* The frequency of anticholinergic toxidrome was higher in the case of alcoholics (88.6% – drunk alcoholics, 78.3% – sober alcoholics) in comparison with non-addicted epileptics (67.1%). The t1/2 of carbamazepine was 42.8 h within the group of non-addicted epileptics, 52.1 h within the group of sober alcoholics, and 84.6 h among drunken alcoholics. *Conclusion:* Although Biological half-life of corbamazepine is higher in alcoholics it has no effect on the severity of poisoning.

27. A Severe Outburst of GHB Poisonings (Gamma-hydroxybutyrate, Gamma-hydroxybutyric Acid) on the West Coast of Sweden. Mortality Numbers ahead of Heroin

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Background: Acute poisoning with GHB (Gamma-hydroxybutyrate, Gamma-hydroxybutyric acid) has been an increasing medical and social problem during the last decade in Sweden, especially on the west coast. Gamma-hydroxybutyrate (GHB) is a drug of abuse that causes euphoria, anxiolysis and hypnosis. *Methods:* The numbers of seized illicit drugs has been recorded by the police force. The numbers of poisoned patients has been recorded with appropiate diagnosis numbers from hospital data-base search. Diagnosis of GHB poisoning was not regularly confirmed by laboratory analysis but rather on the history of the patients. The number of deaths has been recorded by the department of forensic medicine after analysis with a positive drug screening. *Results:* Between 1996 and 2004 the number of seized cases by the police with GHB was 743, GBL 343 and 1,4-butanediol 236,

respectively. In 2004, the total number of deaths on the west coast of Sweden due to poisonings or drug abuse was 6 due to heroin, 7 due to GHB, 32 due to amphetamine, 6 due to cocaine, and one due to methadone. The number of admitted poisoned patients to Sahlgrenska University Hospital during 1996–2004 was 259. One patient died after admittance to the hospital. *Discussion:* Since GBL and butanediol are not classified as illicit drugs the possibilities for the police force to intervene and capture the drugs are severely restricted. Morbidity and mortality has earlier been regarded as rather harmless with these drugs, but our data shows that mortality may be as serious as with heroin. *Conclusion:* A legal classification of GBL and butanediol as narcotics appears to be medically motivated. Drug abuse with GHB is a serious advent with mortality close to heavy addiction to narcotics. Intoxication by GBL and butanediol appears to be as dangerous as intoxication by GHB.

28. Hallucinogenic Plants and Mushrooms in Overdose: Experiences in Baden-Wuerttemberg, Germany

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Background: Pattern and incidence of poisoning after misuse of psychotropic plants is not well investigated in Germany. The only exception is cannabis sativa. Information about botanical drugs is available via the Internet and young people especially are unaware that some of these drugs are potent intoxicants. Furthermore, plants like angel's trumpet are easily available. *Case Report:* We retrospectively analyzed all overdoses after misuse of psychotropic plants and mushrooms reported to the PIC-Freiburg (2002–4). Not included was cannabis sativa. Data were analyzed for patient age, sex, ingested substances, and severity using the poisoning severity score (PSS). *Results:* PIC-Freiburg was consulted in 45,963 cases (2002–2004). There was a total of 121 poisonings after misuse of psychotropic plants or mushrooms (0.3%). Anticholinerg plants: Eighty-seven patients (aged 13–55 years, median 17.5) were included in this study (19 female, 66 male, 2 not documented). Atropa belladonna (8), Brugmansia spec. alone (72) or together with Datura stramonium (3) or Datura stramonium alone (4) were misused. Parts of plant (22), tea (46), or soup (5) were ingested. Three patients smoked leaves of angel's trumpet. Severity of poisoning was severe (2), moderate (60), minor (22), or not documented (3) (PSS). Psilocybin containing mushrooms: Twenty-eight patients (14–30 years, median 17.5), 4 female, 23 male, 1 not documented. Dried (18) or fresh (2) mushrooms were eaten, and mushrooms were smoked (1). Preparation of mushrooms remained unknown in 7 cases. PSS: moderate (9), minor (18), without symptoms (1), Nutmeg: Five patients (2 male, 3 female); age 12–23 years; PSS minor 5. Coingestion with drugs 1. Other Psychotropic plants/mushrooms: A 25-years-old man ingested seeds of ipomea (PSS 1). *Case Discussion:* Mainly anticholinerg plants were misused (72%) and caused more frequently moderate and severe intoxications (71%) than misuse of magic mushrooms (32%). Poisoning after misuse of amanita muscaria/pantherina and psychotropic plants like khat/ayahuasca was not reported. *Conclusion:* Poisoning after abuse of psychotropic plants was sporadic. Severe toxicity was rare and only seen in 2 cases of angel's trumpet poisoning.

29. Libraries as Partners for Community Poison Prevention Education

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Background: Because families with young children frequently visit public libraries, the PCC sought an opportunity to collaborate with libraries to weave poison safety lessons into already-established programming like story time. In May 2005, the PCC received funding from the National Library of Medicine to develop a poison prevention story time tool kit. The kit was distributed to public libraries throughout the state to be used during National Poison Prevention Week (NPPW) and thereafter. *Methods:* Utilizing information gathered from informal focus groups with youth services staff from two library systems and the assistance of a contracted youth services librarian, the PCC: 1. Developed a comprehensive, fun tool kit using the children's book *Five Little Monkeys With Nothing To Do* by Eileen Christelow (poison prevention messages, activities, craft ideas, etc.). 2. Promoted and distributed the tool kit to the libraries statewide. Encouraged youth librarians (YL) to use the tool kit for an NPPW story time event, and order free poison prevention materials using a special order form. 3. Uploaded the tool kit to PCC Web site for public use. *Results:* The PCC distributed 600 tool kits to YLs via the annual meeting of the state's library association and the 10 state library systems in October 2005. Of those, 60 libraries (10% of target group) utilized the tool kit during NPPW reaching more than 4,800 people. As a result of this outreach effort, many librarians plan to become registered poison prevention educators, which will give them unlimited access to a variety of educational materials and presentation tools for all future outreach events. Other PCC educators also downloaded the tool kit from the Web site. PCC satellite coordinators promoted and used the tool kit during NPPW train-the-trainer and general education events. *Discussion:* The creation, distribution and implementation of the

story time tool kit has resulted in expanded opportuntities for cooperation between the PCC and the public libraries in the state. *Conclusion:* Public youth librarians can be deliver poison prevention information and have the potential to reach thousands of children and adults.

30. Integrating Pharmacists and Pharmacy Technicians into Poison Prevention Outreach

Dance V, Schneiderhan M, Burda A, Bachenheimer B, Bhatt V, Chavez D, Cielak K, Eyrich H, Konecki K, Lasak L, Sincak C, Timpe E. *Illinois Poison Center, Chicago, IL, USA.*

Background: In March 2004, the PCC established a Pharmacists' Advisory Board (PAB) that helped identify emerging issues impacting pharmacists, select issues the PCC could address and help the PPC craft a plan to respond to these issues. The PAB was comprised of students and pharmacy professionals from academia, retail, hospital and industry settings. In June 2005, the PAB transitioned into an action group, with the goal to promote poison prevention and safety to the public through advocacy of the pharmacy profession. *Methods:* Utilizing the talents of the 12 PAB members, we set out to: 1. Seek ACPE accreditation approval for 1 hour CEU for the existing online Poison Prevention Educator Training Course (PPETC). 2. Integrate the PPETC into pharmacy college and technician training program curricula. 3. Recruit pharmacists, technicians and students to participate in poison prevention outreach and National Poison Prevention Week activities. *Results:* In less than a year, the PAB accomplished the following: 1. In February 2006, ACPE accreditation became available for 1 hour CEU for the PPETC via the state Health-System Pharmacists Association at a cost of $l,000. Promotion began in March 2006 via professional associations, educators network, schools of pharmacy student/alumni groups and corporate networking. There was no charge for the first 120 completed applications. 2. The PPETC will be integrated into the curricula of the state's pharmacy colleges via: Toxicology Elective and Drug Information courses, Service Learning Program and student common hour/student council meetings. 3. Via contacts with student organizations, 55 student volunteers agreed to participate in education and outreach activities. *Discussion:* The creation and implementation of the PAB have resulted in expanded opportunities for cooperation between the PCC and the pharmacy profession in our state. *Conclusion:* Pharmacists, technicians and students are now given the training, tools and resources to be competent public poison prevention advocates. Using the PAB as a model, plans are underway to integrate other health professions into PCC outreach.

31. Lack of Uniform Message about Unwanted Pharmaceutical Disposal Methods: Opportunity for Education and Outreach

Bottei EM, Gottsch SG, Gunia PL. *Iowa Statewide Poison Control Center, Sioux City, IA, USA.*

Background: The public turns to many sources, including poison control centers, for recommendations on how to dispose of unwanted pharmaceuticals. Unfortunately, the public can be given conflicting recommendations depending upon who is providing the recommendations, and frequently they are not told the best practice for medication disposal. *Methods:* In order to determine what recommendations are being made by various agencies across the state and to assess for educational needs, a selection of health care providing agencies were asked what they recommend to callers who want advice about unwanted pharmaceutical disposal. *Results:* The following agencies were contacted: 25 county public health departments, 5 assisted living facilities, 50 retail pharmacies, 5 hospital pharmacies, 10 hospices, 3 nurse help call lines, 10 family practitioner offices, 10 home health agencies, the state department of natural resources and the regional EPA office. The 120 respondents provided 145 responses, as some respondents provided several disposal options. The recommendations were as follows: 59% recommended disposal down the toilet, 12% disposal in the trash, 14% return to pharmacy, 7% into sharps boxes and/or incineration, 8% other. *Discussion:* Disposal of unwanted pharmaceuticals needs to balance safety, convenience and environmental concerns. Reclamation and incineration maximize both safety and environmental issues. However these two methods can be inconvenient, especially in areas without these services. Disposal via the toilet or the trash are the most common recommendations because of convenience. However, there is significant environmental concern surrounding flushing medications because of the high percentage of water ways in which the EPA has found low levels of pharmaceuticals. Disposal in the trash raises the concerns of children or pets being exposed to these medications. Disposal of controlled substances adds another layer of complexity to this issue. *Conclusion:* Best practices of pharmaceutical disposal (reclamation and incineration) is another area in which PCC's can provide education and outreach, increasing awareness of poison control centers and the national 800 telephone number.

32. Utilization of Washington Poison Center by 911 Dispatchers

Smith B, Cropley J, Von Derau K, Robertson W. *Washington Poison Center, Seattle, WA.*

Background: A five-year review of Toxicall data revealed a declining number of calls to the Washington Poison Center (WPC) from 911 Centers. *Methods:* A survey was mailed to the directors of 48 911 centers serving Washington's 39 counties. Feedback was solicited regarding the 911 center's frequency of use of our WPC, its policies covering usage, and its familiarity with WPC's dedicated phone number for 911. An opportunity to elaborate on perceived roadblocks to WPC's services was also provided. *Results:* Of the 48 surveys mailed, 27 (56%) were completed and returned. Of those, 24 (89%) reported occasional usage of WPC as opposed to 'very often' (7%) and 'never' (4%). Twenty (74%) allow for dispatcher discretion in their decision to contact WPC, and 18 (67%) base the decision on a caller's request. Of the respondents, 14 (52%) have a written policy that specifically addresses when to contact WPC. Almost half (48%) reported no knowledge of WPC's dedicated emergency services line. Two centers (7%) reported a total lack of knowledge of WPC's services, and one center reported that contact with WPC "takes too long." Four (15%) indicated they have no written policy that discusses contact with WPC. Ten (37%) in an open comments section of the survey reported that their poison-related calls were too few to warrant routine contact with WPC. *Discussion:* Some 911 Centers perceive WPC as having an unknown, vague, or very narrow scope of service. Considering 37% of respondents specifically noted their calls don't meet a perceived criteria, we question whether our education/outreach has been sufficient. *Conclusion:* Further instruction of 911 dispatchers and their directors is needed to create awareness of how WPC can best be used to assist with poison and drug-related calls. We have initiated increased communication with 911 centers by presenting an overview of our services at a state "E-911" Advisory Committee meeting. Fact sheets referencing the dedicated emergency services phone number for 911 were distributed to all attendees. More education is planned through 2006 with a follow-up review of Toxicall data in 2007.

Calls from 911 centers (year/no. calls)	
2001	1,505
2002	1,267
2003	1,139
2004	1,111
2005	848

33. Wholesale Toxicology

Maloney GE,[1] Bryant SM,[1] Paloucek FP.[2] [1]*Toxikon Consortium, Chicago, IL, USA;* [2]*University of Illinois College of Pharmacy, Chicago, IL, USA.*

Background: Many ingestions of over-the-counter medications, such as children's vitamins with iron sold in commerical pharmacies, do not contain a large enough volume in a single container to cause serious toxicity. However, mass quantity retail stores have become more common. We sought to determine if over-the-counter medications sold in a single container at these retailers contained enough drug to result in significant toxicity if the entire quantity were ingested. *Methods:* Online and physical searches of the medication sections of 4 major economy-sized retailers were performed. Cough and cold remedies, analgesics, smoking cessation aides, and vitamins were evaluated for active ingredients and quantity in a single container. *Results:* 37 separate items were found to be available in quantities sufficient for massive ingestion from a single container. They included: acetaminophen/diphenhydramine, 390 tablets/bottle; nicotine gum, 200 pieces/box; methyl salicylate containing rubefacient, 100 gm/container; ibuprofen, 200 mg, 1000 tablets/bottle; and children's vitamins with iron, 27 mg elemental/tablet, 300 tablets/bottle. *Discussion:* We found that mass volume retailers sold potentially toxic over-the-counter medications in sufficient quantities for a massive ingestion. This represents an important point for education of healthcare and poison center providers as calculations of potential maximum ingestion based on the amount of drug in a standard container may be underrepresented by the amounts available through the economy-sized retailers. *Conclusion:* Health care and poison center provideres need to be aware of the potential for massive ingestion from a single container purchased at a mass volume retailer.

34. Ability of House Staff to Appropriately Dose Narcotic Pain Medication

Cannon R, Riley B, LoVecchio F. *Banner Good Samaritan Medical Center, Phoenix, AZ, USA.*

Background: House staff feel most comfortable dosing morphine for pain. However, different agents often need to be used. Therefore, the house staff physician's understanding of the doses of alternative analgesics in relation to morphine is important to ensure patient comfort and safety. The purpose of this study was to evaluate house staff's knowledge of the dosing of various narcotic pain medications in relation to a fixed dose of morphine. *Methods:* A convenience sample of house staff and medical students from surgery, internal medicine (IM) and emergency medicine (EM) in two urban teaching hospitals were studied. In the form of a clinical scenario, respondents were asked what intravenous doses of fentanyl (Sublimaze™), hydromorphone (Dilaudid™), and meperidine (Demerol™) they would administer that would provide equal analgesia to 10 mg of morphine. Answers were considered correct if they were within 10% of the correct answers. Oxycodone and hydrocodone were included as distracters and were not scored. Respondents were expected to answer from their own current knowledge without use of references. *Results:* 57 residents (21 surgical, 22 IM, 14 EM) and 15 medical students were surveyed. There were 22 PGY-1, 14 PGY-2, 11 PGY-3, 6 PGY-4, and 5 PGY-5 residents. Among the 57 house staff 35 (61%) dosed fentanyl, 16 (28%) hydromorphne, and 14 (24%) meperidine correctly. Fifteen of 57 (26%) house staff answered none correctly. Only one resident answered all three questions correctly. Among the 15 medical students 2 (13%) dosed fentanyl, 4 (27%) hydromorphone, and 0 (0%) meperidine correctly. Eleven of 15 (73%) medical students answered none correct. There was a general trend towards improvement with increasing level of training. Of those that answered none correctly, 45% were PGY-1, 21% PGY-2, and 9% PGY-3, 17% PGY-4, and 0% PGY-5. *Discussion:* In this study, House staff commonly made errors when dosing alternative narcotics to morphine. This may result in overdosing, jeopardizing patient safety, or underdosing leading to inadequate patient analgesia. *Conclusion:* Training programs should specifically address appropriate analgesic dosing during residency.

35. Education Provides Sustained Improvement in Doctors Knowledge of Methods of Gut Decontamination

Wood DM, Greene SL, Dargan PI, Jones AL. *Guy's and St. Thomas' Poisons Unit, London, United Kingdom*.

Background: Consensus statements and guidelines on the appropriate use of gut decontamination in the management of acutely poisoned patients have been produced by the European Association of Poisons and Clinical Toxicologists and American Academy of Clinical Toxicology. We therefore designed a questionnaire survey to determine whether education on a Clinical Toxicology teaching course improved knowledge of the appropriate use of gut decontamination and whether this acquisition of this knowledge was sustained after the teaching course. *Methods:* Doctors attending a Clinical Toxicological teaching course were recruited to this study. They were asked to indicate which method or method, if any, of gut decontamination would be appropriate for six clinical scenarios of acute poisoning (paracetamol, carbamazepine, methanol, sustained release iron, bleach, and aspirin). Correct methods of gut decontamination (as judged by a panel of Clinical Toxicologists) were scored as 1, giving a maximum score or 6. Study participants completed the survey at the beginning of and on completion of the teaching course. A follow-up postal survey was sent to all participants one month after completion of the course. *Results:* 21 doctors of all grades attended the Clinical Toxicology teaching course. Completed survey questionnaires were returned by 21 (100%) and 18 (85.7%) those surveyed at commencement and completion of the course respectively. The average correct score for the case scenarios was 3.48 ± 0.87 at commencement of the course (mean ± SD) and 4.94 ± 0.73 at the end of the course ($p < 0.001$). Completed follow-up questionnaires were received from 9 (50%) of those who had completed an end of course survey. The average score was not significantly different from that at the end of the course (5.33 ± 0.5, $p = 0.16$). *Discussion:* Doctors' knowledge on methods of gut decontamination was significantly increased during attendance at a Clinical Toxicology teaching course and this improvement in knowledge was sustained after the course. *Conclusion:* This highlights the benefits of Clinical Toxicologists educating doctors on the appropriate use of gut decontamination in acutely poisoned patients.

36. Toxicomythology: A Unique Indian Speciality

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Background: In India, toxicology has traditionally been considered to be no more than a scion of forensic medicine, and a poor cousin of clinical medicine. Even now the subject is rarely taught as a separate entity in undergraduate medical courses in India.

It is clubbed with forensic medicine since the Medical Council of India (MCI) for some obscure reason has thought it fit to have the entire subject of toxicology (and not just the forensic aspects) taught to medical students by forensic pathologists. The latest (1997) curriculum for undergraduate medical education drafted by the MCI reinforces this. Since forensic pathologists have no exposure to the actual management of living victims of poisoning, the subject has shrunk to a description of the medicolegal aspects of poisoning, while the clinical aspects are either glossed over or dealt with wrongly. Today, while a plethora of specialities exist in the field of medicine which a doctor could choose from for his postgraduate studies, there is not even a single medical college in the country offering a course on clinical toxicology. The role of Poison Control Centres is well recognized in Western countries in the prevention and treatment of poisoning, as well as in disseminating accurate information on toxicological matters to medical professionals and the general public. But the concept is unfortunately taking its own time to gain acceptance in India. While Poison Control Centres made their appearance in Western countries in the 1950s, it took more than 40 years for India to realise their importance. Even now, the number of centres is abysmally inadequate – 4 for the entire country. *Discussion:* Because of all of these reasons, toxicology has developed so little that the information contained in standard books on forensic medicine in India generally carry outdated or erroneous information on poisoning, some of which is quite shocking, and outright dangerous when put into practice. This paper deals with the current scenario in an illustrative manner, and also details the struggle on the part of some medical and toxicological professionals to convert this dangerous speciality of toxicomythology into a practically useful speciality of toxicology.

37. Adverse Effects from Ingestion of Redline^{R} Energy Drinks

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Background: Energy drinks are a 3 billion dollar a year industry. Since the removal of mahuang, many products contain high amounts of caffeine. We have noticed an increasing number of calls about a new energy drink called Redline®. *Case Report:* All cases of Redline® ingestion from Jan. 1, 2004 to Mar. 15, 2006 were retrieved by searching with Visual Dotlab from the California Poison Control System database. Nine cases of adverse reactions to Redline®, as the (ready to drink) RTD product or the concentrate, were found. Eight out of the 9 patients were males. Ages ranged from 13 to 46 years of age. Amounts ingested ranged from 2 tsp of the concentrate to 2 cans of the RTD. The majority had ingested 1 can of Redline RTD®. Symptoms: nausea/vomiting 56%, tachycardia 44%, HPT (for 3 pts in a HCF) 100%, jittery/agitation/tremors 67%, dizziness 44%, chest pain 11%, and bilateral numbness 11%. *Case Discussion:* Redline RTD® is an 8 oz. drink containing 250 mg of caffeine and the concentrate contains 250 mg/5cc. These very high doses of caffeine are misleading to clients who likely associate the 8 oz of Redline® to 8 oz of Redbull®. In comparison (for 8 oz), Redbull® contains 80 mg of caffeine, Rockstar® 75 mg, Sobe No Fear® 70.5 mg, Starbucks Double Shot® 129 mg. The amount of caffeine is not indicated on the container or on the website. The FDA requires beverage manufacturers to list the presence of caffeine but does not require them to list the quantity. The amount of caffeine in the concentrate poses a significant risk of accidental ingestion by children or adults. One mouthful (5cc) by a 2-year-old child would likely require hospital care. One swallow by an adult (15–30cc) would provide 750–1500 mg of caffeine, causing significant symptomatology. Redline® also contains vinpocetin and yohimbine. These drugs would potentiate the tachycardia, hypertension, nervousness, dizziness, GI disturbances, and paresthesias of the legs. *Conclusion:* Redline® contains excessive amounts of caffeine. These high concentrations pose a risk to the general public. Containers should be labeled with the quantity of caffeine. Redline® concentrate should be removed from the market or require a child resistant closure.

38. Status Epilepticus Associated with Borage Oil

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Background: Borage oil, a source of gamma linolenic and linoleic acid, has been associated with seizures. We report the first case of status epilepticus associated with the use of borage oil with confirmatory levels of linoleic and linolenic acid. *Case Report:* A 41-year-old previously healthy female presented to an outside medical facility with continuous seizure activity. She had no history of prior seizures and was not on any medications. One week prior to the onset of seizures she began taking several nutritional supplements including the recommended dose of borage oil. The patient initially was noted to have gelastic

seizures, which progressed to generalized tonic-clonic seizures. She was intubated and subsequently transferred to our facility. The physical exam was unremarkable and neurological exam was non-focal. Complete blood count and serum chemistries were unremarkable. Comprehensive drug screening was negative for acidic, basic, and neutral drugs. CSF was negative for viral encephalidities and bacterial or fungal infection. MRI of the brain was normal. Several EEGs demonstrated bilateral temporal lobe seizure foci. Barbiturate coma was induced to suppress all seizure activity. Seven days later she was weaned off pentobarbital and mechanical ventilation. Treatment included phenytoin, carbamazepine, levetiracetam, and topiramate. At the 6-month follow, up she continued to have infrequent partial seizures and difficulty with speech and concentration. Serum concentration of linolenic acid was 345 mcg/g (control value = 191 mcg/g) and linoleic acid was 259 mcg/g (control = 165 mcg/g). *Case Discussion:* Literature review revealed only three cases of temporal lobe seizures attributed to linoleic and linolenic acid exposure. No other cases had confirmatory levels. We present the only case of status epilepticus attributable to Borage oil usage after other known etiologies had been ruled out. Toxicological analysis confirmed the exposure. *Conclusion:* Borage oil can induce status epilepticus. Herbal products and alternative medicines should be considered in the differential diagnosis of status epilepticus.

39. Envenomation by the Brown Tree Snake (*Boiga irregularis*) on Guam

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Background: The brown tree snake (Boiga irregularis) is a common, non-native pest on the island of Guam. The snake has produced extensive ecological damage since its accidental introduction from New Guinea in the last half century. This member of the family Colubridae produces a venomous Duvernoy's gland secretion that enters prey via grooved fangs. The components of the venom responsible for human toxicity are unknown. Though reportedly considered relatively innocuous in its native areas, the brown tree snake is a frequent cause of emergency department visits on Guam. *Methods:* We retrospectively reviewed snakebite cases recorded at the Guam Memorial Hospital emergency department for the years 1987 through 2004. *Results:* A total of 446 cases were identified in the 18-year study period, with all bites attributed to the brown tree snake. Infants less than one year of age accounted for 91 (20%) of all cases. Bites were most likely to occur in children, on an extremity, during the rainy season, at night, and indoors while the victim was sleeping. The most common history is of parents awakening and finding a snake coiled around an infant or small child in his/her bed. Children frequently displayed multiple rows of teeth marks on an extremity. Other than superficial teeth marks at the bite site, most patients were asymptomatic or developed mild local edema. More severe local edema with bleb formation occurred infrequently, most commonly in children. Systemic toxicity was noted only in victims less than one year of age. Symptoms included generalized weakness, respiratory difficulty, and ptosis. No deaths were identified. *Discussion:* Envenomation by the brown tree snake occurs frequently on Guam, presumably due to the high density of this invasive, non-native species on the island. Infants are more likely to receive a larger dose of venom as they are unable to free themselves from the chewing activity of the snake. *Conclusion:* Bites from the brown tree snake in Guam are common and result in significant systemic toxicity in infants.

40. Rattlesnake Envenomation Resulting in Massive GI Bleed and Death

Ruha AM. *Banner Good Samaritan Medical Center, Phoenix, AZ, USA.*

Background: Rattlesnake bites (RSB) are commonly associated with coagulopathy and thrombocytopenia but rarely produce life-threatening hemorrhage. A case of massive GI bleed and hemorrhagic shock following RSB is presented. *Case Report:* A 44-year-old male was bitten on the R index finger and presented to a rural ED. On arrival he was hypotensive and drowsy with hematemesis. There was a puncture wound on the R digit and mild hand swelling. Dopamine, 2 u PRBCs, 1 u FFP, 5 liters IVF and 4 vials of CroFab™ antivenom were given. He was flown to a tox ICU, arriving about 5 h after the bite on dopamine and norepinephrine, with SBP 65 mmHg, HR 140 bpm, T 91 °F. Ventilatory effort was poor and Pox 89% on NRB O_2. The patient was comatose with profuse bleeding via NGT. His entire R arm was swollen and ecchymotic and a bleb was forming on his finger. There was blood oozing from wounds. He was emergently intubated. 11 L blood was lost through the NGT in the 6 h after the bite. Labs on arrival to ICU included pH 6.85, Hgb 1.8 g/dL, PT 46.7 s, fibrinogen 35 mg/dL, Na 145 meq/L, K 4.2 meq/L, BUN 4 mg/dL, Cr 1.1 mg/dL,

Lactic acid 21 mmol/L, CK 66 IU/L, ETOH 104 mg/dL. CXR was neg, echocardiogram was neg for tamponade or effusion, CT brain was neg for bleed, pos for fluid in sinuses. Endoscopy revealed a Mallory Weiss tear responsible for the bleeding, and was neg for varices. In the first 4 h of ICU resuscitation the patient received an additional 5 L IVF, 20 vials CroFab™, 12 u PRBCs, 10 u cryoprecipitate, 8 u FFP, Factor VII, and several amps of NaHCO3. After these therapies the bleeding ceased and pt stabilized with a HR 60, SBP 110 off pressors, O2sat 99% on 1.0 FIO2. He began making urine and following commands. Over the next several days he developed severe sepsis and ARDS, and he expired on day 5 after care was withdrawn. *Case Discussion:* Rattlesnake envenomation frequently produces hematologic abnormalities but these rarely result in bleeding. When severe bleeding occurs it is often the result of DIC. It is possible that DIC contributed, but the major source of blood loss was from a Mallory Weiss tear. *Conclusion:* In this patient with rattlesnake bite, co-morbidities likely predisposed to fatal GI bleed following envenomation.

41. Globalization and Changing Epidemiology: The Example of Lawn Mushrooms

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Background: Our PCC used to consider unintentional lawn mushroom ingestions harmless and managed them at home without GI decontamination if they fulfilled criteria to r/o *Amanita* and *Galerina* species, and *psilocybin*-containing mushrooms. However, in the last year this approach was challenged by the following two cases. *Case Report:* C 1: A 65-year-old woman living in the suburb ate 6 small brown mushrooms picked from her neighbor's lawn. Nine hours later, she developed vomiting and profuse diarrhea with painful cramps in her lower limbs. She presented with metabolic acidosis (bicarb 11 mmol/L) and then developed slight elevations of her LFT's (ALT/AST 142/96 IU/L) and creatinine (166 μmol/L-1.88 mg/dL), which peaked at 48 h and normalized after the third day. The culprit was later identified as *Lepiota Josserandii*, an amatoxin-containing mushroom which had never been observed in our area before. C 2: While dining in a hotel's restaurant in a downtown area, a couple shared a mushroom they had picked from the indoor hotel's flowerbed. In the following 21/2 h, they both experienced vomiting, diarrhea and abdominal pain. Their labs remained normal but they required IV rehydration and antiemetics. They recovered uneventfully. The remains of the mushroom was identified as *Green Sporea Lepiota*, another mushroom not found in our area. It was later discovered that the flowerbed's potting soil had been imported from California. *Case Discussion:* These two cases involved toxic lepiotas never observed in our local flora and consequently, our protocol for lawn mushroom ingestions did not rule them out. With phenomenons like globalization and climate change those situations are likely to happen again. Since those ingestions are common in children, lepiotas, particularly those containing amatoxin such as *L Josserandii*, should be ruled out before considering home management. *Conclusion:* Globalization and other factors are likely going to make us reconsider some of our management protocols. Despite this, most lawn mushroom ingestions will remain harmless. However, better screening criteria for lepiotas and eventually for other kind of mushrooms non-indigenous to our area, should be developed to prevent significant poisonings.

42. Hand Weakness and Paresthesias from *Conus magus* (Cone Snail) Envenomation

Marshall SW, Caravati EM. *Utah Poison Control Center, Salt Lake City, UT, USA*.

Background: Cone snails (*Conus* spp.) are predatory marine organisms that utilize venom to immobilize prey. Toxicity of cone snails may vary by species. There is limited information about human envenomation by cone snails. A human fatality has been reported from the sting of *C. geographus*, while reports of *C. magus* stings could not be found. *Case Report:* A 36-year-old male researcher was stung by a *C. magus* specimen on his left middle finger, dorsal aspect, between the DIP and PIP joint. He was wearing latex gloves and described a sensation similar to a bee sting at the time of envenomation. Within 5–15 minutes, he developed left hand paresthesias and cramping and weakness of the thenar and hypothenar muscles. Vital signs on presentation to the ED were blood pressure 150/103 mm Hg, pulse rate 114, respiratory rate 22, and temperature 37.2°C. His left hand and wrist were placed in a volar splint and wrapped in an elastic bandage to the elbow. He denied progression of numbness, nausea, shortness of breath, chest pain, diaphoresis, diplopia, dizziness, or syncope. Physical exam of the left hand revealed no cyanosis or swelling, no obvious puncture marks, 4/5 grip strength, and 5/5 extension at the wrist and finger abduction/adduction. Electrolytes and complete blood count were normal. The hand weakness, hypertension, and tachycardia gradually improved and he was

discharged after 6 hours of observation in the ED. All symptoms had resolved within 24 hours of envenomation. *Case Discussion:* The venom of cone snails consists of a mixture of small proteins and peptides that have high specificity and affinity for a variety of receptor targets. Blockade of sodium, calcium, and potassium channels and serotonergic and nicotinic receptor antagonism are some of the pharmacologic actions of cone snail venom. Toxicity appears to vary by species. This case illustrates cone snail envenomation by a species other than *C. geographus* can result in local neurotoxicity. *Conclusion: C. magus* envenomation resulted in mild tachycardia, hypertension, and localized pain, paresthesias and muscle weakness that resolved within 24 hours and without any complications.

43. Delayed Neurotoxicity and Rhabdomyolysis with Rattlesnake Envenomation

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Background: Neurotoxicity and rhabdomyolysis are known complications of envenomation by the Mojave Rattlesnake. Symptoms ranging from cranial nerve abnormalities to profound weakness requiring mechanical ventilation have been reported. We report a case of a rattlesnake envenomation, presumed to be a Mojave, in an eight year old boy with delayed onset of neurotoxicity and rhabdomyolysis. *Case Report:* An eight year old boy was transferred to our Pediatric Toxicology Referral Center after sustaining a rattlesnake bite on the left calf 28 hours prior. He had presented to an outlying Emergency Department the day prior with nausea, vomiting and pain in the left calf. He was subsequently discharged after his emesis was controlled. He woke the next morning (18 hours post-envenomation) with recurrent nausea, vomiting, diarrhea, diplopia, weakness and the inability to open his left eye. Upon arrival he was found to have bilateral ptosis, left greater the right, generalized weakness, an erythematous tender area (8cm × 12 cm) of the left calf and left inguinal tenderness. Vital signs were within normal limits. A negative inspiratory force obtained was 20 cm H_2O (predicted 50 for age and weight). He was admitted to the pediatric intensive care unit for observation. Antivenom was not given. A negative inspiratory force obtained on hospital day number two was 60 cm H_2O. An initial CK obtained at the outlying facility was 134U/L. On hospital day number two his peak CK was 22,438U/L. He had a progressive improvement in his neurological symptoms, weakness and did not have any recurrent emesis or diarrhea. He was seen in follow up 4 days after discharge with complete resolution of symptoms. *Case Discussion:* Neurotoxicity and rhabdomyolysis are known complications of envenomation by the Mojave Rattlesnake. These symptoms are usually present early in the course of envenomation. *Conclusion:* We report a unique case of Rattlesnake envenomation with delayed neurotoxicity and rhabdomyolysis.

44. Credible Brown Recluse Spider Bite followed by Id Reaction and Complete Recovery

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Background: Necrotic lesions are often identified as brown recluse spider bites in the absence of a spider or a history of a bite. The natural history of a credible bite is infrequently reported. *Case Report:* A 14-year-old white female from Annapolis, Illinois woke up with pain, redness and swelling in her left axilla. She found a dead spider in her bed. Later in the day, she developed a generalized pruritic maculopapular rash. She presented to a local hospital and was treated with amoxicillin and prednisone. The next day, she complained of joint pain, myalgias, worsening rash, and low grade fever. She was seen at our tertiary care center on the third day. Her initial vital signs were temperature 37.7° F, heart rate 77 bpm, respiratory rate 24/min and blood pressure 136/75. She had a diffuse maculopapular rash on her chest, abdomen, back, thighs and buttocks. The wound in her left axilla showed a 0.5 cm clear blister surrounded by an erythematous induration. Distal to the bite, there was an about 5 × 5 cm area of dependent bluish skin discoloration. Associated tender and enlarged axillary lymph nodes were present. Her parents brought the dead spider. Under magnification, the three pairs of eyes, the characteristic violin marking on the thorax and the hairy legs confirmed the identity of the *Loxosceles reclusa*, or brown recluse spider. Initial blood work showed white blood cell count of 14.9 k/mm^3 with 88% neutrophils, Hemoglobin 13.2 g/dL, hematocrit 39%, and platelets 241 k/mm^3. Coagulation panel and chemistry panel were normal. She was treated for her pruritic rash with antihistamines and steroids and also received antibiotics during her hospitalization. Dermatology consultants agreed that her rash was likely an Id reaction. There was no evidence of hemolysis throughout her hospital course. Her wound was assessed daily. She was discharged on hospital day 5 with oral diphenhydramine and prednisone. At three week follow up, she had complete resolution

and healing of her bite wound without any evidence of soft tissue necrosis. *Conclusion:* We present a case of a credible brown recluse spider bite with an Id reaction and complete recovery.

45. Biting the Hand that Feeds You – A Hagen's Tree Viper Envenomation in Florida

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Background: Many rare and exotic snakes find their way into the United States via breeders. Trimeresurus hageni, Hagen's Tree Viper, is a rare viperidae species found predominantly in Indonesia, Malaysia, and Thailand. There is little published data regarding envenomation by this species, however its bite is believed to cause coagulopathy, thrombocytopenia, hypotension, pain, and potentially severe local tissue injury. *Case Report:* The patient is a 27-year-old man who breeds exotic snakes. While working with a juvenile Hagen's Tree Viper, he was bitten between the thumb and index finger with one fang. On presentation to the ED 3 hours after the bite he reported minimal pain at the bite site and initial vital signs were within normal limits. Physical exam demonstrated profound edema from the first finger to the thumb and throughout the palm. The hand was cool but had good capillary refill and pulses. No ecchymosis was noted at the bite site. Initial lab results showed no evidence of coagulopathies or thrombocytopenia. WBC's were elevated at 16.2 K/UL. He was admitted for repeat lab work and observation overnight. With the exception of one brief, self-limiting bradycardic episode when his heart rate dropped to 38 bpm, the patient did well overnight. He was discharged the following morning. He never required analgesia for pain. *Case Discussion:* The Regional Poison Control Center found that there is no species-specific antivenin available to treat T. hageni envenomations. It was later determined that the Green Tree Viper (Trimeresurus gramineus) antivenin from the Thai Red Cross may be effective in treating the effects of T. hageni envenomations and it was shipped to the treating health care facility, but was never used. *Conclusion:* We report a case of Hagen's Tree Viper envenomation with minimal symptoms treated with supportive care alone. This case, because it was one fang from a juvenile snake may not represent a severe envenomation therefore, no conclusions can be drawn of the effects of a bite from this species of Asian Viper.

46. Food Poisoning by Oleander Skewers: Investigation of a Toxicologic Urban Legend

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Background: Oleander (*Nerium oleander*) contains cardioactive steroids and causes digoxin-like poisoning if ingested. Numerous reports suggest that poisonings have occurred when oleander branches have been used as skewers for cooking food, especially hot dogs. A previous study showed that the oleandrin content of hot dogs cooked on oleander skewers was negligible, and therefore reports of poisonings by this mechanism may represent an urban legend. This study is a literature search to determine if any such poisonings have ever actually been published as primary reports, and to find the origins of this commonly-believed mechanism of plant poisoning. *Methods:* A PubMed search was conducted using the keywords "oleander" and "oleandrin". All results were reviewed to find case reports/series involving human exposures. The relevant articles were reviewed for any description of poisoning through the use of oleander in food preparation. A 'Google' search was similarly conducted using multiple variations of the keywords "oleander," "Nerium," "hot dog," "skewer," "food," and "poison(ing)" for other reports or descriptions of these incidents. The reference sections of all articles obtained above, the relevant chapters from several medical toxicology textbooks, and the author's personal collection of literature regarding oleander were recursively searched to find the original source(s) of these reports. *Results:* No cases of oleander skewer poisoning were identified in the modern medical literature. Statements in modern scientific publications suggesting that such poisonings may occur ultimately refer to a botanical publication that describes no actual poisoning incident nor provides any clinical details. Three reports in French from the mid-1800s refer to a single incident of mass oleander skewer poisoning that may have occurred during the Napoleonic wars, although the clinical details are sketchy and inconsistent. *Discussion:* The persistence of the commonly-held belief that oleander skewer poisoning may occur, despite the absence of any well-documented cases, has all the hallmarks of an urban legend. *Conclusion:* No reports of poisoning by oleander used as a skewer to cook food could be identified in this study.

47. Analysis of Antiretroviral Ingestions Consulted on by a Poison Control System

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Background: Twenty antiretrovirals (ARVs) exist to treat Human Immunodeficiency Virus (HIV). As research grows so does ARV regimen complexity and medication errors (ME) resulting in toxicity- from minor gastrointestinal discomfort to lactic acidosis and death. The purpose of this study was to identify factors associated with ARV ingestion and toxicity. *Methods:* Human ARV ingestions reported to our Poison Control System (PCS) from 1998–2005 were extracted in blinded fashion. Age, ARV, amount, location, reason, decontamination, treatment, symptoms and outcome were evaluated. *Results:* Of the 393 cases reported 155 were excluded as lost to follow-up or confirmed non-ingestion leaving 238 evaluable cases. The median age was 31 yrs (1 day –75 yrs). 72% were male, 33% pediatric, 30% unintentional, 21% MEs, 38% intentional and 9% were adverse drug reactions (ADRs). 33% had co-ingestants. Outcomes attributed to ARVs were 1 death, 8 major, 30 moderate, 82 minor and 117 had no effect. Of the 142 patients evaluated in a health care facility (HCF), 91 were intentional and none were children < 6 yrs. 41 patients were admitted to a HCF, 4 due to MEs and 19 to ADRs. The ARVs most commonly reported were lamivudine (86), zidovudine (58), stavudine (47) and efavirenz (35). *Discussion:* 84% of ARV ingestions reported to our PCS resulted in minor or no effect. Only 17% of ingestions required hospitalization. A low number of cases were MEs but more than half (56%) of hospitalizations were due to an ADR or ME. No unintentional pediatric ingestions required treatment in a HCF. These findings may be limited by the spontaneous nature of PCS reporting and a significant rate of co-ingestion. *Conclusion:* This study demonstrates acute ARV ingestions rarely result in significant effects requiring hospitalization. Toxicity is more likely due to MEs or ADRs from chronic ARV use and PCSs should be aware of significant toxicities in therapeutic dosing.

48. Development of a Simple Inhalational Chlorine Exposure Model

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Background: Chlorine gas (Cl) is an industrial toxin and a chemical warfare agent that produces pulmonary edema. Optimal therapy for Cl-induced pulmonary edema is unknown and there are no simple, readily available Cl exposure animal models to evaluate potential therapies. Rodents are used extensively to study treatments for pulmonary edema. *Objective:* To develop a simple Cl exposure model that produces pulmonary edema in a rodent model. *Methods:* Male Sprague-Dawley rats were anesthetized with ketamine and xylazine and exposed to Cl via one of two techniques. Sodium hypochlorite 5.7% (NaOCl) and hydrochloric acid (HCl) were mixed to produce Cl in both models. A direct exposure model was used in seven rats that inhaled Cl produced by mixing 0.02 N HCl (n = 3) or 0.5N HCL (n = 4) with NaOCl. The second technique utilized a sealed in-line flask containing 1 ml NaOCl + 1 ml 0.5 N HCl to produce 1 dose of Cl. Oxygen (100%) flowing at a rate of 0.5, 1 or 2 L/min was used to introduce the Cl produced into an induction chamber. Twelve rats inhaled Cl in the sealed induction chamber. Seven rats received 1 dose of Cl, 3 rats received 2 doses of Cl and 2 rats received 3 doses of Cl. Survival times were recorded and the lungs were excised. A blinded observer determined the extravascular lung water content (EVLW in g/gm dry) using the wet-dry method and using a correction for lung blood content. Data were analyzed using multiple linear regression. Numbers of doses of Cl and survival times were analyzed for the induction chamber model. *Results:* Direct exposure using 0.02 N HCl resulted in 100% survival and no edema. Direct exposure using 0.5 N HCl resulted in immediate apnea and no edema. The induction chamber exposures resulted in an increase in EVLW of 4.0 gm/gm dry lung (95% CI 2.0–5.9) for each number of doses of Cl. *Discussion:* Rats exposed to chlorine via an induction chamber develop pulmonary edema as measured by an increase in EVLW. Using the described chamber, multiple doses are needed to increase EVLW. *Conclusion:* A simple Cl exposure model was developed that produces pulmonary edema in a rodent model.

49. Poison Control Center Surge Capacity during an Unusual Increase in Call Volume: A Natural Experiment

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Background: Poison Control Centers (PCCs) play a pivotal role in the preparation for and management of poisoning emergencies. Public health disasters, caused by both natural and malicious factors, may drastically increase the number of

inquiries received and handled by PCCs in short periods of time. In order to plan and prepare for such public health emergencies, it is important for PCCs to assess how the unusually large number of calls could affect their level of services during public health disasters. *Methods:* We report data from the New Jersey Poison Information and Education System (NJPIES) that was collected and analyzed after a sudden loss of telephone service to the neighboring New York City Poison Center produced the necessity to reroute calls from that geographical catchment area to NJPIES for a period of several hours. Statistics were derived from our telephone switch's internal reporting system. *Results:* Compared to the same time and day in the previous week, the total number of calls received by NJPIES in the 4 hours after the disruption increased 143%. A substantial rise in calls was observed in every single 15-minute increment during this period with an increase in some of these increments as much as 525%. At the same time, the percentage of answered calls by NJPIES decreased and the percentage of abandoned calls in a 15-minute period reached as high as 62%. Furthermore, the average time for handling calls was longer than usual in most of these 15-minute increments. Finally, we became aware of some limitations of our telephone technology which impacted our ability to respond to the surge of calls. *Discussion:* While NJPIES was able to handle the unusual increase of incoming calls using its available poison specialists and staff, the experience gained from this natural experiment demonstrates the need for PCCs to have a preplanned surge capacity protocol for potential public health emergencies. *Conclusion:* A number of challenges that PCCs have to meet in order to have adequate surge capacity during such events were unveiled during this natural experiment.

50. Acetaminophen Pack Size Limitation and Product Mix. Analysis of Acetaminophen-Containing Products in Hospital Workload

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Background: Legislation to limit acetaminophen pack size was enacted in the UK in 1998. However, surprisingly, overdoses and deaths involving acetaminophen in Scotland have subsequently increased (1). National statistics do not allow analysis of product mix. *Methods:* Admission data was analysed retrospectively for 2000–2005 inclusive. Patients taking one or more acetaminophen-containing compound were identified. Products containing acetaminophen were analysed, comparing over the counter and prescription-only products. *Results:* During the period 2000–2005, there were 14,696 toxicology-related admissions to our clinical unit. 5,500 patients (37.5%) took one or more products containing acetaminophen: 5,916 products containing acetaminophen were recorded (averaging 1.08 products per acetaminophen admission). *Cases:* as for Scottish data (1) admissions involving one or more acetaminophen-containing product as a proportion of all toxicology admissions rose from 35.9% in 2000 to 40.6% in 2005. Admissions involving a prescription-only form of acetaminophen with an opiate fell (from 31.4% to 27.7%). *Products:* of products containing acetaminophen, 66.1% were acetaminophen alone in 2000 and 68.8% in 2005. Over this period overdose with all non-prescription acetaminophen products rose slightly from 70.1% to 72.9% of acetaminophen products. When prescription acetaminophen-opiate preparations were examined, co-codamol (acetaminophen + codeine) rose from 9.8% of all acetaminophen products in 2000 to 19.2% in 2005; co-dydramol (+ dihydrocodeine) fell from 5.4% to 3.8%; co-proxamol (+ dextropropoxyphene) (licence changed to restrict and withdraw in the UK in 2005) fell from 14.7% to 4.2% of all acetaminophen products. *Discussion:* Acetaminophen remains a significant component of overdose presentations in Scotland. The majority of such admissions involve over-the-counter products of acetaminophen alone. *Conclusion:* Restriction of pack size has not reduced overdose behaviour in Scotland. 1. Bateman et al. Legislation restricting paracetamol sales and patterns of self harm and death from paracetamol containing preparations in Scotland, (BJCP 2006 – In Press).

51. "Mercury Menace" News Articles' Impact on a Poison Center's Mercury Exposure Call Volume

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Background: News media plays an important role in disseminating health information. A few studies have documented the effect of news media on poison center call volume. On December 11, 2005, the Chicago Tribune (CT) began publishing a series of front-page articles highlighting the toxicity of mercury in seafood. These high profile features provided an opportunity to examine the effect of the CT's articles on the mercury-related call volume to the Illinois Poison Center (IPC). *Methods:* Phone calls to the IPC were examined for all mercury-related calls over a seven-week period following the publication of the very first article.

Mercury-related calls to the illinois poison center

	Thermometer-related	Seafood-related	Other mercury-related
12/11/05–12/17/05	10	0	0
12/18/05–12/24/05	6	0	0
12/25/05–12/31/05	2	0	1
1/1/06–1/7/06	10	0	0
1/8/06–1/14/06	11	1	1
1/15/06–1/21/06	3	0	1
1/22/06–1/28/06	7	0	3
Mercury-related calls during same time period from the previous year			
12/11/04–12/17/04	11	0	1
12/18/04–12/24/04	15	0	0
12/25/04–12/31/04	11	0	7
1/1/05–1/7/05	12	0	0
1/8/06–1/14/05	10	0	1
1/15/05–1/21/05	4	0	0
1/22/05–1/28/05	13	0	2

Mercury exposure calls were also examined from the same time period the previous year. *Results:* A total of 58 mercury-related phone calls were recorded during the seven weeks following the publication of the first CT article regarding mercury in the seafood. During the same time period the previous year, there were a total of 87 mercury-related phone calls. The details of the calls are included in the table. *Discussion:* Despite the high-profile publication in the CT, there was no associated surge in reported mercury exposure calls. While media influence on consumer behavior is well documented, and media has influenced poison center call volume in previous studies, we did not see an expected surge in mercury exposure phone calls to the IPC after the CT articles. *Conclusion:* The high profile coverage of mercury toxicity by the Chicago Tribune did not lead to a surge in calls to the Illinois Poison Center.

52. Epidemiology of Poisoning Presentations to a Large Urban Emergency Department

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Background: Intentional, recreational or accidental poisoning is common. In 2004 there were over 2.4 million poisoning exposure enquiries from US Poisons Control Centers (PCC) reported to TESS. These summarized reports, although not providing detailed information on each ED, provide a global perspective of poisoning in the US. Similar information, either individualised or summarized is not available in the UK. *Methods:* Data was collected prospectively on all poisoned patients presenting to an inner city London ED from May 2005-February 2006 using an electronic clinical toxicology database (Microsoft Access®). *Results:* There were 998 patient presentations (916 individuals, 57% male, mean age 34 yrs, 5% pediatric). Peak time of presentation 0100–0200, trough time 0700–0800. Mean time to presentation post ingestion 5.6hrs (range 0.1–72hrs). 77% cases arrived via ambulance. Type of poisoning: deliberate self harm 58%, recreational 25%, unknown 8%, accidental 6%, therapeutic error 2%. There were 1,570 total exposures (218 different agents). Most common agents by number of exposures: paracetamol 225, cocaine 125, heroin 100, ecstasy 68, ibuprofen 63, diazepam 59, GHB 51, aspirin 36, ketamine 32. Exposures by group: analgesics 508, drugs of abuse 432, antidepressants 138, sedatives/hypnotics 105, anticonvulsants 44, antipsychotics 42, CVS drugs 30. Ethanol was coningested in 30% of cases, 63% of cases were single ingestions, mean number of ingestions per presentation 1.6. Length of stay: <4 hrs 40%, 4–12 hrs 30%, 12–24 hrs 15%, >24 hrs 15%. Disposition: 51% toxicology ward, 33% discharged home from ED, 5% high dependency bed, 3.9% general medical bed, 2.5% ICU, 4.6% self-discharged. There were 6 (0.6% of presentations) deaths (3 opioids, 1 MDMA, 1 hydroxychloroquine, 1 acetaminophen).

Discussion: There is a diurnal variation in presentation of poisoned patients to our ED. Severe poisoning is uncommon and length of stay is short. Analgesic self-poisoning and recreational use of drugs of abuse represent the majority of presentations. *Conclusion:* Knowledge of epidemiological patterns of poisoning can allow provision of appropriate services at an appropriate time within the ED for management of poisoned patients.

53. Increase Mortality and Morbidity of Tityus Trivitattus Envenomations in Argentina

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Background: Tityus Trivittatus (TT) scorpions' envenomations are frequently seen in Argentina. An envenomation traditionally considered as clinically mild, appeared to have changed in recent years. Envenomation incidents involving the scorpion Tityus Trivittatus reported to SERTOX, culminated in many cases with severe adverse outcomes. *Objective:* to report the trend in morbidity and mortality from envenomations caused by Tityus Trivittatus in the area of Rosario and regions where this species are endemic. *Methods:* Retrospective evaluation of animal envenomation cases reported to SERTOX from 1990 to 2005. This data was compared with a nationwide epidemiological database. *Results:* 2.6% of the total consults attended by SERTOX corresponded to TT envenomations (77% of all animal poisoning). 66.3% of all TT envenomation cases occurred throughout the warm months, mainly November through February. The reported incidents involving TT consistently increased from 2.6% in the 1990 decade to 8.5% from 2003 to 2005. 46.4 % developed local and systemic symptoms in 2000–2002, compared to only 3% in 1990–1994. A trend toward increased severity of the presenting clinical picture and use of antivenom was also observed, with one lethality case reported in 2002 in the city of Rosario. Similar results and trends were observed in the nationwide epidemiological database. *Discussion:* TT envenomations are common in Rosario and Argentina. The incidence as well as the severity of its presentation (including lethality) has remarkably changed in the last decade. Climate changes such as increase humidity and temperature, which facilitate the metabolic and reproductive rate of scorpions and their preys (e.g., cockroaches) might have accounted for the increase number of reported TT envenomations. *Conclusion: Tityus trivitattus* became in recent years a species of concern. Envenomation caused by its sting is potentially lethal. An organized nationwide epidemiological registry including antivenom availability is necessary for better managing these cases of Argentina.

54. Development of "Fast Fact Sheets" for Emergency Departments and Acute Care Health Workers for the Major Biological, Chemical, and Radiological Agents

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Background: Many fact sheets (FS) discussing the care of biological, chemical, and radiological agents exist, but are largely aimed at either the lay public or the public health (PH) community. Those that are applicable to health care workers (HCW) are voluminous (e.g., 7–10 page ATSDR sheets) and not directed to the acute care setting. We sought to develop FS that were directed to acute HCWs in EDs and ICUs that were concise (most 1 page), evidence-based, reviewed by a multi-disciplinary team, and could be rapidly distributed to a large poison center catchment area. *Case Report:* A list of high risk agents for FS development were chosen as follows: biological agents as the CDC Category A agents, radiological agents as the 3 isotopes most commonly involved in accidents and the 3 isotopes most commonly used in industry, chemical agents and toxins as the military agents identified in the Textbook of Military Medicine and any potentially lethal agents that are locally stored in significant quantity as determined by the State Public Health Department and Office of Emergency Management. A template was devised by the Interstate Chemical Terrorism Workgroup and was modified for all agents. Draft FS were produced by a physician who is board-certified (BC) in medical toxicology and emergency medicine, then reviewed by a cadre of PH and health care personnel. Chemical FS were reviewed by a 2nd BC medical toxicologist, a state PH PhD toxicologist, and a certified industrial hygienist. Biological FS were reviewed by a BC infectious disease specialist, a state PH communicable disease specialist, and a hospital infection control officer. Radiological FS were reviewed by a BC medical toxicologist, a state PH radiation safety officer, and a hospital radiation safety officer. All FS were further reviewed by a BC pediatric emergency physician, an RN/CSPI, and, when necessary, a BC critical care physician. *Conclusion:* We describe the development and

multi-disciplinary review of 29 succinct FS that are concise, thorough, evidence-based, and directed to acute care HCWs. These sheets are available for use by other Poison Centers at our website.

55. Do Telephone Enquiry Data Reflect Hospital Admissions and Primary Care Prescriptions?

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Background: Depression is a life-threatening illness. Admissions to hospital with self-poisoning from antidepressants are frequent. It is well recognized that some antidepressant types are potentially more dangerous in overdose than others and that within each class some drugs have a higher case fatality ratio than others. *Methods:* Data were obtained for the seven financial years from 1998/9 to 2004/5. We obtained primary care prescribing data for antidepressants in Wales from Health Solutions Wales. Data on admissions to the Cardiff Poisons Treatment Unit were obtained from our electronic database as were details of telephone enquiries to the Cardiff Centre of the National Poisons Information Service which takes enquiries predominantly from Wales and the South West of England. *Results:* 29,423 of 223,813 (13.1%) telephone enquiries received over the seven year period concerned antidepressants. The proportion of antidepressant enquiries concerning tricyclics antidepressants fell from 46% in 1999/00 to 24% in 2004/5. During the same period SSRI enquiries were little changed from 44% and 50% whilst other antidepressants increased from 11% to 27%. Prescriptions for antidepressants increased from 1,423,618 to 2,229,890 in Wales and from 196,967 to 312,029 in the area from which most patients are admitted. The proportion of prescriptions locally for tricyclic antidepressants varied from 41% in 98/99 to 27% in 04/05 and from and 49% to 52% for SSRIs in the same period. The proportion of patients admitted with tricyclic antidepressant poisoning fell from 47% to 24%, while those from SSRIs mirrored the enquiry data, remaining little changed from 46% in 98/99 to 45% in 04/05. *Discussion:* The pattern of admissions, prescribing and telephone enquiry data closely mimic each other. This raises the possibility of using these types of data for public health surveillance. *Conclusion:* If all antidepressants are of similar efficacy, but of different severity in overdose, the possibility of reducing mortality from antidepressant poisoning by introducing safer prescribing is an attractive possibility. These data could be used to monitor therapeutic interventions.

56. A Description of Crashes Involving Aircraft Used for Aerial Agricultural Chemical Application Operations in the United States, 2001–2005

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Background: Agricultural aircraft crashes have the potential to cause combined traumatic and toxicological injury. We attempted to determine the frequency of such events. *Methods:* Database query of the National Transportation Safety Board Aviation Accident Database for calendar years 2001 through 2005. Specific keywords used in the query were “chemical,” “pesticide,” and “herbicide” in the setting of agriculture aircraft operations. *Results:* Of the 418 crashes of agricultural aircraft in this timeframe, 79 (16 rotor, 63 fixed-wing) were identified as involving chemicals. The pilot was the sole occupant in all but one event. No bystander injuries were noted in any of the 79 crashes. None of the crashes involved mid-air collisions with other aircraft. The pilot actively dumped the chemical loads in 8 events. Ten crashes (1 fatal) occurred after the application of chemicals. In the remaining 61 crashes, 8 were fatal, 4 resulted in injuries described as “serious,” and 10 resulted in “minor” injuries. The specific chemical involved was only named in 7 of the crashes: malathion (n = 3), sulfur (n = 1), bifenthrin (n = 1), picloram (n = 1), and glyphosate (n = 1). Two of the malthion-involved crashes were fatal. The remaining crashes either described the chemical in generic terms (eg., “insecticide,” “pesticide,” and “fertilizer”) or stated that the aircraft carried “chemicals.” Due to the nature of the database, no information concerning the presence of combined injuries was available. *Discussion:* Agricultural aircraft crashes have the potential for combined multi-system traumatic and toxicological injury. The scene transport of contaminated multi-system trauma patients by aeromedical services may be complicated and pose risks to the crew. In the post 9/11 era, the concern for malicious combined injury is greater. Very little research exists concerning the use of common antidotes (e.g., atropine) in the setting of multi-system trauma. *Conclusion:* Further research into the management of combined traumatic and toxicologic injury is warranted.

57. Poisoning Hospitalizations Correlates with Poison Center Call Frequency

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Background: Poison Centers (PC) have been shown to reduce health expenditures by reducing emergency department and clinic visits. The effect or association of PC calls on acute hospitalization rates for poisonings have not been well studied. *Methods:* All non-federal hospital discharges for acute poisoning principal diagnosis codes (960–979, 980–989, 9956X, 3030, and 005) in California between 10/99–6/02 were examined. About 3.3% of the discharges had county/hospital information suppressed in the public use database because of confidentiality criteria. These discharges were excluded from the analysis. U.S. Census Bureau population estimates for appropriate years by counties were also used. The 58 California counties were condensed to 48 counties and 3 "small county" geographic groupings. Exposure calls by counties/groupings to the California Poison Control System (CPCS) for the same period were collected. *Results:* In California, rates of hospitalization for poisoning averaged 0.54/1000 patient years (pt yrs) (range 0.25 (Central Counties Grouping) to 1.53 (Del Norte County). The average length of stay (ALOS) was 2.6 days/admission (range 1.7 (Northeastern Counties Grouping) to 3.6 (Napa County)). Poison exposure calls to the CPCS averaged 8.5/1000 pt yrs (range 4.9 (Los Angeles County) to 19.6 (Napa County). Poisoning discharges/1000 pt yrs positively correlated with PC calls/1000 pt yrs (Spearman correlation of 0.41, P = 0.003). The ALOS did not correlate with PC call frequency. *Discussion:* The CPCS call frequency or county "penetrance" was not correlated with a reduction in the number of hospitalizations for poisoning nor was it associated with reduced ALOS in this study. Further study is needed to understand the etiology of the large differences in county rates of poisoning hospitalizations and ALOS. *Conclusion:* PC call frequency is positively associated with the number of hospitalizations for poisoning in California. This data does not support the hypothesis that increased use of PC reduces acute hospitalization or length of stays for poisoning.

58. A Retrospective Review of AST Levels in Patients Treated with Acetadote® within 8 Hours of a Single Acute APAP Overdose

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Background: Acetadote® was approved by the FDA in 2004 as a 20-hour intravenous (IV) protocol for the single acute toxic ingestion of acetaminophen (APAP) that presents within 8 hours. The aim of this study was to assess the frequency of AST elevation in patients treated with Acetadote® according to the package insert guidelines. *Methods:* We performed a retrospective review of all the Illinois Poison Center cases from January 1, 2005 to February 28, 2006 that were coded as an APAP overdose treated with IV n-acetylcysteine. The inclusion criteria for the study were the following: Acetadote® was specifically identified as the IV n-acetylcysteine product used, the initial AST was <50, there was at least one AST measurement at the completion of therapy, and Acetadote® was dosed according to the 20-hour protocol. *Results:* Thirty-four cases met the inclusion criteria. Two (4.6%) of the 34 patients had an increase in AST. Neither of the two had an AST level at or greater than 1000 U/L at any time. In those two cases, the Acetadote® protocol was extended by continuing with the 16-hour infusion dose (100mg/kg) until the AST level trended downward. Both patients had an uneventful recovery. The remaining 32 (94%) of the 34 patients had no elevation of AST >50 U/L. *Discussion:* Acetadote® is an alternative to the 72-hour oral n-acetylcysteine dosing protocol. The objective of this study was to assess the frequency of AST elevation in patients treated with Acetadote®. *Conclusion:* In our series, 4.6% of the patients who were treated with Acetadote® had an increase in AST levels that resulted in no clinical hepatotoxicity after completion of the 20-hour protocol.

59. Antidote Geomapping: A Novel Approach to an Old Topic

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Background: Antidote stocking has been shown to be non uniform among hospitals and inadequate for several conditions. The geographic distribution and relation to specific areas at high risk for certain poisonings has not been studied. *Methods:* Surveys

Percent of responding hospitals stocking the antidote	
Cyanide kit	63
Atropine	94
Pralidoxime	51
Benzodiazepine	100
Crotalinae snake antivenom	85
Digoxin antibodies	78
Mucomyst IV	36

were mailed to each hospital pharmacy in our state, with phone follow-up performed one month later. Survey data was transferred into Microsoft Access for analysis. Hospitals were placed on a map using a geo-coding application. Maps were drawn using ArcView GIS 9.0, describing the geographic availability of each antidote in each hospital. Circular areas within a 30 miles radius of hospitals that stocked the specific antidote were shaded. Areas within a 30 miles radius around centers at high risk for releasing a specific toxin were also shaded. *Results:* The response rate was 50% (82/164). Among responding hospitals, antidote availability varied between 5 and 100% (see table). Mapping of antidote availability allowed the identification of geographic areas and communities that were not within 30 miles of a hospital stocking a specific antidote. Communities at risk for specific toxic exposures and not located within 30 miles of a hospital stocking the corresponding antidote were also identified. Maps will be presented illustrating these findings. *Discussion:* Antidote stocking in hospitals in our state is not uniform. Geographic distribution is also not homogeneous. Mapping of antidote availability per hospital identifies comunities that are not within 30 miles of a certain antidote. It also identifies neigboring hospitals that have the antidote. The study is limited by the response rate as well as the reporting error inherent in a survey. *Conclusion:* Geo-mapping of antidotes may improve the planning for stocking and prompt utilization of these drugs.

60. Massive Bupropion Overdose with Recurrent QRS Widening and Cardiac Arrest

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Background: We present a massive bupropion ingestion with recurrent QRS widening and cardiac arrest which responded to sodium bicarbonate. *Case Report:* A 41-year-old ingested 60 pills of 300 mg bupropion ER 2 hours prior to presentation. Her inital vitals and physical examination were normal. 10 hours post ingestion (PI) she had two brief seizures. At 11 hours PI, she had a third seizure followed by apnea and asystolic cardiac arrest. She was intubated, resuscitated and was given epinephrine, atropine, and sodium bicarbonate ($NaHCO_3$). Post resuscitation EKG showed a rate 110, QRS 0.156 seconds and sodium channel blockade pattern. QRS narrowed to 0.118 after 7 ampules (amps) of $NaHCO_3$ and BP increased from 64/38 to 89/54. She was then started on $NaHCO_3$ drip for recurrent QRS widening. Blood work showed pH 7.60, potassium 2.2 and sodium 162. She was given magnesium and potassium. Echocardiogram showed normal LV function, but abnormal septal motion consistent with an intraventricular conduction defect. Her QRS remained >0.150 for the following 10 hours till around 25 hours PI when she had a pulseless cardiac arrest preceded by further widening of QRS. After resuscitation with one amp of NaHCO, repeat EKG showed QRS 0.104 and QTc 0.503. She remained unresponsive on ventilatory and pressor support maintaining SBP >90 with good urine output. EEG showed no electrical seizure activity. Cerebral blood flow study at 30 hour PI demonstrated presence of blood flow. At around 35 hours PI, she suffered another pulseless cardiac arrest that was also preceded by widening of QRS. She regained a pulse with one amp of $NaHCO_3$ and 50 ml of 7.5 % sodium bicarbonate. QRS narrowed transiently and then widened and deteriorated into cardiac arrest. At that point her husband was present in the room and requested the cessation of any further resuscitation at about 36 hours PI. Comprehensive urine drug screen detected only bupropion. Her serum bupropion level about 14 hours PI was greater than 400 ng/ml (toxic >100 ng/ml). *Conclusion:* We report a case of massive bupropion overdose associated with recurrent QRS widening and cardiac arrest responsive to sodium bicarbonate.

61. Hypercalcemia in a 4-Year-Old Child following Overdosage of Vitamin D Supplementation: More is not Better

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Background: There has been a recent focus to provide vitamin D supplementation to children. Health Canada advocates a 400 IU daily vitamin D supplementation to every breast fed child less than one year of age. While supplementation may be necessary for some children, the practice is not without risk. A recent case report revealed hypercalcemia due to vitamin D supplementation. We report a second such case. *Case Report:* A 4-year-old boy presented with increasing weakness, nausea, and vomiting over one week. His past medical history was unremarkable. He was not on any prescription medications. He appeared dehydrated and lethargic. Initial vital signs revealed a mild tachycardia. Exam revealed dry mucous membranes and hyporeflexia. An intravenous line was started, fluids were administered and blood was sent to the laboratory for analysis. The results of his blood work were significant for evidence of dehydration and a serum calcium of 18.9 mg/dl. Upon further questioning, his mother revealed that she had been adding a vitamin supplement known as Soladek to his meals. She stated that it contained vitamins A, D, and E and that she had been instructed to add a drop to his food daily. She had been adding a teaspoon to his food daily for the two weeks prior to the development of symptoms. She thought that adding more to his meals would be better. He was admitted to PICU and continued to receive IV fluids. His serum calcium level declined to 9.7 mg/dl over two days. *Case Discussion:* While vitamin D supplementation may be necessary to prevent disorders such as rickets, appropriate dosing is crucial for preventing hypercalcemia. Considering the recent drive to provide vitamin D supplementation to children, the risks associated with overdosing should be reviewed with all parents prior to administration. *Conclusion:* The recent initiative to encourage vitamin D supplementation within the pediatric population is not without risk. Careful dosing instructions and the appropriate warnings should be given to all parents in an attempt to avoid the development of hypercalcemia.

62. Retrospective Review of Time to Hypoglycemia in Pediatric Sulfonylurea Ingestions

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Background: Pediatric sulfonylurea ingestions can lead to significant hypoglycemia. Our institution now follows the conservative practice of 24 hours of observation, without parenteral dextrose. A clearer understanding of the time to hypoglycemia, if any, would help with triage and observation decisions, and possibly avoid unneeded admissions. *Methods:* A retrospective chart review was performed for patients both admitted and transferred to a large, urban, pediatric teaching hospital from 1/1/1999 to 1/1/2006. Non-diabetic children <12 years old with intentional or accidental non-isolated ingestions of sulfonylureas were identified from a search of patient logs. Inclusion criteria included a known time of ingestion, no hypoglycemia on presentation, and no prophylactic treatment given before hypoglycemia. Time to hypoglycemia (BS <55 mg/dL or indicative symptoms), any treatment, and neurological outcome on discharge were recorded. Descriptive statistics where calculated. IRB approval was obtained. *Results:* 48 ingestions where identified and 38 met inclusion criteria. Of these patients, 26/38 (68.4%) never became hypoglycemic. 12/38 (31.6%) had at least one hypoglycemic episode with a mean time to symptoms of 6.1 hours (range 3.6–12.5). Of those who became hypoglycemic, 9/12 (75%) required some treatment other than food or juice. Two children were outliers with single, asymptomatic numerical hypoglycemic episodes during overnight fasting recorded at 12 and 12.5 hours post ingestion respectively. Neither child was ever symptomatic or required treatment. Exclusion of these patients results in a mean time to symptoms of 4.9 hours (range 3.6–7.5). There were no neurological deficits noted in any child on discharge. *Discussion:* Our inclusion criteria were specifically tailored to help address the question of what to do with an asymptomatic, euglycemic child presenting shortly after a sulfonylurea ingestion. After excluding what appeared to be normal overnight fasting hypoglycemia in two asymptomatic patients, the longest recorded time period to symptoms was 7.5 hours. *Conclusion:* Shorter periods of observation, especially for daytime ingestions, may be warranted for selected pediatric sulfonylurea ingestions.

63. A Large Case Series of Acute Pediatric Methotrexate Ingestions: Significant Clinical Effects are Rare

Bebarta VS,[1] Forrester MB,[2] Vu T.[1] *[1]Wilford Hall Medical Center, San Antonio, TX, USA; [2]Texas Department of State Health Services, Austin, TX, USA.*

Background: Significant adverse effects after acute pediatric methotrexate (MTX) exposures have been limited to parenteral exposures. Treatment recommendations for pediatric MTX exposures do not differentiate between routes of exposure. We report

the incidence of significant clinical effects and drug-specific treatments reported in a large series of acute, pediatric MTX ingestions. *Methods:* Poison Center records of all MTX ingestions by patients age <17 years during 2000–2005 were collected from six poison centers. The cases included all MTX ingestions including those with additional substances. One trained reviewer, blinded to the study purpose, used a standardized data collection form to extract study data. Missing or conflicting data was reconciled with predetermined process. *Results:* Forty-seven cases were documented over six years, 42 (89%) of which were unintentional. Thirty-six percent (17/47) were male. The mean age for the unintentional ingestions was 3.7 years (range 20 days-17 years, median 2 years). Five (11%) cases were intentional suicidal ingestions in teenagers. The mean dose in acute, unintentional ingestions (AUI) in all children and in children less than 6 years of age was the same, 8 mg (range 2.5–17.5 mg). Eleven (23%) patients had followup >12 hours. No patient with an AUI developed MTX-induced sedation, hepatotoxicity, renal insufficiency, seizures or bone marrow suppression. Three patients with an AUI received folinic acid, but no patients in this group received sodium bicarbonate or hemodialysis. One patient with an intentional suicidal exposure developed hepatotoxicity, but the patient also ingested a toxic dose of acetaminophen and valproate. Hemodialysis was performed once on this patient. No patient died. *Discussion:* Acute pediatric methotrexate ingestion was uncommon. MTX-induced seizure, renal failure, hepatic injury, and sedation were not documented in our series. Pediatric AUIs rarely received MTX-specific treatments. *Conclusion:* Supportive care and observation should be considered the mainstay of treatment for pediatric AUIs. Prospective verification of our findings is warranted.

64. A Six Year Review of Acute Methotrexate Ingestions in Adults: Significant Clinical Effects and Treatments Used

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Background: Reports of significant methotrexate (MTX) toxicity in acute exposures has been limited to the parenteral route. Treatment recommendations for MTX toxicity do not differentiate between routes of exposure. We report the incidence of significant adverse clinical effects and use of MTX-specific treatments after acute, adult MTX ingestions. *Methods:* Poison Center records of all MTX ingestions by patients age >17 years during 2000–2005 were collected from six poison centers. The cases consisted of all MTX ingestions, including those with additional substances. One trained reviewer, blinded to the study purpose, used a standardized data collection form to extract study data. Missing or conflicting data were reconciled with predetermined process. *Results:* Sixty-three patients met inclusion criteria, of which 56 were acute ingestions. Seventeen percent (11/63) were male. The mean age was 49 years (range 21–92 years). Fourteen (22%) cases involved intentional suicidal ingestions, and 43 (68%) were unintentional. The mean dose ingested was 24 mg (range 2.5–100 mg). Two patients had elevated liver enzymes; however, one was due to a toxic acetaminophen dose and the other to preexisting liver disease. No patient developed new renal insufficiency, seizures, or bone marrow suppression; however, followup >12 hours was limited to12 patients (19%). Nine (14%) patients received folinic acid, three of which received sodium bicarbonate. Seven patients treated with folinic acid were followed for >24 hours. Seven (11%) patients were acute ingestions with suicidal intention. The mean dose in this group was 47.5 mg (range 12.5–100 mg). No patient in this group had serious adverse effects attributable to MTX toxicity. No patient in our series received dialysis and died. *Discussion:* MTX ingestion was uncommon. Significant toxicity or use of MTX-specific treatment was rare after acute MTX ingestions, especially in those with suicidal intent. *Conclusion:* Observational therapy without MTX-specific treatments should be considered in acute, intentional MTX ingestions. A large, prospective study to evaluate this treatment approach is warranted.

65. Children's Exposures to Brimonidine Eye Drops in United States: 1997–2005

Woolf AD,[1] Lai M.[2] [1]*Children's Hospital, Boston, MA, USA;* [2]*American Association of Poison Control Centers, Washington, DC, USA.*

Background: We previously reported on trends in US potential toxic exposures involving brimonidine tartrate, a centrally-acting selective alpha-2-adrenergic agonist whose toxicity is often compared to that of clonidine. Introduced in 1997 as a topical ophthalmic agent to lower intraocular pressure in patients with glaucoma and following optic surgery, brimonidine is packaged in a screw top squeeze bottle without child resistant features. We now investigate the number, types, triage, and severity of unintentional exposures among young children. We also wanted to compare two national databases for their post-marketing surveillance performance. *Methods:* All exposures to brimonidine in categories: "unintentional general" or "therapeutic error" involving children 0–5 years old were retrieved from the AAPCC's TESS database from 1997–2005. An FOIA request was filed to obtain brimonidine exposures reported through the FDA's Medwatch Adverse Events Reporting System (AERS) during 1997–2005. Data

	TESS	AERS	X2	p value
Child <6 years old	185 (44%)	15 (4.4%)	159.9	<0.001
Route – ocular	19 (10.3%)	13 (86.7%)	28.5	<0.001
Route-oral	156 (84.3%)	2 (13.3%)	7.6	<0.01
Triage-ED	78 (42.2%)	–	–	–
Hospitalized	31 (16.8%)	15 (100%)	22.0	<0.001
Naloxone	18 (9.8%)	–	–	–

were analyzed using univariate statistics and Chi Square analysis. *Results:* There were 418 brimonidine reports in TESS and 340 in AERS during 1997–2005. The Table compares TESS and AERS reports of potential exposures to brimonidine among children 0–5 years old. Brimonidine exposures in children ≤5 years old increased in TESS annually from 12 reports in 1997 to 37 in 2005. No pediatric cases appeared in both the TESS and AERS databases. *Discussion:* Reports of inadvertent exposures to brimonidine involving young children increased in frequency over the past 9 years and are more commonly reported to TESS than to the AERS system. *Conclusion:* Poison centers do not routinely report pediatric brimonidine exposures to the Medwatch AERS program. Further studies of the appropriate triage of possible brimonidine exposures, the efficacy of naloxone, and how to prevent inadvertent childhood exposures to this drug are warranted.

66. Lamotrigine and Citalopram Overdose: Unmasking a Brugada ECG Pattern

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Background: Lamotrigine and citalopram are psychotropics with complex receptor physiology and limited cardiac sodium channel blocker (SCB) properties. In overdose, lamotrigine is associated with few cardiovascular effects and citalopram with QT prolongation. We report a case of probable Brugada syndrome, an inherited sodium channelopathy, unmasked by a lamotrigine and citalopram overdose. *Case Report:* A 64 year old man was brought to the ED after presumed overdose with clonazepam, aripiprazole, citalopram and lamotrigine (empty bottles). He was unresponsive with no clear toxidrome; BP, 80/44 mmHg; HR, 80/min; RR, 20/min; and temp, 99 °F. An ECG showed a QRS of 104 ms, QTc of 525 ms, a T40 ms R axis deviation and a type 1 Brugada pattern (characteristic ST-elevation in V1-V3). A 2 mEq/kg bolus of $NaHCO_3$ failed to narrow the QRS but decreased the precordial ST-elevations. His clinical status deteriorated despite 2 g MgSO4 and 2 L of 0.9% NS. Dopamine was added and he was intubated for respiratory distress. Laboratories revealed mild renal insufficiency, negative cardiac enzymes, toxicology was negative for drugs of abuse, acetaminophen, salicylates, lithium, valproate and ethanol. A serum TCA screen showed an amitriptyline level of 45 ng/mL (Therapeutic: 95–250 ng/mL). The serum lamotrigine level was 39 mcg/mL (Therapeutic: 3–14 mcg/mL) and citalopram level 2400ng/mL (Therapeutic: 9–200 ng/mL). The patient recovered with supportive care and the Brugada pattern resolved after 2 days. Echocardiography was normal. Of note, ECGs from a previous suicide attempt involving doxepin revealed the same transient Brugada pattern. *Discussion:* Pharmacologic challenges with SCBs are used to diagnose inducible Brugada patterns from defects in fast sodium channels. Both abnormalities are associated with sudden cardiac death (SCD). If a patient on SCBs is found to have a Brugada pattern on ECG, the medication should be discontinued and a family history for syncope and SCD should be obtained. Electrophysiologic testing, genetic screening and/or implantable-cardioverter-defibrillator placement may be indicated. *Conclusion:* Ingestions of SCBs such as lamotrigine, citlopram and TCA's may reveal previously undiagnosed sodium channelopathies. Appropriate referral is indicated.

67. Pregnancy Outcomes in a Patient with Chronic Aspirin Pica

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Background: Little is known about the effects of high-dose aspirin (ASA) on a developing fetus. The PDR lists the following reproductive adverse events for ASA: prolonged pregnancy and labor, stillbirth, low birth weight, antepartum and postpartum

Pregnancy outcomes

Order	Sex	Gestational age (weeks)	Birth weight (grams)	Apgar @ 1 and 5 min	Oxytocin used	Highest [ASA] (mg/dL)	Lowest [bicarb] (mmol/L)
1	M	40 1/7	3402	8/9	Yes	ND	NA
2	F	38	2977	ND	No	ND	NA
3	NA	5	NA	NA	NA	NA	NA
4	M	39 2/7	2835	9/9	Yes	ND	NA
5	M	37 0/7	3005	8/9	Yes	27	12
6	F	37 5/7	3175	8/9	Yes	24	19
7	M	36 2/7	2381	8/9	Yes	56	13

ND = not documented, NA = not available.

bleeding. *Case Report:* A 26-year-old woman G 7 P 5 Ab 1 was admitted from the ED 3 times during her pregnancy with history of taking large daily doses of ASA to satisfy her craving for the acidic taste. Her peak ASA concentrations were 56.0, 41.5, and 46.9 mg/dL, respectively. She reported taking up to 80 325 mg tablets per day, but reduced her intake to 34–36 tablets per day on the advice of her obstetrician. She was frequently symptomatic with tachypnea and tinnitus on various hospital presentations, and she frequently had supratherapeutic ASA concentrations, metabolic acidosis and/or respiratory alkalosis. She had similar large chronic ingestions of ASA during her previous pregnancies, except for her third pregnancy (spontaneous abortion at 5 weeks). Her pregnancy outcomes are listed in the Table. Delivery of second infant occurred out-of-hospital. She reported craving ASA from 6–8 weeks of gestation until several weeks after delivery. She reported that her mother and grandmother had similar cravings for ASA during their pregnancies. *Case Discussion:* Oxytocin use in all 5 in-hospital deliveries suggests prolonged labor. This may be related to inhibition of prostaglandin synthesis by ASA. One infant with low birth weight was at 15th percentile for gestational age. It is possible that fetal outcomes were benign because major organogenesis had already occurred before her craving for ASA began at 6–8 weeks of gestation. *Conclusion:* Large daily ingestions of ASA during pregnancy was associated with oxytocin use during labor and delivery. Pregnancy outcomes were otherwise normal despite laboratory and clinical evidence of chronic ASA toxicity.

68. How Successful has Restricting Acetaminophen Pack Size been in Reducing Severity of Acetaminophen Overdose in the UK?

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Background: In September 1998, legislation was introduced in the UK to restrict the amount of acetaminophen available in a single pack from non-pharmacy outlets (General Sales List [GSL]) to 16 tablets. The legislation aimed to limit availability and reduce residual stocks in the home. This study aims to determine the success of the legislation by measuring the number of tablets taken per overdose. *Methods:* Data on acetaminophen overdoses was extracted from the poisons center database covering a 9-year period (1996–2004). Data was restricted to intentional self-harm events involving patients >12 years. Data is presented for generic and specific (GSL) acetominophen products. Comparisons were made of the number of tablets ingested pre and post the legislation. *Results:* The poisons center received >90,000 enquiries about acetaminophen-containing drug overdoses over the 9 years analyzed. More than 20,000 enquiries were received where a named GSL acetaminophen preparation had been taken. The proportion of acetaminophen enquiries where 16 tablets were taken has increased post-1998; nearly 50% of all cases between 1999–2004. The proportion of cases where 17–32 and 33–100 tablets had been taken has declined post-1998. The proportion of cases involving >100 tablets remained constant over the study period (<5% of cases). The median number of acetaminophen tablets taken has decreased; pre-1998 the median of tablets was 25 in males, 20 in females; post-1998, 21 in males, 16 in females. These variables were constant between 1999 and 2004. *Discussion:* This large poisons center based study has shown that there were fewer overdoses involving >16 tablets since the introduction of the legislation. Also, the median number of tablets taken has fallen. A limitation of the study is that it was based on calls to the poisons center which may not reflect the total population of acetaminophen overdoses; this is partially mitigated by the duration of follow up and

size of the study group. *Conclusion:* This study suggests that the legislation has been associated with a reduction in the number of tablets taken in acetaminophen overdose.

69. Fatal Arrhythmia from Bupropion Overdose

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Background: Bupropion is an antidepressant that rarely causes serious cardiac toxicity in overdose. We report an overdose which resulted in cardiac effects leading to death. *Case Report:* A 24-year-old male presented to an Emergency Department (ED) with a history of ingesting 100 Wellbutrin® XL 300 mg tablets. His initial HR was 140, BP 154/81 and ECG was normal. The patient had one seizure in the ED that resolved with 2 mg IV lorazepam. He was intubated for airway protection and received gastric lavage followed by activated charcoal. His BP dropped to 82/50 three hours after ingestion but normalized with IV fluids. His serum bupropion concentration 3.5 hours post ingestion was 3,757 ng/mL. Hospital urine toxicology screen was positive for ethanol and THC only. Blood screen showed no ethanol or other substances. About 6 hours after ingestion he had 2 more seizures and was given 1 g phenytoin IV and started on a midazolam drip. Ten hours after ingestion his BP was 58/26 with ventricular tachycardia, which progressed to ventricular fibrillation then asystole. He was resuscitated with IV lidocaine, atropine, epinephrine, sodium bicarbonate, calcium along with CPR and defibrillation. After resuscitation, his BP was 102/80, QRS 200 ms with a left bundle branch block (LBBB). He suffered cardiac arrest again 15 hours after ingestion and died. The post-mortem exam showed a hospital blood bupropion concentration of 14,000 ng/mL. The only other pre-hospital substance detected on the post-mortem drug screen was THC. *Case Discussion:* One death due to cardiac toxicity from bupropion overdose has been previously reported, but no QRS widening or LBBB was noted. *Conclusion:* In addition to seizures, extended-release bupropion was associated with delayed ventricular arrhythmia and death.

70. A Case of Aldicarb Poisoning with Prolonged Effects

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Background: Aldicarb is a carbamate insecticide that has been reported to cause significant morbidity from its cholinergic effects. *Case Report:* A 59-year-old man was intentionally poisoned with Aldicarb by his friend. He rapidly developed muscarinic and nicotinic symptoms including: seizures, fasciculations, salivation, diaphoresis, vomiting, bronchorrhea, miosis and respiratory muscle weakness. His muscarinic symptoms responded to atropine. However, he eventually had to be intubated and had recurrent episodes of fasciculations up to, approximately, 40 hours after the ingestion. His serum cholinesterase level 5 hours after ingestion was depressed to 145 IU/L (normal 3342–7582). At 48 hours, the level increased to 1848 IU/ but continued to be depressed as far out as 10 days post-exposure (1572 IU/L). He required ten days of hospital stay including a week in the intensive care unit. His nicotinic symptoms, manifested primarily by fasciculations, responded to pralidoxime that was administered over 72 hours post-exposure. At one month follwo up the patient had no new or persistent symptoms. *Case Discussion:* Aldicarb is a carbamate that reversibly inhibits acetylcholine esterase. Typically cholinesterase levels should return to normal within 48 hours. The mainstay of treatment includes medical management and atropine. The role of pralidoxime in carbamate toxicity is unclear because carbamate toxicity is thought to be of short duration. This patient continued to have symptoms and depressed cholinesterase levels beyond 48 hours and appeared to improve with pralidoxime. Serum cholinesterase levels were depressed in some reports for 30 and 44 hours while others reported effects on these levels of shorter duration. *Conclusion:* Aldicarb produced severe and prolonged cholinergic poisoning with depressed serum cholinesterase levels for over 10 days.

71. Evolution of a T40MS R Wave in a Citalopram Overdose (OD) with Serotonin Syndrome (SS)

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Background: Citalopram is an SSRI used in the treatment of depression. QT and QRS prolongation has been reported with overdose. Increasing rightward QRS, axis as evidenced by increased T40MS R wave in aVR (T40R) has not been reported. We report

a case of a citalopram OD with a progressive amplitude increase in T40R and QT prolongation as SS worsened. *Case Report:* A 38-year-old female presented after an OD of 1.8 g of citalopram. She denied other ingestion except for cocaine 2 days prior. Initial HR 76, BP 132/77, RR16, T.36.4C, SaO2 98% RA. She was alert and minimally agitated. DTRs were normal, no myoclonus or autonomic instability. Initial EKG was sinus rate 82, with 1.5 mm T40R, QTc of 439 ms and QRS of 86 ms. An old EKG had 1 mm T40R and QTc of 428 ms. Utox: (+)cocaine, (–)TCA. Within 1 h of arrival, she became more agitated and hyperreflexic. BP and temp also increased. EKG showed sinus rate of 80, 2 mm T40R, and a QTc of 486 ms. Despite high doses of IV lorazepam she had worsening myoclonus and extremity rigidity. Serial EKGs showed QTc ranging 465 ms to 507 ms. Maximum R wave height was 4 mm. She developed a temp of 38.2C was paralyzed, sedated and intubated. As her temperature decreased and symptoms resolved the R wave shortened to1.5 mm. The QRS remained 90 ms. She was kept on a lorazepam drip. Paralytics were stopped after 6 h and prior symptoms returned. Paralytics were restarted for 8 h with symptom resolution. She was weaned, extubated and discharged asymptomatic within 72 h of admission. Final EKG had a 1 mm T40R, and QTc of 501 ms. Citalopram levels were 1200 ng/ml and 880 ng/ml 11 and 19 hrs post presentation (therapeutic <200 ng/ml). *Case Discussion:* We hypothesize that the axis shift may be from the cardioactive metabolite of citalopram or by a conduction disturbance from the SS. This may explain why the R wave shortened with treatment for the SS. *Conclusion:* While SSRIs have a good safety profile citalopram has been known to cause seizures and EKG changes in addition to SS. We report a case of a citalopram OD associated with increasing terminal rightward deviation of QRS axis and QT prolongation with worsening SS.

72. Does Ethanol Coingestion Affect Outcome in Acute Acetaminophen Overdose?

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Background: Patients with self-poisoning frequently coingest ethanol and it has been suggested on the basis of animal and *in vitro* studies that ethanol coingestion may be protective in acute acetaminophen poisoning. The aim of this study was to assess the impact of ethanol coingestion on outcome in patients with acetaminophen poisoning. *Methods:* Data was collected prospectively on poisoned patients presenting to an inner city ED from May 2005-February 2006 using an electronic clinical toxicology database (Microsoft Access®). Inclusion criteria for both study groups: acute acetaminophen overdose requiring treatment with intravenous N-acetylcysteine (NAC), documented estimated dose and time of ingestion, measurement of pre and post NAC INR, no history of liver disease, no coingestion of other hepatotoxic agents, no history of chronic ethanol excess (>14 units/wk female, >21 units/wk male), or risk factors for acetaminophen poisoning. The two groups differed by a positive or negative history of ethanol ingestion in the 2 hours prior/post acetaminophen ingestion. *Results:* 31 patients met the inclusion criteria in the non-ethanol and 15 in the ethanol coingestion group. Data are summarized in the table. There was a trend to a greater increase in post-NAC INR in the non-ethanol group and significantly more patients in this group required ongoing treatment with NAC. *Discussion:* One limitation is that the pre NAC INR was greater in the non-ethanol group, this difference was statistically but not clinically significant. *Conclusion:* This study supports the hypothesis that acute ethanol coingestion may be protective in acute acetaminophen poisoning.

	Negative Hx ethanol co-ingestion (n = 31)	Positive Hx ethanol co-ingestion (n = 15)	P value
Mean age	33.37 (15–29)	34.86 (17–85)	ns
Sex M:F (%)	7:24 (23:77)	5:10 (33:67)	ns
Mean time to presentation, hours (range)	8.68 (0.5–72)	8.50 (0.7–48)	ns
Mean reported acetaminophen dose g	21.43	19.2	ns
Mean initial plasma acetaminophen conc μg/mL (range)	181 (27–632)	141 (21–276)	ns
Mean pre-NAC INR (range)	1.09 (0.95–1.28)	1.02 (0.92–1.14)	<0.05
Mean increase in INR post-NAC	0.13	0.08	ns
No. of patients requiring ongoing Rx with IV NAC	6	0	<0.05

73. Isolated Bilateral Hippocampal Infarctions and Severe Anterograde Amnesia as Sequelae of Carbon Monoxide Poisoning

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Background: Carbon monoxide poisoning is commonly associated with lesions of the basal ganglia and cerebral white matter, but hippocampal lesions are less often reported. *Case Report:* A 45-year-old man was found unresponsive in his garage surrounded by automobile exhaust. On arrival to the ED, the patient was intubated and placed on 100% oxygen. He was never hemodynamically unstable. Three hours later, his mental status improved, and he was successfully extubated. Initial testing revealed a carboxyhemoglobin level of 51.7% and a normal CT scan of the brain. Hyperbaric oxygen therapy was initiated within five hours of his presentation, and he received 3 ATA for 30 minutes followed by 2.5 ATA for 60 minutes. Afterwards he was awake and alert but had severe anterograde memory impairment and was unable to recall three objects immediately after hearing them. He scored 21/30 on a Folstein Mini Mental State Examination. MRI of the brain on HD #3 showed isolated bilateral infarctions of the hippocampi. Neuropsychometric testing on HD #5 showed mild impairment of attention and concentration, but severe impairment of both immediate and delayed memory. At HD #24 the patient had improved to recalling 2/3 objects at 2 minutes. Due to continued memory impairment, he was discharged to a supervised environment. *Conclusion:* We report a case of bilateral hippocampal infarctions following carbon monoxide poisoning, resulting in severe memory deficits.

74. Delayed Rise of Peak Acetaminophen Concentration Secondary to Diphenhydramine Co-Ingestion

Spivak LA, Daya MR, Horowitz BZ, Hendrickson RG. *Oregon Health & Science University, Portland, OR, USA.*

Background: A case of a delayed peak acetaminophen concentration is presented. *Case Report:* A 40-year-old male presented to an ED after ingesting an unknown formulation of acetaminophen (APAP) and diphenhydramine. Time of ingestion was verified by a receipt for these products found in his pocket. He received two doses of activated charcoal. His two-hour APAP level was 101 mcg/mL, and a four-hour level was 131 mcg/mL. A level 12 hours post-ingestion was 114 mcg/mL. At this point his AST was 20 U/L and his ALT was 33 U/L. IV NAC was started with a 150 mg/kg loading dose, and dosed every four hours at 70 mg/kg. Seven hours later the APAP was 125.5 mcg/mL. Six hours later the APAP was 121 mcg/mL. In the next 14 hours the APAP level fell to 21.9 mcg/mL continued declining. He developed elevated liver functions tests 36 hours post-ingestion. His AST peaked at 456 U/L and ALT peaked at 942 U/L. NAC was stopped after three days. His INR remained normal, and his creatinine remained at 0.8 mg/dL. *Case Discussion:* The anticholinergic effects of diphenhydramine could have contributed to delayed gastric emptying. He was reported to have hypoactive bowel sounds on hospital day one but was never floridly anticholinergic. The formation of a bezoar could also have caused a delay in APAP absorption. Iatrogenic or occult APAP ingestion were ruled out. It is unclear if NAC administration was beneficial. The patient's liver injury may have progressed without treatment. Conversely, if only a single APAP level had been checked and the LFT elevations remained clinically unappreciated, he may also have experienced an uneventful outcome. *Conclusion:* This case and other similar reported cases suggest that it would be prudent to recheck APAP levels in cases involving co-ingestants that delay gastric motility.

75. Shooting up Gumout®

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Background: Hydrocarbon toxicity is well described after oral exposure. However, there are very few human accounts of intravenous exposure to hydrocarbons and the nature of toxicity by this route. *Case Report:* Patient was a 47-year-old male who intentionally injected approximately 10 mL of Gumout® Fuel Injector/Caburetor Cleaner into an indwelling central line. He subsequently was transported to the emergency department right away. On presentation to the emergency department, the patient was in acute respiratory distress. He was awake and alert. Initial vital signs included blood pressure of 222/116, heart rate of 108, respiratory rate of 40, and and a room air oxygen saturation of 69%. He was emergently intubated. Inital chest radiograph demonstrated diffuse lung lesions consistent with an acute lung injury. He was transferred to a tertiary care center for supportive care.

On day seven, patient extubated himself and was eventually discharged from the medical service. *Case Discussion:* This case demonstrates that intravenous exposure to hydrocarbons can lead to acute lung injury. As there was no oral exposure in the patient, this exposure illustrates that systemic circulation can lead directly to pulmonary toxicity without aspiration. The phenomenon has only been described in animal studies and one human case report. While aspiration is the prevailing pathophysiologic theory of pulmonary toxicity from hydrocarbon exposures, this case lends support to another mechanism of pulmonary toxicity that can occur through the systemic circulation of hydrocarbons. *Conclusion:* Systemic circulation of a hydrocarbon compound can cause acute lung injury.

76. Long-Acting Anticoagulant Rodenticide Poisoning – Bromadiolone Pharmacokinetics

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Background: Warfarin and superwarfarins are commonly used as rodenticide in Hong Kong. The readily availability predisposes to incidental and accidental poisoning. High potency of superwarfarins is not only detrimental to rodents but also potentially fatal to human. The long acting capability may incur prolonged and significant clinical bleeding. *Case Report:* A 40-year-old female, who had weight 52.3 Kg, height 166 cm and BMI 19.0 kg/m^2, suffered from depression and ingested four bags of rat poison containing bromadiolone (0.005%). She presented with substantially prolonged prothrombin time (PT) and activated partial thromboplastin time (aPTT). Fresh frozen plasma (FFP) and oral vitamin K_1 were given immediately. Her initial (day 2) plasma bromadiolone level was 85 ng/mL. As her coagulation profile was persistently abnormal, FFP and oral vitamin K_1 were continued on day 4, 5, 6 and 7, and day 7, 9 and 13–25 respectively (table). Nevertheless, bromadiolone was still detected on day 61 despite showing a slow decline since day 4. After the cessation of FFP and oral vitamin K_1 therapy, her coagulation profile remained normal. *Case Discussion:* This case illustrated that bromadiolone has a rapid distribution phase followed by a slow elimination phase. The estimated half-life is 28 days. The coagulation profile stayed normal after cessation of both FFP and oral vitamin K_1 therapy, which was associated with a plasma bromadiolone level of less than 10 ng/mL. *Conclusion:* We postulated that the plasma bromadiolone level may be a useful marker to guide the management of bromadiolone poisoning.

77. Should we Dialyze Metformin-Induced Lactic Acidosis? A Case Report with Urine Metformin Concentrations

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Background: Metformin has been associated with lactic acidosis in both acute ingestions and therapeutic dosing. There are many reports describing the use of both intermittent and continuous venovenous hemodialysis (CVVH) to treat metformin-induced lactic acidosis (MILA), however urine metformin concentrations in these patients have not been

Delayed acetaminophen peak

Date	Time	APAP (mcg/mL)	AST (U/L)	ALT (U/L)
11/3/06	20:00	101		
11/3/06	21:45	131	25	40
11/4/06	05:30	114.3	20	33
11/4/06	12:25	125.5		
11/4/06	18:00	121		
11/5/06	08:00	21.9	72	99
11/5/06	18:00	<6.7	199	231
11/6/06	05:00	2.3	456	565
11/7/06			442	942
11/8/06			191	596
11/9/06			98	455

Coagulation profile and bromadiolone level

Day	PT (sec) #	aPTT (sec) #	Oral vit. K1 (mg)	FFP (unit)	Bromadiolone (ng/mL)
1	92.0	50.2	–	–	–
2	93.8	59.8	10	6	85
2	13.9	38.8	–	–	92
4	39.5	45.5	–	4	27
5	27.7	43.4	–	–	–
5	36.7	42.3	–	4	–
5	25.0	43.7	–	–	–
5	21.5	43.4	–	–	–
6	33.5	46.6	–	4	–
7	22.0	39.8	10	4	–
9	14.1	37.3	10	–	22
10	14.4	38.3	–	–	14
11	16.3	39.7	–	–	12
13	18.9	43.3	10	–	10
15	14.2	39.8	10	–	–
19	12.8	30.4	10	–	10
22	12.0	35.8	10	–	10
30	11.0	35.8	–	–	7.5
47	10.7	35.5	–	–	6.9
54	10.7	33.1	–	–	5.0
61	10.9	36.9	–	–	2.9

#: Reference range (sec) – PT: 10.0-13.0, aPTT: 24.0-35.0.

previously described. *Case Report:* A 51-year-old woman with a history of diabetes was found in a hotel room with empty pill bottles of metformin and her other medications, insulin syringes, and a suicide note. Initial blood glucose was 20 mg/dL. She was intubated for airway protection, had a generalized seizure and transferred to our ICU. Physical examination was significant for a blood pressure of 80/31 mmHg, sedation and morbid obesity. Initial laboratory data showed a serum lactate of 11.2 mmol/L, arterial pH 7.21, and pCO2 32 mmHg. CVVH was initiated to treat a presumed MILA and was continued for 3 days, during which time her lactic acidosis resolved. She required a norepinephrine infusion for 4 days, but maintained good urine output ranging from 1.6 to 2.3 liters per day. Her initial serum metformin concentration was 42 mcg/ml (therapeutic 1–2 mcg/ml) and urine metformin concentrations ranged from 1400 to 4300 mcg/ml (urine concentrations seen with therapeutic dosing < 1600 mcg/ml). She eventually fully recovered. *Case Discussion:* In a previous report of an acute ingestion treated with CVVH, metformin dialysate concentrations were 130–140 mcg/ml. Even though we were unable to acquire dialysate concentrations, our patient's 10-fold larger urinary metformin concentrations suggests much greater urinary elimination. This is consistent with known pharmacokinetics as metformin has a large volume of distribution (654+/–358 L) and has significant renal tubular secretion. *Conclusion:* We report an intentional metformin ingestion successfully treated with CVVH, with urinary metformin clearance significantly greater than what would be expected through dialysis. Metformin ingestions without refractory lactic acidosis with adequate urine output may not benefit significantly from dialysis.

78. Review of the Clinical Effects following Duloxetine Exposure

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Background: Duloxetine (Cymbalta®) is a new selective serotonin and norepinephrine reuptake inhibitor (SSNRI). It was approved by the Food and Drug Administration in August 2004 for the treatment of major depressive disorder, and one month later it received an indication for the treatment of peripheral neuropathic pain associated with diabetic neuropathy. The purpose of

this study is to review the clinical effects of all single substance exposures to duloxetine during 2004 and 2005 reported by the Texas Poison Center Network. *Methods:* The Texas Poison Center database was searched for all records of single substance human exposures to duloxetine from January 1, 2004 to December 31, 2005. *Results:* A total of 112 duloxetine exposure cases met the inclusion criteria. Eighty cases (71.4%) resulted in no clinical effects and 32 cases reported 44 clinical effects The most common clinical effects were neurological: Drowsiness/lethargy (22.7%), agitated/irritable (6.8%), confusion (4.5%) and hallucinations (4.5%). Tachycardia (15.9%), nausea/vomiting (13.4%), and edema (6.8%) were reported more than once. Drowsiness/lethargy was the most common effect in both children and adults. Tachycardia and nausea/vomiting were the second and third most common effect in adults, but these were not reported in any young children. *Discussion:* Less than one-third of the duloxetine exposures resulted in any clinical effects. There were no deaths or major effects reported. This study is limited by its retrospective nature and its reliance on patient histories. *Conclusion:* Overall, the most frequently reported effects from duloxetine exposure were drowsiness/lethargy, tachycardia, and nausea/vomiting. There appears to be age-dependent differences in clinical effects. Further prospective research is needed to better define the clinical effects of duloxetine by age group.

79. Recurrence of Pediatric Lead Poisoning

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Background: It is estimated that 1 in 10 children in Detroit has lead (Pb) poisoning and our hospital is a referral treatment center. Both the extent to which children require readmission for treatment and risk factors for recurrence are not previously defined. *Methods:* Retrospective chart review of 53 children hospitalized for elevated blood lead levels (BLL) at our center between Jan. 1, 2003 and Dec. 31, 2005. Data included demographics, initial BLL, history of previous hospitalization, red cell indices, and initial abdominal (AbXr) and long bone x-rays. *Results:* A total of 77 episodes of Pb poisoning were eligible for study inclusion representing 53 unique patients. Most patients were male (64%) and African-American (85%). The mean age was 2.6 years. On first admission, the AbXr was positive in 56% and was more likely to be positive with BLL > 50 μg/dL. However, BLL did not significantly differ between patients with positive and negative AbXrs (53 vs. 49 μg/dL). Fourteen (26%) patients required readmission: 9 (17%), 3 (6%), 1 (2%), and 1 (2%) patient(s) had two, three, four, and seven readmissions, respectively. Fifty percent of readmitted patients had positive AbXr findings. Readmitted patients did not otherwise differ significantly in terms of BLLs, FEP, or hematocrit from those not readmitted. *Discussion:* We identified a high rate of readmission (26%) in children with Pb poisoning. The extent to which a large total body Pb burden vs. re-exposure contributes to this recrudescence is not known. The large number of positive abdominal x-rays on readmission suggests that re-exposure may be a significant contributing factor in our population. *Conclusion:* Readmission is common in children with Pb poisoning. Delineating risk factors for recrudescence in those without radiographic evidence of re-exposure deserves further study.

Comparison of patients with elevated BLL on initial and repeat admission

	First admission	Re-admission
	n (%)	n (%)
Total	39 (100%)	14 (36%)
Male	22 (56%)	12 (86%)
African-American	31 (79%)	14 (100%)
Prior admission	0 (0%)	14 (100%)
BLL mcg/dL	49	54
Positive AbXr	22 (56%)	7 (50%)
FEP mcg/dL	173	196
FEPQuant mcg/dL	512	567
HCT (%)	32.7	34.1
MCV (fL)	72.5	72.4

BLL: blood lead level; FEP: free erythrocyte protoporphyrin.

80. A Six-Year Retrospective Evaluation of Oxcarbazepine Overdose as Reported to Poison Centers

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Background: Oxcarbazepine (OXC, Trileptal®) is the keto analog of carbamazepine (CBZ), also with an active metabolite. Unlike CBZ, OXC is not metabolized to an epoxide, which is one of the reasons for its improved side effect profile. With a similar mechanism of action and efficacy during clinical trials, adverse effects other than rash were mild and included dizziness and vertigo. A dose response relationship has not been established, or an amount that can safely be managed at home. *Methods:* A retrospective chart review of all OXC ingestions from 2000–2005 from 2 regional poison centers. Exclusion criteria were multiple drug ingestion and lack of follow up. *Results:* Of 296 patients, 167 (54%) were female. Mean age was 20.5 yrs. (S.D. ± 15.8), with a range of 1–78 yrs. Fifty-four patients (18%) were ≤6 yrs., 165 patients (56%) were seen in an HCF, of which 86 were hospitalized. Symptoms occurred in 151 patients (51%). Symptoms seen were lethargy (n = 93), Nausea/vomiting (n = 46), tachycardia (n = 40), hypertension (n = 7), Resp. depression (n = 7), hypotension (n = 7), EKG changes (n = 5), coma (n = 4), and seizures (n = 3). There were no deaths. Mean and median dose ingested are presented in the table. The dose was known in 244 patients (84%). Therapies beyond decontamination included intubation (n = 6), benzodiazepines (n = 5), antiemetics (n = 5), and serum alkalinization (n = 1). One 3-year-old with an unknown dose required intubation for airway protection. *Discussion:* Unlike CBZ, severe symptoms requiring intervention were infrequent (<3%). *Conclusion:* Unintentional ingestions of ≤3000 mg may be safely managed at home. Minor effects including lethargy and nausea/vomiting were common.

Outcome	Mean dose(mg)	Median dose(mg)
Symptoms	5193	2700
No Symptoms	1587	750
Minor effect	4724	2100
Moderate effect	6776	3600
Major Effect	14500	18000

81. Pediatric Ingestions of Tamsulosin

DesLauriers C, Burda A, Razo M, Wahl M. *Illinois Poison Center, Chicago, IL, USA.*

Background: Little data exists regarding unintentional pediatric ingestions of tamsulosin (Flomax®). Tamsulosin is an alpha$_{1A}$-adrenergic blocking agent available as a 0.4mg capsule dosed once daily for benign prostatic hyperplasia. Overdoses in adults have resulted in headache, dizziness, orthostatic hypotension and bradycardia. *Methods:* A 68-month review of PCC data from 7/1/2000- 2/28/2006 was undertaken. All healthy patients age 10 and under with a history of unintentional ingestion of tamsulosin were included. *Results:* 31 cases were reported during the study period. Ages ranged from 11 months to 9 years; 27 patients were age 3 or younger. 6 cases involved an unknown amount of capsules, 1 case with 4 capsules, 3 cases with a maximum of 2 capsules and 21 cases with 1 or less capsule. 6 patients received activated charcoal in the ED. 16 cases were managed in a HCF, 6 of those patients were admitted for observation. 15 cases involved possible ingestion of an additional drug. 8 cases were not followed to outcome; 4 of these were referred to an HCF and subsequently lost to follow-up and 4 were coded minimal clinical effects possible based on history. Of the 23 cases with documented follow up, 20 resulted in no effect, 1 case with symptoms not related to the drug, and 2 cases resulted in minor symptoms. Neither of these two symptomatic patients had any history of ingesting an additional drug. A 2-year-old child vomited several hours after being found near an open bottle of tamsulosin (unknown amount ingested). A “glassy eyed” appearance was reported by the mother of a 6-year-old child who received one capsule of tamsulosin as a therapeutic error. The patient was brought to a local ED and was noted to be asymptomatic with normal blood pressure. *Discussion:* Our review of 31 unintentional pediatric ingestions of tamsulosin revealed no reports of serious adverse effects. This is likely due to the strong receptor selectivity of tamsulosin for alpha$_{1A}$ receptors located in nonvascular smooth muscle. It has 7–38 times greater affinity for apha$_{1A}$ receptors (primarily located in the genitourinary tract) than for alpha$_{1B}$ receptors (primarily located in vascular smooth muscle). *Conclusion:* Unintentional pediatric ingestions of tamsulosin are unlikely to result in toxicity.

82. Bupropion Ingestion in Children

Spiller HA, Bosse GM, Gray T, Baker SD. *Kentucky Regional Poison Center, Louisville, KY, USA; Hennepin Regional Poison Center, Minneapolis, MN, USA; Central Ohio Poison Center, Columbus, OH, USA.*

Background: The incidence of seizures after unintentional bupropion ingestion in children < 6 years has been reported as 0.2%. However in many poison centers > 80% of these patients are referred to the Emergency Department for evaluation. The purpose of this study was to evaluate if a bupropion dose can be determined for referral to a healthcare facility (HCF) or management at home. *Methods:* We performed a retrospective chart review of all bupropion ingestions in children <6 years old for 2000–2005 from three regional poison centers. Exclusion criteria were lack of follow up or multiple drug ingestion. *Results:* Of 232 patients, 125 (54%) were male. Mean age was 2.2 years (SD + 1.0). 179 (77%) were seen in a HCF, of which 72 (31%) were hospitalized and 53 (23%) were observed at home. Symptoms occurred in 40 patients (17%): sinus tachycardia (n = 29), nausea/vomiting (n = 14), hyperactivity (n = 6), hallucinations (n = 2), and hypertension (n = 2). No seizures occurred. Mean (HR) of tachycardic patients was 129 bpm (SD + 14.8), with a range of 103 to 148 bpm. Tachycardia was of short duration. Mean dosage of those with tachycardia was 17.5 mg/kg. In the two patients with hypertension, the maximum recorded blood pressures were 145/80 mm Hg and 137/90 mm Hg, with HR of 122 and 125 bpm, respectively. Hallucinations were reported by the parents of two patients prior to HCF arrival but were not observed by ED personnel. No interventions were required in any child. Dosage ingested was known for 159 patients. Mean dose and dosage ingested were 150 mg and 10.8 mg/kg, respectively, with a range of 25 to 900 mg and 2.6 to 63 mg/kg, respectively. 90% of patients ingested < 20 mg/kg. Patients were more likely to have symptoms with ingestion >15 mg/kg ($p < 0.05$, Fishers exact test). *Discussion:* A high percentage of children continue to be seen in a HCF. Concern from the higher incidence of severe effects seen with intentional adult exposures may be one of the reasons for this cautious approach. *Conclusion:* Clinical effects requiring intervention did not occur in this case series. Unintentional ingestion of < 15 mg/kg may not require direct medical supervision.

83. Pediatric Exposures Involving 10-Fold Dosing Errors with Metoclopramide Reported to US Poison Centers

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Background: Metoclopramide is prescribed for infants and children for the treatment of gastroesophageal reflux. The objective of this study was to characterize 10-fold dosing errors involving metoclopramide in children < 6 years of age reported to poison centers. *Methods:* National TESS Data were obtained for years 2000–2004 for all unintentional 10-fold dosing errors involving metoclopramide in children < 6 years of age. *Results:* A total of 874 10-fold dosing error exposures involving metoclopramide were identified, of which, 695 (79.5%) involved metoclopramide as a single substance. Of the 695 exposures, 654 (94.1%) occurred at a residence and 16 (2.3%) occurred at a health care facility. 30 (4.3%) were coded as “confused units of measure” and 15 (2.2%) were coded as an “iatrogenic error.”

Age, disposition, and outcome N = 695		Clinical effects N = 695	
Age ≤1 month	21.2%	Drowsy/lethargy	11.9%
Age > 1 month and ≤1 year	73.4%	Agitation	11.2%
Age > 1 year and < 6 years	5.5%	Dystonia	10.9%
Treated at HCF	61.1%	Vomiting	2.3%
Admit critical care unit	5.9%	Tremor	1.7%
Admit non-critical unit	9.6%	Tachycardia	1.7%
No effect	42.6%	Diarrhea	1.6%
Minor effect	16.3%	Muscle rigidity	1.2%
Moderate effect	15.0%		
Major effect	0.6%		
Death	0.0%		
Unknown outcome	24.8%		

Discussion: The majority of 10-fold dosing errors involving metoclopramide occurred at home and involved children ≤1 year of age. The most common clinical effects reported were neurological and over half the patients were treated in a health care facility. *Conclusion:* The frequency and morbidity of 10-fold dosing errors involving metoclopramide warrant increased awareness among health care professionals.

84. Delayed Clinical Decompensation and Death Following Pediatric Nifedipine Overdose

Masneri DA, Herold TJ, Miller MA. *Darnall Army Community Hospital, Ft. Hood, TX, USA; Central Texas Poison Center, Temple, TX, USA.*

Background: The few case reports describing pediatric deaths from SR nifedipine describe severely ill patients upon Emergency Department (ED) presentation. We describe delayed onset of serious symptoms and subsequent death in a 2-year-old boy who ingested an unknown amount of Adalat CC. *Case Report:* A 2-year-old boy was brought to the ED 2 hours after ingesting an unknown quantity of nifedipine SR 90 mg tablets. The child was asymptomatic and by history may have ingested up to five tablets. Activated charcoal was administered and an IV was placed. Labs were significant for a blood glucose of 253 mg/dL. Vital signs were all unremarkable and the child was transferred to the pediatric intensive care unit of a tertiary care hospital. On admission, 5 hours after ingestion, his vital signs were heart rate 150–170 beats/minute, blood pressure 100/40 mm Hg, respiratory rate 36–44 breaths/minute, and oxygen saturation 97–100% on room air. He remained clinically stable with a resting tachycardia and continued hyperglycemia. At 18 hours after ingestion the child's condition was unchanged. Six hours later (24 hours following ingestion) the patient's heart rate decreased with progression to subsequent bradycardia and ventricular fibrillation. Aggressive resuscitation was unsuccessful and he was pronounced dead at 25 hours post ingestion. Postmortem liver nifedipine level was 1.1 mg/kg. Qualitative serum level from the hospital was positive. The sample was insufficient for a quantitative level. *Case Discussion:* This is a case of a pediatric death following SR nifedipine ingestion in a patient presenting with mild symptoms who remained relatively asymptomatic for approximately 20 hours. The cause for late decompensation is unclear. Possible explanations include: failure to recognize clinical toxicity, bezoar/concretion formation, and cardiovascular collapse following prolonged cardiac compensation for the peripheral vascular effects of nifedipine. *Conclusion:* Subtle evidence of toxicity (resting tachycardia, mild hypotension, hyperglycemia) should prompt extreme caution and perhaps provoke aggressive clinical intervention and extended observation in nifedipine overdose.

85. A 34-Month Review of Pediatric Escitalopram Ingestions

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Background: Escitalopram (ESC), the S(+)-enantiomer of citalopram, is a newer selective serotonin reuptake inhibitor. There are few published reports of clinical experience with ESC overdose in children. *Methods:* We conducted a 34-month retrospective evaluation of all cases of unintentional pediatric ingestions of ESC reported to our regional PCC from May 2003 through February 2006. Inclusion criteria were patients 9 years of age and under; exclusion criterion was the presence of mixed ingestion. Cases were analyzed for gender, amount ingested, clinical symptoms, treatment and patient outcome. *Results:* A total of 33 cases were identified. Of these exposures, 48% were male and 52% were female with a mean age of 3.1 years (range: 8 months-9 years). Nine patients had ingested unknown quantities of ESC. Of the cases with stated known quantities of ingestion, the mean amount ingested was 20.6 mg (range: 5 mg-100 mg, SD 20.8); the mean amount ingested per kilogram body weight was 1.5 mg/kg (SD 1.8). Activated charcoal (AC) was recommended in 14 cases. A total of 22 patients were evaluated in a HCF; of these, 3 patients were admitted for overnight observation. Two patients who were evaluated in a HCF developed symptoms; one patient had emesis and flushing within two hours of the ingestion, and one patient developed fever and tachycardia 20 hours post-ingestion. In both of these patients, the exact amount of ESC ingested was unknown. No patient observed in a HCF exhibited cardiac dysrhythmias or seizures. The mean observation time for the patients not evaluated in a HCF was 3.9 hours; all of these patients remained asymptomatic during their observation periods. None of the patients with stated known quantities of ingestion developed any symptoms. Medical outcome was coded as no effect in 31 patients (94%), and minor effects (fever, tachycardia, emesis, flushing) in 2 patients (6%). *Discussion:* In our series of unintentional pediatric ESC ingestions, adverse clinical events were rare. AC administration may have decreased the incidence of adverse symptoms. *Conclusion:* Most cases of unintentional pediatric ESC ingestion can be safely managed at home, particularly if the amount ingested is less than 1.5 mg/kg.

86. Placental Toxicological Analysis and Newborn Parameters in Rural Communities Exposed to Pesticides in Argentina

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Background: An unhealthy environment may account for newborn morbidity; therefore, multiple toxic exposure through the maternal system is of great concern. In the upper Valley of the Negro and Neuquén rivers, the major producer of pears and apples in Argentina, six months of spraying and non-spraying periods are alternated. Mainly organophosphates (OP) are applied by air with farm tractors. However, organochlorinated pesticides (OC) residues are still found in soil and food. Considering geographic characteristics and pesticides environmental dynamics, the exposure risk of these toxics may involve pregnant women living in this area. *Objective:* This study was designed to investigate the relationship between placental biomarkers of pesticide exposition and newborn morphometric parameters. *Methods:* The study was performed prospectively. A cohort of 342 healthy women randomly selected at the prenatal care of the Public Hospital was interviewed. Levels of cholinesterases were measured in whole blood during pregnancy. Morphometric information about the offspring and placentas was recorded. Placental samples were taken from a subgroup of women for OC residues chromatographic determination and enzymes assays. *Results:* Analysis of the newborn morphometric parameters adjusted by sex and gestational age showed a significant increase of the head circumference (HC) in newborns from rural areas, women and also in the ones having indoors fumigation habits. Placentas from mothers living in farms were heavier and had 3-fold greater p, p'-DDE residue than those from urban origin. p, p'-DDE placental levels showed negative significant correlation with birth weight and ponderal index. Plasma cholinesterase decreased during the spraying season and no differences were registered according to residence while placental catalase activity increased in this period and was correlated to HC. *Conclusion:* The decrease of plasma cholinesterase showed that both urban and rural women were exposed to OP during pregnancy; nevertheless, rural placental samples showed greater exposition to p, p'-DDE. Farm residence affected both HC and placental weight but the lack of association of those parameters with p, p'-DDE levels suggests that these effects probably reflect an interaction between OP and OC. HC was also affected by the habit of indoor fumigation. P, p'-DDE exposition affected newborn weight and ponderal index, which indicates *in utero* nutritional status and newborn proportionality, respectively. The chemical stress caused by placenta OP exposure was illustrated by the increased catalase activity observed during the pesticides application period. This could be associated to the cell-damaging effects of highly reactive oxygen species that may contribute to deleterious effects in neurodevelopment. These results corroborate that placenta, the most accessible and available component of the triad mother-infant-placenta, shows cumulative effects that reflect the intrauterine environment in which the newborn is developed.

87. Characterization of Arsenic Calls to a Regional Poison Center

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Background: Calls to poison centers for arsenic (As) exposures are not uncommon. This retrospective study looks at the reasons for calling a Midwestern poison center for As exposures. *Methods:* All As cases from 2003 through 2005 were collected and analyzed. *Results:* Results are summarized in the following table.
Discussion: 31% of calls were from health care providers or the public requesting interpretation of tests which showed an elevated As level in blood, urine or hair. In cases where we had follow up, 24-hour urine specimens with speciation after abstinence from seafood showed no inorganic As and overall As levels within the normal range. 21% of calls involved non-toxic pediatric exposures to As-containing ant pesticides. 17% calls are from individuals who believed they or someone they knew were being poisoned. In the cases where follow up was available in the case of alleged maliscious intent, As levels were within the normal limits. Interestingly, the alleged poisoner was thought to be a woman 10/18 times, a male 2/18 times with 6/18 unknown sex. 10% of calls were regarding CCA treated wood products; the peak was after the EPA banned the products in new residential and playground structures. Intentional ingestions made up less than 3% of calls. There were no deaths during this time period. *Conclusion:* The most common type of arsenic call to this poison center were for assistance with lab tests which indicated an elevated As level. Intentional poisoining is a rare event. Poison centers should educate staff and develop guidelines on the work up of elevated As levels to guide callers with concise recommendations.

Breakdown of arsenic calls to regional poison center

Reason	2003	2004	2005	Subtotal
How to evaluate elevated As level in hair, urine or blood	15	8	10	33
Pediatric exposure to arsenic containing ant killer	6	10	6	22
Someone is poisoning me or someone I know	4	10	4	18
Chromated Copper Arsenate (CCA) treated wood	6	3	2	11
Occupational/school/dermal exposures	4	4	0	8
Arsenic in well water	3	5	0	8
Homeophathic medication exposure	0	1	2	3
Intentional ingestion	2	0	1	3
Accidental Ingestion	1	0	0	1
Total	41	41	25	107

88. Exposure to 1-bromopropane Adversely Affects Vibration Sense and Nerve Conduction Velocity of Lower Limbs and Central Nervous System in Workers

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Background: 1-Bromopropane (1-BP) is introduced as an alternative for ozone-depleting solvents. Recently, new, severe intoxication cases were reported in the US and Japan. The present study investigated the workers in the factory producing 1-BP to clarify the effect of 1-BP exposure on the workers. *Methods:* Forty workers engaged in 1-BP production and forty age- and sex- matched non-exposed workers were examined with tuning fork of the vibration sensation, electrophysiological examinations of lower limbs, WHO neurobehavior core test battery and blood laboratory test. The individual exposure levels were also estimated with passive sampler tubes. Obtained data were analyzed with paired t-test between the exposure group and the control. *Results:* The time-weighted average of exposure levels in workers were 15.3 ± 16.2 (Mean ± SD), 73.7 (Max) and 0.65 (Min) ppm. Delay time for vibration sensation by tuning fork stimulation was significantly elongated in exposure group compared to the control. Exposure group showed elongation in distal latency (DL) and reduction in motor nerve conduction velocity (MCV) in the lower limb compared to the control. The exposure group showed a lower score in tension and fatigue in profile of mood status and Benton test than the control. In the laboratory tests, the exposure group showed an increase in total protein. *Discussion:* Increase in distal latency and total protein and decrease in MCV were also found in our previous animal study. The Benton test showed inferior cognitive function, which accords with the recent severe cases in Utah. *Conclusion:* The present study not only confirmed that exposure to 1-BP adversely affects vibration sensation or elongates DL in humans, which was shown by our previous investigation, but also showed a decrease in MCV and an increase in total protein in humans.

89. Pulmonary Toxicity Following Exposure to Waterproofing Grout Sealer

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Background: A significant number of patients developed respiratory illness following the use of a waterproofing grout sealer in 2005. Six regional poison control centers (PCC) identified this illness pattern by means of the national automated toxicosurveillance system. *Methods:* Retrospective review of all cases of pulmonary toxicity following exposure to a waterproofing grout sealer from 6 regional PCCs between June 1, 2005 and December 1, 2005. *Results:* Thirty cases of pulmonary toxicity resulting

from the use of a waterproofing grout sealer were identified. The majority of patients were using the product at home (80%). Over half the patients presented within 3 hours of exposure. The most common presenting symptoms included shortness of breath (63%), cough (60%), and chest pain (44%), with wheeze (33%) and rales (23%) as the most common signs of clinical toxicity. One patient required endotracheal intubation. Thirty-seven percent of patients had signs of acute pneumonitis on initial chest x-ray. The mean presenting oxygen saturation was 89.5%. Over half of the study population required hospital admission. *Discussion:* Recent changes in the regulation of solvents may have lead to an increase in toxicity through changes in product pressure, particle size, and compatibility between waterproofing resins and new solvents. This grout sealer contains a noxious stimulant (N-butyl acetate), propellants isobutane and propane, C8-C9 hydrocarbon solvents, and a fluoropolymer resin. This product underwent a voluntary recall (related to butyl acetate concentration) coordinated by the CPSC in August 2005. A significant number of cases occurred after the recall date suggesting additional factors were likely involved in producing pulmonary toxicity. *Conclusion:* The exact mechanism of pulmonary toxicity following the use of waterproofing aerosols is not known but is likely due to a combination of its fluoropolymer resin and solvent.

90. The Relationship of Snake Bites and Weather Patterns

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Background: Thousands of children and adults are victims of envenomation every year. Snakes, as cold-blooded reptiles, are active only under specific environmental conditions. As a result, interactions between humans and snakes are thought to occur when weather conditions are warm and dry. *Methods:* All snake bite cases were retrospectively reviewed from our medical toxicology consultation and poison center databases from Jan 2003 until March 2006. Geographic location where bite occurred and date of bite were recorded for each case. Weather conditions from NOAA were then matched with the date and locations. Results were analyzed to determine if more snake bites occurred when conditions were warm and dry. Dry was defined as no precipitation on the day of or day before the bite. Warm was defined as a high temp of 80 °F or over. The institutional IRB approved this study. *Results:* 269 cases were identified, 33 were excluded because of captive snake, non-poisonous snake, pet bite, non-bite venom exposure, or incomplete chart. 221 involved copperheads, 7 timber rattlers, 5 eastern diamond backs, 2 unknown rattlers, and 1 cottonmouth. Conditions were dry for 75 (32%) bites and warm for 181 (77%). Conditions were both warm and dry for 56 (24%) bites and warm and wet for 123 (53%) bites. Using a binomial test, more bites occurred when weather was warm ($p = .001$) and wet ($p = .001$). *Discussion:* Bites were more common when weather conditions were warm and wet which differs from our hypothesis that bites are more common when conditions are warm and dry. One would assume that precipitation would make interaction less likely as fewer humans would enter a snake's habitat and snakes would be less active during wet conditions. *Conclusion:* In this study involving primarily copperheads in the southeast United States, snake bites were more likely to occur when weather conditions were warm and wet.

91. Proximity of Home Residence to Power Plants in Connecticut (CT) as a Predictor of Asthma Admission in Children

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Background: We hypothesized that proximity of homes to power plants would predict asthma hospital admission. *Methods:* Geocoded addresses and ED disposition were identified for 2,673 asthmatic children who came to the CCMC ED over 4 years. Home and CT power plant locations (N = 13) were map projected using ArcMap9.1™. Distance from residence to power plant was calculated using the Pythagorean Theorem. Analysis included X^2 for categorical data, ANOVA for continuous data, and logistic regression for risk of admission predicted by home distance to nearest power plant adjusted for age, sex, race, primary payer, and month or year of visit using SAS™. Alpha <0.05 was significant. There was 89% power to detect 40% increased admissions in patients living ≤ 5 miles from a power plant. CCMC IRB approved this study. *Results:* Mean age was 6.5 ± 5 years, 61% were male and 977/2,673 (36.5%) were admitted. Race was 42.5% Latino, 30% white, 22.1% black and 5.4% other. The primary payer was Medicaid for 57%. Analysis revealed the following (see table).

Association of asthma admission with home proximity to a power plant

Home distance from power plant (miles)	N	% Admitted	OR (95% CI)
≤ 2.5	205	34.2	0.61 (0.42, 0.89)
>2.5 and ≤ 5	1,067	30.3	0.56 (0.43, 0.72)
>5 and ≤ 7.5	481	32.0	0.54 (0.40, 0.71)
>7.5 and ≤ 10	224	38.8	0.65 (0.40, 0.91)
>10	489	48.9	1.00

Adjusted for demographics, $p < 0.001$ for all OR.

Controlling for plant electrical generation and SO_2 or NO_x emissions did not change the results. More children living ≤ 10 miles from power plants that burned municipal waste were admitted (N = 58, OR 1.97; 95% CI 1.10, 3.54; p < 0.05). *Discussion:* The impact of tall power plant stacks that blow air pollutants beyond nearby residences may explain our results. Retrospective data did not allow us to control for exposure to dust, cigarette smoke, pets or other allergens. *Conclusion:* These data do not support power plant emissions as a major cause of pediatric asthma exacerbations in CT.

92. Fatal Inhalation Poisoning after Diluted Paraquat Spray

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Background: Most of fatal paraquat poisoning occur in patients after ingestion. However, inappropriate use of paraquat can result in significant absorption not only through skin, but also by inhalation. Although some reports suggested inhalation paraquat poisoning, there have been no reports of fatal poisoning after paraquat inhalation. *Case Report:* A 68-year-old man sprayed the paraquat in many green houses with doors of their both sides wide open on a day in a strong rattling wind. He diluted 500 ml of the paraquat (24.5%) in 18 L water and sprayed it without wearing a mask all day long. Three hours after the end of spray he started vomiting and on the next day he came to the emergency room, complaining chest discomfort and dyspnea. On admission he was alert and vital signs were not remarkable. His skin was intact, but his tongue was found to be stained with dark green color. Arterial blood gas showed pH 7.26, $PaCO_2$ 26.2 mmHg, PaO_2 97.9 mmHg, HCO_3 11 mmol/L and O_2 saturation 95%. Plasma paraquat concentration at 14 hrs after the end of exposure was 5.6 mg/L. Deferoxamine and ascorbic acid were started with supportive care. His mental state deteriorated 16 hrs after the admission and serum creatinine increased up to 4.91 mg/dl with gross hematuria and oliguria. At 36 hrs after the admission respiratory rate increased to 40/min so that mechanical ventilation was begun. Metabolic acidosis was gradually aggravated 76 hrs after the admission and the blood chemistry revealed total bilirubin 3.9 mg/dl, AST/ALT 549/156 IU/L and BUN/creatinine 65.8/9.9 mg/dl, suggesting multi-organ failure. He died at 86 hrs after the admission. *Case Discussion:* This case indicates that significant amount of paraquat can be absorbed by inhalation while the victim is not aware of the exposure. *Conclusion:* Agricultural workers should be aware that even the diluted paraquat spray may cause fatal inhalation poisoning when they spray paraquat without a mask for several hours in a windy day.

93. From Design to Online in 23.5 Weeks: How we Built the AAPCC New Core Application

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Background: AAPCC developed the Toxic Exposure Surveillance System in 1983. Calls were recorded on paper charts with handwritten notes and machine-readable “bubble” fields. Due to limited bandwidth, only “bubbles” were scanned and sent quarterly to a FoxPro database. In the late 1990s, a closed architecture data system was designed and regional poison centers (RPCs) migrated to computer entry. System function was critical, so in early 2005, with a database of over 39 million human exposures,

the AAPCC board approved development of a New Core Application (NCA). *Methods:* The summer of 2005, requirements gathering began concomitantly with a member taskforce soliciting RPC requirements. Based on the results, an information technology firm assisted with the request for proposal that was let in late summer 2005, followed by a vendor meeting. On 4 August 2005, the AAPCC vendor selection committee selected CIBER, Inc. The NCA build process includes: requirements, design, development, testing (Unit, String, System, Integration, QA), Beta/User Acceptance Testing, user training, and deployment. The NCA Microsoft open architecture allows for quickly adding future components. The NCA interfaces with the four existing RPC clients and Version 1.0 (V1.0) focused on three critical areas: load case data, reports, and toxicosurveillance including a Biosense feed. V1.0 had a 22-week deadline. A 4-person onshore design team worked with 24 developers in Bangalore, India. With an 11.5 hour time difference, development was literally round the clock. The AAPCC NCA steering committee monitored the progress. *Results:* With only one, 1.5 week, extension, V1.0 "goes live" 12 April 2006. V1.1, V1.2, and V1.3, each with added functions, will be complete by 31 October 2006. The NCA has a 24/7 technical issue help desk, another for user issues, and triplicate disaster recovery. *Discussion:* The NCA maintains all current functions with new options for the RPCs that include complete data control, local toxicosurveillance, GIS display, and new reporting capability. *Conclusion:* Using a team concept and 24 hour programming, the AAPCC and CIBER, Inc built the NCA in 23.5 weeks.

94. Evaluation of Poison Center (PC) Consultation on Length of Hospital Stay for Patients with Poisoning

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Background: A recent study suggested a significant reduction in hospital stay of poisoned patients when a poison center was consulted. We sought to reproduce this study with a larger 5-year data set to support or refute this finding and to examine the contribution of covariates such as age, gender, diabetes, cardiovascular disease, and other pre-existing conditions. *Methods:* We compared all cases reported to a statewide regional poison center admitted for hospital care for the years 2000–2004 (n = 14,501) with all hospital admissions E-coded as poisoning in the Uniform Billing data (n = 20,847) maintained by the state department for public health. Probabilistic data linkage was performed to match cases based on age, gender, hospital that provided care, and date of admission (n = 5,542 with a cut-off probability of 0.5). Length of stay, total hospital costs and total laboratory costs were then compared between patients where the PC was consulted (matches) (PC-YES) and patients where PC had not been consulted (PC-NO) using a nonparametric method for factorial design while controlling for age, gender, and pre-existing conditions. *Results:* The mean hospitalized length of stay for PC-YES was 2.5 days compared to 3.3 days for PC-NO. The length of stay was significantly shorter ($p < 0.05$) for those people hospitalized for poisonings and the PC was contacted. Although total hospitalization charges were not significantly different between the two groups, (mean and median charges respectively, $7,287 and $4,460 PC-YES vs. $8,394 and $5,051 PC-NO), total laboratory charges were significantly higher for PC-YES compared to PC-NO (median charges PC-YES $1,205 vs. PC-NO $1,060). *Discussion:* Further analysis will be performed to determine if the PC call was made by the hospital or by the person before being hospitalized to determine if the increased laboratory charges were due to nonspecific initial laboratory testing performed by the hospital before consulting the PC. *Conclusion:* These results suggest that consultation with the PC may reduce the hospitalized length of stay.

95. Adverse Events in Pediatric Exposures to the Cholinesterase Inhibitor Class of Drugs

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Background: Limited overdose and exposure information of the centrally acting cholinesterase inhibitors promoted a retrospective review of reported exposure to the American Association of Poison Control Centers TESS data. *Methods:* Six years of TESS data (2000–2005) was reviewed for all pediatric patients (<18 yrs) involving a cholinesterase inhibitor (AchEI) drug as single ingestant with known outcomes. Data was evaluated for: management site, medical outcome, treatments provided, and clinical effects. *Results:* Of the 876 patients reviewed, 333 met entrance criteria, of which 189 were male. The mean age was 3.5 yrs (S.D. + 4.1). 285 patients were < 6 years. There were 26 severe outcomes (Mod or Maj effect), of these patients 69% were unintentional exposures. The single major effect outcome was a 10 mo old whose symptoms included bradycardia, bronchospasm, and diaphoresis and received intubation, atropine and supplemental oxygen. 187 patients were managed in a health care facility

(HCF), of which 29 were admitted. 142 patients were managed outside of a HCF. Of the 94 (28%) symptomatic patients, the most frequently documented clinical effects were vomiting (n = 52), drowsiness (n = 21), nausea (n = 16), diaphoresis (n = 11), tachycardia (n = 8), bradycardia (n = 6), chest pain (n = 5), hypertension (n = 5), hypotension (n = 5), and tremor (n = 5). The most frequently noted medical treatments were activated charcoal (n = 91), cathartics (n = 24), IV fluids (n = 18), antiemetics (n = 10), and atropine (n = 7). *Discussion:* Pediatric AchEI ingestions were an uncommon event. However, 8% of patients experienced severe outcomes. This suggests caution in the triage of pediatric patients. *Conclusion:* Clinical effects were seen in 28% of patients ingesting a AchEI. Eight percent of the symptomatic patients had severe symptoms. The one patient with a major effect outcome required aggressive medical intervention.

96. Where Did the Calls Go?

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Background: Each year some calls to each poison center (PCC) are routed outside of their region, by misrouting, industry contracts, or other telecommunications issues. We sought to explore reasons behind "misdirection" of calls to one state. *Methods:* State call data were determined from various sources, including AAPCC TESS reports and individual PCC contacts. Reasons for unusual patterns were investigated by consulting local and national telecommunication experts. *Results:* For the past 4 yrs, a consistent trend of total calls originating in our state but handled by PCCs out of state emerged: 2005 (3,092), 2004 (3,025), 2003 (3,018) and 2002 (2,628). This averaged 2.4% of the total annual state call volume. Calls for 2005 were further analyzed. The majority were related to industry contracts (2,159; 69.8%). Another 492 (15.9%) went to adjacent states, likely related to cell phones. At least 280 (9%) went to a state containing a common VOIP nexus. Two distant states were checked, one previously utilizing 800-POISON1 and one not, to see if this number had potential interference. Both had the same number of non-industry calls, 22. There were two surprises. One large local "411" service was still providing callers with the 800-POISON1 number. We also found that any user of "411" who selects automatic dial of 800–222–1222 number after using directory assistance, will be connected to the state where the last user of "411" for ANY reason originated the call from. This is likely the reason for the low number of misrouted calls from remote states. *Discussion:* Exploring the reason for "lost" calls to other PCCs can be a necessary exercise related to state or local funding. Efforts can take many paths. *Conclusion:* Our data show that most "misdirected calls" are likely related to industry contracting. Cell phone usage has a large impact in states adjacent to the PCC, but the call migration is 2-way. VOIP is a growing telecommunications medium that has the potential to have great impact. Misrouting through directory assistance can be avoided through educating the public to avoid automatic dialing via "411" services.

97. Efficacy and Safety of Oral and Intravenous (IV) Acetylcysteine (NAC): A Meta-Analysis

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Background: NAC prevents liver injury resulting from acute acetaminophen (APAP) overdose. It is unclear if there is a difference in efficacy or safety between the oral and IV routes. *Methods:* MedLine and EMBASE (1966–2004) were searched for human exposures to NAC for APAP poisoning (English only). Reports were categorized as prospective or retrospective. Citations that did not contain patient (pt) information were excluded. Efficacy was evaluated for route (oral, IV) and ingestion to NAC treatment interval (10 h, >10 h) using the rate of hepatotoxicity (HPTX) (peak ALT or AST >1000 IU/L). *Results:* 613 publications were reviewed: 27 prospective, 148 retrospective and 438 excluded. Efficacy and safety analyses included 3024 and 7512 pts, respectively. Prospective: The number of adverse events (AEs)/ pt in the oral and IV groups was 0.31 and 0.19, respectively. AEs, including nausea/vomiting and anaphylactoid reactions were reported in both groups. Those treated ≤10 h had 0.11 AEs/pt and those treated >10 h had 0.31 AEs/pt. Rate of HPTX was 21% for IV and 22% for oral ($p > 0.05$). Pts treated >10 h of ingestion were 5 times as likely to develop HPTX ($p < 0.001$) than those treated ≤10 h. Retrospective: AEs/pt was 0.35 (IV) and 0.56 (oral). The rate for early treatment group was 0.87 AEs/pt and late group was 1.62. HPTX developed in 20% of IV and 26% of oral cases ($p > 0.05$). Incidence of HPTX in pts treated within and >10 h was 7% and 35%, respectively ($p < 0.001$). As in prospective literature, those treated late were 5 times as likely to develop HPTX ($p < 0.001$) than those treated ≤10 h. *Discussion:* Although the safety profile of oral and IV NAC appear similar, AEs associated with NAC therapy are not well documented in the

retrospective or prospective literature. The rate of HPTX was similar for route of therapy but a significantly higher risk was discovered for pts treated >10 h post ingestion. *Conclusion:* Pts treated >10 h of ingestion experienced 2–3 times more AEs than those treated earlier. IV NAC is not without risk of nausea/vomiting and oral NAC is not without risk of anaphylactoid reaction. The ingestion to treatment interval, not the route of NAC, is a valuable indicator of risk for HPTX following acute APAP overdose.

98. Toxicological Deaths Reported to a Poison Control Center in Comparison to a Medical Examiner's Office over a Two-Year Period

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Background: Death from poisoning is common, yet predicting exact numbers is difficult. We investigated deaths thought to be related to poisonings reported to our poison control center (PCC) over a 2-year period and reviewed Medical Examiner's Office (ME) reports. *Methods:* PCC and ME charts from 1/2004–12/2005 were reviewed for an outcome of death thought to be related to poisoning. Charts were extracted by trained reviewers who were blinded to the study purpose and they completed a structured data collection sheet. Reviewers were given a concise training session. A total of 222,103 PCC and 2 years of ME reports were reviewed for an outcome of death. PCC data was collected was age, sex, alleged poisons, route, reason for exposure and likelihood of death causation. Chart queries were done by CrystalReports™. Data was analyzed using Excel™ and STATA™ software. *Results:* A total of 56 death reports were compiled at the PCC and 4,917 ME reports thought to be related to poisoning. With regard to the PCC data, the mean age was 39.8 (2–71) yrs. 24 (43%) were male. The most common substance reported were opioids (8), sedatives (5), antipsychotics (5), antidepressants (4), amphetamine (5) and acetaminophen (10). The number of those thought to be undoubtedly responsible was 16 [28.6%], probably responsible was 28 (51%), probably not responsible was 2 (3.6%), not likely responsible was 6 (11%), and clearly not responsible was 3 (5%). A post-mortem examination was preformed on only one patient according to PCC charts. During the same time period the ME reported approximately 4,917 cases where drugs were thought to be associated with death. After a review of both databases at least 17 matching cases were found. *Discussion:* Our poison control center grossly underestimated the total number of toxicological associated deaths in our community. Reporting agencies such as the ME and the PCC have discrepancies. *Conclusion:* Any attempts to summarize data from any individual agency should be corroborated with another reporting agency for completeness.

99. Improving Specificity and Cost-Effectiveness of Toxicology Blood Tests in Patients Admitted for Poisoning

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Background: Poisonings made up 0.2% of emergency workload, commonly from acetaminophen (33%) and sedatives-hypnotics (30%). High performance liquid chromatography or gas chromatography, mass spectrometry techniques, collectively referred to as comprehensive toxicology analyses (CTA), were used routinely and cost about $700,000 per year, despite limited usefulness. It took 1–26 days for the CTA results and was available before disposition in 29.1%. There lacked an awareness of the use of focused toxicology tests despite better turnaround times. We aimed to limit the use of CTA unless indicated and promote focused blood toxicology tests. *Methods:* Clinicians identified the ill defined medico-legal implications of not testing, lack of testing guidelines and that no option than a CTA was allowed in the current test form, drove the current practice. Medico-legal obligations of toxicology testing were clarified with the Singapore Police Force and hospital authority. The latter approved the proposed indications for CTA, i.e., certifying brain death, unexplained coma, physical signs incongruent with the poison, confusing ongoing psychiatric symptoms, in homicides and police requests. A new Toxicology blood test form was designed favoring options for specific agent testing with clinical decision guidelines to help support the choice of a reasonable test. The CTA remained available, but driven by indications. A take and hold policy was coined, enabling the laboratory to hold specimens from immediate testing for selected indications. Talks on the initial management of the poisoned patient were given; the context of blood toxicology tests was placed in perspective. *Results:* Monthly CTA costs fell from $41,380 to $23,544 after intervention. There was no change in the number of toxicology inpatients. *Discussion:* Limitations: the clinical decision guidelines in the form is primitive and not validated, it is however an effective reminder. Education is pivotal, the lack of air-time in a busy hospital, with 500 doctors and high turnover are key hurdles. *Conclusion:* The turnaround time and expense does not justify the routine use of CTA. Guided by instructions in the request form, the new process of toxicology blood testing resulted in cost-savings.

100. Evaluation of Adult Centrally-Acting Cholinesterase Inhibitor Exposures as Reported to US Poison Centers

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Background: Currently, there are four centrally-acting cholinesterase inhibitors (AChEI) available in the US: tacrine, galantamine, rivastigmine, and donepezil. Documented clinical experience involving exposure to these agents is limited. The lack of information makes decisions involving AChEI exposure difficult. *Methods:* A retrospective review of the AAPCC TESS data of acute and acute-on-chronic exposures involving only an AChEI in patients ≥19 yrs with documented medical outcome from 2000–2005 was performed. *Results:* There were 1026 records that met inclusion criteria. Patients aged 71–90 yrs made up 75.1% of reports. Females made up 68.7% of patients. Moderate (197) and major outcomes (20) accounted for 21.2% of exposures. There were no deaths. 18.8% of all patients were admitted to the hospital of these patients 41.5% were admitted to a critical care unit. 61.7% of all exposures were attributed to unintentional therapeutic error.

Occurrence of documented clinical effects

Clinical Effect	n	%
Vomiting	347	33.8
Nausea	286	27.9
Diarrhea	126	12.3
Dizzy/vertigo	102	9.9
Drowsy/lethargy	79	7.7
Diaphoresis	76	7.4
Tremor	53	5.2
Bradycardia	51	5
Confusion	39	3.8
Abdominal pain	30	2.9
Hypertension	29	2.8
Muscle weakness	23	2.2

Other major effects: tachycardia, coma, seizure, cyanosis, conduction disturbance, fasciculation, and hallucination.
48.6% of reports documented performed therapies. Therapies included IV fluid (111), antiemetic (48), atropine (17), benzodiazepine (15), oxygen (14), antihypertensive (4), pralidoxime (4), intubation (3), antihistamine (2), antiarrhythmic (1), anticonvulsant (1), and pacemaker (1). *Discussion:* In contrast to normal poison center distribution of cases a remarkable number of elderly patients and therapeutic errors accounted for exposures. This may highlight an area for proactive intervention/education that could reduce exposures and subsequent hospital referral or admission. *Conclusion:* The majority of patients experienced no or mild effect, however significant or life threatening effects were observed in a small group of patients. An appreciable number of patients were admitted to the hospital.

101. Minimal Local Availability of DMPS: A Cause of Concern in Cases of Severe Arsenic Poisoning

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Background: DPMS (dimercaptopropanesulfonate) is an intravenous chelator which can be used in severe arsenic poisoning when hypotension limits the effectiveness of intramuscular BAL and oral DMSA. Intravenous DMPS is available from one pharmacy in California. Arsenic is widely available and recently there have been several nationally publicized cases of severe arsenic poisoning. Our poison center was consulted for a patient who became symptomatic soon after drinking a 1 fluid ounce bottle of Terro Ant Killer (2.27% sodium arsenate); initial spot urine for arsenic was 25,542 mcg/L. Concerned

that severe toxicity might develop, pharmacies within our state were called to determine the availability of DMPS. *Methods:* The following pharmacies in our state were asked if the had the capability and the willingness to compound DMPS: 1) all compounding pharmacies, 2) the pharmacies in the 11 largest hospitals, and 3) several randomly-selected large commercial pharmacies in large cities. *Results:* Twenty-six commercial and eleven hospital pharmacies were contacted. Only two of the compounding pharmacies are equipped and willing to compound DMPS; neither pharmacy has DMPS immediately available. Reasons preventing pharmacies from being able to compound DMPS are: 1) the inability to obtain DMPS from an FDA-approved chemical company, 2) no protocol in place for compounding DMPS, 3) unfamiliarity with the drug, and 4) the need for an IRB-approved Investigational New Drug (IND) protocol in the hospital. *Discussion:* This patient was successfully treated with BAL and DMPS; the first 24-hour urine had an arsenic level of 7,866.5 mcg/L. While unlikely to be needed, only two pharmacies within the state may be able to provide DMPS. Currently neither of these pharmacies have the product in stock nor protocols for compounding the drug. A state police courrier would be able to transport DMPS from a centrally located pharmacy to any hospital in the state within 5 hours. This would be significantly faster than next-day overnight service from California. *Conclusion:* In the event of serious arsenic poisoning, relying on an out-of-state pharmacy for DMPS would cause a significant delay in the patient's treatment.

102. Pattern of Orlistat Exposures in Children less than Six Years Old

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Background: Orlistat is or may become the first weight-loss drug approved by the United States Food and Drug Administration for over-the-counter sales. However, information on exposures among young children is limited. *Methods:* The pattern of all exposures to orlistat alone among patients ≤5 years old reported to six poison control centers during 1999–2005 was identified with respect to various factors. *Results:* There were 107 cases. The average age was 21.4 months. There were 55 males, 51 females, and one unknown. The dose was identified for 76 cases. The mean dose was 155 mg. All of the exposures were unintentional. The management site was on site for 94 (87.9%), already at a health care facility for 8 (7.5%), and referred to a health care facility for 5 (4.7%) patients. Of the 45 patients with a known medical outcome, the outcome was no effect for 41 (91.1%) and minor effect for 4 (8.9%) patients. Of the 92 cases reported during 2000–2005, the listed adverse clinical effects were diarrhea (n = 4) and vomiting (n = 1), and the listed treatments were decontamination by dilution (n = 62), food (n = 8), activated charcoal (n = 5), other emetic (n = 2), cathartic (n = 1), and ipecac (n = 1). *Conclusion:* Orlistat exposures among young children encountered by poison control centers can usually be managed on site through decontamination and have favorable outcomes with few adverse clinical effects, mainly gastrointestinal in nature.

103. Impact of Hurricane Katrina on Poison Control Center Call Volume and Type

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Background: To determine the impact of a major natural disaster on call volume to the state's Poison Control Center and the types of exposures that occurred after this disaster. *Methods:* Call volume and types of calls to the Mississippi Poison Control Center (MPCC) were obtained by querying the center's database. Types of calls investigated were those that seemed to be of increased frequency to PCC personnel and those exposures felt to be possibly situationally related. The average monthly frequency of each type of call was compared to the frequency for the previous eight months and for the same time period of the previous year. *Results:* The monthly call volume to the MPCC decreased 5% in the 3 months following Hurricane Katrina. The two coastal counties that suffered the worst damage (Hancock and Harrison) showed decreases in call volumes of 65% and 23%. There was a 5% increase in calls for pill identification and no change in the overall percentage of exposure or information calls. Exposures to gasoline were 3.5 times more frequent in the 3 months following the hurricane (CI 2.6–4.7), primarily due to siphoning activities. Lamp oil exposures occurred 4 times more frequently than during the previous 8 months (CI 1.6–9.9). There was no increase in the total number of exposures for children under 6 years old or in the number of drug exposures for children. There was no change in the frequency of carbon monoxide exposures, exposures to household cleaning agents, food poisoning or snakebites. For the three months following the

hurricane, drug-related suicide events occurred less frequently compared to the rest of the year, 0.85 (CI 0.75–0.96). *Discussion:* The toxic exposures that increased following the hurricane were related to the lack of typical energy sources, gasoline and electricity. While the Poison Center did handle calls on the safety of drinking water and food, the overall number of information calls did not increase. *Conclusion:* Following Hurricane Katrina there was a slight decrease in calls to the state's Poison Control Center. There was an increase in gasoline and lamp oil exposures, a decrease in suicidal drug exposures and no change in pediatric exposures.

104. Utilizing Poison Center Data to Provide Hurricane Surveillance – The Florida Experience

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Background: The Florida Poison Information Center Network (FPICN) and the Florida Department of Health (FLDOH) cooperated on expanding FPICN's web-based data access tools. Authenticated users from the FLDOH were able to initiate a secure encrypted session from any standard web browser, query the statewide database in real time, display case level information and use GIS tools to display data. *Case Report:* The FLDOH retrospectively reviewed FPICN data captured during the 2004 hurricane season. FLDOH began prospective daily monitoring of the 2005 hurricane season using categories of exposures suggesting possible health impacts by analyzing real-time poison center data. Analyses of these data were used to detect and prevent additional health hazards following hurricanes by initiating public health messages to communities affected by the hurricane. *Case Discussion:* FPICN/FLDOH received eight case reports of carbon monoxide (CO) poisonings within 18 hours after the eye of Hurricane Dennis made landfall in 2005. In the two days after Hurricane Katrina hit south Florida, there were 28 CO exposures documented with FPICN. Following Hurricane Wilma's (October 2005) prolonged widespread power outages, an increase in hydrocarbon exposures was detected. This information was used to impact the FLDOH's media information messages about how to prevent CO poisoning due to gas-powered electrical generators. Media messages also conveyed how to disinfect water for consumption and how to prevent foodborne illness by practicing safe food handling and discarding spoiled food. *Conclusion:* By utilizing poison center data as a real-time pre-existing sentinel public health surveillance system, the FLDOH had an increased ability to detect health hazards created in the period surrounding hurricanes and to help prevent continued morbidity and mortality related to these hazards. Evaluation of local and national poison control data surveillance used to detect outbreaks of diseases, injuries, or poisonings will need to be an ongoing process to substantiate collection methods, analytical methods, and the decision-making process required to interpret this unique and valuable data.

105. Hurricane Katrina-Related Calls to the Texas Poison Center Network

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Background: On August 29, 2005, Hurricane Katrina made landfall along the Central Gulf Coast effectively displacing hundreds of thousands of citizens from Louisiana to Texas. Evacuees have since utilized services of the Texas Poison Center Network (TPCN). On September 2, 2005, the TPCN began tracking calls specifically related to the Hurricane. The objective of this study was to determine if calls coded as relating to the Hurricane differed from other TPCN calls. *Methods:* Call characteristics for two groups were analyzed. Group 1 consisted of calls from 9/2/05 through 12/31/05 that were coded as relating to Hurricane Katrina. Group 2 consisted of calls from the same time period that were not documented as being related to the Hurricane. Rate ratios (RR) and 95% confidence intervals (CI) were calculated. *Results:* In total, 211 charts were marked as relating to the Hurricane. These consisted of 87 human exposures, 79 drug identification (ID) requests, 44 various information requests, and 1 animal exposure. These calls originated in Texas (191), Louisiana (19), and Mississippi (1). Compared to non-Hurricane calls, calls related to the Hurricane were significantly more likely to be environmental information requests (RR 4.89; CI 2.34–9.03); suspected suicide reports (RR 1.87; CI 1.02–3.15); or drug ID requests (RR 1.54; CI 1.22–1.92). *Discussion:* Disasters of a magnitude similar to that of Hurricane Katrina may create

a vast array of problems and questions among the victims. Poison centers provide free access to vital services that are needed by disaster victims. Poison centers have a nationwide 24/7 system that is capable of collecting disaster-related data that may assist various agencies. *Conclusion:* Calls related to Hurricane Katrina did differ from other calls to the TPCN during the same time period. These calls were more likely to be drug ID requests or environmental questions. Exposure calls were more likely to be suspected suicide reports which may indicate that victims of the Hurricane were at greater risk for suicide.

106. Long-Term Outcome Following Rattlesnake Bite: A Comparison of Wyeth™ Versus CroFab™ Antivenin

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Background: Long-term outcome following rattlesnake bite (RSB) is poorly described. During a rattlesnake antivenin shortage we compared outcomes in groups with different types of antivenin. *Methods:* A prospective, poison control center (PC) based study on all patients with RSB during 3/02–10/05 was done. Inclusion was RSB referred to our PC. Exclusion criteria were a dry bite. Demographic data was obtained (age, site of envenomation, extent of swelling, serial laboratory data (platelets, fibrinogen and prothrombin time), type of treatment received (Wyeth ™ vs. CroFab™ Antivenin vs. none) and length of stay (LOS). A Snakebite Severity Score (SSS) was used. A SSS of 1–2 correlates with mild envenomation and 6–8 is considered severe. The main outcomes were subjective days to return to full grip strength (upper extremity bites) and ability to weight bear (lower extremity bites). Data was entered into EXCEL™ and statistics were calculating using STATA™ software. *Results:* 114 patients were envenomated during the study period with 3 patients were excluded (dry bites). Of the 114 patients, mean age 33.9 [range 3–79] years; 96 received CroFab™ (SSS = 5–8), 18 received Wyeth™ (SSS = 5–8), and 11 received no antivenin (grades 1–3). Mean time to return of full grip strength or full weight bearing was 30 (SD 25.6) days in the CroFab™ group (N = 78; 18 lost to follow-up), 21 (SD 14.1) days in the Wyeth™ group (N = 18; two lost to follow-up) and 22 days (N = 9; 2 lost to follow-up) in the no treatment group (p = .24). The mean length of stay in the Crofab™ was 4 (SD 2.4) days versus 3 in the Wyeth™ group (p = .17). 66% of patients in the Wyeth™ group developed serum sickness and none in the Crofab™ group. *Discussion:* Limitations include small total patients, the number lost to follow-up and the lack of true randomization. *Conclusion:* The time for RSB patients to return to a functional baseline is ~1 month. No statistical differences occurred in outcome with regard to length of stay or return to function although a trend favored the Wyeth™ group at a cost of higher incidence of serum sickness.

107. Surgical Management of Crotaline Snakebite in Patients Treated with Antivenom (AV)

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Background: Management of Crotaline snakebite includes supportive care and administration of AV, if indicated. Surgical management of snakebite is sometimes practiced, though these procedures may rarely be required and some may actually exacerbate tissue injury. This multi-center study identified rates of surgical procedures in patients treated with AV for Crotaline snakebite. *Methods:* Seventeen hospitals throughout the U.S. participated. Exposure and treatment data were captured from medical records of patients treated with Crotalidae Polyvalent Immune Fab (Ovine) and/or Antivenin (Crotalidae) Polyvalent during 2002–04. Snake type (RS = rattlesnake, CH = copperhead, CM = cottonmouth) was collected when clear description or positive identification was documented. Rates for each procedure were calculated. *Results:* 265 records were abstracted (101 (38%) RS, 53 (20%) CH, 7 (3%) CM, and 104 (39%) unknown). Surgical procedures were performed in 28 (11%) patients: 17 received incision and/or suction, 7 received fasciotomy (1 received incision and/or suction and fasciotomy), and excision of necrotic tissue was performed in 4 patients. All surgical procedures were performed on RS (n = 16) or unknown snakebite patients, with the exception of 2 CH patients that received incision and/or suction. Of the 7 patients receiving fasciotomy, elevated compartmental pressure (CP) and other complications warranting the procedure were documented for 6. The seventh patient had no evidence of elevated CP prior to fasciotomy. *Discussion:* Fasciotomy, incision and/or suction, or excision was performed in over 10% of Crotaline snakebite patients treated with AV. Incision and/or suction was most common (7%), though many procedures may not have

been performed by a clinician. Only 2% of patients had elevated CP and received fasciotomy, and 2% were treated with excision. We found that fasciotomy performed in absence of elevated CP and other clinical indications, though rare (<1%), is still practiced. *Conclusion:* Incision and/or suction is still used to treat Crotaline snakebite. Fasciotomy appears to be warranted in very few patients.

108. Antivenom Therapy of Crotaline Snakebites: Did the Poison Control Center Provide an Effective Guideline?

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Background: Crotaline snakebites (*Protobothrops mucrosquamatus* and *Trimeresurus stejnegeri*) are common medical emergencies in Taiwan. The specific antivenom to such snakebites is equine-derived bivalent $F(ab')_2$. We investigated the differences in clinical outcomes between patients who received antivenom dose recommended by the poison control center (PCC, medical group) and patients who received different therapeutic regimen of antivenom (surgical group) in a medical center. *Methods:* We conducted a retrospective cohort study by reviewing medical records of patients with crotaline snakebite between 1991 and 2005. We collected information on demographic variables, treatment, adverse effects of antivenom, and local/ systemic complications. *Results:* One hundred and seventy-nine patients (89 surgical, 90 medical) were eligible for the study. There was no inter-group difference in patients' demographic data. The average dose of antivenom and the probability of antibiotic use were both significantly higher in the surgical group as compared to the medical group (5.9 ± 4.2 vials versus 2.7 ± 1.6 vials; 93% versus 60%). Multiple logistic regression that was adjusted for age, gender, calendar year of envenoming, and antibiotic use revealed no difference in the occurrence of life-thereatening outcomes, including severe rhabdomyolysis, internal bleeding, and acute renal failure between the two groups. Further, there was no inter-group difference in the development of antivenom adverse reactions, local and systemic complications, and digit amputation. *Discussion:* Some important determinants of the clinical outcomes were incompletely documented or unmeasured. The lack of information on these variables, however, was unlikely to confound the effect estimates because the baseline characteristics were similar between the two groups. The use of different groups of patients from the same hospital further minimized the potential confounding effect of quality of nursing care. *Conclusion:* Lower dose of antivenom recommended by the PCC is as effective and safe as higher dose used in the surgical group for the treatment of crotaline snakebites.

109. A Survey of Venomous Bites and Stings in North American Zoos and Aquaria

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Background: Bites and stings from venomous animals pose a risk to persons who work with these creatures regularly, such as employees in zoos and aquaria. We conducted an IRB-approved survey of accredited North American zoos and aquaria to characterize their experiences with envenoming. *Methods:* Surveys were mailed to all 216 zoos/aquaria which are accredited by the American Zoological Association. Curators were asked to complete the surveys anonymously. The questions addressed the number and types of envenomation, outcome, sites of treatment, on-site antivenom storage, and information sources. *Results:* One hundred ten responses were received (51% response rate). Nineteen out of the 20 institutions which house venomous animals have had at least one incidence involving a venomous creature in the last 10 years. Twenty-two species were listed as involved in incidents. This list of creatures included stingrays, gila monster/Mexican beaded lizards, lionfish, crotaline snakes, honeybee, spitting cobra, sea nettle, eyelash viper, and scorpionfish. Management sites included: facility-only (5); emergency department visit (9), and hospitalization (5). There was one fasciotomy done, after a *Crotalus horridus* bite. Twenty-eight percent of the responding facilities reported that they would report or coordinate care with a regional poison control center (PCC). Twenty-seven percent of institutions reported that they stock antivenoms on premises. Primary sources of envenoming information included regional PCCs (11%); the AZA antivenom index (11%), internal protocols, local hospitals, or the internet. *Discussion:* Our survey shows the diversity of species involved in envenomation episodes at zoos and aquaria. Most cases resulted in no long-term disability. There was no common source of medical information used by the majority of curators. This survey may underestimate the true prevalence of

exotic envenomations because private collectors and pet stores were not queried. *Conclusion:* Poison control centers may be asked to help provide information in the case of envenomations from exotic animals at zoos and aquaria. Toxicologists should be aware of the venomous creatures and antivenom resources in their regions.

110. Rising Utilization of Poison Control Center Services for Therapeutic Errors and Adverse Drug Reactions

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Background: Therapeutic errors (TE) and adverse drug reactions (ADR) are common reasons for contacting poison control centers (PCC). We examined 10 years of Toxic Exposure Surveillance System (TESS) data to determine if there was a trend in the utilization of PCC services for TEs and ADRs. *Methods:* TESS reports for the 10-year period 1995–2004 were reviewed for reason for exposure. Statistics regarding TEs and ADRs were recorded from the table "Reason for Human Exposure Cases" in the annual reports. *Results:* For the 10-year study period, the percentage of calls to regional PCCs regarding TEs has been steadily rising (See table). In 1995, TEs comprised 5.4% of exposure calls to PCCs, which rose to 9.1% in 2004. For this 10-year period, the number of calls regarding TEs more than doubled (102.3%) from 110,038 to 222,644, while the overall human exposure case volume for the same time period only increased 20.5%. For the same study period, the percentage of calls involving ADRs to PCCs nationwide remained in the range of 1.4–1.8%. *Discussion:* These observations reflect an increase in utilization of PCC services as a resource for these types of unintentional exposures. *Conclusion:* Nearly 1 out of 9 (10.9%) calls to regional PCCs involve TEs and ADRs. AAPCC and individual PCCs should: 1) urge clinicians to enhance written and verbal medication instructions to patients; 2) promote PCCs as resources for assistance for these exposures; 3) investigate the factors contributing to the rising number of calls to PCCs regarding TEs and ADRs; and 4) further utilize TESS data to characterize and track these unintentional poisonings.

10-year TESS data of human exposure cases, TEs and ADRs

Year	# of Exposures	# of TEs	% of TEs	# of ADRs	% of ADRs
1995	2,023,089	110,038	5.4	28,296	1.4
1996	2,155,952	123,095	5.7	32,866	1.5
1997	2,192,088	131,872	6.0	31,896	1.5
1998	2,241,082	144,328	6.4	31,601	1.4
1999	2,201,156	154,422	7.0	32,742	1.5
2000	2,168,248	152,101	7.0	31,245	1.5
2001	2,267,979	167,014	7.4	35,646	1.6
2002	2,380,028	193,194	8.1	41,215	1.7
2003	2,395,582	215,052	9.0	41,335	1.7
2004	2,438,644	222,644	9.1	42,812	1.8

111. Adverse Reactions to Intravenous N-Acetylcysteine in the Treatment of Acetaminophen Poisoning

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Background: Acetaminophen is the most common drug taken in overdose in many countries. Intravenous *N*-acetylcysteine (IV NAC) is an effective antidote for acetaminophen poisoning if administered within 10 hrs of ingestion. However, adverse reactions (AR) to IV NAC occur in up to 45% of cases. The aim of this study was to characterise the AR rate and explore potential risk factors for these reactions. *Methods:* Data was collected prospectively on poisoned patients presenting to an inner city ED from May 2005 to March 2006 using an electronic clinical toxicology database (Microsoft Access®). *Results:* Acetaminophen was ingested in 306 of 998 acute poisoning presentations. IV NAC was given in 108 cases (79 individual patients) with an observed AR rate of 13% (14 cases: 5 male, 9 female). AR included hypotension (1), throat swelling (1), facial swelling (1),

wheeze (3), nausea / vomiting (5), rash or flushing (7). Three cases developed significant AR (cardiorespiratory dysfunction),11 cases were classified as mild reactions. All cases recovered with cessation of NAC infusion (6 received chlorpheniramine). AR occured during the 15 min infusion in 8 (58%), 4 hr in 4 (28%) and 16 hr in 2 (14%). All significant AR occured during the 15 min infusion. 2 of the 3 significant AR occured in patients with undetectable plasma acetaminophen concentrations. Average initial plasma acetaminophen concentration: AR group 124 μg/ml, non-AR group 139 μg/ml ($p = 0.36$). Positive history of asthma in one (7%) AR group, 6 (9%) non-AR group. Two patients with toxic plasma acetaminophen concentrations developed AR to NAC despite having received NAC in the previous 12 months with no AR. *Discussion:* The AR rate of 13% in this study is at the lower end of the range reported in previous series (6–45%). This study confirmed that most AR occur during the first 15 minutes and most are mild. *Conclusion:* Previous reports have suggested AR to IV NAC may be more common in patients with asthma and those with a low plasma acetaminophen concentration. There were too few asthmatics in this study to determine if asthma is a risk factor for IV NAC AR. This study does not support a link between plasma acetaminophen concentration and AR ratio.

112. Pediatric Fatality Secondary to 'EDTA' Chelation Therapy for Autism

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Background: Chelation therapy has emerged as a popular treatment modality to remove heavy metals, such as mercury, that are thought to cause autism. This controversial treatment raises concerns about the potential confusion of administering edetate disodium to children instead of edetate calcium disodium. To the undiscerning, there is no apparent difference between the edetate or EDTA products. We report a fatality that occurred as a consequence of chelation therapy for autism when the incorrect form of EDTA was administered. *Case Report:* A 5-year-old autistic male was undergoing chelation therapy in a physician's office. While receiving his third treatment he went into cardiac arrest. Resuscitation was initiated in the physician's office and continued enroute to the emergency department. On arrival in the emergency department the poison center was consulted for information on "EDTA." It was unknown at that time which "EDTA" product was administered. The pediatric ACLS protocol was followed including the administration of a standard IV calcium dose, but resuscitation efforts were unsuccessful. Blood drawn during resuscitation revealed a calcium level of 6.8 mg/dl following the IV calcium bolus. It was not determined until after the child's death that he had been given edetate disodium rather than edetate calcium disodium, causing profound hypocalcemia and triggering the cardiac events that led to his death. *Case Discussion:* In 1991, the CDC recommended using only edetate calcium disodium, not edetate disodium to children because edetate disodium may induce tetany and possible hypocalcemia as illustrated in this case. *Conclusion:* While the use of chelation therapy in autistic children has not been validated, there is increasing pressure on physicians to treat pediatric autism with this modality. Therefore, it is imperative that those who chose to utilize this treatment understand that there are two different EDTA products and the attendant consequences associated with improper use.

113. Fatal Intrathecal Morphine Administration with CSF Drug Levels

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Background: Accidental intrathecal morphine injection is a rare but potentially deadly event. *Case Report:* An obese 59-year-old female, with a 20-year history of quadrapelegia, had an intrathecal morphine pump placed 10 years prior to her death. The pump had two ports: one going into the pump's reservoir and the other went directly into the patient's spinal canal. During a routine refilling of the pump's reservoir, 250 mg of morphine was inadvertently instilled directly into the CSF. Within minutes, the patient experienced headache, itchy eyes, leg throbbing, generalized paresthesias and a feeling of doom. The medication error was realized and the patient was taken to the ER. Her blood pressure rose to 200/145 and she was given labetolol. At 1-hour post-injection, the patient began having seizures which were treated with benzodiazepines and fosphenytoin. Two hours post-injection, she had a bradycardic/asystolic arrest from which she was resuscitated. Afterwards, she had persistent hypotension; norepinephrine was rapidly titrated up to 50 mcg/min. She had received 6 mg of naloxone up to that point and a naloxone infusion was started at 1 mg/hr. 50 mL of CSF was removed via the pump's side port. The hypotension remained refractory to all treatment and eighteen hours after the morphine injection, she died. At autopsy, analysis of the pump revealed it was working properly without evidence of malfunction. Autopsy morphine levels were 3.2 mg/mL in the reservoir and 0.4

mg/mL in the CSF. *Case Discussion:* This case illustrates the severe adrenergic surge and refractory hypotension that can occur in an intrathecal morphine overdoses. The complete pathophysiology has not been elucidated, and the use of intrathecal narcotic antagonists, while an attractive theoretical treatment, has not been explored in humans. *Conclusion:* Poison control centers need to have knowledge of, and treatment for, the adrenergic surge and refractory hypotension that results from large-dose intrathecal morphine injections.

114. Cholestatic Hepatitis from the OTC Steroid Supplement Anabolic Xtreme

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Background: The use of anabolic steroids is a common method for improving physical performance and muscle growth. Their use is not without risk. The most frequently used C-17 alkylated steroids are known to affect liver function. We report a series of cases of cholestatic jaundice with the use of an over-the-counter (OTC) product containing methasterone. *Case Report:* Case 1: A 23-year-old man complained of fatigue, nausea, yellow stools and painless jaundice for one month. Laboratory evaluation revealed a total bilirubin of 36 mg/dl with a direct fraction of 28 mg/dl, AST 70 IU/L, ALT 50 IU/L, and alk. phos. 164 IU/L. Liver biopsy showed marked cholestasis, nonspecific portal and lobular inflammatory changes, and normal vasculature. Further history revealed that the patient had been taking an over the counter product called Anabolic Xtreme^{TM} for 3 months, consuming 90 pills the week before his symptoms began. The normal dose was 2 pills per day. At 21 days, he was asymptomatic with a bilirubin of 6.2. Case 2: A 32-year-old man presented with 3 months of vomiting, fatigue, weight loss and jaundice. His medical history was significant for a benign pituitary neoplasm. Laboratory analysis revealed a total bilirubin of 31 mg/dl, AST 110 IU/L, ALT 110 IU/L, and alk. phos. 277 IU/L. His liver biopsy showed chronic cholestasis with normal vasculature. History revealed that he had started taking a supplement called Anabolic Xtreme^{TM} prior to the onset of his symptoms. The exact quantity was unknown, but he stated he only took it for one day. Both patients ingested no other medications, OTC or herbal supplements. Both patients had unremarkable abdominal CT scans and ultrasounds. Viral panels (HIV, EBV, CMV, hepatitis A, B, C), histoplasmosis, coccidioides, alpha-1-antitrypsin, iron studies, ceruloplasmin, UDS (GC/MS), and autoimmune studies were negative in both patients. *Case Discussion:* Among anabolic steroids serious adverse effects are hepatotoxicity, cholestatic jaundice and hepatic tumors. Both patients in this series were using an over-the-counter product called Anabolic Xtreme^{TM}, which contains methasterone, a C-17 alkylated steroid. *Conclusion:* Methasterone was the likely cause of the cholestatic jaundice in these cases.

115. Cardiotoxicity and Neurotoxicity from Transdermal Lidocaine Absorption

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Background: Epilation by selective laser thermolysis is a common dermatologic procedure used to remove hair. Over 1.4 million phototricholysis procedures were performed in 2004 for cosmetic effects alone. Pain is a common side effect of laser hair removal that is caused by the short burst of heat energy created during the procedure itself and the resultant inflammation due to local tissue damage. One method of pain management used is the application of a topical lidocaine anesthetic. *Case Report:* A 55-year-old physician presented to the emergency department 4 hours after a reported dermal application of 600 mL of 30% topical lidocaine gel. The product was applied to the face, neck, and abdomen, after laser autotreatment for cosmetic hair removal. He presented to the emergency department with complaints of lightheadedness, tremor, and dysphoria. On physical exam he had a blood pressure of 122/59 mmHg, heart rate of 92 bpm, respiratory rate of 18/min, and his temperature was 36°C. The patient was tremulous, but was alert and oriented to person, place, situation and time. No seizures were reported. Upon feeling ill, he washed only his face at his office, but was promptly and thoroughly decontaminated with soap and water in the ED. His initial serum lidocaine concentration was 5.1 μg/mL at 6 hours and 4.5 μg/mL at 8 hours after treatment. His ECG showed a prolonged QRS interval duration at 108 msec. After 6.5 hours of monitoring and observation, the patient was discharged in stable condition. *Case Discussion:* Our patient exhibited both cardiac and neurologic signs and symptoms that are consistent with acute lidocaine toxicity after prolonged absorption of a large transdermal dose across a body surface area of about 15%. A widened pulse pressure and prolonged QRS interval suggest cardiac toxicity that may be due to lidocaine-induced sodium channel blockade. *Conclusion:* With the growing popularity and demand for dermatologic laser procedures, clinicians should be aware of the significant systemic toxicity, both cardiac and neurologic, that may result from dermal absorption of topical lidocaine that is commonly used to treat associated post procedural pain.

116. Gadolinium-DTPA MRI Leads to Iron Mobilization in the Tranfusion-Dependent Renal Patient

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Background: Magnetic resonance imaging (MRI) with the contrast agent Gadolinium-DTPA (Gd-DTPA) is thought to be safe in patients with renal dysfunction. *Case Report:* A 66-year-old female with a history of chronic renal failure presented to the hospital due to nausea/vomiting. She was hemodynamically stable, and her physical exam and initial work-up were not revealing. Abdominal CT revealed a questionable pelvic mass so she underwent MRI with Gd-DTPA contrast on hospital day (HD) #3; results revealed a uterine fibroma and decreased T2 signaling in the liver, spleen and bone marrow consistent with hemosiderosis due to her chronic transfusions. While iron studies the prior year were normal, serial serum iron levels peaked at 2,121 mcg/dl on HD #4 and serum ferritin peaked at 151,500 ng/ml on HD #8; there were no appreciable changes in her renal or liver function. Deferoxamine was administered on HD 4–6 due to these toxic concentrations, although the patient never exhibited clinical signs of iron toxicity. She denied ingesting iron-containing products, and thus was discharged on HD #10 when iron laboratory parameters improved. *Case Discussion:* The differential for an elevated serum iron level in the setting of no clinical evidence of iron poisoning is narrow. While a laboratory interference between iron and other substances, e.g. Gd-DTPA was considered, periodic table properties of Gd did not support this theory; furthermore, the markedly elevated ferritin level and MRI showing hemosiderosis confirmed iron overload. A previous study of 1,068 healthy patients receiving Gd-DTPA contrast found minimal side effects in 19.9%[1]. However, research suggests significant iron mobilization in mice with renal failure who received Gd-DTPA in both *in-vitro* and *in-vivo* models[2].Our patient's hemodynamic stability in the setting of such toxic serum iron levels after Gd exposure supports this hypothesis. *Conclusion:* Clinicians should be aware that Gd-DTPA MRI can cause iron mobilization in the transfusion-dependent, chronic renal patient. *References:* 1. Goldstein HA, et al. Radiology 1990; 174:17–23. 2. Vorobiov M, et al. Nephrol Dial Transplant 2003; 18:884–7.

117. Fluconazole Toxicity from Therapeutic Misadventure

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Background: Fluconazole is an antifungal agent that is commonly prescribed for various fungal infections. There are very few reports of fluconazole overdose. We report a case of a significant overdose of fluconazole in a patient. *Case Report:* A 54-year-old man with a history of cerebral palsy, developmental delay, anoxic brain injury, and chronic seizures who had advertently received 1000 milligrams insead of 100 milligrams of fluconazole three times a day for three days for a reported fungal infection. His predominant symptoms at presentation were profound vomiting and tachycardia. Initially, the dosing error was not noted and the patient was admitted to the intensive care unit with a presumptive diagnosis of sepsis. Patient's symptoms resolved the next day after fluconazole was held and intravenous crystalloid was administered for apparent dehydration. A fluconazole level was sent and reported as much greater than a therapeutic level. *Case Discussion:* Fluconazole overdose has been rarely reported. Most of the information regarding fluconazole toxicity has been extrapolated from adverse events from therapeutic administration. This case highlights the gastrointestinal manifestations from an overdose of fluconazole primarily in the form of emesis. Care for the patient's volume status as well as other supportive measures seem to be effective at treating toxicity from a fluconazole overdose. *Conclusion:* Fluconazole overdose may lead to gastrointestinal distress in the form of emesis.

118. Lactate, β-hydroxybutyrate, and Acetoacetate Effect on Serum Osmolal Gaps

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Background: The serum osmolal gap is frequently utilized when evaluating patients with potential toxic ingestions. Unexplained osmolal gaps are often observed; the differential diagnosis includes toxic alcohol ingestion, lactic acidosis, diabetic ketoacidosis, and alcoholic ketoacidosis, but the presumed contributions of elevated lactate, β-hydroxybutyrate, and acetoacetate to the osmolal gap have not been experimentally demonstrated. *Methods:* Varying standardized dilutions of either sodium lactate (molecular weight 89), sodium salt of β-hydroxybutyrate (weight 103), or lithium salt of acetoacetate (weight 101) were added to serum

aliquots from the same pool to give a lactate concentration from 2–25 mmol/L, a β-hydroxybutyrate concentration from 0.26 2.1 mmol/L, and an acetoacetate concentration from 0–50 mg/dL. Sodium, glucose, BUN, β-hydroxybutyrate, and lactate were measured. The calculated osmolality was obtained using the formula 1.86 Na (mmol/L) + 0.056 glucose (mg/dL) + 0.36 BUN (mg/dL) + 9. Osmolality was measured by osmometer (freezing-point depression). Acetoacetate concentration was determined by nitroprusside reaction. The osmolal gap was calculated as the difference between the measured and calculated osmolalities. All values are reported as the mean ± SEM of 3 samples. *Results:* Osmolal gaps at baseline were 5 mOsm/kg. Severe lactic acidosis of 24 mmol/L increased the osmolal gap by 6 mOsm/kg (± SEM 1.6). With acetoacetate, 15 mg/dL increased the osmolal gap by 4 mOsm/kg (±SEM 1.5) and 50 mg/dL increased the osmolal gap by 8 mOsm/kg (±SEM 0.6). β-hydroxybutyrate did not cause an increase in the osmolal gap at a concentration up to 2.1 mmol/L (at least 10x normal). *Discussion:* Lactic acidosis and diabetic ketoacidosis are commonly assumed to elevate the osmolal gap, though evidence is scarce in the literature. Our data show that lactate and acetoacetate contribute only minimally to osmolal gap even at extremely high levels; β-hydroxybutyrate does not contribute. *Conclusion:* Lactic acidosis and diabetic ketoacidosis make only minimal contributions to the osmolal gap.

119. Lead and Its Effects on Cytochromes P450

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Background: In addition to adverse effects on heme biosynthesis, lead may disrupt the activity of other hemoproteins including the cytochromes P450 (CYP); many of which are responsible for drug metabolism. While data in animals suggest a decrease in CYP function with lead exposure, there is little data in humans. *Methods:* Patients with asymptomatic, low level (10–44 mg/dl) lead poisoning were assessed for CYP1A2 and CYP2D6 activity at diagnosis, 1 month, 2 months and after blood lead was less than 10 mg/dl. Low doses of caffeine and dextromethorphan followed by 12–24 hr urine collection and quantitation (by HPLC) of parent drug and metabolites were used as pharmacologic probes to assess CYP1A2 and CYP2D6 activity, respectively. CYP2D6 and ALA-D genotyping was performed using PCR techniques. Lead levels, EPP, and iron studies were performed. *Results:* Eleven out of the 16 eligible children (7 males, 4 Caucasian, average age: 33 months) completed the study. Average time to complete the study was 20 months. Initial blood lead levels ranged from 16–32 mg/dl. Eight subjects had elevated EPP: none had low serum iron. All subjects were homozygous for ALA-D[1] and 10 had a CYP2D6 genotype predictive of an extensive metabolizer phenotype. A random intercepts mixed linear model was fit to the data. No statistical significance was found for CYP1A2 or CYP2D6 urinary metabolic ratio examined in association with blood lead level, change in lead level from baseline or time. *Discussion:* At low blood lead levels, activity of CYP1A2 and CYP2D6 was not found to be altered. Evidence of biochemical lead toxicity and disruption of normal heme biosynthesis reflected by elevated EPP values at blood lead levels > 10 mg/dl may not be generalizable as relates to the function of other critical hemoproteins. Larger studies with appropriate statistical power are required to substantiate the findings from our preliminary study. *Conclusion:* Our preliminary data would suggest that in children with low blood lead levels, lead-associated alteration in biotransformation of therapeutic drugs that are substrates for CYP1A2 and/or CYP2D6 is not expected.

120. The Effect of Amiodarone Post-Exposure on a Rodent Model of Fluoride-Induced Ventricular Tachycardia

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Background: Systemic fluoride toxicity results in cardiac dysrhythmias and death from hypocalcemia, hypomagnesemia, and hyperkalemia. Prior work demonstrated that pre-treatment with amiodarone improved survival in a mouse model of systemic fluoride toxicity and decreased the incidence of fluoride-induced ventricular tachycardia (VT) in rats. Based on these findings, we hypothesized that IV amiodarone post-exposure will decrease the incidence of VT in a rat model of systemic sodium fluoride (NaF) toxicity. *Methods:* We performed a randomized, blinded, placebo-controlled trial using 30 rats. The rats were anesthetized with 1.75% isofluorane via a tracheostomy and instrumented to measure mean arterial pressure (MAP), systolic blood pressure (SBP), diastolic blood pressure (DBP) and to continuously monitor the electrocardiogram. All rats were infused with IV NaF (1.3 mg/kg/min) and observed for 2 hours. After 20 minutes of NaF infusion, the rats were randomized to treatment with IV amiodarone (n = 15) as a 5 mg/kg bolus or an equivalent volume of 5% dextrose (n = 15). Time to onset of VT and time to death was

compared with the Kaplan-Meier analysis and incidence of VT was compared using Chi Square. Change in MAP, SBP, DBP, and HR were compared at 10 minute intervals using repeated measures ANOVA and post hoc analysis using Bonferoni. *Results:* Six rats in the amiodarone group and twelve rats in the control group had VT (p = 0.018). The amiodarone group had a significantly decreased time to VT but not death (see table). Mean MAP, SBP, DBP, and HR were not significantly different between the groups except at 60 minutes when the amiodarone group had lower mean DBP (33 vs 70 mmHg; p = 0.001), MAP (45 vs 85 mmHg; p = 0.004), and HR (172 vs 247 BPM; 0.018) compared to the control group. *Conclusion:* Amiodarone post-exposure decreased both, the incidence and the time to onset of ventricular tachycardia in this model of severe systemic fluoride toxicity.

TABLE 1

	Amidoarone	Control	Log rank (p value)
Median time to VT (min)	79	62	0.0097
Median time to death (min)	65	63	0.14

121. Nitric Oxide Scavenging by Hydroxocobalamin might Explain its Hemodynamic Profile

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Background: The hemodynamic profile of hydroxocobalamin, an investigational cyanide antidote in the United States, differs from that of the only currently available US cyanide antidote, the Cyanide Antidote Kit, which can produce potentially lethal hypotension. Hydroxocobalamin acts by trapping cyanide ions and thereby forming cyanocobalamin. Antidotal doses are associated with typically moderate and short-lived increases in blood pressure in animals and some humans. These studies in anesthetized rabbits were undertaken to explore the mechanisms of the hemodynamic effects of hydroxocobalamin by investigating 1) hemodynamic effects of cyanocobalamin, which is formed on a molar-to-molar basis when hydroxocobalamin binds cyanide and 2) the interference of hydroxocobalamin with the endothelial nitric oxide system. *Methods:* Study 1, which investigated the hemodynamic effects of cyanocobalamin, included two treatment arms: 1) cyanocobalamin (75 mg/kg, IV) followed by saline (n = 7) and 2) saline followed by cyanocobalamin (n = 7). Study 2 assessed the hemodynamic effects of hydroxocobalamin (75 mg/kg, IV) in the presence and absence of the nitric oxide synthase inhibitor L-N^{w}-nitro-L-arginine methyl ester (L-NAME; 30 mg/kg, IV). *Results:* In Study 1, the effects of cyanocobalamin on hemodynamic parameters were indistinguishable from those of saline. In Study 2, hydroxocobalamin was associated with moderate hemodynamic effects including an increase in systemic vascular resistance, an increase in blood pressure, and a decrease in cardiac output. Administration of L-NAME abolished the effects of hydroxocobalamin on all hemodynamic parameters. In follow-on experiments, angiotensin II at a dose producing a pressor response comparable to that of L-NAME did not influence the hemodynamics of hydroxocobalamin. *Discussion:* The latter finding suggests that L-NAME's action was a specific one not attributed to blood pressure increases caused by nitric oxide synthase inhibition itself. *Conclusion:* These studies in anesthetized rabbits demonstrate that the moderate pressor effect of hydroxocobalamin is not related to the formation of cyanocobalamin but is very likely related to the scavenging of nitric oxide by hydroxocobalamin.

122. A Massive Carbamazepine Overdose Treated with High-Efficiency Hemodialysis

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Background: A patient with an overdose of carbamazepine was treated with a high-flux dialysis membrane achieving substantially higher clearance rates than previously reported. *Case Report:* A 29-year-old man presented to the ED after a witnessed ingestion of trazodone, lioresal and carbamazepine. The patient became hemodynamically unstable and obtunded, requiring endotracheal intubation and mechanical ventilation and seized numerous times. His initial carbamazapine level was 23.3 mcg/mL and rapidly rose to 124.7 mcg/mL. The patient was dialyzed with a F160 high flux, polysulfone membrane and multiple serum and dialysate measurements were collected and analyzed. The patient recovered and was discharged to a psychiatric facility. The mean clearance of carbamazepine achieved was 85.9 mL/min. The serum level was 84.1 mcg/mL before and 57.2 mcg/mL after

dialysis. Based on the calculated clearance of carbamazepine and the mean serum concentration during the initial dialysis session, we calculate that approximately 1750 mg of carbamazepine was removed from the patient's serum during four hours of hemodialysis. Based on the reported volume of distribution of carbamazepine of 0.8–1.7 L/kg, this means that approximately 30% of the total absorbed dose was removed. *Case Discussion:* Clearance rates of carbamazapine with conventional hemodialysis have been reported to be approximately 53 mL/min. Our experience with this patient suggests that much higher carbamazepine clearance is possible with high-flux dialysis membranes which are defined by the FDA as those in which the in vitro ultrafiltration coefficient (KUf) is greater than 8 mL/hour/mm Hg. These high-flux membranes allow filtration of very large molecular weight substances and allow for much higher blood and dialysate flow rates. *Conclusion:* High-flux dialysis removed more carbamazepine from a massively poisoned patient than has previously been reported with conventional hemodialysis.

Carbamazepine Serum and Dialysate Levels

Time	Serum level mcg/mL	Dialysate level mcg/mL	Clearance mL/min*
1 hour	124.7	21.6	86.6
2 hours	93.4	16.5	88.3
3 hours	63.3	10.5	82.9

*Blood flow rate = 350 mL/min and Dialysate flow rate = 500 mL/min.

123. CroFab Solubility in Various Reconstitution Media: An In Vitro Study

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Background: We investigated the solubility of CroFab™ (Crotalidae Polyvalent Ovine Immune Fab) antivenom (Savage Labs and Protherics Inc, US) in non-saline solutions. We also assessed whether adsorption to plastic tubing occurs with Crofab preparations. *Methods:* Twelve vials of expired CroFab were divided into 3 groups. Assignment to the solution groups (NS, LR, 1/2 NS) was blinded. For each vial, the antivenom was reconstituted with 10 mLs of one of the solutions and vortexed for 30 minutes. 5 mL of the reconstituted antivenom were aspirated from each vial and diluted into an IV bag containing 75 mL of the same test solution. The protein concentration was measured using a standardized assay (20 specimens per vial). After storage of the bags at 4–6°C for 4 hours, and fluid was again sent for protein concentration (20 specimens per vial). Solution was also tested for protein concentration (10 specimens per vial) after flowing through a six-foot plastic IV tubing set. *Results:* The total protein yield from each step was calculated. Results are shown in the table. *Discussion:* Our data suggest that CroFab is soluble in the different solutions we tested. There was no adsorption effect when Crofab was infused through plastic IV tubing. A limitation of our study is that antivenom function in the different solutions was not assessed. *Conclusion:* Crofab appears to be soluble in all of the solutions tested, and adsorption to IV tubing does not occur. Our study may be of relevance when clinicians or pharmacists mix Crofab into nonsaline solutions.

124. Use of Carbonated Water as a Sonographic Window for Emergency Department Ultrasound Detection of Ingested Capsules

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Background: Emergency department gastric ultrasound could be used to identify the presence of recently ingested medications. Air bubbles in water have been shown to aid in stomach localization by ultrasound. We sought to determine whether gastric ultrasound using carbonated water as a sonographic window could be used to localize the stomach and identify the presence or absence of ingested capsules. *Methods:* A prospective, randomized, blinded and controlled study utilized healthy volunteers. Epidemiologic data collected included age, gender, body mass index and past medical history. Subjects

Recovery* (grams of protein) after reconstitution, 4-hour storage, and IV tubing transfer of CroFab mixed in different solutions

Sample/step	Lactated ringers	Normal saline	1/2 normal saline
Vial A, initial	0.69	0.70	0.75
Vial B, initial	0.78	0.71	0.74
Vial C, initial	0.68	0.68	0.74
Vial A, 4 hrs	0.69	0.67	0.82
Vial B, 4 hrs	0.77	0.71	0.78
Vial C, 4 hrs	0.69	0.67	0.80
Vial A, tubing	0.68	0.66	0.83
Vial B, tubing	0.78	0.71	0.78
Vial C, tubing	0.66	0.69	0.79

*Mean Values; see Methods.

were randomized to ingest either zero, one, ten, or twenty placebo capsules with 350 mL of carbonated water. They immediately underwent a systematic gastric ultrasound examination by a blinded examiner. Localization of the stomach and determination of the presence or absence of capsules by ultrasound were recorded. This study was approved by the hospital's institutional review board. *Results:* The study enrolled 20 subjects. Gastric ultrasound localized the stomach in 19 of 20 subjects (95%). Accurate identification of capsule presence or absence occurred in 11 subjects (55%). Sensitivity was 60% (95% CI, 0.33–0.83), specificity was 40% (95% CI, 0.07–0.83), positive likelihood ratio was 1 (95% CI, 0.44–2.29), and negative likelihood ratio was 1 (95% CI, 0.30–3.35). The ability to identify ingested pills was not influenced by the number of pills swallowed, gender, past medical history or body mass index. *Discussion:* We found that carbonated water greatly enhances stomach localization by ultrasound. However, we found poor accuracy in identifying capsule presence or absence using this model. Refining this technique may aid in capsule quantification in the future. *Conclusion:* Gastric ultrasound can accurately localize the stomach by using carbonated water as a sonographic window. However, gastric ultrasound utilizing this method had relatively poor sensitivity and specificity for identifying ingested capsules shortly after ingestion.

125. In Vitro Studies with a Novel Granular Activated Charcoal

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Background: Activated charcoal (AC) administration is the main method of gut decontamination used in the management of the poisoned patient. However, one of the main limitations of current AC preparations is poor palatability. Current AC preparations are in powder form and are gritty. A potential mechanism to improve palatability is to alter the shape of the AC preparation, in particular, to make it more granular. We designed a granular AC preparation and have undertaken preliminary in vitro studies to determine relative adsorption kinetics compared to current AC preparations. *Methods:* Adsorption characteristics of a specially designed granular carbon (M60) were compared with two AC preparations currently used in poisoned patients (Charcodote (CD), carbomix (CM). Pore size distribution and surface area of the carbons were determined from adsorption-desorption isotherms of nitrogen at 77K. Equilibrium adsorption isotherms, to calculate maximum adsorption capacity (Qmax) and kinetic studies were carried out using amitriptyline and acetaminophen (separately) in simulated gastric fluid (pH 1.2) at 37°C. *Results:* The results are summarized in the table. *Discussion:* The novel granular AC preparation had a higher surface area than current AC preparations and greater adsorption capacity for both acetaminophen and amitriptyline, which could potentially reduce the dosage requirement of AC for the management of poisoned patients. *Conclusion:* These preliminary in vitro studies suggest that the novel carbon M60 has superior adsorption characteristics to current AC preparations. Further studies will be required to confirm this and to investigate other factors that can influence adsorption

Characteristics and adsorption kinetics of AC preparations

	Surface area (m^2/g)	Pore volume (mL/g)	Acetaminophen Qmax (mg/g)	Amitriptyline Qmax (mg/g)
Charcodote (CD)	1497	1.34	81	372
Carbomix (CM)	1461	0.83	122	378
M60	1820	1.72	168	497

Qmax = Maximum adsorption capacity.

characteristics. We are currently designing a volunteer study to determine the palatability of this novel granular carbon compared to current AC preparations.

126. Electrolyte Changes from Fluoride Toxicity in a Mouse Model

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Background: Electrolyte changes associated with systemic toxicity from inorganic fluoride compounds were investigated in a murine model. *Methods:* Adult CD-1 mice were given 1 mL intraperitoneal (IP) injections of normal saline, NaF, or HF after 0.1 mg/kg SC buprenorphine analgesia. Two doses of HF and NaF were used (3 mM/kg and 1.5 mM/kg). Each animal was observed until death, severe distress, hypotonia, or apnea. Upon the display of any of these symptoms, intracardiac puncture was performed using heparinized syringes. Whole blood was collected to measure serum electrolytes. *Results:* All fluoride-treated animals died within 30 minutes. Saline controls were euthanized at 6 hours with inhaled CO_2. Mean values of potassium, calcium, and bicarbonate for each group are listed in the Table. Compared to controls, NaF and HF induced both hypocalcemia and acidosis. These changes were significant ($p < 0.05$) except for calcium decrease after high-dose HF. There was also a dose-dependent trend towards hyperkalemia, which was significant with high-dose NaF only. *Discussion:* The most commonly cited mechanism of acute fluoride toxicity is the binding of free fluoride ions to cations such as calcium. However, our study supports other research suggesting that elevations in serum potassium may also be responsible for toxic effects of fluoride. In our model of severe fluoride toxicity, we found dose-dependent elevations in potassium in combination with hypocalcemia and acidosis. Ionized calcium, which was not measured in our study, may also be decreased due to the concurrent acidosis. Each of these electrolyte derangements can contribute to rapid fatality from inorganic fluorides. *Conclusion:* Further research using this model may help elucidate the cellular mechanisms leading to these electrolyte changes and help to define more effective treatments for systemic fluoride toxicity.

Mean electrolytes after lethal fluoride doses in mice

Treatment (n)	Potassium (mEq/L)	Calcium (mg/dL)	Bicarbonate (mEq/L)
Saline (4)	7.7	7.0	25
3 mM NaF (8)	14.2 *	1.8*	12*
3 mM HF (6)	10.8	5.8	12*
1.5 mM NaF (6)	8.2	2.1*	11*
1.5 mM HF (6)	8.6	3.1*	9*

*$p < 0.05$ compared to saline controls.

127. Use of Clonidine in Prevention and Management of Neonatal Abstinence Syndrome

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Background: Neonatal abstinence syndrome (NAS) is a complicated medical issue with several available treatment regimens, including methadone and other opioids, barbiturates, and benzodiazepines. We describe the largest case series in which clonidine was used for prevention and management of patients with NAS. *Case Report:* Charts of patients treated with clonidine for NAS between January 2003-March 2006 were abstracted for gestational age (GA), birthweight, abstinence score (AS), dose of clonidine, duration of treatment, and additional medications required. Fourteen charts were identified. The mean GA was 30.1 weeks (range, 24.4–40.7 weeks); 3 patients were full-term. 11/14 had been on IV fentanyl for sedation in the NICU; 3/14 were born to opioid-dependent mothers. Clonidine was administered in doses of 0.5–1.0 mcg/kg po every 6 hours. Treatment was started in anticipation of development of NAS in 10 patients, and at the onset of symptoms in 4. Mean abstinence scores were 6.4 pretreatment (range, 0–20) and 1.9 post-treatment (range, 0–5). The greatest improvement was seen in the patients with the highest AS. 4 patients also received lorazepam; 1 received chloral hydrate and 2 received phenobarbital. Eight were treated with clonidine alone, including the patient with the highest AS (20). No patient received opioids. Mean duration of treatment was 6.8 days (range, 4–14). No patients suffered an adverse event (hypotension, bradycardia, excessive sedation, desaturation) from clonidine administration, and no seizures were reported. *Case Discussion:* While clonidine has been used as an adjunct in treatment of adult opioid withdrawal syndromes, its use in neonatal withdrawal has been limited. Based on our initial results in this series, clonidine offers a potential alternative to more traditional agents used to treat NAS. *Conclusion:* Clonidine appears to be effective in prevention and management of NAS. Reduction in abstinence scores was achieved without the use of opioid agents.

128. Does the Clinical Use of Ethanol-Based Hand Sanitizer Elevate Blood Alcohol Levels: A Prospective Study

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Background: Ethanol based hand sanitizers (EBHS) are used in most health-care facilities in the United States of America. Infection control personnel advocate the use of generous quantities of EBHS prior to, and following contact with patients. This translates to the use of these products 10–25 times per hour, depending upon the task being performed. While it is assumed that little systemic absorption of ethanol occurs during EBHS use, many alcohols are absorbed to varying degrees via the transdermal route. Ethanol intoxication by employees in the medical workplace is a potentially serious finding and it is of forensic and medical-legal importance to elucidate the effects of frequent use of EBHS upon serum blood ethanol levels (BAL). To investigate the effect of frequent use of EBHS upon serum blood ethanol concentrations we prospectively studied 5 volunteers undergoing frequent application of EBHS. *Methods:* Enrolled subjects applied 5 ml of the product (62% denatured ethyl alcohol manufactured by Kimberley-Clark) to both hands and rubbed until dry. This activity was repeated 50 times over 4 hours. Participants had their blood drawn prior to, as well as after completing the study. Each participant was without alcohol intake or exposure to alcohol during the 12 hours preceding the study, to include EBHS. *Results:* A total of 5 volunteers were enrolled. All had an initial BAL of <5 mg/dl. All 5 participants completed the 4-hour study. There were no noted adverse reactions during the study. BAL upon completion of the 50 applications of EBHS were <5 mg/dl in all 5 study participants. *Discussion:* This study, which demonstrates negative serum ethanol levels with extremely frequent use of EBHS, concludes that the contribution to BAL of EBHS is negligible and can be discounted by the involved reviewing authority in cases where cause of elevated BAL is unclear. Due to the heavy and consistent use of EBHS in this study, these results are likely to be reproducible in all clinical settings. *Conclusion:* The results of this study demonstrate that use of ethanol-based hand sanitizers, when frequently used in accordance with labeling, do not raise serum blood ethanol levels.

129. Intraoperative Mercury Concentrations during Surgical Removal of Extensive Subcutaneous Elemental Mercury Deposits

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Background: There are a number of case reports of subcutaneous injection of elemental mercury. Large deposits can result in local complications (granuloma formation, infection), pulmonary and systemic embolization and systemic mercury toxicity. To

prevent these complications surgical removal of subcutaneous deposits has been attempted in previous cases. However, there is limited data available to determine whether this causes significant mobilization of mercury which could increase the risk of systemic mercury toxicity. *Case Report:* A 50-year-old male presented to ED after injecting 70–90 mL elemental mercury into multiple sites (right antecubital fossa, forearm, both hands) during the previous 72 hours. The only clinical findings were visible and palpable mercury deposits at the injection sites, with no inflammation or granuloma formation. He had no dyspnea or signs of systemic mercury toxicity. X-rays confirmed extensive mercury deposits at these sites, with no evidence of proximal spread or embolization. Initial mercury concentrations were markedly raised: blood 120 μg/dL, urine 940 μg/dL. Initial urinary low molecular proteins were negative. In view of the extensive deposits he underwent surgical debridement (dorsum of both hands and right forearm). During the 90-minute procedure, 40 mL of mercury was removed. Blood and urine samples were taken at 0, 30, 60, 90, 120, 180 minutes post-commencement of debridement for mercury estimation by cold vapour atomic absorption. *Case Discussion:* Blood and urine mercury concentrations remained stable during and immediately after the procedure (See Table). Over the subsequent 3 weeks blood mercury concentration fell to 54 μg/dL. *Conclusion:* This case suggests surgical removal of large subcutaneous elemental mercury deposits is safe and does not result in significant mobilization of mercury. We would recommend surgical drainage of such lesions to prevent potential risks associated with chronic subcutaneous elemental mercury deposits.

Blood mercury concentration during surgical debridment						
Minutes since beginning of debridement	0	30	60	90	120	180
Blood mercury concentration μg/dL	126	124	120	128	116	120

130. Slow Formate Elimination in Severe Methanol Poisoning: A Fatal Case Report

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Background: Methanol poisoning is a potentially fatal medical emergency because of its metabolism to formic acid. The half-life of formate is mostly reported in the range of 2.5–12.5 hours, but the degree of inter-individual variation is not known. We studied methanol and formate kinetics in a case of late diagnosed methanol poisoning with persisting metabolic acidosis and circulatory failure. *Case Report:* A 63-year-oldman was referred to our hospital with a tentative diagnosis of stroke. He was awake on admission, but soon deteriorated in the Emergency Department, and a metabolic acidosis was revealed. Methanol poisoning was then suspected approximately five hours after admission, but in spite of intensive treatment, he died after six days. Results: The S-methanol half-lives during treatment with fomepizole before and during hemodialysis were 49.5 and 4.1 hours, respectively, while the similar half-lives of S-formate were 77.0 and 2.9 hours. S-fomepizole was measured and found to be within the therapeutic range during treatment. *Case Discussion:* The patient was treated with the established dosing regimen for fomepizole and the measured S-fomepizole levels throughout the treatment were adequate; the S-methanol elimination also suggests that methanol metabolism was blocked. Hence, other explanations for this long formate half-life include slower formate metabolism due to small hepatic folate stores or to genetic deficiencies in formate-metabolizing enzymes or slower formate excretion due to renal tubular acidosis or to a non-oliguric renal failure. *Conclusion:* This case report supports theories that the half-life of S-formate may be of greater inter-individual variation than earlier expected, being by far the longest half-life reported in the medical literature.

131. Intranasal Clozapine Misuse Mimicking Cocaine Toxicity

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Background: Therapeutic chronic clozapine use is well know to cause agranulocytosis, tachycardia and seizures. In overdose, clozapine has been reported to cause, seizures, extrapyramidal effects, somnolence, QT prolongation and leukocytosis. Intranasal clozapine misuse has not been reported as well as the extent of absorption or toxicity when absorbed from this route. We present

a case of intranasal clozapine overdose masquerading as a cocaine overdose. *Case Report:* A 39-year-old schizophrenic man was found unresponsive by his family incontinent of urine and stool and diaphoretic. He was surrounded by pills and lines of a white powder along with a razorblade. The initial blood pressure was 153/80 mm Hg, heart rate 130 bpm, temperature 36.8 °C. Due to his unresponsiveness, the trachea was intubated for airway protection. The electrocardiogram revealed sinus tachycardia with a QTc of 505 ms. Laboratory analysis revealed a white blood cell count of 19,800/mm3, glucose was 201 mg/dL, CPK 3,397 IU/L with negative troponin, and urine toxicology screen negative for all substances, including cocaine and amphetamines. The CT and MRI of the brain revealed no acute intracranial process. The lumbar puncture obtained unremarkable CSF. EEG demonstrated no seizure activity. The clozapine serum concentration, drawn 24 hours post-exposure was 2.78 mcg/ml (normal range 0.2–0.7 mcg/mL). *Case Discussion:* This patient's presentation was initially believed to be caused by intranasal cocaine use; however the clinical effects, QTc prolongation, and laboratory findings confirmed clozapine toxicity. Because most of the pills from home were intact, it likely that the patient crushed a small number of pills and snorted them in lines similar to powdered cocaine. The urine toxicology screen confirmed no cocaine or amphetamines were present and a supratherapeutic clozapine concentration was detected. In this patient it appears intranasal clozapine was well absorbed. *Conclusion:* Intranasal clozapine use can cause similar clinical findings to intranasal cocaine overdose. The elevated concentration supports rapid and extensive intranasal absorption.

132. The Delayed Diagnosis of Thyrotoxicosis in the Setting of Cocaine Exposure

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Background: Patients with cocaine toxicity and thyrotoxicosis may have similar clinical presentations. Although thyrotoxicosis is rare, it is important to differentiate it from cocaine toxicity, as the treatment of the two entities is different. We describe two patients who were initially treated for acute cocaine toxicity and later diagnosed with thyrotoxicosis. *Case Report:* Case 1: A 35-year-old woman presented to the ED with tachycardia and agitation after using cocaine. Her urine toxicology screen was positive for cocaine. She remained symptomatic after 19 mg of lorazepam IV over 16 h. She was later intubated for altered mental status and respiratory failure, remaining tachycardic on lorazepam and diltiazem drips. Thyroid tests ordered 16 h after arrival were markedly abnormal (TSH 0.01uIU/ml, freeT4 3.75ng/dL). Labetalol, solumedrol, and propylthiouracil were started. A thyroid scan showed Graves' disease, and iodine was added. Her free T4 declined, symptoms resolved and she was discharged home on methimazole. Case #2: A 24-year-old man presented to the ED with altered mental status and sinus tachycardia 12 h after using cocaine, marijuana, and alcohol. His urine toxicology screen was positive for those substances. He received 30 mg of lorazepam IV over 8.5 h and was started on a lorazepam drip for persistent symptoms. Thyroid tests ordered 8 h after arrival were abnormal. His TSH was low at <0.03 uIU/ml with an elevated free T4 of 3.66 ng/dL. A thyroid scan showed Graves' disease, confirmed by positive autoantibody studies. His symptoms resolved on labetalol and propylthiouracil. He was discharged home on atenolol. *Case Discussion:* We report two cases of thyrotoxicosis with concurrent cocaine use. Both cases were initially diagnosed as cocaine toxicity, and the patients had prolonged symptoms resistant to benzodiazepines. *Conclusion:* It is important to consider thyrotoxicosis in the differential diagnosis of prolonged cocaine intoxication refractory to standard treatment. Future studies should investigate the relationship between cocaine and thyrotoxicosis.

133. Esophageal Perforation after "Body Packing" Cigarette Tobacco

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Background: Body packing is the act of swallowing containers, condoms, balloons, plastic bags, or packages filled with drugs for the purposes of smuggling. We report a case of a patient who developed an esophageal perforation and mediastinitis after swallowing balloons filled with cigarette tobacco. *Case Report:* A 39-year-old man presented to a rural emergency department with several hours of diffuse abdominal pain and dyspnea. The patient had no past medical history, and with the exception of cigarettes, denied use of medications or drugs. Ten hours prior, the patient reported ingesting twelve balloons filled with unrolled cigarette tobacco. The patient's motivation for body packing cigarette tobacco are unclear, but related to the prison term he was scheduled to begin that day. While swallowing the packets the man reported gagging and retching but was subsequently asymptomatic. An AP radiograph on the chest was unremarkable. Computed tomography of the abdomen and pelvis demonstrated

moderate-sized bilateral pleural fluid collections, inflammatory changes in the posterior mediastinum suggestive of esophageal perforation, foreign bodies in the region of the distal esophagus and posterior mediastinum and numerous rounded foreign bodies within the stomach. The patient was transferred to a tertiary center for surgical repair of esophageal perforation. Although the surgeon noted one of the packets to be ruptured, the patient had negative cotinine and nicotine levels. Despite a protracted postoperative course complicated by sepsis, the patient made a complete recovery. *Case Discussion:* Cocaine and heroin are the drugs most frequently transported in this manner. Problems associated with body packing are related to poisoning from the drug when packets rupture or from mechanical problems caused by the packets, themselves. Bowel obstruction, bowel perforation, and, less commonly, espophageal perforation have been reported in body packers. *Conclusion:* We report the first case of cigarette tobacco body packing. While rare, the diagnosis of esophageal perforation should be considered in body packers with chest or abdominal pain.

134. Use and Abuse of Femproporex Amphetamine: A Major Cause of Roadway Accidents in Brazil

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Background: Femproporex is an amphetamine widely used in Brazil as an appetite suppressant drug. Although its use is forbidden in many countries, including the USA and Europe, it has been recently found in nonprescription drugs worldwide exported from Brazil. Because it is metabolized to amphetamine, it increases alertness and wakefulness and causes severe psychiatric disorders, such as hallucinations, psychotic behavior, violent behavior, depression and suicidal intent. It is widely used by truck drivers and operators of heavy equipment and is implicated as a major cause, together with alcohol, of most of the fatal roadway and workplace (occupational) accidents in Brazil. *Case Report:* Between 1996 and 2003, urine samples were collected from truck and car drivers in two different settings and tested for cannabinoids, amphetamines and cocaine. The positive samples were confirmed by GC-MS. The samples were obtained by voluntary consent and anonimity was assured to the donors. In the first series, 728 samples were collected only from truck drivers in three regions of Brazil. The second series included 622 samples obtained in the State of Sao Paulo from two major highways. The overall positive results were 4.5% for amphetamines, especifically femproporex, 0.21% for cocaine and 0.7% for marijuana. *Case Discussion:* "Rebite" is the slang term for femproporex used by truck drivers to maintain wakefulness. Many of the users are forced to drive over 3,000 kilometers (over 2,000 miles) in a single day and the drug becomes a necessary means. Most become addicted to it. Statistics from the Brazilian Highway Police indicate that 70% of severe highway accidents and fatalities are caused by alcohol and femproporex; 38% are caused by the amphetamine alone. *Conclusion:* The use of potent amphetamines, such as femproporex, is the major cause of fatalities and severe accidents in Brazil. Preventive measures and firm repression of its use, including making this drug illegal, may decrease the tragic statistics of highway and occupational accidents.

135. A 23-Month-Old Male with Hyponatremia, Elevated Liver Function Tests, and Elevated Creatine Kinase Following Methamphetamine Ingestion

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Background: A 23-month-old male with a positive methamphetamine drug screen and hyponatremia, elevated liver function tests (LFTs), and elevated creatine kinase is presented. *Case Report:* A father reported to paramedics that his 23-month old son became unresponsive while in the bathtub. The father stated that his son placed his face in the water and then fell backwards, striking his head. Paramedics described the child as conscious, moving all extremities, and responding to stimuli by grunting. His face was edematous, and he had bitten his tongue. His initial vital signs: temperature – 37.1, pulse – 160 (sinus tachycardia), blood pressure – 137/110, respiratory rate – 20s, oxygen saturation – 100% on room air. His received one milligram of Ativan for agitation. He was transferred to a pediatric intensive care unit for evaluation of agitation, tachycardia, hypertension, rise in LFTs, and hyponatremia. His initial sodium was 122 mEq/L. His WBC was 12.4 K/mm^3. His ALT was 112 U/L, AST 382 U/L, and alkaline phosphatase 187 U/L. His initial CK was 8,736 U/L, and fell to 900 U/L two days later. His creatinine remained normal. His head CT was negative for intracranial abnormalities. His UDS was positive for amphetamines, and a confirmatory screen revealed the presence of methamphetamine and amphetamine. *Case Discussion:* The patient's agitation, tachycardia, hypertension, and laboratory abnormalities resolved within 72 hours. There is no history of a witnessed ingestion but the parents stated that the patient spent time at a friend's house who had a history of methamphetamine use. As the patient had a normal birth history, and no past medical history, his possible seizure activity, agitation, tachycardia, hypertension, and electrolyte disturbances

appear to be the result of methamphetamine intoxication. This is supported by the reversal of all signs and symptoms within 72 hours of hospital admission. A child abuse evaluation was performed and the Department of Human Services was notified. The child was placed in temporary protective custody. *Conclusion:* This patient exhibited symptoms of methamphetamine intoxication, along with unusual electrolyte disturbances.

136. Extended Release Versus Immediate Release Morphine: Differences in Abuse and Medical Outcomes

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Background: Prescription opioid misuse and abuse is a growing public health concern. Of particular concern is the abuse of extended release (ER) formulations, which contain larger amounts of opioid than immediate release (IR). We describe differences in demographics and outcomes for the abuse of ER versus IR morphine. *Methods:* Exposure data for 2005 from 16 poison centers serving over 108 million people were evaluated. Inclusion criteria were morphine intentional exposures (suicide, abuse, misuse, and intentional unknown) for all ages and unintentional exposures for ages <6 years. *Results:* 1,605 exposures were included: 11% ER and 89 % IR. A significant difference was not found between gender and formulation (chi-square, $p = 0.663$) (% male: ER = 47; IR = 45). IR exposures involved a significantly greater mean number of substances (3.7 versus 1.9) (t-test, $p < 0.001$). The table describes the significant differences found between age group and formulation and between medical outcome and formulation. ER resulted in no deaths compared to 13 deaths from IR, five of which (38%) occurred in those 13–19 years (3 abuse ingestions; 2 intentional unknown ingestions). *Discussion:* The abuse of morphine most commonly involved IR products and varied by age group, number of substances involved, and medical outcome. A concerning number of ER morphine exposures occurred in children <13 years, and a concerning number of deaths from IR morphine occurred in those 13–19 years. *Conclusion:* Understanding these differences can assist officials and manufacturers in developing prevention and intervention techniques in addressing this abuse epidemic.

Age group and medical outcome by morphine formulation

Morphine formulation:		ER N (%)	IR N (%)	p value
Age group (years)	<13	31 (18)	122 (9)	
	13–19	18 (11)	113 (8)	
	20s	30 (18)	241 (17)	
	30s	23 (13)	275 (19)	0.001
	40s	28 (16)	326 (23)	
	≥50s	28 (16)	261 (18)	
	Unknown	13 (8)	96 (7)	
Medical outcome	No effect	25 (15)	176 (12)	
	Minor	38 (22)	364 (25)	
	Moderate	21 (12)	376 (26)	<0.001
	Major/death	9 (5)	144 (10)	
	Other*	78 (46)	374 (26)	

*Not followed, nonexposure, unrelated, unknown.

137. Audience Research for Social Marketing Programs Targeting Latino and Chinese Communities

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Background: Social marketing uses commercial marketing concepts to promote health behavior change. Program developers must first complete audience research to ensure the needs of target populations are met and perceived barriers are addressed. *Methods:* Based on Toxicall and Census 2000 data, 8 communities with low call rates (<3 per 1,000 population) and populations

of >60% Latino (n = 4) and >20% Chinese (n = 4) were identified. Quantitative (surveys) and qualitative (focus groups) methods were used applying the Health Belief Model to assess knowledge, attitudes, and behaviors about poison prevention and calling the poison center. *Results:* Eight focus groups were held with caregivers of children under 6 years old (N = 92); 4 in Spanish (n = 44) and 4 in Chinese (n = 48). None of the participants were able to state the poison center number, but most reported that poisonings were very serious. Perceived barriers include the inability to speak with someone in their language, a preference for calling 911, and child welfare concerns. Caregiver (N = 80) and community-provider (N = 33) interviews were also conducted in the targeted areas. Findings showed that 90% of caregivers and 79% of providers did not know the poison center number. Caregivers reported language (56%), preference for calling 911 (51%), and child welfare concerns (44%) as barriers. Only 6% of providers distribute poison center materials. Respondents' sources of health information include family, pediatricians, TV, and radio. *Discussion:* This study is unique in conducting and comparing audience research within Latino and Chinese communities. Our results are consistent with previous studies that also found caregiver barriers related to child welfare concerns and a preference for calling 911 instead of the poison center. *Conclusion:* Both communities were unaware of the poison center number. Chinese and Latino caregivers perceive barriers to calling the poison center as language, a preference for calling 911, and child welfare concerns. Based on these findings, a targeted social marketing program is being developed.

138. Education on Wheels – Using a Popular Nutrition Program to Educate Seniors

Heinen MA. *Northern New England Poison Center, Portland, ME, USA.*

Background: Seniors take more prescription and over-the-counter medications than any other age group and may find it difficult to remember and manage different schedules, side effects and restrictions. Thus, seniors are at risk for medication-related poisonings. In 2005, the Northern New England Poison Center received 1,075 exposure calls from seniors, and 84% were related to medication. This study evaluates senior medication safety practices and educational materials. *Methods:* A convenience sample of Meals on Wheels (MOW) nutritional programs in Maine and Vermont was selected to participate in this study. Participating programs distributed medication safety surveys with their meals. Four to six weeks later the MOW programs distributed the "Medication Safety Packet" to all the MOW recipients. Four weeks after receiving the "Medication Safety Packet" MOW recipients received a follow-up medication safety survey. The data were analyzed to assess current medication safety practices and evaluate if the educational materials impacted medication safety practices. *Results:* The initial survey had a response rate of 34%; the follow-up survey had a response rate of 22%. Approximately half the follow-up survey respondents remembered receiving the safety packet. The percent of seniors who displayed the poison center number near their phone or on the refrigerator increased significantly after they received the safety packet from 32% to 98%. There was no increase in identification of the poison center as a resource for medication errors or medication information. To ask about a medication error, the majority would call the doctor. To learn more about their medication, 80% would call a pharmacist. The average age of the respondents was 75 years old and 25% were male. Sixty percent took three to nine medications and nearly 50% used a weekly medication reminder case. *Discussion:* This educational program improved the number of households with the poison center number available, but did not change medication safety practices. *Conclusion:* The use of MOW programs is a low cost approach to share information with homebound seniors. Future partnerships with physicians and pharmacists may increase the effectiveness of senior-focused medication safety education programs.

139. Professional Outreach by Certified Poison Information Specialists

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Background: Collaboration between hospital and poison control center (PCC) staff is critical. There is little published with regard to professional outreach education (POE) by SPIs to disseminate information and to help strengthen this relationship. *Methods:* Two CSPIs and the PCC educator developed an outreach program for healthcare professionals. A telephone query of staff development liaisons/ED managers was performed. Based on proven educational and marketing techniques, a 20 minute "Facts To Act" (FTA) presentation was developed. It's goal was to provide information about how best to use the PCC, its mission and services. The FTA included information about the national toll-free number, website, TESS data, HIPAA laws and PCC resources. The importance of reporting exposures was emphasized. An evaluation tool was developed and used to measure attitudes, identify knowledge and gauge CE topics of interest. *Results:* Sessions were conducted from May-August, 2005. 34 of 36 (94%) targeted

hospitals with working EDs were visited. A total of 26 formal FTA and 36 informal talks were given. In addition, there were 41 visits to other specialty units as well as 5 other venues (including EMS). A HIPAA fact sheet as well as 3,436 brochures and 2,315 stickers/magnets were distributed. After completion of the program, 275/292 (94%) of participants knew how to contact the PCC and 264/271 (97%) indicated that they were more likely to call. *Discussion:* This CSPI initiative was the first of its kind for our PCC and was met with enthusiasm. The acquisition of a mailing list for future PCC mailings was an added benefit. CE topics most requested included: substances of abuse, acetaminophen overdose/N-acetylcysteine use, drug overdose/antidotes, inhalant abuse and serotonin syndrome. There were numerous positive written comments about the breadth of services and the expert guidance the PCC could provide. *Conclusion:* POE conducted by CSPIs helped to increase PCC visibility and disseminate information about its services and HIPAA exemption status. Participants indicated an increased likeliness of using the PCC for future exposures. A future goal is to develop other materials/presentations relevant to clinical staff in our service area.

140. Got Activated Charcoal?

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Background: In 2004, the AAPCC published "Guidelines on Use of Ipecac Syrup in the Out-of-Hospital Management of Ingested Poisons." These guidelines did not support the routine stocking of ipecac in all household with young children and concluded that individual poison centers should decide whether or not to recommend ipecac. The Northern New England Poison Center (NNEPC) no longer recommends ipecac for home use; instead, it recommends storing activated charcoal in rural homes (never to be used without consultation from a poison center or physician). This study evaluated the availability of activated charcoal at Northern New England pharmacies. *Methods:* Pharmacies in the Maine, New Hampshire and Vermont were mailed an executive summary of the AAPCC's 2004 syrup of ipecac guidelines, the NNEPC Ipecac Fact Sheet, and a confidential survey. The survey collected information about storage and sales of syrup of ipecac and activated charcoal, and awareness of NNEPC's ipecac/charcoal policy. Data were analyzed to 1) measure pharmacists' knowledge about the NNEPC's ipecac/charcoal policy; 2) assess if knowledge of NNEPC's policy was related to the availability of ipecac and activated charcoal; and 3) identify patterns in use of educational materials provided to pharmacies. *Results:* The majority of pharmacies were unaware of the NNEPC's ipecac policy. Awareness of the policy did not differ by state or between chain and independently-owned stores. Pharmacies aware of the policy had powder charcoal available at a greater percent than those who were not aware of the policy (32% versus 17%, respectively). However, there was no statistical difference in the percent stocking ipecac or the practice of offering to order activated charcoal. Of all the pharmacies that participated, 32% had charcoal pills and 24% had charcoal powder. Almost all the pharmacies (95%) stated they will distribute poison center stickers and 78% will distribute NNEPC's ipecac policy statement. *Discussion:* More needs to be done to educate pharmacies about the NNEPC's ipecac policy, to encourage them to stock the powder form of activated charcoal and to share their expert knowledge with customers. *Conclusion:* Pharmacies can be a key partner in educating the general public about current best practices related to poison prevention and first aid treatment.

141. Factors Affecting Poison Center Utilization

Bundens JR,[1] Thompson JD,[1] Snodgrass WR,[1] Rios J,[2] Yudizky M,[2] Houghton-Insall C,[3] Farrar R,[4] Saenz E,[5] Barrara-Garcia V,[6] Forrester MB,[7] Winter ML.[1] *[1]SETPC, UTMB, Galveston, TX, USA; [2]NTPC, PRMC, Dallas, TX, USA; [3]CTPC, S&W Memorial, Temple, TX, USA; [4]PPC, TTUHSC, Amarillo, TX, USA; [5]WTPC, Thomason Hospital, El Paso, TX, USA; [6]STPC, UTHSC-SA, San Antonio, TX, USA; [7]TDSHS, Austin, TX, USA.*

Background: Poison center staff spends countless hours increasing awareness of poisons, yet center utilization rates are low. A recent study suggests that 46% of pediatric poisoning cases at emergency departments do not contact the poison center first for advice. Previous studies of factors influencing the public's use of the poison center relied on responses of low income minority mothers. This study uses a statewide needs assessment questionnaire to determine factors influencing poison center use in the general population. *Methods:* A questionnaire to determine the prevalence of factors influencing utilization was developed using health behavior models. The questionnaire was conducted by educator staff at six poison centers throughout Texas and given to verbally consenting persons ages 18 and older during outreach activities. *Results:* Of 504 respondents, most are aware of poison information.

Poison knowledge	
Heard of poison center	79%
Identify who answers calls	55%
Recognize core functions	54%
Believe poison to be anything	91%
Identify risk factors	64%
Identify proofing tips	53%

However, 83%, do not feel that anyone in their household are likely to be poisoned. In the event of a poisoning, 91% have access to a phone, but only 12% recall the number to the poison center. Only 9% of respondents believe the poison center would report the call to protective services. Seventy percent feel comfortable providing treatment at home. Topics of most interest are the poison center number and first aid. *Discussion:* Knowledge does not appear to be a primary factor influencing utilization. Factors that may include 1) the concept of susceptibility, and 2) access to the correct number in an emergency. *Conclusion:* To increase utilization rates, future educational programs should stress susceptibility to poisonings, preparedness and the importance of posting emergency numbers.

142. Chemical Terrorism Education: An Opportunity for Hospital Outreach and Revenue Generation

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Background: In the event of either an accidental or deliberate large-scale chemical release, poison control centers will play a significant role in providing treatment recommendations and education to the health care professionals who are treating the victims. Poison control centers must establish themselves as credible and available resources before a chemical disaster happens. *Case Report:* Our state department of public health (DPH), funded through a HRSA terrorism-preparedness grant, requested an outside agency to perform professional education about chemical terrorism. The DPH accepted our proposal and the funded a 0.75 full-time equivalent (FTE) Terrorism Preparedness Educator position in our poison center. A one-hour program was developed that covered the signs, symptoms and treatments of vesicants, cholinesterase inhibitors and several industrial chemicals. Education about the poison center, its services, and surveillance activities was also included in the presentation. The course was offered free of charge to all 119 hospitals in the state and Continuing Education Credits were available for nurses. *Case Discussion:* Forty-five hospitals accepted the free training and a total of 587 emergency department personnel were trained. The training was universally well received; one attendee stated that this was the only chemical training that she had had since her hospital purchased a portable decontamination shower 3 years earlier. $21,000 was received by our poison center and was used for salary support and to purchase promotional materials. *Conclusion:* This program helped reinforce our poison center as an authority on the treatment of chemical exposures and a valuable resource in the event of a chemical release. The funding also allowed poison center staff to travel long distances to hospitals which otherwise would be unlikely to receive in-person education from the PCC.

143. Website Survey Data Establishes a Baseline Awareness of Audience Utilization Patterns and Perceptions of a Poison Center Website

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Background: As the use of an online website survey is new to most Poison Centers (PC), a web-based, online customer satisfaction survey was developed to measure baseline awareness of audience utilization patterns and perceptions of a PC website used to disseminate poison information. *Methods:* The PC website logged 37,511 visits since 2002. An internet-based satisfaction survey tool with 20 multiple-choice and open-ended questions was available for completion. Responses were captured and analyzed by an internet-based survey company. *Results:* The survey was reviewed by 208 and completed by 100 respondents. Females accounted for 79% with 3% of total respondents listing their age as “60 + .” Another website directed 39% of respondents to the site with 38% led by a search engine. As to reasons, 7% selected “a poison emergency,” 62% “general information,” and 31%

"specific topic." Of respondents, 43% recorded they had previously called a PC, while 55% had not. To find the number for a PC, 45% selected "from a PC product" and 33% selected "phonebook." Sixty-six percent indicated they found the information they were looking for, 70% found the information helpful and 80% expressed satisfaction with the site. The majority found the site to be "informative" (87%), "easy to read" (90%), "easy to understand" (93%), and "reliable" (88%). Of those listing a "best" feature, 63% of responses were related to poison prevention information and design elements. *Discussion:* Survey and visitor data can provide valuable information about audience use and perceptions of a PC website designed for dissemination of poison prevention information. *Conclusion:* Further consideration should be given to developing strategies to attract other segments of the target population to the website and to entice survey non-respondents to provide feedback for future design and development. Further research should be directed to analysis of website online customer satisfaction survey data.

144. Child-Resistant Closures for Mouthwash: Do They Make a Difference?

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Background: The Poison Prevention and Packaging Act of 1970 mandated that certain potentially hazardous drugs and other products be sold in child-resistant containers (CRC). CPSC estimates that CRC's for aspirin and oral prescription medicine saved the lives of about 700 children since the requirements went into effect in the 1970's. Under this Act the CPSC issued a rule requiring child-resistant packaging for mouthwashes containing 3 grams or more of ethanol per package. The effective date was July 24, 1995 and applied to all applicable products packaged on or after that date. *Methods:* To determine the effectiveness of this 1995 ruling, all AAPCC TESS data involving children less than 6 years of age who ingested ethanol-containing mouthwash ten years prior to the implementation of this ruling, the transition year and ten years after were reviewed. Only single substance exposures were included. Data reviewed included the total number of exposures per year and the outcome. *Results:* A total of 61,185 cases met the criteria. There were 18,275 exposures from 1985 through 1994-pre-requirement (PR) (0.12% of all exposures); 39,376 from 1996 to 2005-post requirement years (AR) (0.17% of all exposures); and 3,534 cases reported in 1995 (0.17% of all exposures). Definitive outcomes were coded in 62.6% of the PR group and 42.2% of the AR.

	No effect	Minor	Moderate	Major	Death
PR	81.5%	17.1%	1.2%	0.18%	.02%
AR	89.7%	9.6%	0.6%	0.1%	.00%

Discussion: Mouthwashes can contain a high percentage of ethanol (14 – 27%) and are accessible and attractive to children. CRC's are defined as packaging that is designed to be significantly difficult for a child to open or obtain a harmful amount of a substance within a reasonable time. Although the number of exposures did not decrease, the outcomes of the exposures improved. *Conclusion:* Numerous factors affect these results. However, in those cases where definitive outcomes were coded, the AR group has better outcomes.

145. Crofab Use for Copperhead Envenomation in the Young

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Background: The indications for the use of ovine polyvalent Fab immunoglobulin fragments (CroFab ®) in the treatment of copperhead envenomation remain controversial. The experience with Crofab use in the pediatric population is limited, especially in regard to the treatment of copperhead bites. We report a case series of Crofab use in young children less than 8 years old for copperhead bites. *Case Report:* All snake bite cases were reviewed from the medical toxicology consultation service and the poison center databases from Jan 2003 until March 2006. Data was then abstracted by a single reviewer and compiled for analysis. Severity of bite was coded according to Toxicall outcome standards. The institutional IRB approved this study. *Results:* A total of 10 cases were identified. There were 7 males. There were three 2 year olds; two 3 years olds; three 4 year olds; one 6-year-old; and one 7-year-old. Three children had upper extremity bites and 7 had lower extremity bites. All were classified as moderate

bites. Nine Children initially received 4 vials of Crofab; 4 of these children received additional Crofab ranging from 1–3 vials for rebound swelling. One child received 6 vials initially, and did not receive additional Crofab. Only one child was admitted to an intensive care unit for observation, all others were admitted to a ward bed. There were no adverse events attributed to Crofab administration. All cases reported arrest of tissue swelling after administration of Crofab. At their latest contact, which ranged from 48 hours to 1 month, all patients reported improvement of symptoms. *Case Discussion:* Copperheads are part of the crotalidae family with venom similar to, but reportedly less potent than that of rattlesnakes. Although systemic, life threatening signs are rare after copperhead bites, inflicted tissue damage can cause significant morbidity. Given the low incidence of documented adverse reactions, Crofab remains a viable treatment option for children. *Conclusion:* In this small case series of young children, Crofab was administered for the treatment of copperhead bites without adverse clinical reactions.

146. Just When You Thought It Was Safe . . . A Death from Laetrile

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Background: With cancer continuing to be one of the leading causes of death in the United States, desperate patients have been known to resort to unconventional medications and methods if there appears to be any promise of success. No where are patients more vulnerable than in a situation thought to be hopeless by conventional medical standards. In this era, the Internet has become the new corner drug store for many modern-day pharmaceutical practitioners offering invalidated treatments and promises to any patient looking for an elusive cure. *Case Report:* The patient, a middle-aged male, who was under conventional treatments for lung cancer, presented to the local ED with respiratory distress. Shortly after supportive resuscitation measures were begun, the patient went into cardiac arrest and full ACLS protocols were instituted. During the code, family of the patient produced a bottle of "Amygdalina" (Laetrile) tablets that the patient had reportedly purchased over the internet. Family reported that the patient had ingested approximately 20 of the 100mg tablets the previous evening in an attempt to speed his recovery from cancer. The patient was pronounced dead before antidotal therapy for cyanide exposure could be administered. Thiocyanate levels returned within normal range but serum cyanide level eventually returned at 5.1 µg/mL with a "toxic" level being reported at 0.5 µg/mL. *Case Discussion:* Although it has been around for centuries, it has been decades since laetrile, vitamin B-17 has made the headlines of the US media. Once thought to have been squelched by the US FDA, laetrile has made a comeback through the ready access afforded by the world-wide web. Beyond the reach of our national agencies, "cancer treatment centers" have surfaced world-wide with the internet as their store-front and offer hope to anyone willing to pay for it. *Conclusion:* We report a case of death from the toxic effects of cyanide caused by the misuse of laetrile, intended to cure lung cancer.

147. Envenomation Importation: Cases of Scorpion Envenomation after Transport to a Non-Endemic Area via Airline Luggage

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Background: Centruroides sculpturatus scorpions are endemic to a small area of North America that includes western New Mexico, Arizona, and southern California and the west coast of Mexico. Hottentotta judaicus scorpions are endemic to Israel and are not found in the United States. We report two cases of envenomation by scorpions that occurred after transport of the scorpion to a non-endemic area via airline luggage. *Case Report:* Case 1-A 42-year-old male busboy was walking in a hotel hallway when he unwittingly picked up a scorpion that he mistook for a piece of trash. He was envenomated on the hand and developed immediate pain, followed by diaphoresis, local pruritis, hyperaesthesia, and tachycardia (116 bpm). His co-workers captured the scorpion and brought it to the ED where it was identified as Centruroides sculpturatus. He was treated with opioids and observed in the ED for 4 hours during which time his symptoms and tachycardia resolved. Further exploration into the case revealed that the current hotel conference was attended by a large number of visitors from Arizona and the West Coast of Mexico. A 5-year-old girl in the US was unpacking from a trip to Israel when a scorpion crawled out of the luggage and stung her on the dorsum of the right foot. She developed pain, edema, and erythematous patches on her lower extremity as well as tachycardia (124 bpm). She was treated with opioids and antihistamines, observed overnight and made a full recovery. The scorpion was identified as Hottentotta judaicus. *Case Discussion:* Scorpions are not endemic to the areas where these envenomations occurred. In both of these cases, the scorpions were captured and brought for identification. However, it is unknown how many unidentified stings, bites, and exposures

occur from non-endemic creatures. This scenario may continue to increase as world travel increases. *Conclusion:* Toxicologists and SPIs should consider envenomations by non-endemic creatures due to the rapidity and availability of travel to and from endemic areas.

148. Clinical Aspects of Snake Envenomations in Spain

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Background: Data on human envenomations often cover limited geographical areas. The purpose of this investigation is to determine the morbidity of snake envenomations in Spain. *Methods:* Retrospective review of snake bites from 1991 to 2003 in the Spanish Poison Control Center. *Results:* A total of 480 cases were registered. Calls started increasing in March, and peaked from May to September. Adults were 74.8%, children were 22.8%, 1.5% were animals, and the rest unknown. A percentage of 47.7% were viper, mainly in the geographic area of *Vipera latastei*; 17.3% were *Culebridae*, including 7 cases of *Malpolon monspensullanus*; 3.5% exotic snakes including python, boa *Elaphe guttata*, *Trimeresurus albolabris*, rattlesnake, common kingsnake, cottonmouth, and copperhead. Bites on the upper extremities were 76.4%, followed by the lower extremities (17.3%), trunk (3.6%), and head (2.7%). Severity of envenomation: mild 32.5%; moderate-severe 18.9%; dry bite 9.3%; no signs of bite 3.3%; and unknown or not evaluated 36%. Local signs: edema, 177 occasions, pain, 79; erythema, 23; hematoma, 17; paresthesia, 13; necrosis and adenopathies, 7 each; lymphangitis, 3; cyanosis and blisters, 2 each; and ecchymosis, cellulitis, lymphedema, thrombophlebitis, or local infection, 1 each. Systemic signs: vomiting 11; nausea, diarrhea, dizziness, drowsiness, hypotension, renal failure, 2 each; headache, vagal reaction, tachycardia, dysnea, ataxia, hemolysis, rhabdomyolisis, disseminated intravascular coagulation, shock, 1 each. Analytical abnormalities: leukocytosis 3, elevated creatine kinase, thrombocytophenia, coagulation alterations, 2; anemia 1. Preconsultation treatment: none, 139 cases; corticosteroids, 67; tetanus protection, 17; analgesics, 14; antibiotics, 9; antihistamines, 8; antivenom, 3, and benzodiazepines, 2. Cases of erroneous or useless treatment: tourniquet (4 cases); incisions or suctions (4); and ammonia and vinegar (1 each). *Discussion:* The majority of snake bites reported involved native animals but also exotic snakes. Manifestations can be severe requiring hospital care. *Conclusion:* Data collected by PCC might give clues to know the situation of envenomations and the possibility of avoiding erroneous therapeutic measures.

149. A Summer of Mushroom Poisonings: Cluster of 23 Human Exposures to *Amanita pantherina* and *Amanita muscaria*

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Background: Amanita pantherina (AP) and *Amanita muscaria* (AM) mushrooms are widely distributed throughout the US and can be difficult to identify. The 2004 AAPCC database lists 44 exposures to this group of ibotenic acid mushrooms. Of these, our center managed 23 (52%). Limited clinical data is usually available on these cases and few have mycology consultation. Our mycologist created a telephone algorithm to assist identification. During the summer of 2004, we noted a spike in the number of AP and AM mushroom exposures. *Case Report:* We conducted a retrospective review of mushroom exposures from 2003 – 2005 using the search terms "unknown mushroom," "*Amanita pantherina*," and "*Amanita muscaria*." Only cases identified by the poison center mycologist using the telephone algorithm were included. For 2004, there were 397 human mushroom exposures, 97 with mycologist consultation. Twenty-three of these (16 AP and 7 AM) occurred during the 3-month period July – September. This compared to 1 in 2003 and 5 in 2005 for the same period (no differences were found and are not included in the analysis). Most (70%) were > 18 years old and 57% were female. Eighteen patients (78%) developed symptoms within 1–3 hours post ingestion. The top five symptoms reported were nausea/vomiting (70%), muscle twitching (43%), CNS depression (39%), coma (30%) and altered mental status (30%). Effects persisted for 13–24 hours in 56% of the exposures. Ten exposures (43%) were managed in a health care facility. Treatment included IV fluids, intubation, charcoal and benzodiazepines. There were no deaths or long-term sequelae documented. *Case Discussion:* Mushroom exposure symptoms are not always precisely matched to the correct species. To properly assess the clinical picture and treatment options, accurate identification is beneficial. In our case series, mushroom identification and symptoms were congruent. *Conclusion:* The expeditious management and favorable outcomes in our series demonstrate the importance of poison center mycological consultation in the acute management of AP and AM mushroom exposures.

150. Serotonin Toxicity from the Combination of Hawaiian Baby Woodrose and Pro-Serotonergic Pharmaceuticals

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Background: Hawaiian Baby Woodrose (HBWR) seeds were used recreationally during the 60's and 70's for their hallucinogenic properties. The active component is lysergic acid, which has a similar structure and action to lysergic diethlyamide (LSD). The hallucinogenic and toxic effects are mediated by agonism of the 5-HT_{2A} receptor. The combination of HBWR with prescription amitriptyline and fluoxetine lead to serotonin toxicity in our patient. *Case Report:* A 21-year-old quadriplegic male with chronic venitlator dependency ingested 8 HBWR seeds with recreational intent. Within 2 hours from ingestion the patient developed difficulty breathing and his ventilator began to alarm from oxygen desaturation. His vital signs on presentation were recorded as a heart rate of 104 bpm and temperature 104.0 °C. The patient appeared to be hallucinating along with agitation, trismus, and dilated pupils. The patient was treated with lorazepam and intravenous fluids which reversed his toxicity within 12 hours. *Case Discussion:* Hawaiian Baby Woodrose (*Argyreia nervosa*) and the Morning Glory are from the same family of *Convolvulaceae*. The seeds resemble small chocolate chips and are usually ingested 4–8 at a time, which is proposed to be equivalent to 10, 000 µg of LSD (400–500µg is considered a large LSD dose). The hallucinatory effects are reported to last 6–8 hours and are of a lesser degree than described with LSD. HBWR seeds have greater autonomic/hallucinongenic effect ratio similar to scopolamine. This patient took a typical recreational dose but serotonin toxicity developed secondary to a drug interaction with his pro-serotonergic prescription medications. The patient's clinical course is consistent with the reported duration of action of HBWR. His and autonomic and muscular signs correlated with serotonin toxicity. *Conclusion:* There are reports of HBWR induced psychosis and overdose with a similar presentation and time course, but without the severity of toxicity seen in this patient. The drug interaction with his prescription medications probably augmented the serotonergic effect of the HBWR.

151. Cardiovascular Suppression in Acute Amanita Muscaria Overdose

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Background: Serious toxicity following ingestion of *A. muscaria* is rare. The primary toxins, ibotenic acid and muscimol, are not known to have directly negative inotropic or chronotropic effects. We report a patient with bradycardia and hypotension following acute *A. muscaria* intoxication. *Case Report:* A healthy 19-year-old man ingested tea brewed from 25 grams of "Grade A" Latvian *A. muscaria* purchased via the Internet. Within one hour, friends observed that he was agitated and confused with intermittent periods of deep sedation. At 3 h post-ingestion, CNS, cardiovascular and respiratory depression were noted as follows: GCS, 8; HR, 51 bpm; BP, 96/52 mmHg; and RR, 8 bpm. Mydriasis, flushing, and myoclonus were also present. Treatment included IV atropine 0.5 mg, diazepam 10 mg, and ventilatory support. Hemodynamic improvement was rapid and extubation occurred within 10 hours. GC/MS performed on the original mushrooms did not reveal adulterants. *Case Discussion:* Bradycardia and hypotension are rare after *Amanita* ingestion. However, these reports are specifically restricted to children after *A. pantherina* intoxication. Despite its name, significant amounts of muscarine are not found in *A. muscaria*. Both this confusing nomenclature and the wide variation in presenting symptoms have occasionally led to inappropriate administration of atropine as an "antidote." Ibotenic acid and muscimol are agonists at glutamate and GABA receptors respectively and do not cause direct cardiosuppressive effects but likely contributed to the CNS alterations and myoclonus observed in this patient. *Conclusion: A. muscaria* intoxication can be vexing because of its confusing nomenclature and clinical presentation. Further research is needed to delineate the cardiotoxic components of this species. While the severe poisoning noted in this patient may have resulted from ingestion of a highly concentrated tea, quick resolution occurred with supportive care.

152. Cranial Catscan Findings Following Acute Cyanide Ingestion

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Background: Cranial catscan findings following acute cyanide ingestion are rarely described. *Case Report:* A 43-year-old man presented to the emergency department (ED) comatose following drinking from a coffee cup shortly after his ex-lover visited him

at his work site. Witnessed stated he collapsed and had a gran mal seizure. He then became apneic and was endotracheally intubated by paramedics. His past medical and medication history were unremarkable. His physical examination revealed a rectal temperature of 95.9 °F, pulse 101 beats per minute and a blood pressure is 86/44 mm/Hg. No spontaneous respiratory effort or movements were noted. Pupils are 4 mm and nonreactive. He was areflexic including absent plantar reflexes. The remainder of his physical examination was normal. The patient received two liters of normal saline then 15 micrograms/Kg/minute of dopamine to maintain a systolic blood pressure of 100 mm/Hg. The patient did not receive amyl nitrite due to intubated state but did receive sodium nitrite followed by sodium thiosulfate without improvement. Arterial blood gas was obtained which showed a pH of 7.03 and a high normal oxygen. A cranial catscan revealed diffuse hypodensity involving the brainstem and the cerebellum. A small fourth ventricle, cisternal space effacement and abnormal density of the basal ganglia were noted. All findings are consistent with diffuse cerebral and cerebellar edema with impeding brainstem herniation. Urine EMIT™ drug screen was positive for opiates, cocaine and cannabinoids. A blood cyanide level later become available and was 157 ug/dL (normal < 20 ug/dL). The patient was pronounced brain dead and expired within 24 hours. *Case Discussion:* The cranialCT findings in cyanide overdose are rarely described. Our patients cranial catscan is a classic finding that is rarely reported. *Conclusion:* Fatal cyanide poisoning is associated with diffuse cerebral and cerebellar edema on cranial catscan.

153. Dietary Caffeine use is Common among Females Using Other Pharmaceutical Products

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Background: Although caffeine supplementation in dietary tablets and health beverages has increased in recent years, characteristics of patients seeking treatment for supplemental caffeine use and their medical outcomes is unknown. *Methods:* A 3-year (01/01/02-12/31/04) retrospective analysis of all supplemental caffeine ingestions reported to a regional poison center (annual census >90,000) was conducted. Included were intentional ingestions in patients age 10 and older involving a dietary tablet or beverage containing supplemental caffeine. Excluded from analysis were cases involving only a coffee or tea product, prescription medications containing caffeine, suicide attempts, therapeutic errors and unintentional ingestions. *Results:* Of 265 cases reported to the poison center involving some form of caffeine, 70 cases involved supplemental caffeine in the form of a dietary tablet or beverage. Of these 70 cases, 55% were female, mean age was 25 years (95%CI: 22.1-27.9). Only 1 case involved concomitant use of alcohol, 3 involved an illegal recreational drug, and 41 cases (59%) involved concomitant use of other pharmaceutical products. Six patients needed ICU admission, 2 needed admission to a medical floor, all patients survived to discharge. Of 195 caffeine cases not involving a dietary tablet or health beverage, only 48% were female, mean age was 19.6 years (95%CI: 18.7 to 20.5), and only 21% reported concomitant use of another pharmaceutical product. *Discussion:* Patients seeking medical treatment for use of supplemental caffeine in the form of a dietary tablet or beverage tend to be females in their mid-20s. Concomitant use of other pharmaceutical products in this group is common. *Conclusion:* Caffeine use in the form of a dietary supplement is more common in females and among those using other pharmaceutical products.

154. A Case of Misidentification: The Problem with Berries

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Background: Accidental ingestion of plant material by children under the age of 6 years accounted for 73% of plant exposure calls made to poison control centers (PCC) in the year 2004. Reliable identification of plant species is difficult over the phone, and callers may be referred to local plant nurseries for assistance. We present a case of berry misidentification that led to unnecessary medical management of a pediatric exposure. *Case Report:* The parent of a 2-year-old male contacted the PCC for advice after the child ingested 2 berries from a vine growing wild at the edge of their yard. Attempts by the parent to locate the exact plant species through the Internet proved unsuccessful. The poison specialist tentatively identified the plant as *Solanum dulcamara* (bittersweet nightshade) based on the description of the plant and berry. The parent was directed to take the specimen to their local plant nursery for definitive identification, and instructed to call the PCC back for further discussion. Upon later follow-up with the parent, it was discovered that the nursery identified the plant as *Atropa belladonna* (deadly nightshade). The parent called the PCC from the nursery, but was routed to a different PCC than that of initial contact. The child had been transported to a local emergency department where activated charcoal was administered via nasogastric tube, and the child observed for

symptoms. The child experienced diarrhea as the charcoal was passed, but developed no further symptoms and was discharged to home after several hours. *Conclusion:* Although identification of plant species over the telephone is uncertain, the characteristics described in this case were clearly not consistent with *Atropa belladonna*. Whereas nursery staff may be knowledgeable about cultivars used in landscaping, they may not be as familiar with species found naturally in the local flora. Poison control specialists should consider the potential for misidentification of native species by nursery staff, which may result in inappropriate medical management of pediatric plant exposures.

155. Fatal Ingestion of a Mexican Herbal Tea Containing Pennyroyal

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Background: Pennyroyal (*Mentha pulegium*) is a cultivated Eurasion herb of the true mint genus and an ingredient of medicinal teas used around the world. It is a diuretic and abortifacient but is most commonly used to treat stomach ailments. Pulegone is the toxic constituent associated with the major toxicity of pennyroyal. *Case Report:* A 27-year-old recent Salvadoran immigrant, following the advice of a *curandera* (Mexican folk healer), drank "Te de Medianoche" (midnight tea) daily for two weeks to treat abdominal pain. The tea also contained *Satureja macrostema*, *Hipericum perforatum* (St. John's Wort), *Citronella mexicana*, and *Tagetes florida*. He presented to the ED with altered mental status and these vital signs: BP150/90 mmHg, HR 91 bpm, RR18 bpm, T 98.2, oxygen saturation 98%. He received ET intubation and sedation. Initial labs were Na^+ 104 mEq/L, K^+ 2.8 mEq/L, Cl^- 65 mEq/L, HCO_3 26 mEq/L, Glu 111 mg/dL, AST 150 U/I, ALT 114 U/I, $AlkPO_4$ 126 U/I, NH_3 34 mcg/dL, WBC 9.1/μL, Hct 39%, BUN18 mg/dL, creatinine 1.3 mg/dL, urine 3 + proteins and ketones, and CPK 2632 U/I. Cardiac monitor and ECG showed a normal sinus rhythm, CXR and brain CT were normal. He was given hypertonic saline IV and NG *N*-acetylcysteine therapy. Electrolyte values and liver functions gradually improved over four days, however, cardiopulmonary status deteriorated over the next two weeks as he developed pneumothoraces. By week three his EEG showed no brain activity. The patient never regained consciousness and life support measures were withdrawn on Day 29 with family consent. The family refused autopsy and repatriated the remains to El Salvador. *Case Discussion:* There were 29 pennyroyal ingestions reported to the AAPCC in 2004 resulting in none to minor effects, only one major effect, and no deaths. Our patient ingested a tea containing multiple herbs, with pulegone being the most toxic constituent. His electrolyte disturbances, hepatic dysfunction, and general clinical deterioration are strongly suggestive of pennyroyal toxicity. *Conclusion:* Herbal remedies recommended by *curanderos* to treat common ailments may contain multiple ingredients, some of which may lead to life-threatening or fatal consequences.

156. Validity of the AAPCC Beta Blocker Ingestion Guideline

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Background: The American Association of Poison Control Centers' out-of-hospital guideline published in 2005 advises specific amounts of β-blocker medication that require evaluation at a health care facility (HCF). Our goal was to validate this guideline using actual pediatric patients. *Methods:* This was a retrospective study of the database from six poison centers for unintentional ingestions of the three most common β-blockers from 2000 to 2004. Only children under the age of 6 years with single substance ingestion of propranolol, atenolol, or metoprolol where selected. In addition, each case had to have a recorded weight, amount ingested, follow up call and known outcome recorded. *Results:* There were a total of 441 children with single β-blocker ingestion. There were no deaths and no severe symptoms noted (0%, 95% CI 0-0.9%). The amount ingested and body weight were recorded for 258 (21% ingested atenolol, 56% metoprolol, and 22% propranolol). The average age was 24.1 months. The most common treatments provided to the 152 (58.9%) who received some treatment were activated charcoal (55.8%), gastric lavage (8.9%), intravenous fluids (3.1%), and syrup of ipecac (1.9%). Only two patients were treated with glucagon. There were 184 (71.3%) who were treated at a HCF. However, the guideline would have referred only 127 (49.2%) to a HCF. Thirty children of the 131 (50.8%) children that the guideline would have recommended treatment were not treated. Only 6 (2.3%) children had mild clinical effects, and these did not appear dose-related. *Discussion:* The 2005 AAPCC β-blocker guideline appears to provide very safe triage dosages (negative predictive value = 100%, 95% CI 97.2-100%) for young children. *Conclusion:* If it had been available, the guideline would have kept an additional 55 (21.3%) children at home. Since there were no severe clinical effects in this group, even higher triage doses could be used to keep even more of these children at home without incurring additional risk.

157. A Nonstatistical Algorithm for Automated Bioterror Event Surveillance

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Background: Increased awareness of potential terrorist acts has led to development of automated public health surveillance systems which evaluate markers of illness, including clinical symptoms, school or workplace absences and purchases of nonprescription medications. Deviations from historical patterns identify clusters. Statistical methods are used to increase the "signal to noise ratio," reducing the number of false alarms generated. Parameters can be tailored to reflect expected deviations (e.g., weekday versus weekend, seasonal variations, etc.) Operating continually with on-site experts (SPIs) at the initial point of contact, Poison Control Centers (PCCs) are ideal sites for early detection of public health threats. Utilizing PCCs in this manner can ensure response before any harm has occurred. Experienced SPIs often identify events by recognizing more subtle changes in case patterns than do statistical methods. We developed a nonstatistical pattern recognition algorithm to more closely approximate event recognition by SPIs. *Methods:* Blinded PCC case data are loaded from Toxicall® to AllegroCache™, a dynamic object caching system. Inquiry cases and exposures are included, as inquiries may provide the first indication of an event. Case data are compared with one or more threshold values (specific or default); exceeding them alerts the SPI to respond in real time by: 1) dismissing events known insignificant, 2) referring identified events to direct responders, or 3) deferring uncertain events for later reevaluation (e.g., after additional research). *Results:* Automated surveillance systems can help identify threats to public health, including acts of bioterrorism. Though statistical methods are commonly used to identify such events based on deviations from patterns, logical algorithms represent another view of data patterns more like that applied by the on-site experts. *Conclusion:* Poison control centers have access to early information about events of public health significance, including acts of bioterrorism, and the on-site experts to interpret and act on that information. A nonstatistical algorithm can provide a valuable alternative to statistical methods for evaluating patterns of case information.

158. Poisoning in Prisons: A Closely Guarded Secret

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Background: About 1% of the adult USA population is incarcerated (2.2 million). Guarded transportation of these patients to a health care facility is often required. A MEDLINE search found no recent studies on providing medical toxicology care to this unique at-risk population. Our goal is to review the toxic exposures to incarcerated patients to determine the substances, treatments, and outcomes. *Methods:* This was a retrospective review of the poison center exposure database for one state from 2002 to 2005 for human exposures at a prison, jail or detention center. The cases were reviewed for age, gender, route of exposure, substance(s), symptoms, treatment, and outcome. *Results:* The state has approximately 155,000 inmates. There are 156 cases that met the inclusion criteria. Most were men (75.0%), and the ages ranged from 14 to 56 years. The most common substances ingested were antidepressants, antipsychotics, NSAIDs, acetaminophen, and unknown drug. Some of the unusual substances were razor blades, glass, aluminum sulfate, carburetor cleaner, herbicide, lice products and graffiti remover. Ninety-five (60.9%) had no symptoms or minimal symptoms. Another 18 (11.5%) had only minor clinical effects. Only 6 patients (3.8%) had moderate or major effects. There were 33 patients (21.2%) who were not followed and their outcome is unknown. No deaths were reported. *Discussion:* This is the first study of the medical toxicology of prisoners. Their transport to and care in a HCF have risks that require additional resources not needed by other patients. Although both common and unusual substances were ingested by these patients, very few prisoners needed transport to a HCF. Poison centers could help correctional facilities by better understanding which patients need transport to a HCF. *Conclusion:* There was about one call per year to a poison center for every 4,000 prisoners. Most inmates can be observed at their correctional facility and do not require secured transportation to a HCF. Additional research is needed to determine the unique services that poison centers should provide to this unusual population.

159. Analysis of the Ethylene Glycol Poisoning: A 5-Year Study in the Czech Republic

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Background: To evaluate retrospectively the severity and renal consequences following ethylene glycol (EG) ingestion in a 5-year study in the Czech Republic. *Methods:* Data from medical reports concerning clinical course of patients with EG

intoxication reported to the Czech Toxicological Information Centre and toxicological laboratories between 2000 and 2004 were analysed. *Results:* Medical records of 206 cases of EG intoxication were obtained. Twenty-four patients were children; they ingested EG unintentionally (the highest amount was about 30 ml). They developed only mild metabolic acidosis (33%). Twenty-four adults died due to EG intoxication. One hundred and three patients ingested unintentionally 60 ml of EG on average; the maximal serum EG level was 4.00 g/l. Metabolic acidosis (50%), nephrotoxicity (13%) and coma (5%) developed from symptoms of intoxication. Sixty-three patients (49 males, 14 females) attempted suicide with EG. They ingested significantly higher dose of EG (mean 330 ml) than patients who drank EG by mistake. The maximal serum EG level was 8.68 g/l. Signs of intoxication were metabolic acidosis (76%), coma (54%), and acute renal failure (44%). Fifty-one adults developed signs of nephrotoxicity. In 20 patients, renal function normalized until their discharge from the hospital. Further 21 patients were followed-up. In 10 patients the renal function completely recovered during 6 months, in 2 patients until 12, and in 1 patient until 17 months after discharge from the hospital. In 3 patients renal parameters were altered 6 months after discharge from the hospital but they did not comply with further follow-up. In 5 patients renal damage persisted 12 months after discharge from the hospital. *Discussion:* The potentially toxic dose of EG can be as little as one swallow. Haemodialysis treatment probably positively influenced the course of severe intoxication. Our follow-up analysis supports the opinion that EG toxic kidney damage is reversible. *Conclusion:* Unintentionally ingestions were connected with mild symptoms under the treatment with ethanol. The suicide attempts caused severe complications, the haemodialysis was mostly required.

160. Longitudinal Trends in the Incidence of Pyrethrin and Pyrethroid Exposures in the United States

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Background: The Food Quality Protection Act resulted in a decision by the EPA to phase out and eliminate the use of organophosphate insecticides in residential environments. The phase out process spanned from 2000 to 2005. Our previous Poison Control Center research determined there was a decline in organophosphate exposures during that time period. This phase out may have resulted in an increased consumer use of organophosphate alternatives. This study utilized national Poison Control Center data to assess whether the risk mitigation decision affected exposures to other classes of insecticides, pyrethrins and pyrethroids, in the U.S. *Methods:* Pyrethrin and pyrethroid, and total insecticide exposure data were extracted from Annual Reports of the American Association of Poison Control Centers Toxic Exposure Surveillance System (TESS) for 2000 to 2004. Pyrethrin and pyrethroid incidents were examined by total exposures for each year, and stratified by age range, reason, and medical outcome. Pyrethrin and pyrethroid incidents were examined as a proportion of all insecticide exposures. *Results:* Pyrethrin and pyrethroid exposure incidents increased. This increase was observed for all age categories and exposure reasons. The proportion of all insecticide exposure incidents involving pyrethrins and pyrethroids consistently increased for each year. Of those cases where medical outcomes data were recorded (44% of all cases), the majority of outcomes resulted in no symptoms (38%) or minor symptoms (52%). *Conclusion:* TESS data showed a clear and consistent increase in incident cases involving pyrethrins and pyrethroids in association with the phase out of organophosphates from residential uses. Regulatory decisions can have a complicated effect on the incidence of human exposures to pesticides.

Year	No. of exposures (*)	Age			Reason	
		<6	6–19	>19	Unintentional	Intentional
2000	13,759 (30)	4,926	1,735	6,945	12,859	392
2001	17,294 (36)	5,828	2,138	9,174	16,094	427
2002	19,442 (38)	6,476	2,193	10,573	18,032	531
2003	21,135 (41)	6,787	2,353	11,661	19,607	507
2004	24,169 (45)	7,387	2,653	13,877	22,355	646

*Percentage of all insecticide incidents involving pyrethrins and/or pyrethroids.

161. Relationship between Accidental Workplace Carbon Monoxide Deaths, Season, and Temperature

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Background: Carbon Monoxide (CO) is a lethal but preventable cause of morbidity and mortality in the workplace. The medical literature suggests that CO deaths increase during the winter season and in relation to severe weather disturbances, however it is not clear whether this is strictly related to temperature. *Methods:* We created and analyzed a database of CO workplace fatalities compared to mean monthly US temperatures for the years 1992 to 2004 inclusive. The data was derived from data collected by the Center for Fatal Occupational Injury (CFOI) and National Climactic Data Center (NCDC). *Results:* The CFOI database reported 313 CO deaths during this period, 217 of these were accidental. Winter months (December, January, February) account for 108 (50%) of the 217 fatalities. The number of CO fatalities for each month in the 156 month period were plotted against the mean US temperature for each month and subjected to regression analysis. The correlation between number of fatalities and temperature was negative, weak and significant, with an adjusted R square of 0.12 and $P < 0.0001$. Plotting the number of CO fatalities in each month of the year (e.g., January all years) versus mean temperature across all years for that month revealed a stronger negative correlation, adjusted R square of 0.58 and $P < 0.01$. Finally, a plot expressing the percentage of all deaths versus mean monthly temperature as a threshold reveals a sharp rise in the rate of deaths for months with mean temperatures below 38°F. *Discussion:* This research does not represent the full scope of CO poisoning or examine regional weather conditions. Nonetheless, poison centers and public health officials may find this information useful in creating public awareness campaigns to reduce CO poisonings. *Conclusion:* Deaths from CO poisoning are associated with winter season, are related inversely to temperature, and rise steeply in months when the mean US temperatures is below 38 °F.

Workplace CO fatalities 1992 to 2004 by month of they year

Months	Total fatalities	Mean US temp
Jan	44	32.50
Feb	29	36.53
Mar	22	43.83
Apr	23	52.45
May	16	62.88
Jun	19	69.54
Jul	11	74.57
Aug	24	73.40
Sep	8	65.93
Oct	22	54.58
Nov	22	42.84
Dec	36	34.64

162. National Toxicity Trends Associated with Waterproofing Agents

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Background: To characterize six years of national data on human exposures to aerosol waterproofing agents reported to the TESS database. *Methods*: Aerosol waterproofing agents were identified from Poisindex (PDX) products and searched for human exposures in TESS from Jan 1, 2000 through Feb 28, 2006. *Results*: For all routes, there was an increase in exposures over time. For inhalation route, exposures were 132 (2000), 95 (2001), 95 (2002), 184 (2003), 188 (2004), 347 (2005), and 101 (2006). The increase between 2002 and 2003 was related to at least two different products, and is likely due to new entries in PDX, which carried through to subsequent years. The increase in 2005–2006 was related to tile grout and boot sealant outbreaks. There was a clear seasonal trend, with more exposures occurring during fall/winter months. Median age was 13 years (mean 18.2); gender

predominantly male (56%). The most frequent clinical effects were cough (23%), dyspnea (16%), and dizziness (5%), with others less than 5% each. Only 13% remained asymptomatic when followed to a known outcome. Management was on-site in 61%, with 24% treated and released at a health care facility; 5% were admitted. Treatments included dilution (41%), fresh air (37%), bronchodilators (8%), oxygen (7%), steroids (3%), and antibiotics (2%); 3 required intubation. Outcome was moderate (17%), minor (25%), and major (8 patients). Outcome severity was associated with median age (major/moderate 48 versus 28 yrs). *Discussion*: The number of human exposures to aerosol waterproof products has increased markedly over the past six years. *Conclusion*: Aside from known outbreaks over the past year, there is a baseline, escalating rate that warrants further prevention measures, given significant morbidity shown by our data. The seasonal trend suggests that education should be focused on the fall and winter months.

163. Epidemiology of Acute Poisoned Children in Oslo – A Two-Year Prospective Study

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Background: The incidence and types of acute poisonings in children change over time. This study was designed to evaluate the current epidemiology of poisonings among children in Oslo, and findings were compared to a similar study from 1980. *Methods:* Prospective observational study including all children <16 years of age with a main diagnosis of acute poisoning admitted to hospital or the Central outpatient clinic in Oslo during two years. *Results:* 226 children with 234 episodes of acute poisonings admitted to the outpatient clinic (97) or hospital (137) were included. The annual incidence was 1.2%. Highest incidences were found in 1-year-old males (5.1%) and 15-years-old females (8.4%), producing a U-shaped curve. All repeaters were females, age 14 and 15 years old. Among the youngest children, pharmaceuticals (42%), domestic products (30%), and plants or mushrooms (16%) were the most common toxic agents; whereas ethanol (51%) and tablets (47%) were most common among the older children. The reasons for poisonings <8 years were mainly children playing (88%) and medication failure (7%), while reasons ≥8 years were suicide attempts (33%), other deliberate self-harms (15%) and alcohol or drug related (30%). All children survived without sequelae. *Discussion:* Total incidence was significantly reduced from 1980 ($p < 0.001$). Significant incidence reductions were seen for pharmaceuticals (–61%, $p < 0.001$), tobacco (–97%, $p < 0.001$), and petroleum products (–61%, $p = 0.035$). No significant changes for other agents. Types of pharmaceuticals changed; reduced tranquilizers (11%–3%) and salicylates (7%–1%), while paracetamol increased (0–6%). Older children were more seriously poisoned than younger children; 33% vs. 17% were hospitalized more than one day, 28% vs. 3% were treated in the ICU, and 22% vs. 15% developed complications. *Conclusion:* Associated with the countermeasures initiated in Oslo after the study in 1980, the incidence of acute poisonings in children has decreased. There were two major groups of poisoned children; those 0–4 years old, accidental, but mildly poisoned during play; and older girls, age 14–15, with deliberate or alcohol-related self-poisonings, as seen in adults.

164. Poison Center's Role in Chempack Activation and Response

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Background: Chempack (CPK) is a federal program managing "forwardly placed" sustainable repositories of nerve agent antidote (pralidoxime chloride) and symptomatic treatments (atropine sulfate, diazepam) throughout the US. The Illinois Poison Center (IPC) was asked to serve as a 24-hour resource to facilitate activation and transport of CPKs from storing to non-storing facilities and first responder field treatment sites. A simple and reliable process with few steps was desired. *Methods:* Chicago and IL Departments of Public Health, emergency management agencies (EMAs), and IPC drafted a CPK Sharing Protocol (CSP) using the 24-hour IPC call center. *Results:* The following plan will be used for transfer of assets from a CPK HCF to a non-CPK HCF first responder field treatment site: 1) A working diagnosis of nerve agent exposure with imminent depletion of antidote is made; 2) Non-CPK HCF or first responder in field calls state or city EMA requesting CPK assets; 3) Requestor provides incident information to EMA; 4) EMA notifies IDPH or CDPH CPK Team, IPC, law enforcement, and internal administration; 5) Using reference, IPC identifies predetermined CPK HCF for requesting non-CPK HCF or field incident; 6) IPC calls CPK HCF ED Charge Nurse to request activation of CPK portion(s); 7) Pharmacy and security staffs activate CPK container. CPK contents are divided into thirds; coded orange, blue and green. Requested colors are pulled and inventoried; 8) Inventory transfer forms are

completed by DEA registered personnel; 9) Colors are bagged and sealed with provided rolling duffel bags; 10) Bags are transported to a predetermined transfer point under security escort; and 11) IL EMS or Chicago Police transport bags to non-CPK HCF/incident. *Discussion:* Rapid activation and transport of CPK assets to multiple non-CPK HCFs or field incidents is a potentially complicated dispatching duty. *Conclusion:* Initial IPC CPK dispatching is a "forward only" flow of communication during the initial 1–2 hours of response, where partner agencies have a pre-understanding of the process and responsibilities of all involved.

165. Epidemiology of Acetaminophen Poisoning Presenting to a Large Urban Emergency Department

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Background: Acetaminophen is the commonest drug involved in self-poisoning in many countries. The aim of this study was to describe the epidemiology and outcome of acute acetaminophen poisoning presentations to an individual ED. *Methods:* Data was collected prospectively on all poisoned patients presenting to an inner city ED from May 2005-February 2006 using an electronic clinical toxicology database (Microsoft Access®). *Results:* 306 of 998 (31%) poisoning presentations to the ED involved acetaminophen overdose (55% female, mean age 31; 45% male, mean age 40). Co-ingestants were present in 66% cases (ethanol in 32% cases). Mean reported acetaminophen ingestion was 12.4g (known in 67% of cases). Mean time to presentation (known in 79% of cases) was 6.75 hours. 80 (26%) patients were high risk for acetaminophen related hepatotoxicity (66 chronic ethanol excess, 9 eating disorder, 4 taking P450 inducers, 1 chronic disease). Acetaminophen was detectable (>10 μg/ml) in 56% (171) of cases (mean initial acetaminophen concentration 112 μg/ml, range 11–632 μg/ml). 108 (35%) cases required antidotal treatment with IV N-acetylcysteine (NAC). 9 (3%) developed significant hepatotoxicity (INR>1.3 and/ or ALT>1000IU/L) requiring extended treatment with NAC (mean time to presentation in this group 29 hrs, range 7.5–72 hrs). Mean peak INR 2.49 (range 1.32–6.39) and ALT 4570IU/L (range 611-9900IU/L). 4 patients developed renal impairment (1 in the absence of hepatotoxicity), 2 required renal replacement therapy. There was one death (0.3% cases); this was in the one patient who developed acute liver failure and who died 2 days post-transplantation. No patient administered IV NAC within 8hrs of ingestion developed significant hepatic or renal toxicity. *Discussion:* Most cases did not have potentially toxic plasma paracetamol concentrations requiring NAC treatment; although the 35% who were given NAC is higher than previously reported series (3–20%). *Conclusion:* Significant hepatotoxicity was rare and confined to late presenting patients. None of the patients who presented early and were given NAC within 8 hours of ingestion developed heptotoxicity. Prompt assessment and treatment of patients with acetaminophen poisoning is important.

166. Relative Toxicity of Tricyclic Antidepressants in Overdose

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Background: In the United Kingdom between 5 and 10% of all drug overdoses include use of a tricyclic antidepressant. The toxicity of these agents is well known. Epidemiologic data has suggested that some agents (e.g. dosulepin [also known as dothiepin], amitriptyline) are more toxic than others (e.g., lofepramine). These data are derived from the Fatal Toxicity Index, which is the number of registered deaths with the agent divided by the numbers of prescriptions issued. This measure is subject to confounding and bias, for example there may be preferential prescribing of particular antidepressants to patients at increased risk of overdose. *Methods:* Retrospective cohort study of all patients with drug overdose including exposure to a tricyclic antidepressant and presenting to a single hospital in the north of England between January 2000 and December 2005. Admission to an intensive therapy unit (ITU) was used as a surrogate indicator of severe toxicity. *Results:* Of 65,67 episodes of drug overdose presenting during this period, 550 (8.4%)included use of a tricyclic antidepressant. Of these, 25 (4.5%) required admission to an ITU, most often due to a deterioration in conscious level. This was more common for patients taking co-ingestants, especially sedatives and alcohol. For individual agents, ITU admission rates were 13/261 (5.0%) for amitriptyline, 10/157 (6.4%) for dothiepin, 1/78 (1.3%) for lofepramine and 0/45 for other tricyclics. Of the patients who took more than one tricyclic, 1/9 was admitted to ITU. There were no significant differences in age, sex or frequency of alcohol, sedative or other co-ingestant exposure between these various groups. Information on the doses apparently taken is not available. *Discussion:* These data support earlier epidemiologic evidence that dosulepin and amitriptyline are more toxic than lofepramine when taken in overdose. A much larger data set would be

required to compare adequately the toxicity of dosulepin with that of amitriptyline. *Conclusion:* Dosulepin (dothiepin) and amitriptyline are more toxic than lofepramine when taken in overdose.

167. Computerized N-Acetylcysteine Physician Order Entry by Template Protocol for Acetaminophen Toxicity

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Background: Computerized physician order entry (POE) is an essential component of electronic medical records. We describe our experience with n-acetylcysteine ordering for acetaminophen (APAP) toxicity with the use of pre-arranged templates, or order sets. *Methods:* All computerized physician n-acetylcycteine orders (by template through the EPIC system) for APAP toxicity were retrospectively analyzed over a 20-month period from July, 2004 to February, 2006. *Results:* There were 24 total cases. In nine (37.5%) of the cases the Prescott continuous infusion protocol was used. Five (20.8%) of the cases involved the Rocky Mountain 48-hour intravenous protocol, and in 10 (41.7%) cases the 72-hour oral protocol was used. There were no medication administration errors. All APAP toxicity cases were successfully treated with no deaths or liver transplantations reported. *Discussion:* The advantages of templated POE include standardized ordering, computerized weight-based dosing calculation, physician prompts for correct sequencing of orders, legible and rapid communication to pharmacy, and direct physician to pharmacist communication with no intermediaries. *Conclusion:* Our experience demonstrates that n-acetylcysteine treatment protocols are ideally suited for templated POE.

168. Anaphylactoid Reaction to Octreotide

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Background: Octreotide, a synthetic somatostatin analogue inhibits the secretion of insulin from pancreatic βeta cells. It is a recommended antidote for sulfonylurea poisoning. We report a case of an apparent hypersensitivity reaction to octreotide. We could find no previous report. *Case Report:* A 2-year-old, 13.5 kg boy was found to have altered mental status, diaphoresis and decreased responsiveness. He had previously been playing with his father's glyburide. His bedside blood sugar was 25 mg/dl (1.4 mmol/L). It initially responded to hypertonic dextrose in water but because of relapse, he was treated with 13.5 ug of octreotide. Immediately after its intravenous administration he had a behavioral change and an urticarial rash. There was no respiratory or cardiovascular involvement. There was no further hypoglycemia and no additional octreotide therapy. *Case Discussion:* Our patient had an apparent allergic reaction to octreotide. Octreotide, a somatostatin analogue, is an unlikely antigen and somatostatin is a demonstrated mast cell histamine releaser. Therefore, this reaction was likely anaphylactoid in nature rather than a true allergic (hypersensitivity) event. *Conclusion:* Clinicians should be aware of the potential for an anaphylactoid reaction to octreotide and be prepared to treat it with appropriate pharmacotherapeutic agents as the situation requires. An alternate strategy is considering diazoxide rather than octreotide for the treatment of sulfonylurea-induced hypoglycemia.

169. Ingestion of Liquitab Contents by a One-Year-Old Child

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Background: Liquitabs contain concentrated liquid detergent for washing clothes. Enquiries to NPIS (Cardiff Centre) in 2005 regarding these fabric cleaning sachets account for 50% of all enquiries regarding washing detergent and 70% of those regarding washing liquid. Ninety percent of cases involved children under 5 years. Reports of corrosive eye damage has led to concern. *Case Report:* A 1-year-old boy was brought to hospital 1 hour after biting into a Bold 2-in-1 Lavender and Camomille Liquitab. Detergent was seen in the child's mouth and swallowing water caused the child to vomit. On admission he was noted to be irritable, drowsy and had lots of airway secretions. He was apyrexial with saturations of 94%, heart rate was 156 bpm and respiratory

rate 29 per minute with coarse bilateral crepitations. One hour later oxygen saturations had reduced to 89%, respiratory rate 30, with signs of respiratory distress. He received oxygen and a salbutamol nebuliser with no effect. CXR was unremarkable. Five hours after ingestion he suffered from respiratory deterioration, was intubated and transferred to PICU with predominantly metabolic acidosis, heart rate 180 bpm, BP 90/50 mmHg. He was well perfused. Chest x-ray now showed right upper zone consolidation. Ventilation was weaned the following day. He was extubated but had stridor, wheezing and excess secretions which improved slightly with adrenaline nebuliser and dexamethasone. He was reintubated. Three days later he was extubated. He had significant wheezing, subsequently developed stridor and tracheal tug and was given adrenaline nebulisers and further dexamethasone whereafter symptoms settled. Full recovery followed over the next two days. *Case Discussion:* Reports of foam aspiration from laundry detergents are rarely serious. Advice given when children are exposed to washing detergents is often that they are minor irritants which carry a small risk of aspiration if foaming at the mouth or vomiting occurs. *Conclusion:* In view of the seriousness of this case and recent reports of corneal damage, further investigation may be warranted regarding the pH of these agents, whether they pose a greater risk than normal washing detergents and whether the manufacturers are providing adequate information and childproof packaging.

170. Neuroleptic Malignant Syndrome (NMS) Induced by Aripiprazole (ARP)

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Background: ARP is an atypical antipsychotic which has not been reported to produce significant toxicity. We report a patient who developed NMS and responded with treatment. *Case Report:* An 18-year-old female presented to an ED 12 h PI after ingesting a handful of 5 mg ARP tablets. She was minimally responsive to verbal stimuli.VS: BP 111/50, HR 50/min, R 28/min, T 101.7 °F. The patient had generalized muscle stiffening and rigidity. Abnormal lab tests were an elevated CPK of 1591 and a leckocytosis of 20,000. The patient had been on ARP for 2 months PTA. Management consisted of intubation, assisted ventilation, and oral bromocriptine 5 mg q 8 hrs with lorazepam prn, APAP suppositories, a cooling blanket and hydration with IV fluids. Although her temperature rose to 102 °F on day 2, she began to awaken on day 3, was able to be extubated and became afebrile. She continued to improve while receiving the above therapy for 1 wk and was discharged without any sequelae. *Case Discussion:* The adverse events reported from an ARP OD by the manufacturer and from a small series of published exposures in the literature so far, has consisted of mild CNS effects that were managed only with supportive care. Our experience of managing 37 patients between January 03–March 06 with ARP OD has been similar. Only 1/10 symptomatic patients developed NMS while the rest had mild CNS effects managed with supportive care. The NMS triad involves the ANS (fever in 100%), the extrapyramidal system (rigidity), and cognitive changes. Two lab findings reported in 75% of NMS cases are a high CPK and leukocytosis. Once symptoms develop, progression is rapid and reaches a peak in 72 hrs and can last for 8 hrs-40 days. Most patients who survive make a full recovery but some maybe left with permanent neurological deficits. Early recognition is important to reduce mortality. Supportive therapy with adequate hydration, cooling blankets to reduce hyperthermia and ventilatory assistance are essential. Discontinuing the neuroleptic and administering bromocriptine and dantrolene (individually or combined) is recommended to reduce the morbidity/ mortality. *Conclusion:* We report the first case of NMS induced by an ingestion of ARP that responded to appropriate medical management.

171. Oral Systemic Use of Benzydamide: A Major Drug of Abuse among Brazilian Youth

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Background: Benzydamide is NSAID used in many countries for topical use for relief of oral and gynecological symptoms. It appears that Brazil is unique in that there are oral systemic formulations as well, and, hence, there are infant drops, tablets, throat sprays, mouthwash, and vaginal douches. Oral systemic use, even at therapeutic doses, may be a cause of hallucinations, acute psychotic behavior, irritability, aggressiveness, and gastrointestinal discomfort. It is a major drug used by young adults, as it is a cheap drug to obtain hallucinogenic responses *Case Report:* A total of 30 cases of acute overdose were reported to CEATOX (Sao Paulo Regional Poison Center) between January 2002 and February 2006. The cases were analyzed as to age, sex, motive for overdosing, amount ingested, and outcome. The results showed there were 23 cases of drug abuse, 6 suicide attempts, and one of therapeutic error. The mean age was 18.1 years; there were 21 males, 6 females and three unknown, while the average number of tablets was 12.8 per victim in accidents. In the suicide group, the mean age was 17.3 years of age, and the number of tablets was

27.8 per victim. One 15-year-old girl died after taking 100 tablets. The symptoms presented included 18 with hallucinations, 8 cases of gastrintestinal discomfort, 3 with neurological disorders, and one death. *Case Discussion:* In recent years, benzydamide has gained widespread popularity, especially among teenagers, as it can be easily and inexpensively acquired with a high chance of obtaining the desired effect of intense symptoms of hallucination, agitation and "tripping," most often at the end of the week. It is touted as an inexpensive and legal substitute of ecstasy, glue sniffing and even cocaine, as it may be acquired in any pharmacy. Consumption of benzydamide has increased dramatically in the past four years. It may become easily a major substitute of ecstasy and even cocaine. The side effects may be very discomforting and include vomiting, pain and even bleeding. *Conclusion:* Benzydamide has become very popular especially in the evenings and may even sustitute other models of illegal drugs. Benzydamide can be easily obtained and may become a new player among drug of abuse.

172. Is it worth Checking Blood Tests after Early Treatment of Acetaminophen Overdose with Intravenous Acetylcysteine?

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Background: Intravenous acetylcysteine is the treatment for choice for patients with acetaminophen overdose in the UK. Most clinicians check prothrombin time (PT), plasma creatinine, plasma bicarbonate and alanine transaminases (ALT) after treatment is completed. However, there is uncertainty as to the need for this in those treated within 8 hours of overdose. The aim of this study was to identify the frequency of PT, creatinine and/or ALT abnormalities after early acetylcysteine treatment. *Methods:* Retrospective cohort study of patients with acetaminophen overdose treated within 8 hours with intravenous acetylcysteine between April 2003 and March 2006. *Results:* Of 182 episodes of acetaminophen poisoning treated with intravenous acetylcysteine according to UK treatment guidelines during the period of study, 24 (13%) were documented as starting acetylcysteine within 8 h of overdose. Of these, 3 had abnormal ALT measurements at presentation and 10 had risk factors suggesting increased risk from acetaminophen hepatotoxicity (chronic excess alcohol consumption in 9, carbamazepine treatment in 1). Following a standard 20.25 hour treatment course with intravenous acetylcysteine, 4 patients had abnormal ALT values (64, 66, 185 and 235 IU/L). In one, this was similar to the pre treatment value and in another the ALT had not been measured prior to treatment. Thus, there were 2 patients with documented normal liver function at presentation who subsequently developed raised ALT values. None of the patients treated within 8h developed an increased PT (>15s) or creatinine. *Discussion:* Clinically important liver function abnormalities are uncommon in patients treated with acetylcysteine within 8 h, but small increases in ALT do occur. *Conclusion:* More data are required before blood sampling after early acetylcysteine treatment is abandoned.

173. Suicide with Intravenous Vecuronium

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Background: We report a case of a retired anesthesiologist committing suicide using intravenous vecuronium. Because comprehensive post-mortem toxicology screens don't identify nondepolarizing neuromuscular blocking agents, her initial toxicology screen was negative. The drug was only found because specific analysis was performed after consideration of her occupational history. Suicide with nondepolarizing neuromuscular blocking agents should be considered in individuals that have access to these drugs. *Case Report:* A 63-year-old woman was found deceased with a fresh venipuncture in her left arm. To her side, there was a capped, 10cc syringe which contained a drop of brownish liquid. Her medical history included hypertension and asthma. Family denied that she had any present illness or that she took prescription or recreational drugs. She was an anesthesiologist, but had been retired for five years. Postmortem exam was significant for an ulcerated mass on the left breast that had an underlying diameter of 3.5 inches. She had multiple fixed lymph nodes. Except for the venipuncture, there were no signs of trauma or violence. An initial GC/MS serum toxicology screen was negative for nearly 250 therapeutic agents and drugs of abuse. The syringe residue was negative for KCl. After consideration of the decedent's occupational history, the residue in the syringe was tested for nondepolarizing neuromuscular blockers. The syringe was rinsed with deionized water, and a liquid sample was analyzed using high performance liquid chromatography

and tandem mass spectrometry (LC-MS/MS). The sample was qualitatively positive for the presence of vecuronium. *Case Discussion:* In most patients, a 10cc syringe of vecuronium would produce neuromuscular blockade in 3–5 minutes with 95% clinical recovery between 45 and 65 minutes. Her physical exam revealing only metastatic cancer and her negative toxicology screen suggested that she died by suicide as a result of respiratory muscle paralysis from self-administered vecuronium. *Conclusion:* Nondepolarizing neuromuscular blocking agents are rarely used for self-harm, but they should be considered in individuals that have access to these drugs.

174. What Role does (Should?) the PCC Play Regarding the Medication Safety of Drugs Administered Off-Label?

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Background: Intravenous N-Acetylcysteine (IV NAC) was approved by FDA in 2004 for patients with acetaminophen poisoning who weigh >40 kg. Although it has been used in smaller patients, there are unique safety issues (e.g., dilutional hyponatremia) that must be considered in this population. Rapid administration of IV NAC has been associated with hypotension, urticaria, dyspnea, bronchospasm, and angioedema. Since the use of IV NAC in children was not FDA-approved (until recently), the prescribing information (PI) did not contain proper dosing recommendations for children. *Case Report:* A 15-month-old boy presented to the ED 8 hours after ingesting acetaminophenm. His acetaminophen level was of 118mg/dl. He was well appearing. Intravenous N-Acetylcysteine was recommended by the PCC. The bolus and 4-hour portion were administered appropriately. However, due to a misunderstanding of the weight-adjusted protocol provided by the PCC, the 16-hour infusion was administered at a rate ten times greater than recommended. The physician thought that the entire 16-hour infusion was an hourly infusion. The child received two thirds of the infusion before the error was realized. The child never developed any symptoms or vital sign changes. The infusion was stopped, and then restarted two hours later. His laboratory work was normal at the end of the 16-hour protocol. *Case Discussion:* Medication safety continues to be a challenge. In situations in which these drugs are used in an off-label manner (e.g., pediatric dosing that is not FDA approved), poison centers often provide the needed information to allow safe use. Despite providing this information for this case, a medication error still occurred. In March 2006, the FDA approved an updated PI that includes dosing information for patients above 10 kg. *Conclusion:* In an attempt to reduce medication errors and adverse events, it is the duty of the PCC to provide information and guidance for the off-label administration of a drug. Unfortunately, medication errors or adverse events may still occur.

175. Lithium Overdose with Electrocardiogram Changes Suggesting Ischemia

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Background: Lithium overdoses are associated with electrocardiographic changes of QT prolongation and ST segment and T wave changes. We report unusual electrocardiographic changes suggesting cardiac ischemia in a patient with a chronic lithium overdose who was too confused to give a history. *Case Report:* A 47-year-old incarcerated man suffering from diabetes, schizophrenia, and bipolar disorder was treated with lithium 1200 mg twice daily. Other medications were glipizide, metformin, haloperidol, aspirin, quetiapine fumerate, and pantoprazole. He became confused, ataxic, and anorexic in jail. Lithium level was 4.69 meq/L. He was transferred to the Emergency Department. Vital signs were normal. He was awake but confused with jerking movements of the extremities. Speech was incoherent. BUN, creatinine, and electrolytes were normal. Lithium level was 4.61 meq/L. Electrocardiogram revealed ST segment elevations in the anterior leads with downward concavity. T waves were biphasic. These changes were not on a prior electrocardiogram. Since these changes suggested cardiac ischemia and the patient was unable to respond to questions about chest pain, cardiac enzymes and an emergent echocardiogram were done. Troponin I was less than 0.1 mg/mL. Echocardiogram was normal without wall motion abnormalities. Treatment was with saline hydration, hemodialysis and whole bowel irrigation. Post-dialysis lithium level was 1.53 meq/L. Over the next three days, his electrocardiogram normalized. His speech gradually became coherent. After a one-week hospitalization, he returned to jail. *Case Discussion:* This patient was too incoherent to give a history of chest pain or any other history. Electrocardiogram suggested an acute myocardial infarction. Cardiac enzymes and an emergency echocardiogram were used to rule out myocardial infarction. Resolution of electrocardiogram abnormalities after elimination of lithium suggested that electrocardiogram changes associated with lithium

toxicity can be misinterpreted as cardiac ischemia. *Conclusion:* Electrocardiogram changes associated with lithium toxicity can mimic cardiac ischemia.

176. Are Poison Center Recommendations for High-Dose Insulin Treatment in Calcium-Channel Blocker Poisoning Patients Followed?

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Background: High dose insulin (hyperinsulinemia-euglycemia therapy, HIE) is being recommended more frequently in calcium-channel blocker poisonings. It is unclear whether these recommendations are correctly followed. *Case Report:* We reviewed all cases of symptomatic calcium channel blocker ingestions (defined as SBP <100 mm/Hg) in which HIE therapy was recommended between January 2002 and March 2006. Guidelines for calcium channel blocker poisoning and HIE therapy were available in mid-2002 and routinely faxed to referring facilities. HIE therapy was recommended in 69 cases. Recommendations were correctly instituted in 37 patients (54%). Recommendations were not followed in 32 patients (46%). There were 2 deaths in this group. Eleven patients received no insulin. Thirteen patients received a bolus dose of insulin IV at less than the recommended dose; 12 patients received 0.1 units/kg; and 1 patient 0.2 units/kg. No bolus dose was documented in 8 patients. Twenty-one patients received an insulin infusion at less than the recommended rate (0.1 unit/kg/h in 21 patients). Reasons that were documented for not following treatment guidelines were: 1) physicians were not comfortable with poison control center recommendations in 13 cases, 2) pharmacy was not comfortable with poison center recommendations in 7 cases, 3) the patient's cardiovascular status was improving in 5 cases, and 4) no reason was given in 7 cases. The number of cases where recommendations were not followed were evenly distributed across the 4-year study period. *Case Discussion:* HIE is a novel treatment modality in patients poisoned with calcium-channel blockers. Many clinicians are unfamiliar with the rationale for its use and are uncomfortable initiating therapy. Failure to follow treatment guidelines occurred frequently in our series. *Conclusion:* HIE therapy recommendations for calcium channel blocker poisoning were not instituted in 32/69 patients (46%). Further education of clinicians regarding use of HIE therapy may be needed.

177. Multiple Organ Toxicity Following Ingestion of Copper Sulfate

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Background: Copper sulfate (CuSO4) is a rarely reported cause of severe poisoning. We present a patient who survived acute, massive CuSO4-associated multiple organ failure and describe the course and management. *Case Report:* 27-year-old man presented with severe abdominal pain and blue emesis 9 hours (h) after intentionally ingesting 6 tablespoons of crystalline "root killer" (99% CuSO4). Over the next 10 days hepatic injury, hemolysis, methemoglobinemia, rhabdomyolysis, and renal insufficiency ensued. Lab results were: peak AST/ALT, 4501 U/L and 1746 U/L, respectively, on day 2, with normalization on day 6; peak MetHgb, 7.5% on day 4; peak CPK, 4975 IU/L on day 5; and peak creatinine, 2.1 mg/dL on day 7. Hemolysis was most severe on days 3 and 4. EGD showed diffuse antral ulceration. Treatment included chelation with BAL and D-penicillamine, IV *N*-acetylcysteine (NAC), and methylene blue. Serum Cu levels were 469 mcg/dL at 9 h post-ingestion, 129 mcg/dL after 48 hrs of chelation, and 119 mcg/dL after 96 hrs of chelation. Urine Cu excretion was 44 mcg/L during the last 24 h of chelation. *Case Discussion:* CuS04 toxicity results from both direct and systemic effects. Direct mucosal corrosive injury can cause early GI bleeding and distributive shock. At physiologic levels, ceruloplasmin binding minimizes systemic Cu-induced oxidative effect. In toxicity, protein binding is exceeded and free Cu catalyzes the formation of reactive oxygen species leading to diffuse oxidative injury. Chelators may be chosen alone or in combination, based on their primary action: BAL eliminates Cu by biliary excretion and D-penicillamine by renal excretion. Due to its antioxidant effect, addition of NAC can supplement therapy. *Conclusion:* This report describes survival after massive CuSO4 ingestion associated with hepatotoxicity, hemolysis, methemoglobinemia, rhabdomyolysis, renal insufficiency, and injury to the gastrointestinal tract. Treatment approaches are not well-defined, and in this case, included chelation therapy, administration of an IV antioxidant (NAC), and supportive care.

178. Mortality in Acute Metformin Overdose is Predicted by Serum pH, Lactate, and Metformin Concentration

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Background: Lactic acidosis associated with metformin therapeutic use and intentional overdose is described in the literature. No relationship between mortality and serum pH, lactate, or metformin concentration has previously been described. *Methods:* We reviewed the literature using Medline and PubMed databases from 1966 to present for cases of metformin therapeutic use or overdose with documented mortality data and values of serum pH, lactate, and metformin concentration. We also included two unpublished cases of metformin overdose that meet these criteria. Patient age, gender, IV $NaHCO_3$ therapy, and hemodialysis therapy also were analyzed. Cases were categorized into intentional overdoses and therapeutic complications. *Results:* We found 21 cases of metformin overdose (5/21 died) and 67 cases of therapeutic metformin lactic acidosis (29/67 died) that met inclusion criteria. No intentional overdose patients died whose serum pH nadir was > 7.0, maximum lactate concentration < 25 mmol/L, or maximum metformin concentration < 50 mcg/mL (therapeutic range 1–2 mcg/mL). Intentional overdose patients with a nadir serum pH < 7.0 had 71% mortality (5/7; RR = 10.7, $p = 0.001$), lactate concentration > 25 mmol/L had 71% mortality (5/7; RR = 10.7, $p = 0.001$), and metformin concentration > 50 mcg/mL had 42% mortality (5/12; RR = 4.2, $p = 0.045$). No such associations were found in the therapeutic complication subgroup. No associations were found between age, gender, IV $NaHCO_3$ therapy, hemodialysis intervention, and mortality in either subgroup. *Discussion:* Relationships between mortlity and serum pH, lactate, and metformin concentrations, although intuitive, have never been described previously. Intentional overdoses show a strong relationship between mortality and clinical data (pH, lactate, metformin concentration), whereas metabolic acidosis in therapeutic use does not. *Conclusion:* Serum pH, lactate, and metformin concentrations all predict mortality in metformin overdose patients. No such relationship exists in patients with lactic acidosis following therapeutic metformin use.

179. Repeated Cardiac Arrests in a Patient who Surreptitiously Ingested Sotalol: A "Cold Case" Solved

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Background: Sotalol is an infrequently reported agent of intentional overdose. The cardiotoxicity following massive Class III antidysrhythmic overdose can be a challenge to successfully manage. We report two instances of cardiac arrest in the same patient – separated by over a year – which were retrospectively determined to be the result of sotalol ingestions. *Case Report:* On New Year's Eve, a 61-year-old female presented in ventricular tachycardia. Upon administration of amiodarone, she experienced cardiac arrest. After successful defibrillation, she converted to Torsades de Pointes (TdP). She stabilized after the administration of magnesium and chemical overdrive pacing. Suspecting an overdose, extensive analytical testing – with attention to those pharmaceutical agents to which she had access – revealed no toxicological findings. The patient admitted nothing. Cardiology and cardiac electrophysiology evaluations were negative. The patient re-presented sixteen months later in cardiac arrest, and followed a similar clinical course. Sotalol was identified as a possible exposure based on further history and investigation. The patient finally admitted to a sotalol overdose. Through further interviews it was determined that her earlier presentation was also the result of sotalol ingestion. *Case Discussion:* Focused toxicological analysis identified a massive concentration of sotalol. Toxicokinetic data was obtained from serial measurements of sotalol over the course of 36 hours. The peak sotalol concentration was the second highest reported in the literature. Class III antidysrhythmic poisonings may present with characteristric cardiotoxicity. Magnesium sulfate, overdrive pacing, and ionotropic support may all be required to successfully manage the critically ill overdose patient. *Conclusion:* This patient survived two cardiac arrests following surreptitious, massive ingestions of sotalol. Analytic screening for unknown drugs or poisons, in the absence of supporting history, has limitations. Our poison center had the opportunity to successfully close an unsolved "cold case" after a second, strangely similar interation with the patient over a year later.

180. Survival Despite Potentially Deadly Salicylate Level

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Background: Serum salicylate levels of greater than 100 mg/dl in acute human poisonings are potentially lethal. We report the survival of a patient with the highest recorded salicylate level (195 mg/dl) in the English literature. *Case Report:* A 15-year-old

female presented to an ED less than 3.5 hours after ingesting 50 tablets of 500 mg aspirin and an unknown amount of ibuprofen. The patient's mother witnessed a seizure at home and the patient received 2 mg lorazepam after a seizure or syncopal episode occurred in the ED waiting room. The patient complained of nausea, vomiting, dizziness and tinnitus. Physical exam was unremarkable on presentation. Vital signs were: blood pressure 127/70 mm/Hg, pulse 127 bpm, respirations 20 rpm, temperature 98°F. Activated charcoal was administered and an IV bolus of 110 mEq sodium bicarbonate followed by an IV infusion of 1/2NS with 50 mEq of sodium bicarbonate at 150 ml/hr was initiated. Baseline laboratories included: serum salicylate 58.6 mg/dl, serum bicarbonate 16 mEq/L, serum potassium 3.9 mEq/L, serum creatinine 0.8 mg/dl, serum chloride 103 mEq/L, with an ABG of pH 7.45, pCO2 28, pO2 115. Due to the large amount of aspirin ingested, the nephrology service was contacted. A repeat salicylate level 5.5 hours after the initial level was reported as > 100 mg/dl and upon dilution yielded a level of 195 mg/dl. Vital signs at this time included a heart rate of 109 bpm, respiratory rate of 28 rpm, ABG pH of 7.5 and pCO2 of 28. Three hours of hemodialysis was performed one hour after the second salicylate level was reported. The salicylate level post-dialysis was 74.4 mg/dl, which further declined to 28.2 mg/dl four hours later following continued serum alkalinization An EEG and MRI were normal and no further seizure activity was noted. The patient was discharged home without sequelae two days later. *Case Discussion:* While it is questionable whether our patient's seizures were related to acute salicylate poisoning, this symptom in conjunction with the history and other subjective symptoms prompted early, aggressive treatment. *Conclusion:* Despite having a serum salicylate level in excess of any previously reported in non-lethal poisonings, our patient survived due to early and aggressive treatment.

181. At What AST and ALT Does Hepatic Dysfunction Occur Following Acetaminophen Poisoning?

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Background: Treatment studies for acetaminophen poisoning have historically defined hepatotoxicity as a serum AST > 1000 U/L. While the ALT and AST are markers of hepatocellular necrosis, they give no measure of the functional consequences of hepatic injury; patients may have marked elevation of ALT and AST with no change in coagulation function or bilirubin excretion. The purpose of this study is to identify the serum ALT and AST that provide a specificity of 95% for the identification of hepatic dysfunction. *Methods:* The original clinical trial data for the national trial of oral N-acetylcysteine was reentered into a database. Patients with a maximum reported prothrombin time (PT) ratio (measured PT divided by the institutional upper limit of normal) above 1.5 and a maximum reported total bilirubin above 2.2 mg/dl were categorized as having hepatic dysfunction. We determined the Receiver Operator Characteristics of maximum reported serum ALT and AST to identify patients with hepatic dysfunction. *Results:* 1,297 records were included; 38 patients met ALT criteria and 41 met AST criteria for hepatic dysfunction. There were 318 patients with no ALT data and 162 patients with no AST data; these patients were excluded from further analysis. The median and range of ALT for patients with and without hepatic dysfunction were 4920 IU/L (25 to 11,260 IU/L) and 22 IU/L (1 to 20,000 IU/L) respectively. The median and range of AST for patients with and without hepatic dysfunction were 4910 IU/L (204 to 20,400 IU/L) and 30 IU/L (1 to 30,000 IU/L) respectively. An ALT cutoff of 1600 IU/L had a specificity of 95.0% (95% CI 93.4 to 96.3%) and a sensitivity of 79.0% (62.7 to 90.1%)for the detection of hepatic dysfunction. An AST cutoff of 1180 IU/L provided a sensitivity of 95.1% (95% CI 83.5 to 99.4%) and a specificity of 95.0% (93.5 to 96.2%). *Discussion:* Our study is limited by missing cases and non-standardized evaluation and treatment. *Conclusion:* A serum ALT of 1600 IU/L or AST of 1180 IU/L appears to have excellent specificity for hepatic dysfunction and could be a valid marker of hepatic injury following acetaminophen overdose.

182. Glyburide Sold as "Street Steroid" Causes Hypoglycemia Complicated by Inappropriate IV Administration of Octreotide

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Background: The "street" sale of drugs can involve the unscrupulous substitution of one substance for another. We present a case of hypoglycemia caused by ingestion of glyburide sold as a "street steroid." The hypoglycemia was complicated when octreotide was administered intravenously (IV), resulting in repetitive hypoglycemic episodes in the intensive care unit (ICU). *Case Report:* A 29-year-old amateur boxer presented to the emergency department (ED) 6 hours after ingesting 14 pills of an "anabolic steroid" he had purchased on the street. In the ED, the patient complained of feeling lightheaded and tremulous. Vital signs: temperature, 98.9°F; pulse, 113/min; blood pressure, 118/62 mmHg; respirations, 20/min; pulse oximetry, 99% on room air. The initial fingerstick

blood glucose level was 62 mg/dL and the physical exam was normal. During observation, the patient became diaphoretic and disoriented. A repeat fingerstick revealed a glucose level of 35 mg/dL; 50 mL of 50% dextrose was administered IV, which resolved the symptoms. Later, the patient's companion returned and presented the ED staff with a remaining tablet of the unknown drug, which was confirmed to be glyburide, 5 mg. The patient was given 50 mcg of subcutaneous (SQ) octreotide, and no further episodes of hypoglycemia occurred in the ED. Unfortunately, the ICU team mistakenly prescribed IV octreotide, resulting in recurrent episodes of clinical and numerical hypoglycemia, occurring 2 hours after an IV dose of octreotide and 12 hours after admission to the ICU. The patient's condition was again stabilized with IV dextrose and SQ octreotide. He was discharged home after receiving SQ octreotide every 6 hours during a 24-hour period and having 24 subsequent hours of euglycemia, with no rescue therapy needed. *Case Discussion:* This patient suffered repetitive hypoglycemia due to a sulfonylurea over 36 hours except when octreotide was administered SQ. *Conclusion:* Proper administration of octreotide is critical to ensure its efficacy as an antidote for sulfonylurea overdoses. Also, when screening patients who have overdosed on drugs purchased on the "street," physicians must consider the potential for a lethal substitution.

183. Maintenance Doses of Fomepizole during Hemodialysis: What is the Point?

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Background: Concurrent use of fomepizole and hemodialysis was first reported in 1995. Fomepizole is a competitive inhibitor of alcohol dehydrogenase, and it prevents the conversion of methanol to its more toxic metabolite formic acid. However, formic acid is not protein-bound and is easily dialyzable with a low molecular weight of 46 g/mol, and a volume of distribution of 0.5 L/kg. Therefore, inhibition of methanol metabolism by fomepizole during dialysis may not affect clinical outcome. We report a case of methanol poisoning treated without maintenance doses of fomepizole during dialysis. *Case Report:* A 39-year-old man was admitted following ingestion of methanol over a period of two days. His only complain was visual blurring. His physical examination was remarkable for a heart rate of 101 beats per minute, and a respiratory rate of 18 breaths per minute. The eye examination revealed conjunctival injection and normal visual acuity. His initial pH was 7.2, CO2 12, anion gap of 24. The initial methanol level was 117 mg/dl. The patient was given the loading dose of fomepizole and started on hemodialysis. He was also started on a bicarbonate infusion, and folate supplementation. He was dialyzed for 10 hours, but no maintenance dose of fomepizole was given. Hemodialysis was stopped when the methanol level came down to 8 mg/dl. The patient remained well, and he did not develop recurrent acidosis. His repeat eye examination was normal. *Conclusion:* Hemodialysis is effective for the removal of both methanol and formic acid. Formic acid has a short elimination half-life during dialysis. In our patient, hemodialysis without the use of maintenance doses of fomepizole did not result in any adverse outcome. We feel that concurrent use of fomepizole during dialysis may be unnecessary. Prospective studies are necessary to determine if this can be done safely and will have significant impact.

184. Zonisamide Ingestion with Prolonged Coma and Renal Tubular Acidosis

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Background: Zonisamide is a sulfonamide anticonvulsant. Overdoses have been rarely reported. *Case Report:* 35-year-old women had not been seen for 2 days when found comatose. Regular medications were zonisamide, acetaminophen/butalbital, carbamazepine, tizanidine, and fentanyl. On presentation she had a GCS of 3, and there was no response to naloxone. Initial laboratory results included serum Na^+ 140 mMol, K^+ 4.9 mMol, Cl^- 107 mMol, CO_2 18 mMol, AST 7555 U/L, PT 18.8 s., Bili 0.9 mg/dL, APAP 3.8 ug/L, carbamazepine 4.7 ug/L, and ammonia 189 mmol/L. ABG showed pH 7.3, pCO_2 31 torr, PO_2 491 torr. A urine drug screen (GC/MS) (capable of detecting all of the above agents except fentanyl) showed butalbital, zonisamide, carbamazepine and acetaminophen. IV N-acetylcysteine was begun. AST, ammonia, and PT began to normalize rapidly, but she remained comatose. On day 2 evidence of renal tubular acidosis (RTA) appeared with Na^+ 144 mMol, K^+ 2.9 mMol, Cl^- 122 mMol, CO_2 12 mMol and anion gap of 10 mMol. She was treated with IV $NaHCO_3$ for 4 days before resolution of RTA. By day 4 mental status had improved greatly, and she was extubated with no neurological sequelae. Serial plasma zonisamide and butalbital levels were measured during hospitalization. On day 2 (4 days after suspected ingestion), plasma zonisamide levels were still elevated at 100 mcg/ml (theraputic15–30), and remained elevated until the patient's mental status improved, when it had fallen to 30.4 mcg/ml. Plasma butalbital levels were always within therapeutic range. The patient admitted to taking mainly

zonisamide and acetaminophen. *Case Discussion:* Initially the patient's coma was felt to be secondary to either butalbital or hepatic encephalopathy from APAP toxicity. Her continued coma following recovery of liver function and the therapeutic butalbital levels made this unlikely. Her history and elevated plasma zonisamide levels confirmed zonisamide as the main ingestant. Distal RTA has been described previously in therapeutic zonisamide dosing, but not in overdose. *Conclusion:* Zonisamide overdose was characterized by prolonged coma and renal tubular acidosis.

185. Brodifacoum Ingestion and Treatment with Vitamin K: A Case Report Including Serial Brodifacoum Levels and Discussion of Brodifacoum Elimination

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Background: Brodifacoum is a long-acting anticoagulant found in the rodenticide d-Con. It is often termed a "super warfarin" due to its potency and longer duration of action compared to warfarin. The mechanism of action is via inhibition of vitamin K-dependent gamma-carboxylation of clotting factor precursor proteins. Ingestion of brodifacoum can lead to severe coagulopathy with need for prolonged treatment. There is limited data regarding optimal treatment regimens of vitamin K for brodifacoum ingestions and mixed data in the literature describing brodifacoum elimination kinetics. *Case Report:* A 35-year-old woman presented to the ED with wrist lacerations. She also stated that she had ingested an unknown rat poison that was found to be d-Con. The patient had no evidence of bleeding but an initial INR was elevated at 4.8. She was given 20 mg of vitamin K PO but her INR continued to increase. Additional vitamin K was administered in 4 hour intervals until the INR began to decline. The patient was stabilized, after a week of dose adjustment, at 70 mg vitamin K PO q 12 hours. During a prolonged stay on inpatient psychiatry we obtained serial brodifacoum levels. The initial, peak brodifacoum concentration was 180 ng/mL 3 days from time of ingestion. At 87 days from time of ingestion the patient's brodifacoum level was 12 ng/mL. Repeat level 3 weeks later was non-detectable. When the brodifacoum level returned at 12 ng/mL the vitamin K was held without further increase in INR. The patient was discharged with intensive outpatient follow-up. *Case Discussion:* We present a brodifacoum induced coagulopathy treated successfully with vitamin K. We were able to obtain serial brodifacoum levels for this patient and plot the concentration of brodifacoum as a function of time which allowed us to determine a rational point to stop therapy. The elimination half-life of brodifacoum in this patient was 21.2 days. *Conclusion:* Management of a patient who has ingested brodifacoum may be facilitated by obtaining serum brodifacoum levels.

186. Diphenhydramine Overdose Reversed with Aggressive Physostigmine Administration

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Background: Diphenhydramine overdose has been treated with physostigmine; however, the dose needed to reverse the effects has never been related to a serum concentration. *Case Report:* A 32-year-old man was found, tremulous and confused, by his roommate on the floor of their bathroom. The patient was unable to give a history, but the roommate reported he had been in this state $1^1/_2$ hr prior to arriving at the ED. His roommate revealed that the patient used cocaine 3 days earlier and was currently using an OTC drug for flu-like symptoms. Vital signs: T, 100.9°F; P, 161 beats/min; BP, 170/95 mmHg; RR, 18/min; pulse ox, 99% on RA. Physical exam revealed dilated pupils that were equal and reactive bilaterally and a dry oral mucosa. Lungs were clear and the CVS exam was remarkable for tachycardia. Abdominal exam revealed diminished bowel sounds and distended bladder. Neurologically, the patient's speech was incomprehensible, and he moved all extremities, though aimlessly. Unable to follow commands, he would intermittently look at and reach for the ceiling lights. A Foley catheter was inserted and released 800 mL of urine. 6 mg of IV lorazepam was administered with no significant effect. Then, 2 mg of physostigmine IV elicited slight improvement in mental status and speech. With subsequent re-dosing of another 4 mg IV 60 minutes later, the patient's mental status, speech and vital signs normalized. He denied a suicide attempt but admitted to ingesting an OTC to alleviate cold symptoms. The patient made a complete recovery after a 2-day hospital stay. Serum toxicology screening detected no ethanol, acetaminophen nor salicylates. REMEDi-HS® (HPLC) assay revealed cocaine metabolites and also confirmed the presence of diphenhydramine and its metabolites. The serum diphenhydramine concentration determined by gas chromatography was 1110 ng/mL (therapeutic: 30–50 ng/mL). *Case Discussion:* Though the patient denied an overdose, toxicology screening proved what was seen clinically, that the patient had overdosed on an anticholinergic. *Conclusion*: This patient, with a serum diphenhydramine concentration of 1110 ng/mL, required 4 mg of physostigmine to reverse his central anticholinergic symptoms.

187. Early Triage Decision Rule for Pediatric Organophosphate/Carbamate Exposures

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Background: Unintentional pediatric exposure to organophosphates and carbamates is common in the developing world where these products are used as insecticides in homes and for agricultural purposes. Optimal resource use requires a triage decision rule. *Methods:* Prospective observational data collection and subsequent derivation of an early triage decision rule to predict severity of course. *Setting:* Specialist poisoning hospital in a large city in a developing nation. *Patients:* Children less than 6 years of age, without pretreatment, presenting within 2 hours of an exposure to an OP or C. *Outcome definitions:* Minimal course; no atropine or obidoxime required, no hypoxia. Moderate course; atropine only required. Severe course; atropine and obidoxime required/ICU admission. *Results:* Between Feb 2004 and Oct 2005, 95 children meeting the study criteria gave consent and completed the study observation period. All who ultimately met moderate or severe criteria required intervention on arrival. There were 30 with minimal, 40 with moderate and 25 with severe course (4 died). The initial serum cholinesterase was very low (<1000 U/L) in 9/30 mild, 39/40 moderate and 25/25 severe patients. By discharge, it rose at least 25% in all of these cases and in 6 other mild with a less significant initial reduction in activity. Pinpoint pupil alone identified 63/65 moderate or severe patients while identifying only 2/30 mild patients (97% sens., 83% spec.). Pinpoint pupil or diarrhea identified 65/65 moderate or severe courses while identifying 7/30 mild (100% sens., 77% spec.). *Discussion:* Based on this limited study, symptoms occur rapidly, so early triage is possible. Although not the purpose of this study, this schema suggests possible pediatric triage criteria following mass exposure to nerve agents. *Conclusion:* Using two features, pinpoint pupils and diarrhea, pediatric patients could be triaged to those who would have a minimally symptomatic course requiring no medications vs. those who may require atropine or obidoxime.

188. Methemoglobinemia due to Malachite Green Ingestion in a Child

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Background: Malachite green (4-(4-Dimethylaminobenzhydriylidene)cyclohexa-2,5-dienylidene) dimethylammonium chloride is a an aniline dye used to treat parasitic and fungal disease in fish and as a biological stain in cell and tissue cultures. A MEDLINE search for the years 1966 through 2006 located no published reports of human injury from acute ingestion of malachite green. *Case Report:* A 3-year-old healthy, 17.3 kg, female with no previous significant medical history was discovered by her father with blue lips and nailbeds after ingesting up to two ounces of an aquarium product containing 0.075% malachite green (45 mg). By history no other ingestants were available. In the emergency department she was awake and crying with generalized cyanosis. An initial methemoglobin (MetHb) was reported as 51%, to which the patient responded by immediately becoming pink when methylene blue was infused at 2 mg/kg. A repeat MetHb level $2^1/_2$ hours post ingestion was 6.5%. The child transferred to a regional pediatric intensive care unit and observed for 20 hours without return of symptoms. *Case Discussion:* Malachite green is commonly available as an aqueous dilute solution, in the chloride salt form, as an aquarium product. The large ingestion in this case may be responsible for the previously unreported effect seen in our patient. *Conclusion:* This is the first reported case of methemoglobinemia from malachite green.

189. Medication Administration Error Resulting in an Overdose of IV N-Acetylcysteine in a Pediatric Patient without Adverse Effects

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Background: Hyponatremia, status epilepticus and at least one death have been reported with overdose of IV N-acetylcysteine (IV NAC). Administration of IV NAC is a complex procedure, requiring multiple dosages, involving either multiple IV bags and/or IV drip rates. *Case Report:* A previously healthy 24-month-old, 16 kg male presented soon after possible ingestion of up to 6 grams (375 mg/kg) of acetaminophen over a one-hour period. A 4-hour acetaminophen level was 247 mcg/mL. Oral NAC was given, but the child promptly vomited the loading dose and then vomited again despite anti-emetics. He was then started on IV

NAC per the standard 20-hour dosing schedule (150 mg/kg loading dose, 50 mg/kg over 4 hours first maintenance dose, 100 mg/kg over 16 hours second maintenance dose). The solution was prepared in one 120 mL bag of D5W containing a total of 4800 mg of NAC (40 mg/mL). The patient received the proper loading dose over fifteen minutes without incident. The child then received the remaining solution (60 mL, containing 150 mg/kg NAC) in under 4 hours, at which point the error was discovered. The child was asymptomatic and treatment with NAC was continued for the remaining 16 hours at the usual second maintenance dose rate. Serum chemistries were monitored and remained within normal limits throughout his hospital stay. He remained asymptomatic and had no apparent adverse effects from either the acetaminophen or IV NAC overdoses. *Case Discussion:* Overdose of IV NAC has been associated with serious outcomes. We report a two-and-a-half fold overdose of the first maintenance infusion. This child recieved both the appropriate loading dose and the standard second maintenance infusion. There were no adverse effects. This case illustrates one potential source of medication administration error when using a single-bag method of IV NAC preparation. *Conclusion:* This is an example of medication error using a single-bag method of IV NAC administration and in this 24-month-old child, no adverse effects were seen following an overdose of the first maintenance infusion.

190. Rapid Intravenous Administration of Acetylcysteine in a Pediatric Patient

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Background: Acetylcysteine is the approved antidote for the treatment of acetaminophen overdosage. For over two decades in the US it was administered orally using an 18 dose, three-day regimen. Now intravenous acetylcysteine (Acetadote®) is approved using a 21-hour regimen as a constant infusion. The original prescribing information recommended infusion of the loading dose over 15 minutes with maintenance dosing infused over four-hour and 16-hour periods. Controversy has surrounded the infusion rate of the initial bolus dose and the potential for infusion-rate-dependent adverse events such as anaphylactoid reactions. We report a dose administration error in a pediatric patient who received the four-hour maintenance dose over four minutes instead of four hours and did not experience any ill effects. *Case Report:* A two-year-old toddler was being treated for a toxic acetaminophen ingestion with intravenous acetylcysteine (Acetadote®). The initial loading dose was administered as per the poison center protocol over one hour. The child then received the maintenance dose of 50 mg/kg (640 mg) over a four minute period mistakenly instead of over the recommended four-hour infusion time. The child did not exhibit any adverse effects even with the rapid administration of the drug or with the remainder of the continuous infusion. *Case Discussion:* Concern regarding the potential for severe anaphylactoid reactions associated with a rapid intravenous loading dose of acetylcysteine has led some clinicians to administer the drug at a more conservative rate of infusion (60 minutes versus 15 minutes). While the study that was used to secure FDA approval of the intravenous acetylcysteine formulation failed to demonstrate a statistical difference in the occurrence of anaphylactoid reactions based on infusion rate, the manufacturer has recently changed the product information to recommend a 60 minute loading dose infusion rate. The rate of administration of the maintenance doses remains unchanged. *Conclusion:* Although the infusion rate of intravenous acetylcysteine is controversial, we report a case of extremely rapid infusion in a pediatric patient without sequelae.

191. Salicylate Toxicity caused by the Genital Exposure of a Methylsalicylate-Containing Rubefacient

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Background: Methylsalicylate-containing rubefacients have been reported to cause salicylism after ingestion and after topical application to abnormal skin. Many over-the-counter products contain methylsalicylate. We present a unique case of salicylate poisoning caused by genital exposure to methylsalicylate. *Case Report:* A male teenager presented to the emergency department with shortness of breath, chest pain, and polydipsia for one day. On physical examination, the patient was afebrile with heart rate of 100 beats per minute, blood pressure of 100/60 mmHg, respiratory rate of 30 per minute, and a room air pulse oximetry of 100%. The physical examination was positive only for tachypnea. Laboratory evaluation revealed hyperglycemia, an anion gap metabolic acidosis, and a salicylate level of 68 mg/dL. On direct inquiry, the patient denied ingesting any salicylate-containing products but eventually reported the use of an entire 60-gram tube of Bengay® on the genitalia during repeated masturbation. The patient was successfully treated with supportive care and urinary alkalinization. *Case Discussion:* Salicylism resulting from the

ingestion of methylsalicylate-containing rubefacients is well described. Salicylate toxicity has been reported after topical application in patients with abnormal skin such as psoriasis, ichthyosis, and erythroderma. Salicylate toxicity resulting from dermal exposure to intact skin has not been reported. The scrotal skin has been demonstrated to have up to a forty-fold greater absorption compared to other dermal regions. Furthermore, heat and exercise have been shown to increase dermal absorption of methylsalicylate. *Conclusion:* Genital exposure to a methylsalicylate-containing rubefacient resulted in salicylate toxicity in this teenaged patient.

192. Analysis of Aripiprazole Poisonings in Children

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Background: Aripiprazole (Abilify®) is a second-generation antipsychotic approved by the FDA in 2002. Little is known about aripiprazole's toxicity in children. The goals of this study were to utilize Toxic Exposure Surveillance System (TESS) data to:1) describe the signs, symptoms and clinical courses associated with aripiprazole poisoning in children less than 6 years of age, and 2) characterize aripiprazole poisoning dose-response relationships in these children. *Methods:* 756 single-agent aripiprazole ingestions by children less than 6 years of age were reported to TESS from Jan 2002 through Dec 2005. Dose ingested, age, and TESS-based clinical outcomes (CO) were available for 401 cases. Any ingestion reported as a "taste or lick" (n = 7) was included as a dose of 1/10 of the dosage form involved. Weights were imputed for 189 missing values based on a linear fit of weight for age for the other 212 patients. Dose-response of CO vs. log-dose was examined via nominal logistic regression using SAS JMP vers 6.0. *Results:* Doses ranged from 0.5 to 700 mg (0.5–87 mg/kg). 280 of 401 children (70%) were treated in healthcare facilities, and 87 of 280 (22%) were admitted. The distribution of COs were no effect (46%), minor effect (42%), moderate effect (11%), and major effect (0.2%). There were no deaths. The most common signs and symptoms were drowsiness (41.6%), vomiting (7.5%), tachycardia (5.5%), ataxia (3.7%), agitation (3%), dystonia (2.2%), nausea (1.7%), and tremor (1.7%). Potentially life-threatening manifestations included hypotension (0.5%), coma (0.5%), dysrhythmia (0.2%) and seizures (0.2%). 33% received GI decontamination. Symptoms resolved within 8 hours for 53% of symptomatic patients and within 24 hours for 80% of symptomatic patients. CO vs. log-dose/kg showed dose response ($p < 0.0001$). The dose associated with minor or worse CO in 50% of children [95% CI] $ED_{50\%}$ was 65.1 mg/kg (36.1, 102) and for moderate or worse CO, $ED_{10\%}$ was 83.9 mg/kg (27.6, 157). *Conclusion:* These data suggest limited toxicity associated with aripiprazole poisoning in children less than 6 years of age.

193. Opisthotonus caused by Tramadol Overdose in an Infant

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Background: Tramadol, an opioid-type analgesic, is known to cause seizures, agitation and hypertension in overdose. We report an infant poisoned with tramadol who presented with opisthotonus. *Case Report:* A previously healthy 8-week-old male was found in his crib grunting, stiff and arching his back 2 hours after a feeding. His parents brought him to the emergency department by car; they had difficulty placing him in his car seat due to stiffness and arching back. Parents denied any history of ingestion or exposure, and stated there were no medications in the home. The patient was bottle fed a commercial formula. Initial vital signs: temperature 36.6°C, heart rate 140, respirations 38 and blood pressure 195/43 mmHg. He was minimally responsive with marked full body extensor hypertonicity. The rest of the physical exam was unrevealing. The arching resolved after treatment with three 0.1 mg/kg doses of IV lorazepam. Complete blood count, electrolytes and head CT were normal. Cerebrospinal fluid cultures, including herpes virus cultures were negative. He was treated for presumed meningitis with antibiotics and acyclovir. Urine screen for drugs of abuse was negative. The comprehensive urine drug test was positive for tramadol by gas chromatography/mass spectroscopy. Parents were again confronted and this time admitted to having tramadol in the home, although they continued to deny administering it to the child. His neurological exam normalized over the next 3 days and he was discharged into the custody of child protective services. *Case Discussion:* Opisthotonus as a presenting symptom is rare; its differential diagnosis includes tetanus, strychnine poisoning and meningoencephalitis. Two previous reports describe accidental poisoning of infants with tramadol suppositories. These infants presented with sedation, respiratory depression, miosis and seizures. This is the first reported case of opisthotonus caused by tramadol. *Conclusion:* We report an infant poisoned with tramadol, presenting with opisthotonus. Tramadol should be considered in the differential diagnosis of any child presenting with opisthotonus.

194. Generalized Seizure Following Accidental Pediatric Tiagabine Ingestion

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Background: Tiagabine is a newer antiepileptic that has been reported to cause seizures and dystonic reactions with large ingestions by adult patients. There is limited data regarding tiagabine toxicity in the pediatric population. *Case Report:* A 4-year-old previously healthy male presented to an outside hospital 1 hour after ingesting 26# 2 mg Gabitril® (tiagabine) tablets (2.98 mg/kg) and up to 4# 30 mg Prevacid® (lansoprazole) tablets. The medications were his grandmother's and were not stored in a child-proof container. Shortly after ingestion, the patient was drowsy and exhibited whole body twitching lasting 30 minutes. He was taken to the emergency department (ED) where he had a 10 minute generalized tonic-clonic seizure. The seizure was characterized by extensor posturing, tongue thrusting, eye twitching, fist clenching, and repetitive groaning and resolved after the administration of 1.4 mg (0.8 mg/kg) of lorazepam. His initial vital signs were: Temperature 97.8 ° F, heart rate 130 beats per minute, respiratory rate 30 per minute, and O_2 saturation of 100% on room air. His physical examination was remarkable for agitation, horizontal nystagmus, and overall increased motor activity. The patient had a normal basic metabolic panel, glucose of 97 mg/dL, normal ECG, and undetectable acetaminophen and salicylate levels. Over the first 6 hours, the patient required 5 doses of lorazepam (5.0 mg total) for fussiness and agitation. After admission, the patient's vital signs remained stable and he had no further seizure activity. The patient was discharged 26 hours post ingestion with a normal neurologic exam. His tiagabine level was 430 ng/mL (5–70 ng/mL therapeutic) drawn approximately 6 hours post-ingestion. *Conclusion:* Tiagabine toxicity may lead to seizure activity. This case illustrates a tiagabine-induced seizure, which responded well to benzodiazepines, in a previously healthy child.

195. Chronic Mercury Inhalation Produces Acrodynia, Tremor and Erythism and Mimics Pheochromocytoma in a 14-Year-Old

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Background: Chronic mercury poisoning rarely presents with acrodynia or mimics pheochromocytoma. We present such a case in a 14-year-old who improved following removal from exposure and chelation therapy. *Case Report:* A 14-year-old male presented to a local hospital with pain in his knees and thighs. He had become exceedingly withdrawn and shy over the preceding 8 weeks. His initial vital signs on presentation were temperature 36.8 °C, heart rate 120/min, respiratory rate 16/min and blood pressure 150/106. Physical examination revealed a resting hand tremor, profuse diaphoresis, proximal muscle weakness and ataxic gait. He had a desquamating erythematous rash on the palms, soles, toes and fingertips. His demeanor was noted to be extremely withdrawn. He had elevated plasma metanephrines 0.68 nmol/L and urinary vanillylmandelic acid 17.3 mg/ 24 hours. After an extensive negative inpatient evaluation looking for suspected pheochromocytoma tumor, he was found to have an elevated 24 hour urine mercury on hospital day (HD) 5 of 263 mcg/24 hours. Blood mercury was 6 mcg/L on HD# 12. His clinical presentation and characteristic rash were felt to be consistent with mercury poisoning. He was treated with oral dimercaptosuccinic acid (DMSA) for a total of 19 days. Environmental testing of his primary residence, a former television repair shop, detected increased mercury vapor at 0.052 mg/m^3 of air (ACGIH TLV 0.025 mg/m^3). Measurement of mercury content on surfaces in the house showed levels at 184 – 251 ppm. Over the course of 3 weeks, his clinical condition improved. His rash, resting tremor and muscle weakness showed complete resolution at 7 weeks after his initial presentation and he required decreasing dose of antihypertensive therapy. His repeat 24-hour urine mercury was 18 mcg/24 hours at 9 weeks post chelation. *Conclusion:* We report a rare presentation of chronic inhalation of mercury vapor. The patient showed significant clinical improvement with chelation therapy and removal from the exposure.

196. Phosphine Toxicity with Echocardiographic Si gns in Railcar Stowaways

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Background: We relate the use of echocardiography to confirm cardiac dysfunction after exposure to phosphine in a fumigated railcar. *Case Report:* Three patients travelled surreptitiously inside a rice-filled railcar for 6 hours. Patient 1, an 18-year-old

woman, was found dead. Patient 2, a 20-year-old man, expired within 12 hours of hospitalization despite aggressive ACLS measures. Autopsy showed normal organs and normal postmortem electrolytes in both patients 1 and 2. Premortem echocardiogram in patient 2 revealed an ejection fraction of 10%. Patient 3, an 18-year-old man, presented in extremis (BP 90/50, hr 120) with severe agitation and tachypnea. An echocardiogram obtained on the first hospitalization day revealed global hypokinesis with a 15% ejection fraction. He received IV magnesium, steroids, and dialysis. Three days later, repeat echocardiogram revealed EF of 40% and mild MR/TR. He recovered and was discharged by hospital day #8. Railroad authorities confirmed the presence of aluminum phosphide tablets inside the railcar. Ambient air tested near patient clothing at the hospital showed a phosphine concentration of 4 PPM; the 8hr TWA-PEL is 0.3 ppm. *Case Discussion:* Phosphine, a gas liberated when metal phosphides react with moisture, is a mitochondrial poison. Myocardial cells may be particularly sensitive. Echocardiography in two patients demonstrated contractile depression. The nonsurvivors developed respiratory failure and arrythmias likely due to phosphine inhalation. The surviving patient recovered despite myocardial shock, with both clinical and echocardiographic improvement. *Conclusion:* Phosphine toxicity and early echocardiography should be considered in severely ill, hyotensive patients exposed to fumigants.

Initial results from patient 3	
ABG (on face-mask oxygen)	7.277/27/105/ COHgB 1.3 %/ METHgB 0.8 %
Chemistry	Na 141; K 4.7; cl 97; HCO3 14; BUN 28; creat 2.3; Ca 9.3
Cardiac markers	CPK 399; troponin 0.06; BNP 34;
Chest radiograph	No infiltrates
EKG	Sinus tachydcardia
UA	1.030; 100 prot; trace kets; 25 blood; no cells.
LFTs, lipase, CBC	All normal
Acetaminophen, salicylates, EG, MeOH	All negative

197. Time Delay to Confirmatory Blood Lead Levels

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Background: The CDC recommends confirmation of an elevated capillary blood lead level (BLL) over 70 mcg/dL with a venous BLL as an "immediate, emergency lab test." We hypothesized that the hospitals covered by our regional poison center are unable to obtain immediate confirmatory BLLs. *Methods:* We surveyed all 45 acute care hospitals in our PC call area to ascertain: 1) whether a BLL was done at that hospital's laboratory or sent to a referral lab; 2) what the average turn around time was for a BLL; and 3) if they were capable of running an immediate BLL. We defined immediate as a turn around time within 8 hours. Eight hours was chosen as it provides information in a clinically useful period of time. We also compiled the total number of beds and the total number of critical care beds at each hospital an attempted to correlate each with BLL turn around time. *Results:* Surveys were returned from 43 (96%) hospitals. The number of beds ranged from 14–825 and the number of critical care beds ranged from 0–94. All hospitals surveyed sent BLL to a referral lab, none where able to run an "immediate" level. The mean BLL turn around was 1.8 days (range 1–5) 95% CI (1.6–2.2). There was no correlation (using simple linear regression) between total number of beds or number of critical care beds to BLL turn around time ($p = 0.63$ and 0.60, respectively). *Discussion:* None of the hospitals surveyed in this study can meet the CDC recommendations for immediate confirmation of an elevated capillary BLL. Nearly two days is need on average for the most rapid turn around time of confirmatory BLL testing. Clinicians should anticipate the need to make decisions based on available clinical data at the time while awaiting confirmatory BLL testing. The CDC and medical toxicologists should develop interim treatment recommendations for guidance while awaiting confirmatory BLL levels. *Conclusion:* No hospitals surveyed can meet the CDC recommendations for confirmatory BLL.

198. A Cohort Study of Acute Lung Injury after Use of a Spray-On Grout Sealer

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Background: Tile Perfect Stand 'N Seal™ is an aerosol grout sealer that was recalled after reports of acute lung injury. We report the clinical course of patients that contacted our poison center (PC) following exposure to this product. *Methods:* Our PC database was searched for calls related to Tile Perfect Stand 'N Seal "Spray-On" Grout Sealer™ from January 2004 to December 2005. The first call was in September 2004. The poison center data for each case were abstracted using a standardized form to record the exposure, symptoms, clinical findings, and outcome. *Results:* A total of 110 human exposures were reported. These calls were from several states and the national medical information line for the product. The age range of affected persons was 11 to 76 years old, with a median age of 40 and 63% were male. The most common initial symptom was shortness of breath, reported by 68%. The median time to onset of symptoms was 45 minutes. The CXR was and abnormal in 21% of patients, and 12% of patients had documented hypoxia. The severity of outcomes was mild (cough, chest tightness) in 6%, moderate (hypoxia, shortness of breath, wheezing, CXR findings) in 67% and major (mechanical ventilation) in 2%. The effects were unknown for 5% of the patients and no deaths were reported. *Discussion:* We report a large cohort study of acute lung injury after human exposures to Tile Perfect Stand 'N Seal "Spray-On" Grout Sealer™. The majority of callers reported moderate pulmonary symptoms but 2 patients required mechanical ventilation. The cause of the pulmonary toxicity is unknown. While no exposed person died, the product was recalled from the market on August 31, 2005 in part due to pc reports of patient injury. *Conclusion:* Tile Perfect Stand 'N Seal "Spray-On" Grout Sealer™ exposure appears to cause acute lung injury in some patients. Symptomatic patients usually have moderate symptoms, but some require mechanical ventilation.Reporting bias limits our ability to make conclusions regarding the incidence of symptoms. The long-term effects of this exposure are uncertain.

199. Dental Amalgam Contamination of a High School

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Background: Prefilled dental amalgam capsules contain 50% elemental mercury (Hg), and various amounts of silver, tin, copper, and zinc. A multiple capsule release in a high school created a public health event. *Case Report:* A 16-year-old male student removed approximately 50 capsules from a dental office. An unknown number were taken to school; 35 unopened capsules were recovered at his home. Each capsule was thought to contain 800 mg of Hg. Eleven of the school's 200 students played with the capsules. After discovery, the State Communications Center (SCC) initiated a call with EPA, State Bureau of Homeland Security, ATSDR, State Public Health, school principal, local fire and HazMat, and poison center. Calls continued throughout the incident. The action plan included Lumex sampling of school and home and blood from the student and his family (see table). Initial Hg levels were above the EPA action limit (AL) of 1 mcg/m^3. The school's highest air concentration was 65 mcg/m^3. Other "hot" areas were the floor, keyboard, and students' clothing. To decontaminate, EPA recommended heating the school to 85°F for 24–72 hours. Repeat samples were below the AL.

	Mercury levels				
Patients	Whole blood (mcg/L)	House	mg/m^3	School	mg/m^3
16-year-old Male	18	Car seat	50.0	9 Classrooms	1.0 – 65.0
37-year-old female	6	Kitchen	10.0	3 Closets	>1.0
15-day-old infant	5	Bedroom	20.0	Office	7.0

Case Discussion: Despite elevated ambient air and surface Hg concentrations at the school and the home, no exposed individual exhibited acute toxicity. Students' clothing may have caused widespread contamination at school and home. Hg blood levels reflected exposure but did not warrant treatment. *Conclusion:* The SCC's ability to rapidly integrate multiple health and governmental agencies facilitated a methodical, efficient response. Each agency was kept fully informed of the situation and all planned actions through a series of conference calls. Prompt action using the SCC concept averted panic and allowed the various agencies to focus on public health and environmental issues. This case represents a model for future public health emergencies.

200. The Evaluation of Prognostic Factors in Acute Organophosphate Poisoning

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Background: Acute organophosphate poisonings cause substantial morbidity and mortality worldwide. However, there was presently no universally accepted criteria available to grade the disease severity in acute organophosphate poisonings. We tried to investigate the clinically prognostic value of different laboratory parameters and scoring system in acute organophosphate poisonings. *Methods:* All acute organophosphate poisoning patients admitted consecutively to Kaohsiung Veterans General Hospital from 2003 to 2004 were prospectively enrolled in this study. Serum amylase, RBC cholinesterase levels were measured, and 12-lead electrocardiogram were done in all patients upon admission. The APACHE (Acute Physiology and Chronic Health Evaluation) II and III scores were calculated on admission as well. Patient prognosis was evaluated using 2 outcome variables: necessity for intubation and ventilatory support, and mortality. *Results:* Of the 24 poisoning patients (19 men, 5 women), the mean age was 57.6 ± 16.9 years (range from 14 to 82 years). Eleven patients (45.9%) developed acute respiratory failure and received ventilatory support. The mortality rate in this study is 12.5% (3/24). Patients who developed respiratory failure had higher APACHE II score and APACHE III scores (70 ± 27) than those who did not (32 ± 27); ($p < 0.05$). The mortality group had APACHE III scores (98 ± 9) than the survivor group (32 ± 27); ($p < 0.05$). There was no significant difference between the two groups in the percentage of QTc prolongation, levels of serum amylase, serum and RBC cholinesterase. Age and the percentage of hyperamylasemia was higher in the respiratory failure group than non-respiratory failure group. *Discussion:* Hyperamylasemia was closely related to clinical severity and presence of acute respiratory failure. The clinical value of APACHE III score in assessing disease severity following acute organophosphate poisonings is good either in respiratory failure or mortality. *Conclusion:* This study suggests that APACHE scoring system is a useful index of severity in acute organophosphate poisoning.

201. Acute Neurologic Toxicity Associated with Inhalational Exposure to Methyl Iodide and Iodine-131

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Background: Methyl iodide toxicity is very rare, primarily reported with dermal exposure and can result in ataxia and cerebellar dysfunction. We present a case of acute inhalational exposure to methyl iodide and iodine-131 who developed neurologic toxicity within 12 hours of exposure onset. *Case Report:* A 55-year-old male nuclear engineer was working in a malfunctioning laboratory hood resulting in a 6-hour exposure to methyl iodide and iodine-131. Six hours later he developed vomiting, vertigo, loss of balance, and ataxia. He presented to the local Emergency Department (ED) 4 days later for persistence of these symptoms. His past medical history was significant only for hypertension. His triage vital signs were: T 97.5 °F; HR, 73 bpm; BP, 169/93 mmHg; and RR 24/min. Mild ataxia was noted on physical exam, which was otherwise normal. A complete blood cell count, serum chemistry, and thyroid function tests were within normal limits. The radiation safety officer was alerted and the patient surveyed for radioactivity with a Geiger counter, which was negative. The patient was treated with meclizine and had minimal improvement. The patient refused admission, but returned to the ED the following day for re-examination. His symptoms persisted, and he left prior to complete evaluation and was lost to follow-up. *Case Discussion:* Methyl iodide toxicity commonly presents after a latency period of 1–4 days. A review of the available literature

has identified only four other cases of inhalational exposure all of whom developed neurologic symptoms a median of 72–96 hours after exposure. Iodine-131 would be expected to primarily accumulate in the thyroid and cause only local effects. Potassium iodide would not be expected to be beneficial due to the delay in presentation. *Conclusion:* Inhalational exposure to methyl iodide can result in acute neurologic toxicity. Healthcare professionals should be prepared to respond to atypical chemical and radiological exposures.

202. Teleworking: Enhancing the Provision of Provincial Poison Services

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Background: Ontario's population of 13 million people had been served since 1979 by two Regional Poison Information Centres, located in Toronto and Ottawa. Each call centre was located within a centralized hospital setting. In November 2005, the Ottawa Poison Centre abruptly closed. This resulted not only in a significant increase in call volumes, but the Toronto Centre was now mandated to provide French language services to the francophone population of Ontario. *Methods:* To cope with the problem of increasing workload and language issues the existing centre utilized leading edge communication technology to ensure quality poison information services were provided seamlessly throughout the province. The Toronto Poison Centre embraced the concept of teleworking, an emerging global phenomenon, in order to capitalize on an existing body of knowledge. *Results:* Experienced bilingual Specialists in Poison Information (SPIs) from the defunct centre were recruited to work remotely from home. The technology for remote access included dedicated desktop computers for each SPI in their home, High Speed Internet Access, Virtual Private Network (VPN) access, and Voice over Internet Protocol (VoIP) telephones. Remote SPIs utilize a site-to-site VPN tunnel setup to establish a connection to the centre's Terminal Server, thereby accessing documentation software as in-coming poison calls are dispersed via an automated call distributor (ACD). *Discussion:* Teleworking refers to the utilization of information and communications technologies that enable individuals to work at a distance. In our example these technologies allowed experienced SPIs to functionally relocate without leaving home. Our centre was able to quickly hire trained Specialists and fulfill our mandate, while SPIs were able to not only maintain their skills but also their quality of life. *Conclusion:* The utilization of teleworkers is a viable option to enhance the provision of poison information services. Although further data is required to assess both the economical and human impact of the technology, it provides an avenue that can be explored in times of disaster where physical and geographical constraints may limit access of staff to a central location.

203. Are Changing Phone Technologies Increasing Misrouting of Poison Center Calls and Hurting Regionalization?

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Background: Call routing is intended to connect callers of the national toll-free number to the poison center (PC) serving their location, based on the area code and exchange of the phone. Misrouted calls and calls arriving at an unintended PC appear to be increasing over the past 3 years. Cell phone use also has grown dramatically, from 97 million US subscribers in 2000 to 148 million in 2003 and 194 million in 2005. *Methods:* Six months of exposure calls (n = 45,560) to a regional PC (9/1/05–3/1/06) were retrospectively compared for caller location (as reported by the caller) and the calling telephone area code and exchange (NXX). An industry-standard database (NALEND NXX, January 2006) was then used to determine the actual state location of each exchange and its assignment to cell phones or "standard" (land-line or VOIP) lines. Geographic mismatch between the caller's physical location and the NXX location was determined for these calls, from both within and outside our designated service area. *Results:* Data for the location of caller and exchange existed in 40,583/ 45,560 calls (89.1%). Misrouted calls, defined as calls from outside our service area at the time of the call, accounted for 1,206/ 45,560 (2.67%) of exposure calls during these 6 months. Cell phones were used in 5,235/ 31,569 (16.6%) of in-state calls but 700/ 1,403 of out-of-state calls (49.9%) ($p < .001$, χ^2). Mismatch between caller location and NXX occurred in 8.3% of calls made from a cell phone NXX but only 0.5% of calls from a standard NXX ($p < .001$, χ^2). *Discussion:* Calls to PCs are more likely to be misrouted when originating from a cell phone. Possible reasons may include: cell phones used from a site away from their "home" NXX, connecting to a cell tower outside the immediate area of use, and using directory assistance to connect the caller. *Conclusion:* Revisiting the methodology of call distribution between PCs seems necessary. Calls can be routed based on caller location or based on their phone NXX; these are increasingly unrelated, leading to

misrouting. Cell phones seem to be the major contributor. VOIP and other emerging technologies are likely to further exacerbate the problem.

204. Poison Center Student Rotations and Cultivating Poison Specialists

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Background: Recruiting and educating future specialists in poison information (SPIs) is essential for the continued development of Poison Control Centers (PCCs). Student rotations in clinical toxicology and poison information are an important element of this process. The purpose of this study is to identify if and how PCCs incorporate pharmacy student education into their poison center practice. *Methods:* All U.S. AAPCC-member PCC managing directors were emailed a survey inquiring if they offered pharmacy student rotations, what poison center activities students participated in, teaching tools used and obstacles encountered in developing and maintaining a rotation. *Results:* Seventy-five percent of PCCs responded. Of those, 90% offer rotations (<5% were mandatory) to pharmacy students and 50% hired former students as SPIs. The average lengths of rotations are five weeks. Most respondents have 1–2 preceptors that can accommodate 2–3 students at a time. A direct association with a pharmacy school was reported by 55% of respondents, with 60% participating in a pharmacy school elective toxicology course. Seventy-six percent of respondents allow students to answer calls from the public, 45% allow students to answer calls from health care facilities and 36% allow direct student-patient interaction on rounds. Only 29% offer a paid student intern program. Time allocation (64%) was the most commonly cited obstacle to developing a PCC student rotation. *Discussion:* Strong relationships between PCCs and pharmacy schools introduce students to the field of clinical toxicology and PCCs. The results of this survey demonstrate a wide variation in the development, content and structure of student rotations. *Conclusion:* Pharmacy student PCC rotations are a viable and valuable way to cultivate future SPIs. Continued efforts should be made by PCCs to foster good relationships between their centers and pharmacy schools to generate and maintain student participation in PCC rotations.

205. Cost-Effectiveness of a Poison Center/EMS Collaborative Project

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Background: When 911 is called, an ambulance is dispatched and the patient is usually transported to a hospital. In most cases of minor poisoning such transport is not medically necessary and results in high healthcare costs to the patient, family, and/or local taxpayers while inefficiently using limited emergency resources. To address this issue, the West Texas Regional Poison Center (WTRPC) has partnered with El Paso Fire & Medical Services (EMS) since 1995 to provide toxicological and treatment information simultaneously to EMS dispatchers and 911 callers before an ambulance is dispatched. This partnership is designed to reduce the number of unnecessary EMS dispatches and subsequent transports of accidental poisonings, while ensuring patients' safety through WTRPC's follow-up calls. *Methods:* We reviewed 10 years of poison center records (1996 through 2005). Each case consists of a three-way conversation between the WTRPC specialist, EMS dispatcher, and the 911 caller. If all parties agree an ambulance is not necessary, the case is classified as a 'No Roll' and the WTRPC completes follow-up calls as per protocol. *Results:* Over the last ten years, EMS dispatchers have relayed over 4,700 poison-related calls to the WTRPC. On average, 53% of these 911 calls (range 42–67% annually) have been diverted, thereby saving transport and hospital fees charged to the patient, while freeing up overburdened emergency services. The total estimated cost-savings over 10 years is greater than $5 million, with annual savings approaching $1 million per year. *Discussion:* This partnership has effectively increased the number of minor poisonings that are appropriately and safely treated at home as opposed to the region's EDs while allowing more EMS units to be available for other emergencies. *Conclusion:* The poison center-EMS partnership in our region has resulted in significant cost savings for patients with minor poisonings where 911 is contacted initially instead of the poison center. Similar partnerships between poison centers and local EMS agencies could be replicated in other regions of the country and may result in significant cost savings to the country's health-care system.

206. Caller Behavior Response to a Restrictive Drug Identification Policy: Outcomes Evaluation

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Background: One test center within our poison center network implemented a restrictive drug identification policy in 2003. Previous reports indicate that this policy effectively reduced the number of drug identification calls. It was unknown if the observed decrease in calls was associated with caller behavior change or random change in call volume. The purpose of this investigation was to determine if the restrictive policy effectually resulted in a caller behavior change evidenced by decreased repeat inquiries. *Methods:* Records from our poison center network database for 2005 were queried to determine the distribution of calls received from a distinct phone number. The number of calls from a given phone number was limited to 20 in order to avoid capturing generic numbers (cell towers, etc). The number of calls to a given phone number were compared for the entire poison center network against calls originating in counties served by the test center that were handled by the test center. *Results:* A total of 55,750 public drug identification calls were documented in the network. Public drug identification calls from a distinct number calling once in the entire poison center network represented 77%, and calling twice were 12.7%. For drug identification calls handled by the test center, the percent of distinct numbers calling once was 87.4% and calling twice was 7.4%. Our test center reports a –5.1% difference in drug identification calls from repeat inquiries with a 1.14 ratio and corresponding 95% confidence interval of 1.03–1.26. *Discussion:* It was theorized that drug identification inquiries are partially a repetitive behavior exhibited by individuals interested in unauthorized use of medications. Implementing a restrictive policy could enable a center could deter inappropriate drug identification practices. *Conclusion:* Repeat drug identification calls to the test center were significantly reduced compared to the rest of the network. This caller behavior change is largely responsible for the observed overall decrease in drug identification calls to the test center.

207. Severe Acute Arsine Poisoning Treated by Plasma Exchange and Hemodialysis

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Background: Arsine is a toxic gas which can cause fatal hemolysis and multiorgan damage, blood exchange transfusion or hemodialysis has been recommended to the treatment of severe acute arsine poisoning, but neither data are available on severe acute arsine poisoning treated by plasma exchange, nor study is about which kinds of blood purification are much more available. The study was to probe into the effects of plasma exchange and hemodialysis to severe acute arsine poisoning and the possible mechanisms. *Methods:* Of 14 patients with severe acute arsine poisoning, 12 were treated with plasma exchange, and 2 with hemodialysis. Plasma exchange was performed for 1–2 times per patient, during which the replacement fluid was fresh frozen plasma, total 1400–4000 ml. Laboratory factors, including concentrations of arsenic both in blood, the discarded plasma and urine, were examined. *Results:* All the patients treated by plasma exchange were survived, but to the patients by hemodialysis, one of whom died quickly and another took months for kidney to recover. Plasma exchange terminated hemolysis of arsine quickly and prevented arsine from worsening kidney and other organs damage. The concentrations of arsenic in discarded plasma were (27.7–88.7) mg/L, and the total arsenic descarded were (55.4–177.4) mg by plasma exchange. The laboratory factors that showed significant association with treatment response were the creatine kinase, lactate dehydrogenase, blood urea nitrogen, total bilirubin and heart-related enzymes. *Discussion:* The mechanism underlying the therapeutic success of plasma exchange remains speculative, in part it may be because plasma exchange could nonspecifically remove the toxins and intravascular erythrocyte fragments, metabolites of arsine, which accumulate in blood and cause severe secondary damage, but hemodialysis just remove the low molecule endotoxin such as BUN and Cr. *Conclusion:* Plasma exchange is an effective method to patients with severe acute arsine poisoning and seems to be superior to hemodialysis, these patients are suggested to be treated aggressively as early as possible.

208. How do Callers Obtain the Poison Center Telephone Number? An Analysis of a Convenience Sample

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Background: Managers of poison centers (PCs) are faced with the challenge of ensuring the broadest public awareness of the PC access telephone number while working within a limited advertising budget. A determination of which sources callers use most

frequently could be used to better invest public education monies. *Methods:* In this pilot study, we conducted a convenience sample survey of individuals who had just called the poison center during January-February 2006. Callers were asked at the end of their call: "Where did you obtain our phone number today?" The choices included: stickers, magnets, television, print (newspapers, pamphlets, coloring books), billboard, 911, phonebook, pharmacy, physician, family member, internet, emergency department (ED), nurse help line, and "other" (including services such as 211, 311, and 411). There were 200 respondents. *Results:* The phonebook was the source for 57 callers (29%) and the pharmacy accounted for 31 callers (16%). Nurse help lines, EDs, and physicians accounted for 26 (13%), 18 (9%), and 13 (7%) caller sources respectively. Magnets and stickers were the source for 19 callers (10%). Another 19 callers used "other" sources (10%). The internet was the source for 6 callers (3%). Print sources were not used by any of our respondents to obtain the PC phone number. *Discussion:* The phonebook was by far the most common single source for obtaining the poison center telephone number (29%). Collectively, nurse help lines, MD offices and ED referrals accounted for 29% of the callers. Surprisingly, refrigerator magnets, telephone stickers, and all forms of print altogether accounted for very few calls. Although PCs commonly utilize print as a major educational and advertising method, not a single caller stated they had obtained our phone number by this means. *Conclusion:* This pilot study suggests that the telephone book is the most common choice of the citizens of our region to find the number to call a PC. A larger survey may be useful to help determine how poison centers could best distribute monies designated to advertise the poison center number.

209. Cost-Benefit Analysis of Poison Center Phone Services

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Background: Maintaining funding for poison center (PC) operations has become a major challenge nationwide. Increasingly, state and federal budget cuts have resulted in diminished funding to PCs. This has threatened the livelihood of many centers and forced operations to find alternative means of funding to maintain basic public services. Policymakers controlling the allocation of state and federal monies are more supportive of projects with proven cost-effectiveness. In an effort to demonstrate the cost-effectiveness of current PC phone services, a cost-benefit analysis of a regional center was completed. *Methods:* A telephone survey design was used to collect data from PC callers during an 8-week period from August to October 2004. Callers with human exposure poisonings that were determined by the PC to be of minimal or no risk and appropriate for home management were asked to complete the phone survey. Callers were inquired their alternative plan if the PC staff had not been available to assist them. A follow-up phone call between 2–5 days following the initial call was made to determine if any additional healthcare service utilization had occurred despite home management advice from the PC staff. Healthcare cost data was used to measure economic outcome benefit based on the survey results. Informed consent was obtained from all participating callers. *Results:* A total of 652 caller surveys were completed. The benefit-to-cost ratio was 7.77 (95% CI 6.93 to 8.61). The benefit was measured as the medical service charges related to suspected poisoning exposures that would be incurred if the PC had not been available for assistance with the exposure. The cost estimation included all costs associated with the operation of the PC. *Discussion:* PC funding provides a significant positive return based solely on preventable medical evaluations and treatments. *Conclusion:* Despite not including the added value of other PC services (i.e., public and professional education programs), the PC is a sound investment for any funding agency seeking to improve public welfare and minimize unnecessary medical costs.

210. Development of a National Antidote Stock Guideline for EDs in the UK

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Background: The timely supply of antidotes is crucial in the care of poisoned patients. There is, however, no authoritative UK guideline for the stocking of antidotes in the ED and a recent survey showed the stocking of antidotes in UK EDs is not uniform. The aim of this work was to develop and disseminate such a guideline in a collaboration between a poisons center and the British Association for Emergency Medicine (BAEM). *Methods:* A list of 36 agents used in the management of poisoning was considered for inclusion in the guideline by a panel of 4 Clinical Toxicologists, an Intensivist, 5 ED physicians, 2 ED pharmacists and a Specialist in Poisons Information. The agents were grouped into 4 clinically relevant timeframes and dosages and the amount needed to treat a 70 kg patient for 24 hrs were included. Further peer review was provided by the BAEM Clinical Effectiveness

Committee and an ED Pharmacy Group. *Results:* Agents were grouped in 4 timeframes. Immediately available in ED: absolute alcohol, *N*-acetylcysteine, activated charcoal, atropine, benzatropine, calcium chloride/gluconate, calcium gluconate gel, hydroxocobalamin, diazepam, dicobalt edentate, flumazenil, glucagon, GTN, methylene blue, naloxone, procyclidine, hypertonic sodium bicarbonate, sodium nitrite, sodium thiosulphate. Available within 1hr: phentolamine or phenoxybenzamine, dantrolene, deferoxamine, digoxin specific Fab, *Klean Prep*®, methionine, phytomenadione, pralidoxime, isotonic sodium bicarbonate. Available within 4 hrs: Adder antivenom, calcium folinate, octreotide. Not critically time dependent or rarely used/could be held supraregionally: non-indigenous animal antivenoms, Berlin Blue, dimercaprol, fomepizole, pyridoxine, sodium calcium edetate, succimer, unthiol. *Discussion:* The guideline was published as a 2 page format table on the BAEM and poisons center websites and letters were sent to all UK ED Attendings and chief pharmacists to publicise it. *Conclusion:* A succinct, practical antidote guideline was produced by a multidisciplinary team and it has been widely circulated in the UK. It should prove a useful tool for EDs and the take up of its recommendations will assessed in 2007.

211. Poison Centers' Role in Facilitating Rapid Testing of Ethylene Glycol and Methanol

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Background: Patients presenting with clinical or laboratory data suggestive of Toxic Alcohols (TA) (ethylene glycol or methanol) represent a diagnostic challenge. Most therapeutic decisions regarding initiation and discontinuation of therapies depend on a TA level. Lack of access to rapid determination of TA levels results in extended hospitalization and expensive therapies. In our region, only our tertiary teaching hospital performs TA levels in-house. *Methods:* When TA levels are recommended by a medical toxicologist, the PC offers to have the samples run at our facility. Our PC, medical toxicologists and clinical toxicology laboratory developed a systematic method for handling samples and reporting results. The medical toxicologist, in consultation with the on-call pathologist, is responsible for approving the test. Referring facilities are FAXed instructions on sample amount, tube type, directions on where to deliver the sample upon arrival at our facility, and contact information. In return they provide information on patient name, billing information, and contact for reporting of tests. Results are reported to PC and referring hospital. CSPIs at the PC provide a 24 hr link to facilitate problems in the process. *Results:* Most hospitals will not get TA results from their usual referral labs for at least 48 hours. Our laboratory's results are usually available in less than 4 hours and so are limited only by transport time from the outlying facility. *Discussion:* Antidotal therapy and hospital stay for 2 days while awaiting confirmatory lab data is costly. The role of toxicologists as "gate-keepers" for stat TA and for PC to facilitate more rapid TA levels represents a significant resource for consulting hospitals. *Conclusion:* Poison Centers working in conjunction with tertiary teaching hospital's laboratory can facilitate rapid testing of TA for the hospitals they serve. This service reinforces the role PC play in providing efficient, cost effective delivery of health care.

212. Registry of Fatal Poisonings (FP) in Santa Fe, Argentina from 1990–2005: The SERTOX Experience

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Background: Organized data collection on FP is an important aid in determining the potential toxicity of chemicals in a region, and therefore, for poisoning prevention. Poison Center's (PC) data can be particularly helpful for this purpose. The 18 poison centers dispersed in the entire Argentinean territory, serve a population of 38 million residents. However, a centralized multicenter-exposure surveillance system like TESS is unavailable, preventing the development of better strategies for poison prevention and control. SERTOX is located in the province of Santa Fe serving more than 3,000,000 of the inhabitant area. Since 1990, SERTOX pioneered a systematic collection of poison information data from its coverage area, a system lacking in the majority of other Argentinean PCs. *Methods:* Each FP case reported to SERTOX was evaluated for age, gender, type of substance ingested, and for class of ingestion (i.e., non-deliberate vs. deliberate). *Results:* Between the period of 1990–2005, 21,797 reported cases of substance exposure were registered in Sertox. Twenty-six (14 females and 12 males (0.11%)) had a fatal outcome. The age distribution was fairly equal among older than 40 and younger than 20 years old (ten cases in each group). Two cases were toddlers younger than 2 years old. The most predominant form of intoxication was deliberate self-poisoning compared to non intentional poisoning (19 vs. 7). Pharmaceutical, non pharmaceutical, and mixture of pharmaceutical and non pharmaceutical substances

were involved in 5, 19, and 2 cases, respectively. In 14 cases, pesticides (64% was parathion) were involved. *Discussion:* Our statistical data show a high incidence of deliberate self-poisoning attempts. Parathion was commonly used until 1995, when was banned in Argentina, subsequently a trend toward prescribed and OTC pharmaceutical was recognized (similar to 1st world countries trend). We believe that a similar trend prevails in other areas in Argentina; however, we cannot state this definitively. *Conclusion:* We stress the need to implement a multicenter TESS-like system in Argentina to improve poison control.

213. Introduction of Poison Center Services to American Samoa

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Background: In September 2004, the Human Resources Service Administration began funding the provision of poison center services to previously un-served American Samoa. *Methods:* We initially focused our efforts directly at the island's sole hospital. A questionnaire was sent to the Health Department regarding cultural factors, healthcare capabilities and the spectrum of poison exposures in American Samoa. Letters sent to the public health director, hospital personnel and emergency medical services described the poison center's services. Customized telephone stickers and brochures were mailed to the Health Department and emergency service providers were phoned. Our representative traveled to American Samoa to provide in-services on the poison center and to gather additional data. In-service training was provided to our SPIs. Initial challenges included the inability to place directly-dialed 800 calls to the U.S. mainland. After creation of this capability some calls were randomly distributed to other U.S. poison centers. Correction required six months of effort and still necessitates the dialing of a prefix access code. Additional contacts were made with practitioners to assess the service provided, healthcare capabilities, and to provide toxicology education. *Results:* Between July 2005 and January 2006 we received 24 human exposure calls and 5 information calls from American Samoa. Of the exposure calls, 54% (13/24) involved prescription (7) or over-the-counter preparations (6). There were ingestions of laundry detergent, pine sol, fabric softener, hydrocarbons (kerosene (3), transmission fluid and gasoline), one ciguatera poisoning, and 2 fish stings. Six (25%) had major (1) or moderate (5) outcomes and no deaths were reported. *Discussion:* A myriad of challenges exist in providing poison center services to regions that are geographically remote, outside of the continental U.S., and have not previously had such services. These obstacles are augmented by the existence of different and unfamiliar cultural features, substance exposure patterns, and healthcare systems and resources. *Conclusion:* Although establishing and maintaining a working relationship with American Samoa has had difficulties, a sustained collaborative effort has mitigated many of the initial barriers.

214. OpdA, a Bacterial Organophosphorus Hydrolase, Prevents Lethality in Rat Models of Dichlorvos and Parathion Poisoning

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Background: Organophosphates (OPs) cause up to 300,000 deaths every year. An OP hydrolase capable of enzymatically degrading OPs in circulation could be useful as an antidote. Our goal was to determine the effectiveness of OpdAin rat models of severe dichorvos and parathion poisoning. *Methods:* OpdA, an organophosphorus (OP) hydrolase from *Agrobacterium radiobacter* with a wide range of *in vitro* OP substrates was concentrated and purified by standard techniques for *in vivo* experiments. Male Wistar rats weighing 300 +/– 25 gm were given 3xLD_{50} of parathion (rat oral LD_{50} = 6 mg/kg) or dichorvos (rat oral LD_{50} = 50 mg/kg). Rats were randomized (n = 8 per group) to receive 0.5 mL IV saline (negative control) or equal volume of hydrolase (dose of 0.15 mg/kg) immediately after poisoning (dichlorvos group) or 10, 45, and 90 minutes after poisoning (parathion group). To determine if OpdA remained active after several hours, 1.5 mg/kg OpdA was given IV followed by 3xLD50 parathion or dichlorvos 3 hours later. Outcomes of interest were survival to 4 and 24 hours. Grouped survival data were compared using the Chi-Square test. *Results:* All 8 negative control animals died within 45 minutes of parathion poisoning and within 11 minutes of dichlorvos poisoning. With dichlorvos, 8/8 animals in the OpdA treatment group survived to 24 hours ($p = 0.0001$ compared to negative control group). With parathion, 8/8 animals in the OpdA treatment group survived to 4 hours and 5/8 survived to 24 hours ($p = 0.009$ vs negative controls). In the delayed OP poisoning groups, 4/4 parathion poisoned rats survived to 24 hours ($p = 0.001$) while 0/4 rats survived to 24 hours in the dihchlorvos group. *Discussion:* We present evidence of the efficacy of OpdA against parathion

and dichlorvos in the rat. No acute adverse effects from the hydrolase were evident, and repeated dosing of 0.15 mg/kg OpdA IV every week for 4 weeks caused no observable effects. *Conclusion:* OpdA is effective as monotherapy after severe dichlorvos and parathion poisoning in the rat. When used in larger doses, OpdA retains clinically relevant activity for at least 3 hours.

215. Serial Neurophysiological Studies in 70 Patients with Organophosphate Poisoning: Early Prediction of Intermediate Syndrome

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Background: Intermediate syndrome (IMS) is a major cause of death from organophosphate poisoning (OPP) in Asia. IMS prediction may be important clinically and for research. *Methods:* A prospective case series of 70 consenting symptomatic patients with laboratory confirmed OPP, underwent repeated physical examinations & daily serial Repetitive Nerve Stimulation (RNS) studies with single supramaximal stimulation and RNS of R/L Ulnar Median nerves 1HZ, 3Hz, 10Hz, 15Hz, 20Hz & 30Hz. *Results:* Forty-eight out of 70 of patients ingested Chlopyrifos. Nine out of 70 patients developed classical IMS. Four out of nine IMS patients developed respiratory failure needing ventilatory support. Serial RNS changes in classical IMS correlated with physical examination (see table). Decrement Increment (DI) pattern was detected only at intermediate & high frequencies early in the clinical course. With clinical progression DI was seen with low frequencies. RNS in severe IMS showed severe decrements mostly at high frequencies. There were twenty-three out of 70 patients who developed weakness of neck flexors and proximal limb muscles of varying degrees but did not progress to classical IMS syndrome. They demonstrated DI phenomena at intermediate frequencies and high frequencies. A third group (three out of 70) of patients did not develop clinically detectable muscle weakness but had DI at high frequency stimulations. *Discussion:* It appeared that there is a correlation between DI patterns and the development of IMS. The presence of DI patterns in patients with either mild or no symptoms suggests a sub clinical syndrome which may be important when examining efficacy of treatments for OP poisoning. These findings may also help to distinguish IMS from other syndromes of OP induced muscle weakness. *Conclusion:* IMS is probably a spectrum disorder. Neurophysiological examination may be of value in predicting the development of intermediate syndrome and as a tool in understanding the pathophysiology of the condition.

TABLE 1

Clinical Grade Muscle Weakness	RNS
No weakness/MRC Grade 4	DI From 10 to 30 Hz
MRC Grade 3/2	DI From 1 to 30 Hz
Clinical IMS	Decremental reponse only

216. Effect of Hydroxocobalamin on Morbidity and Mortality after Acute Cyanide Poisoning in Dogs

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Background: This study was conducted to compare the efficacy of hydroxocobalamin with that of saline vehicle for the treatment of acute cyanide poisoning in dogs. *Methods:* Isoflurane-anesthetized, intubated beagle dogs were administered potassium cyanide (KCN; 0.4 mg/kg/min, IV) until 3 min after the onset of apnea. This protocol produced severe cardiovascular and respiratory deterioration that would have led to death without treatment. Treatment was initiated by ventilating all animals with 100% oxygen. Hydroxocobalamin (75 mg/kg [n = 19] or 150 mg/kg [n = 18], IV) or saline vehicle (n = 17) was then infused over 7.5 min. Mechanical ventilation was stopped after 15 min. Animals surviving a 2-hour monitoring period were allowed to recover from anesthesia and were maintained for a maximum of 14 days. *Results:* Within the first 4 hours after KCN poisoning, death occurred in 60% (n = 10) of vehicle-treated dogs compared with 5% (n = 1) and

0% of dogs treated with low-dose and high-dose hydroxocobalamin, respectively. Fourteen days after poisoning, mortality rate was 82% in vehicle-treated dogs compared with 21% and 0% of dogs treated with low-dose and high-dose hydroxocobalamin, respectively. Vehicle dogs that did not survive beyond the 4-hour postdose period exhibited neurological signs ranging from stupor to nonresponsiveness. Dogs in the vehicle group and the low-dose hydroxocobalamin group that survived past 4 hours but were euthanized by day 4 also had neurological signs including lethargy, ataxia, dementia, and paresis. Dogs that survived to day 15 had minimal clinical observations considered not to be related to KCN poisoning or to study treatment. The improved outcome following KCN poisoning in hydroxocobalamin-treated dogs was associated with rapid recovery of mean arterial blood pressure with an onset during the hydroxocobalamin infusion period. *Discussion:* Hydroxocobalamin-associated reduction in mortality, cardiovascular recovery, and protection against neurologic toxicity appeared to be dose related. *Conclusion:* Hydroxocobalamin 75 mg/kg and 150 mg/kg were highly effective in the treatment of acute cyanide poisoning in dogs.

217. Effect of IV Albumin on Brain Salicylate Concentration in a Porcine Model

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Background: Death from salicylate (SAL) reflects neurotoxicity. Brain SALs are in equilibrium with plasma free SAL, and plasma SAL is partly bound to albumin (Alb). We wondered if IV Alb would decrease brain SALs in poisoned swine, which exhibit salicylate pharmacokinetics similar to humans. In moribund patients, such action might allow survival while dialysis was being prepared. *Methods:* Seventeen male swine under anesthesia were instrumented and mechanically ventilated under paralysis. 400 mg/Kg Na SAL were given IV over 15 min. One hour later, pigs were randomized to receive 5 mL/Kg IV 25% Alb or an equal volume of 0.9% NaCl (controls) over 15 min. ABGs, total and free serum (SAL), and serum (Alb) were followed serially. Ventilation was adjusted and $NaHCO_3$ given to keep blood pH between 7.45 and 7.55. At time 3 h, pigs were euthanized and brains removed for measurement of brain SAL. Total urinary SAL excretion was also measured. Brain SALs were compared using the Mann-Whitney U test. Groups were compared for blood pH, serum Alb, and total and free serum SALs using repeat measures ANOVAs. With N = 16, we calculated a power of 0.8 to detect a difference in mean brain SALs of 25%. *Results:* There were 8 controls and 9 albumin animals. Mean serum total and free SALs were similar in groups for the first 60 min, with a total SAL of about 78 mg/dL immediately before Alb or saline infusions. Baseline mean serum Albs were also similar, but rose in Alb animals from 1.3 to 3.1 mg/dL after Alb infusion ($P < .001$). IV Alb caused a 25% rise in the percent serum SAL that was protein bound. However, this was accompanied by a 21% rise in total SAL without statistically significant fall in free SAL ($P > .12$). Mean brain SALs were 20.5 mg/100 g in controls and 18.3 mg/100 g in Alb animals ($p = 0.07$). No statistically significant differences between groups in blood pH or total urinary SAL excretion were found. *Discussion:* IV Alb increased the percent of protein bound SAL, but rises in total serum SAL from a decline in Vd offset dramatic falls in serum free SAL and brain SAL. *Conclusion:* We failed to demonstrate a statistical fall in brain SAL despite more than doubling serum Alb content and concentration.

218. Non-Radioactive Cesium Toxicity: A Case of Treatment Using Prussian Blue

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Background: Cesium (Cs) chloride is being used in alternative therapies for cancer. High levels of Cs are arrhythmogenic and are used in animal models to study long-QT syndrome and torsades de pointes (TdP). A handful of human cases of Cs-induced TdP have also been reported in the litereature. Prussian Blue (PB) is approved for use in the United States for thallium and radioactive Cs poisoning. Through interruption of the enterohepatic circulation of Cs, t 1/2 of Cs is reduced from 80 days to 26 days when PB is used. There are no reports of PB used for the treatment of non-radioactive Cs toxicity. *Case Report:* The authors present a case of Cs toxicity from alternative cancer therapy in a 58-year-old woman manifested by recurrent syncope, polymorphic ventricular tachycardia, hypokalemia, and a QT prolonged to 690 ms. Along with conventional measures, PB was used to treat Cs toxicity. The patient's long QT was incompletely normalized with supportive care (K+ and Mg+ replacement, and IV lidocaine) but normalized quickly with PB treatment. During PB treatment, Cs levels fell rapidly with normalization of the QT (elimination half-life 7.9 days). After PB treatment, the Cs elimination t 1/2 lengthened to 86.6 days, consistent with published literature. The patient experienced no PB-related side effects. *Case Discussion:* PB treatment led to far more rapid reduction of both Cs levels and QT prolongation than previously reported in the

literature. Because Cs arrhythmias are dose-dependant, it is plausible that PB administration could further reduce the risk of ongoing cardiac arrhythmias. In this case Cs levels were quickly reduced to levels previously reported to be safe and associated with normal QT intervals. *Conclusion:* In this case treatment of Cs toxicity with PB dramatically decreased the t 1/2 of Cs from 86.6 to 7.9 days, with associated normalization of QT interval and cardiac rhythm. Prussian Blue is a safe, well-tolerated option for treatment of non-radioactive Cs toxicity.

219. Unrecognized, Life Threatening Hypoglycemia due to Maltodextrin in Enteral Nutrition

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Background: Portable glucometers often utilize enzymatic glucose dehydrogenase (GDH) to measure glucose concentration (GlucC). False glucose elevation may occur when certain exogenous sugars are present in the blood (e.g., galactose and maltose). Maltodextrin is a polymer of maltose that is digested in the GI tract to glucose prior to absorption. We report a case of an unrecognized fatal hypoglycemia in the setting of elevated glucometer GlucC due to maltodextrin. *Case Report:* A 79-year old man with a history of IDDM was admitted for presumed sepsis. Upon admission, he was fully alert and oriented. He received vancomycin, cefepime, amikacin, voriconazole and both regular and glargine insulin. He received enteral feeds containing maltodextrin (Peptamen) by NG tube. A routine evening glucometer GlucC was 465 mg/dL, and insulin was administered. The following morning the laboratory reported a serum GlucC of 10 mg/dL. The patient was found comatose and a glucometer GlucC was 201 mg/dL. Intravenous glucose caused no improvement and the patient subsequently expired. Review of the patient's glucometer GlucCs compared to serum GlucCs revealed a persistently elevated reading on the glucometer. *Case Discussion:* Maltodextrin is metabolized to maltose by hydrolases and glucosidases present in the gut. Maltose, a glucose disaccharide, is metabolized to monosaccharides by brush border hydrolyases in the small bowel prior to absorption. Maltose is not usually absorbed from the GI tract. When given parenterally, maltose interferes with glucometers that use GDH but not those that use glucose oxidase. Presumably, in the setting of gastric inflammation, such as chemotherapy or sepsis, maltose, as reported with sucrose, may be absorbed by passive diffusion. It is unclear if maltodextrin is absorbable or interferes with glucometry, although icodextrin, another polymer of glucose that is used in peritoneal dialysis, may be absorbed peritoneally and produce falsely elevated glucose. *Conclusion:* GI absorption of maltodextrin or maltose in certain patients may produce falsely elevated glucometer readings, leading to unrecognized hypoglycemia.

220. Massive Yohimbine Overdose Associated with Sodium Channel Blockade

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Background: Yohimbine is an herbal product derived from the *Corynanthe yohimbe* tree. It is sold as an aphrodisiac and athletic enhancing agent. Yohimbine is a centrally acting alpha$_2$ –adrenoceptor antagonist and exerts its effects by increasing norepinephrine release from the sympathetic nerves. We report a case of sodium channel blockade, seizures and hypotension in a patient who reportedly took 3 g of yohimbine. The dose for erectile dysfunction is 5–6 mg TID. The largest overdose reported is 1.8 g. *Case Report:* A 25-year old man presented to the ED with a seizure after ingesting 3 g of yohimbine in an effort to "bulk up". At the hospital he was obtunded, his BP was 70/30 mmHg; HR, 110/min; he was afebrile. He was intubated for airway protection. An ECG showed a QRS of 154 ms, an R' in aVR, an S wave in I and aVL. The QTc was 453 ms. Hypertonic sodium bicarbonate, 3 mEq/kg, was administered and the QRS duration decreased to 120 ms. The QTc remained unchanged. The patient's exam was otherwise normal except for the presence of an erection that resolved shortly after arrival. The patient was started on a bicarbonate drip, sedated with lorazepam and admitted to the ICU. His vital signs improved with supportive care. He also denied taking any other products. The patient's laboratory values were remarkable for a negative troponin, negative urine drug of abuse screen and TCA. His chemistry was normal. GC/MS of the powder revealed the presence of yohimbine. *Case Discussion:* Yohimbine results in a sympathomimetic syndrome and increases perfusion of the corpora cavernosum. Overdose is associated with hypertension and tachycardia. It is unclear why this patient became hypotensive. Animal studies suggest that yohimbine has sodium channel blocking properties. However, there are no reports of clinical toxicity related to this effect. Our patient exhibited signs and symptoms of sodium channel blockade and significant toxicity after an inadvertent overdose. *Conclusion:* Massive ingestion of yohimbine can cause seizures and myocardial sodium channel blockade. Sodium bicarbonate reverses the widening of the QRS associated with sodium channel blockade.

221. Etoricoxib (Arcoxia™) and Severe Recurrent Ulceration of the Penis: A Case Report

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Background: Anti-Cox-2 drugs are a potential cause of vascular disease, especially to the heart. Coagulation disorders are carefully monitored to prevent cardiac disease. However, there are potentially other organs that may be targets to the antiinflammatory effects of these drugs. Lesions to the skin have been infrequently reported to rofecoxib, celecoxib and etoricocib. However, there have been no previous reports of lesions to the penis with their use. *Case Report:* A 34-year-old white man, married, suffered from gout for the past two years. One year ago, after an acute episode of intense pain to the shoulder joints, he was prescribed etoricocib (100 mg once daily). After four days, the joint pain was relieved, but he noticed an ulcerative lesion on the side of the glans on the penis. He was prescribed medicine for fungal infection and antibiotics for STD (sexually transmitted disease). Six months later, the shoulder pain recurred and he was prescribed the same drug, and on the fourth day, the lesions appeared again on the penis. Again the physician diagnosed as STD and local fungal disease. He repeated the treatment with antibiotics and topical ointments, and again the lesions resolved. Again six months later, the shoulders hurt and he was prescribed the same treatment. Four months later, after receiving again etoricib, the ulcer reappeared and the lesions worse. *Case Discussion:* Etoricoxib is a selective anti-COX2 inhibitor. Other similar drugs (rofecoxib, celecoxib) inhibit the production of vascular prostate production of vascular prostacyclin (PG12), vascular prostacyclin (PG12), an inhitor of platelet aggregation and a vasodilator. Unlike conventional non-steroidal antiinflammatory drugs, COX-2 inhibitors do not reduce the endogenous production of thromboxane A2, a potent platelet activator and aggregator, thereby causing a potentially prothrombotic cascade of events that could lead to a significant increase in the risk for thrombotic cardiovascular events (myocardial infarction, occlusive stroke) in patients receiving these drugs. The lesions on the penis are apparently fixed drug reactions. *Conclusion:* Skin eruptions are more common as side effects of drug use. The presence on the penis is rare but must be contemplated.

222. Femproporex: An Amphetamine Afpetite Suppressant and its Abuse Potential

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Background: Femproporex is the most popular amphetamine used as an appetite suppressant in Brazil. Its use is forbidden in most countries of the world, including USA, Europe and Japan. In Brazil, however, it accounts for over 70% of the prescriptions of anorectic drugs. In March 2006, WHO and the United Nations reported that Brazil had posted a 325% increase of amphetamine use in the last 10 years. Brazil, known for its beautiful women, is the leading nation in amphetamine consumption, followed by the USA with 15% less. Acute and chronic use of femproporex can cause severe neurologic and psychological disorders, such as hallucinations, violent behavior, paranoia, delusions, psychosis, intense depression and suicidal attempts. It is the second leading cause of psychiatric internment, after alcohol. Recently, two reputed "natural" formulations for losing weight sold exclusively by the Internet to the US, was found to have femproporex amphetamine and benzodiazepines. *Case Report:* Between January 2003 and January 2006, 130 cases of overdose of femproporex were reported to CEATOX (Sao Paulo Regional Poison Center). Epidemiological data indicated that 90% were women, mostly between the ages of 17 and 40 years of age; 36% were suicidal attempts. Over 90% of the formulated drugs contained other substances, such as thyroid hormones, benzodiazepines, diuretics and laxatives. Many of the women had Body Mass Index under 25 which indicates that in these women the main motive was not weight loss nor appetite suppression. *Case Discussion:* Femproporex is one of the most potent drugs for appetite suppression, and is forbidden in many countries. It is transformed in the liver to amphetamine, which is highly addictive, besides bringing euphoria, "feeling good," hallucinations, hyperactivity, psychosis, psychiatric disfunction. It is the second psychiatric cause of hospitalization in women, after alcohol. Overdose and chronic use may cause renal, muscular and cardiac disorders. It is very easily habit forming. *Conclusion:* Femproporex is a drug with high risk and low safety profile. It has a tendency to cause psychiatric disorders and addiction. There should be a large campaign to ban it.

223. Severe Serotonin Toxicity Treated with Intravenous Propofol

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Background: Patients with mild serotonin toxicity usually improve with supportive care, withholding of serotonergic drugs, and serotonin antagonists such as cyproheptadine. Those with more severe symptoms including agitation, hyperthermia, and muscle rigidity typically require sedation with intravenous (IV) benzodiazepines (BZD), external cooling, and sometimes mechanical ventilation with

paralysis. *Case Report:* A 20-year-old woman on venlafaxine and dextroamphetamine presented with seizures and confusion after a buproprion overdose. She was tachycardic and hyperthermic (pulse 156, maximum temperature 39.2), with hyperreflexia and sustained clonus. She was treated with BZD and intubated for airway protection. She became more agitated with muscle rigidity and respiratory compromise despite receiving lorazepam 30 mg and diazepam 240 mg IV over a 4-hour period. In the second case, a 46-year-old woman on sertraline 50 mg daily became confused, combative, and tachycardic (pulse 146) with clonus, muscle rigidity, and hyperreflexia after being given IV fentanyl 50 mg. She was initially sedated with IV diazepam 10 mg. Over a 2-hour period she required additional diazepam 60 mg and lorazepam 10 mg, and was intubated for airway protection. Both patients fulfilled Sternbach's criteria and the Hunter criteria for serotonin toxicity. In both cases sedation was rapidly achieved, clonus, hyperreflexia and rigidity resolved after BZD therapy was discontinued, an IV propofol drip begun, and titrated to effect. Neither patient required paralysis. The first patient was discharged to a psychiatric facility, the second to home. *Case Discussion:* Though it has no known serotonin antagonist activity, propofol is a GABA agonist as well as a glutamate antagonist, properties that likely account for its efficacy in treating alcohol withdrawal delirium. Rat models of severe sertonin toxicity have demonstrated increased extracellular glutamate in the prefrontal cortex. *Conclusion:* Propofol may be the drug of choice in severe serotonin toxicity, possibly obviating the need for mechanical ventilation and paralysis. More study is needed to clarify the role of glutamate neurotransmission in human serotonin toxicity.

224. Retrospective Review of Flomax^{R} Ingestions by Children

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Background: Flomax^{R}, tamsulosin, is an alpha 1 adrenoceptor blocking agent with selectivity for alpha 1 receptors in the prostate and bladder neck. Blockade of these receptors causes the smooth muscles to relax, improving urine flow rates. It is used for treating benign prostatic hyperplasia and is being studied for the treatment of primary bladder neck dysfunction. Orthostatic hypotension was reported in 1.3% of men with doses of 0.4–0.8 mg daily. Dizziness was reported in 3–17% and somnolence in 3–4%. Literature review revealed one case report of a Flomax^{R} overdose – an adult ingested 5 tabs and had hypotension and bradycardia. The purpose of this study is to determine the toxic effects from a pediatric ingestion of Flomax^{R} and to develop a threshold for ED referral. *Methods:* This is a retrospective review. All cases of ingestion of Flomax^{R} by children five and under, from Jan 1, 1998 to Dec. 31, 2005, were retrieved from the California Poison Control System database using Visual Dotlab search criteria. All patient identifiers were removed. IRB approval was obtained. *Results:* Forty-six cases of pediatric ingestions of Flomax^{R} were retrieved. Twenty cases were eliminated because they contained coingestants or were not followed to known outcome, leaving 26 evaluable cases. Demographics: ages: <1yo 3.8%, 1yo 57.7%, 2yo 30.8%, 3yo 7.7%. Males 53.8%, Females 46.2%. Exposure site: own residence 92.3%, other residence 7.7%. All were unintentional acute ingestions. Management site: home 38.5%, HCF 61.5%. Amount ingested: <1 tab 34.6%, 1 tablet 30.8%, >1 to 2 tabs 7.7% and >2 to 3 tabs 3.8%, unknown amt 23.1%. Treatments: observation only 61.5%, charcoal 38.5%. One patient developed dizziness. Outcome: No effect 96.2%, minimal effect 3.8%. *Discussion:* Ingestions were equally divided between boys and girls. 73.1% of ingestions were for 3 capsules or less. Outcomes were the same whether charcoal was given or not. The one patient with a symptom was a 12 mo. boy with an ingestion of a 1/2 capsule. Parents reported that he "acted like he was dizzy" for 20 minutes. *Conclusion:* Ingestions of up to 0.8mg of tamsulosin by children are unlikely to cause symptoms and can be observed at home with careful home follow-up.

225. Salicylate Testing in the Emergency Department: Are Clinical Features Sufficient to Rule out Salicylate Poisoning?

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Background: Currently, salicylate (SL) testing is routine in the workup of patients presenting to the emergency department (ED) with any suspected overdose (OD). Patient history, signs, and symptoms may help to determine the need for SL testing in such cases. *Methods:* A retrospective review of all adult patients tested for serum SL concentration (SSC) at 2 EDs from 8-25-2003 to 12-10-2005. Data from each chart was applied to 2 algorithms. Algorithm 1 (A1) warranted testing for patients with a current history of SL OD, or an initial or average respiratory rate (RR) >20. Algorithm 2 (A2)

warranted testing for patients with a current history of SL OD, or RR > 20, or initial temperature >100.0 F, or initial heart rate >100, or initial altered level of consciousness, or tinnitus. The sensitivity (SN) and specificity (SP) of each algorithm was determined for cases of SL poisoning in which a specific intervention was performed (hemodialysis, alkalinization, multi-dose activated charcoal (MDAC), or whole bowel irrigation), and for cases with SSC > 30 mg/dl. *Results:* A total of 847 patients were tested for SL during the study period, and 49 had detectable SSC. Seven patients received specific interventions (alkalinization or MDAC) and 12 had SSC > 30 mg/dl. A1 was 100% SN and 74% SP ($p < 0.001$) in warranting testing in patients receiving a specific intervention, and 92% SN and 74% SP ($p < 0.001$) in warranting testing in patients with SSC > 30 mg/dl. A2 was 100% SN and 28% SP ($p = 0.199$) in warranting testing in patients receiving a specific intervention, and 100% SN and 28% SP ($p = 0.044$) in warranting testing in patients with SSC > 30 mg/dl. *Discussion:* Use of A1 would have significantly reduced the number of SL tests sent, and the costs to patients, insurers, and hospitals during the study period, without missing any patients receiving specific interventions for SL poisoning. *Conclusion:* Patient history of current SL OD, or an initial or average RR > 20 in a patient suspected of any OD may be clinical features sufficient to warrant SL testing in the ED. Lack of these features may be sufficient for refraining from testing.

226. Breath Alcohol Analyzer Mistakes Methanol for Ethanol

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Background: Breath analyzers are used to detect alcohol in motorists and others suspected of public drunkenness. A concern is their ability to detect interfering substances that may falsely elevate the ethanol reading. *Case Report:* A 47-year-old-man was found in a public park acting intoxicated. A breathalyzer test by law enforcement with the Intoxilyzer® 5000EN measured ethanol as 0.288% without interferents noted. He was suicidal and was brought to an ED with slurred speech and drowsiness. Vital signs: BP 80/40 to 107/70, HR 80–90. He subsequently admitted to drinking HEET® Gas-Line antifreeze, which contains 99% methanol. Two to 3 hours after ingestion, serum and urine toxicology screens were negative for ethanol, ethylene glycol, acetaminophen, salicylates, tricyclic antidepressants, amphetamine, barbiturates, benzodiazepines, cocaine metabolites, methadone, opiates, and cannabinoids. His serum methanol concentration was 589 mg/dL, serum osmolality 503 mOsm/kg, C02 30 mEq/L, glucose 109 mg/dL, creatinine 1.0 mg/dL, ABG: pH 7.36, pCO2 42 mm Hg, pO2 84 mm Hg, HCO3 23 mEq/L, osmolar gap 193 and anion gap 17. The patient was treated with ethanol, fomepizole, and hemodialysis without complications. *Case Discussion:* This is a unique clinical case of a breathalyzer falsely reporting methanol as ethanol. Intoxilyzer devices have been shown to indicate substances other than ethanol as interferents in DUI subjects (acetone, 2-proanol, and methyl ethyl ketones). In an in-vitro study, five solvents triggered an interference message by the breath analyzer for toluene, m-xylene, o-xylene, and isopropanol but not with methanol concentrations ranging from 0.04 g/L to 7.91 g/L. Our case is consistent with this in-vitro finding and the patient was fortunately brought to the ED where prompt treatment was initiated. *Conclusion:* Elevated serum concentrations of methanol can be interpreted as ethanol by the alcohol breath analyzer, Intoxilyzer® 5000EN. This can potentially result in a delayed or misdiagnosis and subsequent methanol toxicity.

227. Intentional Castor Bean Ingestion with Serial Ricinine Levels

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Background: Castor beans are the seeds of the castor plant *ricinus communis*, a common ornamental. They are readily available and contain the potent toxin ricin. Literature suggests a minimal adult lethal dose of 4–8 beans. Ricinine (RICN), another toxic alkaloid present in the bean, is measured in urine using an LC/MS/MS method developed by the Centers for Disease Control and Prevention. We present the first case of an intentional castor bean ingestion confirmed and followed

with serial RICN levels. *Case Report:* A 58-year-old 75 kg M thoroughly chewed and swallowed 6 castor beans in a suicide attempt. 5 hrs post ingestion nausea, vomiting, diarrhea, abdominal cramping and chills ensued. The patient arrived at the ED, 14 hrs post ingestion, with stable vital signs and an unremarkable physical exam except for some mild lower abdominal tenderness. Initial labs were unremarkable except for a mildly elevated alkaline phosphatase and a urine drug screen positive for THC. GI symptoms resolved within the first 12 hrs. The patient remained stable and never developed further laboratory abnormalities or symptoms. He was medically cleared on Day 4 and discharged from psychiatry on Day 7 without further sequelae. He was without complaints 1 month later.
Case Discussion: Estimated recovery of the RICN in the urine over the 3 days is less than 10%. Castor bean ingestion has been reported to result in severe GI symptoms followed by multi-organ injury and death. Ricin has gained attention as a possible agent of concern for terrorism. The urinary RICN assay was developed as a marker for ricin exposure and was able to confirm ingestion in this case. The assay has significant sensitivity, enabling detection of asymptomatic lower level exposures. *Conclusion:* An intentional ingestion of 6 castor beans with a relatively benign course is presented. This is the first human exposure confirmed and followed with urine RICN levels.

Urine RICN Levels

Time post ingestion(hrs)	RICN(ng/ml)	Cr corrected RICN(μg/g-cr)
14	1400	591
26	190	674
40	550	511
49	330	226
63	130	135

228. Histopathologic Findings after Treatment of Acute Cyanide Poisoning with Hydroxocobalamin or Vehicle in a Canine Model

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Background: This investigation was undertaken to assess histopathologic correlates of acute cyanide poisoning and its treatment with the cyanide antidote hydroxocobalamin in a canine model. *Methods:* Isoflurane-anesthetized, intubated adult beagles were administered potassium cyanide (0.4 mg/kg/min, IV) until 3 min after the onset of apnea. Hydroxocobalamin (75 mg/kg [n = 19] or 150 mg/kg [n = 18], IV) or saline vehicle (n = 17) was then infused over 7.5 min while animals were mechanically ventilated with 100% oxygen. Mechanical ventilation was stopped after 15 min. A board-certified veterinary pathologist conducted gross and histopathologic evaluation of tissues after animals had died from potassium cyanide or were sacrificed 15 days post-cyanide infusion per protocol. *Results:* Mortality rate was 82% in vehicle-treated animals compared with 0% and 21% in animals treated with hydroxocobalamin 150 mg/kg and 75 mg/kg, respectively. Brain weights at necropsy were generally lower in hydroxocobalamin-treated dogs than vehicle-treated dogs, a finding attributed to a high incidence of edema in vehicle-treated dogs. No gross findings were noted in the brains of any hydroxocobalamin-treated dog. Only vehicle-treated animals that died within the first 4 days of cyanide infusion had gross brain findings, which included discoloration of the cerebrum and herniated cerebellar vermis. The number of dogs with histopathologic brain lesions at necropsy was higher in the vehicle group (15 of 17) and the 75 mg/kg group (17 of 19) than the 150 mg/kg group (6 of 18). Lesions in organs other than the brain were considered typical of spontaneous findings in laboratory beagles with the exception of minimal-to-mild kidney infarcts (n = 3) that possibly were sequelae of the microtip catheter in the aorta. *Discussion:* Administration of potassium cyanide was associated with gross and histopathologic evidence of extensive brain injury. *Conclusion:* Administration of 150 mg/kg of the cyanide antidote hydroxocobalamin compared with saline vehicle prevented mortality and significantly reduced the incidence and severity of brain injury.

229. The TCA "Tox Screen": Where Should We Draw the Line?

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Background: Tricyclic antidepressant (TCA) immunoassays have many cross-reactants. We propose that use of a TCA assay with a higher threshold cutoff (1000 vs. 300 ng/mL) will provide more confidence in attributing a positive TCA immunoassay (IA) result to cross-reacting substances. *Methods:* This prospective IRB-approved study enrolled patients over a 15-month period (June 2004 through September 2005). Inclusion criteria: positive urine TCA IA screen (threshold 300 ng/mL) in patients 18 years of age or older, and completion of the consent form and a short survey regarding their recent use of medications/drugs. The patient's EKG was reviewed for changes consistent with TCA toxicity. Confirmation of TCA urine IA results was performed by high performance liquid chromatography (HPLC) with a TCA detection cutoff of 1000 ng/mL. *Results:* Of the 71 total patients enrolled, 28 (39%) admitted to recent use of diphenhydramine and 27 (38%) admitted to recent use of quetiapine. Eighteen of 71 patients (25%) had the presence of TCA's or TCA metabolites in their urine confirmed by HPLC. The remaining 53 patients' (75%) samples contained drugs that commonly react with the TCA IA, yielding false-positive (FP) results. The most common FP results were attributed to diphenhydramine (24 of 53, 45%) and quetiapine (16 of 53, 30%) by HPLC. Using an IA with a threshold of 1000 ng/mL (Triage®, BioSite, San Diego, CA), we identified 13 of the 18 HPLC-proven TCA positive urines with 5 false positives (Sens: 72%, Spec: 90%). None of the patients enrolled in the study had EKG changes that were consistent with TCA toxicity. *Discussion:* The use of a high threshold TCA IA alone or in combination with a low threshold assay, along with the appropriate clinical evaluation, can improve patient care and disposition by reducing false positive results. *Conclusion:* TCA IA's with low cutoffs (300 ng/mL) may have false-positive rates of 75%. The etiology of false positive TCA IA's can usually be identified by patient interview and/or the use of HPLC. However, HPLC is not readily available. The use of a high threshold IA greatly reduces the number of FP TCA results.

230. Fentanyl Tea: The Effect of Brewing Time and Patch Size on Fentanyl Concentration

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Background: Fentanyl is a synthetic, fast acting opiate 80 times more potent than morphine. It is available in 3 preparations: parenteral for injection, transdermal patch, and oral as a lollypop. All formulations of fentanyl are abusable; however, the increasing availability of the transdermal patch and the fact that a used patch contains a substantial amount of fentanyl, has made the patch a widely abused form of the drug. The abuse of fentanyl via the transdermal patch has increased dramatically over the past decade, from 22 case reports in 1995 to 1506 in 2002. Persons abusing the fentanyl patch have found many creative ways of extracting the fentanyl. By removing the fentanyl gel with a syringe, the drug can be directly injected intravenously, used to lace tobacco and smoked, or abused in a variety of other imaginative ways. In one case report a woman expired following consumpion of a tea made by placing a patch in hot water. We are reporting the first study quantifying the amount of fentanyl that may be extracted by making such a tea. *Methods:* Various dose levels of unused fentanyl transdermal patches were used (25 mcg, 50 mcg, 75 mcg and 100 mcg). Each patch was placed into 250 mL of water that had been brought to a boil. Five mL aliquots were drawn from each sample at 2.5, 5, 10 and 20 minutes and placed into preservative-free red top tubes that were subsequently sent for analysis and quantitation by high performance liquid chromatography (HPLC). *Results:* Results are displayed in the following table:

	Brewing time			
Patch Strength	2.5 min	5 min	10 min	20 min
25 mcg/hr	0.62*	0.98	2	2.9
50 mcg/hr	1	2.4	3.4	5.4
75 mcg/hr	1.1	3.5	5.3	8.1
100 mcg/hr	2.9	2.3	5.1	6.3

*All fentanyl concentrations in mcg/mL.

Discussion: Fentanyl concentrations in the various aliquots generally increased over time and with increased patch concentration. By 20 minutes, each brew was found to contain fentanyl concentrations that could be medically harmful if ingested. *Conclusion:* A hot water extract, or tea, derived from fentanyl transdermal patches may contain substantial amounts of fentanyl and may be harmful if ingested.

231. Parenteral Ophthalmic Antimuscarinic Agents Versus Atropine to Prevent Lethality in Rats Poisoned by Dichlorvos

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Background: Most hospitals lack an adequate supply of atropine to treat multiple patients poisoned by an organophosphorous compound (OC) or nerve agent. Our objective was to evaluate the effect of parenteral ophthalmic antimuscarinic agents (Isopto Homatropine 5%, and Atropine Sulfate 1%) on survivability in a rat model of acute, lethal OC poisoning. *Methods:* A dose response study was performed prior to experimentation. Sprague-Dawley rats were sequentially pre-treated and then poisoned five minutes later in order to obtain ideal dosing for study comparison. Administration of dichlorvos (10 mg/kg) subcutaneously (SC) resulted in 100% mortality, while pre-treatment with intraperitoneal (IP) atropine (10 mg/kg) was sufficient to keep alive 100% of rats poisoned by dichlorvos (10 mg/kg). During the experimental phase, rodents were randomized to receive one of four IP antidotes (n = 10 per group); 1) normal saline 0.3 mL, 2) atropine 10 mg/kg, 3) ophthalmic atropine sulfate 10 mg/kg, or 4) ophthalmic homatropine 20 mg/kg. Five minutes following pre-treatment, dichlorvos (10 mg/kg) was administered SC. Mortality rates and time to death were compared using chi-square analysis and the Kaplan-Meier method with logrank test respectively. If alive at 120 minutes, survival was assumed and the study was terminated. *Results:* Survival in rats pre-treated with standard atropine was 100%. Survival in rats pre-treated with ophthalmic homatropine and atropine sulfate were 100% ($p < 0.001$; 95% CI 0.98, 1.02) and 90% ($p < 0.01$; 95% CI 0.71, 1.09) respectively compared to controls (20% survival; 95% CI 0.04, 0.45). Time of death ranged between 7 and 19 minutes. Overall comparison of survival time revealed a statistically significant improvement in experimental groups compared to controls ($p < 0.0001$). *Discussion:* Concentrated ophthalmic antimuscarinic agents show promise as alternate sources of antidotal therapy for patients with OC or nerve agent poisoning. *Conclusion:* Pre-treatment with parenteral ophthalmic homatropine or atropine sulfate was equal to standard atropine in preventing lethality in this rat model of acute, lethal OC poisoning.

232. False Negative Meconium Fatty Acid Ethyl Esters Due to UV Radiation Exposure

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Background: Use of meconium fatty acid ethyl esters (FAEE) in identifying in utero ethanol exposure has been previously described. We report a case of false negative meconium FAEE due to suspected UV radiation exposure of the specimen. *Case Report:* Meconium FAEE levels from 8 sets of twins during the calendar year 2005 were reviewed. The detection threshold of meconium FAEE is 500 mg/g. The meconium FAEE levels were concordant in 7 sets of twins (negative in 6 sets of twins and positive in one set of twins). In one set of twins there was a significant discrepancy in the meconium FAEE levels: one twin was recorded as positive and the other negative (FAEE level 38861 rng/g in twin A and 0 mg/g in twin B). Confirmatory studies were performed. The only difference between the siblings was that the twin with a level of zero was receiving intensive UV phototherapy for hyperbilirubinemia. *Case Discussion:* Meconium FAEE obtained from twin neonates should yield similar results due to their common in utero exposure. Meconium containing suction traps are frequently left at the neonate's bedside until the trap is full, leading to exposure to UV radiation if the patient is receiving phototherapy. UV radiation exposure can result in degradation of the ester bonds and carbon-carbon double bonds and cause false negative meconium FAEE levels. *Conclusion:* Neonatal FAEE levels may exhibit false negatives due to the fragility of the ester and carbon-carbon double bonds in the meconium. We believe that leaving the sample under phototherapy lights can compromise the integrity of the analyte.

233. Herbal N-Acetylcysteine as an Antidote for Acetaminophen Toxicity

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Background: Currently in the United States there are two FDA approved forms of N-acetylcysteine (NAC). Oral NAC which is inexpensive and unappetizing, and the more expensive intavenous brand name NAC. An herbal form of NAC is available for purchase at health food stores. The objectives of this study were to identify the presence and quantity of NAC in herbal preparations. *Methods:* The labels of three herbal NAC products (A, B, C) stated that each capsule contained 600 mg of NAC. A fourth product (D) stated each capsule contained 750 mg of NAC. The products were analyzed by liquid chromatography-mass spectrometry-mass spectrometry (LC/MS/MS). The LC/MS/MS method uses electro spray ionization in negative mode to identify the structure and concentration of a species in a solution. Both NAC and *N*-acetylserine (NAS), were used as internal standards, supplied by Sigma > 99%. Preparation of the standard curve was determined with standard stock solution of NAC and NAS. The capsules contained in one bottle of each of the products were separately emptied and diluted in methanol (1:100), with a final concentration of 6 mg/ 1 mL. *Results:* All products presented had NAC as the active ingredient. Negative electrospray mass spectra of NAC shows intense (M – H)- ions at *m/z* 162. When the samples were analyzed and duplicated, the average amount of NAC in each product was: A) 510 mg, B) 500 mg, C) 555 mg, and D) 735 mg, respectively (see table). *Discussion:* NAC was present in all of the herbal products. The mean concentration was lower than indicated on the label, but was consistently ≥500 mg. *Conclusion:* Herbal NAC may represent a third therapeutic option as an antidote for acetaminophen toxicity in the future.

Contenst of herbal N-Acetylcysteine poducts

Product	Amount per capsule on label	Presence of NAC	Mean concentration of NAC per capsule by LC/MS/MS
A = GNC	600 mg	Yes	510 mg
B = Vitamin world	600 mg	Yes	500 mg
C = Wild oats	600 mg	Yes	555 mg
D = Biochem	750 mg	Yes	735 mg

234. Time-Delay of Confirmatory Methanol and Ethylene Glycol Levels

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Background: Potential exposure to the Toxic Alcohols (TA) ethylene glycol and methanol represent a diagnostic challenge to both treating physicians and consulting poison centers. Confirmatory TA levels are difficult to obtain rapidly. As a result, patients are often subjected to lengthy hospital stays and prolonged antidotal therapy while test results are pending. We investigated the lab capabilities of handling TA levels of the hospitals covered by our poison center. *Methods:* We surveyed all 45 acute care hospitals in our call area to ascertain: 1) whether TA levels could be performed on site or needed to be sent to a referral lab; and 2) the average length of time for a TA level to return. We also compiled the total number of beds and number of ICU beds at each hospital and attempted to correlate each with TA turn around times. *Results:* Surveys were returned from 43 (96%) hospitals. The number of beds and ICU beds ranged from 14–825 and 0–94 respectively. Two hospitals ran TA on-site and were also could perform a stat (within 1 hour) level. These hospitals were excluded from further analysis. All other hospitals sent TA to referral labs. The mean TA turn around was 2.1 days (range 1–5). There was a correlation (using simple linear regression) between total number of beds and TA turn around ($p = 0.032$) there was no correlation to number of ICU beds and TA turn around ($p = 0.21$). *Discussion:* The potential cost of antidotal therapy and hospitalization for 2 days pending confirmatory lab data is concerning. Larger hospitals were capable of obtaining TA results faster despite sending the sample to a referral lab. One hospital capable of performing stat TA levels has a history of accepting samples from outside institutions if consulting toxicologist feel it is an appropriate request. The potential of consulting toxicolgists as “gate-keepers” for stat TA when clinically indicated is intriguing.

Conclusion: Confirmatory TA levels took and average of over 2 days in this sample. Clinicians should anticipate delayed confirmation and take and active role in facilitating more rapid results.

235. "DXemon Juice": An Analytical Evaluation of the Product of the "Agent Lemon" Dextromethorphan Extraction Technique

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Background: Dextromethorphan (DXM) is an OTC cough suppressant that is commonly abused as a recreational drug. As pure DXM is rarely available, users either ingest combination cold preps or perform an "Agent Lemon" extraction to purify/free-base DXM into "DXemon juice." A case of severe DXM intoxication after this extraction has been reported. We were concerned that patients who ingest the extracted product may be exposed to higher concentrations of co-medications including APAP, antihistamines, and decongestants. To explore this, we performed the "Agent Lemon" extraction on a multi-symptom cold preparation as described on a popular website and quantitatively analyzed the extraction product. *Methods:* 295mL (10 fluid ounces[ozs]) of Vicks® NyQuil Brand Multi-Symptom cold/flu relief was mixed with 300mL household ammonia and vigorously shaken for 5 min. 133mL (4.5 ozs) of Zippo® brand lighter fluid (naphtha) was added and shaken for 5 min. The mixture was allowed to separate(30 min) and the hydrophilic layer was discarded, leaving the hydrophobic layer. 150mL of room-temperature tap water was added, mixed for 5 min, allowed to separate again (30 min) and the hydrophilic layer was again discarded. 250mL of lemon juice (citric acid) was added to the solution, mixed for 5 min, and allowed to separate (30 min). The hydrophobic layer was discarded. GC/MS was performed on the hydrophilic solution(233mL) to determine its contents. *Results:* The "DXemon Juice" solution contained DXM 600 mcg/mL (139 mg – 37% extraction); APAP 48.9 mcg/mL (11.3 mg); doxylamine 160 mcg/mL (37.3mg); pseudoephedrine 0 mcg/mL. *Discussion:* A popular extraction technique exists ("Agent Lemon extraction") to purify DXM and separate it from co-medications in multi-symptom cold preparations. Extraction of a 10 oz bottle of combination cold medication yielded 139 mg of DXM, 37.3 mg of doxylamine, and small amounts of APAP and pseudoephedrine. *Conclusion:* Toxicologists and SPIs should be aware of this extraction technique and the possibilities of toxicity from DXM and doxylamine after ingestion of this product. APAP and pseudoephedrine toxicity is unlikely after ingestion of "Dxemon Juice".

236. Clenbuterol-Adulterated Cocaine: A Case Series

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Background: Clenbuterol is a long-acting selective beta$_2$-adrenergic agonist, which has been recently implicated as the adulterant responsible for prolonged atypical reactions associated with heroin use. Other reports of drug adulteration with clenbuterol are rare. We present a case series of patients exposed to clenbuterol-tainted cocaine. *Case Report:* Three patients (A, B, and C) without significant past medical history presented to the Emergency Department (ED) with complaints of palpitations and agitation, several hours after snorting cocaine (A, B, and C) and drinking ethanol (C). Patient ages were 20 years old (A) and 22 years old (B and C). Initial vital signs revealed tachycardia (HR 140's/min in all 3 patients), hypotension (95/52 mm Hg in A) and a wide pulse pressure (108/36 in B, 101/44 in C). EKGs showed sinus tachycardia, with ST depression evident in patients A and C. Laboratory studies demonstrated hypokalemia (2.2–2.5 mmol/L), hyperglycemia (225–265 mg/dL), and elevated lactate concentrations (3.9–5.8 mmol/l) in all 3 patients. Patient C had an elevated troponin-T (.07 ng/mL, reference <.03 ng/mL). Urine samples, obtained from each patient 10 hours after admission, were analyzed by GC/MS and revealed the presence of cocaine and clenbuterol (A: clenbuterol concentration 3.07 mg/L, cocaine concentration 0.391 mg/L; B: clenbuterol 7.17 mg/L, cocaine 1.53 mg/L; C: clenbuterol 1.27 mg/L, cocaine 0.042 mg/L). The patients were admitted to the hospital and treated with oral potassium supplementation and intravenous fluids; the tachycardia and hypokalemia resolved within 36 hours, and the patients were discharged home without sequelae on hospital day 2 (B) or 3 (A and C). *Case Discussion:* The patients' clinical presentation and laboratory abnormalities (hypokalemia, hyperglycemia, hyperlactemia) matched the CDC's case definition for clenbuterol poisoning. The patients' duration of symptoms was consistent with clenbuterol's long elimination half-life (25–39 hours). *Conclusion:* Clenbuterol

may be used to adulterate both heroin and cocaine. Use of the CDC's case definition for clenbuterol intoxication may help identify additional cases in the ED population.

237. Chronic Inhalant Abuse of Carburetor Cleaning Spray without Significant Methanol Induced Ocular Toxicity

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Background: Because of the volatile nature of methanol, it can be absorbed through the alveoli during the inhalation of carburetor cleaning spray. We present four exposures of a 22-year-old female who chronically "huffs" 1.5 cans of carburetor cleaning spray daily. *Case Report:* A 22-year-old female who inhales carburetor cleaning spray daily had four documented exposures in our poison center database (see table). The first two presentations were after nausea and vomiting, or chest pain and dyspnea forced her to seek medical attention. The second two visits occurred after suicidal gestures, in which neighbors intervened on her behalf. She confided that she occasionally experienced hazy or snowy vision during her daily use. These symptoms were interrupted by syncope from the peak effect of the hydrocarbons. When she awoke her vision would be at baseline. An ophthalmology consult on the third visit revealed no evidence of formate induced ocular toxicity. *Case Discussion:* We report a patient who tolerated extremely high serum methanol concentrations (mean 73.25 mg/dL), chronically, without apparent ophthalmologic sequelae. Our patient does not present to a healthcare facility for the majority of her exposures and her toxicokinetics are unknown. *Conclusion:* This case series demonstrates the serum methanol concentration which is considered toxic may need to be redefined in inhalant abuser.

Laboratory Values of Chronic Inhalational Exposure to Methanol

Four exposures to one individual	Maximum detected methanol concentration	Mean methanol concentration	Lowest serum bicarbonate	Mean serum bicarbonate	Lowest pH	Mean pH	Antidotes/ dialysis
Case 1	76 mg/dL	49.3 mg/dL	8.0 mEq/L	13.7 mEq/L	7.22	7.37	Yes/yes
Case 2	73 mg/dL	36.5 mg/dL	8.0 mEq/L	20.0 mEq/L	7.25	7.38	Yes/yes
Case 3	57 mg/dL	30.5 mg/dL	8.0 mEq/L	18.8 mEq/L	None recorded	0	Yes/yes
Case 4	87 mg/dL	43.7 mg/dL	6.0 mEq/L	19.5 mEq/L	7.57	7.57	Yes/yes
Total mean	73.25 mg/dL	40 mg/dL	7.5 mEq/L	18.0 mEq/L	7.34	7.44	Yes/yes

238. NEW Drug Use is Common in Patients with a Spinal Cord or Traumatic Brain Injury

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Background: Recreational abuse of Non-traditional, Emerging, and Web-based (NEW) drugs is commonly reported in the popular media, but remains rarely described in the medical literature and has not been examined as a risk for sustaining a spinal cord injury (SCI) or tramautic brain injury (TBI). Our objective was to identify the prevalence of NEW drug use in patients with SCI and TBI. *Methods:* From 1/05 to 6/05, consecutive SCI and TBI patients >17 years of age admitted to an academic rehabilitation center were prospectively enrolled. A structured interview was conducted to identify all forms of pre-injury substance abuse, including abuse of alcohol, traditional drugs (amphetamine, benzodiazepine, barbiturate, cocaine, opiate, THC, PCP), and NEW drugs. Data are reported as proportions with 95%CI. *Results:* Of 62 eligible patients, 54 consented for the study and had complete data for analysis (SCI = 29, TBI = 25). Median age was 31 years(range 18 to 80). 85% were male. 37 patients were white, 7 hispanic, 5 black, 1 Asian Indian, 4 other. Abuse of alcohol was identified in 33%(95%CI:20–46), traditional drugs in 28%(95%CI:15–40), and NEW drugs in 20%(95%CI:9–31). In patients with NEW drug abuse, median age was 22 years(range 20–54), 100% were white, 40% had at least 1 ED visit for a minor issue in the 2 year period before their injury. NEW drugs abused in this cohort included prescription narcotics and stimulants, inhalants, GHB, ketamine, peyote, designer stimulants, and mushrooms. *Discussion:* Previously undetected NEW drug abuse was identified in one-fifth of patients with a SCI or TBI. They were primarily young, all were white, and 40% had a previous ED visit before their injury. Current trauma registries do not

require NEW drug screening, and NEW drugs are not identifiable using standard hospital serum or urine tests. *Conclusion:* Future research should focus on identifying NEW drug use patterns in ED patients in an effort to prevent future catastrophic injuries like SCI or TBI.

239. "Hagigat" – A New Illicit Form of Khat (Cathinone)

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Background: Khat (Catha edulis) leaves (containing sympathomimetic alkaloids, mainly cathinone) have been chewed for centuries for their stimulant properties. Calls concerning exposure to illicit capsules of "Hagigat" (containing 200mg cathinone) began reaching the Poison Information Center in September 2004. The objective of this study is to report the consequences of illicit exposure to cathinone. *Methods:* Prospective observational study of calls to the Poison Center regarding exposure to Hagigat between September 2004 and June 2005. Demographic, clinical and follow up data were abstracted and subjected to descriptive analysis. *Results:* Thirty four consecutive patients were analyzed. Age range was 16 – 54 years and female/male ratio was 24/10. The amount ingested ranged between 1/2 to 6 capsules; route of exposure was oral (32 patients) or sniffing (2 patients). The time elapsed from exposure to the appearance of symptoms was 30 minutes to 6 hours. The main clinical manifestations were headache (50%) lasting up to 7 days, vomiting (32.4%), hypertension (26.5%), nausea (23.5%), tachycardia (20.6%), abdominal pain (20.6%), dyspnea (20.6%), chest pain (17.6%) and myalgia (14.7%). The main complications were myocardial ischemia (3; 2 had also pulmonary edema) and intracerebral hemorrhage (1); all occurred in young healthy individuals. There were no fatalities. All patients required supportive therapy including IV fluids, analgesics, antiemetics, sedatives and vasodilators. One patient was mechanically ventilated and one required neurosurgical intervention. No association could be established between the severity of exposure, amount of Hagigat capsules, route of exposure and co-exposures. *Discussion:* Exposure to illicitly synthesized cathinone is associated with serious cardiovascular and neurological toxicity even in young healthy individuals. This may be explained by the much higher amount of cathinone in Hagigat capsule compared to Khat (200mg vs. 36mg/100g leaves, respectively). *Conclusion:* Substances of natural origin can be unsafe especially if concentrated in the process of synthesis.

240. When Huffing Goes Bad: Propane Lips

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Background: Propane is a simple hydrocarbon, naturally occurring as a gas but usually stored under high pressure as a liquid. An uncommon choice, it has been used by "huffers" for intoxication. Previous reports of propane-related burns have been associated with transferring propane between storage tanks or tank valve malfunction. We report the first case of freezing-burns related to huffing of propane. *Case Report:* A 15-year-old male with a history of polysubstance abuse was evaluated for propane-induced oropharyngeal burns. He had disconnected a propane tank from the barbecue grill, inserted the hose into his mouth, and turned on the tank. He felt intoxicated within seconds and was rendered unconscious in less than 30 seconds. He awoke on the ground and found the hose frozen to his mouth and tongue. He turned the tank valve off and warmed the tubing with his hands to remove it from his mouth. He was taken to the hospital, where he was awake, alert, and in no distress. Because of 2° burns to his lips and tongue, he was transferred to our burn referral center, admitted for observation, and recovered without incident. Clinical photographs were obtained. *Case Discussion:* Despite being easily available, propane is rarely inhaled to get high. It induces intoxication through a combination of hydrocarbon-related narcosis and simple asphyxiation. The high is reportedly brief, lasting one-to-two minutes per inhalation. Propane is stored under high pressure as a liquid. Energy is required for the liquid to evaporate to a gas. Because the energy used is the heat from the local environment, thermal (freezing) burns of tissue contacted during this process may occur. Propane has been previously reported to cause thermal burns when it accidentally escaped from storage containers. In an attempt to avoid the effects of cold injury, huffers have developed various systems that protect the oral structures. Death has been reported due to propane inhalation, apparently from simple asphyxia. Thermal burns as a result of recreational propane inhalation has not been previously reported. *Conclusion:* Use of propane as an agent for huffing can result in thermal burns.

241. Methadone Deaths from Pain Clinics: A Danger not Appreciated from Addiction Management Purported Safety

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Background: With a reputation of safety in addiction management, methadone is increasingly becoming an opiate of choice in pain clinics. *Case Report:* This reports the highest fatal blood level of methadone (4.6 mg/L) among two deaths from methadone intoxication in pain clinic managed patients. Among the two cases in this report, the blood level of 4.6 mg/L was higher than expected for the dose that had been chronically prescribed of 60 mg twice a day and increased to 60 mg three times a day within 48 hours of his demise. The other fatal case was a newly prescribed methadone pain clinic patient, who overdosed on all 16 of 10 mg tablets prescribed within a 48 hour period of their being dispensed, having a postmortem methadone blood level of 0.26 mg/L. These two cases illustrate both extremes with the highest ever reported fatal level of 4.6 mg/L in a chronically dosed patient and a relatively low fatal level of 0.26 mg/L in an overdosing newly prescribed patient. *Case Discussion:* The forensic toxicology literature has reported methadone involved in fatalities in several series of cases. In reports described by Baselt, the average fatal mathadone blood level was 1.0 mg/L with a range of 0.4–1.8 mg/L. Garriott et al reported six fatal cases with the highest methadone blood level of 1.31 mg/L. Gagajewski and Apple described methadone in the top 10 drugs of medical examiner investigated deaths in Hennepin County, Minnesota where among 96 methadone positive cases, death was drug-related in 36.3 percent with methadone blood levels ranging from 0.18–3.99 mg/L. Three of their methadone deaths were in methadone maintenance treatment programs for less than a week with their blood levels 0.19, 0.64 and 0.64 mg/L. Green et al described methadone-related fatalities among 118 opiate overdose deaths in the District of Columbia, reporting 39 due to methadone alone and 21 to a combination of heroin and methadone. *Conclusion:* Therefore, safety with methadone needs to be approached cautiously and the dangers of relative toxicity appreciated.

242. Cocaine Use Does not Predict Clinician Decision Making when Presenting to an Emergency Department with Chest Pain

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Background: Cocaine related chest pain is well studied. Cocaine is a significant risk factor for acute coronary syndrome. This risk must be taken in context with regard to other risk factors, physical findings, and diagnostic testing. Data suggest that a period of emergency department observation in patients with low to intermediate cardiovascular risk is acceptable. The purpose was to determine whether clinician decision making was impacted by a self-reported recent history of cocaine abuse. *Methods:* Cocaine use, disposition, and diagnostic treatment were documented for patients presenting to the emergency department with a complaint of chest pain. Disposition and diagnostics included discharge to home, stress test and discharge, admission to telemetry, admission to the Cardiac Care Unit (CCU), admission for catheterization, and admission for stress test and telemetry. Logistic regression and simple correlation analyses examined whether an association existed between the self-report of cocaine use and the final disposition and diagnostic modalities utilized. *Results:* Cocaine use and further diagnostic treatment were documented for 1019 patients. Sixty-two patients self reported cocaine use. There were no correlations between cocaine use and discharge ($P = 0.17$), cocaine use and stress test ($P = 0.19$), cocaine use and telemetry admission ($P = 0.14$) cocaine use and CCU admission ($P = 0.31$) or cocaine use and cardiac catheterization ($P = 0.15$). There was no association between cocaine use and any treatment. *Discussion:* There was no statistically significant relation between the self-reporting of cocaine use and final disposition. There was no relation between self-reported cocaine use and selection of diagnostic modality. Although cocaine is a risk factor for acute coronary syndrome, in low to intermediate risk patients a brief observation period is adequate. *Conclusion:* Our findings indicate no difference in risk stratification based on the final disposition of our patients. Better risk stratification may translate into a safe and effective reduction in number and length of admissions, and is worthy of further study.

243. Doctors Know that Cocaine is a Risk Factor for Acute Coronary Syndrome, but Don't Routinely Ask about it in Clinical Practice

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Background: Cocaine is known to cause acute coronary syndromes (ACS). In a previous retrospective study, only 13% of patients presenting with chest pain were asked about cocaine use. We designed a study to determine doctors' knowledge of cocaine as a risk factor for ACS and whether they applied this knowledge in routinely asking patients presenting with possible ACS about cocaine

use. *Methods:* Junior medical staff were presented with a scenario of a patient with ACS and asked to identify potential risk factors for acute coronary syndrome and which ones they routinely asked about in clinical practice. *Retrospective Study:* A retrospective notes review of patients presenting to a large inner-city teaching hospital Emergency Department (ED) with ACS was undertaken in December 2005. ED notes were reviewed to determine whether cocaine use/non-use had been documented. *Results:* 34 residents/fellows completed the ACS survey questionnaire. There was no significant difference in the awareness of cocaine as a risk factor for ACS compared to classical cardiovascular risk factors. Only 56.3% would ask about cocaine use/non-use routinely in clinical practice. They were significantly more likely to enquire about classical cardiovascular risk factors [smoking 100%; hypertension 100%; previous IHD 100%; diabetes mellitus 100%; cerebrovascular disease 100% and family history 100% ($p < 0.001$ for all comparisons with cocaine); hypercholesterolemia 90.6% ($p < 0.005$)]. *Retrospective Study:* 109 patients meeting the inclusion criteria were identified. There were 71 (65.1%) males, mean age ± Std. Dev. was 55.7 ± 17.0 years (range 18–89 years). Cocaine use was only recorded in 4 (3.7%) of the patient notes surveyed. *Discussion:* We have demonstrated that although most junior doctors are aware that cocaine is a risk factor for ACS, they do not routinely ask about or record its use in clinical practice. *Conclusion:* It is essential that junior doctors ask about cocaine use in patients with ACS, since the management of cocaine induced ACS is different.

244. Evaluation of Clinical and Paraclinical Parameters in Methanol-Poisoned Patients in Loghman-Hakim Hospital Poison Center for 2 Years

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Background: Methanol poisoning is a medical emergency characterized by metabolic acidosis, visual disturbances, CNS effects and circulatory and respiratory collapse. The aim of this study was to assess the clinical and laboratory parameters in methanol-poisoned patients to determine the prognosis of their toxicity. *Methods:* This is a retrospective study which was done in methanol-poisoned patients in Loghman-Hakim hospital poisoning center during 24 months. History, signs, symptoms, paraclinic findings, medical interventions and final outcome of the patients were abstracted from the patients' files. *Results:* During this time 30 methanol-poisoned patients were admitted. All the patients were male. Mean of age was 30.76 years (range 18–85). 67% of patients were between 21–40 years old. Most of the patients (40%) referred to hospital between 12–24 hours after alcohol ingestion. In most of the patients (36%) the amount of alcohol ingestion was 200–500 mL. According to type of alcohol, most of them (80%) drank illegal alcohol. The mortality rate was about 30%. About 7% of patients became blind due to their poisoning and others (63%) full recovered without any complications. 50% of patients presented with coma. In most of the patients (57%) the pH in the first arterial blood gas was between 7–7.20. In 31% of patients the methanol level was 20–50 mg/dL. All of them treated with sodium bicarbonate, folic acid and 80% of them treated with ethanol; 47% of them treated with hemodialysis (range 1–3). *Discussion:* Level of consciousness on presentation, serum methanol level and arterial blood gas showed significant correlation (*$P < 0.05$) with* prognosis. *Conclusion:* Coma on presentation, metabolic acidosis and initial serum methanol concentration are poor prognostic indicators.

245. Pediatric Exposures to Grandparent's Medication

Oller LK,[1] Sawyer TS,[1] Moyer CJ,[2] Lowry JA.[1] *[1]Mid-America Poison Control Center, Kansas City, KS, USA; [2]Kansas Department of Health and Environment, Topeka, KS, USA*.

Background: In 2004, the Mid-America Poison Control Center (MAPCC) received 13,328 exposure calls in children 0–5 years. Of these, 49% were due to exposure to a pharmaceutical substance. Census data shows a great increase in the number of grandparents raising or helping to raise their grandchildren. In addition, many grandparents provide daycare for their grandchildren. This study was designed to assess pediatric exposures to grandparent's medications. *Methods:* During an 8 month period, MAPCC assessed pediatric calls for exposures to grandparent's medications. Survey participants were identified. After verbal consent, a phone survey was conducted as scripted to obtain additional details regarding the exposure. *Results:* MAPCC was able to capture 4% of pediatric calls related to grandparent's medication. Call back surveys were completed for 72% of these exposures. In 76% of these cases, the exposure occurred in the grandparent's home. In 75%, the child did not live in the grandparent's home. Cardiovascular drugs were involved in 25% of the exposures. Of these, 20% were calcium antagonists and 10% were beta

blockers. Analgesics were involved in 13%. Hormones and hormone antagonists were involved in 10%, and 44% of these were oral hypoglycemics. In 65%, the medication was not in its original container. The majority were in some type of daily organizer/reminder. In 81% of the exposures, the medication was not in a child-resistant container. Children were treated in a health care facility in 28% of these cases, as compared to 10% of other pediatric cases during this same time frame ($p < 0.0001$). *Discussion:* In 50% of the callers surveyed, the responders indicated that he/she had not received any information regarding preventing accidental poisoning. Traditional poison education programs may overlook this group of caregivers. This is a concern, since medications for older adults are some of the most toxic and may present the highest risk. *Conclusion:* With the increase of grandparents caring for young children, this is an area of poison prevention education that needs to be targeted.

246. Culturally Relevant Communications Strategy Increases Spanish-Language Calls to PCC

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Background: Call data indicate non-English speaking residents do not often utilize PCC services despite availability of simultaneous interpretation in over 100 languages. Numerous research studies, including our own, have established that monolingual Spanish speaking parents do not use PCC services. In order to serve this known "at-risk" population, a culturally relevant "in-language" communications strategy was formed. Materials, created in Spanish targeting low-income, low-English proficiency parents were developed. A pilot initiative leveraging existing locally-based networks employing community members as health workers was implemented to increase knowledge and use of PCC services. *Methods:* Effectiveness of this targeted strategy was measured by tracking PCC calls using contracted telephone interpreter service. Four years of data from same service was reviewed to determine number of calls with an interpreter, languages requested, and geographic origin. *Results:* Number of calls requesting Spanish increased by 45.4% from 2002 to 2005. An increase was noted each year: 9.44% from 2002–2003, 14.3% from 2003–2004, and 16.24% from 2004 to 2005. Calls from geographic regions receiving targeted outreach strategy increased by 71.59% from 2002–2005. *Discussion:* Latinos constitute 32.4% of the state's total population and the majority of children born in the state are now Latino. This demographic change has important implications for PCC services. Latino children are more than 2x as likely as non-Latino Caucasian children to be hospitalized as a result of poisoning. Though higher poisoning exposure risk has been documented for this population, PCC utilization rates are significantly lower in zip codes with predominantly Latino residents. Although progress is evident, sustained, targeted, outreach remains critical. *Conclusion:* A highly-focused, consumer-friendly, culturally relevant communications strategy utilizing indigenous community networks brings awareness of PCC services to underserved audiences, increasing utilization consistently and significantly.

247. If You Build It, They Will Come: Utilization Patterns of a Regional Poison Center Web Site

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Background: The Internet is an important means of communicating with today's society – it is readily accessible 24 hours a day and subjects are easily searchable. In the US, nearly 204 million people (68.1% of the population) use the Internet. Internet usage has grown more than 113% from 2000–2005. In fact, Americans now use the World Wide Web as an important source of information. Poison centers must adapt to the technological advances and changes in how society obtains information to continue spreading the message of poison safety. To take advantage of this communications shift, a regional poison center adapted its website to offer comprehensive resources to a variety of audiences. For the public, the site houses poison prevention information, interactive games for children and disaster preparedness resources. For educators, the site offers an online training program and resource center. For health professionals, the site contains clinical information to help them treat poisonings and materials to prepare for potential mass-casualty events. *Methods:* Website page visits were compared for 2004 and 2005. To categorize utilization of the website, information intended for the general public, educators and health care professionals was monitored. *Results:* Total page visits increased from 68,696 to 185,176 (+ 166%). Page visits from the general public increased from 43,549 to 83,894 (+ 92.7%). Page visits from educators increased from 12,433 visits to 72,148 visits (+ 479%). Page visits from health care providers increased from 14,708 to 31,139 (+ 112%). *Discussion:* As society continues to use the Internet as a source of information, poison centers should integrate a Web component into their communications plan. This poison center site's enhanced content and navigation led to increased visits by all target audiences. *Conclusion:* A comprehensive, strategic website can be a critical com-

munication and education tool for poison centers. By offering a myriad of resources to parents, children, educators and health care professionals, a website is an effective way to provide information to a diverse array of individuals and help impact the public health of communities.

248. Combining Primary and Secondary Poison Prevention in One Initiative

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Background: The Institute of Medicine (IOM) report on *Forging a Poison Prevention and Control System* stressed the importance of poison prevention education (primary prevention) and poison center awareness (secondary prevention). The IOM indicated that combining the two prevention "messages in the same package" makes it difficult to measure the effectiveness of education. The report recommended that poison prevention education efforts should be integrated into other public health initiatives. In an attempt to combine both primary and secondary poison prevention education messages and to participate in an organized general health program at a minimal cost, a certified regional poison information center (CRPIC) participated in the following program. *Methods:* A children's hospital produces a quarterly guide to raising healthy children. It is mailed free of charge to 150,000 households in 412 zip codes served by the CRPIC. A one-half page poison prevention and CRPIC awareness message was printed in the center section of the magazine. Bound adjacent to the poison education message, was a sheet of stickers, each having the national toll-free Poison Help telephone number. To assess the impact of this initiative on exposure and information call volume, 6 months of CRPIC call data from 2004–05 served as the benchmark for comparison with the same 6 months of data from 2005–06 following the distribution of the magazine. Data are reported as the mean ± the standard deviation. *Results:* Monthly CRPIC call volume increased from 3602.0 (±213.5) to 3922.2 (±145.04) during the study period. Exposure call volume decreased from 1860.5 (±164.5) to 1774 (±154.4). Information call volume increased from 1741.5 (±74.2) to 2144.2 (±206.5). *Discussion:* Call volume is a reflection of awareness. No other concentrated CRPIC awareness initiatives were conducted during these time periods within the zip codes. Contrary to the results of this initiative, most passive education efforts have not increased poison center awareness. *Conclusion:* Combining both primary and secondary poison prevention methods increased CRPIC awareness and may have had a small impact on the number of exposures.

249. Designs of Liquid Cleaning Agents (LCA) Resembling Food Supplement Drinks (FSD) May Lead to Unintentional Exposures

Caraccio T, Carbain A, Daly A, Dahm D, Iovino B, Kang-Yum E, McFee R, McGuigan M. *LI Poison Center, Mineola, NY, USA.*

Background: Recently, our Poison Center received a call from a news reporter asking if we have had any unintentional ingestions of 2 LCA, Fabuloso® and Mistolin®, which have labels depicting colorful pictures of fruits or plants, are in bottles shaped like fruit supplements, and come in several appealing fragrances. *Methods:* A retrospective review of human ingestions involving Fabuloso® and Mistolin® from 1/1/03–3/25/06, was conducted by our center. In addition, 6 SPIs and 2 educators from our Center independently evaluated 4 pictures of Fabuloso®: Lavanda, Ocean fresh, Limon, and Fresco Aman in 1 liter bottles at www.Mexgrosser.com and 2 pictures of 15 oz. containers of Mistolin® Lavender and Liquid cleaner at www.dealtime.com in home furnishings to determine any similarities to FSD. *Results:* There were 21 ingestions of Fabuloso® and 31 of Mistolin®. 26 occurred in children < 6 yrs and 25 > 19 yrs. Ten patients developed mild GI symptoms and 8 were seen in an ED with symptoms from Mistolin®. In 1 case, a 20-yr-old female who ingested 6 oz of Mistolin® said "she had mistakenly thought it was her regular fruit drink since it resembled it so closely in design." Six elderly patients mistakenly thought it was their own drinking bottles. The 6 SPI's and 2 educator's were all stunned by the resemblance of these containers to common liquid FSD and felt these could be easily mistaken for them. *Discussion:* Some manufacturers have resorted to ultra-modern designs of LCA in order to make them more attractive. In the past, baby powder bottles shaped like milk bottles resulted in numerous children aspirating the powder until the bottles were redesigned. A larger analysis of LCA ingestions is needed to confirm our impression that the packaging designs of LCA may influence the rate of unintentional ingestions because of a close resemblance to liquid FSD. In the interim, we encourage manufacturers to reconsider the designs of LCA containers to make them look different than liquid FSD. *Conclusion:* Designs of some LCA may be a source of unintentional exposures in children and adults. This is a source of concern for Poison Centers as our population continues to age.

250. Desktop Video Delivery as a Learning Tool for SPIs: One Poison Center's Experience

Smith DH, Schauben JL, Rawls, III HM. *Florida Poison Information Center – Jacksonville, Jacksonville, FL, USA.*

Background: Poison centers educate Specialists in Poison Information (SPIs) by providing current information on evolving treatment philosophies, antidotes, triage, and global current events. We evaluated the effectiveness of desktop video delivery as a mechanism for facilitating learning. *Methods:* Thirty-four digitalized videos and two articles on a variety of toxicological topics were made available for desktop viewing during a 22-month period. Ten of these videos and the 2 articles were mandated for completion. These items could be accessed anytime on site during the workday at the SPI's discretion. Participants completed a structured, 25-item survey. This survey was designed to assess reason for viewing, satisfaction with content and mode of delivery, likelihood of use and its overall value as an educational tool. *Results:* A total of 94 (52%) surveys were completed. Eighty percent of the respondents indicated mandatory compliance as the reason for completion. Those completing voluntary surveys did so due to interest in the topic (53%) or as a quick refresher on the topic (47%). *Discussion:* The majority of those surveyed indicated being very satisfied (40%) or satisfied (37%) with the desktop viewing experience. When asked if the item contained information to assist the SPI in performing their job duties, 86% indicated yes. Ninety-five percent found desktop delivery an effective means of learning. Sixty-one percent preferred poison center-based desktop ready videos as a mode of learning when compared to web-based videos delivered to the home (12%). While only 12% of the respondents indicated web-based video home viewing as a preferred method of learning, 55% indicated making educational videos/articles available via home access as a useful option. Ninety-three percent of the participants reported being very likely (17%) or likely (76%) to view a video/read an article via desktop during working hours. *Conclusion:* Desktop video delivery is a viable option for enhancing the learning opportunities of poison center SPIs. Further evaluation of advantages/obstacles and pre/post testing is warranted to measure the full impact of this technology as an educational tool.

251. Does Toxicology Knowledge Improve after a Toxicology Rotation?

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Background: Many Emergency Medicine (EM) residencies do not have a clinical toxicologist on faculty, and Critical Care fellows (CC), Internal Medicine (IM), Pediatric (P), Family Practice residents(FP), and medical students (MS) have no formal clinical toxicology training. The study objective was to determine if rotators gained clinical toxicology knowledge after a formal rotation at a poison center. *Methods:* The data was gathered retrospectively from a database of clinical toxicology rotators over a 19 month period. The rotators were administered the same test prior to, and after completion of the rotation. The percentage correct on the pre-test was compared to the percentage correct on the post-test, for each classification of rotators, by a paired t-test. The p-value, mean difference, standard deviation, and 95% confidence intervals were calculated. *Results:* 42 (95%) of 44 rotators during that time period were included because of complete records. Each group of rotators was found to have a significant change in pre-test and post-test scores, except in the family practice group. This group was limited by a small number (see table). *Discussion:* We can not account for the difference in clinical toxicology knowledge prior to the test, or the possibility of rotators memorizing a pattern of answers. The rotation did not equal the same number of days for everyone. In the groups with adequate numbers there does appear to be a significant change in test scores. *Conclusion:* This data demonstrates an improvement in test scores in most groups after a formal toxicology rotation.

Clinical toxicology assessment scores

Total = 42	Mean pre-test % correct	Mean post-test % correct	Mean difference	SD difference	CI of difference	p value
EM = 16	62.06	84.67	22.60	13.00	29.56–15.69	0.0001
IM = 11	49.27	77.45	28.10	19.88	41.54–14.83	0.0008
FP = 2	54.50	80.50	26.00	7.00	89.53–37.53	0.12
CC = 5	58.80	90.40	31.60	15.50	50.74–12.46	0.01
MS = 8	45.75	86.50	40.75	10.32	49.38–32.12	0.0001

252. Tennessee Poison Center Partners with Statewide District Attorneys to Educate Health Care Professionals about Methamphetamine and to Promote *Poison Help*

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Background: Tennessee Poison Center is a statewide poison control center serving 5.6 million residents in 95 counties. Community based education is challenging due to the geography of the state and staff availability of one part time educator. Innovative collaborations to provide education are sought to achieve the Center's goals. *Case Report:* In 2005, the Governor's Task Force on Methamphetamine Abuse called for Tennessee to "educate communities about the dangers of methamphetamine abuse." As a result of this Task Force, the Tennessee District Attorneys launched the *Meth Destroys* statewide methamphetamine education campaign. Tennessee Poison Center met with the public relations firm that developed the *Meth Destroys* Campaign and emphasized the importance of utilizing Tennessee Poison Center as a resource for both public and professional education on methamphetamine use. *Case Discussion:* Through this collaboration, an educational poster is being developed to educate health care professionals about the initial management of children exposed to methamphetamine labs in the home. This will be distributed to Emergency Departments throughout the state and will include the Poison Help logo and the 1–800–222–1222 phone number. A website regarding the dangers of methamphetamines has been developed (www.MethFreeTN.org) and has received over 900,000 hits. *Conclusion:* Through this innovative partnership Tennessee Poison Center is able to provide additional educational opportunities to all Tennesseans and to promote awareness of its Poison Help service in all 95 counties.

253. Methemoglobinemia Produced by a Herbal Dietary Supplement (HDS)

Caraccio T, Kim K, Kang-Yum E, Dente E, McGuigan M, McFee R, Mofenson H. *LI Poison Center, Mineola, NY, USA.*

Background: Jungle Juice® is a HDS whose manufacturer claims it contains special nitrites which can increase sexual stimulation. We report a patient who developed methemoglobinemia requiring treatment with methylene blue. This is the first case report of a liquid HDS used for the advertised indication associated with methemoglobinemia. *Case Report:* A 63-yr-old male was admitted to the ED after ingesting 2 oz of Jungle Juice® liquid containing 6% ammonium nitrate (22 mg/kg of nitrates) that he purchased over the Internet. The patient complained of nausea and vomiting and was noted as mottled and dusky on admission. At 6 h post-ingestion, he developed purple cyanosis and diaphoresis with some decreased respiratory effect. ABG: pH 7.42, pCO_2 29, pO2 72, O_2 sat 97% with a methemoglobin level of 22.1%. His cyanosis cleared within 15 min. after treated with 2 mg/kg (162 mg) of IV methylene blue. Administration of 100% oxygen and nebulized albuterol treatment, resulted in respiratory improvement over the next few hours. His methemoglobin level was 0.8% @ 7 hr PI. Promethazine was given for nausea and vomiting. The patient had no further signs or symptoms of toxicity and was subsequently discharged over the next 3 hours. *Case Discussion:* Many drugs and chemicals including nitrates can induce methemoglobinemia after ingestion, inhalation and skin absorption. The toxicity of nitrates is due to the in vivo conversion to nitrites. The minimal toxic dose is variable and assessment of the severity of toxicity should be based on clinical findings. Common overdose effects include orthostatic hypotension, methemoglobinemia, reflex tachycardia, headache, nausea, and vomiting. Treatment of OD is focused on hypotension, seizures, and methemoglobinemia. Methylene blue is given along with 100% oxygen and isotonic fluids to treat the methemoglobinemia and systemic manifestations. *Conclusion:* HDS containing ammonium nitrate advertised to increase sexual stimulation need to be added to the long list of substances that have been associated with methemoglobinemia. Clinicians need to be aware of its potential toxicity and management.

254. Recurrent Hematologic Abnormalities Following Antivenom (AV) Therapy for Crotaline Snakebite

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Background: Recurrence (REC) of hematologic abnormalities following AV treatment of Crotaline snakebite has been described. This study identifies factors that may be used during the course of therapy to identify patients at risk for REC. *Methods:* Medical records for patients treated with Crotalidae Polyvalent Immune Fab during 2002–04 were abstracted from 17 US hospitals. Snake

type (rattlesnake = RS, copperhead = CH, cottonmouth = CM, unknown = UK) was recorded. Clinical severity prior to AV (SEV: 0–6 pt scale) was assessed using standard criteria. Initial control (IC) was defined as a trend toward normalization of all venom effects, judged by an expert panel. REC was defined as emergence of coagulopathy (CREC: FIB<150 or INR>1.2) or thrombocytopenia (TREC: PLT<150) after IC. Only patients with >24 hrs follow-up post-AV were eligible for REC assessment. Nonparametric methods and regression were used to identify REC risk factors. *Results:* Eighty-one (32%) of 250 cases met all REC eligibility criteria, including evidence of IC and >24 hrs follow-up. REC was found only in RS patients, or in UK patients in AZ or west TX (see table). No RECs were found in CH (11) or CM (1) patients. Patients with REC had greater medians for SEV (REC = 4, no REC = 3, p = .002), time from bite to IC (11 h, 8 h, p = .009), number of loading doses to IC (2, 1, p = .011), and number of maintenance doses after IC (3, 2, p = .012). Only SEV was a significant predictor of REC (p = .002). One REC was associated with clinically significant bleeding. *Discussion:* We found REC only in RS- or UK-envenomated patients in areas where RS predominate. Severely envenomed patients and/or those requiring more aggressive AV therapy may be more likely to have REC, but these factors alone cannot effectively predict REC. *Conclusion:* REC could not be clearly differentiated on the basis of particular demographic, exposure, and/or treatment factors due to wide patient variability.

Snake Type	REC	CREC	TREC
RS	6/32 (19%)	5/31 (16%)	2/31 (7%)
UK	17/37 (46%)	11/36 (31%)	10/37 (27%)
Total	23/81 (28%)	16/79 (20%)	12/78 (15%)

255. Eastern and Texas Coral Snake Bites: What's the Difference?

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Background: North American coral snake antivenin is indicated for envenomations from both subspecies of *Micrurus fulvius: M.f. fulvius* (Eastern) and *M.f. tenere* (Texas). However, bites from Texas coral snakes may not be as severe as those from Eastern coral snakes. Our goal is to determine the differences between these subspecies by analyzing coral snake bites from Florida and Texas. *Methods:* Retrospective review of poison center cases of coral snake bites from January 1, 2003, through December 31, 2005. Data was collected from six poison centers in Texas and one in Florida. *Results:* There were 109 victims: 59 from Eastern coral snakes and 50 from Texas coral snakes. There were no clinical or statistical differences in age or gender of the victims between the two groups (p > 0.05). In both groups, most (66.1% and 56.0%) victims had no clinical effects or only minor clinical effects. More victims bitten by Eastern coral snakes had systemic effects (39.0% and 14.0%; p = 0.01). About half (49.1% and 54.1%) of each group received antivenin, and both groups had patients with adverse reactions to the antivenin. There were no deaths. *Discussion:* The two subspecies of *Micrurus fulvius* are separated by the Mississippi River. No large study of the differences between the bites of these two subspecies has every been published. This is the largest study of North American coral snake bites, and many of the differences and similiarities that it found were surprising. *Conclusion:* No differences were found between victims of Eastern and Texas coral snakes for age, gender, severity of clinical effects, and use of antivenin. Bites from Eastern coral snakes are more likely to produce systemic effects than Texas coral snakes. Many vicitms in both groups did not receive antivenin and remained asymptomatic or had only minor clinical effects.

256. Kabocha Squash Neurotoxicity in Dogs: A Halloween Hazard

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Background: Kabocha pumpkin is a generic group for many strains of Japanese winter squashes and pumpkins of *Cucurbita moschata* and *Cucurbita maxima*. There are numerous cases of human poisonings from cucurbitacins, tetracyclic triterpenoids

contained in ornamental species. There is one case of a dog that developed seizures from a related cucurbit, *Momordica charantia*, but no prior cases from Kabocha. *Case Report:* Two 18-month-old, healthy, sibling male Labrador retrievers ingested 2/3 of a 7-inch Kabocha pumpkin, purchased as a Halloween display and kept on the back porch. After 30 min the owner observed both to have salivation, tremors, tachypnea, ataxia, and seizure-like activity, which increased over the next 2 hours. The dogs were taken to a veterinarian specialist, intubated, given activated charcoal, IV saline, diazepam, and methocarbamol. One dog was given atropine to rule out organophosphate poisoning, and the other was given furosemide due to concerns over fluid overload. Over the next 18 hours both dogs exhibited lateral nystagmus, hypersalivation, tremors (whole body in one, facial in the other), intermittent rigid paralysis in one, ataxia, weakness, unresponsiveness to vocal stimuli, and slight tachycardia. One dog had a stool containing Kabocha seeds along with fluorescent green urine, about 12–16 hrs after ingestion. All symptoms were resolved within 24 hours. All labs were normal other than modest CPK and AST elevation in one dog, and mildly decreased electrolyes, without acidosis, likely dilutional. *Case Discussion:* The ASPCA animal poison control center had 3 canine exposures to *Cucurbita* species (unclear if domesticated or decorative) between 1/2002–3/2006. Symptoms included vomiting, lethargy, head shaking, hypersalivation, and listlessness. While human cases have generally cited severe GI toxicity, neurotoxicity and seizures have occurred with high doses. The only other published canine Cucurbit exposure demonstrated seizures, rigidity, tachypnea, and tachycardia. Our cases had rapid onset of large dose, and evidence of exposure in urine and feces. *Conclusion:* Kabocha pumpkin and other ornamental gourds, should be listed as Halloween hazards for pets.

257. Narrow-Complex Tachycardia, Hypokalemia and Hypophosphatemia in a Young Male Bodybuilder with Hyperlipidemia

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Background: There are few reported cases of acute poisoning with bodybuilding supplements. Possible reasons include: Supplements are called “natural” and therefore are healthy; some have illegal components, and finally, clinicians don’t ask about them. Regardless of patient claims, we should be diligent in addressing supplement use and performing toxicologic evaluations when a constellation of symptoms does not fit the parameters of a conventional diagnosis. *Case Report:* The patient, a 26-year-old male with hyperlipidemia, was admitted with palpitations. During his initial evaluation he was found to be profoundly hypokalemic (2.2 mmol/L) and had a narrow-complex tachycardia. Within hours of his admission he became clinically unstable and required transfer to the ICU. His electrolyte derivations were difficult to correct and his tachycardia and hypertension were minimally controlled using IV esmolol and amiodarone concurrently. He had multiple serum/urine lab abnormalities (cortisol 11.5 mcg/dL, ACTH 7.7 pg/mL) and eventually required BIPAP. The patient continually denied all drug/supplement use until directly confronted with the comprehensive blood drug screen lab values which revealed clenbuterol and ephedrine. *Case Discussion:* Clenbuterol is similar to albuterol in being a potent β2 adrenoceptor agonist but its half-life is considerably longer, up to 39 hours. In cattle it decreases adipose tissue and increases muscle mass. Ephedrine is an α & β adrenoceptor agonist and is used for weight loss. Though internet ads claim the side effects are minimal, obviously that isn’t the case. This patient underwent two unsuccessful cardioversions, required BIPAP and was given in excess of 320 meq of potassium before the drugs left his system. *Conclusion:* This patient demonstrated toxic, life-threatening effects from the ingestion of clenbuterol and ephedrine but repeatedly denied using supplements. The comprehensive drug screen was performed because there was no rational explanation for his refractory hypokalemia, hypophosphatemia and narrow-complex tachycardia. Early toxologic evaluation gave him the best possible chance at survival.

258. Ingestion of Veratrum Viride (False Hellebore) Leading to Bradycardia and Hypotension in a Frontier Environment

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Background: Veratrum viride (false hellebore) is a plant that contains veratrum alkaloids. We report a case of ingestion of veratrum viride leading to bradycardia and hypotension. *Case Report:* A 34-year-old man and his 8-year-old son was camping in a remote area of Alaska. The father foraged for plants to make a soup. He ate several bites of the plant and then chopped several

leaves to make the soup that was ingested by both the man and son. Shortly after ingesting the plant, the father developed lightheadedness and used a book to identify the plant as Veratrum viride. He contacted the poison center via satellite phone. Airlift was not possible and he was instructed to make his way to a hospital. He and his son hiked 10–15 miles to a set of train tracks in time to wave down the daily train traveling through the area. 4–6 hours after the ingestion and now on a train, the father contacted the poison center by satellite phone and reported lightheadedness, sweating, and vomiting in both him and his son. The poison center contacted pre-hospital agencies and both patients were picked up at the train by an ambulance. Both had hypotension and bradycardia: Father (60 bpm, 96/50 bp), Son (54 bpm, 80/50 bp). The poison center instructed pre-hospital personnel to treat the patients with charcoal and atropine and contacted the hospital. After a 90 min transport to a hospital, the son was asymptomatic and his vital signs had stabilized. The father had a heart rate of 30 and systolic bp of 80, and reported lightheadedness and double vision. He was treated with IV atropine and fluids and his vital signs improved (60 bpm, normal sinus, systolic pressure 120). Both recovered well and were discharged 24 hours after their ingestion. *Case Discussion:* Veratrum viride (false hellebore) intoxication is rare, but has been occasionally reported due to mistaken identification in foragers. This case demonstrates this rare toxicity and displays the complex coordination of treatment and transport necessary when providing poison center coverage for a frontier area. *Conclusion:* We report a rare case of veratrum viride ingestion leading to vomiting, bradycardia, and hypotension.

259. Persistent Envenoming Locally after Cobra Snakebite

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Background: The cobra snakebite is one of the most serious and destructive injury to human beings in the world due to its highly toxic venom. Significant local tissue necroses instead of minimal neurotoxic paralysis have been noted and specific antivenin had been administered in cases of cobra snakebite in Taiwan. The pathophysiology is not definitely clear. *Case Report:* A 56-year-old woman suffered from an unwitting snakebite over the second toe of right foot in her house on the afternoon of April 13, 2003. She was treated with wrong antivenin 30 minutes after snakebite. We were consulted and six vials of specific antivenin to cobra snake was administered 24 hours later. The wounded site progressed to be ulcerated, ecchymosed and blister formation occured. She took several surgical interventions over right foot later on. We studied the venom concentrations of blister fluid and necrotic tissue that were drawn or incised from the wound. We found that a high venom concentration in blister fluid and local necrotic tissue was noted even after a large dose of specific antivenin (table). *Case Discussion:* The toxic components of cobra venom might bind firmly in local tissue where injured, and is hard to be excreted or neutralized by specific antivenin as noted in animal study. From this case's experience, it indicated that the blisters should be broken due to the large amount of venom persistently found in the blister fluid. *Conclusion:* Other vigorous methods of treatment, in addition to adequate antivenom as early as possible are indicated, and need further investigation to mitigate the possibility of tissue loss in severe cobra snake envenoming.

The venom concentration in patient's samples at varied & indicated time

Sample \ time	24 hrs	30 hrs	44 hrs	68 hrs	72 hrs
Serum (ng/ml)	26.6	ND	3.2		
Blister fluid (ng/ml)			1391	1062	
Necrotic tissue (ng/gm)					135

ND: non-detectable.

260. Sequelae of Delayed Diagnosis of Food-Borne Botulism

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Background: Improper home canning is a concern related to food-borne botulism. Clostridium botulinum exotoxin is one of the most toxic substances known to man and produces a classical descending bilateral paralysis. Though rare, food-borne botulism is

difficult to treat and manage, with long term effects and slow recovery is expected if not rapidly diagnosed. *Case Report:* A 14-year-old female presented to her dentist's office for routine dental work. An allergic reaction to the nitrous oxide/lidocaine she was given prior to her dental procedure was suspected. The patient complained of dyspnea and dysphagia. She was transferred to a local emergency department and was intubated secondary to profound weakness. After stabilization she was transferred to a children's pediatric intensive care unit where it was noted that she could move only her toes on command. The poison control center was contacted by the initial facility and again consulted the attending PICU physician who reported profound paralysis with dilated and minimally reactive pupils. Botulism poisoning was suspected when further discussions with the family revealed that improperly canned venison stew had been previously ingested by the patient. The patient developed multiple urinary tract infections, poor gut motility, and pneumonia secondary to aspiration prior to intubation. The patient was treated with antibiotics, TPN, enoxaparin to decrease potential for DVT, gabapentin, and botulinum antitoxin type A and B. Administration of antitoxin to this patient was delayed three days from her initial admission due to difficulties in early diagnosis and lengthy procurement procedures. Minimal responses were noted after treatment with the botulinum antitoxin type A and B. Three weeks after initial patient admission, it was confirmed that the patient's serum blood was positive for botulism toxin A. After a six month hospitalization and extensive rehabilitation the patient slowly regained use of all extremities and returned to normal, if somewhat limited, daily activities. *Conclusion:* Improperly home canned foods pose a serious medical threat. Early recognition of symptoms related to food-borne botulism is imperative.

261. Toxicity after Misidentification of Foxglove for Comfrey in the Garden

Spain MM, Marraffa JM, Stork CM. *Upstate New York Poison Center, Syracuse, NY, USA.*

Background: Herbal enthusiasts continue to explore the medicinal properties of botanicals. Text books indicate that Comfrey (*Symphytum officinale*) can be mistaken for Foxglove (*Digitalis purpurea*) when not in bloom. We describe a case of misidentification with recurrent episodes of toxicity. *Case Report:* A 36-year-old female with past medical history of Crohn's disease presented to the emergency department (ED) four times within 10 days complaining of lightheadedness and near syncope. During the first 2 episodes, medical evaluation was negative, the symptoms resolved and the patient was discharged. On the third presentation, vital signs included a heart rate (HR) 44 bpm and blood pressure (BP) 81/51 mmHg. Electrocardiogram (ECG) revealed sinus bradycardia with narrow complexes and scooped ST segments. Despite 2 L of crystalloid fluid, the patient remained hypotensive and bradycardic. Further investigation revealed that the patient was chronically ingesting comfrey, made into a tea, from her backyard, for abdominal discomfort. Initial laboratory analysis was normal with a serum potassium of 3.5 mEq/L. After 24 hours, the patient remained awake and alert complaining of muscle weakness and white vision changes with a HR 41 bpm and BP 81/41 mmHg. A serum digoxin and digitoxin level obtained at this time was 3 ng/mL and 6.6 ng/mL(range: 10–32 ng/mL), respectively. Without specific therapy, the patient had resolution of symptoms within 36 hours and left the hospital against medical advice. During the fourth episode, 4 days later, the patient was found unresponsive at home with bradycardia and hypotension. At that time, serum digoxin and digitoxin levels were 3.3 ng/mL and 17.9 ng/mL, respectively. Serum potassium was 3.8 mEq/L and ECG showed sinus bradycardia with scooped ST segments. Ten vials of Digibind® were given with resolution of vital sign abnormalities and symptoms. She was discharged to home on hospital day 2 with HR 68 bpm and BP 107/67 mmHg. *Case Discussion:* Wilderness medicine texts describe the potential for misidentification of Foxglove for Comfrey. *Conclusion:* To our knowledge, this is the first published report of this with resultant toxicity in a patient consuming what she believed to be Comfrey.

262. *Daphne caucasica* Ingestion in a Child

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Background: Toxicity of the *daphne caucasica*, a deciduous shrub, is unknown. Plant toxicity reference texts suggest the *daphne mezereum* may cause severe gastro-intestinal effects including bloody diarrhea, with severe cases reportedly experiencing delirium, seizures and death. Micromedex references all *daphne* genera to a single management, which references the effects reported to *daphne mezereum*. Micromedex reports that "only one berry or leaf is expected to produce symptoms, and 2 or 3 may be fatal in a child. As few as 12 may be very serious in an adult." A search of MEDLINE located no reports of human ingestion of any *daphne* species. No direct reports of toxicity from this group of plants could be located. We report a case of ingestion of *daphne*

caucasica in a 4-year-old boy. *Case Report:* A 4-year-old boy was witnessed, by an older sibling, ingesting three leaves of *Daphne caucasica*. The mother initially contacted a local plant nursery for positive identification, which stated this was a "class one" toxin. The child was aymptomatic and was managed at home with dilution. Over the following four hours the child had a normal lunch time meal and remained asymptomatic. *Case Discussion:* This is the first reported ingestion of *daphne caucasica* in a human. In contrast to plant toxicity references, ingestion of up to three leaves produced no symptoms. *Conclusion:* Unintentional ingestion of *daphne caucasica* may not require direct medical observation.

263. An Overdose of Aconite by a Twenty-Six-Year-Old Woman and a Review of Literature

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Background: Aconite (AC) has been used for years topically as an analgesic, systemically for various applications, and even as a potent poison. We present the case of a woman who overdosed on a tea made of AC and a literature review. *Case Report:* A 26-year-old woman presented to the Emergency Department (ED) after ingesting a tea concocted from herbs that included AC. 15 minutes after ingesting the AC, the patient reported that she felt her tongue was becoming numb. The sensation traveled to her perioral region first, then to extremities, and finally she felt tightness in her chest and began to vomit. The initial electrocardiogram (EKG) obtained in the ED revealed an accelerated idioventricular rhythm. As her stay progressed in the ED, the rhythm strip showed sinus rhythm with PVCs, and the repeat EKG showed a sinus rhythm with first-degree heart block. The patient was transferred to the observation unit overnight. The repeat EKG revealed normal sinus rhythm with early repolarization. Her symptoms resolved, and she was discharged without sequela. *Case Discussion:* We present this case because of the increasing popularity of herbal supplements and the possible danger associated with the perception among patients that herbal preparations are safe. AC contains a number of alkaloids that act on sodium channels. These actions contribute to the cardiotoxicity of AC. With the high LD50/ED50 of AC, it is not a safe or practical anaglesic. Although the risk of AC toxicity can be reduced with profuse soaking, the risk of toxicity can never be eliminated. Preparations of herbs are exempt from federal regulation if they are labeled as dietary supplements. These products run the risk of being contaminated with unlisted components that place the patient at risk from other toxicities. *Conclusion:* It is imperative to obtain thorough medical histories including herbal medications for all patients, but especially those with suspected overdoses. With the increasing popularity of herbal remedies, increased public awareness of potential dangers is imperative. It may again be time to raise the question of regulating herbal preparations.

264. Respiratory Illness Associated with Boot Sealant Products

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Background: To characterize an outbreak of severe respiratory illness associated with newly introduced boot sealant products during 2005 and 2006. Experiences from 6 poison centers in 5 states are presented. *Methods:* A retrospective analysis was performed on all shoe or boot aerosol waterproofing or sealant product exposures with respiratory illness reported to the study centers from January 2005 through March 2006. Age, location of exposure, pulse-ox, CXR, LOS, symptom duration, product lot #, and treatments were analyzed using SPSS (v 11.5). Long-term follow-up to confirm clinical outcomes was conducted. *Results:* There were 219 exposures (191 human, 28 animal) between 2/20/05 and 3/10/06. Products were sprayed indoors in 84.5%, outdoors in 12.3%; 2.3% were occupational. 55% of human patients were evaluated in a hospital;10% were admitted. Median LOS was 1 day (range 1–4). There were no human fatalities. Two cats required oxygen therapy for up to 4 weeks; 2 died. 89.5% of cases clustered around 2 products that were voluntarily recalled. *Discussion:* Features of serious respiratory illness from aerosol waterproofing products are described. Conclusion: Successful coordination among neighboring poison centers prompted identification of this outbreak, effected product recalls, and likely prevented additional morbidity. The products involved were not listed in Poisindex, making tracking of the cases difficult. A solution was developed that should ease this problem for future outbreaks.

Key clinical findings (humans)

Age(yr)	Symptom	Duration	CXR	Pulse Ox	Treatment
N = 180 Range 0.5–69.5 Median 31.5	N = 191 Cough (79.6%) Dyspnea (60.7%) Chest pain (28.8%) Throat irritation (18.8%) Tachypnea (6.3%)	N = 171 Range 0.25–504 Median 19 hrs	N = 64 Positive 16 (30%) Negative 37 (58%) None 11 Unk 126	N = 48 Range 61–100 Median 96	N = 165 Albuterol 36% Steroids 16% Oxygen 24%

265. Validity of the AAPCC Calcium Channel Blocker Ingestion Guideline

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Background: The American Association of Poison Control Centers out-of-hospital consensus guideline published in 2005 advised specific amounts of calcium channel blocker (CCB) ingestions that require evaluation at a health care facility (HCF). Our goal was to validate this guideline using pediatric patients reported to poison centers. *Methods:* This was a retrospective study of the database from six poison centers for unintentional ingestions of calcium channel blockers from 2004 and 2005. Inclusion criteria: children 6 years and younger, ingestion of a single CCB and no other cardioactive agents (combination medications such as CCB/ACEI and CCB/anti-lipid agents were included), a recorded weight, estimated amount ingested, follow-up call, and a known outcome. *Results:* There were a total of 474 children with CCB ingestion. There was 1 death and 4 other patients with severe symptoms requiring treatment (1.1%; 95% CI 0.5 – 2.5%). 109 cases met the inclusion criteria (amlodipine 47.7%, 15.6% diltiazem, 14.7% nifedipine, 3.7% felodipine, 16.5% verapamil, 1.8% nisoldipine). The average age was 22 months. Extended-release preparations were responsible for 47 cases (43.1%). Although 99 patients (90.8%) were actually treated at a HCF, the guideline would have referred 98 (89.9%) patients. However, 8 patients who were not referred to a HCF would have been if the guideline had been used. The guideline would have referred all 5 patients with severe symptoms to a HCF. *Discussion:* The overall agreement of actual recommendations to those of the guideline was 84.4% (95% CI 76.4 – 90.0%). Because so few children (10.1%) would have been kept at home, the overall accuracy of the guideline was only 14.7% (95% CI 9.2 – 22.5%). Major clinical effects from CCB ingestions in this age group are severe but rare. *Conclusion:* The guideline appears to provide very safe triage dosages (negative predictive value = 100%; 95% CI 74.1 – 100%) for young children. It does refer too many children (89.9%) to a HCF. The triage doses could be raised to keep additional children at home without incurring additional risk.

266. Non-Fatal US Poisoning ED Visits and Hospitalizations 2001–2004

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Background: Two types of harm caused by poisoning are injuries severe enough to require hospitalization or exposures that result in emergency department (ED) visits. The NCIPC/CPSC joint National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP) provides estimates of nonfatal injuries seen in US EDs. Estimates are derived from a stratified probability sample of 66 hospitals, representative of US hospital settings. In the US, nearly all acute poisonings requiring hospitalization are seen in EDs. *Methods:* Multiple quires of the NEISS-AIP databases of non fatal ED visit data were analyzed. Poisoning was defined by discharge diagnosis codes using ICD-9 (E850-E869, E950-E952, E962, E980-E982, E972). Rates were cases/100,000 with *age adjusted to the 2000 Census. All figures below are statistical estimates. *Results:* During years 2001–4, 3,139,236 non

fatal ED visits (*rate 271) for poisoning resulted in 1,194,947 (38%) hospitalized or transferred (Hosp/Trans) cases (*rate 103). The mean age for visits was 33.2y, 52% were male (*rate 283), 53% White (rate 209), 15% Black (rate 302), 2% Hispanic (rate 159), 68% unintentional and 31% suicidal. The mean age for Hosp/Trans cases was 36.1y, 48% were male (*rate 99), 57% White (rate 85), 14% Black (rate 109), 5% Hispanic (rate 40), 43% unintentional and 57% suicidal. 70% of suicidal intent poisoning visits lead to Hosp/Tran versus 24% for unintentional. Patients ≤ 12 years old comprised 11% of ED visits (rate 176) and < 3% of Hosp/Tran cases (rate 18). The 15–19 years of age group had the highest rate of ED visits (427), but the 3rd highest rate of Hosp/Tran (154). *Discussion:* Until a centralized database of US ED discharge data exists, the NEISS-AIP is the best source of data. While the unintentional group represents the greatest % of poisoning deaths, it represents the smallest % of ED visits leading to hospitalization. This implies that severe unintentional poisonings either die out side of the hospital are resuscitated, observed and discharged. *Conclusion:* Trending NEISS-AIP data on non fatal ED visits for poisoning will provide objective outcome data to assess efforts by poison control centers to reduce certain harms from poisoning, unnecessary ED visits and poisonings requiring hospitalization.

267. Correctional Facility Exposures Reported to a Regional Poison Center

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Background: Correctional facility poison exposures and ability to provide on-site medical management are both ill defined. Our objective is to describe exposures and treatments reported to a regional poison control center by correctional facilities. *Methods:* Human exposures reported to the Utah Poison Control Center between July 1997 and December 2005 were reviewed. Cases were selected if the original call was from a correctional facility and the patient was at least 20 years old. Frequencies and cross-tabulations were performed to describe the data. *Results:* A total of 232 cases were identified. Mean age was 30 years (range 20 to 64 years). Most patients were males (183, 78.9%) aged 20–29 years (104, 44.8%). Most exposures were intentional (160, 69.0%) with suspected suicide (115, 49.6%) and intentional abuse (25, 10.8%) common reasons. Ingestion was the most frequent route (182, 76.1%) followed by ocular exposures (22, 9.2%). Analgesics was the most common substance category (30, 10.68%) followed by antidepressants (28, 10.0%), household cleaning agents (28, 10.0%), anticonvulsants (26, 9.3%), and cardiovascular drugs (19, 6.8%). Most patients were managed within the correctional facility (168, 72.4%). Decontamination alone was the most common treatment in this setting (72, 42.9%) followed by observation only (54, 32.1%). Common decontamination modalities included dilution/ irrigation and single dose activated charcoal. Additional therapy with or without decontamination was utilized in 31 patients (18.4%) and the most common interventions including intravenous fluids (13, 7.7%), benzodiazepines (4, 2.4%), and antiemetics (4, 2.4%). 145 patients managed on-site were followed to a known medical outcome, and the majority had no more than minor effects (125, 86.2%). One patient suffered major adverse effects and no deaths were reported. *Discussion:* Correctional facilities often manage poison exposures on-site. Recognizing common substances involved in these exposures may aid correctional facility personnel in developing harm reduction and treatment strategies. *Conclusion:* Poisoned prisoners are frequently ingesting analgesics with self-harm intent and are often managed within the correctional facility with minimal medical consequences.

268. Race, Age, and Gender Differences in the Incidence Rates of Non-Fatal Intentional Poisonings in US Emergency Departments

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Background: The Toxic Exposure Surveillance System includes age and gender regarding poisoning; however, race information is not known. We sought to describe the demographics of patients with intentional poisoning presenting to emergency departments to identify patients at highest risk. *Methods:* The Web-based Injury Statistics Query and Reporting System (WISQARS) provides national estimates of injuries treated in EDs through the Center for Disease Control's National Center for Injury Prevention and Control. We searched the database from 2001 to 2004 for nonfatal self-harm (intentional) poisoning to investigate differences in incidence rates by race, age, and gender. *Results:* From 2001–04, there were 976,974 reported cases of nonfatal intentional poisonings with an incidence rate of 21 cases per 100,000 person-years (95% confidence interval 17 – 26). Females had a higher rate than males: 25 (20 – 31) for females v. 17 (13–20) per 100,000 person-years for males, $p < 0.05$. Persons age 30 years or less had a higher rate than those 30 years and older: 24 (19–29) for ≤ 30 v. 19 (15–23) per 100,000 person-years for >30,

$p < 0.05$. Females age 15–19 had the highest rate: 71 per 100,000 person-years (56 – 86) by gender and age group. White females age 15–19 had a considerably higher rate (62 per 100,000 person-years (45 – 79)) than both Blacks (43 per 100,000 person years (29 – 57)), and Hispanics (24 per 100,000 person years (10 – 38) $p < 0.05$). *Discussion:* This study identifies groups at high risk for intentional poisoning. Identification of these high risk groups may be important in planning intervention and prevention strategies. We found that females have higher rates than males, younger patients (≤30) have higher rates than older patients and young white females (15–19) are at the highest overall risk for intentional poisoning. *Conclusion:* Younger people and females are at high risk for intentional poisoning and adolescent white females are the highest risk group. Emergency physicians, primary care physicians and psychiatrists should be aware of age, gender, and race specific risks when planning prevention strategies or prescribing antidepressant therapies.

269. US Poisoning Mortality is Rising Steadily & So What?

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Background: The primary mission for poison centers and clinical toxicologists should be to reduce harm from poisoning especially death, injuries and wasted health care resources. One Healthy People 2010 objective is to reduce poisoning deaths to 1.5/100,000. *Methods:* Fatality quires of the CDC WISQARS™ and WONDER™ databases of National Center for Health Statistics Vital Statistics System and Bureau of Census data were analyzed. Poisoning was defined by underlying cause of death (UCOD) codes using ICD-9 for 1981–98 (E850-E869, E950-E952, E962, E980-E982, E972) and ICD-10 for 1999–2003 (U01.6-U01.7, X40-X49, X60-X69, X85-X90, Y10-Y19, Y35.2). Rates were deaths/100,000 with *age adjusted to the 2000 Census. *Results:* From 1981–2003, 279,671 poisoning deaths occurred at a rate of 5.8 and yearly rates increased by *2x. While intentional rate decreased by *0.7x, the unintentional and undetermined rates increased by *3.3x and *2.7x, respectively. The male/female *rate ratio rose from 1.5 to a peak of 2.5 in 1995 then fell to *1.9. The five age groups with the highest rates in descending order were: 40–44y (13.3), 35–39y (12.3), 45–49y (11.7), 30–34y (10), 50–54 y (8.6) and these rates increased steadily over time. Kids ≤ 3 y comprised < 0.05% and ≤12 y < 0.8% of deaths. White race comprised 85% overall (rate 6.4), Black 13% (6.4), Native American 1% (6.1) and Asian/Pac Islander 1% (1.6). The five states with the highest rates were NM 11.7, NV 11.4, CO 9.2, AZ 8.8 and AK 8.6. Two classes caused ~50% of deaths from 1999 – 2002; narcotics and psychodysleptics (39.4%) and gases and vapors (9.6%). *Discussion:* Because ICD10 UCOD codes are non specific, multiple cause of death (T) code analyses are required to determine specific drug/toxin causation. However, UCOD data indicate that opiates, cocaine and carbon monoxide are responsible for the greatest numbers of US poisoning deaths. Take Home Naloxone and Safe Injection Sites are examples of innovative programs intended to reduce opiate deaths. *Conclusion:* Mortality data provide an objective outcome by which programs aimed at harms reduction should be evaluated. US poisoning mortality rates are rising, despite our current efforts. So what can we do about it? High risk demographic and drug/toxin groups warrant greater focus and more innovative interventions.

270. Ventilatory Management of Poisoned Patients: Prospective Multi-Center Survey

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Background: Very few studies describing ventilatory support in poisoned patients have been published, so a multi-center survey was conducted in selected centers in France, Belgium, Switzerland. *Methods:* to describe the incidence of ventilatory support of poisoned patients in the pre-hospital and hospital phase. This prospective, multicenter epidemiologic study surveyed health care practices for one month (June 1–30, 2005). All cases of adult poisonings requiring ventilatory support were surveyed for age, sex, medical history, poisons involved, symptomatology indicating a ventilatory support, and characteristic of the ventilatory support. *Results:* 84 (36 SAMU 48 ICU) of the 257 departments contacted agreed to participate. Pre-hospital management (SAMU): Of the 1851 poisoning cases, 149 (8%) were included. 78 women (age 46 ± 15 years) and 70 men (age 40 ± 15 years) were reported. The delay between the exposure and medical care was 4.8 ± 7.9 hours (median 2 hours). Medications accounted for 73.0% of exposures. Benzodiazepines (74%), neuroleptics (39%) and serotonin reuptake inhibitors (25%) were most common. 77.2% of cases demonstrated central neurological signs with 80% having hypotonic coma (GCS was 7). 42% of patients had respiratory failure with 46% from aspiration. 31% of cases demonstrated cardiovascular disorders. 63% of cases required invasive ventilation. In ICU: Of the 275 ICU intoxicated patients, 164 (60%) were included. 86 women (age 46 ± 14 years) and 78 men (age 41 ± 12 years) were reported. The mean SAPS II score in 119 patients was 42 ± 16. The median time to ICU admission was 4.5 hours

after the intoxication. The most common exposure agents were benzodiazepines (66%), neuroleptics (38%), ethanol (31%), and carbamates (27%). 93% of cases demonstrated central neurological signs with 84% from hypotonic coma (GCS was 6 ± 3). 43% of cases demonstrated respiratory disorders with 42.4% related to aspiration. 40% of cases demonstrated hemodynamic compromise. Invasive mechanical ventilation was necessary in 93.3% of the patients. Ventilatory support was sustained for 2.7 days (median: 2 days). The mean ICU stay was 4.5 days. *Conclusion:* Ventilatory support is commonly required for severe intoxications.

271. Gender Differences in Snakebite Injuries among Children and Adolescents

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Background: Gender has been noted to be significantly related to the incidence of accidental injury with males being more likely to be injured, but it is unclear at what age these gender differences first appear. *Methods:* A nationwide, multicenter, retrospective evaluation of antivenom therapy for Crotaline snakebite collected data from 2002 through 2004 from 24 poison centers. Data points abstracted included age, sex and location of bite. Contingency tables of the data with statistical significance by Fisher's exact test were calculated. *Results:* 204 records involving children and adolescents were abstracted. The bite location was not documented or listed as head/neck in 3 records and these were not included in the data analysis. Among children, there were bites in 136 males and 65 females with 42 in children < 4 years of age, 66 in 4–9 years of age, 36 in 10–12 years of age and 57 in 13–18 years of age. In all these age groups, males were more likely to suffer an upper extremity injury than females (56.6% vs. 26.2%; $p < 0.01$). Boys were more likely to suffer upper extremity injuries in all age groups ($p < 0.05$) except in the 10 through 12 years of age group where there was no difference between the genders ($p = 0.729$). Boys became more likely to suffer an upper extremity bite with increasing age ($p = 0.029$) while there was no significant change in location in girls ($p = 0.223$). *Discussion:* This data demonstrates that over all males are more likely to suffer Crotaline snakebites receiving antivenom therapy than females. Significant differences between location of snakebites were found. Males were more likely to be bitten in the upper extremities than females. This difference appears as early as 1 to 4 years of age. It is plausible that this difference in bite location could be due to a difference in behavior in males and females. Accidental bites seem more likely in the lower extremities as the victim unintentionally startles the snake. Upper extremity injuries, however, may be due to play or investigative behaviors as the victim reaches for the snake. *Conclusion:* Male children are more likely to suffer an upper extremity snake bite than females.

272. Does the West Nile Virus Increase DEET Exposures? Colorado Results

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Background: Colorado documented its first case of West Nile Virus (WNV) in 2002 and in 2003 experienced the worst WNV outbreak in the US. Consequently, the number of public health education programs recommending personal insect repellents for WNV prevention increased. We sought to determine whether increased insect repellent use resulted in more exposures, specifically to n-n, diethyl-m-toluamide (DEET). Secondly, if there were more exposures to DEET, would exposure severity change? *Methods:* WNV epidemiological data was obtained from the Centers for Disease Control, Fight the Bite Colorado, and United States Geological Survey websites. We queried our database using the search terms "DEET" and "Unknown Personal Insect Repellent" for each month of 2003 and 2004. All exposures to DEET or DEET-containing products were included. *Results:* The most common minor symptom (both years) was dermal irritation followed by conjunctivitis and "other" effects. Moderate symptoms (both years) in decreasing order were pain, blurred vision, pruritis, syncope, numbness, and a single seizure. Health care facility evaluations were performed in 29 exposures in 2003 and 30 in 2004. Treatment included decontamination and supportive care. No continuing effects were documented. *Discussion:* Confirmed exposures (See table) to WNV were lower in 2004 than 2003. This was inversely proportional to the number of DEET exposure cases reported. DEET was associated with no effect, minor and moderate outcomes. Despite a higher number of 2004 DEET exposures, there were no major outcomes. The number of no effect and minor effect outcomes increased while moderate effect outcomes increased by only two cases. *Conclusion:* Multiple public health campaigns encouraged appropriate DEET use to prevent WNV infection. Although reported DEET exposures increased, outcome severity did not. We conclude this is related to heightened awareness and the correct use of DEET.

WNV and DEET exposure data

Year	WNV cases	DEET exposures	Outcome severity			
			No Effect	Minor	Moderate	Major
			N (%)*	N (%)	N (%)	N (%)
2003	3244	293	70 (28)	97 (38)	6 (2)	0 (0)
2004	323	348	137 (42)	136 (42)	8 (2)	0 (0)

*$p < 0.05$.

273. A Developing Drug and Poison Information Centre in Singapore: The First Two Years

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Background: The Drug and Poison Information Centre (DPIC) in Singapore was set up in February 2004. This study analyzes poison enquires received in its first two years. *Methods:* A retrospective review of records from March 2004 to February 2006 was performed. Patient demographics, toxic agent and quantity, route and cause of exposure, symptoms and patient outcome were documented in a database and analysed. *Results:* Of the 7,377 calls received, 759 (10.3%) were related to poisonings. There were 376 (49.5%) and 383 (50.5%) calls during and after office hours, respectively. Seven hundred and seventeen (94.5%) calls concerned specific patients and 42 (5.5%) calls were for poison information. There were equal numbers of male and female victims. Fifty-one percent of the victims were less than 21 years of age. Accidental exposures consisted of 470 (65.6%) calls while intentional exposures consisted of 226 (31.5%) calls; it was unknown in 21 (2.9%) cases. Analgesics (139, 14.9%) were the most commonly seen exposure. Other exposures included traditional medicine (15, 1.6%), other medicines (258, 27.5%), industrial chemicals (73, 7.8%), bites and stings (91, 9.7%) and other products such as pesticides, cosmetics and nutri-supplements (360, 38.5 %). Most of the exposures were via the oral route (504 of 733 exposures routes, 68.8%). A majority of victims from the public were advised to be observed at home (94 out of 138 victims, 68.1%) while a majority of victims from hospitals' Emergency Departments (ED) were advised to be observed and discharged if well (350 out of 503 victims, 69.6%). In total, 271 (37.8%) victims were admitted for their condition. Some of the admitted victims were medically stable, but were admitted for psychiatric management, and some were admitted due to a lack of observational facilities in the ED. *Discussion:* Almost half of the calls were received after office hours. This shows the importance of having a 24 hours service. The high number of accidental exposures highlights the need for poison prevention education. *Conclusion:* The DPIC is a useful resource for Singapore. Further studies should be conducted to look at the cost-effectiveness of the DPIC in Singapore's context.

274. Comparison of Stocking of Poison Antidotes in Alabama Hospitals over Seven Years

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Background: A previous study of Alabama hospitals in 1998 revealed that 0% of sampled hospitals had adequate stocking of 9 antidotes. This study has two objectives: to re-evaluate the current antidote supply in Alabama hospitals; and to compare these findings with the 1998 study. *Methods:* Surveys were faxed to all Alabama hospital pharmacy directors. The same 9 antidotes originally queried in 1998 were evaluated. Participants were asked to document the exact quantity (grams, vials, kits) for each antidote stocked in the pharmacy. Adequate stocking criteria for each antidote defined in the 1998 survey and a 2000 consensus benchmark criteria were used for comparisons to current study findings. *Results:* 52/95 (55%) completed the survey. Significant increases in understocking were cited for pralidoxime, Cyanide kit and antivenin. Compared to 2000 consensus benchmark recommendations, all antidotes failed to meet the standards with significant increases of understocking for: crotaline antivenom (65.4% vs. 16.7%; $p < 0.001$), deferoxamine (88.5% vs. 35.4%; $p < 0.001$), and digoxin immune Fab (98.1% vs. 79.1%; $p < 0.01$). *Discussion:* There was no significant improvement in antidote stocking of Alabama hospital pharmacies in 2005

compared to 1998 criteria. In fact, significant declines in digoxin immune Fab, pralidoxime, and Cyanide antidote kit supplies were identified. *Conclusion:* Specific guidelines mandating levels of antidote inventories for hospitals are needed. These inventories could be shared regionally in order to meet demands of care and to reduce costs to individual hospitals.

Comparison of understocked antidotes 1998 and 2005

	% Understocked 1998 study	% Understocked 2005 study	P value
Fomepizole (4 vials)	93.8%	88.5%	0.56
Pyridoxine (5 grams)	83.3%	92.3%	0.28
Digoxin Immune Fab (10 vials)	79.2%	90.4%	0.19
Ethanol (70 grams)	62.5%	75.0%	0.26
Pralidoxime (2 grams)	41.7%	63.5%	0.05
Deferoxamine (1 gram)	35.4%	55.8%	0.07
Cyanide Antidote Kit (1 kit)	25.0%	46.2%	0.05
Wyeth Antivenin Crotalidae (5 vials)	16.7%	44.2%	<0.01
Naloxone (>2 mg)	2.1%	0%	0.96

275. Safety of High Dose Insulin Therapy in Calcium Channel Antagonist Overdose

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Background: Animal data and human case reports support the effectivness of high-dose insulin (HDI) as an antidotal therapy for calcium channel antagonist (CCA) overdose. However in our experience critical care clinicians are often reluctant to administer HDI due to concerns about possible adverse effects. *Case Report:* We treated 6 patients with significant CCA toxicity with HDI (insulin 0.5–2.0 units/kg/hour) and dextrose (10–50% infusion to maintain euglycaemia) in combination with conventional inotropic agents (epinephrine, norepinephrine, dobutamine) and calcium. Data are summarised in the table. There were no clinically significant episodes of hypoglycaemia or hypokalaemia. Patients required minimal intravenous dextrose and potassium duing the first 24 hours of therapy. Patients who were administered high doses of dextrose developed significant hyperglycaemia. *Case Discussion:* CCA inhibit insulin release and induce insulin resistance, inhibiting efficient myocardial cell uptake of glucose. Provision of HDI therapy early in the course of CCA poisoning when insulin resistance is high may improve outcome. *Conclusion:* Treatment of significant CCA poisoning with HDI therapy in a monitored environment is unlikely to produce adverse effects. Critical care clinicians should consider HDI early in the course of CCA poisoning when it is likely to be most beneficial.

Physiologic and biochemical data during first 24 hours in 6 patients with CCA overdose treated with HDI

Drugs Ingested	Presentation BP (mmHg)	Mean insulin infusion rate (units/hr)	Max insulin infusion rate (units/hr)	Total potassium administered (mEq)	Total dextrose administered (g)	Blood sugar range mg/dL (mean)	Recovered
Verapamil 2000mg	90/50	62.5	75	60	12.5	77–158 (95)	Yes
Amlodipine, sotalol	90/55	25	85	0	35	74–255 (171)	No
Diltiazem 10080mg, doxasozin 40mg	55/30	45	60	80	240	119–500 (333)	Yes
Diltiazem, diazepam	70/30	75	150	80	58	81–232	Yes
Amlodipine 280mg, doxasozin	60/40	147	280	40	230	43–464 (335)	Yes
Amlodipine 300mg, atenolol 2000mg	70/30	146	160	0	0	106–409 (224)	Yes

276. Shortened Course of N-acetylcysteine (NAC) for Acute Acetaminophen Poisonings

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Background: There are several approaches to treating acute acetaminophen (APAP) poisonings ranging from 20-hour IV NAC to 72 hour oral NAC. No NAC dosing regimen has been proven to be superior in efficacy. We propose a shortened course of oral NAC (SCON) in all acute (ingestion over less than 2 hours) APAP ingestions at risk for hepatotoxicity, regardless of the time of presentation after the overdose. *Methods:* Acute APAP poisoning cases were prospectively collected and retrospectively reviewed over a 5 month period. SCON therapy is defined as five 70 mg/kg maintenance doses of oral NAC after a 140 mg/kg oral loading dose. At the time of the last dose, labs were drawn for LFTs, coagulations studies (coags) and serum APAP concentration. If the 20-hour labs were normal, and the serum APAP concentration was unmeasurable, NAC was discontinued. LFTs and coags were redrawn 36 hours after the time of the ingestion unless SCON was scheduled to be stopped within 2 hours of the 36-hour post-ingestion time, in which the post-SCON labs sufficed. In patients discharged before a 36-hour set of labs were obtained, the patient or their health care provider was contacted at 48–72 hours post-ingestion to assess clinical status by phone survey. Survey questions asked about the presence of abdominal pain, vomiting, jaundice or confusion. *Results:* 181 patients were identified at risk for hepatotoxicity during the study period, 11 of these were eliminated from review due to missing information. 48 (28%) patients were treated with IV NAC. 28 (16%) received 20-hour oral NAC therapy, none developed hepatotoxicity by 36-hour labs or phone follow-up criteria. Of the 94 patients that received more than 20 hours of oral NAC, 61 (65%) had more than 5 doses secondary to transaminitis. 40 of these patients presented with elevated enzymes; 16 patients developed transaminitis by the 20th hour of therapy. 33 patients (35%) were treated for greater than 20 hours by physician choice. *Discussion:* From our preliminary data, it appears that SCON is both safe and effective in treating acute APAP poisonings. *Conclusion:* Larger trials should be performed to validate our findings.

277. Revisiting Dilution for Poison Ingestions

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Background: The concept of diluting non-corrosive toxin ingestions was discouraged in the 1982 AAPCC Policy Statement: Gastrointestinal Dilution with Water as a First Aid Procedure in Poisoning; yet is still widely recommended by poison specialists 22 years later. Diluting ingestions of hydrocarbons or highly water-soluble drugs can potentially increase the risk of patient morbidity. The purpose of this study is to reevaluate this treatment modality. *Methods:* A search of the English literature for documents pertaining to the dilution of poison ingestions was performed. Key words searched included: dilute, dilution, poison, poisoning, toxin, toxicity, toxicology, milk, antidote, treatment, pre-hospital, and first-aid. Additionally, the TESS database was queried for human ingestion (only route of exposure) cases reported to the AAPCC for the year 2004. Cases involving hydrocarbons with related vomiting or respiratory symptoms that had dilution coded as an intervention were tabulated. *Results:* This search revealed no published literature demonstrating a positive influence on patient outcome for diluting toxic ingestions. However, a standard recommendation for diluting all ingested poison cases in toxicology textbooks as late as 1990 and a fatal case of water intoxication secondary to diluting a bleach ingestion were found. From the TESS data, almost *1 million* ingestion-only cases were coded with dilution as an intervention. For hydrocarbon ingestions, dilution was coded in 2300 cases with cough coded in 2280, vomiting in 492, positive x-ray findings in 113 and pneumonitis in 29. *Discussion:* This data indicates that dilution is still considered a viable treatment modality despite a lack of scientific support. The large number of dilution cases in the TESS data could be a reflection of poison specialists coding dilution when recommending wiping/rinsing the mouth or getting rid of a bad taste. *Conclusion:* While it is difficult to determine to what extent dilution contributed to patients developing respiratory symptoms, poison specialists should be judicious in recommending dilution for ingested non-corrosive toxins, especially hydrocarbons. Perhaps additional database coding options are warranted to more accurately reflect what poison specialists are actually suggesting.

278. Intentional Ingestion of Roxarsone (3-Nitro-4-Hydroxyphenylarsonic Acid) with Subsequent Elevated Liver Enzymes

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Background: Roxarsone is an organoarsenic feed additive for poultry and swine. It contains arsenic primarily in the pentavalent form. We report an intentional ingestion of this compound. This patient subsequently developed elevated liver enzymes and right upper quadrant (RUQ) abdominal pain. *Case Report:* A previously healthy 19 year-old male reportedly ingested 56.7 g of roxarsone powder mixed with water and 10 mL of nux vomica (strychnine) in a suicide attempt. He denied any other ingestions. He went to sleep and awoke 8 hours later with nausea, vomiting, and RUQ abdominal pain. He was given ipecac at home with increased vomiting and was brought to a local hospital. Upon arrival, he was noted to have RUQ abdominal tenderness; the remainder of the examination was unremarkable. His initial laboratory tests were unremarkable, including an acetaminophen at <10 mcg/mL. Liver function tests were normal 24 hours postingestion. The electrocardiogram and abdominal plain film were normal. Patient was started on succimer 10mg/kg every 8 hours. Initial blood arsenic level was 256 mcg/L (<60), spot urine was 11,317 mcg/g creatinine (<50), and a 24-hour urine arsenic was 1524 mcg/L (<80). His RUQ pain persisted and his liver function tests showed an AST of 234 IU/L and an ALT of 218 IU/L at 44 hours postingestion. His ALT peaked at 313 IU/L with an AST of 211 IU/L at 58 hours. Patient's liver enzymes and abdominal pain gradually declined over 16 days (while finishing 19-day course of succimer). Repeat urine arsenic levels progressively declined during his stay. He was never hemodynamically unstable, and he did not develop any neuropathies, bone marrow suppression, or other clinical effects of arsenic poisoning. *Case Discussion:* Organoarsenic compounds are generally regarded as less toxic to humans. In this case RUQ abdominal pain and elevated liver enzymes occurred after ingestion of roxarsone. *Conclusion:* We report acute abdominal pain, vomiting, and liver toxicity after ingestion of roxarsone.

279. Pediatricians have Greater Knowledge of the Methods of Gut Decontamination and Greater Use of Gut Decontamination in Clinical Practice

Wood DM, Greene SL, Dargan PI, Jones AL. *Guy's and St. Thomas' Poisons Unit, London, United Kingdom.*

Background: Gut decontamination consensus statements have been produced by the American Academy of Clinical Toxicology and European Association of Poisons and Clinical Toxicologists. These guidelines do not differentiate between adult and pediatric patients, we therefore designed a questionnaire survey to determine whether there was a difference in the use of gut decontamination in clinical practice and doctors' knowledge of the appropriate use of the methods of gut decontamination between adult and pediatric physicians. *Methods:* Adult general internal physicians and general pediatricians were recruited and were asked about use of the various methods of gut decontamination (induced vomiting, gastric lavage, AC, MDAC and WBI) in the last 12 months. For six simulated clinical scenarios of acute poisoning (paracetamol, carbamazepine, methanol, sustained release iron, bleach and aspirin), they were asked to indicate which method or methods, if any, of gut decontamination would be appropriate. Correct methods of gut decontamination (as judged by a panel of Clinical Toxicologists) were scored as 1, with a maximum score of 6. *Results:* 69 physicians of all grades and 23 pediatricians of all grades completed the questionnaire. General pediatricians were significantly more likely to have used gut decontamination in last 12 months compared to adult general internal physicians (any method, gastric lavage, AC, MDAC and WBI: $p < 0.0001$ for all). They also had a significantly greater knowledge of the appropriate use of gut decontamination in the simulated scenarios with a score of 3.78 ± 1.59 (mean ± SD), compared to 2.30 ± 1.28 for the general internal physicians ($p < 0.0001$). *Discussion:* This study suggests that pediatricians have a greater knowledge of the appropriate use of gut decontamination and use gut decontamination procedures more frequently acutely poisoned patients than adult general internal physicians. *Conclusion:* This suggests that education by Clinical Toxicologists is required to increase the knowledge in adult physicians and to augment the knowledge in pediatricians.

280. Circumstances of Exposure Resulting in Hospitalization for Poisoned Pediatric Patients

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Background: Poisonings are the second leading cause of injury-related hospitalizations for pediatric patients. Most exposure data comes from poison control center (PC) charts. More complete exposure data from hospital records may assist in targeting prevention

programs. *Objective:* Describe the circumstances that resulted in exposures to pediatric patients that resulted in hospitalization. *Methods:* We reviewed hospital medical records of all pediatric patients (age ≤13 yrs) hospitalized in Oregon for exposure to poisons during a 21-month period. Trained staff abstracted demographic data and information related to the circumstances of exposure from the medical record using descriptions modified from TESS. *Results:* The mean age of 372 children was 2.9 ± 2.6 yrs; 44% were female. Circumstances related to the exposure were: 172 (46%) accidental general; 70 (18.8%) family member medication (MEDS); 46 (12%) MEDS stored in container other than prescription bottle; 6 (2%) intentional misuse; 6 (2%) suicide or self-harm; and 41 (11%) unknown. The most common category of substances ingested were; cardiovascular (16 %); hydrocarbons (8%); analgesics (7%); anticonvulsants (6%); cough/cold preparations (5%); stimulants (5 %) and cleaning substances (4 %). Of 17 intubated patients, the most commonly ingested substances were cardiovascular (4) and anticonvulsants (4). Analysis of variance of mean length of stay (LOS) in days by substance showed significant difference in LOS ($p = 0.021$). Ingestion of stimulants resulted in significantly longer LOS compared to other categories (2.2 ± 5.6 vs. 0.9 ± 1.2, $p < 0.001$). *Discussion:* Cardiovascular agents are an important class of substances resulting in pediatric hospitalizations. Access to family members MEDS and storage of MEDS in non-prescription containers are circumstances that merit more study for better poison prevention methods. *Conclusion:* Data abstracted from hospital medical records may complement data from PCC charts in understanding circumstances of exposure resulting in hospitalization for pediatric poisonings.

281. Determining the Impact of Acetadote® on the Treatement of Acetaminophen Poisonings

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Background: For decades, the oral form of n-acetylcysteine (NAC) has been given intravenously (IV) to patients with acetaminophen (APAP) poisonings who were not candidates for oral therapy. Recently, an IV formulation of NAC, Acetadote®, was approved by the FDA for use as a first-line agent in mild-moderate APAP poisonings. This study was designed to determine the impact of an FDA approved form of IV NAC on the treatment of APAP poisonings. *Methods:* We performed a cross-sectional study of poison center records involving patients treated with IV NAC from 1 year before and after the June 2004 release of the FDA approved form of IV NAC. Data collected included: date, age, sex, type of APAP product, coingestants, reason for exposure, duration of exposure, time until first dose of NAC, length of therapy, reason for IV NAC, if oral NAC was also given and why the patient was switched, adverse reactions, outcome. *Results:* For the year prior to Acetadote®'s release, 50 of 1697 (2.9%) cases treated with NAC involved the IV form. For the year following Acetadote®'s release, 184 of 1909 (9.6%) cases treated with NAC involved IV. Patient demographics, reason for exposure, product type, and chronicity of use were similar for both groups. In 17 of the 171 (10%) cases with a determinable reason for IV use, IV NAC was the physician's first-choice in only 1 case prior to Acetadote®'s release and 16 cases after despite no clear indication for its use. *Discussion:* The release of Acetadote® was associated with a 268% increased in IV NAC utilization. A substantial number of clinicians chose IV as their preferred route of NAC administration without clear clinical indications. This seems unwarranted given the lack of outcome data to establish the IV route as superior to oral, that IV NAC carries the potential risk of life-threatening adverse reactions and the relative higher direct and indirect costs of IV NAC. *Conclusion:* The availability of Acetadote® was associated with an apparent unjustifed increase in IV NAC use for APAP poisonings. Clinicians need to be judicious in their decision to use IV NAC before abandoning oral administration.

282. Increased Incidence of Quetiepine Poisoning as Recorded by NPIS (Cardiff Centre) and a Case of Quetiepine-Induced Seizure

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Background: To report a case of quetiapine overdose in the context of the epidemiology of quetiapine poisoning in Wales and the South West of England. *Method:* NPIS call records were reviewed and analyzed. Enquiries involving quetiapine were collated. Responses to follow-up letters were reviewed and a literature search conducted. *Case Report:* An 18-year-old female arrived in the emergency department with a Glasgow Coma Scale of 7/15 and a sinus tachycardia of 190–200 approximately 1 hour after ingesting 26 tablets of quetiapine (strength unknown). The patient became unresponsive (GCS 3/15) and at 7 hours post ingestion suffered a generalised tonic–clonic seizure that lasted for two or three minutes. Five milligrams of diazepam was given intravenously and no further seizures occurred. Twenty seven hours post ingestion the patient still had a sinus tachycardia of 120 bpm,

however their GCS had improved to 15/15. *Case Discussion:* Few cases of seizures after quetiapine overdose have been reported: Mowry et al. (1999) reported two cases with single seizures in a case series of 209 patients taking intentional overdoses (0.96%); Balit et al (2003) reported a case series in which two patients from 18 developed seizures (11%). *Conclusion:* Since the introduction of Seroquel (quetiapine) to the United Kingdom in 1997, both the number and percentage of quetiapine enquiries received by NPIS (Cardiff Centre) have risen markedly. We describe a case in which an adult female developed a generalised clonic–tonic seizure after ingesting 26 tablets of quetiapine. A literature review revealed few reports of seizures resulting from overdose, and considerable variation in its reported frequency. Due to the increasing occurrence of quetiapine overdose, it is important that cases involving the drug are well documented and reported in order to improve our understanding of the its toxicity.

Year	1998	1999	2000	2001	2002	2003	2004
Total enquiries	30031	31337	33433	36010	35852	32034	26164
Quetiapine calls	6	9	34	80	89	114	144
Quetiapine calls (%)	002	0.029	0.102	0.222	0.248	0.356	0.55

283. Hemodialysis and Chelation Therapy in Massive Arsenic Herbicide Ingestion with Peripheral Neuropathy, Hepatic, Renal, and Severe Ototoxicity

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Background: Arsenic is considered to be an effective agent for homicide and suicide. The organic form is believed to be far less toxic than the inorganic form. We report a patient who survived after an intentional ingestion of an organic arsenical herbicide resulting in massive arsenic concentrations and the development of multiorgan toxicity, including permanent hearing loss and peripheral neuropathy. *Case Report:* A 17-year-old boy intentionally ingested up to 0.95 L of weed killer containing monosodium acid methanearsenate (MSMA) 9.48% (4.5% elemental arsenic). He was tachycardic, vomiting, and diarrheal, then developed altered mental status and hypotension. He received ET intubation, IV fluids, sodium bicarbonate, vasopressors, IV NAC and dimercaprol (BAL). Labs revealed elevated LFTs, CPK, BUN, creatinine and metabolic acidosis. Hemodialysis was performed daily for 20 days to treat anuria and remove arsenic. Arsenic measured on initial spot urine was 1,436,149.9 mcg/L and first 24-hour urine output totaled 492,893 mcg. Oral succimer (DMSA) chelation was added upon extubation at 2 weeks and given concurrently with BAL for 2 weeks, then was continued alone. Clinical effects eventually resolving were hallucinations, spastic gait, slurred speech, rash, pancolitis, hepatomegaly and splenomegaly, but peripheral neuropathy symptoms persisted. Hearing loss developed and progressed to total deafness requiring cochlear implants. The patient remained on DMSA for 4 months for persistent symptoms and elevated arsenic levels. No adverse effects were observed from prolonged chelation. *Case Discussion:* Only one other case report was found describing severe ototoxicity and other neurological effects due to the organic arsenical MSMA. The massive ingestion by our patient resulted in the highest urine concentration of arsenic ever reported. Hemodialysis was used in conjunction with DMSA and BAL chelation therapy with no measurable adverse clinical effects. *Conclusion:* Our case demonstrates that extremely elevated arsenic levels may be survivable with early and aggressive treatment, but may result in permanent neurotoxic effects such as severe hearing loss.

284. Paraquat Poisoning: Caution in Interpreting Prognosis Based on Plasma Paraquat Concentrations

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Background: Acute paraquat poisoning can result in significant morbidity and mortality and numerous studies with different management strategies have failed to find an effective treatment. The prognosis is poor in those with a high plasma paraquat concentration and in these individuals the most appropriate approach is often palliative care. *Case Report:* A 66-year-old lady presented to ED 14 hrs after ingestion of 150 mL paraquat (unknown concentration). She had abdominal pain and vomiting during the first 12 hrs and a burning sensation in her mouth and throat that lasted for several days. Initial examination revealed erythema

of her buccal mucosa but was otherwise normal; initial biochemistry tests were normal. Her plasma paraquat concentration was 0.216 mg/L at 15 hrs and 0.345 mg/L at 19 hrs. These were above the Proudfoot nomogram of 0.17 mg/L and 0.12 mg/L respectively suggesting poor prognosis. She was treated conservatively with IV fluid resuscitation and a single 4 g IV magnesium dose. Her creatinine rose on day 2 (1.9mg/dL), peaked on day 4 (2.2mg/dL) and returned to normal on day 10. Subsequently she remained asymptomatic and 4 weeks post-ingestion she was discharged to a psychiatric unit. Further investigations including a chest X-ray and lung function tests at 4 months post-ingestion were normal. *Case Discussion:* The Proudfoot normogram is one of many prognostic systems that have been developed for acute paraquat poisoning, however none of them have been independently validated in a large cohort. In this case the plasma paraquat concentrations were well above the Proudfoot concentrations indicating likely fatality. The SIPP (Severity Index of Paraquat Poisoning) also predicted fatality; however the Jones regression analysis indicated a 68% chance of survival based on the 15-hour concentration. *Conclusion:* This case illustrates that the prognostic tools available for paraquat poisoning are not sensitive. Further work is required to define and identify prognostic factors in paraquat poisoning. Successful prediction of paraquat poisoning severity is important as it can prevent inappropriately aggressive treatment in those only minimally poisoned and those who have little hope of survival.

285. Glasgow Coma Scale and its Relationship to Intubation in Patients with Poisoning

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Background: The aims of this study were to determine if there is any correlation between intubation and the Glasgow Coma Scale (GCS) of a poisoning patient. The GCS was compared with its 3 individual components to consider which modality is a better predictor of intubation in poisoning. *Methods:* A retrospective cohort study was conducted on all poisoning admissions. *Results:* There were 2,610 patients admitted to the Toxicology unit at Westmead Hospital between February 1997 and June 2004. A total of 189 intubated patients were analyzed. This study found that an initial GCS ≤8 had a sensitivity of 69.3% (95% CI: 62.6 to 76.0) and specificity of 98.2% (CI: 97.7% to 98.8%), with an error rate of 4% for predicting intubation. However, the sensitivity would increase to 78% (95% CI: 72% to 84%) if a GCS ≤8 at any time during admission was used for analysis. Logistic regression analysis showed that if an initial GCS of 8 was taken as a cut off point, the odds of intubation was 125 times higher for those with a GCS ≤ 8 compared to those with a GCS >8 [(95%CI: 81–198), $p < 0.001$]. The odds of intubation dropped by a multiplicative factor of 0.51 per unit increase in GCS (95% CI: 0.47–0.54), $p < 0.001$. The GCS as a whole was a better predictor for intubation compared to its individual constituents of eye, motor, & verbal scores. *Discussion:* The GCS is an independent marker to define the level of consciousness. This study showed that an initial GCS ≤8 was not a good indicator to predict who would require intubation in poisoning. However, the sensitivity would increase from 69 to 78% if a GCS of 8 or less at any time during admission was used. The ROC curve in poisoning showed that the GCS was a better test when compared with its individual stems. *Conclusion:* This study demonstrated that a single initial GCS level on patients who presented with poisoning had a low sensitivity to predict intubation. However, the use of progressive GCS would improve its sensitivity.

286. Cyanid Intoxication: Course before and after Treatment with Antidote

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Background: Cyanide inhibits cytochrome oxidase which in turn affects the metabolism of all cells, most prominent in CNS and the cardiovascular system. We report clinical observations and acid/base-status, including lactate, before and after antidote treatment for a potential lethal dose of potassium cyanide. *Case Report:* An 18-year-old man with a history of anorexia was found unresponsive in his room at 02:15 AM, about 15 minutes after attempting suicide by ingesting potassium cyanide. He was diaphoretic with froth from his mouth and had mydriasis and convulsions. Pulse was rapid, irregular and respiration insufficient.

On admission at 03:10AM BP was 110/65, HR 96, GCS 5. ECG showed atrial fibrillation and RBBB. Laboratory values: pH 7.17, pCO_2 14.3 mm Hg, Base deficit 22.9 mM, Lactate 22 mM. Simultaneous arterial and venous oxygen saturation were 0.92 and 0.82, respectively. He was intubated, put on a ventilator and treated with iv sodium bicarbonate, dopamine and norepinephrine. Later potassium cyanide was found hidden in his room. Cessation of pressor medication was possible shortly after administration

of hydroxocobalamin (5 g) at 06:50AM. Sodium thiosulfate (7.5 g) was given 12 hours later. The next day he was extubated and the third day discharged for psychiatric follow-up without sequelae. *Case Discussion:* Antidote administration was assosiated with improvement in metabolic acidosis as shown in the table.gr

Time	03:10	03:55	05:00	06:00	07:00	08:18	11:07
pH	7.17	6.97	7.21	7.21	7.19	7.34	7.42
pCO2 (mm Hg)	14.3	31.5	18.4	25.3	39.8	46.7	44.3
HCO3 (mM)	5	6.8	7.1	9.7	14.6	24.6	28.7
Base deficit (mM)	22.9	24.8	19	16.8	12.7	0.8	–4.2
Lactate (mM)	22	21	21	19	17	7.8	2
Bicarbonate given (mM)			50	100	100		

Analysis of serum taken 03:40 AM showed a cyanide level of 0.21 mg/l, but due to instability of cyanide in vitro, this concentrations might have been falsely lowered. *Conclusion:* Our observations illustrate persistent severe lactacidosis after oral intake of potassium cyanide with improvement in clinical condition and lactacidosis associated with hydroxocobalamin treatment.

287. Methanol Elimination Kinetics during Hemodiafiltration: A Case Report

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Background: Model engine fuels commonly contain methanol and nitromethane. The latter can interfere with the Jaffe measurement of serum creatinine, and can be used as a surrogate marker of significant ingestion. Hemodiafiltration (HDF) has only been reported in 2 patients with methanol poisoning treated with IV ethanol. We report a case of significant methanol poisoning treated with fomepizole (4-MP) and HDF. *Case Report:* A 38-year-old male presented to ED 2.5 hrs after ingestion of 500 mL of a methanol/nitromethane model engine fuel. On arrival he was agitated with BP 107/85 mmHg, HR 60 and GCS 15/15. Initial bloods tests were compatible with significant nitromethane ingestion*:* BUN 6.7 mg/dL, creatinine 59.0 mg/dL (Jaffe reaction) and 0.72 mg/dL (enzymatic reaction). There was no metabolic acidosis (pH 7.47). Initial methanol concentrations were 2.47 g/L (3 hrs post-ingestion) and 2.31 g/L (12.5 hrs). He was treated with IV 4-MP 15 mg/kg at 8 hrs post-ingestion, then 10 mg/kg 12 hourly. In view of the very high methanol concentration HDF was started at 22 hrs post-ingestion at a blood flow rate of 125 ml/min (4-MP continued at 1 mg/kg/hr). Primasol replacement was post-filter at 1–2 L/hr, to achieve hi-flux HDF this was also infused countercurrent at 1–2 L/hr. HDF was discontinued after 10 hrs (methanol concentration 0.67 g/L); 4-MP continued at 15 mg/kg 12 hrly until methanol concentrations were undetectable. He was then transferred to an inpatient psychiatric unit. *Case Discussion:* During HDF samples were taken every 2 hrs of ultrafiltrate and from the pre- and post-filtrate arms of the HDF circuit. Blood samples were also taken frequently prior to and after HDF. Methanol concentrations were measured by gas chromatography with flame ionizing detection. The elimination half-life of methanol was 86.7 hrs pre, 8.7 hrs during and 52.3 hrs post-HDF. Filtrate methanol concentrations fell in line with serum methanol concentrations from 1.7 g/L (serum 1.6g/L) after 2 hrs HDF to 0.98 g/L (serum 0.67 g/L) after 10 hrs. Sieving coefficient was 1.08–1.50. *Conclusion:* HDF can be considered as an alternative extracorporeal treatment modality to hemodialysis in patients with significant methanol poisoning.

288. Bezoar Formation Following a Slow-Release Clomipramine and Mirtazapine Overdose

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Background: Bezoar formation following overdose is a cause of delayed and prolonged toxicity. We describe a bezoar with slow-release clomipramine (clomipramineSR). *Case Report:* A 35-year-old female was admitted following a generalized, tonic-clonic seizure after an unknown overdose. Time of ingestion was possibly 12 h earlier. Physical examination revealed a GCS of 10 and

an anticholinergic toxidrome. Blood pressure was 122/56 mmHg, heart rate 116 bpm and respirations 19 breaths/minute. The initial ECG only showed sinus tachycardia. Shortly after admission the patient had another seizure which was treated with diazepam and sodiumbicarbonate because TCA poisoning was suspected. Blood pressure dropped to 70/41 mmHg and an idiopathic broad QRS complex rhythm with terminal upward deflection in aVR appeared. The arterial blood gas revealed a metabolic and respiratory acidosis. The patient was intubated and treated with additional doses of sodiumbicarbonate, fluids and norepinephrine. Other routine laboratory data were normal. Following stabilization, gastric lavage was performed and activated charcoal administered because a recent ingestion was considered. We were then informed that clomipramineSR and mirtazapine were taken presumably 12 h earlier. Insertion of a smaller tube for whole bowel irrigation failed; endoscopy revealed a large plug in the distal oesophagus which could only be removed via gastrotomy. Toxicological analysis of the bezoar revealed clomipramine and mirtazapine. Plasma concentration of clomipramine was 2322 ng/ml. The patient made an uneventful recovery. *Case Discussion:* Delayed onset and prolonged duration of toxic symptoms following an overdose should raise the possibility of the ingestion of slow-release formulations and/or formation of a bezoar. To our knowledge, this is the first case report describing bezoar formation following an overdose with clomipramineSR. *Conclusion:* This report decribes a patient with bezoar formation following an overdose with clomipramineSR and mirtazapine possibly contributing to delayed and prolonged toxicity.

289. Significant QT Prolongation Following Severe Valproate Toxicity

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Background: Valproate toxicity does not commonly cause significant QT prolongation (QTc > 0.5 seconds). We report a case with significant QT prolongation that resolved parallel to declining valproate level. *Case Report:* A 33-year-old female with a history of bipolar disorder intentionally ingested approximately 58 divalproex EC 500 mg tablets 12–24 hours prior to presentation. She had a depressed level of consciousness. Her vital signs were temperature 94.8°F, heart rate 75 bpm, respiratory rate 15/min, and blood pressure 96/52. Initial serum valproate level was 1,057 mcg/ml. Initial laboratory results were sodium 155 mmol/L, potassium 4.6 mmol/L, chloride 111 mmol/L, bicarbonate 24 mmol/ L, BUN 5 mg/dL, creatinine 0.9 mg/dL, glucose 122 mg/dL, ammonia 114 mcmol/L, ALT 18 U/L and AST 41 U/L. Complete blood count was normal. EKG on presentation revealed normal sinus rhythm with a rate of 73 bpm, QRS 0.90 sec and QTc 0.571 sec. She was rewarmed and given 2 liters of intravenous crystalloid and 2 grams of intravenous magnesium sulfate. She was intubated for airway protection. A repeat EKG showed QTc of 0.576 seconds. Concurrently, her serum potassium was 4.1 mmol/L. Magnesium dosing was repeated. After 18 hours she was successfully extubated. Her mental status cleared and her hypotension resolved over the course of her hospitalization. She denied any other ingestion and her only regular medication was divalproex EC. Her QTc interval over a period of 5 days was: 0.576 sec, 0.538 sec, 0.449 sec and 0.389 sec on hospital days (HD) 1, 2, 3, and 5 respectively. Valproate levels corresponding to these EKGs also decreased: 1057 mcg/ml, 507 mcg/ml, 76 mcg/ml, and less than 10 mcg/ml on HD 1, 2, 3 and 5 respectively. Ammonia peaked at 114 mcmol/L on HD #1 and decreased to 54 mcmol/L on HD #5. Liver transaminases remained normal. She did not develop cardiac arrhythmias. *Conclusion:* We report a case of severe valproate toxicity resulting in significant QT prolongation which paralleled serum valproate concentration.

290. Diltiazem Toxicity Resulting in Large Pleural Effusions

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Background: Although pulmonary edema is a well described complication of calcium channel blocker (CCB) toxicity, pleural effusions resulting from CCBs, including diltiazem (DTZ), have not been reported. We report a case of DTZ OD with development of bilateral pleural effusions. *Case Report:* A 28-year-old female with history of depression, asthma, blindness, hypoglycemia and a “fast heart rate” presented to an ED with abdominal pain. A CT Scan was normal with the exception of pill fragments in the stomach and intestine. She then admitted to ingesting 100 DTZ and 100 hydroxyzine (HYZ) tablets in a suicide attempt 5 hrs prior. Initial VS were HR = 63 with junctional rhythm on ECG, BP = 98/41, 96% room air O_2 sat. She had clear lungs and normal heart sounds. There were no anticholinergic findings or other evidence of HYZ toxicity. Shortly after admission her O_2 sat decreased to 86% and bibasilar rales developed. ABG showed a PH = 7.42, pCO_2 = 40, pO_2 = 63 on 100% O_2 via NRB. CXR showed pulmonary vascular congestion. Lasix was given and CPAP was started. An echocardiogram showed vigorous and above normal left ventricular contractility with fractional shortening of 48% and was otherwise normal. Chest ultrasound showed large

bilateral pleural effusions. Thoracocentesis produced 700 cc of transudate from the right pleural space and 800 cc from the left pleural space, resulting in clinical improvement. A serum DTZ level obtained 3 hours after admission was 782 ng/ml (50–200). *Case Discussion:* It is possible that the vasodilatory effects of DTZ resulted in fluid extravasation into the pleural space. *Conclusion:* We report a case of DTZ ingestion resulting in large pleural effusions with hypoxemia in the absence of significant hemodynamic instability or pump failure.

291. Massive Ibuprofen Ingestion Successfully Treated with Extra Corporeal Membrane Oxygenation (ECMO)

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Background: Ibuprofen is rarely associated with severe toxicity. We report a massive ibuprofen overdose resulting in severe hypotension, requiring Extra-Corporeal Membrane Oxygenation (ECMO). *Case Report:* A previously healthy 14-year-old male was found unresponsive at home, with an empty 500 count bottle of ibuprofen (200mg). "Hey look, I ate the whole thing" was written on the bottle. He was intubated at the scene, and transported to a local emergency department. Initial vital signs: blood pressure 64/30 mmHg, heart rate 120 bpm and O_2 saturation 95%. He was treated with 40 cc/kg normal saline, and escalating infusions of norepinephrine, phenylephrine and vasopressin, with minimal improvement in his blood pressure. Initial laboratory studies revealed pH 7.18, anion gap 28, and blood lactate16mmol/L. He was transferred by helicopter to a tertiary care pediatric intensive care unit and treated with bicarbonate and an epinephrine infusion in addition to the other vasopressors. ECMO was initiated due to severe refractory hypotension and acidosis. Serum ibuprofen level 12 hours post ingestion was 776 mcg/mL (therapeutic20–30 mcg/mL). Urine drug screen for drugs of abuse, serum acetaminophen and salicylate levels, and carboxyhemoglobin level were negative. He was weaned from ECMO on hospital day #3, and he was discharged from the hospital to an inpatient psychiatric unit on hospital day #9, with no apparent medical sequelae. *Case Discussion:* This patient's 12 hour ibuprofen level (776 mcg/mL) is far above the "possible toxicity" line on the nomogram previously published by Hall et al. Severe hypotension has been reported previously with ibuprofen overdose, and usually is treatable with standard vasopressor therapy. Although ECMO use has been reported as therapy for severe flecainide, diltiazem and quinidine toxicity, this is the first reported case of successful ECMO treatment for ibuprofen overdose. *Conclusion:* We report a 14-year-old with massive ibuprofen overdose resulting in coma and severe hypotension, successfully treated with ECMO as heroic therapy. This is the first reported case of successful ECMO treatment for ibuprofen overdose.

292. Ingestion of Mercury Bichloride with Acute Renal Failure Despite Early Chelation

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Background: A case of acute renal failure resulting from the ingestion of mercury bichloride ($HgCl_2$) tablets is presented. *Case Report:* A 26-year-old male ingested approximately 25 grams of $HgCl_2$ pills from an antique medicine bottle. He presented to an ED after an unknown ingestion time with hematemesis and normal vital signs. The poison center recommended chelation with BAL and calcium EDTA, as well as hemodialysis. Hemodialysis was not initiated but chelation was started with BAL and calcium EDTA three and a half hours after arriving at the ED. His initial 24-hour urine mercury level was 9,677 mcg/L/day (nL: 0–10 mcg/L). The initial whole blood inorganic mercury level was 4,376 mcg/L (nL: 0–10 mcg/L), and fell to 1,737 mcg/L 24 hours later, and to 1,317 mcg/L in 48 hours. Hemodialysis was started on hospital day two for acute renal failure. His peak BUN/creatinine was 52/9.0. He started succimer on the seventh hospital day for a 19-day course, and was transferred to a psychiatric unit on the ninth day. He continued to receive outpatient hemodialysis until his renal failure resolved 46 days after his initial presentation. The patient's last recorded inorganic mercury blood level was 133 mcg/L, 144 days after ingestion. *Case Discussion:* Chelation started immediately after the ingestion of inorganic mercury salts may reduce the incidence of renal failure. Mercuric bichloride tablets are absorbed from the stomach within ten minutes of ingestion and $HgCl_2$ is then distributed to the liver, kidneys, and muscles. Excretion of inorganic mercury begins soon after ingestion. It is detected in the urine in as little as two hours. The mean half-life for urinary mercury excretion is 59 – 64 days. Hemodialysis clearance of the BAL-mercury complex is about 5 mL/minute. Inorganic mercuric salts are corrosive to the gastrointestinal tract, skin, and eyes. They are also nephrotoxic. Neurological toxicity may be manifested within one to three weeks. This patient developed a reversible nephropathy, and has not exhibited any neurological sequelae from this ingestion. *Conclusion:* Despite early chelation, this patient developed acute renal failure after $HgCl_2$ ingestion and required hemodialysis for six weeks.

293. Status Epilepticus Following Ingestion of Fluvoxamine: A Case Report with Serum Fluvoxamine Concentrations

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Background: Fluvoxamine is a selective serotonin re-uptake inhibitor (SSRI) used in the treatment of severe depression. Clinical features of fluvoxamine intoxication are usually mild if less than 1 g has been ingested and commonly include nausea, vomiting, drowsiness, abdominal pain and anti-cholinergic effects. Similar to all SSRIs and serotoninergic drugs, there is a risk of serotonin syndrome following ingestion. Seizures, a feature of severe fluvoxamine toxicity, have previously reported to be controlled by benzodiazepines alone or in combination with phenytoin. *Case Report:* A 25-year-old female was bought into the Emergency Department in a collapsed state. Prior to her collapse she had reported ingestion of 9.6 g of fluvoxamine, approximately 12 hours previously. She was haemodynamically stable on presentation and her initial EKG showed sinus rhythm with normal QRS/QTc duration. Approximately 4 hours post-presentation she developed grand mal seizures that did not respond to benzodiazepines (Lorazepam boluses to a total of 7 mg followed by infusion of 2 mg/hr and then Midazolam bolus of 4 mg followed by infusion of 6 mg/hr). Her seizures continued despite loading with 2 g phenytoin and thiopentone (total dose 250 mg). There were no features of severe serotonin syndrome. She was therefore loaded with 800 mg phenobarbitone and her seizures ceased. There was no recurrence of her seizures and she did not develop symptoms of serotonin toxicity. She was discharged how 72 hours after presentation following a psychiatry consult. *Case Discussion:* A blood sample on presentation to ED was collected for measurement of fluvoxamine concentration (using high-performance liquid chromatography with ultraviolet detection). Her fluvoxamine concentration on presentation was 1970 μg/L (therapeutic range 160–220 μg/L). No other drugs were detected on routine toxicologic screening. *Conclusion:* We have described here the first reported case of confirmed isolated severe fluvoxamine toxicity with status epilepticus, requiring treatment with quadruple anticonvulsant medication.

294. A Prospective Investigation of Pediatric Loratadine Ingestions: Establishing a Dose-Response Relationship

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Background: The purpose of this prospective study was to characterize the dose response relationship of loratadine in pediatric overdose. *Methods:* Patients (pts) age 5 and under with unintentional loratadine single-agent ingestions reported to a poison center were enrolled in this prospective study from Jan 2004 to Dec 2005. Suspected ingestions less than 300 mg were monitored at home for symptoms. Suspected ingestions over 300 mg were referred to the emergency department (ED). Loratadine blood levels were drawn for pts with moderate or severe symptoms. *Results:* Sixty-eight patients were enrolled. Six were lost to follow-up. 53 (86%) had no effect, 7 (11%) had minor effect, and 2 (3%) had moderate effect as defined by TESS. The average suspected dose ingested was 85 mg (range 5–830). Pts with no effect, minor effect, and moderate effect had an average suspected dose ingested of 49.5 mg (range 5–200), 167.9 mg (range 20–680), and 725 mg (range 620–830) respectively. Both pts in the moderate effect group met the criteria for blood levels. Pt 1 (14 kg 3 year old) ingested up to 620 mg maximum. Activated charcoal (AC) was given within 2 hours of ingestion. PE revealed a HR 144, BP 112/67, T 99.4, RR 28, and normal mental status. A 2.5 hour post-ingestion loratadine blood level was 310 ng/ml (therapeutic 4.7 ng/ml). Pt 2 (7.7 kg 2 year old), ingested up to 830 mg maximum. AC was given, the patient was drowsy with a maximum HR 190, BP 99/68. The loratadine blood sample sent was insufficient for analysis. 57 pts were managed at home (average dose 57 mg, range 5–680) and 5 were managed in the ED (average dose 396 mg, range 70–830 mg). *Discussion:* Significant elevation of loratadine blood level in a pediatric patient produced only tachycardia to 144 which resolved without intervention. The most common effects were sedation, agitation, and tachycardia. *Conclusion:* Unintentional pediatric loratadine ingestions rarely resulted in significant outcomes. Loratadine appears to cause only minor symptoms with suspected doses up to 620 mg. This validates our previous retrospective study suggesting that suspected ingestions less than 300 mg may be safely monitored at home, with referral to the ED if significant symptoms develop.

295. One Pill Is One Too Many: Profound Hypoglycemia in Adults Mistakenly Given a Single Sulfonylurea

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Background: Sulfonylurea poisoning may result in profound hypoglycemia We highlight the potent potential toxicity of these agents by reporting 2 cases of significant hypoglycemia, including one death, among non-diabetic adults each mistakenly

administered a single sulfonylurea pill. *Case Report:* Case 1: A non-diabetic 55-year-old male hospitalized after hemicolectomy was administered glyburide, 10 mg, after a resident physician mistakenly entered the order for the wrong patient. He developed recurrent, symptomatic hypoglycemia (trough blood glucose < 30 mg/dL) which was supported with an intravenous dextrose infusion, intravenous dextrose boluses, and octreotide. The hypoglycemia resolved, without sequelae, by 36 hours after the medication error. Case 2: A non-diabetic 39-year-old male dialysis patient with atrial fibrillation was mistakenly given another patient's glipizide, instead of coumadin, at his pharmacy. He realized the error after taking one 10 mg pill, and he contacted the pharmacist and was advised to "drink juice and eat hard candy." Twelve hours later he felt tired and weak, and he could not be awakened the following morning. Fingerstick blood glucose at the scene was non-detectable. During resuscitation efforts, four 50cc amps of 50% dextrose were given before bringing his blood sugar above 60 mg/dL. Brain MRI demonstrated encephalopathy consistent with hypoglycemic injury. The presence of glipizide was confirmed in the blood. He expired 19 days after hospital admission. *Case Discussion:* Life-threatening hypoglycemia has been demonstrated following the ingestion of 10mg of glyburide or glipizide by non-diabetic adults. *Conclusion:* Non-therapeutic ingestion of sulfonylurea medications should be considered medically serious, among adults as well as young children. Medication errors involving oral hypoglycemic agents can have grave results.

296. Infant Salicylism after Cutaneous Application of 5% Methylsalicylate

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Background: Many topical folk remedies contain methylsalicylate (MeS). The perceived health risks of these products may be low. We present a serious salicylate (SAL) poisoning after topical application of 5% MeS ointment on an infant. *Case Report:* A 3-month-old male presented with severe respiratory distress and mild diarrhea. Laboratory analysis revealed an anion gap metabolic acidosis (Na 138, K 4.5, Cl 105, HCO3 8, AG 25) that was attributed to gastrointestinal fluid losses and underlying illness. After admission and IV hydration, the patient's condition steadily improved with resolution of the acidosis and clinical symptoms. Adjunctive urine and serum tests for inborn errors of metabolism were sent. Poison control was contacted when GC-MS analysis revealed several large peaks corresponding to multiple SAL metabolites. Blood samples from hospital day 1 and 2 showed SAL concentrations of 41 mg/dL and 28 mg/dL respectively. Further history revealed that the child was treated with a topical ointment named White Monkey Holding Peach Balm. The mother applied the ointment to the child's abdomen, chest, and back daily immediately following his bath. The product listed 3% MeS on the label but laboratory analysis of the sample showed the presence of 5% MeS. The child's skin was intact and he had received no other salicylates. *Case Discussion:* Most previous reports of cutaneous salicylism involve use of SAL on abnormal skin. One report documented toxicity from salicylic acid cream applied under an occlusive dressing to intact skin. MeS is known to have greater dermal absorption than other SAL, secondary to its lipophilic properties. Peripheral vasodilitation, disruption of skin integrity, and repeated SAL exposure have been shown to increase cutaneous SAL absorption. Infants and children may be at greater risk due to their large body surface area relative to their size. *Conclusion:* To our knowledge this is the first reported case of infantile salicylism with dermal use. Repeated application of low concentration methylsalicylate products may pose a serious risk to this patient population.

297. Pediatric Benzonatate Exposures: A Six-Year Retrospective Review of 67 Patients

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Background: Benzonatate is a non-opioid antitussive medication structurally similar to tetracaine commonly used for cough control. There are multiple case reports in the medical literature defining the potentially serious effects of benzonatate toxicity. To date there is no published study of the clinical toxicity of benzonatate in pediatric patients. This is the first large case series of patients exposed to benzonatate and the first study of pediatric exposures. *Methods:* The Texas patient exposure database was searched for all human exposures to benzonatate exposures from January 1, 2000 to December 31, 2005. Inclusion criteria include: ingestion of benzonatate as a single agent, age < six years old, and followed to a known outcome. *Results:* There were 170 benzonatate exposures in the database, of which 67 patients met our inclusion criteria, 39 males and 28 females. Age ranged from 12 to 72 months with a mean of 27.5. Seventeen patients (25.4%) developed a clinical symptom. The most frequently documented clinical effects were: bad taste or oral numbness (#5) and vomiting (#5), followed by cough (#3) and choke/gag (#3). Thirty seven patients (55.2 %) were treated in a health care facility of which seven (7/67) were admitted. The most common treatment noted was activated charcoal for 32 patients, cathartic for 22, dilution

for ten and lavage for five. Medical outcome was no effect, 49 patients (49/67), minor effect 15/67, moderate and major effect one each, and one confirmed non-exposure (1/67). *Discussion:* This is the largest study of benzonatate toxicity to date and the only study regarding children. Most pediatric patients (95.5%) who are reported to have ingested benzonatate develop only minor effects or remain asymptomatic. *Conclusion:* The extensive clinical toxicity of benzonatate has been defined in the medical literature through multiple cases reports. This study shows that the vast majority of pediatric patients exposed to benzonatate have a positive outcome. Further research is needed to develop a dose response curve to better define pediatric toxicity.

298. Outcomes of Ethylene Glycol Ingestions in Children Less than 6 as Reported to United States (US) Poison Centers (PC)

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Background: EG is an often-reported pediatric ingestion to US PC. Although there is concern as to the toxicity of EG, actual outcome has not been well characterized. In 2005 an out-of-hospital guideline (GL) was released for management of EG. We hypothesize that <0.1% of unintentional pediatric EG ingestions will develop toxicity. We also hypothesize that those that require health care (HCF) evaluation can be identified by history. *Methods:* This is a retrospective review of exposures reported to US PC from the TESS database. We evaluated all exposures for patients <6 for the AAPCC EG generic codes from 1/1/2000–12/31/2005. We sought to identify adverse outcomes for taste/lick/drop (TLD) exposures. We also sought to characterize patients coded as major or death. We determined the history for all major and death outcomes. *Results:* There were 4428 EG exposures. 15 (0.3%) had major outcomes and none died. All 15 had either unknown amounts ingested (UAI) or confirmed > TLD. 4152 were coded as unintentional. 12 (0.3%) had major outcomes but again all had UAI or were confirmed > TLD. 1824 (44%) were confirmed TLD ingestions. There were no deaths, major, or moderate outcomes, but 6 (0.3%) received ADH blockade. 1565 (86%) of these were managed at site of exposure, 246 (13%) had HCF evaluations and 13 (1%) unknown disposition. *Discussion:* Although >0.1% of unintentional ingestions had major outcomes, this includes 6 patients with TLD ingestions that received ADH blockade with minor outcome or no effect. This may reflect patients that received ADH blockade inappropriately or patients that did not become toxic because of the blockade. All cases with major medical outcomes were identified as UAI or confirmed >TLD. Using the GL, all pateints that eventually had major outcomes would have been sent to a HCF. *Conclusion:* Pediatrics with EG ingestions confirmed as TLD, with the aid of the GL, may be managed at the site of ingestion. A small proportion of patients with non TLD ingestions develop symptoms; patients in this group should have a HCF evaluation.

299. Inadvertent Epidural Morphine Overdose in Four Peripartum Women and Their Neonates

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Background: Peripartum epidural anesthesia includes infusions of a local anesthetic and an opioid such as bupivacaine and fentanyl, respectively. We report a series of cases of decreased consciousness and respirations following administration of epidural morphine from pre-manufactured epidural cartridges mistakenly labeled as containing bupivacaine and fentanyl. *Case Report:* A term woman in her twenties with a history of gestational hypertension, was admitted to labor and delivery. She presumably received an epidural injection of bupivacaine and fentanyl for pain management. During her delivery she was sedate, difficult to arouse and had pinpoint pupils. Her female neonate had decreased responsiveness. The newborn's one minute Apgar score was 2. With respiratory support and naloxone, her 10 minute Apgar was 9. Post delivery, the mother had respiratory depression. She required a naloxone infusion. Over the next few hours, three more mothers had decreased consciousness. They also responded to naloxone infusions. Two more neonates also required naloxone. *Case Discussion:* The mothers had received epidural infusions from pre-manufactured cartridges labeled as containing 2 mcg/ml of fentanyl and 0.125% of bupivacaine. Urine drug screens using GC/MS were positive for morphine in all the mothers. The cartridges were from the same lot and manufacturer. Unopened cartridges from the same lot tested positive for morphine at a concentration of 1 mg/ml. The mother's had received epidural morphine, total doses ranging from 57–79 mg, approximately twenty times the normal epidural dose. The mothers required naloxone infusions for 9–14 hours. The FDA was notified and assisted with the investigation and removal of the cartridges from other US hospitals. *Conclusion:* Overall, epidural anesthesia with fentanyl and lidocaine is safe. Side effects with normal dosing include hypotension, post-dural puncture headache, and rarely, convulsions and cardiac arrest. Coma and respiratory depression are not expected. When unexpected side effects occur, especially when involving many patients, clinicians should be aware of the potential for medication errors both by the hospital and/or by the manufacturing pharmaceutical company.

300. Fatal Outcome after Ingestion of Concentrated Calcium Polysulfide-Containing Fungicide

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Background: Calcium Polysulfide (CPS) is found in veterinary products used topically as fungicides. Few published reports exist of poisoning with CPS. *Case Report:* A 51-year-old female ingested a mouthful of 97.5% CPS-containing product thinking it was tea. The patient immediately vomitted, lost consciousness, and had a brief generalized seizure. EMS arrived to find the patient had regained consciousness and reported a strong sulfur odor. On arrival to the ED 1-hour post-ingestion the patient was altered with BP 211/96, HR 126, RR 20, pulse-ox 84% on facemask oxygen, and afebrile. There were no oral burns but the patient did have a large sulfur-smelling stool. Initial arterial blood gas showed pH 7.32, pCO2 22, pO2 219, and HCO3 11.6. Initial lab abnormalities included glucose 334, AST 95, HCO3 15, anion gap 23, calcium 13.4, and WBC 27.9. Over the next several hours the patient became obtunded, hypotensive, and had worsening cyanosis. She was intubated and started on dopamine and norepinephrine. Her metabolic acidosis (MA) worsened and was accompanied by renal dysfunction (creatinine 1.6). Nineteen hours post-ingestion co-oximetry revealed pH 6.99, PCO2 38.8, PO2 313, HCO3 8.9, COHgb 1.1%, MetHgb 3.1%, and sulfhemoglobin "high." Serum lactate was 7.4 mmol/L (normal 0.5–2.0). The patient subsequently suffered an anterolateral ST-elevation myocardial infarction followed by cardiac arrest and died 21 hours post-ingestion. *Case Discussion:* CPS may react with hydrogen chloride in the stomach to release hydrogen sulfide (HS) gas. Cytochrome oxidase dysfunction caused by HS and absorbed sulfate contribute to MA and cardiovascular collapse. Nitrites, normobaric, and hyperbaric oxygen are suggested therapies for HS poisoning. CPS ingestion has also resulted in corrosive gastrointestinal injury. Sulfhemoglobinemia has been described after CPS ingestion and may be a result of sulfur donation from either CPS or HS. *Conclusion:* This is the fifth case of CPS poisoning in the English literature. Similarities of our case with others include altered mental status, MA, sulfhemoglobinemia, cyanosis, hypercalcemia, transaminitis, renal dysfunction, cardiovascular collapse, and death.

301. Pediatric Exposures Involving 10-Fold Dosing Errors Reported to US Poison Centers

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Background: Unintentional 10-fold dosing errors occur in the pediatric population. The objective of this study was to characterize 10-fold therapeutic dosing errors in children < 6 years of age reported to poison centers. *Methods:* National TESS data were obtained for years 2000–2004 for all unintentional 10-fold dosing errors reported in children < 6 years of age. Cases were selected for analysis if they involved a single substance only. *Results:* A total of 3,894 exposures were identified. 3,609 (92.7%) of exposures occurred at a residence, 223 (5.7%) occurred in a health care facility, and 121 (3.1%) were coded as an "iatrogenic error." *Discussion:* Exposures involving cimetidine/other H2 antagonist and metoclopramide were more frequent than other substances. These medications are often prescribed to children with gastroesophageal reflux and sometimes given together. *Conclusion:* The most common substances involved in 10-fold dosing errors reported to US poison centers were cimetidine/other H2 antagonist and metoclopramide, occurred at home, and involved children ≤ 1 year of age. Increased awareness among health care professionals regarding dosing errors with these medications is warranted.

Most common substances		Age, disposition, and outcome	
Cimetidine/other H2 antagonist	23.5%	Age ≤ 1 month	19.7%
Metoclopramide	17.8%	Age > 1 month and ≤ 1 year	55.2%
Dextromethophan w/o ppa	6.8%	Age > 1 year and < 6 years	25.1%
Antibiotic: systemic	5.4%	Treated at HCF	43.5%
Antihistamine w/o opioid, w/o ppa	4.6%	Admitted to hospital	12.2%
Gastrointestinal prep: other	4.1%	No effect	34.5%
Albuterol	3.9%	Minor effect	16.7%
Acetaminophen: pediatric	2.6%	Moderate effect	7.0%
Iron (excluding vitamins with iron)	2.2%	Major effect	0.9%
Antispasmotic: anticholinergic	2.1%	Death	0.1%

% of 3894 exposures.

302. Material Safety Data Sheet (MSDS) Inconsistencies Pertaining to N, N diethyl-m-toluamide (DEET)

Reilly TH, Holstege CP, Kirk MA. *Blue Ridge Poison Center, University of Virginia, Charlottesville, VA, USA.*

Background: The general public's use of DEET products is increasing in the United States over concerns of vector borne-illnesses. A recent case of rapid onset DEET-induced coma and seizure in a child following oral exposure highlighted the potential misinformation the general public can receive from internet available MSDSs. We hypothesized that the DEET MSDSs available on the internet are inconsistent in the information provided pertaining to potential clinical effects and recommended first aid. *Methods:* An internet Google search for "MSDS" and "DEET" was performed. A total of 28 different DEET product MSDSs were randomly selected for review. Information pertaining to expected clinical effects and recommended first aid were documented. The date of the most recent MSDS revision was noted. *Results:* Of 28 MSDSs reviewed, 27 (96%) failed to document seizures as a potential complication of exposure and 16 (57%) failed to document the potential complication of central nervous system depression. Thirteen (46%) recommended the induction of vomiting following ingestion exposures; 2 recommended induction of vomiting with salty or soapy water and 5 recommended induction of vomiting by touching the back of the throat with a finger. One stated that the patient should keep their head below their hips to prevent aspiration of liquid into the lungs. Eight (29%) either stated an oral ingestion was nontoxic or gave no information that an oral ingestion could be toxic. Dates of the most recent revision for each MSDS ranged from 1 to 19 years ago, with no revision date found on four. *Discussion:* The use of internet MSDS by the public could lead to inappropriate triage and first aid. MSDS content should be closely scrutinized prior to placement on the internet and manufacturers should be encouraged to regularly review MSDS for content accuracy. The general public should not use internet MSDS as post-exposure management guidelines. *Conclusion:* This internet search reveals the widely variable and inaccurate MSDS information accessible to the public pertaining to DEET exposures.

303. Hypocalcemia and Death after Inhalational Sulfuryl Fluoride Exposure

Schneir AB, Betten DP, Kene M, Clark RF. *University of California, San Diego Medical Center, San Diego, CA, USA.*

Background: Systemic fluoride (F^-) effects are the proposed mechanism for sulfuryl fluoride (SO2F2) toxicity. This is supported by the metabolism of inhaled SO2F2 in animals, and the clinical course described in reports. However, serum Ca^{2+} levels have not been documented. Hypocalcemia, one of multiple features of F^- toxicity, would support this mechanism for SO2F2. *Case Report:* A 37-year-old female was exposed inhalationally for three hours to SO2F2. She was hypotensive, tachycardic, disoriented, and had abdominal pain, ocular burning, nausea, and shortness of breath. Exam revealed scleral injection and lacrimation. Saline was administered IV and topically to her eyes. Performed soon after arrival, a chest x-ray was normal and an ABG revealed: pH 7.45, pCO2 21, P02 104. An initial Ca^{2+} was 5.3 mg/dL (reference 8.4–10.3). Testing for albumin, ionized Ca^{2+}, and Mg^{2+} was never done. Two hours after arrival she had stool incontinence, seizures, and lost her pulse. At no point previously was she hypoxic. Over the next 30 minutes, despite receiving 7 grams of Ca^{2+}, and 6 grams of Mg^{2+} IV, she had various dysrhythmias, including torsades, vfib, and ultimately asystole. Autopsy revealed tracheitis, pulmonary congestion and edema. An antemortem blood F^- was 24 mg/L and cause of death was attributed to pesticide poisoning. *Case Discussion:* The lacrimation, scleral injection, respiratory difficulty and pulmonary edema were likely due to the pre-instilled chloropicrin. Many of her systemic effects, including abdominal pain, confusion, convulsions, dysrhythmias, hypotension, incontinence, vomiting, and death have been reported in prior SO2F2 exposures. The presence of hypocalcemia, refractory ventricular dysrhythmias, and death is typical in systemic F^- poisoning from other agents. The antemortem F^- is similar to the 20 mg/L described in a previously reported fatal case of SO2F2 poisoning. *Conclusion:* The mechanism proposed for SO2F2 poisoning is the in vivo release of F^-. Unique to our case is the documentation of hypocalcemia, which combined with the patient's course, marked by ventricular dysrhythmias, and death, strongly supports F^- as the principal mechanism for toxicity.

304. Imidacloprid-N-Methyl Pyrrolidone Insecticides Poisoning Mimicking Cholinergic Syndrome

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Background: There have been few cases of acute overdose of imidacloprid-N-Methyl pyrrolidone insecticides despite wide usage. We report two cases of such poisoning mimicking cholinergic syndrome. *Case Report:* A 64-year-old woman presented to

the emergency department with nausea, vomiting, dyspnea, lack of coordination, and altered mental status, approximately 1–2 hours after ingesting 150 cc 30 mg of formulation with 9.6% Imidacloprid and the solvent N-methyl pyrrolidone. Physical examination revealed comatous status, diaphoresis, increased salivation and bronchial secretion, and hyperactive bowel sounds.The blood cholinesterase concentrations was within normal limit. Endotracheal intubation was performed and aggressive treatment was given. However, she finally died of nosocominal pneumonia. Another 71-year-old male was admitted to another hospital due to nausea, vomiting, miosis, diaphoresis, bradycardia and altered mental status after ingesting about 200 cc of unknown insecticides. Gastric decontamination and intravenous administration of 2 mg atropine was given because the treating physicians thought the ingested insecticides might be cholinesterase inhibitors. In our hospital blood cholinesterase level was within normal limit and only supportive treatment was given. He finally discharged 6 days later with uneventful recovery. The insecticides he has taken was later confirmed to be a formulation with 9.6% imidacloprid dissolved in N-methyl pyrrolidone. *Case Discussion:* Imidacloprid act as agonists at the insect nicotinic acetylcholine receptor. These insecticides are believed relatively low toxicity to humans because they react less with human nicotinic receptor subtypes compared to insects, and they do not readily penetrate the human blood brain barrier. With poor penetration through the blood brain barrier, centrally mediated effects would not be expected at low levels of exposure. However, a larger dose of imidacloprid may cause severe neurological toxicity such as cholinergic syndrome in our 2 cases. *Conclusion:* Patients ingesting large volumes of imidacloprid- N-methyl pyrrolidone insecticides formulations may mimick cholinergic syndrome.

305. Studies of Diesel Exhaust Constituent Exposures in and around Stalled and Working Locomotives

Cavender F, Goad P, Tarkington B. *Center for Toxicology and Environmental Health, Little Rock, AR, USA.*

Background: In two separate studies involving diesel locomotives, the exposure to carbon monoxide (CO) and other pollutants were monitored in the lead and trailing locomotives and in manned helper units at the end of trains. In one study, carboxyhemoglobin levels in crew members entering a tunnel where an idling locomotive was stalled were determined, and in the second study, the potential for pollutant exposure in deadheading crews riding in trailing locomotives was evaluated. In two tunnel simulation studies, one involved an idling helper unit stalled in a 3,333 ft tunnel near Guernsey, WY and the second involved idling lead and trailing locomotives stalled in a 1,170 ft tunnel near Caliente, CA. *Methods:* In the deadheading study, the levels of diesel fuel, diesel exhaust constituents, asbestos, and silica in the cabs of lead and trailing locomotives were determined for a number of train runs under a variety of conditions. These conditions include cab windows open or closed, number of exhaust stack sets in front of the cab, orientation of the locomotive, passage through tunnels during the run, and locomotive body type. *Results:* The results of these studies show that all of the constituents of diesel exhaust were present in small quantities in the lead, 1st trailing, and 2nd trailing locomotive or helper unit cabs in one or more train runs. Elemental carbon and nitric oxide concentrations were significantly higher in the 1st trailing and 2nd trailing locomotives, but the levels were below current occupational standards for these constituents. *Discussion:* For CO, the exposure of railway workers during the resetting the brakes of a helper unit stalled in a tunnel or uncoupling and pulling the power of the train stalled in a tunnel is below the current TLV of 25 ppm. In addition, based on the TLV for NO_2 and the BEI for carboxyhemoglobin, the level of these markers of diesel exhaust exposure in this study are also below levels of concern for railroad workers. *Conclusion:* Deadheading crews and workers in tunnels will be exposed to higher levels of diesel exhaust constituents, but the concentrations do not pose a health threat to these crews.

306. Delayed Diagnosis of Lead Poisoning Caused by an Indian Ayurvedic

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Background: Lead poisoning with encephalopathy is a rare presentation in adults. It is widely reported that some Indian Ayurvedic medications contain lead in amounts sufficient to cause lead poisoning. We report an adult male with lead encephalopathy, caused an oral Indian Ayurvedic medications. *Case Report:* A 25 yo Indian man complained of N/V, anorexia, malaise, and abdominal pain over the previous 2 weeks. Basophilic stippling was noted on his blood smear prompting a blood lead level (BLL), which returned at 192 mcg/dL. He was sent to the ED, where his initial vital signs were BP, 140/85 mmHg; pulse, 90 bpm; T, 98.6F. He was oriented but had intermittent agitation. His neurological exam was otherwise unremarkable. His abdomen was nondistended with mild, diffuse tenderness. Laboratory values showed: hemoglobin, 9.6 g/dL; hematocrit, 29.9%, mean cell

volume, 70 femtoliters; iron, 90 mcg/dL (nl 80–180 mcg/dL); and ZPP, 186 mcg/dL blood (nl 0–35 mcg/dL blood). He was treated with BAL and CaNa2EDTA, and subsequently with succimer. His mental status returned to baseline over several days. Despite intensive questioning he denied taking any medications including Ayurvedics. However, his family noted that he began to use an Ayurvedic one month previously to prevent diabetes. The family brought in a product specimen that, when analyzed, contained a high concentration of lead. *Case Discussion:* Lead poisoning is often a delayed diagnosis given its associated vague complaints. An alteration in mental status combined with chronic abdominal complaints should raise suspicion. A detailed medication history must include traditional (Ayurvedic) and nontraditional remedies. In this patient, the source of the patient's lead poisoning was initially missed, but the history from family made the diagnosis. *Conclusion:* Adult lead encephalopathy is an elusive diagnosis. A suspicion of Ayurvedic use with appropriate questioning is crucial to making the diagnosis.

307. Industrial Radiography Source Exposure: A Case Series

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Background: More than 200 cases of mishandling, misappropriation or unwitting exposure to industrial radiography devices (IRDs) have been reported since 1942. These IRDs, used commercially to search for defects in piping, metal vessels, and wells, represent a rare but potentially devastating cause of morbidity and mortality. We report a case series of patients exposed to Iridium-192 during the inspection of an IRD. *Case Report:* During the routine inspection of an IRD, three men became aware that the camera source had been incompletely retracted into its heavily shielded box, exposing them to the 93.4 Curie Iridium-192 source during handling of the device. All three presented to EDs several hours after the incident, requesting blood tests mandated by their employer. They described an 18,000 rad (180 Gray) acute exposure to the hands and 0–8 rad whole body irradiation (WBI). The patients had unremarkable physical examinations and normal complete blood counts. Treating physicians were concerned regarding possible secondary risk to themselves and staff. Communication ensued amongst the RI Department of Public Health, the treating ED, the Regional Poison Control Center, the patients' employer, and the REAC/TS physician in Oak Ridge, TN. Per REAC/TS recommendations, all three patients were given prophylactic pentoxyfylline and methylprednisolone. Three days later, the workers were evaluated by a hematologist who performed a complete history and physical examination, and drew blood for cytogenetics biodosimetry. The patients had no evidence of burns, and repeat CBCs were normal. Further dose reconstruction efforts and clinical findings suggested that patients were exposed to a lower radiation dose than originally suspected. *Case Discussion:* Despite familiarity with IRDs, these patients had a potentially devastating radiation exposure. Treatment efforts were complicated by a lack of provider familiarity with the management of an acute radiation incident. Early contact with REAC/TS greatly facilitated the care of these patients. *Conclusion:* Awareness of the risk posed by IRDs is critical to the prevention and treatment of acute radiation incidents.

308. Concomitant Carbon Monoxide and Formic Acid Vapor Poisoning after Performing Cardiopulmonary Resuscitation in a Hazardous Environment

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Background: Poisoning related to carbon monoxide (CO) or acid vapor inhalation is common, but concomitant exposure to CO and acid vapor is extremely rare. We reported two patients who were poisoned with both CO and formic acid after performing cardiopulmonary resuscitation in a room full with formic acid vapor and CO, which was produced via a chemical reaction between formic acid and sulfuric acid. *Case Report:* A 26-year-old male committed suicide by mixing formic acid and sulfuric acid in his bedroom. He was found comatose and was immediately resuscitated by his parents. He was dead on the way to a local hospital. The 53-year-old father fell into unconsciousness after performing cardiopulmonary resuscitation to his son and was sent to another hospital, manifesting coma, mild hypoxemia, and metabolic acidosis. The initial carboxyhemoglobin level (COHb) was 45.9%. He was intubated and then referred to our service for hyperbaric oxygen therapy (HBO_2). Despite aggressive therapy, he developed acute respiratory distress syndrome (ARDS) 2 days later. He was extubated on day 8 after receiving intensive care. The 53-year-old mother felt dizziness, headache, and sore throat after staying in the house during the course of resuscitation. The initial COHb level was 23%. *Case Discussion:* The first patient was successfully treated with HBO_2, corticosteriod, N-acetylcysteine and antibiotics. The second patient's symptoms rapidly improved after oxygen therapy. Both patients were discharged after

attaining a stable condition. *Conclusion:* Formic acid can produce CO after heating or reacting with sulfuric acid, and therefore can cause concomitant CO poisoning. Management of CO poisoning under such circumstance could be complex because there are concerns that HBO_2 may expose the acid-damaged lungs to the potential toxicity of free radicals. Although HBO_2 is generally safe among CO poisoned patients with normal lung function, its risk in patients with ARDS remains unclear. The role of antioxidants in such patients also awaits further study.

309. A Regional Poison Center's Cost Savings to Taxpayers

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Background: Various studies conducted by poison control centers (PCC) have demonstrated the cost-effectiveness resulting from utilization of poison center services. Our PCC performed a cost-effectiveness study within our state that focused on the savings to taxpayers that resulted when our PCC kept Medicaid and Medicare recipients as well as uninsured patients from unnecessary utilization of emergency healthcare resources. *Methods:* Our patient database was searched over the most recent two months with the following fields selected: human, exposure, managed on site, unintentional (not including occupational), and caller relationship (babysitter, father, grandparent, mother, other relative, spouse, or self). During this time period 3,429 cases were found that matched these search criteria. These callers were randomly surveyed and asked the following two questions along with general satisfaction questions: 1) If the PCC did not exist, what action would you have taken?, and 2) What type of insurance coverage do you have? *Results:* A total of 346 patients with poisoning exposures were contacted that had been safely and effectively managed at home after calling our poison center. Data contained a margin of error of +/– 5% with a confidence level of 95%. Overall, 63.9% of these callers would have gone to the emergency department, 5.5% would have called 911, 12.4% would have called a physician, and 4.1% would have gone to the physician's office. Of these 346 callers, 34.1% were Medicaid recipients, 7.8% were Medicare beneficiaries, and 11.3% were uninsured. According to the National Center for Injury Prevention and Control *Injury Fact Book* medical expenses associated with a poisoning exposure average $925 per case if the patient is not hospitalized. In this study alone taxpayer costs would have totaled $108,800 if 63.9% of these patients had gone unnecessarily to the emergency department. Applying these statistics to the 27, 867 human exposures managed at home by our PCC in 2005 results in a cost savings of more than $8,700,000. *Conclusion:* Utilization of Poison Control Center services results in substantial health cost savings for tax payers.

310. Public Health Preparedness – A Poison Center Model

Seroka A, Bronstein A, Wruk K, Bogdan G, Lewis G. *Rocky Mountain Poison & Drug Center, Denver, CO, USA.*

Background: In 2003, our poison center partnered with a state health department to establish the Health Emergency Line for the Public (HELP) to provide information during bioterrorism and other health events. HELP responded to 3 major state events: the worst West Nile Virus (WNV) outbreak in the US, an influenza event with pediatric deaths and an influenza vaccine shortage. In 2005, it was used to meet preparedness needs in another state for WNV and then for a Hepatitis A Event (HAE) that occurred at an international conference. *Methods:* Our call center infrastructure easily supports the HELP model: public health messages 24/7 using an Interactive Voice Response Unit (IVR) and access to live agents from 7 AM to 11 PM daily. Separate T1s are used to prevent health events from interfering with normal poison center operations. Limited funding prompted using Poison Information Providers (PIPs) rather than Specialists in Poison Information. Epidemiologists prepared FAQ libraries on WNV, Influenza, Avian Flu and emerging public health messages. Dead Bird Reports were collected, geocoded and distributed weekly to state epidemiologists. This HELP model for WNV was developed for another state. The HAE truly tested this model. Within 24 hrs of notification, HAE FAQs and screening trees were developed and implemented to support that event. *Results:* HELP received 53,800 calls from July 2003 thru October 2005. IVR messages satisfied 60% of the callers. The remainder chose to speak with a PIP. Highest call volumes occurred during Influenza (365 calls/hr, 2,565 calls/d). HELP handled 888 calls over 1 month for the HAE. *Discussion:* Poison centers have the technology and staffing infrastructure to assist public health agencies rapidly expand their capability to respond to bioterrorism and public health emergencies like pandemic flu. We designed the model to deliver consistent, updated information. Demonstration of our rapid event response, led to expanded service agreements. *Conclusion:* Our model efficiently delivered consistent, updated information and collected valuable surveillance and situational awareness data for public health officials. Such public health preparedness partnerships strengthen the role of poison centers and secure funding sources.

311. Embracing New Technology: Poison Center Use of Digital Technology

Lintner CP, Hughes K, Anderson D. *Hennepin Regional Poison Center, Minneapolis, MN, USA.*

Background: With the availability of affordable digital technology many Americans are familiar with taking and transmitting digital images via the internet. Poison center staff can take advantage of this technology to supplement verbal histories taken by phone. Calls involving mushroom ingestions have been particularly problematic, as the general public is not familiar with common mushroom terminology making phone identification difficult at best. We established a guideline for sending digital pictures to our poison center to aid and speed the process of mushroom identification via a web-based e-mail server. *Methods:* In 2005, an e-mail account,xxmushroom@hotmail.com, was established for easy access by all poison center staff. Callers with a questionable mushroom exposure and the ability to email a digital photograph were asked to email the image to this account. Specialists in Poison Information reviewed the digital photograph and easily forwarded it to the staff mycologist for identification. The image was linked to the medical case record for easy retrieval and storage. *Results:* This process has been used in 7 cases. Upon review of the digital photograph four cases were determined to be of no clinical concern. Three cases were presumptively identified by a mycologist as Chlorophyllum molydbites, Lepiota species and Conocybe filaris. *Conclusion:* The use of digital photographs and email can aid Specialists in Poison Information in the identification of mushrooms species. This technology could also used for other exposures that require rapid identification of a toxin, such as plants, insects, or storage containers in haz-mat incidents.

312. Pandemic Flu Plan – Does Your Poison Center Have One?

Seroka A, Wruk K, Bronstein A, Bogdan G. *Rocky Mountain Poison ? Drug Center, Denver, CO, USA.*

Background: With the possibility of a flu pandemic on the horizon, our poison center determined we needed a plan to support staff and maintain business continuity should such an event occur. The Centers for Disease Control (CDC) predict that if Avian Influenza (H5N1) can effectively transmit from human to human, it could result in significant morbidity and mortality similar to the 1918 flu pandemic. If quarantine, isolation and social distancing are mandated, we know that our staff would not be exempt. Unlike regional disasters, in a pandemic we would not be able to depend upon other poison centers for support. *Methods:* Based on 1918 data, our center anticipates up to 25% of staff may not be able to come to work. This would require continued service delivery with 2.5 fewer employees per shift. We completed a CDC survey identifying our strengths and weaknesses. We reviewed related policies and procedures: temporary personnel for potential staff shortages, basic infection control procedures in the workplace, current remote agent program and its expansion capability to support staffing shortages. Remote agents of equal skills in equal time frames were compared for productivity and quality. We also tested our interactive voice response unit (IVR) to handle emergency messages, drug identifications and call backs. *Results:* Remote agents handled 7.4 calls/hour and on-site staff handled 6 calls/hour with no significant difference in quality (Accuracy: Remote 88.4%, On-site 88.3%). The IVR made 112 call back attempts during the test with 48.2% of the calls completed on first attempt and 32.1% requiring a second attempt for completion. *Discussion:* Our remote agent program was our greatest strength. The IVR drug identification module is scheduled for testing and expected to reduce the drug identification workload by at least 25%. *Conclusion:* A Pandemic Flu Plan is a necessary strategy to protect our poison center's ability to support staff and maintain service continuity during such an event. Our remote agent program is a viable solution for our response. The remote agent program requires expansion to a wider group of staff for temporary disaster response. Drills will be an important ongoing means of assuring that planning is adequate.

313. Twenty-Month In-Depth Analysis of Poison Center TESS Coding

Bottei EM, Noble TF, Gunia PL, Gray JR. *Iowa Statewide Poison Control Center, Sioux City, IA, USA.*

Background: All sixty-one poison control centers submit their data to the AAPCC and the accuracy of the TESS aggregate data is only as good as the data submitted by the individual centers. *Methods:* All SPIs at our poison center have completed the AAPCC's on-line coding education module. All exposure cases in our poison center must receive a SPI-level quality assurance review before the case can be closed. At each monthly staff meeting, all closed exposure cases from the previous month with outcomes of "major" or "death" are reviewed by the entire staff. This consists of both a medical review and a review of the appropriateness of the coding in all areas. *Results:* Over twenty months, 219 cases were reviewed (average: 10.95 cases/month). A total of

493 coding corrections were made for an average of 2.25 corrections per case (range: 0–23 corrections per case). Coding changes were made in the following areas: clinical effects 60.4%, therapies 23.3%, substances 5.9%, acuity 2.4%, route 0.8%, outcome 0.8%, and all others 6.3%. *Discussion:* These coding reviews brought several points to light: 1) individual SPIs have different interpretations of TESS definitions, 2) TESS definitions do not always provide clear cut guidance on how to code certain situations, 3) medical director input affects approximately 10% of the coding changes, and 4) certain clinical effects and therapies (i.e., seizures and octreotide) are accidentally coded because of their location in their respective pop-up screens. *Conclusion:* While it makes sense that cases with serious outcomes might need coding changes, a review of cases with less-serious outcomes may also reveal them to be in need of coding revisions. None of the coding changes affected patient care.

314. Creating Poison Center Surge Capacity in Response to a Mass Casualty Event

Kemmerer DA, Lund JL, Tanguay R, Tomassoni AJ, on Behalf of the NNEPC Staff. *Northern New England Poison Center, Portland, ME, USA.*

Background: In April 2003, seventeen people were intentionally poisoned with arsenic at a Maine church social. Within hours many were critically ill. One patient died. The SPI considered broad differential diagnoses including heavy metal poisoning. Consulted PC toxicologists arrived at the presumptive diagnosis of arsenic poisoning, later confirmed by Maine's Health and Environmental Testing Laboratory. *Case Report:* This surge of critical patients created excessive demands for SPIs, PIPs and toxicologists. Routine call volume increased with heightened public awareness of heavy metal poisoning, resulting in a surplus of time-consuming calls. The workload of staff heavily utilized under normal volume approximately doubled. SPIs reconfigured poison center staffing and developed enhanced internal communication plans. Staff assisted with patient tracking, clinical consultations, tracking laboratory results, review of frequent ECGs, managing the antidote registry, coordinating media interviews, developing treatment protocols, coordinating after-hours calls for Maine CDC & Prevention, facilitation of communications with patients and family members, and requests to intercede with insurers on behalf of victims. *Case Discussion:* Two SPIs were dedicated to arsenic-poisoned patients for the first days while others were dedicated to normal call volume. Clinical and laboratory data and responses to therapy were amassed throughout the course of hospitalization for review by toxicologists. By dedicating efforts of specific staff to arsenic-related cases, SPIs were able to help develop individualized care plans and full poison center records for each patient. This augmented consult capacity of toxicologists. Care plans were taught to hospital staff and modified in consultation with toxicologists to maintain quality of care. SPIs coordinated antidote and patient movement. Improvisations included a tracking board for patient status, laboratory results, therapy, antidote availability, and transfers. *Conclusion:* SPIs and PIPs played a pivotal role in the management of a sustained surge of critically ill poisoning victims while maintaining daily operations without interruption.

315. Repeat Use of a Regional Poison Center: A Retrospective Analysis

VandenBerg MJ, Jenson SB, Judge BS. *DeVos Children's Hospital Regional Poison Center, Grand Rapids, MI, USA.*

Background: Data regarding repeat use of poison centers are not reported in the Annual Report of the American Association of Poison Control Centers Toxic Exposure Surveillance System. Having information readily available on Toxicall® about a previous caller could prove invaluable to the Specialist in Poison Information (SPI) in caring for that caller. We sought to determine the number of repeat callers and the number and type of calls they placed to our regional poison center in 2004. *Methods:* A retrospective review of all calls received by our poison center from 1/1/04 to 12/31/04 was performed. Cases were reviewed alphabetically by last name and by phone number. Repeat callers were defined as an individual placing a call from the same household, phone number, or organization. Repeat callers were identified and the number and type of calls they placed were entered into a database. Call types were subdivided into 1) drug information and identification, 2) exposures, and 3) other information. *Results:* A total of 47,957 calls were received in 2004. 7699 calls (16.05% of total calls) were placed by repeat callers (n = 2623). 1792 callers contacted the poison center twice while 831 callers contacted the poison center three or more times. One household called the poison center 19 times for exposures in children. Nine repeat callers contacted the poison center 20 or more times; one of these repeat callers contacted the poison center 29 times primarily for drug information and identification. Sixty-two calls were received from a single law enforcement organization. Exposures (n = 4062), drug information and identification (n = 3381), and other information (n = 256) accounted for 52.8%, 43.9%, and 3.3% of repeat calls, respectively. *Conclusion:* A surprising number

of the total calls received by our poison center in 2004 were made by repeat callers. Information about previous callers, if made available on Toxicall® may be useful to the SPI in expediting care to the caller or in recognizing potential patterns about the caller such as drug abuse or child neglect.

316. Increased Plasma Lactate Concentrations are Associated with Cyanide but not Other Types of Acute Poisoning

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Background: Diagnosis of cyanide poisoning (CP) is made by laboratory measurement of blood cyanide levels but results are typically unavailable for hours to days. Cellular hypoxia indicated by lactic acidosis may be a useful marker of CP. However, it is not known to what extent lactic acidosis is a direct result of cyanide effects on oxidative phosphorylation versus a secondary response to shock and hypoperfusion. We therefore compared plasma lactate concentrations in patients with acute poisoning due to cyanide and other agents. *Methods:* Plasma lactate, blood chemistry/gases, vital signs, and outcomes were measured in 9 patients with acute CP and 9 with acute nonCP matched for age, sex and blood pressure (BP). NonCPs included psychotropic drugs (4/9), cardiotropic drugs (3/9), and other toxicants (2/9). Groups were compared using the Wilcoxon signed rank test. *Results:* Mean age (39 yr), sex ratio (5 men/4 women), and systolic BP (CP 84/nonCP 89) were matched between the two groups. There were no significant differences in prothrombin time, blood glucose, serum ASAT, blood gases, or outcomes between groups. Patients in the nonCP group had higher serum ALAT ($p < 0.02$) and CPK ($p < 0.008$) compared to the CP group. Heart rate was significantly increased ($p < 0.02$) in patients in the CP group. Mean blood cyanide concentration was 156.0 ± 84.3 μmol/L in the CP group. Plasma lactate concentration was significantly increased in the CP group compared to the non-CP group [22.0 ± 17.6 mmol/L (˜10x normal) vs. 2.5 ± 1.8 mmol/L, respectively ($P < 0.008$)]. *Discussion:* Plasma lactate concentrations in patients with acute CP are significantly increased in comparison with those measured in drug-poisoned patients. These results suggest that cardiovascular shock is insufficient to explain elevated lactate concentrations observed in cyanide-poisoned patients. The data are consistent with a direct effect of cyanide on lactic acid production and support the use of monitoring plasma lactate levels as a timely biomarker of CP. *Conclusion:* Rapid detection of cyanide poisoning can ensure that appropriate antidotal and supportive treatments are administered.

317. Retrospective Evaluation of Outcomes of Benzonatate Exposures: A Statewide Poison Control System-Based Study

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Background: Benzonatate is a commonly prescribed antitussive with significant cardiovascular and neurologic toxicities. We sought to identify outcomes from benzonatate toxicity reported to a statewide poison control system (PCS). *Methods:* Records of all benzonatate ingestions reported to our PCS from 1998- 2005, inclusive, were extracted. Only cases where benzonatate was the sole ingestant were included in the study. Data were collected on age, amount ingested, treatment, symptoms and outcome. Regarding outcome types, minor was defined as oral numbness, nausea or vomiting; moderate as the presence of tachycardia, hypo/hypertension; and major as seizure, loss of consciousness, cardiac arrest, arrhythmia or intubation. *Results:* 83 cases were included in the analysis; 118 cases were excluded due to coingestants, unconfirmed ingestion or lost to follow up. In 13 cases the amount ingested was unknown. In 69 cases the outcome was no effect or minor. In all cases with major outcomes onset of toxicity was rapid (within 2 hours). Thirty-five cases involved children under 6 years of age. Five cases had major effects; no decontamination was done in 4 of those. The lowest amount resulting in minor effects was 10 mg/kg. The largest ingestion that remained asymptomatic was 9.17 mg/kg. Patients aged 6–19 years were involved in 12 cases. Two ingestions (doses: 2000 mg and unknown) developed major effects; both were intentional and suffered cardiac arrest, and one had seizures. The lowest ingestion resulting in minor toxicity was 300 mg. Adults over age 19 years were involved in 36 cases. There was one major outcome, in a 30 yo male who had seizures after mistakenly ingesting 600 mg. *Discussion:* Although limited by retrospective design and exclusion criteria, this study suggests that most major effects were seen with ingestions of greater than 10 mg/kg in children or 600 mg in adults. *Conclusion:* Most benzonatate ingestions resulted in minimal or no toxicity without intervention. Our data suggests that adult ingestions greater than 600 mg or pediatric ingestions above 10 mg/kg require emergency department referral.

318. Incentives: Is the Pay-Off Worth the Pay-Out?

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Background: A state poison center (PC) faced continued probationary status as a Certified Regional PC. A contributing factor for this designation was the center's high staff turn-over rate which made it difficult for the PC to credential SPIs to sit for the certification exam. To promote structured studying and learning of those eligible to sit for the exam, a financial incentive package was developed. *Case Report:* In 2004, our Regional PC reached a critical point with regards to the percentage of SPIs certified relative to those who were uncertified. To help SPIs with their knowledge base, teaching sessions were planned by both SPIs and toxicologists to enhance the learning process. In '04, five specialists sat for the exam; four first time participants, one for recertification. Of the five who took for the exam, only one SPI (the recert) achieved a passing grade. In an attempt to increase the passing rate, PC administrators agreed that another approach was needed to further incentivize SPIs to study diligently in order to pass the exam. In 2005, seven SPIs sat for the exam; four were repeaters from the previous year, two were first time takers, and one was re-certifying. All SPIs were informed that a financial incentive package (which included paid study time, a free toxicology text and other attractive incentives) were available to them. SPIs embraced the incentives and began to study well in advance of the exam. In July of 2005, our PC was notified that all seven SPIs had successfully achieved a passing score. *Case Discussion:* Providing incentives is not new to the clinical setting. Various plans have been instituted to increase productivity or to promote cost savings. Our plan took elements from both plans and tailored them to meet our objectives. *Conclusion:* A Regional PC developed a strategy to encourage employees to increase study efforts in order to pass the SPI certification examination. An incentive package that included paid study time, a toxicology text, and paid time off as a reward for success may have contributed to the successful passing of the certification exam by all seven of our poison information specialists who sat for the exam.

319. Use of Chemical Pesticides of Agricultural use in the Basin River of the Piura River

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Background: The Earth's heat is affecting the distribution of pests in crops in the costal zone of Peru. We inquired about the use of Chemical Pesticides of Agricultural Use (PQUA) and their potential effects on organisms and the environment (water or soil). We were interested in the knowledge of end users regarding the use of such chemicals. *Methods:* We visited 29 towns and completed 121 surveys. *Results:* Altogether we reported 73 PQUA in use throughout the river basin, and 5 products were not registered in Peru (or Ecuador). We noted 10 distinct chemical groups. 97.5% used pesticides in their crops, 98.3% declared to have used or currently used Ecuadorian products due to low cost, direct sales in the field and "the same effect." 99.2% don't understand the category of risk: IA, IB, II and III, and 68.3% don't know how to interpret the "pictogramas" (pictures) of warning on the label. We identified a pressure to obtain high crop yields as important in the use of these chemicals. *Discussion:* There has recently been interest in evaluating the knowledge of local farmworkers regarding PQUA and the presence of such chemical in fragile ecosystems. In general there was a low level of understanding about PQUA use among the population. The current process of registering PQUA in Peru has recently been considered drafting new laws about product safety evaluation. If implemented, the companies must present scientific information and a program of use in rural zones. *Conclusion:* The use of chemical substances need consideration due to the risk for health and environment reasons. Further research about the consequences of the use of PQUA's for populations and the environment is neccessary.

320. Impact of a Quality Assurance Tool for Call Recordings

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Background: An objective quality assurance (QA) tool for poison control center (PCC) call recordings was developed. Previous to the call recorder, our PCC QA program included only regular, systematic visual chart reviews by the Managing and Medical Directors. Our objective was to see if the quality of PCC calls was impacted by the inclusion of this tool in our QA program. *Methods:* This tool incorporated QA and performance parameters from the existing job descriptions only. These

parameters fell into four categories: communication skills, active listening skills, completeness of poison management and documentation. The objectivity of this tool was tested (results were previously presented). Using this QA tool, 40 random calls were scored (20 within 6 months before and 20 within 6 months after the tool was implemented). The Managing Director and two PharmD students completed the review of these 40 cases. *Results:* The average score for each of the measured areas of QA are depicted in the table.

QA tool scores

	Communication skills	Active listening skills	Completeness of poison management	Documentation
Average score pre-QA tool	98.6%	92.4%	94.4%	94.2%
Average score post-QA tool	100%	92.6%	88.4%	84.9%

Discussion: Following implementation of the QA call recording tool, there was not an overall positive change in the quality of our calls. However, the small sample size may have not been sufficient to reveal a true trend. *Conclusion:* Longer follow up is needed to assess the impact of expanding our QA program to include this QA tool for recorded calls.

321. An Outcome Prognosis Method in Cases of Acid Poisonings

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Background: Poisonings by corrosives are widely spread in Russia; the most life-threatening of them are acid poisonings. The lethality rate here reaches 10–12%, while cases of poisonings by alkali and bleaches stays at the 0–1.5% level. In order to enhance the early diagnostics and to provide improved medical aid in cases of acid poisonings, the aim of the present study is the development of table-based methods of outcome prognosis for such type of poisonings. *Methods:* We retrospectively studied 346 medical cards of perorally patients poisoned by acids (196 acetic acid and 150 mineral acid poisonings). In developing the tables, Genkin and Gubler's heterogeneous sequential recognition procedure (1978) was used, which belongs to the group of Bayes methods. This procedure performs feature selection with the help of Kullback informativeness measure. The developed outcome prognosis table was tested on 102 patients with acid poisonings. *Results:* Diagnostic tables have been developed for the prognosis of the outcome of acute acid poisonings. The testing in clinical settings yielded findings demonstrating that the outcome prognosis table has a good prognostic value. *Discussion:* The stude of the sensitivity and specificity of the test with the help of ROC analysis produsedthe following results: the area under the curve made up 0.988 (0.943–0.998). *Conclusion:* The outcome prognosis tables used in cases of acid poisonings are easy-to-use and recommended to be employed by practicing toxicologists.

322. Development of an Electronic Clinical Toxicology Database as a Tool to Increase the Knowledge Base in Clinical Toxicology

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Background: Modern medical practice is increasingly based on "evidence based interventions," proven to be effective through the gold standard "randomized controlled trial (RCT)." However, the nature of clinical toxicology makes RCTs difficult, resulting in a sparse evidence base. The need for tools enabling systematic collection of large quantities of observational data on poisoned patients as a method of assessing and validating clinical toxicology practice is increasingly recognised. *Methods:* A user-friendly electronic relational database was developed over a 2-year period (May 2003 – April 2005) using Microsoft Access®. Data variables (over 300) were compiled by a multidisciplinary team (clinical toxicologists, ED physicians, internists, poison information scientists). The database has been used to collect/analyze information, and generate educational and audit reports on poisoned

patients presenting to a large urban ED since May 2005. *Results:* Data was collected on 998 poisoned patients presenting to the ED from May 2005 – February 2006. During this period acute medical staff received 20 educational reports and participated in 5 audit meetings. Major shortfalls in clinical management of acetaminophen, opioid, salicylate, cocaine and tricyclic antidepressant poisonings were identified. There was an improvement in the number of poisoned patients receiving optimal clinical care (60% October 2005, 80% February 2006) and a significant decrease in the number of related critical clinical incidents. Analysis of epidemiological data identified peak poisoned patient presentation times and resulted in improved provision of clinical toxicology resources. Identification of community sources of gamma-hydroxybutyric acid (GHB) poisoning lead to close cooperation with local police and paramedics in an attempt to reduce the severity of GHB poisoning. *Discussion:* Systematic prospective collection and electronic analysis of data on poisoned patients presenting to the ED has lead to an improvement in patient care. *Conclusion:* Utilization of electronic data collection and analytical tools may make a significant contribution to the further development of evidence based clinical toxicology.

323. Generalizability and External Validity Testing of Poison Center Education Program Evaluation Tool

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Background: The purpose of this study was to assess the generalizability and external validity of our bilingual Poison Center education program evaluation tool: The Child Poison Awareness Inventory (CPAI). The authors previously described the development of the evaluation tool in a pilot study. *Methods:* A total of 90 additional educators from 15 independent areas were selected to serve as experts on a review panel. Ten classes with a total of 242 students from pre-K through 6th grade representing a wide variety of demographic backgrounds including non-English speakers, urban and rural communities, special education classes and other targeted high-risk student populations were selected for validity testing of the CPAI. Testing was preformed during poison prevention and awareness programs led by trained poison center educators. *Results:* Qualitative results from the review panel indicate that the CPAI tool is expected to be effective and is able to be generalized to primary-school student populations. The CPAI scored likely to be successful with an average score of 3.35 on a 4-point Likert scale. The aesthetic component of the CPAI scored 3.31 and the functional component scored 3.39. Time requirements for CPAI administration ranged from 2–30 minutes with an average of 10 minutes required for each pre-test and post-test period. Trained educators observed overall acceptance of the tool from educators and students alike. In comparing the results from the initial pilot study we found no significant difference in the CPAI performance measures indicating sufficient external validity. *Discussion:* The CPAI was designed for pre-K through 6th grade poison education programs and was limited to English and Spanish print. Future CPAI applications should accommodate a wider academic grade range and linguistic population representative of the Poison Center region served. *Conclusion:* The CPAI is an effective evaluation tool in measuring elementary poison education programs. This program evaluation process allows for continuous program improvement and modification to meet the needs of the targeted population.

324. Pediatric Poisoning Deaths Reported to US Poison Control Centers, 1994–2005

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Background: Prevention of pediatric poisoning deaths remains a public health priority. Little information is known about these deaths and how well poison control center (PCC) data represent the problem. The purpose of this study is to describe pediatric poisoning deaths reported to US PCCs and to compare the incidence of poisoning deaths to the National Vital Statistics System (NVSS). *Methods:* All human poisoning deaths < 19 years of age (single substance only) were obtained from the American Association of Poison Control Center's (AAPCC) Toxic Exposure Surveillance System (TESS) for the years 1994–2005. AAPCC data were compared to the latest available NVSS mortality data from the National Center for Health Statistics. *Results:* From 1994–2005, 676 pediatric poisoning deaths involving one substance were reported to AAPCC (53% of all pediatric deaths reported). An increase from 50 deaths in 1994 (3.8 deaths/100,000 poisoning exposure calls for children < 19) to 83 deaths (5.5 deaths/100,000) in 2005 was noted. Forty one percent (n = 278) of these deaths were unintentional, of which 54% occurred in children < 2 years of age. Among the unintentional death cases, 86% were acute; 86%

occurred at a residence and 5% at a health care facility (HCF); 88% were managed at a HCF (81% admitted to an ICU but 13% treated and released). Fifty seven percent of these deaths involved ingestion and 31% inhalation. The substance involved was known in 99% of cases, most commonly CO (28%) and hydrocarbons (9%). Forty-eight of the 278 deaths (17%) involved a therapeutic error, most commonly with acetaminophen. For the years 1994–2003, 2,836 unintentional deaths were recorded by the NVSS (multiple substances included) compared to 218 unintentional deaths reported to TESS (single substance only). *Conclusion:* A large proportion of pediatric poisoning deaths occur in very young children and are unintentional. TESS includes important information about pediatric deaths not included in the NVSS. However, PCC data under represent the incidence of poisoning deaths in children compared to national mortality data. Utilization of PCCs for management advice and reporting should be emphasized.

325. An Examination of Poison Control Communication

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Background: Every year 50,000 callers fail to follow Poison Control Center (PCC) referrals to a health care facility (HCF). Likelihood of PCC nonadherence is the result of multiple factors—one of which is communication. Study objectives: 1) adapt and apply a widely used medical communication coding system to PCC calls; and 2) describe the communication process for callers referred to HCF. *Methods:* Qualitative and quantitative methods were used. First, we conducted a focus group with 10 SPIs from the Utah Center (UPCC). SPIs discussed communication issues related to HCF referrals. Second, 81 recorded cases (41 adherence; 40 nonadherence) were selected from the UPCC database. We adapted the Roter Interaction Analysis System (RIAS) and applied it to call dialogue (inter-coder reliability r>.80). *Results:* Content analysis of the group transcript revealed 3 themes. First, SPIs make a rapid likelihood-of-adherence assessment based on caller characteristics. Second, they use this assessment to inform their responses. Third, they expressed a desire for communication training to improve assessment and intervention. RIAS-related analyses showed PCC communications to be SPI-driven (i.e., SPIs talking 30% more than callers). 18% of SPI talk was devoted to information giving and 20% to question asking. Caller communication was largely related to provision of information (63%). Emotional and partnership talk was 14% of all SPI talk and 3% of all caller talk. SPI emotional/partnership talk was significantly greater for calls which resulted in adherence $t(79) = -2.24$, $p = .03$. *Discussion:* Our application of a widely used medical coding system reliably captured the PCC communication process. SPIs were emotionally responsive and facilitated partnership with callers—behaviors which were related to caller adherence. Focus group results suggest that SPIs assess the likelihood of caller nonadherence which informs how they respond to callers. *Conclusion:* This research has implications for the development of evidence-based PCC communication training approaches.

326. Evaluation of the Cardiac QT Liability of CNS Drugs Using a hERG Channel Binding Assay

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Background: The hERG (human ether-a-go-go related gene) potassium channel is required for normal cardiac repolarization and is susceptible to blockade by a wide variety of compounds, including many antipsychotics and antidepressants. Compound interaction with hERG can lead to cardiac QT interval prolongation and life threatening arrhythmias. *Methods:* A competitive binding assay was developed using 3H-E4031, a class III anti-arrhythmic agent and membranes from HEK293EBNA cells stably expressing recombinant hERG (HEK293-hERG). Rubidium efflux was used to measure hERG function. The ability of these assays to identify compounds with potential adverse cardiac effects was examined using drugs, including CNS-targeted drugs, with known cardiac effects ranging from those with no known adverse effects to drugs that were withdrawn from the market due to increased risk of sudden death associated with Torsades de Pointes. *Results:* Binding assays using 293-hERG membranes gave highly reproducible results (Z' greater than 0.5) that correlated well with the IC50 values obtained by patch clamp ($r2 = 0.94$). The rubidium efflux assay gave highly reproducible results that correlated well with patch clamp IC50 values. *Discussion:* The ability of these assays to identify drugs with potential adverse cardiac liability was examined using a set of drugs, including those acting on CNS targets, with known cardiac effects. Included were drugs that were withdrawn from the market due to increased risk of

sudden death associated with Torsades de Pointes (see table). *Conclusion:* In conclusion, the hERG binding and rubidium assays are generally predictive of patch clamp results, and can be used to evaluate cardiac QT liabilities of CNS-acting drugs.

QT prolongation liabilities of CNS drugs

Drug	Indication	QT prolongation	Patch clamp	Rb efflux	Binding
Bromopride	Nausea	No	ND	>20	>20
Imipramine	Depression	Yes	3.4	12.2	7.4
Risperidone	Depression	Yes	0.17	8.5	0.77
Amitriptyline	Depression	Yes	10	8.3	13
Pimozide	Psychosis	Yes	0.018	0.011	0.031

Values in μM; ND: not determined.

327. The 72-Hour Oral Versus the 20-Hour Intravenous N-Acetylcysteine Protocols for Treatment of Acute Acetaminophen Overdose

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Background: We sought to compare outcomes of patients treated with the 72-hour oral N-acetylcysteine (NAC) protocol (72 h PO) with those treated with the 20-hour intravenous NAC protocol (20 h IV) for potentially toxic acetaminophen (APAP) levels up to 24 hours following an acute overdose (OD). *Methods:* Patients who received 72 h PO NAC from 1976–85 as part of the US National Multicenter Study (USNMS) were compared with patients treated with 20 h IV NAC for an acute APAP OD at 34 Canadian (CAN) hospitals from 1980–2005. The main outcome measure was the incidence of hepatotoxicity (AST or ALT > 1000 IU/L). Multiple logistic regression and generalized additive models were used to compare the two groups while controlling for time to treatment, age, gender, ethanol coingestion, chronic alcoholism, extrapolated 4 hour APAP level (IAL), categorized risk based on IAL, and interaction of NAC protocol and IAL with time to treatment. *Results:* There were 2,022 and 1,813 patients in the 72 h PO and 20 h IV groups, respectively. The unadjusted overall incidence of hepatotoxicity was 15.4% and 7.3% for the 72 h PO and 20 h IV groups (8.4% absolute difference, 95% CI 6.0,10.1). After adjusting for time to treatment and other covariates, the 72 h PO group had a significantly greater odds of hepatotoxicity from 4 hrs (odds ratio (OR) 4.60, 95% confidence bands (CB) 2.29,9.25) until 13 hrs post-ingestion (OR 2.0, 95% CB 0.99, 4.02). Thereafter, there was no statistical difference between the treatment groups (OR 0.72, 95% CB 0.36, 1.45 at 24 hrs). *Discussion:* Given the different time periods, jurisdictions, and nonrandomized study design, our results must be interpreted cautiously. *Conclusion:* The comparison of the USNMS and CAN data suggests that, overall, treatment with 72 h PO NAC is associated with a higher incidence of hepatotoxicity than 20 h IV NAC. After adjusting for time to treatment and other covariates, the difference between the groups is greatest from 4–13 hours.

328. Hypoglycemia in Patients Treated with High-Dose Insulin for Calcium-Channel Blocker Poisoning

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Background: High dose insulin (hyperinsulinemia-euglycemia, HIE) therapy is being used with increasing frequency in calcium-channel blocker poisoned patients. The number of patients who develop hypoglycemia when treated with HIE is not well described. *Methods:* All symptomatic (defined as SBP <100 mm/Hg) calcium-channel blocker ingestions managed with HIE therapy from January 2002-March 2006 were identified. There were a total of 37 patients; 17 ingested dihydropyridines, and 20 ingested non-dihydropyriridines. There were 6 deaths. Blood glucose levels prior to the initiation of insulin therapy ranged from 57–778 mg/dL (mean 187 mg/dL). Twenty-Three patients were hyperglycemic (blood glucose > 140 mg/dL), and 2 patients were hypoglycemic (blood glucose <65 mg/dL) prior to initiation of insulin therapy. Supplemental glucose was administered to 30

patients upon initiation of HIE therapy. An insulin bolus dose of 1 unit/kg was administered to 33 patients; 3 patients received a bolus of 0.5 unit/kg insulin, and the bolus dose was unknown in 1 patient. The insulin infusion rates were1 unit/kg/h in 12 patients, 0.5 units/kg/h in 21 patients, and missing in 4 patients. In patients where the exact dose was not recorded, notation had been made that high-dose insulin had been administered. Hypoglycemia developed in 5 patients, requiring discontinuation of HIE therapy; all of these patients were hyperglycemic prior to initiation of HIE therapy. There were no reported co-ingestions of hypoglycemic medications. The 2 patients who were hypoglycemic prior to initiation of insulin therapy did not have any further decrease in their serum glucose. None of the patients in whom insulin was stopped early due to refractory hypoglycemia died. *Results:* HIE therapy did not cause hypoglycemia in most patients in our series. Patients who had normal or low blood glucose levels prior to starting HIE therapy were not at increased risk of developing hypoglycemia. *Conclusion:* In our experience, hypoglycemia occurred infrequently (5/37) in patients receiving HIE therapy for calcium channel blocker poisoning.

329. Provoked Urinary Excretion Testing for Heavy Metals in Children with Autism

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Background: The practice of prescribing chelators to autistic children is based on the premise that heavy metals contribute to the autism phenotype, *and* that the chronic symptoms of autism can be ameliorated by reducing heavy metal body burden. *Methods:* With IRB approval, 17 children with autism and 5 typically developing were tested for chelatable body burden of arsenic (As), cadmium (Cd), lead (Pb), and mercury (Hg). Children scoring within ranges diagnostic of autism on standardized measures were eligible for enrollment. Evaluation included a questionnaire regarding potential exposure to heavy metals, diet restrictions, and an unprovoked 24-hour urine sample collected as baseline. Three doses of the oral chelating agent, DMSA, were dispensed for the provoked excretion test. The 24-hour provoked urine excretion collection started simultaneously with the first dose, and ended approximately 8 hours after the third dose. Samples were refrigerated and batch-sent for As, Cd, Pb, and Hg concentrations. *Results:* Fifteen autistic and 4 typically developing children completed the study. Based on results of 24-hour DMSA provoked urine excretion testing, none of the participants excreted toxic quantities of As, Cd, Pb, and Hg. The *baseline* excretion for all 19 children was either undetectable or within the defined normal range. The DMSA *provoked* excretion was either undetectable or within the normal range for 14 of the 15 autistic children, and all four of the typically developing children. A repeat provoked urine excretion of mercury on the remaining autistic child was within the normal range after removing fish from his diet. *Discussion:* The size of this study limits generalizability. However, there has been very little normative data published, to date, on the body burden of heavy metals in children with autism. Chelation remains a popular alternative mode of treatment for autism despite risks. *Conclusion:* Based on the 24-hour DMSA provoked urine excretion results in this study, there is no evidence that any of the 15 autistic participants would benefit from chelation therapy.