

Abstracts

To cite this article: (2004) Abstracts, Journal of Toxicology: Clinical Toxicology, 42:5, 713-826, DOI: [10.1081/CLT-200026959](https://doi.org/10.1081/CLT-200026959)

To link to this article: <http://dx.doi.org/10.1081/CLT-200026959>



Published online: 30 Aug 2004.



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Abstracts

1. A Pilot Study of Fomepizole for the Treatment of Acute Diethylene Glycol Poisoning

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Background: Diethylene glycol (DEG) poisoning has been implicated in multiple deaths, typically from mass poisonings with contaminated pharmaceutical elixirs. No antidotal therapy has been formally investigated. This study examined the effects of fomepizole (4-MP) in a rat model of DEG poisoning. *Methods:* Ten male Wistar-Furth rats received DEG 16 gm/kg by gavage. Five (treatment group) received 96 mg/kg of 4-MP (accounting for the dose conversion from humans to rats) every 12 h. Five (controls) received saline IP. Serial serum samples were collected for concentration of DEG, bicarbonate, and creatinine. *Results:* Two rats from the treatment group died with serum DEG at 24 h > 890 mg/dl. All rats in the treatment group were sedate and appeared ill for the duration of the study, while control rats appeared well. All tabulated data are mean values for the animals that survived 48 h after DEG dosing.

	DEG (mg/dl) 1, 24, 48 h	HCO ₃ ⁻ change (mmol/l)	Cr change (mg/dl)
Control (n=5)	344, 172, 34	-12.0	+1.26 (+485%)
Treatment (n=3)	313, 233, 216	+7.6	+0.13 (+40%)

Conclusions: In this preliminary rat model, the natural history of DEG poisoning is the development of metabolic acidosis and renal injury. Treatment of 4-MP seems to prevent these effects and slow the clearance of DEG. However, since sedation and mortality were only seen in rats given the antidote, it is conceivable that either parent DEG or high-dose 4-MP in this model may have inherent toxicity. These findings have important implications for future research.

2. The Use of Recombinant Carboxypeptidase G2 in the Rescue of Patients with Methotrexate Induced Renal Insufficiency

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Background: Methotrexate (MTX) serum concentrations can remain elevated in patients with renal failure after treatment with high-dose methotrexate (HD-MTX). This is a rare but life-threatening complication of such therapy. Carboxypeptidase G2 (CPG2; Voraxaze™) is a recombinant enzyme which cleaves MTX to a nontoxic metabolite (2, 4 -diamino-N-pterotic acid, DAMPA). An emergency critical care protocol has been developed and used in Germany to evaluate the clinical benefits of CPG2 therapy. **Methods:** Patients with $>5 \mu\text{M}$ MTX at 42 h or $>1 \mu\text{M}$, $>0.4 \mu\text{M}$ MTX in their serum at 42 h or 48 h after HD-MTX ($>1\text{g/m}^2$), if present with renal insufficiency (serum creatinine >1.5 times normal), were eligible for study entry. MTX and DAMPA were evaluated by HPLC. **Results:** Forty-two patients with acute leukaemia, lymphoma, or germ cell tumor (ages 10–78 yrs) were enrolled. Serum MTX in 24 patients ranged from 0.35 to $166 \mu\text{M}$ at the time of CPG2 dosing. CPG2 (10–58 units/kg) was subsequently given by intravenous infusion. Serum MTX fell to $\leq 1 \mu\text{M}$ or undetectable levels within 7–50 min post-CPG2 administration. In 21 of 39 patients with renal insufficiency, creatinine levels returned to normal ($<110 \mu\text{M}$) within a median of 18 days and to a median of $97 \mu\text{M}$ by the end of follow-up for all patients. **Conclusions:** CPG2 is a highly effective and promising rescue treatment for patients with delayed elimination of MTX.

3. Incidence and Outcomes of Patients with the Brugada Pattern in a Large Case Series of Tricyclic Overdoses

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Background: The Brugada electrocardiographic pattern (BEP) is rarely reported after TCA overdose (OD). We describe the incidence and outcomes of patients with a BEP after antidepressant (AD) OD. **Methods:** Two trained, blinded reviewers using a standard data collection sheet reviewed a database of previously collected AD ODs. BEP was defined as a RBBB pattern with ST elevation in leads V_1 - V_2 . Patients with isolated TCA OD (I-TCA) without co-ingestants were compared to all AD ODs with a BEP. Outcomes were death, dysrhythmias, seizures, widened QRS, hypotension, intubation, and admission to ICU. TCA was confirmed and co-ingestants excluded with laboratory testing. Descriptive statistics and relative risk (RR) were calculated. **Results:** A total of 389/618 AD ingestions involved a TCA, and 116 were I-TCA ODs and had a reviewable ECG. BEP occurred in 9 cases—2.3% of all TCA OD. All BEP patients ingested a TCA and 2 were I-TCA ODs. Median age and TCA level were similar (I-TCA 27.5 yr old vs. BEP 31 yr old; I-TCA 485 ng/mL vs. BEP 792 ng/mL). No deaths or dysrhythmias occurred in the BEP group. The RR in the BEP group compared to the I-TCA group for hypotension was 3.4 ($p=0.005$), seizure 3.0 ($p=0.08$), and wide QRS 4.8 ($p=0.032$). There was no statistical difference for ICU admission (RR 1.1) or intubation (RR 1.4). **Conclusion:** BEP is uncommon after TCA OD. Patients with BEP are not more likely to die or have dysrhythmias. They are more likely to have hypotension and a wide QRS; however, our sample of BEP cases was small.

4. Fomepizole Concentrations in Rat Fetal Tissue

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Background: Fomepizole has been utilized with remarkable success for poisonings from ethylene glycol and methanol, however, very little information is available regarding the safe and effective use of fomepizole in pregnancy. In this report we describe the findings from an animal model constructed in effort to investigate the kinetics of fomepizole in pregnancy. **Methods:** Pregnant Sprague-Dawley rats were administered fomepizole 15 mg/kg intraperitoneally on day 19 of the normal 21-day gestation period. The dams were anesthetized at 1, 4, and 12 h post administration, at which times serum, liver, kidney, and fetus tissues were collected. Tissue samples were prepared using methods determined from a pilot study and fomepizole concentrations were analyzed using HPLC. **Results:** Concentrations of fomepizole measured in fetal tissue were similar to those measured in the maternal liver and kidney tissue. As such, fetal tissue concentrations were about five fold higher than maternal serum concentrations on a per gram of tissue basis. The nonlinear elimination rate of fomepizole from maternal serum

was about 8 $\mu\text{mol/L/h}$, or slightly slower than that in male rats at the same dose. Elimination of fomepizole from fetal tissue followed a similar time course as that in the maternal tissues. *Conclusions:* Because significant concentrations of fomepizole were detected in the fetal tissue, fomepizole could afford significant protection against fetal formation of toxic methanol or glycol metabolites. Although the implications of these findings are obvious, the risk vs. benefit to the fetus cannot be fully elucidated from these data.

5. The Stability of Pralidoxime Solution After Discharge from a Mark-1 Autoinjector

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Objective: We sought to determine the chemical stability of pralidoxime solution after discharge from a Mark-1 autoinjector. The pralidoxime solution can be used to administer weight-adjusted doses to small children. *Methods:* Pralidoxime autoinjectors were swabbed with isopropyl alcohol and then discharged into emptied, sterile, plastic 10 mL vials. Samples were withdrawn using aseptic technique for analysis of pralidoxime by a validated stability indicating high-performance liquid chromatography method. *Results:* No evidence of significant degradation products appears up to 48 h after pralidoxime autoinjector discharge. Concentration without degradation of the solution was noted over time when the autoinjector needle caused coring of the vial closure. *Conclusion:* Mark-1 autoinjectors are not suitable for administering pralidoxime to small children. However, the autoinjectors are a readily available source of concentrated pralidoxime for administering weight-adjusted doses in small children. The pralidoxime solution obtained in this manner remains chemically intact for at least 48 h.

6. Status Epilepticus After a Massive Intravenous N-Acetylcysteine Overdose Leading to Intracranial Hypertension and Death

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Background: Cases of N-acetylcysteine (NAC) overdose have been reported before. In some cases, these overdoses have led to deaths if an anaphylactoid reaction was present. NAC is known to cause seizures in animal models at doses of $\geq 750\text{--}2625$ mg/kg. *Case Report:* A healthy 30-month-old girl was thought to have ingested 418 mg/kg of acetaminophen. Because the emergency physician feared the time of ingestion might not be accurate, he decided to start the 20.5 h IV NAC protocol. He mistakenly prescribed NAC 20% in milliliters, the intended maximum amount of dextrose 5% that could be administered to a child. The patient received a 4-fold error in dose during the first infusion, a 40-fold error during the second and the beginning of the third infusions. Overall, she received over 6 h and 40 min, a cumulative IV dose of 2462 mg/kg of NAC instead of 207.8 mg/kg. Five hours after the error was detected, she started developing myoclonus on the left side of her body and left eye deviation on and off for the next 3 h despite treatment. A first CT scan was normal. A few hours later she sustained shorter recurrences of the myoclonus. Twelve hours after the error was detected she started to have irregular breathing and became unresponsive to pain. A repeat CT scan showed diffuse cerebral edema. She was transferred to a tertiary care center for organ donation. A postmortem examination showed the presence of acute anoxic encephalopathy with marked cerebral edema and the beginning of uncal herniation that confirmed the clinical diagnosis of intracranial hypertension and brain death. *Conclusion:* A cumulative IV dose of 2462 mg/kg of NAC was associated with status epilepticus, intracranial hypertension, and death in a child.

7. Atypical Experience: A Case Series of Pediatric Aripiprazole Exposures

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Background: Aripiprazole is a new psychotropic agent that possesses a unique pharmacologic profile. The drug demonstrates mixed dopamine and serotonin agonist-antagonist activity and has been labeled a third-generation antipsychotic and dopamine-serotonin system stabilizer. Pediatric and overdose experience is limited. **Case Series:** *Patient 1:* A 2-yr-old female ingested 40 mg of her grandmother's aripiprazole. She vomited multiple times over a 14-h period and developed significant lethargy that lasted approximately 30 h. Her vital signs remained stable throughout her course. *Patient 2:* Daily therapy with aripiprazole 10 mg was initiated in a 6-yr-old male. Following his first two doses, the child exhibited lethargy, drooling, and seemingly flaccid facial muscles. The child was referred to the emergency department where his symptoms improved after the administration of diphenhydramine 25 mg. *Patient 3:* A 15-yr-old female ingested eight of her own aripiprazole 15 mg tablets. She was observed in the emergency department for 4 h but remained asymptomatic. *Patient 4:* A 15-yr-old male ingested 300 mg of his own aripiprazole. He received activated charcoal and was observed in the emergency department for 6 h. His EKG was unremarkable and he exhibited no clinical effects. *Patient 5:* A 16-yr-old female remained asymptomatic while in the emergency department for approximately 7 h after ingesting an unknown amount of aripiprazole. **Conclusion:** Aripiprazole is capable of producing marked lethargy and gastrointestinal upset in pediatric patients. Adolescents may well tolerate acute-on-chronic overdoses. Major clinical effects, i.e., seizures, dysrhythmias, were not reported in this series.

8. Pneumonitis and Respiratory Failure Secondary to Civilian Exposure to a Smoke Bomb in a Partially Enclosed Space

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Background: Smoke bombs are used as military screens or as smoke generators in training drills. They usually contain zinc oxide and hexachlorethane. Upon ignition, extremely hygroscopic zinc chloride is formed. This compound reacts with water to form highly corrosive hydrochloric acid and zinc oxychloride. When used in open air, these bombs are thought to be safe. **Case Report:** We report the exposure of a 25-yr-old male who was hiding in a semi-enclosed storm drain from the police, when he was exposed to a Superior 3C smoke bomb for 30 min. He immediately complained of coughing and was evaluated in a health care facility and treated with antibiotics in jail. The patient's condition worsened over the next 3 days, and he was then reevaluated due to respiratory distress. He developed bilateral pulmonary infiltrates consistent with the adult respiratory distress syndrome and required mechanical ventilation. His clinical course was complicated by bilateral pneumothoraces and subcutaneous emphysema. He underwent tracheostomy and remained ventilator dependent for 33 days. His outpatient follow-up showed pulmonary fibrosis and marked loss in pulmonary function. **Conclusion:** This case emphasizes the potential hazards of using zinc oxide smoke bombs in enclosed or even semi-enclosed spaces. The delay in the development of radiographic findings and the potential progressive worsening of symptoms should be kept in mind when evaluating such patients.

9. Lamotrigine-Induced Seizures in a Pediatric Patient

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Background: Lamotrigine is an antiepileptic agent that stabilizes neurons by preventing the release of glutamate. Seizures have not been reported in adults following overdose, even with levels as high as 35.8 mg/L; however, a 2-yr-old female is reported to have had seizures with a lamotrigine level of 3.8 mg/L. Suggested therapeutic range is 1–4 mg/L. **Case Report:** A healthy 19-month-old male, with no prior history of seizures, arrived at the emergency department soon after ingesting an unknown number of his mother's lamotrigine 25 mg tablets. Physical examination revealed tachycardia, inconsolability, and the following vital signs: HR 152–207 crying, RR 26, T 95.7, normal blood pressure, pupils 3 mm, and pulse oximetry 98% on room air. Approximately 20 min after ingestion, the child's nurse witnessed a full body seizure lasting 10 sec followed by one more brief self-limited seizure. The

child became increasingly irritable and had multiple episodes of vomiting. Activated charcoal 1 gm/kg was administered via a nasogastric tube. A lamotrigine level was 20.3 mg/L 1 h after ingestion. The child had an uneventful hospitalization and was discharged home 24 h later. The child was asymptomatic 1 week later. *Conclusion:* The second case of lamotrigine-induced seizures in a pediatric patient without serious cardiovascular toxicity is reported, with a level approximately five times the upper limit of the therapeutic range. We propose that the pediatric population may be at increased risk of seizures following lamotrigine poisoning and that lamotrigine serum levels may not be clinically useful for predicting outcome after overdose. However, further investigation is needed to confirm this hypothesis.

10. Hepatotoxicity in Acute Iron Poisoning

Tenenbein M, Robertson A. *University of Manitoba, Winnipeg, Canada.*

Background: Although liver injury is a known consequence of acute iron poisoning, its description is limited to several case reports. It appears to be dose-related, however, there are published reports of severe iron poisoning without liver injury. We reviewed our hospital's experience to gain a better understanding of the risk for hepatotoxicity after acute iron ingestion. *Methods:* We reviewed the medical records of all patients who were admitted for iron poisoning over a 20-yr period. Extracted data included routine demographics, ingested dose, time of ingestion, and the highest serum iron and hepatic transaminase concentrations. Iron poisoning was defined as a serum iron >300 µg/dl (54.5 µmol/L) within 12 h of ingestion. Hepatic injury was defined as a transaminase >150 U/L which is five times the upper limit of the reference range. Severe hepatotoxicity was defined as a transaminase >1000 U/L. *Results:* We found 72 patients who fulfilled our inclusion criterion. There were 60 iron poisoned patients (13 male) without hepatotoxicity. They were 1–48 yrs old. Their serum iron concentrations were 303–704 µg/dl (55–128 µmol/L). Nine of these patients had serum iron >500 µg/dl (91 µmol/L). There were 12 patients (2 male) with hepatotoxicity. They were 2–40 yrs old. Nine were severe (transaminase 2,430–13,000 U/L) and five of them died. The other four had transaminase values of 176–562 U/L and iron concentrations of 429–594 µg/dl (78–108 µmol/L). Transaminase elevation occurred within 48 h of ingestion in all and within 24 h in most patients. *Conclusion:* These data support hepatotoxicity due to acute iron poisoning as a dose-related phenomenon. Onset of hepatotoxicity occurs within the first 48 h after ingestion. The risk begins with serum irons of 400–500 µg/dl (73–91 µmol/L). Greater than 50% of iron-poisoned patients with serum iron concentrations >500 µg/dl (91 µmol/L) will have liver injury.

11. Acute Pancreatitis Following an Overdose of Erythromycin

Tenenbein MS, Tenenbein M. *University of Manitoba, Winnipeg, Canada.*

Background: Antibiotic overdose is typically regarded as a benign event. We present a 15-yr-old girl who developed pancreatitis following an overdose of erythromycin. *Case Report:* A 15-yr-old girl presented for care because of nausea, vomiting, and epigastric pain of a few hours in duration. The onset of symptoms was 2 h after an overdose of 16 erythromycin capsules of 333 mg. She had normal vital signs and other than epigastric tenderness, her physical examination was normal. Her symptoms improved in a few hours and she was discharged. Her serum lipase result was delayed because of a malfunction of the laboratory analyzer. It was later found to be 2,024 U/L (N<60). She was recalled for reassessment. Epigastric tenderness and guarding were the only physical examination abnormalities. Her serum lipase was 1,834 at 13 h after the first determination. She was admitted to the hospital and her symptoms and signs resolved over the next several hours. Her serum lipase was 73 U/L the following day and she was discharged home. *Conclusion:* Our patient had transient pancreatitis following an overdose of erythromycin. This antibiotic stimulates receptors of motilin, the gastrointestinal prokinetic hormone. It also stimulates tonic biliary contraction and has been shown to induce contractions of the sphincter of Oddi in animals. This would lead to an obstruction of biliary and pancreatic flow, which is a potential explanation for the pancreatitis. Our patient supports pancreatitis as a potential outcome of erythromycin overdose.

12. Serotonin Syndrome from Acute Olanzapine Overdose

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Background: Serotonin syndrome (SS) may occur from therapeutic use or overdose of medications that increase serotonergic tone. Atypical antipsychotics have only rarely been associated with SS, and all previous reports occurred with therapeutic dosing. Some toxicologists have expressed doubt that SS can occur in association with the atypical antipsychotic agent olanzapine. Indeed, some authors have even suggested using atypical antipsychotics to treat SS, as they are known to act as serotonin antagonists. We report a case of SS resulting from an acute isolated overdose of olanzapine. *Case Report:* A 36-yr-old man with a known prior psychiatric history presented to the emergency department (ED) after an intentional drug overdose. He rapidly developed ataxia, a progressively worsening mental status, neuromuscular symptoms (myoclonus; increased muscle tone, especially of the lower extremities), tachycardia, and hypertension. The presumptive diagnosis of SS was made based upon the patient's list of medications, which included sertraline and olanzapine; sertraline was the suspected overdose agent. Alternative causes of altered mental status were ruled out and the patient was admitted. When the patient's mental status cleared the following day, he reported having ingested ~700 mg olanzapine and none of the sertraline. Quantitative toxicologic testing revealed supratherapeutic olanzapine levels, while the sertraline level was undetectable. *Conclusion:* Serotonin syndrome may occur from acute overdose of olanzapine. The proposed mechanism is by displacing serotonin from the 5-HT₂ and 5-HT₃ receptors, thereby increasing the activity at unopposed 5-HT_{1A} receptor subtypes.

13. Topamax Toxicity in the Pediatric Population

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Background: Topamax is an FDA-approved second-generation antiepileptic drug with actions on voltage-dependent sodium and calcium channels and GABA and excitatory amino acid receptors. We report a 3-yr-old girl with persistent neurologic symptoms after acute ingestion of Topamax. *Case Report:* A 3-yr-old girl was picked up from the sitter's acting "spacey." The sitter later reported an empty bottle of Nyquil and Topamax (100 mg tablets) on the floor. Presenting to the emergency department 3 days postingestion, the child appeared confused and was only able to crawl. At one point, she looked directly at her mother and asked, "Where is my mommy?" She had visual hallucinations and screamed while pointing to "objects" on the wall. Neurologic exam was notable for slurred speech and severe ataxia. All laboratory testing, urine chemical dependency screen, ASA/APAP/ETOH, CSF, chest x-ray, head CT, and EEG were normal. Topamax level on third-day postingestion was 9.4 mcg/mL and 4.2 mcg/mL on the fourth day. The patient slowly became oriented to family and regained normal gait on the fourth day. Her slurred speech persisted until the sixth day after ingestion. *Conclusion:* Topamax is an antiepileptic drug with multifactorial mechanisms of action not entirely understood. We report here a 3-yr-old girl with prolonged neurologic symptoms including hallucination, slurred speech, and severe ataxia after acute Topamax ingestion. Prior report of one case study did not include hallucination or prolonged neurologic symptoms with acute Topamax ingestion.

14. Extracorporeal Albumin Dialysis Does Not Reduce Serum Drug Concentrations After Overdose with Sustained-Release Verapamil

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Background: Extracorporeal albumin dialysis (ECAD) is a novel liver support device with the potential to enhance elimination of highly protein bound drugs from plasma following overdose. We report a case of severe verapamil

poisoning where ECAD was utilized to enhance verapamil elimination. *Case Report:* A 50-yr-old man presented 8 h postingestion of 4.8 g of SR verapamil. He was alert, heart rate (HR) 30 bpm, BP 70/30 mmHg, RR 20/min. He had minimal response to multiple therapies including IV crystalloids, atropine, CaCl₂, glucagon, and epinephrine and norepinephrine infusions. Temporary cardiac pacing improved HR with minimal effect on BP. GI decontamination could not be performed as the patient had an ileus. Eighteen hours postingestion the patient became increasingly acidemic, anuric, and remained pressor-dependent. ECAD was commenced using a Molecular Adsorbent Recirculating System (MARS), Teraklin, Rostock, Germany. Serial serum [verapamil] and [norverapamil] were measured during 8 h of ECAD. The patient's clinical condition gradually improved but serum drug levels did not fall during ECAD. *Conclusion:* Verapamil is 90% protein-bound with a volume of distribution (Vd) of 5 L/kg. ECAD it did not reduce serum [Verapamil] or [Norverapamil] in this case report and is unlikely to be of benefit in the enhancement of verapamil elimination. ECAD may have more utility in the elimination of highly protein bound drugs with lower Vd (<1 L/kg), such as phenytoin or carbamazepine.

15. Profound Metabolic Acidosis and Oxoprolinuria After Acetaminophen Use

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Background: Severe metabolic acidosis is rarely seen after acetaminophen use. We report a case of profound metabolic acidosis and oxoprolinuria associated with a supratherapeutic acetaminophen level. *Case Report:* A 58-yr-old female is brought to the emergency department by her husband with confusion. Past medical history included depression, an eating disorder and ethanol, benzodiazepine, and analgesic abuse. On arrival she was disheveled, cachectic, and tachypneic; BP 171/93 mmHg, HR 80 bpm, RR 35 bpm, and T 32.5°C rectal. No odor was detected on her breath. Laboratory evaluation showed a K of 3.8 mEq/L, anion gap 31, lactate 3.1 mmol/L, APAP 49 ug/ml, AST 1308 IU, ALT 348 IU, INR 1.2 and ABG pH 7.02, pCO₂ 10, pO₂ 104. Osmol gap was 3 mOsm/L. Urine was negative for acetone. Methanol, ethanol, and ethylene glycol were not detected. An electrocardiogram showed sinus rhythm with a normal QRS and QTc of 564 msec. She was treated vigorously with bicarbonate, potassium chloride, and NAC. Her early course was complicated by profound hypokalemia and ventricular dysrhythmias. The acidosis resolved slowly over 48 h with a full recovery. Urine 5-oxoproline submitted the day of admission subsequently returned at 2350 mmol/mol creatinine (nl<100). *Conclusion:* Acidosis due to oxoproline (pyroglutamic acid) is a rare disorder most commonly diagnosed in infants with inborn metabolic errors of glutathione synthetase or oxoprolinase. Acidosis due to oxoproline is reported in adults with critical illness, often in association with acetaminophen use. It should be considered in the differential of a high anion gap metabolic acidosis in the setting of acetaminophen use.

16. Toxic Alcohol Evaluation of Pediatric Patients is Often Incomplete

DesLauriers C, Mazor S, Metz J, Mycyk M. *Illinois Poison Center, Toxikon Consortium, Chicago, IL.*

Background: Ethylene glycol (EG) and methanol (ME) poisoning has been frequently reported in pediatric patients, but hospital compliance with poison center recommendations is unknown. *Methods:* This is a 2-yr retrospective review of all suspected EG and ME ingestions in pediatric patients (age <10 yrs) reported to a regional poison center. All ingestions that the poison center considered serious enough to warrant hospital laboratory evaluation were included in the analysis. In all cases poison center staff recommended anion gap, osmol gap, EG, and ME levels. *Results:* Thirty-three cases met inclusion criteria. Mean age 2.9 yrs (range 1–10); 42% were male. Anion gap was calculated in 21/33 (64%) cases; osmol gap was calculated in 12/33 (36%). Before EG or ME levels were obtained, fomepizole was recommended in 12/33 (36%) cases and given in 5/12 (42%); fomepizole administration was delayed in 3/5 (60%) cases because the patient “was a child” and hospital staff did not consider toxicity a possibility. EG and ME levels were done

in 21/33 (65%) cases; an elevated level was measured in 5/21 (24%; 95%CI:4–44%) cases; fomepizole was administered before a level was reported in only 3/5 (60%) cases. In the fourth case the patient was discharged before a level was obtained: the hospital unsuccessfully called the patient back for re-evaluation after discharge. In the fifth case, fomepizole was given only after an EG level was reported. *Conclusion:* Although hospital workup is often inconsistent with poison center recommendations and toxic alcohol poisoning is uncommon in pediatric patients, toxicity is confirmed in one-quarter of cases when levels are obtained.

17. Atomoxetine (Strattera®) Exposure in Children

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Background: Atomoxetine uses a novel nonstimulant approach to the treatment of attention-deficit/hyperactivity disorder (ADHD) and is pharmacologically unrelated to other therapies used for ADHD, such as methylphenidate or clonidine. There have been no reports of overdose of atomoxetine in children or adults. *Method:* Prospective case series at three regional poison centers for atomoxetine ingestion. Exclusion criteria were poly-pharmacy ingestion or lack of follow-up. *Results:* Twenty-eight patients were reported, with 15 males (54%). The mean age was 5.8 yrs (S.D.±4.9) with a range 9 months to 17 yrs. Seventeen patients were managed at home, 10 managed in the hospital, of which 2 were admitted and 1 patient was managed in a physician's office. Symptoms reported were tachycardia (n=6), drowsiness (n=4), hypertension (n=2), and vomiting (n=2). Localized myoclonus was reported in 2 children (1 with a history of petite mal seizures)—1 patient after accidental ingestion and 1 patient on the second day after initiation of atomoxetine therapy. No arrhythmias beyond sinus tachycardia were reported. Mean maximum HR in those with tachycardia was 131 bpm (S.D.+ 14). The mean dose ingested categorized by medical outcome were no effect (n=17) 43 mg (S.D.±36), minor effect (n=8) 124 mg (S.D.±200), and moderate effect (n=3) 249 mg (S.D.±327). There were no major outcomes or fatalities. The lowest dose ingested with hypertension was 480 mg and occurred in a 14-yr-old female (136/95). Activated charcoal was given to 7 patients. No other therapies were reported. *Conclusion:* In this small case series, clinically significant effects requiring direct intervention did not occur. Myoclonus is previously unreported. GI decontamination and/or observation appear to be sufficient for accidental ingestion.

18. Hyperosmolality: Another Indication for Hemodialysis Following Ethylene Glycol Poisoning

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Background: Fomepizole has successfully treated ethylene glycol (EG) toxicity in patients with early presentations. Indications for hemodialysis (HD), despite fomepizole therapy, include significant, refractory acidosis or renal failure. We report a case of severe EG poisoning initially, stabilization with fomepizole but complicated by hyperosmolality. *Case Report:* A 50-yr-old woman was transferred to our medical toxicology service after a witnessed ingestion of EG-containing automotive antifreeze. Upon arrival, 3 h after ingestion, lab analysis revealed serum pH of 7.3 (base deficit of 14), anion gap of 29, CO₂ of 22, creatinine of 0.9, and a measured serum osmolality of 673 (osmolal gap of 344.5). Fomepizole was administered, and she was started on D5W with two amps of sodium bicarbonate. The serum EG level was reported at 1600 mg/dL. HD was held due to normal renal function and serum pH. However, the patient developed complications secondary to hyperosmolality; a significant osmotic diuresis (urine output of 11,550 mL over 12 h), and acute hyponatremia (174 mEq/L) not corrected with aggressive fluid administration. HD was initiated to acutely correct her fluid status and hyponatremia. *Conclusion:* A very high EG

level will lead to a significant increase in serum osmolality with possible fluid and electrolyte complications. Serum hyperosmolality should be considered as an indication for HD in a patient with EG poisoning.

19. Cyclobenzaprine and Prolonged Anticholinergic Toxicity, Hypotension, and Mild Intraventricular Conduction Delay

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Background: Cyclobenzaprine (CZ) overdoses have not been confirmed to produce clinically evident sodium channel blockade (wide QRS, hypotension); and anticholinergic effects uncommonly last >24 h. We report CZ OD with anticholinergic toxicity lasting 12 days, widened QRS, and hypotension requiring vasopressors. *Case Report:* A 60-yr-old man ingested 275 10 mg CZ pills and became comatose, requiring intubation within 40 min of ingestion. ECG revealed sinus tachycardia at 148 bpm with QRS=90 ms. He received 50 g activated charcoal via NG and 4 L NS IV for mild hypotension and was transferred to us. At 3.5 h after OD, HR=135 bpm, BP=140/90, T=98.6 R. Patient was comatose with 4 mm pupils, dry skin, and axilla. QRS was 94 ms. Two hours later SBP dropped from 150 to 60 and HR dropped to 100. Saline and bicarb boluses were given without effect and a norepinephrine infusion was begun with good response. On day 2 QRS=100 ms. Patient awoke with agitation and delirium on day 3. Mumbling speech, hallucinations, and confusion persisted after extubation on day 6 until day 12, by which time QRS had narrowed to 86 ms. Eleven plasma CZ levels were drawn during intoxication, and CZ level upon arrival was 460 ng/mL (10–30 ng/mL), decreasing to 58 ng/mL on day 10. Urine GC/MS showed only CZ and a trace amount of dextromethorphan. CYP450 2D6 and 3A4 genotyping revealed normal metabolic capacity. *Conclusion:* Large CZ ingestion may produce prolonged anticholinergic toxicity as well as some sodium channel blocking effects.

20. Tiagabine Overdose in a Toddler Resulting in Seizure Activity

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Background: Tiagabine (TGB) is a novel antiepileptic that acts by decreasing GABA uptake. The literature contains one report of an adult with epilepsy who ingested up to 1 g of TGB and developed status epilepticus. We report on a pediatric patient who ingested significantly less TGB but still developed tonic-clonic seizures. *Case Report:* A previously healthy, 13 kg, 2-yr-old girl developed generalized tonic-clonic seizure activity at home approximately after 1 h of ingesting 90 mg of her grandmother's TGB (45 2 mg tablets). At the hospital she had two more seizures at 1.5 and 3.5 h postingestion. The seizures were generalized tonic-clonic lasting a couple of minutes and responding to 0.5 mg IV lorazepam. Her serum TGB levels were 530 and 130 ng/mL approximately 5 and 11 h postingestion (5–70 ng/mL trough levels with most probable range for seizure control). She was discharged home 27 h postingestion in good condition. *Conclusion:* TGB is a novel antiepileptic that can cause convulsive seizures in overdose. Poison Centers should realize that a safe pediatric exposure to TGB has not been determined and should triage cases accordingly.

21. Acute Hydroxychloroquine Ingestion Treated with Intravenous Diazepam-Case Report and Literature Review

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Background: Intentional massive hydroxychloroquine overdose is often fatal, even with aggressive supportive care. Limited evidence suggests that treatment with high-dose IV diazepam and electrolyte replacement may be life-saving. **Case Report:** A 37-yr-old female, with history of lupus and depression, presented 1 h after ingesting 12 g of hydroxychloroquine and 6 to 9 g of acetaminophen. Initial vital signs were within normal limits. She was somnolent but arousable with otherwise normal physical and neurologic exam. Initial ECG was normal. She was hypokalemic (1.6 mEq/L, normal 3.5–5.5 mEq/L) and hypocalcemic (ionized Ca 0.39 mEq/L, normal 2.24–2.46 mEq/L). She received IV diazepam (120 mg) bolus then a continuous infusion of 120 mg/24 h. Repeat ECG 1 h later demonstrated a PR of 214 msec, QRS 112 msec, and QTc 465 msec. After potassium was given, her serum K⁺ measurements were 2.9 mmol/L and 3.3 mmol/L. Hydroxychloroquine levels were 3.0 mcg/mL, 2.7 mcg/mL, and 0.5 mcg/mL, on days 1, 1.5, and 3 of her course (Ref. 0.1–1.0 mcg/mL). The 4 h acetaminophen level was 198.3 mcg/mL. IV infusion of diazepam continued until hospital day 4, without hemodynamic instability. She received a 72 h course of N-acetylcysteine. She was transferred out of the ICU on hospital day 6. **Conclusion:** This young woman presented after ingesting 12 g hydroxychloroquine. Overdoses of this magnitude often have fatal consequences. Rapid, aggressive treatment with diazepam and potassium repletion likely aborted the expected ventricular dysrhythmic effects of hydroxychloroquine.

22. Cardiac Conduction Disturbances Secondary to Chronic Abuse of Loperamide: An Initial Case Report

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Background: Loperamide is a widely used over-the-counter antidiarrheal medication. CNS depression is the most commonly reported toxic effect. Cardiovascular effects have only been reported once, in a child, and in animal studies. **Case Report:** A 30-yr-old, previously healthy male presented after multiple syncopal episodes. Initial ECG showed an accelerated idioventricular rhythm with alternating bundle branch blocks. Electrolytes were normal; urine drug and comprehensive toxicology screen were negative. Further history revealed that the patient had been taking approximately 400 mg of loperamide per day for several weeks. Loperamide level on hospital day 2 was 22 ng/mL, three days after the last loperamide dose (Ref. 0–2 ng/mL). His hospital course was complicated by several episodes of nonsustained ventricular tachycardia and cardiac arrest with successful resuscitation. Cardiac catheterization and electrophysiology studies were unremarkable. At the time of discharge his cardiovascular manifestations had resolved, except for persistent T wave inversions throughout the precordium. Subsequent follow-up 1 month later showed complete normalization of his ECG. **Conclusion:** This is the first case report of an adult with cardiac conduction disturbances following chronic high-dose loperamide use. Negative toxicologic screens, cardiac studies and normal electrolytes, and resolution of cardiac abnormalities after loperamide cessation leaves no other plausible explanation for this presentation.

23. A Case of Disseminated Intravascular Coagulation (DIC) After Intravenous Injection of Methadone Capsules

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Introduction: Methadone maintenance treatment for opiate addicts is widely used in Switzerland. Methadone is generally distributed as a liquid but in some cases also as tablets or gelatinous capsules to prevent erroneous intravenous application. For the purpose of making liquid methadone gelatinous, some pharmacists use kaolin. **Case Report:** A 55-yr-old man on methadone maintenance therapy (30mg/d) was admitted to an emergency department 30 min after intravenous injection of gelatinous contents of two capsules of methadone, dissolved in NaCl 0.9%. He

showed a heart rate of 110/min and a blood pressure of 80/40 mmHg. Initial laboratory data included white blood cell count of 18.0 G/l (normal range 4–10), platelets 229 G/l (150–400), INR 4.0 (0.9–1.2), PTT 43 sec (28–40), and fibrinogen 0.3 g/l (1.8–3.5). At 2.5 h later, platelets decreased to 128 G/l and fibrinogen to 0.1 g/l, INR was 3.47 and PTT 43 sec. After 18 h fibrin D-dimers were elevated >10 mg/l (<0.49). The evolution was uneventful with normalization of coagulation parameters within 24 h. Analysis of the gelatinous methadone capsules revealed that they contained 110 mg kaolin in addition to 30 mg of methadone *Conclusion:* We hypothesize that our patient developed DIC after intravenous administration of methadone capsules containing kaolin. However as no other coagulation factors than fibrinogen were measured quantitatively, a pure hyperfibrinolysis cannot formally be excluded, although the thrombopenia makes it unlikely. Since kaolin is well known to activate the intrinsic pathway of coagulation, it should no longer be used as adjuvant in capsules containing drugs of abuse.

24. Valdecoxib (Bextra®) Overdose: A Case Series

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Background: Valdecoxib (Bextra®) is a COX-2 inhibitor, nonsteroidal anti-inflammatory drug (NSAID), approved by the FDA in October 2001. During clinical trials, compared to other NSAIDs, there were lower rates of gastroduodenal ulcers, and platelet function was not inhibited, but there were similar rates of allergic reactions. Overdose experience is very limited. *Methods:* Poison center retrospective case series of isolated valdecoxib overdose exposures are reviewed. *Results:* Between December 2002 and February 2004, 51 isolated valdecoxib exposures were reported to three poison centers. Reasons for exposure were the following: 26 unintentional-general; 13 therapeutic error; 7 adverse reaction; 3 intentional suicide; and 2 intentional misuse. There were 42 acute, 5 chronic, and 4 acute-on-chronic exposures. Mean age was 18.1 yr (range 0.9 yr–84 yr); 27 female, 24 male. The mean valdecoxib dose was 2.6 mg/kg (range 0.3–5.1 mg/kg; 5–360 mg). Forty patients were managed at home and 11 at a health care facility (HCF). No patient managed at home required subsequent HCF evaluation. Six patients (12%) became symptomatic, with complaints variously of abdominal pain (2), nausea, vomiting, and diarrhea (1), hives/itching (3), tachycardia (1), and drowsiness/lethargy (2). The mean dose of symptomatic and nonsymptomatic patients was 4.1 mg/kg and 1.5 mg/kg, respectively. Managements were the following: 14 observed only; 29 given food or fluid to dilute exposure; 1 given antihistamine; 2 had induced emesis; 1 received activated charcoal; and 2 received IV fluids. Outcomes were the following: 6 minor effect (three admitted); 17 no effect; 24 not followed/minimal clinical effects possible; 3 unrelated effect; and one unknown. *Conclusion:* Single-agent exposures to valdecoxib at or below 5.1 mg/kg produced no effect or minor effects. Unintentional exposures were generally managed at home without adverse results.

25. Green Skin Discoloration After Blue Dye Per Rectum in a Neonate

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Background: FD&C blue dye toxicity has been previously reported in elderly patients receiving blue dye in enteral feedings. This is the first reported case of green skin discoloration in a neonate. *Case Report:* A 19-day-old ventilator-dependant premature infant received blue dye per rectum during an evaluation for a fistula between his intestine and bladder. Ten cc of blue dye was diluted in 20 cc of normal saline and inserted per rectum. One-and-a-half hours later the baby's urine and stool turned green. Five hours later the baby's skin turned green. Physical exam revealed T: 98.6 F, mean arterial pressure: 50, HR: 158, RR: 40 on the ventilator. Other than the green skin color, his physical examination remained unchanged. His methemoglobin (MHb) level was 4.1%. On postdye day number 2, his MHb level peaked at 5.3%. That night his blood pressure and urine output decreased so he was started on dopamine and given boluses of IV crystalloid. He stayed on dopamine for approximately 48 h. Over the next 4 days

his MHB level decreased and his skin color reverted to its baseline yellowish hue. His CBC remained unchanged, and he demonstrated no evidence of hemolysis. His newborn screen for G6PD was negative. On postday number 8 he was advanced to age-appropriate nutrition and has since returned to his baseline condition. *Conclusion:* Precautions using FD&C blue dye are necessary in patients with increased gastrointestinal absorption due to the potential for oxidative stress. In patients with increased gastrointestinal absorption, a smaller dose than standard and careful monitoring for oxidative stress as evidenced by rising MHB levels, metabolic acidosis, or hypotension is prudent.

26. QRS Prolongation Associated with Bupropion Ingestion

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Background: Bupropion is an aminoketone antidepressant and smoking cessation aid whose exact mechanism of action has not been identified. It is believed to inhibit dopamine, norepinephrine, and serotonin reuptake. Conduction delays have rarely been associated with bupropion use. *Case Report:* A 45-yr old female ingested 80 tablets of bupropion SR 200 mg and an unknown quantity of over-the-counter “sleeping pills” 45 min prior to emergency department presentation. Gastric lavage and activated charcoal were instituted. One episode of spontaneous emesis occurred 3½ h after ingestion and 18 bupropion tablets were seen. Initial EKG 5 h postingestion revealed a QRS of 74 ms. The patient became agitated and developed visual hallucinations. IV diazepam was administered for several short generalized seizures 5 h postingestion. The QRS was 130 ms 11 h postingestion, and 122 ms 15 h postingestion. The QRS did not narrow after 3 amps of NaHCO₃. Plasma bupropion level 14 h postingestion was 1266 ng/mL (reference range 25–100 ng/mL). Conduction delays persisted for 24 h. The patient developed aspiration pneumonia and had a stormy ICU course. *Conclusion:* Bupropion was thought to be devoid of cardiotoxicity when first marketed. We found four cases of bupropion-induced QRS prolongation in the literature. This case is significant for having 1) ingested the largest amount of bupropion and 2) the highest documented nonfatal plasma bupropion level. Bupropion may cause conduction delays similar to the tricyclic antidepressants in the overdose setting by an unknown mechanism.

27. Take Too (Many) ASA and Call Me from the Morgue

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Objective: To review fatalities from salicylate overdose to determine if there is need for a lower dialysis threshold and whether the presence of co-ingestants would impact the fatal salicylate level. *Methods:* A retrospective analysis was performed on salicylate fatalities coded as an acute ingestion and reported to the AAPCC TESS database from 1986–2003. The age, peak salicylate level, time of ingestion (if available), co-ingestants, and serum level of co-ingestant (if available) were analyzed using SPSS (v 11.5). The cases were then stratified into age (year) quartiles (I=0 to 30, II=30.1–50, III=50–75, IV=75.1 or older) and the mean salicylate level was compared. All co-ingestants were classified into the following categories: CNS depressants, stimulants, agents that could cause metabolic acidosis, and acetaminophen. *Results:* The mean salicylate level for all fatalities (n=427) was 98.6 (±52.2 SD) mg/dL. There was a statistically significant difference between group I and groups III and IV (I vs. III mean difference –23.2, SE 6.85, 95% CI 5,41.4, P<0.01; I vs. IV mean difference –32, SE 9.6, 95% CI 6.6,57.4, P<0.01), but no statistically significant difference when comparing the other quartiles' levels with each other. There was also a statistically significant decrease in the mean fatal salicylate level when there was a co-ingestant and a lower level still when the co-ingestant was a CNS depressant (Non-co-ingestant—100.6 mg/dL; co-ingestant—95.8 mg/dL; CNS depressant—90 mg/dL) (p<0.05). *Conclusion:* The mean peak salicylate level in fatalities is decreased in patients where there are co-ingestants, particularly if the co-ingestant is a CNS depressant, and in patients older than 50 yrs. With a mean overall fatal level of 98.6 mg/dL,

more aggressive treatment modalities, such as dialysis, should be considered at much lower levels than currently recommended.

28. Use of Sublingual Olanzapine in Serotonin Syndrome

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Background: A number of agents have been proposed for the treatment of serotonin syndrome. The most commonly used agent, cyproheptadine, can only be used orally and would be ineffective if given after activated charcoal. Parenteral chlorpromazine can be used but it has a number of other side effects. Olanzapine is a potential treatment because of its high affinity, as an antagonist, to the 5HT receptor. A dose of 5 mg a day produces >90% saturation of the 5-HT₂ receptor. *Methods:* This case report is of a 33-yr-old female presenting 9 h after the deliberate ingestion of 2.1 gm Venlafaxine XR, 2.4 gm Sodium Valproate EC 200mg x 12 and 6 gm of acetaminophen. On examination, she was anxious, agitated, diaphoretic, tachycardic with a HR of 120/min, bilateral horizontal nystagmus, generalized increased muscle tone and clonus. Within an hour of arrival 50 gm of activated charcoal was given. A diagnosis of serotonin syndrome was made. The patient was given 10 mg sublingual olanzapine. *Results:* Twenty minutes after the olanzapine the patient had complete resolution of all symptoms. She was no longer agitated and had a normal mental state enabling a full psychiatric history to be taken. As a precaution she was observed for a further 24 h without the return of any serotonergic symptoms. *Conclusion:* Olanzapine is an effective treatment for serotonin syndrome due to its high affinity for the 5-HT₂ receptor. It has advantages over cyproheptadine as it can be absorbed sublingually and appears to have fewer side effects than chlorpromazine. It may also allow earlier discharge. Any comparison of serotonin syndrome treatments should include olanzapine.

29. Acute Poisoning of Yam Bean Seeds: Clinical Manifestation Mimicking Acute Cyanide Intoxication

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Background: The yam bean is native to the American tropics and naturalized in southern Florida, but it was carried to Asia and the Pacific Islands later. Yam bean is a common food for some vegetarians in southern Taiwan. However, its seeds are rarely consumed. We report a case of yam bean seeds poisoning in Taiwan. *Case Report:* A 54-yr-old female vegetarian suffered from severe abdominal cramping, diarrhea, and vomiting about 2 h after eating a large quantity of soup containing plant seeds. She felt difficulty breathing and lost consciousness 1 h later. She was initially sent to a local hospital where gastric lavage, activated charcoal, and endotracheal intubation were given there. After arriving in our ED, initial physical examination revealed dilated pupils and coma with no focal neurological signs. The initial blood pressure was normal. Laboratory data showed severe anion gap metabolic acidosis, with a serum lactate level of 185 mg/dl. No serum osmolar gap, renal, or hepatic failure was noted. The initial impression of cyanide intoxication was made, and she was given sodium nitrite and sodium thiosulfate intravenously. Hypotension ensued shortly and pulmonary artery catheterization showed a decreased cardiac index. Aggressive fluid and inotropic therapy were given, and the patient eventually recovered. The blood cyanide level of patients was negative. *Conclusion:* Acute poisoning of yam bean seeds can mimic acute cyanide intoxication. Careful monitoring of cardiac function and aggressive supportive treatment may be necessary.

30. Fenfluramine Flashback

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Background: Fenfluramine, a racemic mixture of dextro- and levo-fenfluramine, was previously prescribed in combination with phentermine for the purpose of weight loss. The FDA removed it from the market in 1997 because of an association with valvular heart disease and pulmonary hypertension. We report a case of significant toxicity from fenfluramine purchased in 2002. *Case Report:* A previously healthy 31-yr-old female was found comatose beside an empty bottle of fenfluramine. A total of 120 10 mg tablets were missing. She presented to the ED comatose, afebrile, tachycardic (120 BPM), hypotensive (BP 80/60 mm Hg) and in need of airway protection. Eye exam showed dilated pupils at 8 mm bilaterally with horizontal nystagmus, and her extremities were moderately rigid. Significant laboratory results included an anion gap of 18, undetectable salicylates, and acetaminophen in the serum, and a qualitative urine toxicology screen positive for amphetamines. The patient was treated with benzodiazepines, had an uncomplicated course, and was extubated 2 days after admission. Confirmatory serum levels of fenfluramine and norfenfluramine were 2480 ng/mL (therapeutic; 35–380 ng/mL) and 330 ng/mL (steady-state levels following daily doses; 60–160 ng/mL) by GC/MS, respectively. The patient admitted to buying fenfluramine over the Internet as well as from a local herbalist. *Conclusion:* This case illustrates some of the manifestations of acute poisoning secondary to fenfluramine, a banned anorectic agent that can still be purchased illicitly. Products withdrawn or taken off the market by the FDA may still pose a threat to the population at large.

31. Prospective Multi-Poison Center Study of Ziprasidone Exposures

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Background: When compared to other atypical antipsychotic agents, ziprasidone is associated with greater incidence of QTc interval prolongation in therapeutic use. Prolongation of the QTc interval can lead to Torsades de Pointes and sudden death. The likelihood of QTc prolongation after acute ziprasidone overdose is unknown. We conducted a multi-poison center prospective study to assess the assumption that ziprasidone overdose would not lead to significant QTc prolongation (QTc > 440 msec). *Methods:* Case forms were sent to six participating centers and data collection began in September 2003. Case exclusion criteria were the following: 1) coingestants known to prolong the QTc interval, 2) patient not followed to known outcome, 3) history of arrhythmia, uncompensated heart failure, recent myocardial infarction, or long QT syndrome. *Results:* Twenty-one cases met inclusion criteria. Acuity breakdown revealed 3 acute exposures, 16 acute-on-chronic, 1 chronic, and 1 unknown. All patients were managed in a health care facility, with two requiring intensive care unit admission. The most common clinical effects reported were drowsiness (10 patients) and tachycardia (8). Two patients developed QTc prolongation. The first patient, an 18-yr-old female, ingested an unknown amount of her own ziprasidone. EKG performed 2 h postingestion revealed the following: HR 87 beats/min, QRS 100 msec, QT 436 msec, QTc 523 msec. The second patient, a 51-yr-old male, ingested 1040 mg of his own ziprasidone. Initial EKG results (6 h postingestion) included HR 70 beats/min, QRS 90 msec, QT 300 msec, QTc 320 msec. Repeat EKG performed 4 h later measured QT 470 msec, QTc 510 msec, with no change in heart rate. *Conclusion:* These data demonstrate the potential occurrence of QTc prolongation in association with ziprasidone overdose.

32. Unreported Symptoms Seen in a Series of Topiramate Overdoses

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Objective: To determine the characteristics of a topiramate (TPM) overdose and to establish a mg/kg send-in level. *Methods:* All blinded cases of TPM as the sole ingestant from the years 2002–2003 were examined. Data points obtained were age, sex, dosage, type of exposure, reason, symptoms, treatment, onset, duration, and outcome. *Results:* There were 76 TPM cases followed to known outcomes. Ages: <6 yr: 17, 6–12 yr: 4, 13–19 yr: 19, ≥20 yr: 36. Sex: M, 26, F, 50. Type of exposure: acute 52, chronic 7, acute on chronic 17. Reason: unintentional general 16, therapeutic error 21, suicide 30, abuse/intentional. Misuse 5, adverse reaction 4. Symptoms: sedation 13, tachycardia 10, N/V 9, agitation 6, dizziness 6, confusion 4, hypokalemia 3, tremors 2, seizures 2, hypotension 2, HTN 2,

abdominal pain 2. No hyperchloremic acidosis or coma was seen. Therapy: observation 48, charcoal 24, IV fluids 6, potassium 3. Onset: 21/24 (87.5%) had symptom onset within 2 h. Duration: <2 h: 3, <8 hr: 17, <24 h: 5, <3 days: 6. Outcome: no effect 37, minor 35, moderate 4, major 0. Evaluation of mg/kg amounts ingested: children \leq 3-yr old that ingested up to 9 mg/kg and were observed only, had minor or no effects. Patients 12 yrs old and older ingesting up to 500-mg were observed only and had no effect or minor effects. *Conclusion:* Topiramate overdoses commonly result in sedation, tachycardia, and GI symptoms. Seizures are rare. Although not previously reported in topiramate overdoses, tachycardia was reported in 10 cases (HR=100–113) and hypokalemia was reported in 3 cases (K=2.0–3.2). Onset of symptoms is within 2 h. The vast majority of patients do well, resulting in minor or no effects. In children \leq 3 yrs old, ingestions of up to 9 mg/kg can be safely observed at home. Accidental ingestions of up to 500 mg by teens and adults can be safely watched at home.

33. Reasons for Outpatient Pediatric Medication Error

Stremski E. *Children's Hospital of Wisconsin Poison Center, Milwaukee, WI.*

Objective. Most literature on therapeutic medication error discusses inpatient administration. This analysis looks at errors made in the outpatient delivery of medications to pediatric patients. *Methodology.* This was a 3-yr review of a poison center's unintentional therapeutic errors (UTE) in patients \leq 19 yrs old, exposure site was not a health care facility. Cases categorized by four age groups and whether or not the error was made by a health care professional. Cases having a serious injury were defined as those that required a critical care intervention (INT) or ICU observation (OBS). TESS scenarios were grouped as a dose error, timing error, or an incorrect medication. *Results.* A total of 5,220 cases were identified, representing 6% of all human exposure cases, and 54% of all UTEs for the time period. Ninety-seven percent occurred in a residence, 2% in schools, 89% were single substance.

Age group	Dose error	Timing error	Incorrect med	Total	Percent of ages
\leq 2 Y	991 (52%)	705 (38%)	180 (10%)	1,876	39%
3–5 Y	492 (50%)	360 (36%)	129 (14%)	981	21%
6–12 Y	514 (38%)	538 (40%)	272 (22%)	1,324	28%
13–19 Y	254 (42%)	230 (38%)	116 (20%)	600	13%
Total	2,251	1,833	697	4,781	X ² p-value=0.001

In 22 cases with serious injury criteria there was no difference in the age distribution (5,7,5,5). Twelve cases were due to dosing errors and 10 due to an incorrect medication. Six cases needed INT and 16 were OBS. There were 6 cases of professional error, all from the dispensing of a wrong medication. *Conclusion:* Serious injury was an infrequent complication. Older age groups more often accounted for errors involving a wrong medication, while errors made in young age groups were more often due to dosing. Improper timing and incidence of serious injury did not differ by age.

34. Scombroid-Induced Myocardial Ischemia

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Background: Scombroid toxicity usually manifests with prominent dermal and gastrointestinal symptoms. We present a case of scombroid-induced myocardial ischemia with no dermatologic findings. *Case Report:* A 78-yr-old Filipina woman was brought to an emergency department by ambulance with lightheadedness and weakness after eating mackerel. She described myalgias, left-sided shoulder and neck pain, but denied chest pain, nausea, dyspnea, pruritis, or dermal irritation. She was taking isoniazid for previous positive PPD but was otherwise in good health.

Initial vital signs revealed normothermia, a blood pressure of 66/43 mm Hg, respirations of 18/min, and her heart rate of 55/min with multiple premature ventricular contractions on the monitor. She was alert with no skin rashes or lesions. ECG revealed ST depressions suggestive of lateral wall ischemia. The hypotension did not respond to 4.5 L of normal saline, diphenhydramine 25 mg, or an infusion of dopamine, but normalized after a single dose of 0.1 mg of subcutaneous epinephrine. Serial serum troponins peaked at 18.3 ng/mL. Echocardiography was normal and heart catheterization revealed mild fixed non-obstructive coronary artery disease with 30% occlusion of small portions of the right coronary, left anterior descending, and circumflex arteries. The patient had a full recovery. A sample of the ingested fish was found to contain levels of histamine at 1000 parts per million (20 times the federal action level). Previous studies have demonstrated histamine-induced ventricular automaticity and provocation of coronary vasoconstriction with intravenous histamine in patients with fixed nonobstructive coronary disease. In addition, isoniazid inhibits the metabolism of histamine. *Conclusion:* Scombroid-induced myocardial ischemia without skin manifestations is a rare and serious complication that has not previously been reported.

35. Methylphenidate Ingestions: Comparison of Drug Formulations

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Objective: To determine if the amounts at which patients develop symptoms vary for immediate (IM), intermediate (IT), and long-acting (LA) dosage forms of methylphenidate. *Method:* All blinded cases of methylphenidate as the sole ingestant for the years 2002–2003 were examined. Data points obtained were age, sex, drug formulation, dosage, type of exposure, reason, symptoms, therapy, onset, duration, and outcome. *Results:* There were 329 methylphenidate cases followed to known outcome: 139 IM, 38 IT, and 152 LA. Demographics: M, 178, F, 151; Age: <6 yr: 99, 6–12 yr: 122, 13–19 yr: 62, ≥20 yrs: 39. Children <6 yr were the primary victims with IM and IT forms, ages 6–12 predominated in the LA group. Acute 176, Chronic 10, Acute on chronic 142. Reason: unintentional gen. 103, therapeutic error 140, suicide 36, abuse 19, ADR 8, intentional misuse 25. Symptoms: tachycardia=89, agitation/hyper/anxiety=72, HTN=25, tremors=21, drowsy=16, N/V/D=15, insomnia=14, seizure=1. Tx: observation: 218(66.3%), charcoal: 91(27.7%), sedation 16(4.9%). Onset: Most cases had sx within 6 h. Duration: 59.3% had sx resolve ≤8 h, 90.4% had sx resolve by 24 h. Outcome: No effect 162, minor 132, moderate 35, major 0. Outcomes of 50 IM ingestions at ≤1 mg/kg with only observation caused no effect in 33 and minor in 17. Ingestion of 11 IT products from 1–2.2 mg/kg with only observation resulted in no effect in 5 and minor in 6. Fifty-eight double-dose ingestions of LA formulations at ≤4 mg/kg with observation only resulted in no effect in 42 and minor in 15. *Conclusion:* All products cause sx within 6 h, resolving in 24 h. Ingestions of >1 mg/kg for IM products should be sent in. Therapeutic errors of LA product up to 4 mg/kg can be observed at home, if not chewed. There is not enough data to confirm a send-in level for IT products, although <2.2 mg/kg appears to be safe.

36. Carbetapentane Toxicity Presenting as a Pseudo-Parkinsonian Reaction

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Background: Carbetapentane (pentoxyverine, CBP) is a non-opioid antitussive present in prescription cough medications. It is relatively new and little is known about its toxic side effects. This drug has a high affinity for sigma receptors similar to haloperidol and blocks NMDA effects in the CNS as well as binding to dopamine 3 receptors. *Case Report:* A 15-yr-old male was found in the bathtub staring and unresponsive. He had a diagnosed upper respiratory tract infection treated for 4 days with cefdinir and a cough and cold preparation containing carbetapentane tannate, chlorpheniramine maleate, and phenylephrine HCl. He had a history of asthma and was maintained on fexofenadine HCl, and montelukast sodium. Levothyroxine was in use for obesity. On physical exam

he was responsive to deep pain with posturing only. His facial expression, grimace, eyes open, and waxy rigidity were consistent with Parkinson's disease. He had no purposeful responses but increased his rotary hand movements, became agitated, and had coarse tremor when stimulated. He was intubated and mechanically ventilated for three days. An in-depth investigation did not reveal any other etiology. He spontaneously improved and was removed from the ventilator. His neurologic status improved to normal over several days. *Conclusion:* The manufacturer noted a single case of agitation and decreased mentation in a preadolescent treated with cefdinir and a cough and cold preparation containing carbetapentane tannate, chlorpheniramine maleate, and phenylephrine HCl. Propiverine, a structural analog, has been reported to cause 2-week-long Parkinsonian symptoms, and both propiverine and CBP cause catalepsy in mice. Poison centers are encouraged to observe and report any similar events associated with this new drug.

37. Accidental Overdose of Digoxin in a 9-Minute-Old Neonate

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Background: We describe the successful treatment of a 9-min-old child who was given a potentially lethal dose of digoxin. *Case Report:* The healthy 3 kg girl was delivered uneventfully and had 1 and 5 min APGAR scores of 6 and 6. She was given what was believed to be 0.4 mg of naloxone IM for respiratory depression and cyanosis. Ten minute APGAR was 9. The child was transferred to newborn nursery with normal HR and BP. Three hours postinjection, she developed an irregular bradycardia with a HR of 80 and a BP of 68/46. Staff realized that digoxin 0.5 mg was accidentally given instead of naloxone. Labs drawn at this time revealed a digoxin level >4 ng/mL and K⁺ of 8.3 mEq/L, and the patient was given 5 mg of Digibind™. The poison center was contacted and advised administering the rest of the vial of Digibind™ (for a total of 39 mg), and that the child may need further Digibind™ depending upon symptoms. Four hours post-digoxin injection, she developed apnea and ventricular tachycardia. She received CPR and lidocaine and had return of spontaneous circulation without the need for electrical cardioversion. The infant had a total of five episodes of VT or asystole in the next hour requiring CPR. She was treated with calcium gluconate (300 mg), NaHCO₃, and insulin+glucose for a potassium level of 9.4 mEq/L. She received a total of 105 mg of Digibind™ in the 4 h after the overdose was recognized. She was extubated on day 2 and was released from the hospital asymptomatic on day 9. *Conclusion:* This case demonstrates the safe use of calcium and large quantities of Digibind™ after an accidental overdose of digoxin in a newborn.

38. Aspiration Hazards of Emollient Cosmetic Products

Burda A, Metz J, Sims J, Wahl M. *Illinois Poison Center, Chicago, IL, USA.*

Background: Ingestions of emollient-based cosmetics are generally managed as nontoxic or as minimally toxic exposures. We present a case series of six pediatric ingestions of emollient cosmetic products, each with signs and symptoms of pulmonary aspiration. *Case Series:* Between December 2001 and February 2004, our poison center was consulted on six patients, ages 13 months to 2 yrs, who aspirated emollient cosmetics. All were treated in an emergency department. SX: vomiting (5); cough (4); tachypnea (4); fever (5); wheezing, retractions, grunting, or respiratory distress (3); and infiltrates on CXR (6). All were treated supportively. TX: nebulized beta-agonists (3); antibiotics (2); and supplemental oxygen (3). None required intubation. Two were admitted to a pediatric intensive care unit. All six patients recovered. Two of four products had child safety closures; one product was implicated in three cases. The products and major ingredients per MSDS are as follows: 1) Proclaim hair polisher: Cyclomethicone, dimethiconol. 2) Lancome Bi-Facil Double Action Eye Makeup Remover: Cyclomethicone, cyclopentasiloxane, cyclohexasiloxane, dimethicone, Dimethicone Copolyol. 3) Pink Oil Moisturizer Glosser: Paraffinic and aliphatic hydrocarbons. 4) Maxi Pro Hair Polish Vita Shine: Cyclomethicone, dimethicone.

Conclusion: Emollient cosmetics containing paraffinic hydrocarbons or silicone derivatives can pose a significant poisoning hazard to small children. Measures such as improving child-resistant packaging and prominent warning labels should be implemented.

39. Hemodialysis Clearance of Metronidazole Following Overdose

Burda A, Fischbein C, Howe T, Wahl M. *Illinois Poison Center, Chicago, Herrin Clinic, Herrin, IL.*

Background: Hemodialysis (HD) clearance of metronidazole (MET) following standard therapeutic dosing has been described. Amounts removed range from 24–45% of administered doses. Information regarding clearance following acute overdose, however, is lacking. MET pharmacokinetics are peak oral absorption 1–2 h; bioavailability >90%; VD 0.25–0.85 L/kg; protein binding <20%; T-1/2 6–14 h; 6–18% excreted unchanged in urine; extensive hepatic metabolism, MW=171. Kinetics are unaltered in renal disease. *Case Report:* A 62-yr-old, 76 kg man with a PMH of CRF, DM, HTN, CHF, atrial fibrillation, OCD, RLE amputation, and Parkinsonism ingested 17 tablets of MET 500 mg (8.5 gm) the morning of his scheduled dialysis. No GI decontamination was performed. Predialysis BUN=80 mg/ml, SCr=9.2 mg/dl, and AST=21 U/L. The 9.5 h postingestion venous plasma MET (predialysis) level was 120 mcg/ml. The expected peak level following a single 500 mg dose is 11.5 mcg/ml; following a 2 gm dose, 30 mcg/ml. Drug assays were performed by HPLC. The patient underwent 4 h of dialysis with a Fresenius 2008 H machine at a blood flow rate of 450 ml/min using an Optiflux 200 NR dialyzer at a dialysate flow rate of 800 ml/min. The 14.5 h postingestion (1 h post dialysis) venous plasma MET level was 32 mcg/ml. The patient experienced no GI, neurologic, hepatic or other signs of MET toxicity before, during or after dialysis. *Conclusion:* Following an 8.5 gm ingestion of MET, a standard 4 h dialysis procedure along with endogenous hepatic metabolism demonstrated a significant reduction in blood levels of 73.3% with an approximate half-life of 2.5 h. Assuming complete oral absorption nearly one half-life elapsed prior to dialysis; a VD of 0.6 L/kg; and steady-state drug levels before and after dialysis, the total body MET fell from 5.47 gm to 1.46 gm (4.01 gm) or 47.2% of the ingested 8.5 gm dose.

40. Evolving Epidemiology of Drug-Induced Seizures Reported to a Poison Control Center System

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Objective: Ten years ago, a retrospective poison center study found that the leading causes of drug-induced seizures were tricyclic antidepressants, cocaine and other stimulants, antihistamines, theophylline, and isoniazid. We sought to determine whether the causes and consequences of drug-induced seizures have changed in the last decade. *Methods:* We conducted a retrospective review (cross-sectional study) of all calls to our poison control system in 2003 in which seizures occurred in association with poisoning or drug intoxication. The poison center chart of each case was reviewed to determine the drug(s) involved, the type and pattern of seizures, who witnessed the seizure activity, and the medical outcome. A scoring system was used to evaluate the probability that the seizure was related to the exposure. *Results:* 386 cases were judged to be related to poisoning or drug intoxication. The leading causes of seizures were bupropion (89 cases, 23%), diphenhydramine (32 cases, 8.3%), tricyclic antidepressants (30 cases, 7.7%), tramadol (29 cases, 7.5%), amphetamines (27 cases, 6.9%), isoniazid (23 cases, 5.9%), and venlafaxine (23 cases, 5.9%). More than one epileptogenic drug was involved in 71 (18.4%) cases. In 263 patients (68.1%) only a single seizure was reported, while 27.2% (105 cases) reported 2 or more discrete seizures, and 3.6% (14 cases) reported status epilepticus. Two-thirds (65.5%) of the cases involved suicide attempts while 14.8% were the result of drug abuse. There were 8 deaths. *Conclusion:* While tricyclic antidepressants, antihistamines, stimulants, and isoniazid remain common causes of drug induced seizures, bupropion, tramadol, and venlafaxine have emerged as common causes of drug-induced seizures.

41. Pulseless Ventricular Tachycardia Secondary to Alternative Cancer Therapy with Cesium Chloride

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Background: Cesium chloride is the salt form of a naturally occurring element in the alkali metal group. Cesium chloride has been touted as an alternative cancer therapy. Proponents believe that the alkali properties of cesium preferentially raise the pH of tumor cells promoting apoptosis. Experimentally cesium chloride induces QT prolongation and polymorphic ventricular tachycardia due to interference with potassium influx. *Case Report:* A 43-yr-old woman with previously diagnosed glioblastoma multiforme presented to the emergency department complaining of 2 days of nausea and vomiting. During triage, the patient lost consciousness and was found to be pulseless; the cardiac monitor revealed a wide complex tachycardia. The patient was defibrillated with return of sinus rhythm. Despite magnesium sulfate and lidocaine treatment, two more episodes of pulseless ventricular tachycardia occurred and responded to defibrillation. An EKG obtained between episodes demonstrated no abnormality other than a prolonged QTc interval (527 ms). Laboratory results were significant for mild hypokalemia (3.1 mmol/L) and a normal magnesium (1.7 mg/dl). Further history revealed that she was taking up to 6 g of cesium chloride orally per day for several weeks. It was purchased on the Internet by her family after exploring alternative cancer therapies. There was no history of ingestion of any other agents associated with QT prolongation. The serum cesium level was >11,000 mcg/dL. *Conclusion:* We report a case of ventricular tachycardia secondary to the use of cesium chloride as an alternative cancer therapy. As alternative regimens become increasingly available and appealing, toxicologists must remain vigilant for rare but serious poisonings.

42. Aspiration Pneumonitis Due to a Silicone-Containing, Hydrocarbon-Free, Hair Shine Product in a 9-Month-Old

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Background: While subcutaneous injection of silicone has been reported to cause ARDS, aspiration of silicone has not been reported as a possible cause of pneumonitis and subsequent ARDS. *Case Report:* We report a previously healthy 9-month-old male who was referred to the emergency department (ED) after an older sibling gave him an open bottle of Hair Shine (Vogue International™), a hydrocarbon-free, silicone-containing product, and he drank from it. He immediately developed cough, noisy breathing, and grunting. He was observed for 6 h and found to have normal CXR and oxygen saturation of 92% on room air. He was discharged on prednisone. Eight hours after discharge he developed increased work of breathing and returned to the ED, with an oxygen saturation of 80% on room air. He deteriorated quickly, was intubated, and ventilated, initially with conventional then high-frequency oscillating ventilation. He required cardiovascular support with dopamine, and milrinone for 3 days, and he was extubated on day 7. He clinically improved and was discharged on the day 17. *Conclusion:* We report a case of aspiration pneumonitis in a 9-month-old male that was secondary to a hydrocarbon-free, silicone-containing Hair Shine product. Silicone ingestion may be an overlooked cause of aspiration pneumonitis.

43. Dyskinesias Associated with Atomoxetine in Combination with Other Psychoactive Drugs

Bond GR, Garro AC, Gilbert D. *Cincinnati Children's Hospital Medical Center, Cincinnati, OH.*

Background: Toxicity experience with atomoxetine, a selective norepinephrine reuptake inhibitor, is limited. *Case 1:* A 9-yr-old, 77 kg boy with attention-deficit/hyperactivity disorder (ADHD), stable on clonidine 0.3 mg bid and Adderall 30 mg XR 2 q AM for years, was started on atomoxetine 25 mg daily. Over 2 weeks he experienced decreased appetite, decreased sleeping an increased licking of lips, visual hallucinations (“bugs”). Two days before

presentation abnormal mouth and hand movements began. PEx: A&O x2, calm, BP 138/86, HR 96. He had continuous, involuntary, perioral area, hand, and leg movements that stopped with touch or use. No dysarthria. No change occurred with diphenhydramine 50 mg IV. All medications were held. He did not sleep. Sixteen hours later the movements had ceased. *Case 2:* An 18-yr-old, 50 kg girl with ADHD and anxiety disorder titrated up to 225 mg/d venlafaxine over 5 weeks. Atomoxetine was started during the third week at 18 mg/d × 1 week, 25 mg/d × 1 week, then 40 mg/d × 1 week. Three days prior to presentation fine tremors of her hands and legs began. On the day of presentation, she developed lip smacking, facial tics, and dysarthria that stopped with use. PEx: A&O, HR 110, BP 108/67. She had constant twitches of her face, lip smacking, tongue twitching, and inability to vocalize or ambulate. Tremors improved slightly after diphenhydramine 50 mg IM plus 12.5mg IV. Over 24 h, her movements improved moderately. Both medications were discontinued. *Conclusions:* Symptoms suggest a norepinephrine or dopamine effect. Possible explanations include atypical atomoxetine effect, excess norepinephrine or dopamine effects due to poor metabolizer status (CYP 2D6 polymorphism/deficiency) or a drug-drug interaction. Clinicians should be aware of dyskinesias when combining atomoxetine with dopaminergic or noradrenergic medications.

44. Temporary Paralysis Resulting from Medical Error

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Objective: To report a case of medical error that resulted in prolonged paralysis and to describe the presentation, management, hospital course, and outcome of an epidural instillation of magnesium sulfate. *Background:* Medical errors are estimated to cost between 17 and 29 billion per year. Adverse drug events are known to result in additional health care costs and disability. Many of those errors occur in operating rooms. Magnesium is commonly administered intravenously to treat preeclampsia. Magnesium toxicity is rare, but can occur through excessive iatrogenic administration. At high doses, it can cause neuromuscular blockade. Like many other intravenous preparations, magnesium is packed in glass vials, which are easily confused. *Case Report:* A 26-yr-old female presented for a cesarean section in her thirty-sixth week of pregnancy. She was prepped for an epidural. Instead of the intended anesthetic, 10 g of magnesium sulfate were instilled epidurally. She developed a paralysis of her lower extremities. The poison center was contacted 7 h after the installation. She recovered slowly. She recovered her ability to ambulate without assistance by discharge 18 days later. At the time of discharge, she had residual pain. She developed constipation and difficulty voiding, with reproducible residuals remaining at time of discharge. *Conclusion:* Epidural installation of magnesium sulfate by error resulted in a prolonged paralysis, including difficulties with bladder and bowel dysfunction. Care should be taken to ensure that magnesium is not instilled epidurally.

45. Massive Amlodipine Overdose Successfully Treated Using High-Dose Vasopressin

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Background: Amlodipine, a dihydropyridine calcium channel antagonist (CCB) interacts with peripheral vascular smooth muscle with little affinity for myocardial calcium channels. Vasopressin is shown to be effective in other disease states affecting peripheral vascular resistance. We describe a case of life-threatening exposure to amlodipine successfully managed using vasopressin. *Case Report:* A 22-yr-old female presented to the emergency department (ED) 11 h after a reported acute exposure to 80-amlodipine 10 mg tablets. She was awake and alert with vitals including heart rate (HR) 115 bpm and blood pressure (BP) 80/60 mmHg. Finger stick glucose was 215 mg/dL. Despite 4 L of crystalloid fluid, the patient remained hypotensive and tachycardic with a BP 70/40 mmHg and HR 110 bpm. High therapeutic doses of dopamine, norepinephrine, calcium gluconate, insulin, and epinephrine were initiated without effect. Over the next 12 h, she was intubated for respiratory support, and Swan-Ganz catheter

revealed a systemic vascular resistance (SVR) of 188 dynes·sec/cm⁵ with a cardiac output of 6 L. CVVH and charcoal hemoperfusion were initiated, and despite aggressive supportive care, she remained hypotensive with a blood pressure of 80/40 mmHg. Vasopressin, titrated to 4.8 units/h, resulted in immediate improvement in BP to 105/60 mmHg and SVR to 526 dynes·sec/cm⁵. The patient completely recovered. Plasma amlodipine level was 140 ng/mL, 36 h post-exposure (therapeutic: 3–11 ng/mL). *Conclusion:* Vasopressin may be of benefit in the management of dihydropyridine CCB overdose in patients who fail standard therapies.

46. Intravenous N-Acetylcysteine (NAC) Protocols Recommended by North American Poison Centers

Lindgren K, Lattrez J, Nguyen C, Bangh S, Ling L. *Hennepin Regional Poison Center, Minneapolis, MN.*

Background: N-Acetylcysteine (NAC) is standard therapy for acetaminophen overdose. While previously approved by the FDA for oral administration, NAC is often given intravenously (IV) in an “off-label” capacity. Although IV NAC is safe and efficacious, it is unclear how many poison centers recommend this “off-label” use of NAC. *Methods:* Trained staff at 67 North American Poison Centers were surveyed by telephone. Respondents were asked about their center’s policies regarding the use of IV NAC. Staff were also asked which IV protocol they used and whether they had a written protocol. *Results:* Sixty-four of the 67 (96%) poison centers responded. Eight percent (5/64) of poison centers do not recommend IV NAC under any circumstance. Of the remaining 59 centers, over half (32/59) recommend IV NAC only if the patient cannot take the medication orally. Nineteen percent (11/59) of centers that recommend IV NAC use the Prescott protocol, while 63% (37/59) recommend some variation of the Rocky Mountain protocol. Four centers (7%) use a combination of the Rocky Mountain and Prescott protocols depending on serum levels and/or time of presentation. Five centers (8%) use other protocols, while 3% (2/59) of respondents didn’t know which protocol their centers recommend. Twenty-five percent (15/59) of centers recommending IV NAC have no written protocol. *Conclusion:* While the majority of North American poison centers recommend IV NAC for acetaminophen overdose, there is considerable variation in the protocols employed for its administration. These numbers will likely change with the FDA’s recent approval of an IV form of NAC.

47. Fatal Myositis Associated with Epinephrine Auto-Injector

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Background: Epinephrine auto-injectors have been widely prescribed to patients at risk for anaphylaxis. Since September 11, 2001, the distribution of auto-injectors containing other emergency drugs such as atropine has rapidly expanded. In both civilian and military emergencies, they are designed to be used through clothing without skin preparation. We report a fatal case of clostridial infection associated with the use of an EpiPen[®]. *Case Report:* Working in her garden, a 52-yr-old woman was stung by a bee on her right shoulder. Because of previous hymenoptera reaction, she swabbed her right anterior thigh with alcohol and gave herself an EpiPen[®] injection. In the emergency department (ED) 1 h later she showed no signs of allergic reaction and was released. She returned to the ED early the next day complaining of severe pain at the injection site. Examination revealed localized tenderness and erythema of the distal anterior thigh. She was admitted in the afternoon for treatment of cellulitis. Signs and symptoms rapidly progressed: warmth, edema, erythema, and ecchymosis had enveloped the entire thigh by the evening of admission. Diagnosis of clostridial myositis was made, and before midnight she was emergently taken to the operating room (OR). Exploration revealed gas bubbling through the tissues and necrotic muscle, which was resected. She developed refractory hypotension, metabolic acidosis, and severe hemolysis. After several cardiac arrests beginning in the OR, she died 34 h after her EpiPen[®] injection. *Conclusions:* Even swabbing with alcohol failed to cleanse her skin of clostridial spores, and epinephrine may have facilitated anaerobic infection by causing local tissue ischemia. With more widespread use of auto-injectors, the risk of this rare complication may increase.

48. Review of the Clinical Effects Following Atomoxetine Exposure

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Background: Atomoxetine (Strattera[®]) is a highly selective presynaptic inhibitor of norepinephrine approved in November 2002 for use in pediatric, adolescent, and adult patients with attention-deficit/hyperactivity disorder (ADHD). The purpose of this report is to review the clinical effects of all single substance exposures to atomoxetine during 2003 reported to the AAPCC. *Methods:* The AAPCC TESS database was searched for all records of single substance human exposures containing the substance code for atomoxetine. Data was reviewed from January 1–December 31, 2003. *Results:* A total of 1,693 atomoxetine exposure cases were contained within the TESS database. The largest number of all reported clinical effects (345 out of 837) was neurological. Drowsiness/lethargy (19.12% of all clinical effects), agitated/irritable (6.45%), and dizziness/vertigo (5.02%) were the most common neurological effects. Gastrointestinal effects were the second most commonly reported, with vomiting (9.56%), nausea (8.12%), and abdominal pain (3.70%). The third most reported category was cardiovascular effects: tachycardia (8.36%), hypertension (2.87%), and chest pain (1.19%). The most commonly reported clinical effect in both children 5 yrs old and under or 6–12 was drowsiness, followed by vomiting. Tachycardia and drowsiness were most commonly reported in adolescents. In adults, nausea, drowsiness, and dizziness were most frequent. *Conclusion:* Overall, the most frequently reported clinical effects following an atomoxetine exposure were neurological followed by gastrointestinal and cardiovascular. Pediatric patients, adolescents, and adults all had a unique profile of clinical effects.

49. Brugada Pattern After Large Amitriptyline Overdose not Responsive to Sodium Bicarbonate

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Background: The Brugada Syndrome (BS) is associated with sudden death and is thought to be mediated by myocardial sodium channel dysfunction leading to slow inward current. The Brugada electrographic pattern (BEP) seen in BS has been reported after TCA overdose, however its response to sodium bicarbonate (NaCO₃) has not been described. We describe the effects of NaCO₃ in a patient with BEP after a large amitriptyline (AMT) overdose. *Case Report:* A 50-yr-old male presented to the emergency department after he overdosed with 13.5 g of AMT 1 to 2 h prior. On presentation, the patient had seized and was comatose and pulseless with a wide complex tachycardia. He was resuscitated using ACLS protocol (epinephrine, amiodarone, defibrillation, CPR) and administered a total of 350 mEq NaHCO₃ by bolus. The QRS interval narrowed from 160 ms to 124 ms; however, a BEP was apparent. Further shortening of the QRS was achieved after the patient received additional 350 mEq of NaHCO₃ by bolus; however, the BEP was unchanged. The patient's arterial pH was 7.56, Na 150 mEq/L, TCA level >1000 ng/mL, cardiac enzymes were negative, and no reciprocal ECG changes were evident. The BEP resolved 5 h after the last NaHCO₃ bolus and the patient had an uneventful clinical recovery. *Conclusion:* The sodium channel mediated BEP remained unchanged in this TCA overdose despite narrowing of the QRS complex following NaHCO₃ administration. It is possible that different mechanisms entitle the creation of the BEP after TCA overdose, and its significance in TCA-related mortality remains to be evaluated.

50. Determining Triage Guidelines for Accidental Overdose with Calcium Channel Antagonists

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Background: Calcium channel antagonists (CCAs) are known to cause significant toxicity in overdose. Determining triage guidelines for CCAs is an important but difficult task. This study was designed to determine if an accidental overdose of a patient's CCA would result in clinically significant cardiovascular (CV) symptoms (hypotension,

bradycardia, conduction disturbances). *Methods:* Poison center records over a 3-yr period were reviewed for acute cases of adults ingesting at least double their prescribed dose of CCAs and were evaluated in an emergency department (ED). Cases were reviewed for patient age and sex, co-ingestants, CCA involved, dosage form, dose taken, usual dose, symptoms, available vital signs, and medical outcomes. *Results:* A total of 161 cases were identified (51 cases involving co-ingestants and 13 in which the usual dose was unknown were excluded). A total of 122 patients (76%) were female, and the mean patient age was 64 years. One hundred four (60%) cases involved ingestions equal to double the usual dose (DD), 57 (33%) involved more than a DD. For DD cases, 9 (9%) developed clinically significant CV symptoms; while in cases with more than DD, 8 (14%) did. *Conclusions:* While the majority of patients who accidentally ingested at least double the usual dose of their CCA did not develop significant cardiovascular symptoms, the fact that a small number did is concerning. This study suggests that interpatient variability of responses to supratherapeutic doses of CCAs will make establishing a threshold toxic dose difficult.

51. The Dilemma of Delayed Symptom Onset After Bupropion Overdose

Elko C, Bunce J, Martin T. *Washington Poison Center, Seattle, Washington.*

Background: Overdose with the antidepressant bupropion may result in seizures after a delay as long as 8 to 36 hours. Not all patients overdosing on bupropion will have a seizure, and the appropriate amount of observation is uncertain. The purpose of this abstract is to describe and compare the time of symptom-onset to the duration of follow-up. *Methods:* Bupropion exposure calls managed at a health care facility (N=588) from January 1999 to March 2004 were reviewed. The inclusion criteria were that patients were asymptomatic on the initial contact with the poison center, had a documented time of both ingestion and symptom onset, and at least one follow-up call (N=139). For patients with delayed symptoms, only bupropion-alone cases were included. *Results:* The average time to develop a seizure was 6.7 ± 4.6 h (range 0.5–17 h). Summarized in the table below is a comparison of initially asymptomatic patients who did or did not develop symptoms:

	Mean time (hours) to symptom onset after exposure (range)	Duration (hours) of follow-up after exposure (range)
Never having symptoms (N=112)	Not applicable	8.1 ± 8 (0.22–43)
With delayed symptoms (N=27)	5.3 ± 4.7 (1.1–17)	24 ± 18 (2.2–58)

Conclusion: Although the cases never having symptoms were followed on average 2.8 h longer than the average time for a delayed symptom, this retrospective study could not define what is an adequate length of follow-up. A prospective observational study is needed to develop a management guideline.

52. Repetitive Naloxone Dosing Does Not Reverse Gamma-Butyrolactone (GBL) Sedation in a Rat Model of Severe Intoxication

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Objective: High-dose naloxone therapy has reversed mild GBL intoxication in an animal model. Our previous work with a severe intoxication model did not show reversal of GBL after pretreatment with a single, high dose of naloxone. However, naloxone has a short half-life, and repeat doses of naloxone may be needed to affect GBL sedation in severe intoxication. We hypothesize that repeated administration of naloxone will decrease the sedation

time of severe GBL intoxication. *Methods:* We performed a randomized, blinded, placebo-controlled crossover trial using 80 rats. The rats were randomized to intraperitoneal (IP) pretreatment with 10 mg/kg naloxone (group N) or saline (group C). After 10 min, the rats were given 700 mg/kg GBL IP. Following the GBL, group N received naloxone IP (10 mg/kg) and group C received saline IP every hour until recovery of postural tone (ROPT). A blinded observer continuously observed them for time to loss of postural tone (LOPT), loss of righting reflex (LORR), and recovery of righting reflex (RORR) and ROPT. The end points were duration of LOPT and duration of sedation (RORR-LORR). Data were analyzed using a time-to-event analysis and log rank test. A pretest sample size calculation ($\alpha=0.05$, power=80%) determined that 38 rats per group would detect a change in sedation time from 3 h to 1 h. *Results:* The median duration of sedation was group C, 222.4 min (95% CI 206–239) and group N, 208.9 min (95% CI 188–230). The mean duration of LOPT was group C, 281.7 min (95% CI 244–319) for and group N, 277.6 min (95% CI 253–272). *Conclusion:* Repeated serial administration of high-dose naloxone does not effect earlier arousal in a rat model of severe GBL intoxication.

53. Successful Treatment of Ventricular Tachycardia Associated with High-Dose Propofol Infusion

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Background: Prolonged propofol infusion in children, and to a lesser extent in adults, may result in metabolic acidosis, rhabdomyolysis, dysrhythmias, and cardiovascular collapse. We present the first reported case of ventricular tachycardia successfully treated with amiodarone, in an adult patient who was receiving a high-dose infusion (80 mcg/kg/min) of propofol for 4 days. *Case Report:* A 19-yr-old healthy male, who sustained an isolated gunshot wound injury to the head, was placed on high-dose propofol for sedation and control of increased intracranial pressure. On the fourth day of the infusion, the patient developed sustained ventricular tachycardia with HR=143/min and BP=110–140/70–80 mm Hg. Propofol was stopped immediately and the patient was treated with 150 mg of amiodarone bolus followed by an infusion for 24 h. The patient converted to a sinus rhythm within 45 min. During the entire event, the patient's blood pressure remained normal. CPK was elevated but troponin-T and lactate levels were normal. The propofol level was 3.9 mcg/mL, 2 h before the occurrence of the arrhythmia. (Propofol levels of 6.1 mcg/mL prevented movement in 50% of patients when used as an anesthetic. Patients were awake at levels of 1 mcg/mL.) *Conclusion:* In rare cases, high-dose propofol infusion may cause ventricular dysrhythmias. We report a case where amiodarone successfully converted propofol-related ventricular tachycardia.

54. Costly Non-Toxic Methemoglobin Mimics

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Background: Methemoglobinemia is a condition that, in some situations, can cause a life-threatening cyanosis. A toxic etiology should always be considered as part of the differential diagnosis. As seen in the following cases, the cause can sometimes be a benign mimic. *Case Series:* Case 1: A 49-yr-old female employed at the jewelry counter of a department store presented to a health care facility complaining of chest pain and bluing of her extremities. Case 2: An anxious teenage girl appeared at her family physician's clinic with blue palms. Case 3: An 18-yr-old male presented to a rural hospital with "diffuse cyanosis." He was transferred to a tertiary care center via ACLS ambulance for further evaluation and treatment. Case 4: Alarmed by a bluish discoloration on her lower extremities, a 22-yr-old female, with a history of thrombophlebitis, presented to a rural hospital. Case 5: A 37-yr-old female presented to the local emergency department after noticing that her chest and arms were blue. Case 6: A family of five presented to an emergency department worried by blue "spots" on the soles of their feet. In all of these cases mimicking methemoglobinemia, the

patients were minimally symptomatic or asymptomatic. Four patients underwent extensive medical work-ups to determine the etiology of the apparent cyanosis. Further investigation revealed that all patients were either wearing or in close physical contact with fabric that contained blue dye. *Conclusion:* Before ruling out cyanosis from methemoglobinemia in a minimally symptomatic patient, one should distinguish true blue from *faux bleu* by wiping the affected skin with an alcohol swab. If the color is removed in this manner, the patient, insurance carrier, and health care system can be spared expensive and inconvenient testing.

55. Prolonged and Recurrent Cardiotoxicity from Desipramine Ingestion

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Background: Cyclic antidepressants (CAs) are a source of morbidity and mortality in acutely poisoned patients. Cardiovascular complications may persist beyond the average drug half-life or that of its active metabolite. Cases of CA ingestions with widened QRS intervals persisting for up to 5 days have been reported. *Case Report:* A 36-yr-old male found unresponsive was brought to the Emergency Department (ED). He had been taking desipramine for depression. His QRS interval was 190 ms and he received 11 NaHCO₃⁻ boluses with normalization of his blood pressure and narrowing of his QRS interval to 170 ms. He was started on a NaHCO₃⁻ drip at 150 cc/h. He remained hemodynamically stable until 19 h later when his QRS interval widened to 188 ms. He required further NaHCO₃⁻ boluses and a norepinephrine drip for hypotension. During the next 5 hospital days he was treated with approximately 50 NaHCO₃⁻ boluses for episodes of hypotension and QRS widening. His maximal QRS interval was 216 ms, with a sodium of 161 mmol/L and a pH of 7.6. Nine days after admission his QRS interval normalized to 88 ms. A desipramine level sent from the ED returned as 2870 ng/ml (therapeutic range 100–300 ng/mL). He was discharged neurologically intact. *Conclusion:* We report a case of CA poisoning with recurring ECG abnormalities lasting over 1 week. Though the average half-life of desipramine is 17.1 h, prolonged cardiovascular toxicity may occur. This is likely secondary to delayed gastrointestinal absorption, enterohepatic circulation, and altered protein binding.

56. Risk for Long-Term Nephrotoxicity After Ethylene Glycol Poisoning

Marraffa JM, Stork CM, Cantor R. *SUNY Upstate Medical University, CNY Poison Center, Department of Emergency Medicine, Syracuse, NY, USA.*

Objective: Patients with renal toxicity secondary to ethylene glycol poisoning often require chronic hemodialysis (HD). The objective of this study was to determine the long-term prognosis in terms of requirement for HD in these patients. *Methods:* This was a retrospective descriptive trial of all cases reported to the Poison Center with a text field entry of ethylene glycol or antifreeze from January 1999 through December 2003. Inclusion criteria included ethylene glycol exposure or antifreeze exposure. Excluded were patients not exhibiting an elevation of creatinine of >0.5 mg/dL of baseline and requiring less than 2 days of acute HD. Patients requiring long-term HD were evaluated for length of renal failure and HD. *Results:* A total of 221 patients met the inclusion criteria. Forty-eight patients were admitted to a health care facility for ethylene glycol toxicity. Fifteen (31%) patients had subsequent renal damage. Eleven of the 15 patients (73%) required long-term HD. Five of 11 remained on HD for an unknown time and were lost after a follow-up of 15 days. Four of 6 patients remained on HD for 2 weeks. Six of 11 remained on HD for less than 6 weeks. Two of 6 remained on HD for 6 weeks. All patients with follow-up available had return of normal renal function despite the initial nephrotoxic insult. *Conclusion:* Based on intention to treat, 45% of patients could require long-term HD; however, all patients with follow-up information available could be removed from HD by 6 weeks. We conclude that patients requiring long-term HD secondary to ethylene glycol may have a return to near normal kidney function after time and may not require life-long HD. This is the first study evaluating the length of renal toxicity secondary to ethylene glycol poisoning.

57. Chronic Digoxin Intoxication and Hypokalemia

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Background: It has been postulated that hypokalemia is common in chronic digoxin intoxication due to concomitant diuretic use. However, no reports evaluating this phenomenon exist. The current study looked at serum potassium levels as well as other variables including age, sex, and renal function as possible predictors of toxicity and outcome. *Methods:* This study was a retrospective chart review of 94 patients admitted with the ICD-9 diagnostic code for cardiac glycoside toxicity. Collected data included patient age, sex, and medications prescribed prior to admission. Serum potassium levels, serum digoxin levels, BUN and creatinine levels upon admission were recorded. Patient outcome was included as well as any therapy that was initiated to treat the elevated digoxin level (medication held or administration of digoxin-specific antibody). *Results:* The median serum potassium was 4.70 mEq/L. The median serum digoxin level was 3.5 ng/mL. Only three patients had serum potassium levels less than 3.5 mEq/L. Only six patients received digoxin specific antibody. The majority was treated by withholding further digoxin doses until levels fell back under 2.0 ng/mL. There were no deaths related to the elevated digoxin level. The data did not show any statistically significant predictive values for age, sex, or renal function with the BUN p value of 0.06 coming closest to the 0.05 threshold. *Conclusion:* Hypokalemia is not a common occurrence in patients admitted with chronic digoxin intoxication.

58. Summary of Sustained-Release Acetaminophen (SR-APAP) Data from the American Association of Poison Control Centers (AAPCC)

Green JL, Dart RC, Bogdan GM. *Rocky Mountain Poison and Drug Center, Denver, CO.*

Background: Sustained-release preparations of acetaminophen account for a growing proportion of sales and poisoning exposures. We mined the TESS database to better understand the SR-APAP experience as reported to poison centers. *Methods:* Using specific product codes, the TESS database was searched from 1994–2002 for human exposures to SR-APAP. The characteristics of these calls were summarized and medical outcomes compared to those associated with exposure to immediate-release acetaminophen (IR-APAP). *Results:* A total of 3003 SR-APAP calls met search criteria. Callers were typically female (66%) with an average age of 29 years. Reasons for exposure were unintentional (60%) and intentional (37%). Thirty percent of reported exposures involved at least one additional substance. Of the 3003 calls, 86% were acute, 5% were chronic, and 8% were acute-on-chronic exposures. Overall, 31% reported at least one clinical effect. The most common related clinical effects were gastrointestinal (vomiting/nausea/abdominal pain) and hepatic (elevated AST and ALT/prolonged PT). Clinical effects were more likely to occur following an intentional exposure as opposed to an unintentional exposure ($p < 0.001$). Reported medical outcomes for followed cases: 60% experienced no clinical effects, 26% minor effects, 11% moderate effects, and 3% major effects. Two deaths were reported. There was no difference in medical outcome between patients exposed to SR-APAP and those exposed to IR-APAP, including instances of death ($p > 0.05$). *Conclusion:* The majority of SR-APAP exposure calls to poison centers result in little or no clinical effect. The medical outcomes following exposure to SR-APAP appear similar to those following exposure to IR-APAP.

59. Aripiprazole Ingestion in Two Pediatric Patients

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Background: Aripiprazole (Abilify[®]) is an atypical neuroleptic drug approved in November 2002 for the treatment of schizophrenia. Usual adult doses are 10 to 15 mg daily. Its exact mechanism of action is unknown but is believed

to involve partial agonist effects on dopamine D2 and serotonin 5-HT1A receptors and antagonism of 5-HT2A receptors. Data are limited as to its effects in overdose and in accidental pediatric ingestions. We report two pediatric cases involving aripiprazole ingestion. *Case Reports:* Two 2-yr-old females arrived in an emergency department 3 h after reported ingestion of a total of six Abilify[®] (15 mg) tablets. They had no significant past medical history or access to other medications. Activated charcoal was withheld due to the delayed presentation. Patient A (12.2 kg) vomited several times and was somnolent. Initial vital signs were T 95.8F, P 100/min, RR 40/min, BP 102/55, O₂ sat 99%. One hour later, patient A developed hypotension (BP 80/37, P 104/min), which resolved with IV fluids. Patient A subsequently developed tachycardia to a maximum rate of 136/min. Patient B (13.4 kg) was somnolent with intermittent periods of irritability. Vital signs were T 96.1F, P 104/min, RR 32/min, BP 94/62, O₂ sat 100%. Patient B also developed tachycardia, to 132/min. There were no other EKG abnormalities. Both children received maintenance IV fluids and were admitted for overnight monitoring. Vomiting, tachycardia, and hypotension resolved within 6 to 8 hours of ingestion. Mental status returned to normal approximately 24 h post ingestion. *Conclusion:* Significant central nervous system and cardiovascular effects can occur in children from accidental ingestions of aripiprazole.

60. Venlafaxine Overdose Resulting in Seizures and QRS Widening 16 H After Exposure

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Background: Venlafaxine is a bi-cyclic antidepressant that inhibits the presynaptic reuptake of serotonin, norepinephrine, and to a lesser extent, dopamine. Seizures, sinus tachycardia, and hypotension are reported after overdose. QRS complex widening is associated with overdose secondary to sodium channel blockade. We report the first case of seizures and QRS widening occurring at least 16 h after initial exposure. *Case Report:* A 44-yr-old female presented to the emergency department with complaints of increasing agitation. Past medical history was significant for dissociative disorder, depressive disorder, and bipolar disease. The patient denied acute ingestion or suicidal ideation. Baseline electrocardiography (ECG) revealed normal sinus rhythm with a QRS complex <100 milliseconds (msec). The patient was admitted to the inpatient psychiatry service. Approximately 16 h after presentation, the patient was found unresponsive, experiencing generalized tonic-clonic seizures. An ECG revealed a QRS complex duration of 190 msec. Sodium bicarbonate boluses resulted in narrowing of the QRS duration to 90 msec. The patient remained on a sodium bicarbonate infusion for 24 h and recovered without sequelae. A venlafaxine serum concentration obtained 24 h after presentation was 730 ng/mL. *Conclusion:* Seizures and QRS widening occur rarely after venlafaxine overdose. This is the first reported case of seizures and ECG changes occurring late in the course of toxicity.

61. Metformin Clearance is Poor with Continuous Veno-Venous Hemodiafiltration (CVVHDF)

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Background: Life-threatening lactic acidosis is associated with metformin blood levels >5 mcg/mL (therapeutic range 1 to 2 mcg/mL). A single previous report of the utility of CVVHDF in a patient with a massive intentional overdose suggested a modest clearance, but no data was available regarding endogenous urinary clearance. There are no previous reports of CVVHDF in metformin-associated lactic acidosis secondary to acute renal failure. *Case Report:* An 80-yr-old woman with a previous left nephrectomy, type 2 diabetes mellitus, atrial fibrillation, and cryptogenic cirrhosis was admitted with hypotension, junctional bradycardia (pulse 22/min), anemia, severe lactic acidosis (pH 6.83, bicarbonate 6 mEq/L, lactate 18 mmol/L), and oliguric renal failure (BUN, 42 mg/dL; creatinine, 3.1 mg/dL.) CVVHDF was initiated secondary to persistent lactic acidosis and hemodynamic instability. A Gambro Prisma continuous renal replacement machine was used with a Prisma M100 filter. Blood, urine, and 10 h of

dialysate were analyzed for metformin. The pre-CVVHDF metformin level was 9.2 mcg/mL. A total of 27.5 mg of metformin was eliminated in the dialysate over 10 h with a mean clearance of 9 mL/min. The patient recovered. Of note, renal clearance (300 mL of urine over 18 h) removed 300 mg of drug. *Conclusion:* The metformin clearance by CVVHDF in this patient was less than the 50.4 mL/min previously reported, and less than that reported for hemodialysis (68–170 mL/min). By contrast, even in this patient with oliguric renal failure and a single kidney, renal elimination was about six times greater than the elimination from CVVHDF. Based on this experience, using CVVHDF for the sole purpose of metformin elimination appears unjustified.

62. The Effect of Amiodarone in Mice with Acute Cocaine Toxicity

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Objective: Amiodarone (AM) blocks K⁺ and Ca²⁺ channels, possesses type Ib antidysrhythmic, sympatholytic, and myocardial depressant effects, and is first-line ALCS antidysrhythmic therapy for ventricular dysrhythmias. COC has “Quinidine-like” effects, and increases sympathetic drive and circulating catecholamines. Thus, amiodarone may be beneficial in the setting of COC toxicity, but remains unstudied. The aim of this study was to evaluate the effect of AM on mortality and seizure incidence in acute COC toxicity with the hypothesis that AM will increase survival, but not affect seizure incidence. *Methods:* An approximate intraperitoneal (ip) LD₅₀ dose of COC (110 mg/kg) was selected. Male Swiss-Webster mice weighing 29–37 g were randomized to two groups. The control group received saline ip 30 min before COC. The study group received 40 mg/kg of AM ip 30 min before COC. Mice were monitored by a blinded observer for 2 h after COC administration. The safety of AM (40 mg/kg ip) was confirmed in five mice. *Results:* No mice in the AM only group developed toxicity or died. In the NS+COC group 31/32 (96.9%, 83.8 to 99.9%) mice seized with a median time to seizure of 2.5 min, and 23/32 (71.9%, 52.3 to 86.3%) died with a median time to death of 5.5 min. In the AM+COC group 31/33 (93.9%, 79.0 to 99.3%) mice seized with a median time to seizure of 2.0 min, and 24/33 (72.7%, 54.5 to 86.7%) died with a median time to death of 6.0 min. All animals that died did so within 8.5 min. The difference in the proportion of animals dying in the AM+COC group compared to the NS+COC group was 0.008 (–21 to 22%). A power analysis showed less than a 5% chance of finding a survival benefit >22% in the AM+COC group. *Conclusion:* AM did not affect mortality or seizure incidence in this model of acute COC toxicity.

63. Does CROFAB Bind All Components in Crotaline Venoms?

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Background: Envenomation by crotaline snakes in the United States is often treated with ovine crotaline Fab fragments (CroFab, FabAV). In some cases, recurrent coagulopathy develops after initially successful treatment with FabAV. One potential explanation is that snakes from geographical regions where recurrence occurs may have venom components that are not bound by FabAV. We assessed directly the binding of crotaline FabAV to a series of crotaline venoms using standard techniques. *Methods:* Protection against coagulopathy by FabAV was assayed using fibrometry in the presence of *C. atrox* venom. Gel electrophoresis was then used to separate venom components based on molecular weight in the venoms of 14 species of snakes including all 4 species used to produce FabAV. The gel was next subjected to Western blotting with blocking by bovine serum albumin (BSA) and binding by ovine Fab AV as the primary antibody and donkey antisheep IgG as the secondary antibody. *Results:* PT results were 24.9 sec (fibrinogen control); 185 sec (fibrinogen with 5 µg venom) and >240 sec (fibrinogen with 20 µg venom). Incubation with FabAV returned the PT to control values, even with the high venom dose. Western blotting indicated good separation of biologically relevant components of venom, including coagulopathic enzymes

and low molecular weight presynaptic neurotoxins: all were bound by FabAV. *Conclusion:* FabAV protects against PT prolongation and immune blotting indicates effective binding of coagulopathic venom components in an in vitro model. Difficulty in obtaining initial control or recurrence of venom effect does not appear to be the result of an inability of FabAV to bind important venom components.

64. Diethyldithiocarbamate (DDC) Exacerbates Thallium Toxicity in Rat Hippocampal Astrocytes (RHA)

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Background: Although applications for thallium (Tl) are essentially limited to industrial use in the United States, malicious exposure and international availability still produce numerous cases of severe neurotoxicity. In a previous study we developed a model for Tl neurotoxicity using RHA. DDC is a known chelator of Tl. Animal and human experience with DDC suggests that although it increases urinary excretion of Tl, it exacerbates neurotoxicity and death. In order to validate our model we sought to investigate the effects of DDC on RHA. *Methods:* The study evaluated two doses of DDC (an LD₂₅ and an LD_{12.5}) in combination with thallium acetate at doses of 0.0 mM (control), 0.5 mM, 1.0 mM, 1.5 mM, and 2.0 mM. Flasks were seeded with 15,000 cells of an immortal line of RHA in media enriched with 10% fetal bovine serum (FBS) and grown until subconfluency. The media was removed and replaced with fresh media containing 10% FBS and DDC. One hour later, the DDC was removed and fresh media with 10% FBS and Tl was added. The cells were collected by trypsinization and counted on treatment days 2, 4, 6, and 8. The study was repeated three times. *Results:* Control cells grew normally achieving 140×10^3 by day 8. Growth in cells treated with both DDC and Tl at any dose studied was significantly less than both the control, and cells treated with Tl alone [85×10^3 (day 8, 0.5 mM Tl) from a preliminary study] ($p < 0.01$, ANOVA). The maximal growth in any of the DDC+Tl treated cells was only 11×10^3 (day 8, LD₂₅ DDC, 0.5 mM Tl). *Conclusions:* DDC exacerbates thallium-induced death of RHA. Because this is consistent with human and animal experience it suggests that a RHA model can be used to investigate the mechanism of thallium-induced neurotoxicity and potential treatments.

65. Orexin-A Attenuates GBL/GHB Toxicity in Rodent Overdose

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Background: Orexin-A and -B (OX-A, OX-B) are recently discovered hypothalamic neuropeptides that modulate arousal and sleep-wake cycles, and loss of orexin cells has been implicated as the etiology for human narcolepsy. OX-A and OX-B have been shown to induce wakefulness when injected intracerebroventricularly (i.c.v.) into rats. Recently, i.c.v. administration of OX-A and OX-B in rats reduced barbiturate-induced anesthesia by 15–40%. Neuroanatomically, the highest density of GHB receptors in the human brain is also in the hypothalamus. *Objective:* We tested the hypothesis that OX-A can reduce GBL/GHB-induced CNS depression. *Methods:* Using standard stereotaxic surgical procedures, an 8 mm stainless-steel guide cannula was implanted unilaterally into the lateral cerebroventricle of 12 male Sprague-Dawley rats using the following stereotaxic coordinates: AP –0.8 mm, L 1.2 mm, V 4.0 mm relative to bregma. Rats were then pretreated with OX-A 30 mcg/rat i.c.v. (N=6) or sterile water 4 mL/rat i.c.v. (N=6). Ten minutes later all rats were given GBL 600 mg/kg i.p. Time-to-onset of toxicity (loss-of-righting reflex) and duration of toxicity were then measured for each rat. *Results:* The mean time-to-onset of toxicity \pm SEM (min.) was 10.8 ± 2.5 and 8.0 ± 1.5 for OX-A pretreated and control rats, respectively (P=NS). The mean duration of toxicity \pm SEM (min.) was 129.3 ± 13.8 and 189.3 ± 14.9 for OX-A pretreated and control rats, respectively (P<0.05). OX-A pretreatment reduced the duration of GBL/GHB toxicity in rats by 32%. *Conclusion:* OX-A can significantly reduce the duration GBL/GHB-induced CNS depression. This data suggest that orexinergic neurons may be an important target for GBL/GHB, but the pharmacologic mechanism and receptors involved in this interaction remain to be elucidated.

66. Expired 2-PAM Effectively Reverses Cholinergic Crisis in Humans

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Background: Although theoretical arguments suggest that expired pralidoxime (2-PAM) may be considered in the treatment of cholinergic crises during mass-casualty events, there are no published in vitro, animal or human data to support its efficacy. We recently had the unique opportunity to test this theory. *Case Series:* Two separate requests came from a tertiary care hospital in the Dominican Republic (DR) for emergent and compassionate donation of 2-PAM for patients with intentional ingestions of known pesticide cholinesterase inhibitors. In each case the patients had severe cholinergic toxicity, including massive bronchorrhea and flaccid paralysis requiring intubation. Although each received about 10 h of continuous IV atropine (range 15–20 mg/h), they remained critically ill. Because no 2-PAM was available in the DR we sent our entire “in-date” supply of 2-PAM (12 gm) on the next flight to treat the first patient. Within 30 min of treatment there was a dramatic response, but he remained ill. With consent from the local DR staff, an additional 24 gm of expired 2-PAM (5 months beyond date) was sent the next day for his continued therapy. It appeared efficacious. The same treating staff requested the remainder of our expired 2-PAM (24 gm, 3.5 yrs post date) for the second patient who presented several days later. After 2-PAM therapy, she had marked and immediate improvement, with return of motor function and reduced atropine requirement. Both patients made full recoveries. *Conclusion:* Even with stockpiling, a mass casualty event might exhaust existing supplies of 2-PAM. In the present cases, use of expired 2-PAM effectively treated cholinergic crises. Although the true shelf-life is unknown, properly stored 2-PAM appears to retain activity >3 yrs beyond expiration. Expired drugs should only be considered in extreme circumstances.

67. Caffeine Elimination Half-Life During Peritoneal Dialysis in a Pediatric Overdose

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Background: Limited data are available on the elimination half-life of caffeine during peritoneal dialysis when used in the management of pediatric overdose. *Case Report:* A 2-yr-old boy ingested an unknown number of Yellow Jackets Good Energy Pills (caffeine 300 mg and ephedrine 25 mg). He became hyperthermic (105°F), tachycardic (260/min), and had altered mental status necessitating intubation. He was also noted to have a metabolic acidosis (pH 7.24) and mild renal insufficiency (creatinine 1.5 mg/dL, BUN 28 mg/dL). He received fluids and benzodiazepines upon his arrival to the tertiary care center. A caffeine blood concentration of 114.4 mg/L was reported at 17 h after ingestion. To possibly enhance caffeine elimination, peritoneal dialysis was started 25 h after presentation and continued for 72 h. Four blood samples for caffeine were obtained during peritoneal dialysis and one sample 26 h after the end of dialysis. Nonlinear regression showed apparent first-order elimination ($r^2=0.992$) with a half-life of 13.6 h during peritoneal dialysis. Including the levels drawn before and after dialysis did not change the elimination half-life (13.6 h, $r^2=0.996$). Normal elimination half-life of caffeine is reported to be between 3 and 6 h, with reported half-lives of 15.5 h in overdose. Minimal change in elimination half-life was noted during peritoneal dialysis in our child, in contrast to the only other reported case, which showed enhanced elimination with a half-life of 9.1 h. *Conclusion:* Peritoneal dialysis did not seem to significantly enhance the elimination of caffeine during pediatric caffeine overdose in contrast to a previous case report.

68. Case Series of Elevated Troponin I Following Carbon Monoxide Poisoning

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Background: Troponin I is a marker of myocardial injury. Carbon monoxide (CO) is associated with myocardial “stunning.” We present six cases demonstrating the effects of carbon monoxide poisoning on troponin I levels. **Case Series:** Cases 1–6 can be found in the chart below with the presenting carboxyhemoglobin (COH) level, serum bicarbonate, and peak troponin I.

Age	Troponin I	COH	Bicarbonate	Electrocardiogram findings
41	1.41 ng/mL	35%	18 mmol/L	ST; lateral ST segment depression
61	9.80 ng/mL	36%	18 mmol/L	NSR; anterior/lateral ST segment depression
22	1.82 ng/mL	45%	15 mmol/L	NSR
20	9.90 ng/mL	20%	24 mmol/L	ST; anterior ST segment elevation
2	0.20 ng/mL	29%	12 mmol/L	ST
26	0.62 ng/mL	50%	18 mmol/L	ST; anterior ST segment elevation

ST=sinus tachycardia; NSR=normal sinus rhythm.

The 2-yr-old patient was poisoned via smoke inhalation; the remaining cases were poisoned solely by CO. All patients received hyperbaric oxygen therapy and recovered without sequelae. All cases, except the 2-yr-old, had an echocardiogram and/or stress test; all had normal testing. **Conclusion:** This is the first reported case series of carbon monoxide poisoned patients presenting with elevated troponin I levels. Despite elevated troponin I levels and electrocardiogram abnormalities suggesting ischemia, cardiac evaluation following recovery demonstrated normal cardiac function.

69. The Reliability of History in Suicidal Patients: Is Routine APAP Screening Required?

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Background: Among suicidal overdose (OD) patients who deny acetaminophen (APAP) ingestion, <1% of patients have treatable levels, according to published reports. It is not clear that APAP testing of every patient who denies taking the drug is proper use of limited health care resources, particularly in countries with limited revenues. The purpose of this study was to determine if a denial of taking APAP effectively identifies patients who do not require APAP testing. **Methods:** All suicidal OD patients who were able to provide a history to the Emergency Department MD were included in the study. All patients received APAP testing and were asked to identify the timing and number of agents they ingested. **Results:** A total of 172 consecutive suicidal overdose patients were enrolled in the study, including 116 females (67%). No APAP level was obtained in 9 of the patients, and history was unavailable in 10, including 1 patient in which both were missing. Of the remaining 162 patients, 48 were admitted to APAP, and 114 denied APAP ingestion. APAP was detected in 30 (62.5%) of those who reported ingestion of APAP, with 2 (4.2%) requiring antidotal treatment. Among 114 who denied ingestion of APAP, 3 (2.6% of total, or 5% of polypharmacy ODs) had detectable levels; none of these required treatment. Patients who reported no ingestion of APAP were more accurate than those who reported its ingestion ($P<0.001$), and none required treatment. No suicidal patient who denied both APAP and polypharmacy OD had detectable APAP. **Conclusion:** Suicidal patients who deny both APAP and polypharmacy ingestion may not require routine APAP screening.

70. Severe Coagulopathy from Envenomation by an Eastern Massasauga Rattlesnake (*Sistrurus catenatus*) Successfully Treated with Crofab™

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Background: Severe coagulopathy from envenomation by an Eastern Massassauga rattlesnake successfully treated with CroFab™ [Crotalidae Polyvalent Immune Fab (Ovine)] has not previously been reported in the literature. *Case Report:* A 49-yr-old male presented to a northern Michigan hospital emergency department (ED) approximately 30 min after a rattlesnake bite to his right middle finger. Initially he had nausea and vomiting. Prior to arriving to the ED the patient took a photograph of the snake and presented it to a Michigan Department of Natural Resources officer who confirmed its identity as an Eastern Massassauga. Upon presentation he had edema, erythema, pain, and one puncture mark involving the affected digit without signs of active bleeding. The patient was transferred to our institution for further evaluation and treatment. Initial lab values were remarkable for APTT > 150 s, PT > 120 s, INR > 10.5, fibrinogen < 50 mg/dL, and FDP > 40. The patient was given five vials of CroFab™ approximately 6 h after envenomation. Lab values after the initial dose of CroFab™ were APTT 39 s, PT 31.6 s, INR 2.9, fibrinogen 26 mg/dL, and FDP > 40. The patient received a total of 16 vials of CroFab™. On the day of discharge he had minimal swelling in his right hand without any pain and his APTT, PT, INR, and FDP were normal, but his fibrinogen was 149 mg/dL. The patient had a normal APTT, PT, and INR at 1 and 2 weeks after discharge and reported no bleeding problems. *Conclusion:* In our patient, CroFab™ was successful in treating a severe Eastern Massassauga-induced coagulopathy without recurrence of coagulopathy on follow-up.

71. Seizure, Dysrhythmia, and Cardiac Arrest Following IV Tetracaine/Epinephrine Solution in Two Neonates

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Background: Neonatal drug errors occur frequently but the course, outcome, and causation is often hidden as litigation proceeds, limiting the ability of others to learn from the experience. *Case 1:* A 2½ week old, 3 kg, neonate experienced an episode of staring, apnea, and bradycardia followed by tachycardia. He was intubated and seemed stable. One half-hour later, another episode occurred consisting of wide complex tachycardia (HR 148 QRS 0.172 sec), then asystole. He was treated with CPR, cardioversion, lidocaine, and bicarbonate and stabilized over the next few minutes. *Case 2:* A 6 month-old, 5 kg, premature boy experienced fussiness, cyanosis, decreased oxygen saturation, then seizure activity. Phenobarbital 20 mg/kg was given and “flushed” with heparinized saline. Suddenly his heart rate increased to 240/min (narrow complex). He received adenosine 75 micrograms/kg × 1 but resolution occurred over 30 min. *Etiology:* A tray of vials labeled as Heparin Flush Solution was found on the unit. It contained identical 5 mL vials with similar white, typed pharmacy labels. Some read “Tetracaine 1% & Epinephrine 1:2000” while others read “Heparinized Saline 2 units per mL.” The infants had received approximately 2 mL of the tetracaine solution before each of the events. *Conclusions:* Toxicity was sudden and brief, consistent with massive IV dosing and the short half-life of the drugs. Hypertension, seizure, bradycardia, and cardiac arrest are expected with these drugs. Several factors contributed to this event. Similar-appearing vials were kept in the same refrigerator in the pharmacy. The vials were properly labeled, but came from a tray labeled Heparin Flush Solution. Heparin flush was the only medication in this type of vial used on the neonatal unit. Ambient lighting may have been low to help with neonatal circadian rhythm.

72. Severe Serotonin Syndrome from Escitalopram Overdose

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Background: Persistent and prolonged serotonin syndrome from overdose of a single serotonergic agent is rare. Escitalopram (Lexapro®) is a new selective serotonin reuptake inhibitor (SSRI) reported to have 15 times the serotonergic effects of citalopram. We report the first case of severe prolonged serotonin syndrome with escitalopram overdose and a moderately elevated serum escitalopram level. *Case Report:* A 38-yr-old male was brought to the ED 1 h after a reported ingestion of 100–200 mg of escitalopram. Vital signs were P 139/min, BP

168/58 mm/Hg, RR 32/min, T 99.3°F. The patient developed altered mental status, agitation, had myoclonus, hyperreflexia, and rigidity in the lower extremities with minimal involvement of the upper extremities. The patient was sedated with lorazepam, paralyzed, intubated, and packed in ice. Vitals prior to intubation were P 150/min, BP 170/70 mm/Hg, and T 104°F. After sedation and paralysis, the patient's pulse and blood pressure decreased and temperature fell to 97.2°F. The patient received cyproheptadine, paralytics, and benzodiazepines. Paralytic therapy was continued for the next 101 h. During this time several attempts to discontinue paralytics were met with increasing muscle rigidity and a rapid rise in temperature necessitating re-paralysis. A serum escitalopram level drawn at presentation was 110 ng/mL (therapeutic 20–60 ng/mL). Comprehensive urine toxicology studies showed only escitalopram and acetaminophen, and a serum lithium level was negative. He was discharged on hospital day 11 neurologically intact with no complications. *Conclusion:* Escitalopram can cause severe prolonged serotonin syndrome in overdose. The occurrence with only moderately elevated levels may be the result of its increased potency as compared to other SSRI's.

73. Carboprost Exposure in a Newborn Resulting in Minimal Toxicity

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Background: Carboprost is a synthetic analogue of prostaglandin F_{2α} and is used in the treatment of postpartum hemorrhage. Neonatal exposure to this is hopefully rare. The largest dose of carboprost (Hemabate[®]) reported in a neonate was 250 micrograms (mcg), and only one such case report exists. This newborn developed significant clinical findings including tachypnea, bronchospasm, hypertension, dystonia and/or seizure activity, hyperthermia, and diarrhea; he recovered fully within 18 h. The only other two cases were reported by the manufacturer at lesser amounts, and the children remained asymptomatic. We report a case in which a child developed only mild toxicity following exposure to a 250 mcg dose. *Case Report:* A full-term, 3-day-old boy was injected intramuscularly with 250 mcg carboprost (Hemabate[®]) in a therapeutic error. The patient was to receive a hepatitis B immunization. The hospital pharmacist contacted the poison center, and shortly thereafter, the patient's father called the poison center requesting information about this drug and potential toxicity. At 1.5 h postexposure (PE), the patient was asymptomatic. The patient became febrile 2 to 4 h PE with a maximum temperature reaching 101.6°F. At the parent's request, the infant was transferred by ambulance to a larger hospital, with a neonatologist, where he arrived about 4.5 h PE. The patient was placed on 1:1 nursing care and continuous pulse oximetry. The patient's fever resolved and did not recur. The only other sign of toxicity was diarrhea at about 15 h PE, which quickly resolved within 2 h from onset. The patient was discharged about 48 h PE and remained otherwise asymptomatic. *Conclusion:* This case demonstrates a neonate exposure to a large dose of carboprost in which the child did not develop the cardiorespiratory and neurological sequelae described in the previous similar case report.

74. Acute Phenylbutazone Toxicity: A Toxicokinetic Analysis

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Objective: Phenylbutazone is a nonsteroidal anti-inflammatory drug widely available in large doses as a first-line anti-inflammatory for horses. We present toxicokinetic data from a significant human overdose. *Case Report:* A 48-yr-old male was found unconscious in his horse's stall, with several bottles of phenylbutazone nearby. Upon arrival to the emergency department, he was minimally responsive with normal vital signs. His clinical course was complicated by respiratory failure, seizures, rhabdomyolysis (serum creatine phosphokinase peak at 211,991 U/L 5 days postingestion), renal failure (serum creatinine peak at 2.5 mg/dL 5 days postingestion), and liver injury (mild elevations in transaminases). Serum phenylbutazone on admission was 470 mcg/mL (2 h postingestion), 510 mcg/mL (8 h), and 420 mcg/mL (16 h). The calculated half-life was 27 h, considerably shorter than the 72 h half-life of

therapeutic dosing, suggesting initial dose-dependent kinetics. Serum oxyphenbutazone, the major active metabolite of phenylbutazone, was 45 mcg/mL (2 h), 50 mcg/mL (8 h), and 50 mcg/mL (16 h). The half-life of oxyphenbutazone (72 h) appears unchanged in overdose. Hemodialysis was not employed because of the high reported protein binding of phenylbutazone (90%). The patient recovered fully after several weeks of intense supportive care, which included urinary alkalization for the rhabdomyolysis. *Conclusion:* Phenylbutazone is a toxin that can lead to significant multiorgan system damage. Although pharmacokinetics in overdose differ from therapeutic doses, the mainstay of treatment is aggressive supportive care.

75. A 3-Year Review of Citalopram and Escitalopram Ingestions

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Background: Citalopram and its isomer escitalopram are selective serotonin reuptake inhibitors (SSRI) used for the treatment of depression. *Methods:* A 3-yr retrospective review of citalopram or escitalopram ingestions reported to a regional poison control center from January 1, 2000 to December 31, 2003 was conducted. Cases involving co-ingestants, chronic ingestion, or cases lacking medical follow-up were excluded. *Results:* 773 cases were reported; 261 cases met the inclusion criteria. Of these 228 (87%) were citalopram, median dose 536 mg (range 40–5000 mg), 33 (13%) were escitalopram, median dose 222 mg (range 30–1400 mg). Seventy-five percent of the patients were female. The median age was 25 yrs (range 1–85 yrs). The most frequently reported symptoms included tachycardia (185), hypertension (45), lethargy (37), gastrointestinal complaints (27), seizures (18), agitation (10), QT prolongation (8), confusion (6), tremor (6), hypotension < 100 SBP (5), and dizziness (5). Twenty percent of patients (53) experienced some alteration in their mental status. The two most serious symptoms reported were seizures and QT prolongation. Seizures were reported in 18 (6.9%) patients (17 citalopram; 1 escitalopram). Of these 18 patients, 9 received anticonvulsants. ECG monitoring was reported for 54 patients with 8 (3%) reporting a prolongation of the QT interval. Outcomes were characterized as follows: 1 major (0.38%), 20 moderate (7.7%), 79 minor (30%), and 161 no effect (61.7%). Disposition: 217 (83%) were monitored in the emergency room and 44 (17%) were admitted to the hospital. *Conclusion:* In our review, seizures and QT prolongation were the most serious symptoms reported following citalopram and escitalopram overdose. Acute care of patients should include close monitoring of patients' neurologic and cardiac status.

76. Send-Out Comprehensive Toxicology Screens Increase Length of Stay Without Affecting Disposition

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Background: Comprehensive toxicology screens are often utilized in the evaluation of suspected poisonings in the pediatric emergency department (ED). At many hospitals, these tests are not done in-house but are send-out tests. We sought to determine if the increased length of stay incurred by the send-out test resulted in any changes in disposition from the emergency department. *Methods:* We reviewed charts from all patients in our ED over a 6-month period, for whom comprehensive toxicology screens were ordered from the ED (n=103; ED has 90,000 visits/year). Turnaround time for the test (in-house vs. send-out) was obtained, and charts were reviewed to determine if information obtained from the send-out test resulted in changes in management or disposition. We also evaluated the charts for any substances found on the send-out test that would not have been detected by a limited, in-house drugs-of-abuse screen that would/should have changed disposition. Charts were excluded (n=9) for incomplete information or for a nonclinical (i.e., forensic) purpose for ordering the test. *Results:* The turnaround time for the comprehensive send-out screen was 6 h, vs. 98 min for the in-house screen. In 11 cases, patients were discharged from the ED with send-out results still pending. In no case was a clinically relevant substance that resulted in a change in management or

admission disposition detected. *Conclusion:* Comprehensive toxicology screens, when performed as a send-out test, do not result in any significant changes in management or disposition, but do increase length of stay.

77. The Utility of Comprehensive Send-Out Toxicology Screening in Pediatric Emergency Department Patients

Maloney G, Casavant MJ. *Division of Pharmacology/Toxicology, Children's Research Institute, Columbus, OH.*

Background: Comprehensive toxicology screening is utilized in addition to or in place of drugs of abuse (DOA) screens in many institutions. Whether the additional information from the comprehensive screen results in any clinically significant changes in management is unclear. *Methods:* The charts of all ED patients at our institution (90,000 visit/yr pediatric tertiary ED) for a 6-month period for whom comprehensive toxicology screening was performed were reviewed. Patients were excluded if toxicology screening was obtained for nonmedical reasons (such as request of law-enforcement officials) or if no results were available on the chart. Results of the comprehensive screen were compared to the DOA screen results; if the DOA was not ordered we compared the results of the comprehensive screen to the list of drugs that should be detected by the DOA screen. Change in management was defined as initiation of treatment based on results of the screen or change in admission disposition. *Results:* A total of 103 charts were reviewed; 9 were excluded. The remaining 94 charts resulted in 110 separate comprehensive toxicology screens (some patients had multiple visits). In one case, the diagnosis should have been changed based on the test results; in no cases did management or disposition decision change based on data obtained. *Conclusion:* In a pediatric ED population, addition of comprehensive toxicology screening to urine drugs-of-abuse screen did not change management.

78. Pharmacokinetics of Intravenous (IV) Fomepizole Versus Oral (PO) Fomepizole in Healthy Human Volunteers: Preliminary Results

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Background: The alcohol dehydrogenase inhibitor, fomepizole, is available for the treatment of toxic alcohol poisoning. Studies demonstrate that fomepizole achieves clinically effective serum concentrations after IV or PO use. However, available supportive pharmacokinetic data are limited. *Objective:* To determine the pharmacokinetic profile of fomepizole after PO and IV therapeutic doses. *Methods:* This was a prospective, randomized, crossover trial in healthy human volunteers. Each subject received 15 mg/kg fomepizole orally and intravenously over 30 min with random first-route assignment. Ten micromoles/L was assumed to be the minimum effective concentration (MEC). Serum was collected at 0, 0.25, 0.5, 1, 2, 4, 7, 12, 24, 36, and 48 h after initiation of the study, stored at -70°C and batch analyzed. Iterated values of raw data were achieved using WINNONLIN. Area under the concentration vs. time curve (AUC) $\mu\text{mol}\cdot\text{hr/L}$, peak concentration (C_{max}) $\mu\text{mol/L}$, time to MEC (T_{mec}) hours, and time above MEC (T_{amec}) hours. *Results:* Five subjects have completed the study. Data for two subjects are available for analysis. The mean values \pm standard deviation for IV vs. PO administration, respectively, are as follows: AUC 6131.4 ± 1428.5 , 5643.5 ± 1005.4 ; C_{max} 266.5 ± 2.1 , 257.5 ± 43.9 ; T_{mec} 0.17 ± 0 , 0.17 ± 0 ; and T_{amec} 48 ± 0 , 42.5 ± 3.5 . *Conclusion:* Preliminary data support that oral and intravenous administration of fomepizole in therapeutic doses appear to result in similar AUCs, C_{max} , T_{mec} , and T_{amec} .

79. Time of Onset of Seizures After Bupropion Overdose

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Background: Seizures are a well-documented consequence of bupropion overdose. Concerns about delayed-onset seizures have raised questions regarding an appropriate period of observation for these patients. We reviewed our exposure data in an effort to more clearly define a reasonable observation period. *Methods:* We conducted a retrospective review of all bupropion exposure cases, received by the (DPIC) between January 2000 and January 2004. Confirmed nonexposures, pediatric tastes or licks, cases where poisoning was purported but the caller had hung up before providing any information, and animal exposures were excluded. *Results:* A total of 600 exposure cases were received; 342 cases met the inclusion criteria. The average dose of bupropion was 4100 mg (R= 300–9150). Four patients took the immediate-release formulation of bupropion, 27 took the sustained-release formulation, and in one patient the formulation was unknown. Thirty-two patients developed seizures. Eleven of 32 patients had multiple seizures. In 8 of the patients who had a seizure the exact time after ingestion could not be determined. Of the remaining 24 cases the median times of onset of first seizure and last seizure were 4 h (R=1–10) and 14 (R=3–36), respectively. The median time between first and second seizures was 8 h (R=1–31.5). Sixteen of the 32 patients developing seizures took co-ingestants. However, no patients who remained seizure-free for 10 h after the overdose went on to develop seizures regardless of formulation, co-ingestants, or dose. *Conclusion:* In our series patients who remained seizure-free for 10 h after a bupropion overdose did not develop seizures regardless of formulation, co-ingestants, or dose. Patients who have one seizure are likely to re-seize and should be admitted for 24 h observation.

80. Extracorporeal Removal of Acetaminophen

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Background: The effectiveness of N-acetylcysteine (NAC) makes routine extracorporeal removal of acetaminophen (APAP) unnecessary, and there are few reported cases of hemodialysis. In a patient with hepatic dysfunction and an extraordinarily high level of acetaminophen, extracorporeal removal may be warranted, especially if emergent transplantation is a consideration. *Case Report:* A previously healthy 22-yr-old female was found unresponsive 16 h after ingesting 75 g APAP and 3.75 g diphenhydramine. She was intubated, given activated charcoal, and fluid resuscitated with NaHCO₃-containing crystalloid (due to her initial pH=6.9). Post-resuscitation arterial blood gas was pH 7.28, pCO₂ 17 mm Hg, HCO₃ 8 mEq/L. She received intravenous N-acetylcysteine. Subsequent laboratory evaluation revealed HCO₃ 6 meq/L, lactate 13.5 mmol/L, and INR 3.4. Her 22- and 28 h serum APAP levels were 716 mcg/mL and 586 mcg/mL, respectively (calculated t_{1/2}=20 h). She was listed as Status I for orthotopic liver transplantation. We were concerned that her high APAP level and long t_{1/2} might lead to toxic levels of APAP persisting to time of transplantation. She underwent hemodialysis (HD) from hours 33 to 37 postingestion to remove circulating APAP. Her serum APAP level 39 h postingestion (2 h p-HD) was 142.5 mcg/mL; 9.75 g APAP were removed; her clearance was 24 L. She spontaneously recovered liver function by 5 days postingestion and did not proceed to transplant. *Conclusion:* HD removes significant amounts of circulating APAP after overdose. In very selected cases, it may be a reasonable intervention in acetaminophen toxicity.

81. Laboratory Workplace Coffee Tampering with Sodium Azide

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Background: Intentional poisoning with sodium azide is uncommon but frequently fatal, whether homicidal or suicidal. Sodium azide is commonly available in laboratories. *Case Report:* A 38-yr-old male laboratory worker complained of sudden dizziness, flushing, sweats, and palpitations 1 min after sipping his coffee. He felt hot, turned pale, and lost consciousness for 40 sec. A 36-yr-old female coworker was found unconscious in her desk chair with an “almost full” cup of coffee in a nearby office. In the emergency department (ED), both had normal exams and lab tests except for mild hypotension, which resolved with IV fluids within 2 h. The poison center recommended that

the coffee be analyzed. Local police refused involvement until there was evidence of a crime. The WA State Toxicology Laboratory refused to test the specimen unless requested by police. The employer arranged testing of the coffee, which was “negative.” Two more employees became acutely ill while drinking office coffee 25 days later at the same site. One reported palpitations and blurred vision with 20 sec of taking one sip. The other took two sips and within 1 sec noted flushing and palpitations lasting 10 min. One declined evaluation but the ED exam and labs on the other were negative. Coffee specimens from both incidents subsequently tested positive for toxic levels of sodium azide. Police found an opened bottle of it at the site. The perpetrator was never caught. *Conclusions:* The rapid onset of toxicity in these cases was more likely due to inhalation of hydrazoic gas liberated when the azide was mixed with hot water than gastrointestinal absorption of azide. Sodium azide poisoning is capable of rapid “knock-down” type and potentially lethal poisoning and should be suspected in poisonings associated with laboratory workers.

82. Cardiac Arrest and Withdrawal After Clonidine Overdose in a Toddler with ADHD

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Background: Clonidine is commonly used to treat attention-deficit/hyperactivity disorder (ADHD) in children. While overdose is common, cardiac arrest is not. Withdrawal, although reported in adults, is not generally reported in children. *Case Report:* A 3-yr-old male with ADHD and bipolar affective disorder presented to the ED within 1 h following an acute on chronic overdose with up to 60 clonidine 0.1 mg tablets. Initial effects included miosis, bradycardia with a pulse in the 60 s, and irritability. He developed intermittent somnolence, which responded to stimulation. The heart rate increased after administration of a 0.5-mg bolus dose of naloxone. The patient was intubated. Lavage was performed and activated charcoal with sorbitol given. Approximately 6 h postingestion, the patient’s heart rate dropped to the 30 s and he became asystolic during transfer from a bed to a stretcher. Resuscitation with atropine and chest compressions was successful. A transvenous demand pacemaker was placed, and captured periodically in response to episodes of bradycardia. The bradycardia appeared to respond to naloxone 2 mg/hr, preventing further activation of the pacemaker. Within 18 to 24 h of the overdose, the patient’s heart rate and blood pressure increased to 180 beats per minute and 150 systolic, respectively. The patient’s pupils were dilated. Clonidine 0.1 mg reduced the blood pressure to 120 systolic within 15 min of administration. *Conclusion:* Clonidine overdose may cause significant bradycardia leading to cardiac arrest in severe cases. The bradycardia may respond to naloxone. Significant withdrawal can occur within 1 day of massive acute on chronic clonidine overdose in children treated for ADHD.

83. Zantac[®] (Ranitidine) Therapeutic Errors in Infants

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Background: Zantac[®] (Ranitidine) is a histamine H₂ receptor antagonist commonly prescribed for the treatment of gastric and duodenal ulcers, and gastroesophageal reflux disease in infants, in doses of 2–4 to 5–10 mg/kg twice a day, respectively. The maximum tolerated dose is not established. The frequency of Zantac therapeutic errors (TE) in infants, reported to our center, led us to investigate their characteristics for future management decisions. *Methods:* A retrospective review of Zantac TE in infants (≤ 2 yrs of age) during 2000 to 2003. *Results:* There were 10 cases of Zantac TE in infants in 2000, 24 in 2001, 17 in 2002, and 31 in 2003, for a total of 82 cases. The 74/82 (90%) were < 1 yr of age with a median age of 5.3 months (range 10 days to 2 yrs.). TE scenarios included 10-fold errors 13/82 (16%); double-dose 23/82 (28%); other incorrect dose 22/82 (26%); incorrect formulation 10/82 (12%); dispensing cup errors 7/82 ($< 1\%$), and unknown 3/82 ($< 1\%$). Patient weight and dose data were available for 57/82 (70%) of cases. Of these, 15/57 (26%) experienced 1 to 4 Zantac[®] TE per day in excess of 10 mg/kg (range 11 to 25 mg/kg), resulting in doses of up to 75 mg/kg/day, with durations of up to 5 weeks. Only three patients developed mild symptoms of irritability, vomiting, and/or diarrhea with no clear dose relationships. One patient, who received 56 mg/kg/day of Zantac for 5 weeks prior to a

medical evaluation for diarrhea of unknown duration, had normal liver function tests and was discharged 3 h later. *Conclusion:* These data indicate a wide range of tolerability for acute and chronic exposures related to Zantac TE in infants and support their conservative management. The frequency of reports of Zantac TE suggests the need for better labeling and parental dosing instructions.

84. CNS and CV Effects in Acute Amantadine Overdoses in Children

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Overview: Despite reported associations between amantadine overdose and dysrhythmias or seizures, little is known about doses causing these effects in children. We studied doses causing CNS or CV effects in children <6 yrs with acute overdoses. *Methods:* Data for amantadine-only exposures in children <6 yrs were obtained from the AAPCC TESS (1994–2003). Nonacute exposures, adverse drug reactions, and cases with “unrelated effects” or “not followed” were excluded. An “ideal group” (IG) with known doses (“exact doses”) was used to compare doses causing CNS or CV effects (CE) and doses without CNS or CV effects (NE). Cases with CE in the IG were also compared to cases with CE and unknown (U) doses (“maximum or estimated dose” or unknown dose). *Results:* A total of 518 amantadine-only exposures in children <6 yrs were reported (0 deaths and 1 case, a chronic exposure, classified as a “major effect”). A total of 288/518 cases met inclusion criteria. Those where 129 clinical effects recorded in 288 cases. A total of 67/129 effects were CNS: drowsiness 31/67, agitation 21/67, and hallucinations 8/67 were most common, but 1 child had a single seizure after a maximum dose of 38.5 mg/kg, and 2 had dystonia. CV effects were only hypertension (n=2) and tachycardia (n=3). No other serious effects were recorded in the 518 total cases. A total of 242/288 cases had NE (210 U; 32 IG), and 46 had CE (37 U; 9 IG). The RR of CE in the IG compared to the U group was 1.6 (p=0.15). Dose (mg/kg) range; median; and interquartile range in the IG+NE group was 0.08–33.3; 6.5; 4.6–8.4, and 7.1–166.7; 14.4; 9.1–22 in the IG+CE group. Doses causing CE were significantly higher than doses with NE (Mann-Whitney U p<0.005). *Conclusion:* A wide range of doses caused CE. The lowest dose causing CE was 7.1 mg/kg. CE in children <6 yrs with amantadine overdoses were uncommon and usually mild.

85. The Use of IPCS/EC/EAPCCT Poisoning Severity Score Scale in Clinical Toxicology of Corrosive Poisoning

Sarmanaev SKh.

Background: The first step of a correct treatment is a correct diagnosis. To correctly diagnose a disease, a consensus of classifications is needed, which is widely practiced in many clinical disciplines. Clinical toxicology has virtually been lacking well-developed scales for estimating the degree of CP severity. The IPCS/EC/EAPCCT PSS (Persson et al., 1998) is one of recent standardized universal scales of grading the severity of a poisoning. *Methods and materials:* The PSS scale was evaluated in Toxicological Center on data from 112 patients with acute CP. Its generally recognized advantages are easy of application and possibility for a unified estimation of all poisonings. *Results:* It was found that correlation with the GI injury was 100%, while correlation with the injury of most other systems was only 30–80%. These characteristics are explained by the fact that in the toxicology of searing, non-resorbative CP (alkalis, mineral acids, oxidants) the greatest significance is with the degree of the GI injury, while other systems are injured indirectly. Thus, the results of scale estimation in toxicology of non-resorbative CP largely reflects the degree of the GI injury. The second important finding is the fact that the scale is not suited for determining potentially lethal patients. Using probabilistic recognition methods, we have developed a grade-based method to estimate the patient’s state for prognosis of the outcome of CP and determination of specific symptoms of systems’ injury. We suggest adding to this scale a criterion of the fourth severity degree, which requires studying the probabilities of distribution of possible prognostic symptoms in cases of CP.

86. Determination of Fomepizole Concentrations in Tissue

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Background: The volume of distribution of fomepizole suggests a wide tissue distribution, but the levels of fomepizole in tissues, especially the target liver tissue, have never been examined. This pilot study in rats quantified fomepizole pharmacokinetics in tissue compartments as compared to serum. *Methods:* Male Sprague-Dawley rats were administered fomepizole 15 mg/kg intraperitoneally and sacrificed at 1, 4, 12, or 24 h. Serum, kidney, and liver tissues were collected, tissue homogenates prepared in buffer, and then frozen for later analysis. Homogenates were deproteinized with trichloroacetic acid, spiked with a 3-methylpyrazole standard, extracted with Bondelut SCX columns and analyzed in duplicate by HPLC. *Results:* Tissue concentrations of fomepizole were significantly greater than serum concentrations (5–10-fold higher per gram of tissue). Kidney concentrations were similar to those found in the liver. Elimination of fomepizole from serum followed nonlinear kinetics with an apparent elimination rate of 13 $\mu\text{mol/L/h}$, such that no fomepizole was detected in serum by 24 h. The elimination of fomepizole from the liver and the kidney followed similar kinetics as that in the serum, but with higher rates of elimination. Because of the higher initial concentrations in tissues, fomepizole remained detectable in the kidney and liver at 24 h. *Conclusions:* Fomepizole concentrations in tissue samples are significantly higher than those in the serum, but fomepizole is rapidly eliminated from tissues such that there is no long-term retention.

87. Osmotic Activity of Ethanol in Fresh Whole Blood

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Background: Calculations to determine the serum osmolal gap require a term to account for ethanol's contribution to total osmolality. Several studies have empirically shown that ethanol (EtOH) contributes more to total osmolality than predicted by its serum concentration, with each mEq/kg of EtOH accounting for 1.12–1.25 mOsm/kg. Our prior studies showed that this nonideality could not be replicated in vitro with EtOH dissolved in saline, serum, plasma, or plasma with added red blood cells (RBCs) simulating whole blood. This study determines whether EtOH's nonideal contribution to osmolality can be replicated using fresh whole blood as the solvent. *Methods:* Fresh whole blood was collected via phlebotomy into lavender-top EDTA tubes from a single healthy adult subject who refrained from alcoholic beverages for >24 h. Samples were spiked with varying amounts of EtOH to produce specimens with EtOH concentrations ranging from 0 to 500 mg/dL and allowed to equilibrate for 30 min. Samples were centrifuged and the supernatant plasma was analyzed to determine a concurrent basic metabolic panel, EtOH level, and osmolality by freezing-point depression method for each sample. The slope of the EtOH concentration vs. total osmolality lines was determined by linear regression and compared to predicted slope if EtOH affects osmolality in an ideal fashion. *Results:* The slope of the EtOH concentration vs. total osmolality line was 0.240 ± 0.008 mOsm dL/mg kg. This slope was not statistically different from the predicted ideal (0.234 mOsm dL/mg kg; $p=0.49$). *Conclusion:* EtOH's nonideal effect on osmolality could not be reproduced in this model using fresh whole blood as the solvent. EDTA may interfere with transmembrane fluid or electrolyte shifts, or as yet undiscovered factors may influence EtOH's effect on osmolality in vivo.

88. TESS-Based Clonidine Dose-Response in Pediatric Exposures

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Background: Pediatric clonidine poisonings are associated with serious clinical outcomes. The dose-response relationships for clonidine exposures reported to the AAPCC Toxic Exposure Surveillance System (TESS) were

examined. *Methods:* A total of 3458 single-substance clonidine exposures in children <6 yr of age reported from January 2000 through December 2003 were examined. Dose-ingested, age, and clinical outcome (CO) were available for 1550 cases. We added respiratory arrest (n=8) as the most severe CO category (Arrest, Major, Moderate, Mild, and No effect). Exposures reported as a "taste or lick" (n=51) were included as a dose of 1/10 of the dosage form involved. Dose ranged from 0.4 to 1980 (median 13) $\mu\text{g}/\text{kg}$. Weight was imputed based on a quadratic fit of weight for age. Dose Certainty was coded as Exact (26% of cases) or Not exact (74%). CO was examined via logistic regression using SAS JMP (release 5.1). *Results:* The logistic model describing CO ($p < 0.0001$) included Log_{10} -dose/kg ($p = 0.0000$) and Certainty ($p = 0.045$). The CO data are summarized by quintile (number, %) in the table. *Conclusion:* TESS data can provide the basis for a statistically sound description of dose-response for pediatric clonidine exposure.

Clinical outcome	Dose quintile [$\mu\text{g}/\text{kg}$]					Total	Effect level	Dose [$\mu\text{g}/\text{kg}$]
	[<7.8]	[7.8–9.9]	[9.9–16]	[16–31]	[>31]	[Any]		
None	168 (11%)	152 (10%)	122 (8%)	104 (7%)	70 (5%)	616 (40%)		
Minor	109 (7%)	108 (7%)	122 (8%)	120 (8%)	106 (7%)	565 (36%)	ED _{50%}	2.8
Moderate	28 (2%)	47 (3%)	58 (4%)	75 (5%)	104 (7%)	312 (20%)	ED _{50%}	43
Major	5 (0.3%)	3 (0.2%)	8 (0.5%)	10 (0.7%)	23 (1.5%)	49 (3%)	ED _{10%}	1066
Arrest	0	0	0	1 (0.1%)	7 (0.4%)	8 (0.5%)	ED _{1%}	3005
Mod-arrest	33 (11%)	50 (16%)	66 (21%)	86 (28%)	134 (43%)			

89. In Vitro Evaluation of Concomitant Use of Activated Charcoal and N-Acetylcysteine

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Background: N-Acetylcysteine (NAC), as an oral antidote for acetaminophen (APAP) overdose, has been available since 2002 in Japan. To evaluate the appropriateness of concomitant administration with activated charcoal (AC), we designed in vitro adsorption studies of NAC and APAP onto AC. *Methods:* Four AC products were evaluated with respect to their abilities to adsorb APAP and NAC in vitro from simulated gastric (SGF, pH=1.2) and intestinal fluids (SIF, pH=6.8). Different amounts of each ACs were added to vials containing 20 mL of stock solutions of each drug. The vials were incubated for 1 h, then the AC was removed from the samples by filtration. The filtrates were analyzed by HPLC with UV detection to determine the residual drug concentrations. *Results:* Three commercially available antidotal ACs effectively adsorb APAP. The adsorption of APAP is optimal with AC doses of 4 g per gram of APAP, which is easily within the range of recommended doses of AC for poisonings. After incubation with AC, amount of unchanged NAC in residual fluid was less in SIF than in SGF. The residual NAC concentration in SIF is zero with AC doses of 3 g per gram of NAC. HPLC analysis of filtrates indicates that NAC can be significantly oxidized to a disulfide, N,N'-diacetylcystine (DAC) in the presence of AC. *Conclusion:* Our data suggest that AC functions as both adsorbent of NAC and catalyst for oxidation of NAC to DAC at physiologic intestinal pH value, within the range of recommended doses of AC and NAC. Therefore, it is recommended that AC should not administer concomitantly with NAC if the start of initial therapy delayed.

90. Enhancement by Disulfiram on Trichloroethylene-Induced Neurobehavioral Toxicity in a Murine System

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Objective: Trichloroethylene (TCE), an industrial solvent, has become a major environmental pollutant because of widespread use and improper disposal. The metabolism of TCE is primarily through the cytochrome P450 system,

principally the isoenzyme CYP2E1. Disulfiram has been identified as a mechanism-based inhibitor of human and animal liver microsomal CYP2E1 *in vitro*. This study investigated the effect of disulfiram, at a dose that inhibits CYP2E1, on *in vivo* TCE-induced neurobehavioral toxicity following acute exposure. *Methods*: Male B6C3F1 mice (N=10/group) were pretreated with disulfiram 600 mg/kg intraperitoneal (i.p.) (dose based on preliminary studies) or with vehicle alone. One-hour later mice from both groups received i.p. TCE (2250 mg/kg). Neurobehavioral toxicity was evaluated quantally (pass/fail) by two functional outcome measures: the righting reflex and the rotarod test. Serial testing was performed: prior to pretreatment, prior to i.p. TCE and at 15-min intervals for 240 min. *Results*: Mean time (minutes) for loss-of-righting reflex and impaired rotarod ability was not significantly different between pretreated mice and controls ($p>0.05$). Disulfiram pretreatment significantly increased mean time of recovery ($p<0.01$) and mean total time of impairment for both the righting reflex and rotarod test relative to controls ($p<0.01$). *Conclusion*: Pretreatment with an inhibitor of CYP2E1 (disulfiram) significantly increased the duration of TCE-induced neurobehavioral toxicity in mice. CYP2E1 activity can vary among individuals and may alter TCE detoxification ability. Further investigations are needed to understand the role of individual variations of CYP2E1 and consequent variations in sensitivity to the toxicity TCE.

91. Modulation of Murine CYP2E1 Activity by Disulfiram on Trichloroethylene-Induced Neurotoxicity—A Pilot Study

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Objective: Trichloroethylene (TCE), a volatile organic solvent, is primarily metabolized through the cytochrome P450 system, principally the isoenzyme CYP2E1. Up to 1% of the general population have a genetic polymorphism in CYP2E1, which could contribute to an impaired metabolism of TCE. The purpose of this study was to investigate whether impaired CYP2E1 activity would alter TCE-induced neurobehavioral toxicity. *Methods*: Male B6C3F1 mice (n=5–10/group) were pretreated with the CYP2E1 inhibitor disulfiram 600 mg/kg intraperitoneal (i.p.) (dose based on our preliminary studies) or with vehicle alone. One hour later mice from both groups received incremental doses of TCE i.p. to complete dose-response curves. Two standard neurobehavioral outcome measures were used to assess the TD₅₀ of TCE: the righting reflex and the rotarod test. *Results*: Pretreatment with disulfiram decreased the TD₅₀ of TCE for the righting reflex from 3222 mg/kg (95% CI, 2971–3494 mg/kg) in control mice to 1261 mg/kg (95% CI, 966.2–1645 mg/kg) in pretreated mice ($p<0.0001$). Pretreatment with disulfiram also decreased the TD₅₀ of TCE for the rotarod test from 1720 mg/kg (95% CI, 1358–2133 mg/kg) in control mice to 703 mg/kg (95% CI, 437.7–1129 mg/kg) in pretreated mice ($p<0.0001$). *Conclusion*: Pretreatment with disulfiram significantly increased the toxicity of TCE in mice. The presence of a genetic polymorphism in CYP2E1 could contribute to an unexpected tolerance or conversely an unexpected exaggerated toxic response to TCE exposure. Since disulfiram has actions other than CYP2E1 inhibition, further studies are needed to characterize more precisely the mechanisms underlying the effects on the TCE-induced toxicity observed in this study.

92. TESS-Based Amlodipine Dose-Response in Pediatric Exposures

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Background: There is little information available regarding amlodipine overdose in children. The dose-response relationships for pediatric amlodipine exposures reported to the AAPCC Toxic Exposure Surveillance System (TESS) were examined. *Methods*: A total of 1251 single-substance amlodipine exposures in children <6 yr of age reported from Jan 2000 through Nov 2003 were reviewed. Only cases with doses coded as "Exact" or "Estimated" and with dose, age, and clinical outcome (CO) were analyzed (N=678). Cardiac effects (hypotension, conduction disturbance, dysrhythmia, or tachycardia) were added as the most severe CO category (Cardiac, Moderate, Mild, and No

Effect). Exposures reported as a ‘‘taste or lick’’ (n=53) were included as a dose of 1/10 of the dosage form involved. Dose ranged from 0.015 to 14.9 (median 0.380) mg/kg. Weight was imputed based on a quadratic fit of weight for age. CO was examined via logistic regression using SAS JMP (release 5.1). *Results*: Only dose/kg contributed to the logistic model ($p=0.04$). The CO data are summarized by quintile (number, %) in the table. *Conclusion*: TESS data can provide the basis for a statistically sound description of dose-response for pediatric amlodipine exposure.

Clinical outcome	Dose quintile [mg/kg]					Total	Effect level	Dose [mg/kg]
	<0.21	0.21–0.36	0.37–0.48	0.49–0.81	>0.81	Any		
None	128 (94%)	120 (89%)	128 (94%)	125 (93%)	125 (92%)	626 (92%)		
Minor	2 (1.5%)	8 (5.9%)	4 (2.9%)	4 (3%)	3 (2.2%)	21 (3.1%)	ED _{10%}	1.1
Moderate	2 (1.5%)	2 (1.5%)	0 (0%)	0 (0%)	1 (0.7%)	5 (0.7%)	ED _{10%}	6.5
Cardiac	4 (2.9%)	5 (3.7%)	4 (2.9%)	6 (4.4%)	7 (5.1%)	26 (3.8%)	ED _{10%}	12
Mod-card	6 (4.4%)	7 (5.2%)	4 (2.9%)	6 (4.4%)	8 (5.9%)			

93. Evaluation of Ciguatoxin on the Eastern Mediterranean Coast

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Background: Ciguatera poisoning (CP) is caused by consuming fish that feed on ciguatoxin-producing dinoflagellates and is common in tropical and subtropical regions. Clinical manifestations include acute and delayed gastrointestinal and neurological effects. Recently, CP was reported on the Mediterranean coast of Israel after consuming *Siganus luridus*, a common edible fish. *Objective*: A pilot study to evaluate the prevalence of ciguatoxin-contaminated fish from the Israeli Mediterranean coast. *Methods*: Large and small *S. rivulatus* from polluted seawater (Haifa bay) and a group of large *S. rivulatus* from relatively clean seawater (Dor) were analyzed in the summer. Ciguatoxin was assessed in each fish by a membrane immunobead assay (Ciguacheck, Oceanit, Hawaii) based on a color reaction interpreted as positive, borderline, or negative and scored as 2, 1, and 0, respectively. *Statistics*: Unpaired student's t-test, Chi square, Kruskal-Wallis, and Wilcoxon. *Results*: Haifa bay: Large *S. rivulatus* were more ciguatoxin-contaminated than small ones (1.6–0.56 and 1.29–0.58, respectively, $p=0.0351$). Both large and small fish from the polluted site were more ciguatoxin-positive (64% and 35%, respectively) compared to fish from the clean site (5%), $p=0.0001$ and $p=0.0004$, respectively. *Conclusions*: *S. rivulatus* from polluted seawater of the Eastern Mediterranean region is contaminated with ciguatoxin. It is suggested that manmade pollution and global temperature increase can lead to the proliferation of toxic dinoflagellates and entrance of ciguatoxin into the food web in regions where it was previously unknown. Diagnosis of CP can be difficult and it lacks specific therapy. Its prevention by early detection and control of pollution is important.

94. 4,5-DHHA is a Biomarker for 1,4-BD and GBL in Murine Overdose

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Background: A rapid and sensitive diagnostic test for detecting GHB is presently lacking; moreover, the development of a GHB assay is confounded by the natural presence of GHB in the human body as a catabolite of GABA metabolism. GHB accumulates to toxic levels in the human inborn error of GABA metabolism, succinic semialdehyde dehydrogenase (SSADH) deficiency. Patients with this metabolic disease manifest many of the same symptoms as

acute GHB overdose, and the accumulation of 4,5-dihydroxyhexanoic acid (4,5-DHHA) in urine is pathognomonic for this GHB metabolic disorder. *Objective:* We tested the hypothesis that 4,5-DHHA can be a selective biomarker for excess *exogenous* GHB from acute 1,4-BD and GBL overdose. *Methods:* Male Sprague-Dawley rats were administered 1,4-BD 1 g/kg i.p. (N=10), GBL 1 g/kg i.p. (N=3), or saline vehicle (N=11) and placed in metabolic cages for a 6 h urine collection. Samples were stored at -80°C prior to analysis. Quantification of urine 4,5-DHHA was performed using isotope dilution gas chromatography-mass spectrometry. Protein concentration was determined by the Bradford method using bovine serum albumin as standard. *Results:* The mean concentration of 4,5-DHHA \pm SEM (mmol/mol creatinine) was 4.87 ± 0.41 ($P < 0.01$), 3.22 ± 0.33 ($P < 0.01$), and 1.19 ± 0.10 for rats treated with 1,4-BD, GBL, and saline vehicle, respectively. *Conclusion:* In addition to being a biomarker for excess *endogenous* GHB from the GHB metabolic disorder of SSADH deficiency, 4,5-DHHA may also be a selective biomarker for excess *exogenous* GHB following acute 1,4-BD and GBL overdose.

95. 4,5-DHHA is a Biomarker for GHB in GHB Mutant Mice

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Background: Human succinic semialdehyde dehydrogenase (SSADH) deficiency results in the shunting of the metabolic flux of GABA from the Krebs's Cycle (normally responsible for >99% of GABA metabolism) toward GHB production (normally responsible for 0.16% of GABA metabolism). Patients with SSADH deficiency have extremely elevated CSF, blood, and urine GHB levels; moreover, the accumulation of urine 4,5-dihydroxyhexanoic acid (4,5-DHHA) is pathognomonic for this metabolic disorder. Recently, SSADH deficient mice (GHB mutant mice) were created in the C57/129Sv background using standard gene targeting. *Objective:* In this study, we performed extensive metabolic analyses for 4,5-DHHA in regional brain tissues derived from GHB mutant mice. *Methods:* Sections of freshly harvested brain cortex (CTX), cerebellum (CRB), and hippocampus (HIPP) were taken from 17-day-old GHB mutant (N=9), heterozygous (N=11), and wild-type (N=7) mice, and quantification of regional brain tissue 4,5-DHHA was performed using isotope dilution gas chromatography-mass spectrometry. Protein concentration was determined by the Bradford method using bovine serum albumin as standard. *Results:* The 4,5-DHHA was undetectable in the brain CTX, CRB, and HIPP of any wild-type or heterozygous mice. Conversely, in GHB mutant mice, the 4,5-DHHA mean level \pm SEM ($\mu\text{mol}/100$ mg protein) was 0.134 ± 0.017 ($P < 0.001$), 0.102 ± 0.011 ($P < 0.001$), and 0.138 ± 0.012 ($P < 0.001$) for brain CTX, CRB, and HIPP, respectively. *Conclusion:* The 4,5-DHHA appears to be a sensitive and specific biomarker for excess GHB accumulation in GHB mutant mice.

96. 4-MP Blocks 1,4-BD Neuroprotection in Rodent Stroke

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Background: Recently, we demonstrated 1,4-BD treatment to have a neuroprotective effect in rats undergoing stroke by permanent middle cerebral artery occlusion (MCAO), presumably by its biotransformation to GHB. *Objective:* To determine if 1,4-BD neuroprotection in rodent stroke can be blocked by 4-MP. *Methods:* Fifteen male SD rats were anesthetized with isoflurane. A small incision was made in the left internal carotid artery and 4/0 monofilament passed 2 cm proximally, lodging it in the anterior cerebral artery and occluding the origin of the MCA. The filament was sutured into place and the incision closed. The rats were divided into groups treated with 1,4-BD 300 mg/kg i.p. alone, 4-MP 25 mg/kg i.p. + 1,4-BD, or saline vehicle at 30 min before as well as 180 and 360 min. after infarction (N=5 each group). Twenty-four hours later, brains were removed, cut into 1 mm coronal slices, and stained with 2% TTC, a water soluble, colorless solution reduced to an insoluble red pigment by viable neuronal cells. The coronal sections were photographed with a 4.0 megapixel digital camera and analyzed with SigmaScan Pro[®] 5.0 image analysis

software. The infarct areas for each treatment group were represented as the mean % volume \pm SEM of ischemic injury and compared to controls by ANOVA with post-hoc Neuman-Keuls Test. *Results:* The mean % volume of infarction for control rats was $30.8 \pm 2.0\%$ vs. $12.5 \pm 5.0\%$ ($P < 0.05$) and $34.7 \pm 1.0\%$ ($P = \text{NS}$) for rats treated with 1,4-BD alone and the combination of 4-MP+1,4-BD, respectively. *Conclusion:* We conclude from this data that 1,4-BD likely has a neuroprotective effect in the MCAO rodent stroke model via its in vivo biotransformation to GHB. Furthermore, the neuroprotective effect of 1,4-BD can be blocked by the alcohol dehydrogenase inhibitor 4-MP.

97. GBL Neuroprotection in Rat Stroke is GABA_B Receptor-Mediated

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Background: Recently, we demonstrated GBL treatment to have a neuroprotective effect in rats undergoing stroke by permanent middle cerebral artery occlusion (MCAO), presumably by its in vivo biotransformation to GHB. *Objective:* To determine if the mechanism of GBL neuroprotection in rodent stroke is mediated by the GABA_B receptor by using the GABA_B receptor-selective antagonist SCH50911. *Methods:* Fifteen male SD rats were anesthetized with isoflurane. A small incision was made in the left internal carotid artery and 4/0 monofilament passed 2 cm proximally, lodging it in the anterior cerebral artery and occluding the origin of the MCA. The filament was sutured into place and the incision closed. The rats were divided into groups treated with GBL 300 mg/kg i.p. alone, the combination of SCH50911 50 mg/kg i.p.+GBL, or saline vehicle at 30 min before as well as 180 and 360 min after infarction (N=5 each group). Twenty-four hours later, brains were removed, cut into 1 mm coronal slices, and stained with 2% TTC, a water soluble, colorless solution reduced to an insoluble red pigment by viable neuronal cells. The coronal sections were photographed with a 4.0 megapixel digital camera and analyzed with SigmaScan Pro^o 5.0 image analysis software. The infarct areas for each treatment group were represented as the mean % volume of ischemic injury \pm SEM and compared to controls by ANOVA with post-hoc Neuman-Keuls Test. *Results:* The mean % volume of infarction for control rats was $30.8 \pm 2.0\%$ vs. $8.2 \pm 3.0\%$ ($P < 0.001$) and $37.6 \pm 2.0\%$ ($P = \text{NS}$) for rats treated with GBL alone and the combination of SCH50911+GBL, respectively. *Conclusion:* Because GBL's neuroprotective effect can be blocked by the GABA_B receptor-selective antagonist SCH50911, we conclude that the mechanism for its neuroprotection is GABA_B receptor-mediated.

98. Lower-Dose GHB Produces Increased Locomotion in Mice for the Open Field Test

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Background: GHB has been a popular drug of abuse, and its overdose toxicity is principally manifested by respiratory and CNS depression. Nevertheless, GHB has legitimate medical uses, having been demonstrated in clinical trials to decrease both daytime excessive sleepiness and cataplexic attacks in patients suffering from narcolepsy. And since July 2002, GHB has been approved by the FDA as a pharmacotherapy for treating narcolepsy. *Objective:* We investigated if GHB can produce a similar stimulatory effect in mice for the open field locomotion test. *Methods:* Thirty-two male CD-1 mice were administered GHB at doses of 100 mg/kg, 200 mg/kg, 300 mg/kg, or an equal volume of saline vehicle i.p. (N=8 each group). Mice were then returned to their cages and their movements were tracked and calculated every 10 min by a video tracking system and computer software program, Ethovision v2.2 (Noldus Information Technology, Wageningen, Netherlands), for the subsequent 120 min. Data for each group are represented as the mean total distance traveled \pm SEM (cm) at each 10-min observation session. *Results:* The mean total distance traveled every 10 min for mice receiving GHB 100 mg/kg was 2452 ± 129 cm vs. 1645 ± 156 ($P < 0.001$), 1689 ± 175 ($P < 0.001$), and 1874 ± 135 ($P < 0.001$) cm for mice receiving GHB 200 mg/kg, GHB 300 mg/kg, or saline control vehicle, respectively. *Conclusion:* GHB can increase the locomotion of mice for the open field test when administered at the lower dose of 100 mg/kg. However, at the relatively higher doses of 200

mg/kg and 300 mg/kg, GHB significantly decreased the locomotion of mice for the open field test. Whether this low-dose observation is due to an anxiolytic effect or central stimulant effect remains to be elucidated.

99. Aluminum Toxicity Following IV Use of Oral Methadone Solution

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Background: Aluminum toxicity has been reported in hemodialysis patients exposed to aluminum-contaminated dialysate and oral aluminum-containing phosphate binders. We report a significant case of aluminum toxicity in a patient with preserved renal function following chronic intentional intravenous (IV) injection of oral methadone solution heated in an aluminum pot. *Case Report:* A 43-yr-old male IV drug user presented to hospital with progressive cognitive decline, memory loss, and ataxia. Microcytic anemia, abnormal red cell morphology, and basophilic stippling were noted. Bone marrow biopsy showed osteosclerosis and myelosclerosis. Serum creatinine was 1.7 mg/dL (150 µmol/L), blood lead was normal, but serum aluminum concentration was 180 µg/L (6.65 µmol/L) [normal up to 10.8 µg/L (0.4 µmol/L)]. For 3 to 4 years prior, the patient had injected “cooked” oral methadone. He had been dispensed oral methadone as a diluted solution flavored with orange or grape juice crystals (e.g., Tang™) containing citric acid. The mixture was heated in an aluminum pot to reduce the volume. Hospital treatment included chelation with IV deferoxamine infusion for 7 months with doses ranging from 12.5 mg/h up to 125 mg/h. Dose adjustments were based on neurological symptoms and renal function. Weekly intermittent IV deferoxamine 5 mg/kg was administered for a further 2 months as an outpatient until the patient failed to return. Serum aluminum level after 9 months of chelation was 64.5 µg/L (2.39 µmol/L). Neurological symptoms were marginally improved. *Conclusion:* Chronic IV injection of oral methadone solution heated in an aluminum-based cooking utensil may result in significant aluminum toxicity.

100. Crystal Dex—Purified DXM Using an Acid/Base Extraction

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Background: Dextromethorphan (DEX or DXM) is an opioid cough suppressant that binds to the phencyclidine site on the NMDA receptor and is commonly abused as a recreational drug. Pure DXM is not available, so abusers typically ingest combination cold medications (Robo, Coricidin HBP). In an effort to avoid the undesirable effects of decongestants and antihistamines that are packaged in cold preparations, an acid-base extraction to purify DXM has become popular. We report a case of severe dextromethorphan toxicity after purifying cold preparations into Crystal Dex. *Case Series:* A 20-yr-old male ingested approximately 1 g of crystal, or purified, dextromethorphan. He arrived to the ED obtunded, HR 99, BP 70/30, and with shallow respirations. Physical examination was significant for large pupils that were reactive to light and dry, red skin. BS were present and there was axillary sweat. The patient was intubated and resuscitated with IV fluid. Five hours after his ingestion he became hypertensive (202/88) with psychomotor agitation, and tremor, which was treated with benzodiazepines. He was extubated 12 h after ingestion, and his symptoms resolved. *Technique:* An agent lemon extraction was utilized and is described here. Sixteen ounces of liquid cough preparation are mixed with ammonia and stirred. Lighter fluid is added and shaken. The solvent layer is removed, then mixed with citric acid and shaken. The nonsolvent layer is removed, boiled (to evaporate any remaining solvent), and ingested. *Conclusion:* Toxicologists and CSPIs should be aware of this purification process and the potential toxicity that is associated.

101. Rising Abuse of Coricidin HBP™ over a Three-Year Period

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Objective: Intentional abuse of Coricidin HBP™ (Dextromethorphan HBr 30 mg and Chlorpheniramine Maleate 4 mg per tablet) is well documented. We studied poison center statistics to document trends in the incidence of abuse category of this product. *Methods:* All Coricidin HBP™ cases were collected and studied by our poison center for a 3-yr period, 2001 to 2003. The data were analyzed regarding reason for exposure, patient age and gender, percent of patients treated at a hospital, and patient flow through the hospital. *Results:* Results obtained are recorded in the following table:

Year	Total cases	# Abuse	# of Patients 13–19 yrs old	13–19 male	13–19 female
2001	127	107 (84%)	102 (93%)	60 (58%)	42 (42%)
2002	176	138 (78%)	123 (89%)	75 (61%)	48 (39%)
2002	210	166 (79%)	148 (89%)	83 (56%)	65 (44%)

For 2002 and 2003, 81% of calls pertaining to adolescents involved a hospital emergency department, 40% of those patients were discharged from the ED, 7% were lost to follow up, and 53% were admitted to either ICU, telemetry GMF, or a psychiatric unit. 39% of the admitted patients went to the ICU, and the average length of ICU admission was 1.6 days. *Conclusion:* Over a 2-yr period, there was a 55% increase in calls to this regional poison center regarding coricidin abuse. These figures point to a significant trend toward increasing abuse of this OTC cold product. The rising abuse is leading to an increased use of medical resources. Further education and drug prevention outreach is needed to arrest this disturbing trend.

102. Delayed Passage of Heroin Packets by a Body Stuffer

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Background: Previous case series have documented the course of heroin body stuffers; however, gastrointestinal retention of drug packets has not been reported. *Case Report:* A 41-yr-old male swallowed a plastic bag which contained seven small heroin packets immediately prior to being arrested. Individual heroin packets were wrapped in plastic and stapled. Approximately 2 h later he began to feel effects of heroin intoxication which lasted 36 h. Several days later the patient reported experiencing withdrawal symptoms which lasted 4 days. Twelve days after ingestion the patient was seen in the prison infirmary for epigastric discomfort. He admitted to the ingestion and abdominal radiographs revealed staples found in the stomach. Twenty days after ingestion repeat films revealed staples in the lower GI tract. Subsequent evaluation the following day with contrasted CT of the abdomen revealed packets in the sigmoid colon. A urine drug screen was negative for opioids. An enema was performed, which resulted in the passage of seven empty packets and larger plastic bag. Repeat KUB showed no remaining staples in the GI tract. A previous series of 39 heroin body stuffers were observed for a mean time of 20 h. The patients who developed symptoms (3) did so within 1 h of ingestion. *Conclusion:* This case illustrates that heroin body stuffing may result in prolonged retention of drug packets. The significance of time to passage and risk for delayed toxicity and mechanical obstruction remain uncertain.

103. γ -Hydroxybutyrate (GHB) and γ -Butyrolactone (GBL) Poisoning

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Background: γ -hydroxybutyric acid (GHB) and γ -butyrolactone (GBL) are gaining popularity as drugs of abuse. Data on GHB-like drug overdose is limited. The goal of this study was to characterize the clinical symptoms of GHB-like drug overdose and to provide epidemiological information on this new medical problem in our country. *Methods:* We analyzed all cases of GHB and GBL intoxications reported to the national Poison Centre (PC) between January 1995 and December 2003 using structured reports of the treating physicians. *Results:* A total of 285 cases of GHB or GBL poisoning were reported to the PC. Fifty-two percent presented at weekends, 67% during the night. A total of 73.4% of patients were male, the age (mean \pm SD) was 25.4 \pm 7.2 yrs for men and 21.5 \pm 4.7 yrs for women. A total of 56% ingested alcohol or illicit drugs in addition to GHB or GBL. Sixty-one percent presented with coma. Non-reactive coma (GCS score of 3) was noted in 23% of all patients. Bradycardia occurred in 30% and mild hypotension in 7.6%. Myoclonia was observed in 13% and agitation in 19% of all patients. Vomiting was significantly more frequent in patients with both GHB and alcohol use (32%) compared with GHB use alone (8%). Management of GHB-like drug overdose included supportive care, mechanical ventilation (13%), admission to an intensive care unit (28%), and benzodiazepine administration for agitation. Seven patients with daily GHB use presented with withdrawal symptoms including tachycardia, tremor, agitation, anxiety, and hallucinations. *Conclusion:* GHB-like drug overdose produces considerable morbidity in our country. Multiple drug use is common. Alcohol co-use increases the risk of vomiting and aspiration. Daily GHB use can produce dependence. Overdosing frequently results in nonreactive coma that accounts for the severity of the intoxication and the costs of the management.

104. Salvia: Concentrations and Contaminants

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Background: *Salvia divinorum* is a psychoactive plant of the Labiateae (mint) family native to the Sierra Mazateca region of Oaxaca, Mexico. For centuries, it has been used by the Indians for divination. The active ingredient is a trans-neoclerodane diterpene: salvinorin A. Ingestion of salvia is reported to cause alterations in perception, auditory and visual hallucinations, loss of body control, amnesia, and unconsciousness. Recently salvia has been appearing on the Internet and in head shops as a "legal hallucinogen." We sought to obtain samples from various sources and analyze them for true content. *Methods:* Samples of salvia were legally purchased from various sources. Two samples were purchased from "head shops," one was purchased on eBay, one from an Internet salvia dealer, and one obtained for free from an Internet source promoting the substance. Different strengths and raw leaves were procured. Samples were dissolved in a methanol/acetone solution and analyzed by high-pressure liquid chromatography (HPLC) for presence and quantity of salvinorin A. Samples were also analyzed with thin-layer chromatography for presence of other substances. *Results:* Salvinorin A was present in all specimens. There was no correlation between the reported concentration of salvinorin A and the actual concentration measured. Contamination with caffeine and vitamin E was present in samples. *Conclusion:* Salvia is a potent hallucinogen that is structurally unique. Highly potent samples are legally and easily available. Reported concentrations of the active compound salvinorin A had no relation to the amount present. Misrepresentation of concentrations may lead to inadvertent overdosing or untoward affects.

105. Severe Methamphetamine Toxicity Resulting from Intravaginal Body Stuffing

Kashani J, Ruha AM. *Banner Good Samaritan Medical Center, Phoenix, Arizona.*

Background: Severe toxicity and death may occur in both body packers and body stuffers. This is well reported with cocaine and heroin and less commonly with methamphetamine (MA). The gastrointestinal tract is most often used for both of these practices. We report a unique case of intravaginal body stuffing that lead to severe MA toxicity.

Case Report: A 20-yr-old woman, who was in police custody, developed multiple seizures shortly after admitting to having drugs enclosed in plastic bags hidden in her vagina. The bags were immediately removed and she was transferred to the emergency department (ED). On ED presentation she was unresponsive and apneic, requiring intubation and ventilation. VS were as follows: T=99.2°F, HR=141, BP=144/31, pulse 100% with O₂ given via bag valve mask. ECG revealed a sinus tachycardia. Neuro exam was significant for coma and decerebrate posturing. The vagina was irrigated with saline. She was transferred to a toxicology treatment center and received benzodiazepines and supportive care. Her mental status improved and she was extubated on day 2. She denied ingesting, snorting, inhaling, or injecting MA. She developed rhabdomyolysis with peak CPK of 3840 IU/L, and aspiration pneumonia. By day 4 all symptoms resolved with the exception of a resting tachycardia in the 120 s. GCMS of the urine confirmed the presence of MA and the amphetamine (AMP) metabolite, and excluded co-intoxicants. Quantitative serum levels of MA and AMP on admission were 3100 ng/ml and 110 ng/ml, respectively. *Conclusion:* This case highlights the potential for life-threatening MA intoxication secondary to intravaginal stuffing, which has not previously been reported. If either body packing or stuffing of any agent is suspected, a vaginal exam may be warranted.

106. Pharmacokinetic Interactions of GHB and Ethanol in Humans

Thai D, Haller C, Jacob III P, Benowitz N. *Univ. of Calif., San Francisco, Dept. of Medicine and California Poison Control System, S.F. Division, San Francisco, CA, USA.*

Objective: Gamma-hydroxybutyrate (GHB) and ethanol are often co-ingested in settings of drug-facilitated rape and recreational abuse. Little is known about the effects of ethanol on GHB plasma kinetics. Our objective was to evaluate the pharmacokinetic interactions of ethanol and GHB. *Method:* GHB plasma pharmacokinetic evaluation was conducted as part of a double-blind, placebo-controlled, 4-arm crossover study in eight healthy human volunteers (four men). Subjects ingested 50 mg/kg GHB (Xyrem[®]), 0.6 g/kg ethanol in two doses, or both drugs combined. Serial plasma GHB samples were obtained over a 24 h period. Primary outcomes were area under the curve (AUC) from 0–24 h, elimination half-life ($t_{1/2}$) and maximum drug concentration (C_{max}). Data were analyzed using a paired two-tailed t test. *Results:* A new gas chromatography-mass spectrometer (GC-MS) method was developed to quantitate GHB in human plasma. Ethanol coadministration increased the AUC and decreased the $t_{1/2}$ of GHB (see Table). The C_{max} of GHB was also increased in the presence of ethanol, although the difference was not statistically significant. *Conclusion:* The alteration of GHB AUC and clearance by ethanol may be the result of both increased bioavailability and diminished elimination of GHB. These results may help in part to explain the additive effect of GHB and ethanol on cognitive impairment in humans.

	GHB	GHB and alcohol	P-value
C_{max} (µg/mL)	76.6±19	94.7±20	0.08
T_{max} (hr)	60	45	
$T_{1/2}$ (min)	44.6±14	50.3±14	0.04
CL/F (mL/min/kg)	5.9±2.2	4.3±1.1	0.04
AUC (µg·min/mL)	9350±2926	12258±3197	0.03

107. What Constitutes Confirmatory Testing for Drugs of Abuse? A Case Study of Benzodiazepine False-Positive Immunoassay with Significant Social and Clinical Consequences

Vena J, Wu A, McKay CM. *University of CT/Hartford Hospital, Hartford, CT.*

Background: Urine benzodiazepine immunoassays are notoriously unreliable with regard to false negatives, but may produce false positives as well. *Case Report:* A 41-yr-old male presented to an urban emergency department with chest pressure and suicidal ideation following dismissal from a heroin rehabilitation program due to a positive urine benzodiazepine screen. The patient repeatedly denied the use of any benzodiazepines. The results were reported as “confirmed” on the laboratory report, and methods not further specified. When questioned, the laboratory clarified that a cloned enzyme donor immunoassay (CEDIA, Microgenics Corp., Fremont, CA) was performed using a lowered cutoff value of 200 ng/mL. “Confirmation” was performed by running the same assay on the same sample, due to payor restrictions. At our request, GC/MS with an online glucuronidase hydrolysis was performed on the same sample, using selected ion monitoring mode for nordiazepam, oxazepam, lorazepam, α -OH-alprazolam, temazepam, and 7-amino-clonazepam. The GC/MS results were negative for these benzodiazepine metabolites. Review of the patient’s medications revealed no known interference with the immunoassay, but not all had been investigated by the manufacturer. In the interim, the patient was admitted to the cardiac floor with a negative workup and then spent 12 days as a psychiatric inpatient. *Conclusion:* Caution regarding the screening and confirmation of urine drugs-of-abuse is warranted, particularly in regard to the less-reliable tests, which include urine immunoassays for benzodiazepines.

108. Coricidin Abuse in Adolescent Females

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Background: Dextromethorphan is increasingly abused by adolescents for its potent euphoric and dissociative effects. We reviewed poison control center data to identify trends in dextromethorphan abuse. *Methods:* We abstracted data from the Regional Center for Poison Control and Prevention (PCC) from 2003. *Results:* During that time period, the PCC received 182 calls documenting the recreational use of dextromethorphan by teenagers aged 13–19 (98 girls, 84 boys). Of these calls, 128 (70%) involved the recreational use of CoricidinTM. Of these 128 individuals, 84 were adolescent girls, 44 were teenage boys. If the null hypothesis is that abuse is equally divided between male and female sexes, then the preponderance of Coricidin abuse by females is statistically significant ($P=0.001$). *Conclusion:* Coricidin products appear to be preferred for recreational use by adolescent girls. This data may reflect significant bias, however, as adolescent girls who become intoxicated may preferentially receive medical care and subsequent reporting to poison control centers. In addition, poison control center data are subject to misclassification bias. Nonetheless, dextromethorphan misuse by girls may emulate a broader drug abuse trend. For example, the Community Epidemiology Working Group has identified that the diversion of prescription pharmaceuticals such as clonazepam or OxycontinTM to recreational purposes may occur more frequently in females than males. The misuse of pharmaceutical agents is common enough in adolescents and young adults that the practice is known as “going pharming.” The social and environmental contexts that promote this behavior have not been determined but the practice represents a significant new public health concern.

109. Cardiovascular Responses to GHB and Ethanol in Human Subjects

Haller C, Thai D, Benowitz N. *Department of Medicine and California Poison Control System, S.F. Division, University of California, San Francisco, San Francisco, CA.*

Background: Gamma hydroxybutyrate (GHB) and its chemical analogues are significant drugs of abuse and can produce serious toxicity, particularly when used in combination with other sedative drugs. Our aim was to examine the individual and combined effects of GHB and ethanol in humans. *Methods:* Eight healthy adults (four men)

were given 50 mg/kg GHB (Xyrem™), 0.6 g/kg ethanol in two doses, or both drugs combined in a double-blind, placebo-controlled, 4-arm crossover study. Heart rate (HR), blood pressure (BP), temperature (T), and O₂ saturation were serially monitored for 24 h after dosing. *Results:* Systolic and diastolic BP were significantly decreased by ethanol (max. SBP change –18 mm Hg at 2 h, p=0.04), and ethanol-plus-GHB (max. DBP change –23.3 mm Hg at 2 h, p=0.002), but not GHB alone. HR was increased more by ethanol (max. 16.9 bpm at 75 min, p=0.04), than ethanol-plus-GHB, and unaffected by GHB alone. O₂ saturation was decreased by GHB and ethanol given individually, and maximally decreased by the two drugs combined (max. –2.0% at 1³/₄ h, p=0.0003). Body temperature recorded by skin thermocouple increased in the first hour after dosing for all three treatments relative to placebo. Adverse events included two episodes of self-limited hypotension, and four episodes of nausea and vomiting. Four adverse events occurred with GHB-plus-ethanol, and one with each of the other treatments. *Conclusions:* In modest doses, ethanol but not GHB reduced systolic and diastolic BP. GHB attenuated the HR-accelerating effects of ethanol. GHB and ethanol had additive effects in decreasing O₂ saturation, likely due to central suppression of respiratory drive. GHB-plus-ethanol was associated with more adverse events than the drugs given individually.

110. Cognitive and Mood Effects of GHB and Ethanol in Humans

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Background: Gamma hydroxybutyrate (GHB) and its chemical analogues are frequently abused for their euphoric effects, often in combination with other drugs. Our aim was to examine the individual and combined effects of GHB and ethanol in humans. *Methods:* Eight healthy adults (four men) were given 50 mg/kg GHB (Xyrem™), 0.6 g/kg ethanol in two doses, or both drugs combined in a double-blind, placebo-controlled, 4-arm crossover study. Changes in cognitive performance were assessed by a computerized test battery (CDR™, Goring-on-Thames, UK). Mood responses were serially recorded over 6 h using a written visual analog scale (VAS) questionnaire. *Results:* Two of eight subjects were significantly sedated on one or more treatments and unable to complete scheduled cognitive testing. GHB impaired specific cognitive tasks assessing speed of attention, quality of episodic memory, and speed of memory. Although decrements in speed of response were identified, the accuracy of those responses was not impaired. Additive but not synergistic effects of GHB and ethanol on cognitive impairment were identified. After GHB treatment, men had *increased* VAS mood scores for “drug liking,” and felt “high” and “talkative.” Women had significantly *decreased* scores after GHB, and ethanol-plus-GHB for feeling “confident,” “energetic,” and “friendly,” and *increased* scores for a “bad drug effect.” *Conclusions:* Alcohol and GHB appear to have additive effects in impairing speed of response but not accuracy in tests of cognitive function. Significant gender differences were seen in mood responses, with men reporting more positive effects and women more negative effects of GHB, alone and in combination with ethanol.

111. Seasons of Abuse? Temporal Trends of Prescription Opioids

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Background: Prescription drugs are abused throughout the United States. There are few publications assessing seasonal differences in prescription drug abuse. Using intentional exposure calls to poison centers (PC) as indicators of misuse and abuse, we examined the seasonal differences in abuse among prescription opioids. *Methods:* Intentional exposure calls (November 3, 2002–November 2, 2003) from eight PC involving seven opioids [fentanyl, hydrocodone,

hydromorphone, methadone, morphine, oxycodone (excluding OxyContin) and OxyContin alone] were analyzed by season. *Results:* There were 4,394 intentional exposures and all opioids combined illustrated significant seasonal differences ($p=0.001$). Summer, in general, had higher means, and ANOVA testing with post-hoc comparisons demonstrated significant differences among hydrocodone, oxycodone, and OxyContin:

Opioid/ season	Fentanyl	HC*	HM*	Methadone	Morphine	Oxycodone	OxyContin
Winter	2.31	43.46	0.38	6.92	4.62	10.46	5.69
Spring	2.08	40.69	0.92	7.46	4.38	14.62	9.38
Summer	2.54	54.15	1.15	8.54	5.23	15.00	9.08
Fall	2.38	48.82	1.23	7.31	6.62	14.92	7.31

*HC=Hydrocodone, HM=Hydromorphone, bold italics indicate statistical significance.

Conclusion: The misuse and abuse of prescription opioids varies by season and by opioid, specifically for hydrocodone, oxycodone, and OxyContin, three of the seven opioids investigated. Seasonal trends are essential for understanding misuse and abuse trends and for developing future research and surveillance.

112. Case Series of Methamphetamine Body Stuffers

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Background: Body stuffers are individuals who rapidly ingest poorly wrapped packets of illicit drugs, typically to conceal evidence. While this syndrome has been described for cocaine and heroin users, data on methamphetamine (METH) users has not been reported. *Case Series:* Fourteen cases of body stuffing were identified from a review of all METH exposures ($n=95$) called to a large, regional PCC between 1 January 2001 and 12 December 2003. Reported ingestions ranged from 0.5 g to 4 g (mean=2.06 g). Number of packets ingested was not provided. Ages ranged from 19 to 36 yrs (mean=27.4). There were seven males and four females; gender was otherwise not provided. Reported symptoms were agitation ($n=5$), tachycardia ($n=3$), hypertension ($n=2$), somnolence ($n=2$), seizure ($n=1$), and no symptoms ($n=4$). All symptoms were observed at initial ED presentation. Patients received either activated charcoal ($n=3$), whole bowel irrigation ($n=2$), or a combination ($n=3$); treatment was otherwise not specified. Co-ingestants were THC ($n=3$), benzodiazepines ($n=1$) or both ($n=2$). Six patients were discharged directly from the ED after observation (mean 5.3 h, range 2–9 h). These patients were discharged when asymptomatic to police custody and lost to further follow-up. Seven patients were admitted; five of these went to the ICU. One patient was intubated for 3 days. This patient had rhabdomyolysis, which resolved with IVF. The other patients were discharged within 48 h. Drug packets were recovered in two patients. *Conclusion:* METH stuffers who developed symptoms in this series exhibited them on presentation. More experience in this area is needed to determine the optimal management and time of observation.

113. Hallucinogenic Amphetamines and Tryptamines: Analysis of TESS Data from 1997–2003

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Objective: To examine trends and clinical effects for intentional exposures to hallucinogenic amphetamines and tryptamines reported to U.S. poison control centers. *Methods:* TESS data from 1997–2003 involving intentional human exposures to MDMA, other hallucinogenic amphetamines (HAmph), and hallucinogenic tryptamines (HTryp)

were obtained. Substances were identified using the AAPCC generic codes for “hallucinogenic amphetamines” and “other hallucinogens” and by identifying specific MDMA, HAMph, and HTryp product codes in Poisindex[®]. The frequency of reports and clinical effects for each group were evaluated. *Results:* A total of 10,413 exposures were reported for all three groups during this 7-yr period:

	1997	1998	1999	2000	2001	2002	2003
MDMA	473	601	1393	2337	2168	1821	1204
HAmph	14	13	18	27	37	40	41
HTryp	2	0	8	11	23	65	117

Reports of MDMA exposures peaked in 2000 and declined each of the subsequent 3 yrs. HTryp exposures increased more than ten-fold from 2000 to 2003. The clinical effects most frequently reported in descending order for MDMA were tachycardia, agitation, lethargy, hallucinations, and mydriasis; for HAMph were hallucinations, agitation, tachycardia, lethargy, and mydriasis; and for HTryp were hallucinations, confusion, agitation, vomiting, mydriasis, and tachycardia. *Conclusion:* Reports of HTryp increased and MDMA decreased dramatically over the last 3 yrs. Monitoring of new hallucinogens and their use is warranted.

114. Blindness by Inhalation of Carburetor Cleaners Containing Methanol Among Latinos on the Texas U.S.–Mexico Border

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Background: The epidemiology of intentional inhalation abuse (huffing) of carburetor cleaners (CC) has not been well studied. Less than 10 cases of CC huffing were reported in 2001 along the U.S. side of the 1,254-mile long Texas U.S.–Mexico border. CC may contain one or more solvents including methanol. Development of blindness or significant serum methanol concentrations from CC huffing has not previously been reported. *Case Series:* The annual incidence of CC huffing reported to Texas U.S.–Mexico border poison centers from January 2001 to January 2004 increased almost sixfold. We identified 51 cases of CC huffing involving 40 patients in Texas border regions during this period. All but one patient were Latino with ages in years ranging from 11 to 48 with a mean of 23. Complete blindness developed in 3 patients, significant metabolic acidosis was seen in 24 cases, and 23 cases included the use of at least one form of aggressive therapy (ethanol, fomepizole, hemodialysis, and/or mechanical ventilation). The characteristics of the 3 patients who suffered permanent vision loss are as follows:

Case	Age/sex	Acidosis	[Serum methanol]	Treatment
1	31/M	Yes	53 mg/dL	Ethanol/ fomepizole
2	38/M	Yes	Not obtained	Ethanol/ dialysis
3	28/M	Yes	336 mg/dL	Ethanol/folate/ dialysis

Conclusion: Along the Texas U.S.–Mexico border there is a recent alarming increase in the reported incidence of inhalation abuse of CC that is nearly exclusively associated with the Latino population. Our experience shows that significant toxicity, including blindness and metabolic acidosis, may result from this practice and may require aggressive evaluation and treatment.

115. Green Hornet: Teenage Agony and Ecstasy

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Background: Touted as safe and legal alternatives to ‘street’ drugs, herbal ‘ecstasy’ drinks are sold in stores and on the Internet. Green Hornet (GH) is labeled as containing 11 herbs. *Case Reports:* Four males developed symptoms about 1.5 h after drinking GH and smoking marijuana. Two patients had tonic clonic seizures at the scene and in the ED. All patients had vivid hallucinations, altered mental status, tachycardia, hypertension, hyperthermia and agitation requiring four-point restraints. Initial urine drug screens were positive for tetrahydrocannabinol (all patients) and opiates (patient 3). THCA (tetrahydrocannabinol carboxylic acid) in concentrations ranging from 86 to 289 ng/mL was confirmed by GCMS. The opiate positive specimen was negative for opiates, keto-opiates, and oxymorphone by GCMS.

Patient	DPH (µg/mL)	DMX (µg/mL)	THCA (ng/mL)	Seizures	Reported dose
1. 20yo	46	23	151	Yes	4–5oz
2. 18yo	136	93	86	Yes	4 oz
3. 17yo	173	101	289	No	2 oz
4. 17yo	50	220	103	No	2 oz

Three were discharged the next day. Patient 1 hallucinated for 48 h. GCMS analysis of GH revealed the presence of two off-label substances: dextromethorphan (DMX) 6 mg/mL and diphenhydramine (DPH) 5 mg/mL; 19 small, unidentified peaks were also noted. *Conclusion:* GH, sold as an ‘herbal’ hallucinogen drink, relies more on traditional than alternative psychoactive agents that can cause life-threatening toxicity and present a public health threat.

116. Embryopathy Secondary to Chronic In-Utero Exposure to Carburetor Cleaning Fluid

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Background: The use of automotive products by inhalation and ingestion provides a low-cost and easily accessible option for substance abusers. One such product is B-12 Chem-Tool™ cleaner that contains toluene and methanol, substances capable of crossing the placenta and causing teratogenic effects. *Case Report:* A 32-yr-old woman with a first-trimester pregnancy presented with altered mental status and toluene-induced renal tubular acidosis (RTA). She had at least a 4-yr history of daily huffing and ingestion of B-12 Chem-Tool™. During her pregnancy she had five subsequent hospital admissions in her second and third trimester related to toluene-induced RTA and methanol poisoning. Dialysis was required on two separate admissions for markedly elevated methanol levels. An infant was born by C-section at 32 weeks gestation with severe growth retardation and physical findings of microcephaly, long philtrum, a thin upper lip, close-set eyes, flattened ears, and low hair line. Generalized hypertonicity was noted on physical exam. Subsequent dysmorphology consultation concluded that these physical findings were consistent with intrauterine solvent exposure. *Conclusion:* We present a case of chronic use of Chem-Tool™ carburetor cleaner throughout pregnancy resulting in gross physical abnormalities in a newborn consistent with intrauterine methanol and toluene exposure.

117. Epidemiology of Jellyfish Stings Reported to Poison Centers in Texas During 1998–2003

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Background: Jellyfish are found worldwide. Although morbidity frequently occurs with jellyfish stings, little has been published on the epidemiology of such exposures. This study investigated the relationship between various factors and jellyfish stings reported to poison centers in Texas. *Methods:* Cases were obtained retrospectively from calls to poison centers in Texas and included all reported human exposures during 1998–2003 involving jellyfish stings. *Results:* There were 362 total cases. Among the cases with a known patient age, 17.8% were less than 6 yrs of age, 54.7% were aged 6–19 yrs, and 27.5% were older than 19 yrs of age. Males accounted for 51.9% of the cases and females for 47.2% of the cases. The jellyfish stings were managed on-site (outside of a health care facility) in 87.6% cases. Of the 95 cases with a known clinical outcome, 1.1% had no effect, 81.1% had minor effects, and 17.9% had moderate effects. Cases exhibited a seasonal trend, with most of the jellyfish stings reported during June and July. Counties along the Gulf Coast accounted for 70.7% of the calls. Dermal irritation or pain was reported in 81.7% of cases and treatment by decontamination via irrigation, or washing was reported for 57.5% cases during 2000–2003. *Conclusion:* Jellyfish stings reported to poison centers in Texas occurred predominately among children and adolescents and were slightly more common among males. Although almost all cases had some sort of clinical effect, the effects were usually minor, and most cases were managed outside of health care facilities. Most jellyfish stings occurred in June and July and were reported from counties along the coast, although a number of cases were reported inland. The observed clinical effects and treatments used were consistent with the literature.

118. Epidemiology of Stingray Injuries Reported to Texas Poison Centers During 1998–2003

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Background: Thousands of stingray injuries occur in the United States annually. However, little epidemiologic information on stingray injuries in the United States exists. This investigation examined the relationship between selected factors and all human exposures involving stingray injuries reported to Texas poison centers during 1998–2003. *Methods:* Cases were obtained retrospectively from calls to poison centers in Texas and included all reported human exposures during 1998–2003 involving stingray injuries. *Results:* A total of 129 cases were identified. The reported stingray injury penetrance increased during the 6-yr period. Of the cases with a known patient age, three (2.5%) were less than 6 yrs, 21.3% were 6–19 yrs, and 76.2% were over 19 yrs. The stingray injuries occurred in public areas in 51.9% of the cases. The management site was reported to not be a health care facility in 58.1% of the cases; of the cases with a known clinical outcome, none involved no effects, and 52.4% involved minor effects. The highest proportion of stingray injuries occurred during the summer months, particularly August. The calls originated from counties along the coast in 59.5% of the cases. During 2000–2003, the most frequently reported clinical effect was dermal irritation or pain, and the most frequently reported therapy was decontamination by irrigation or washing. *Conclusion:* Stingray injuries reported to poison centers in Texas were unlikely to involve young children. Most stingray injuries were reported among males, took place in public areas, and occurred during the summer. Although most of the calls originated along the coast, they could originate from elsewhere in the state. Reported stingray injuries involved some sort of adverse outcome, usually mild-moderate, and were frequently handled outside of health care facilities.

119. Snakebite Admissions to Major Hospitals in Zimbabwe

Tagwireyi D,¹ Ball D,² Nhachi C.³ ¹Drug and Toxicology Information Service and ²Department of Pharmacy Practice, Kuwait University, Kuwait City, Kuwait; and ³Department of Clinical Pharmacology, University of Zimbabwe, Harare, Zimbabwe.

Background: There is a general lack of data relating to the pattern of snakebite in most developing countries. We describe the epidemiology of snakebite admissions in Zimbabwe. *Methods:* All cases of snakebite admitted to eight

major referral hospitals in Zimbabwe from January 1998 to December 1999 (inclusive) were identified using ICD-9 codes and ward registers and relevant information recorded using a standard data collection tool. *Results:* There were a total of 273 snakebite admissions with the type of snake recorded in 14.6% of cases; 62.5% involved puff adders (*Bitis arietans*) and 22.9% cobras and mambas. The gender distribution of admitted patients was similar, and over 67% of patients were aged 25 yrs and above. The median length of hospital stay (LOHS) was 3 days (IQR 1–5). Most bites (>80%) occurred in the wetter summer months of November to April. From cases where data was available, about 70% of the bites occurred during evening hours with most bites to the feet (61.2%), upper limb and hand (19.2%), and lower limb (16.5%). Two cases involved spitting snakes. Prehospital interventions commonly involved tourniquets (63.2%), and traditional medical practitioners (34.2%). The case fatality rate (CFR) for snakebite was 2.9%, with antivenin being used in only two patients. *Conclusion:* Snakebite epidemiology in Zimbabwe can largely be explained through climatic conditions and occupational activities. While the CFR is relatively low, morbidity could be reduced through promoting the wearing of shoes.

120. The Use of ELISA in Differential Diagnosis of the Genus *Trimeresurus* Snake Bites in Taiwan

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Objective: In Taiwan, *Trimeresurus mucrosquamatus* (Taiwan habu) and *T. stejnegeri* (green bamboo habu) are the two most important poisonous snakes, and half of the snakebite cases are afflicted by these *Trimeresurus* snakes. Their venoms are thought to be similar in toxicity despite outstanding differences in their appearances. As reported, some distinct clinical pictures have been noted with more bleeding diathesis in *T. stejnegeri* snakebites. The differential diagnosis of these *Trimeresurus* snakebites is important clinically and academically. *Methods:* We developed the method of Sandwich enzyme-linked immunosorbent assay (Sandwich-ELISA) to study the difference in these two snakes' bites. The serum of 9 cases of *T. mucrosquamatus* and 11 cases of *T. stejnegeri* snakebites were proceeded to assay the concentrations of either *T. stejnegeri* or *T. mucrosquamatus* snake venoms. *Result:* The method of ELISA can detect snake venom in biological samples with the 1 ng/mL of detection limit. In cases of definite *T. stejnegeri* or *T. mucrosquamatus* snakebite (snakes witnessed or caught), the cross-reactivity of these two species' venoms and antivenoms was found to be only 1.8–13.5%. *Conclusion:* The bites of these two snakes are hardly to be differentiated by Sandwich-ELISA method clinically.

121. Survival After Multiple Bites from a Black Mamba Snake in a Professional Snake Breeder

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Objective: To describe the presentation, management, hospital course, and outcome of multiple bites with envenomation by a Black Mamba (*Dendroaspis polylepis*), an exotic snake with a high potential for lethality. *Case Report:* *D. polylepis*, native to Southeast Africa, has very lethal venom. It is estimated that two drops can be fatal to an adult. Before antivenin was available, 100% of envenomations were fatal. A 35-yr old obese male professional snake breeder was struck on the left index finger, right thumb, right mid-forearm, and abdomen while handling his Black Mamba. The patient arrived at a local community hospital within 15 min, complaining of arm pain and numbness in both arms and legs. Signs and symptoms included twitching, pallor, diaphoresis, and combativeness. The patient required intubation. The Poison Center was consulted and advised use of South African Institute for Medical Research Polyvalent (SAIMR) Antivenin. He received 15 vials of the SAIMR antivenin. He had a complicated hospital course including wound necrosis, thrombophlebitis, pulmonary embolus, and tension pneumothorax. The patient was ultimately stabilized and discharged after 17 days of hospitalization. *Conclusion:* This case represents the successful treatment of a patient with multiple bites and envenomation by one of the most lethal venomous snakes in the world.

122. Rattlesnake Envenomations: Cost Comparison of Two Antivenins

Klemens J, LoVecchio F, Thole D, Stabnau K, Klemens A, Randall K. *Banner Good Samaritan Regional Poison and Medical Center, Arizona College of Osteopathic Medicine, Phoenix, AZ.*

Background: Cost of antivenin treatment following rattlesnake bite (RSB) is poorly described. *Methods:* We conducted a prospective, poison center (PC)-based study on all patients (pts) with RSB during a 2-month period when both antivenins were sporadically available. Inclusion was RSB referred to our PC. Exclusion criteria was a dry bite. Demographic data was obtained (age, site of envenomation, extent of swelling), serial laboratory data (platelets, fibrinogen, and prothrombin time), type of antivenin received (Wyeth™ vs. CroFab™ Antivenin vs. none), outcomes, and length of stay (LOS). *Results:* Twenty-three pts were envenomated during the study period with 1 pt excluded. Of the 22 pts, mean age was 35.8 [range 3–79] yrs; 14 involved the upper extremity and 8 involved the lower extremity. Eleven received CroFab (SSS=5–8), 4 received Wyeth (SSS=5–8), and 8 received no antivenin (grades 1–3). Length of stay was >2 days longer in the Crofab group, and the pharmacy cost of antivenin was \$886 per vial in the Crofab group and \$440 per vial in the Wyeth group. Mean number of vials was 13 in the Crofab group (\$11,518 per pt) and 23 in the Wyeth group (10,120 per pt). The Crofab group was followed in one to two outpatient visits with laboratory analysis compared to none in the other groups. Mean return of full grip strength was 29 days in the CroFab group, 17 days in the Wyeth group, and 33 days in the no-treatment group. Weight bearing returned at a mean of 38 days in the CroFab group, 15 days in the Wyeth group, and 43 days in the no-treatment group. All pts in the Wyeth group developed serum sickness. *Conclusions:* In this nonrandomized study the use of Crofab was associated with greater cost, increased length of stay, and more frequent physician follow-up. All Wyeth pts developed serum sickness, compared to none in the other groups.

123. Envenomation from a “Fringed Ornamental” Tarantula (*Poecilotheria ornata*)

Dougherty TJ, Greene TF, Burkey WR, Rodi A. *Cape Coral Hospital, Cape Coral FL; Lee Memorial Hospital, Fort Myers FL.*

Background: The “Fringed Ornamental” (*Poecilotheria ornata*) is an ‘Old World’ tarantula native to Sri Lanka. Lay publications claim its venom to be the most potent of all tarantulas with unsubstantiated reports of coma and paralysis. The true risk of envenomation, however, is not reported in the medical literature. We report a case of envenomation by this exotic spider. *Case Report:* A 20-yr-old female was bitten on her right third finger by her pet tarantula. Thirty minutes later she presented to the emergency department, complaining of swelling of her finger, pain radiating up to her axilla, and chest tightness. The patient denied SOB, N/V paresthesias, itching, numbness, or difficulty swallowing. Her vital signs were normal. Her physical exam revealed a puncture wound at the tip of her third right finger, tenderness, and swelling of the pulp surface. No arm swelling, but right axillary tenderness, was noted. Her exam was otherwise unremarkable. Initial treatment included ketorolac 30 mg IV, methylprednisolone 125 mg IV, lorazepam 1 mg. The patient was transferred to In-Pt Toxicology service and was observed overnight. Lab: CBC, CMP and Sed Rate were nl., as were PT/PTT, fibrinogen, and D-dimer. The patient was released on antibiotics, antihistamines, and prednisone. On day 6, she returned, complaining of arthralgias with movement of her third MCP joint, wrist, and elbow with tender axillary lymphadenopathy. Immunological studies were ordered: IgA, IgM were nl, IgG was slightly decreased. IgE was elevated 141 KU/L (nl<114). She was given a medrol dose pack. One week later her symptoms had abated. *Conclusions:* We report of an envenomation from *Poecilotheria ornata* with resultant pain and arthralgias successfully treated with steroids and antihistamines. Elevation in serum IgE suggests an allergic response to the venom.

124. Poison Center Medical Error Reduction and Improvement of Scorpion Sting Management by a Modified Callback Protocol

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Objectives: To evaluate the error-reduction effect of a change in a poison center's pediatric scorpion sting management protocol. **Methods:** A total of 167 sequential poison center scorpion cases involving children (age ≤ 5) were reviewed from before (n=84) and after (n=83) implementation of a new callback protocol that extended the callback period to capture cases with late symptom onset. Errors were identified as failure to provide advice, document sting time, callback in 1 to 2 h, callback in 6 to 8 h, callback every 4 to 6 h, document reason for no phone contact, and document reason for protocol deviations. A test of proportions using Fisher's exact was used to compare error rates of both years. Survival analysis was performed to determine the probability of developing systemic symptoms at various time points after sting time. **Results:** There were significant decreases in overall medical error rates following the adoption of a new protocol. Specifically, the number of callbacks increased significantly ($p < 0.005$) at all three time intervals studied. Survival data verified that 6 h callbacks are sufficient to capture all cases that result in systemic effects. Survival analysis identified the probabilities (instantaneous and cumulative) that a child will go on to develop systemic symptoms at given times after a sting, enabling more specific counseling by SPIs. **Conclusion:** Simple protocol changes can effectively reduce poison center medical error rates in scorpion sting cases, optimize the number of callbacks, and improve the poison center's ability to monitor and assess outcomes.

125. North American Coral Snake Antivenin for Treatment of Exotic Elapid Envenomations in a Murine Model

Richardson WH, Tanen DA, Tong TC, Betten DP, Williams SR, Carstairs SD, Cantrell FL, Clark RF. *University of California San Diego Medical Center, San Diego, CA.*

Objectives: North American Coral Snake Antivenin (CSAV) (Wyeth[®] Antivenin [*Micrurus fulvius*], equine origin) is approved for the treatment of coral snake envenomations in the United States. Although the coral snake is the only elapid native to North America, envenomations from exotic elapids are now more common. This study was designed to evaluate the efficacy of CSAV for the treatment of two exotic elapid envenomations: *Naja naja* (Indian cobra) and *Dendroaspis polylepis* (black mamba). **Methods:** A randomized, blinded, placebo-controlled murine model of intraperitoneal (ip) venom injection was employed. Venom potency was determined in preliminary LD₅₀ dosing studies. Study animals were then divided into five groups of 12 mice: 1) *N. naja* venom+CSAV, 2) *N. naja* venom+0.9% normal saline (NS), 3) *D. polylepis* venom+CSAV, 4) *D. polylepis* venom+NS, 5) CSAV+NS. Twice the LD₅₀ was the chosen venom dose, and the amount of CSAV injected was 10 times the amount needed for venom neutralization. **Results:** The venom LD₅₀ was found to be 2.58 mg/kg and 0.45 mg/kg, respectively, for *N. naja* and *D. polylepis*. Comparison of survival times between groups demonstrated a significant difference in time to death between CSAV-venom groups and venom-only control groups. Animals receiving CSAV and *N. naja* venom survived (mean \pm s.d.) 24.4 \pm 3.0 min vs. 17.8 \pm 1.3 min in the control group ($p < 0.001$) while those receiving CSAV and *D. polylepis* venom survived 203.8 \pm 37.0 min vs. 130.0 \pm 42.6 min in the control group ($p < 0.001$). **Conclusions:** CSAV increases survival time in a murine model of ip *N. naja* and *D. polylepis* venom injection. The clinical implications of this are unclear, given unchanged mortality rates.

126. Systemic Toxicity of Calcium Ionophore A23187: A Model for Anaphylaxis

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Background: The calcium ionophore A23187 degranulates mast cells in vitro but systemic toxicity has never been studied. **Methods:** Six anesthetized pigs weighing 11 to 16 kg received intravenous injections of A23187 at 5 mg/kg. Arterial lines were placed for mean arterial blood pressure (MAP) monitoring and blood sampling.

Cardiac rhythm was monitored continuously. Serum histamine levels were measured pre- and postinjection using an Elisa technique. When MAP dropped by 20%, three control pigs received saline boluses and three pigs were treated with epinephrine 0.01 mg/kg IV and diphenhydramine 1 mg/kg IV. An institutional animal use committee approved the protocol. Data was analyzed using Wilcoxon Rank, paired T-test, and ANOVA as appropriate. *Results:* All six pigs developed generalized flushing. MAP fell from a mean of 77 ± 15.6 mm Hg to 22 ± 24 mm Hg after injection (95% CI 44, 65). Two control pigs died within minutes of injection of A23187. Mean pulse decreased from 130 ± 13 beats per minute (bpm) to 83 ± 24 bpm after injection (95% CI -159, 15). Mean serum histamine levels increased from 712 ± 731 micromol/dL to 1154 ± 799 micromol/dL after injection (Z value=-2.201; P value 0.0277). Administration of epinephrine and diphenhydramine reversed shock in treated pigs. *Conclusion:* Systemic IV administration of A23187 produced clinical toxicity consistent with anaphylaxis. This model has potential as a tool for studying anaphylactic shock.

127. Post-Mortem Chloral Hydrate Disposition and Interpretation of Forensic Data

Tenenbein MS, Sitar DS, Tenenbein M. *University of Manitoba, Winnipeg, Canada.*

Background: In separate and unrelated incidents, three children with profound developmental delay, treated with routine doses of chloral hydrate as a sedative hypnotic, died unexpectedly. All had postmortem serum concentrations of its active metabolite, trichloroethanol (TCOH), in the fatal range. Postmortem tissue redistribution occurs for some drugs and represents a potential explanation for these findings. We investigated whether postmortem redistribution of chloral hydrate metabolites occurs in a rat model. *Methods:* Rats were administered 100 mg/kg of chloral hydrate by gavage and euthanized at 1 h after dosing. Multiple tissues (liver, kidney, blood, heart, lung, muscle, and brain) were sampled at 0, 6, 24, and 48 h after death to quantify TCOH and trichloroacetic acid (TCA), two chloral hydrate metabolites. There were six rats in each of these four groups. Metabolite quantitation was by gas chromatography, and statistical analysis employed ANOVA and Tukey's Test. *Results:* Significant TCOH redistribution was observed only in the liver, with an increase from 30.3 ± 9.8 $\mu\text{g/g}$ (mean \pm SE) at death to 75.7 ± 10.9 $\mu\text{g/g}$ at 48 h postmortem ($p=0.011$), but not when normalized to blood concentration. In blood, the TCOH concentration increased from 4.4 ± 0.8 $\mu\text{g/g}$ at death to 10.2 ± 1.4 $\mu\text{g/g}$ at 48 h post-mortem ($p=0.078$). For TCA, no tissue redistribution was detected postmortem excepting the lung, where normalization of TCA tissue to blood concentration suggested an increase in lung:blood content from 0.6 ± 0.2 to 1.2 ± 0.1 by 6 h after death ($p=0.017$). *Conclusion:* Our data suggest modest and tissue-selective postmortem redistribution of chloral hydrate metabolites. Further studies are necessary to clarify the impact on the interpretation of human postmortem toxicology data.

128. Urinary-Speciatiated Arsenic Levels from Selected U.S. Regions

Wang RY, Paschal DC, Osterloh J, Needham LL. *Division of Laboratory Sciences, NCEH/ATSDR, CDC, Atlanta, GA, US 30341.*

Objective: To characterize the U.S. general population's exposure to inorganic arsenic by geographical region. *Method:* Morning-voided urine specimens were collected from 200 adults, a subset of those participating in the National Health and Nutrition Survey III (1988-1994). The adults were from the general population and selected regions in the United States. The urine was quantified for speciated inorganic arsenic (As+3, As+5, INA), monomethylarsonic acid (MMA), and dimethylarsinic acid (DMA) by chromatographic separation, arsine generation, and AAS detection. Total inorganic arsenic (TOT) was determined by summing the arsenic species. The human subjects review committee approved this investigation. *Results:* This study consisted of 92 men and 108 women, with a mean age of 37 yrs (ranging 20 to 59). The mean (sdev, range) urine levels ($\mu\text{g/L}$) of the arsenic species were INA 1.06 (1.24, 0.25-10.40), MMA 1.06 (2.03,

0.25–25.00), DMA 5.55 (8.48, 0.25–102.00), and TOT 7.32 (9.28, 0.25–102.00). The 95th percentile for TOT was 22.4 (ug/L). The mean speciated arsenic levels by U.S. regions were the following:

Region	(N)	Mean age (yrs)	INA	MMA	DMA	TOT (ug/L)
Southwest	40	35	1.0	0.9	8.6	10.5
West	60	34	1.4	1.4	6.2	9.0
Northeast	60	39	1.0	1.3	4.4	6.7
Southeast	40	39	0.7	0.4	3.1	4.2

Conclusion: This is initial data on the regional distribution of exposure to inorganic arsenic by the U.S. general population. Environmental exposure and individual variability can contribute to differences in urinary inorganic arsenic levels.

129. A Comparison of Drug Information Resources for Drug-Induced QT Prolongation and Risk of Torsade De Pointes

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Objectives: Many drug information resources (DIR) are available to assist clinicians prescribing medications to help prevent adverse drug events (ADE). One of the most serious ADEs is torsade de pointes (TdP), a sometimes-fatal ventricular dysrhythmia that can occur without warning signs or symptoms. We evaluated several DIRs for inclusion of information concerning a drug's potential to prolong the QT interval and/or cause TdP. *Methods:* Several DIRs including Web-based, full-text reference databases, handheld computer programs, and a hard-copy textbook were reviewed for information about potential QT prolongation and TdP. A comparison to a frequently updated, federally funded, web-based listing of QT/TdP drugs was made. *Results:* The DIRs varied in content and comprehensiveness. For drugs well recognized for the potential to cause TdP, the percentage of the DIRs containing this information ranged from 42 to 100%. Omission of drugs or exclusion of information pertaining to QT prolongation or TdP occurred for 27 to 74% of the drugs from the lists. Of the 14 most commonly prescribed drugs with the potential to prolong the QT or cause TdP, the DIRs examined had this information for as few as 1 drug up to all 14. The information about potential drug-drug interactions for commonly co-prescribed QT prolonging drugs was rarely included in the DIRs examined. *Conclusions:* DIRs that clinicians may use to assess the causal relationship for drug-induced QT prolongation or TdP vary widely in their content, inclusiveness, and comprehensiveness. The limitations of these DIRs could negatively affect decisions on prescribing certain medications as well as attempts to causally link certain medications suspected as the cause of this serious ADE.

130. Look What I Found!—Poison Hunting on eBay®

Cantrell FL. *California Poison Control System—San Diego Division, California, USA.*

Background: Many substances deemed too dangerous for commercial use are still available to the general public. The purchase of these may potentially place members of the general public at risk for serious poisonings. This study was designed to document the large variety of dangerous poisons readily available on a popular online auction Website. *Methods:* Over a 10-month period, the online auction Website eBay® was searched daily using the terms “poison” and “contents.” Product name, active ingredients, what form the product is in, amount in container, and relative toxicity

rating (Clinical Toxicology of Commercial Products, Gosselin, et al.) were recorded. If available, pictures of the products were saved. *Results:* There were 121 individual products identified. Fifty-five were in solid/tablet form, 37 were powders, and 29 were liquids. Product containers were full for 56 items and partially full for 65. Twenty-four products contained ingredients rated as “supertoxic” and included strychnine (10), arsenic trioxide (8), cyanide (2), and nicotine, pilocarpine, phosphorus, and powdered conium maculatum (1 each). Sixty-three products contained “extremely toxic” ingredients including thallium, picrotoxin, soluble barium, antimony, mercury, arsenates, podophyllin, fluoride, zinc phosphide, atropine, scopolamine, and plant extracts of gelsemium, aconite, larkspur, and croton. Twenty-one products contained “very toxic” ingredients including lead, copper, camphor, caffeine, theobromine, creosote, pyrogalllic acid, sparteine, quinine, lindane, warfarin, phenol, and digitalis. The remaining 13 were “moderately slightly toxic.” *Conclusion:* While the viability of the labeled ingredients could not be verified, the transportation, handling, and potential utilization of these dangerous poisons by the general public could result in serious poisonings.

131. Geriatric Poisoning Severity: An Analysis of Poison Center Cases

Cobaugh DJ, Krenzelok EP. *American Society of Health-System Pharmacists, Bethesda, MD and Pittsburgh Poison Center and University of Pittsburgh Schools of Pharmacy and Medicine, Pittsburgh, PA.*

Objective: The objective of this study was to calculate hazard factors for medications implicated in geriatric poisonings. *Methods:* Toxic Exposure Surveillance System (TESS) cases from 1993 through 2002 involving exposure to a single substance in patients ≥ 60 yrs coded as adverse reaction, suicide, or therapeutic error were included. For each reason type, hazard factors (HF) were determined by calculating the sum of the major effects and deaths for each substance subcategory and dividing this by the total number of exposures for that subcategory. To normalize the data, the overall rate of major effects and deaths was assigned a hazard factor of 1. Subcategories with a HF of ≥ 2.5 and with ≥ 50 cases reported were included in the final analysis. *Results:* A total of 183,786 cases were analyzed including 28,102 adverse drug reactions, 18,675 suicides, and 137,009 therapeutic errors. For each reason type, the five substance subcategories with the highest HFs are reported. Adverse reaction: biguanide hypoglycemics, 5.4; cardiac glycosides, 4.6; warfarin, 4.2; antineoplastics, 3.6; and heparin, 3.5. Suicide: short/intermediate-acting barbiturates, 5.0; doxepin, 3.2; calcium antagonists, 3.0; morphine, 2.7; and cyclic antidepressant/phenothiazine, 2.7. Therapeutic error: heparin, 13.6; colchicine, 13.5; aminophylline/theophylline, 10.7; lithium, 10.3; and aspirin (unknown formulation), 10.3. *Conclusion:* These data can be used to develop targeted patient education programs and to heighten provider awareness of those medications with significant risk for major morbidity and mortality.

132. Evaluation of a Poison Prevention Video Module in Indiana

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Objective: Poison control centers (PCCs) are underutilized due to lack of knowledge and misconceptions. The purpose of this study was to evaluate the effectiveness of an educational outreach program in Indiana using the poison prevention video module, “Making the Right Call: The Poison Control Center.” *Methods:* We trained educators from health care-related agencies on how to use the module. The educators then presented the module to individuals and groups in the community. These participants completed nine-question pre- and post-tests before and immediately after a presentation of the module. A subset of participants also completed a telephone follow-up survey 3 months later. We compared pre- and post-test answers using Fisher’s Exact Test. *Results:* A total of 144 participants completed pre- and post-tests. Total scores for post-tests were 15% higher compared to pre-tests ($p < 0.001$). After attending a presentation of the module, more participants knew that one should call the PCC for a medication ingestion and that most poisonings can be safely managed at home (for both, $p < 0.001$). Participants were more likely to know the PCC’s hours of operation ($p = 0.04$), and although only 40% of participants knew the PCC phone number before the presentation, 96% knew it after ($p < 0.001$). Eighteen participants completed a telephone

interview 3 months later, and of these, 55% gave the correct PCC phone number to the interviewer. More than 80% correctly answered questions concerning hypothetical poisoning scenarios. Four participants had used the PCC for an emergency since the presentation and 78% had told others about the PCC. *Conclusions:* This module is an effective educational outreach program. Future studies will evaluate if it is successful in increasing calls to the PCC.

133. High-Fidelity Patient Simulation in Medical Toxicology Training—Core Competency Assessment Made Easy

Perez A, Peredy T, McKay CA. *Hartford Hospital/UCONN.*

Background: High-Fidelity Patient Simulation (HFPS) is a recently introduced tool for the assessment of complex task completion during scripted scenarios utilizing computer-augmented anatomic models in a realistic clinical setting. Participants learn by “in vivo” problem solving and self-critique of videotaped performances. Real-time performance evaluation provides opportunity to assess many of the ACGME-mandated core competencies. Critical aspects of the medical toxicology curriculum as outlined by the Council of Residency Directors in Emergency Medicine (CORD–EM) Model of Clinical Practice in Emergency Medicine can be covered using a series of HFPS case scenarios. *Methods:* We developed a 36-scenario 3-yr teaching curriculum incorporating increasingly complex decision-making. A tailored assessment form lists the expected critical actions specific to each scenario within the framework of the CORD–EM physician task list linked to the relevant core competency(s). *Discussion:* Drug overdoses, childhood accidental poisoning, medication interactions in the elderly, and environmental exposures represent some of the crises encountered by physicians that lend themselves well to HFPS training. Medical Toxicology training programs can use this modality to assess core competencies including (1) practice-based learning and improvement and (2) systems-based practice, areas poorly characterized by traditional assessment tools. *Conclusion:* HFPS facilitates the evaluation of the ACGME core competencies in a clinically meaningful, reproducible, and easily recordable fashion.

134. Mercury Thermometer Exchange Project

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Background: Improper disposal of mercury thermometers results in environmental contamination and mercury entering the food chain. In 2002 there were 14,993 calls to poison control centers nationwide about broken mercury thermometers. The objectives of this project were to educate the public about the hazards of mercury and to remove mercury thermometers from general use. *Methods:* A stakeholder committee was organized and a corporate sponsor, a local pharmacy chain with stores in many cities in our state, agreed to participate. Partners in the project included our sponsor, the college of pharmacy, the state department of environmental quality, and local health districts. An exchange program was implemented in which people could turn in their mercury thermometer to a local pharmacy and in return receive an incentive coupon to purchase a digital thermometer at wholesale cost. Collection bins, mercury information cards, and incentive coupons were distributed to participating stores. A press conference was held to educate the public about the hazards of mercury. Radio and television public service announcements instructed the public how to trade in their thermometers. Collection proceeded for 1 week. *Results:* At the end of the collection period, thermometers and other items were gathered and turned in for recycling at the county household hazardous waste facility. Totals collected during the project were 2,116 mercury thermometers, 22 mercury sphygmomanometers, and 14 one-pound jars of mercury. *Conclusion:* A mercury thermometer exchange program has the potential to remove significant quantities of a potentially hazardous pollutant from circulation. Successful thermometer exchange programs require careful planning, funding, community and government collaboration, and publicity.

135. The Nights the Lights Went Out in Canada

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Background: Two significant power failures occurred in Canada in 2003. In August, much of central Canada (along with the Eastern seaboard of the United States) was affected; in September, eastern Canada experienced this problem. Although the causes of the blackouts were different, both blackouts were massive and power was not expected to be restored quickly. *Case Series:* During the hours immediately following the power failure, the Certified Specialists in Poison Information (CSPI's) at both centers observed an increase in the number of exposures to gasoline, with the majority of these exposures resulting from attempted siphoning. Since this trend was expected to continue as pumped gasoline was inaccessible, the Poison Information Centres worked closely with the regional Public Health Departments to prepare and distribute public information notices regarding the problem of gasoline siphoning. Calls related to gasoline siphoning exposures drastically decreased in number and were back to baseline within a few days following the onset of the blackouts. *Discussion:* Poison Information Centres should be proactive and develop a process to alert the community regarding the known risks that occur during disasters; in this case, the siphoning of gasoline during power failures.

136. National Poison Prevention Week Campaign; Effective or Not?

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Background: In an effort to increase public awareness of poisons and poison prevention, Public Law 87-319 was signed in September 1961 authorizing the president to designate annually the third week in March as National Poison Prevention Week. This study investigates the effectiveness of this national campaign at a state level. *Method:* We conducted a 2-yr retrospective review of poison prevention-related calls received by our regional poison center. Toxic exposure surveillance system (TESS) data, pertaining to the number of all prevention-related calls and number of requests for poison prevention materials, were reviewed for calendar years 2002 and 2003. *Results:* A total of 5510 calls were identified as being prevention-related. Of these 5510 prevention-related calls, 1537 (21%) of these were received in the months of March and April. The average monthly number of prevention-related calls for March and April was 481.5 compared to 345.8 for all other months. This represents a 39.2% increase in average monthly prevention-related calls for March and April compared to average monthly prevention-related calls for the other 10 months of the years analyzed. A total of 2120 calls were identified as being requests for poison prevention materials. Of these 2120 material request calls, 585 (28%) were received in the months of March and April. The average monthly number of requests for prevention materials for the months of March and April was 146.3 compared to 71.2 for all other months. This represents a 95% increase in average monthly prevention requests for March and April in the years analyzed. *Conclusion:* National Poison Prevention Week does increase public awareness of poison prevention services. Data collected and analyzed in this study does support this conclusion by showing significant increases in total number and average monthly number of prevention-related calls in the months of and just following poison prevention week.

137. Medical Toxicology and CDC: A Vital Role in Public Health

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Background: Medical toxicologists (MTs) have unique training as physicians to assist in preparing for and responding to public health (PH) threats from chemical agents. We describe some of the activities in which MTs are involved at the Centers for Disease Control and Prevention (CDC) and encourage medical toxicology fellows and

graduates to consider careers in PH. *Methods:* MTs at CDC were asked to provide a descriptive list of their projects. *Results:* Projects included (1) developing and maintaining the first nationwide real-time chemical terrorism (CT) surveillance system with the American Association of Poison Control Centers; (2) developing and maintaining portions of the CDC Emergency Preparedness and Response website; (3) consulting on and investigating illnesses associated with potential chemical exposures, and providing guidance on epidemiology, biological and environmental sampling, and medical education related to such exposures; (4) analyzing and interpreting data for 116 chemicals measured in a representative sample of the U.S. population for the *Second National Report on Human Exposure to Environmental Chemicals*, (5) investigating potential use of current and new biological monitoring techniques, and (6) designing and implementing occupational health hazard evaluations for a variety of toxins at worksites nationally. *Conclusion:* MTs have a vital role in protecting and maintaining public health. Career opportunities for MTs at CDC include investigating environmental and occupational exposures to toxins, designing and implementing epidemiologic studies, participating in CT preparedness and response activities, and developing new biologic monitoring techniques.

138. The BfR Bilingual Database for Case Reports on Poisonings

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Background: The German Chemicals Act § introduced compulsory notification of cases of poisoning to be submitted by attending physicians. In cases of poisoning, physicians are obliged to inform the BfR about substances or preparations implicated, cause of exposure, amount absorbed, and symptoms/signs established. In addition, cases of particular scientific interest (e.g., rare poisonings, high- and low-dose exposures, cases with unexpected clinical course, substances of special interest, etc.) were documented as case records. *Methods:* The cases were documented in a standardized form (accident/situation of poisoning, symptoms/signs, exposure data, clinical course assessment, remarks), indicated by the substance/product involved and supplemented with important references. After co-checks for correctness, completeness, and readability, the German text is translated into English and transferred to a database. In addition, selected case reports from literature were transferred as PDF-files to the same database. *Results:* Since July 2002, based on about 35,000 physicians' reports, 360 cases have been selected, prepared, and processed with additional data. The case reports were written down in uniform documents, provided with keywords and additional information, then assigned to an index word and translated into English. Until summer 2004, the documents are recorded in a prototype database driven by MS Access. From September 2004 onwards, the case report database will be implemented in the Federal Institute's intranet structure. At present, we are reviewing together with specialists in data protection whether the case record database can be opened for specialists. *Conclusion:* Especially in e-learning there is a great interest in case reports; The German Medical Journal intends to offer the case reports on poisonings via its Internet portal.

139. Publication of Abstracts Presented at NACCT

Smollin C, Nelson LS. *New York City Poison Control Center, NY.*

Background: Timely formal publication of material presented as abstracts at national meetings is critical for dissemination of new information throughout the medical community. We investigated the fate of abstracts presented at NACCT 2001. *Methods:* We searched the PubMed database from 2000 through 2004 using authors, title, and keyword for all abstracts from the 2001 NACCT meeting. We categorized abstracts according to type and content. For those published we recorded the title, time to publication, journal, all authors, and the final conclusion. *Results:* Out of 237 abstracts, 57 (24%) were published in indexed medical journals. The publication rate based on type was as follows: case report, 23%; clinical study, 24%; basic science, 32%. Publication rates according to abstract content are listed in the table below; only abstracts regarding natural toxins had a higher publication rate than the overall rate ($p=0.025$; X^2). There were substantial changes in the conclusion of 10 abstracts (17%), in the title of 12

abstracts (21%), and in the addition or deletion of authors in 25 abstracts (44%). Publications appeared in 21 different journals, with an average time to publication of 16 months (range 0–29 months).

Content	Drug abuse	Error	Nat tox	Environ	Terror	Suicide	Other
Total	25	15	34	29	5	37	92
# Published (%)	7 (28)	2 (13)	14 (41)	4 (14)	1 (20)	13 (35)	16 (17)

Conclusions: Most abstracts remained unpublished more than 2 yrs after their initial presentation. Abstracts regarding natural toxins (e.g., envenomations) had a higher likelihood of being published. While publication titles were most often the same, authorship frequently changed. Because some conclusions change, it is important to review the literature regularly when making inferences from abstracts.

140. Train the Trainer Programs Increase Public Education Outreach

Kell S,¹ Waring E,² Soloway RA.³ ¹Blue Ridge Poison Center, University of Virginia Health System, Charlottesville, VA; ²Virginia Poison Center, Virginia Commonwealth University Medical Center, Richmond, VA; ³National Capital Poison Center, Washington, DC.

Background: Each certified regional poison center in the United States serves an average population of 5 million residents in its designated region, and must provide poison prevention education to this population with an average of 1.4 health educator FTEs. The health educator has primary responsibility for making the region's residents aware of how to access the poison center's services and of actions to prevent poison exposures. Public education strategies include group presentations, displays at health fairs, media contacts, and material distribution by mail. Train the trainer programs serve to extend the regional poison center's limited education personnel resources by training additional individuals to deliver poison prevention programs in their local communities. *Methods:* A train-the-trainer curriculum was developed, which provided general poison injury information, targeted programs to teach specific age groups, and additional resources. The curriculum was presented in a 4 h seminar to 65 participants including community health educators, fire department staff, EMTs, and SAFE KIDS coordinators. Each seminar participant received a 150-page binder of materials, including reproducible overheads and program report forms. *Results:* Participant evaluations were overwhelmingly positive. One of the sponsoring poison centers has received reports of 22 programs implemented by seminar participants in a 3-week period immediately following the seminar. *Conclusions:* Regional poison centers can effectively extend public education outreach to local communities by providing train-the-trainer events, including a specific curriculum and other resources, to professionals and volunteers in the field of injury prevention.

141. Toxicology Rotations in Emergency Medicine Programs

Lee J, Lu J, Aks SE, Wills B. Department of Emergency Medicine, Cook County Hospital; The Toxikon Consortium; University of Illinois, Chicago, IL.

Objective: Core competence in clinical toxicology is considered an essential part of emergency medicine (EM) training. We conducted a survey of EM residency directors to determine if a formal toxicology rotation is provided. *Methods:* We surveyed (N=132) 2004 U.S. accredited (EM) program directors (PDs) via electronic mail. PDs were queried regarding the availability of a required or elective tox rotation and the number of staffed BE/BC medical toxicologists. Perceived importance of a tox rotation in a residency program was rated using a likert scale (1 not important to 10 extremely important). If a tox rotation were not available, programs were asked what, if any, they believed to be roadblocks. *Results:* 83 (62.8%) of 132 programs completed the survey. Of the 70 (84.3%) programs

that offered dedicated tox time, 56 (80.0%) were required rotations and 14 (20.0%) were elective. Thirteen (15.7%) did not offer a rotation. The median score for “perceived importance of a tox rotation” in a residency program was 8 (R 3–10), 8 (R 3–10) for those programs offering a rotation, and 3 (R 1–5) for those not offering a rotation. Programs overall had a mean of 24 faculty (SD 14 R 7–55), and 1.3 (SD 1.2 R 0–6) BE/BC medical toxicologists per program. In programs offering a rotation this represented 7% of these EM faculty overall, and in programs not offering a rotation toxicologists represent 1% of these faculty. Roadblocks cited for not offering a tox rotation included lack of expertise, support services, or teaching cases. *Conclusion:* The clinical significance of tox training is reflected in the large percentage of EM programs offering required or elective tox rotations. Further studies would be useful to conduct performance-based-difference in residents conducting a rotation vs. those who do not.

142. The ACMT–ATSDR Consultation Network: First Year’s Experience

Wax P, Nelson L, Seifert SA, Kirk M, McKay C, Clark R, White S, Cetaruk E, Liebelt E, Martin T, Boyer E, Snook CP, Keyes C, Haynes J, Burkhart K, Kosnett M. *ACMT, Reston VA.*

Background: A network linking medical toxicology fellowship programs and the Agency for Toxic Substances Disease Registry (ATSDR)/Centers for Disease Control (CDC) was created to provide consultation and training to ATSDR and its 10 regional offices on the medical aspects of chemical terrorism and mass chemical exposures. We present a summary of network activities. *Methods:* The database of all contacts for the previous 12 months between the medical toxicology network and ATSDR was reviewed. Individual regional activities were categorized by type: consultation, education, public meetings, organizational, and fellow involvement. *Results:* Medical toxicologists and ATSDR’s 10 regional offices met for introductory and organizational meetings. In many cases these staff had no previous or limited contact with medical toxicologists. Subsequent network activities included seven written consultations, participation at three public meetings, provision of five 1-day courses on chemical agents of opportunity for terrorism, and emergency response plan evaluations. The consultations included the availability and interpretation of biomarkers including those for asbestos, benzene, PAHs, and fluoropolymers. The three public meetings were held in conjunction with congressional representatives, CDC branch chiefs, and other federal agency representatives. One concerned the health effects of dioxins, and two concerned groundwater contamination with halogenated solvents. Fellows actively participated in consultations and will lecture in upcoming courses. *Conclusion:* A national network of medical toxicologists has been actively involved with our ATSDR partners. Integrating topics generated by these encounters into the medical toxicology curricula may enhance educational efforts and professional opportunities in environmental toxicology and chemical terrorism preparedness.

143. Teaching Toxicology Concepts Using Human Patient Simulation

Kirk MA, Kell S, Littlewood KE, Eldridge DL, Shukla A, Bell M. *Blue Ridge Poison Center, Departments of Emergency Medicine and Anesthesiology, University of Virginia; Charlottesville, VA.*

Background: High-fidelity Human Patient Simulation (HPS) creates a simulated ‘human laboratory’ to observe clinical effects and perform patient treatments. Basic science instructors report that students overwhelmingly believed simulation training to be a better way to learn physiology, stimulate further questions, make concepts easier to grasp, and demonstrate realistic changes. *Methods:* We performed a pilot study to compare standard lecture format to HPS experience for teaching toxicology principles. A group of 14 undergraduate students was randomized into either a HPS or lecture group and taught toxicological concepts using the same curriculum outline. Outcome measures were differences in pretest and post-test scores for each study group and a qualitative assessment. *Results:* There was no significant difference between the pretest and post-test scores for each group. However, qualitative assessment reveals students overwhelmingly preferred HPS to lectures. In comparing learning formats, a majority of students felt more attentive during and clinically ready after the HPS experience and stated they learned and retained more of the concepts presented. If given the responsibility to present the subject matter themselves, most students recommended a

combined learning approach that incorporates lecture and HPS formats to teach toxicologic principles. *Conclusions:* This pilot study demonstrated that HPS is as effective as lecturing for teaching undergraduate students complex toxicologic principles. HPS is an innovative teaching tool that addresses visual and kinetic learning styles and may enhance learning experiences when used alone or in combination with lecture formats.

144. Is Regional Ethnicity Related to Poison Center Utilization?

Schwartz L, Mercurio-Zappala M, Howland MA, Nelson LS, Hoffman RS. *NYC PCC, St. John's University College of Pharmacy, NY, NY, USA.*

Background: Geographic Information Systems (GIS) software can easily display PCC calls to help plan outreach efforts. GIS maps visually target areas of low call volume by zip code. This study tested the hypothesis that PCC call rates correlate with ethnicity for a given zip code. *Methods:* All PCC calls from 2003 were initially included for study (N=65,358). Calls from zip codes outside the PCC catchment area (n=3267) were excluded. Additionally, to prevent false clusters, hospital calls (n=14,868) were eliminated. U.S. Census data from 2000 were merged with the call data. Twenty-two zip codes with populations <10 were excluded. Using GIS, call rates were visually mapped by zip code and ethnicity for each zip code analyzed. Linear regression by least-squares analysis was used to assess associations between population, ethnicity (defined as White, African American, Latino, Asian, other) and PCC call rate per zip code. A $p < 0.05$ was considered statistically significant. *Results:* A total of 47,223 calls were visually mapped over 182 zip codes. There was no statistically significant association between PCC call volume rates and either zip code population, individual ethnicity, or ethnicity defined as White or non-White. *Conclusions:* Because PCCs do not collect ethnicity data from individual callers the true association between ethnicity and PCC utilization cannot be determined. Additionally, Census 2000 ethnicity data may not provide useful insight when attempting to design community level educational programs. Program planning should be based on further demographic analysis possibly including income data, language barriers, cultural beliefs, and attitudes. These factors should be determined through needs assessments performed at the individual community level from the specific target audience rather than assumed from broad demographic data.

145. Using GIS Software for Planning Poison Education Programs

Schwartz L, Mercurio-Zappala M, Howland MA, Nelson LS, Resnick S, Hoffman RS. *NYC PCC, St. John's University College of Pharmacy, NY, NY, USA.*

Background: Geographic Information Systems (GIS) software offers a novel way to present poison center call data by visually mapping call volume based on regional information such as county or zip code. We sought to determine if GIS software could assist in a targeted education program. *Methods:* All human exposure and information calls for 2003 were initially included for the study (N=65,358). Calls from zip codes outside the PCC catchment area (n=3267) were excluded. Additionally, to prevent false clusters, hospital calls (n=14,868) were eliminated from further analysis. U.S. Census data from 2000 was merged with the call data. Twenty-two zip codes with populations <10 were excluded because they represent large commercial buildings given unique zip codes. Using GIS ArcView 3.3, the call rate (defined as call volume/1000 population) was visually mapped by zip code. For this analysis a low call rate was defined as $\leq 3/1000$. *Results:* A total of 47,223 calls were visually mapped over 182 zip codes. Areas of low call volume were easily identified in 60/182 zip codes. These areas encompass a total population of 3,033,646 people and represent 38% of the center's region. The pooled ethnicity of these areas (defined by U.S. Census) is 1,156,696 (38%) Latino, 951,868 (31%) African American, 418,657 (14%) White, 331,458 (11%) Asian, and 174,967 (6%) Other. *Conclusion:* GIS mapping is an efficient method to conduct community needs assessments for targeted education programs. Qualitative methods including focus groups and interviews to identify barriers to calling the poison control center should be initiated in communities of low call rates.

146. Immigrants and Ingestions—Efforts to Increase Poison Center Utilization in a Population at Risk

Haynes JF Jr, Reeser KA, Artalejo L III, Baeza S III, Saenz E Jr, Parra G. *West Texas Regional Poison Center; Texas Tech University HSC, El Paso, TX.*

Background: Recent immigrants represent an unassimilated population that retains “home” language and culture and faces specific barriers to health care. Spanish speakers who speak English poorly or not at all reflect a recent immigrant community. *Methods:* The West Texas Regional Poison Center (WTRPC) developed a program unique within Texas to address a need to increase utilization of Poison Center services through bilingual SPI services. The plan provides specific educational programs that target Spanish speakers; all staff are bilingual and are trained in cultural sensitivity. *Results:* The State of Texas has a population of 19 million (5+ years of age), with 1.3 million Spanish speakers that speak English poorly or not at all (6.8%). In 2000, only 0.46% of the total calls to all Texas Poison Centers were made in Spanish, while Spanish-speaking calls made up 1.7% of calls from the West Texas Region. Using 2000 census data, in Texas this represents 0.79 calls/1000 Spanish speakers who speak English poorly or not at all. In the WTRPC region, with implementation of focused education, Spanish-speaking calls increased significantly from 1.5/1000 population to 6.3/1000 population from 2000 to 2003. The number of Spanish calls increased less rapidly throughout the remainder of Texas (0.7/1000 to 1.8/1000). *Conclusions:* The WTRPC’s program has markedly increased poison center utilization in West Texas and thus impacted the quality of care available to this population at risk. While we serve a Spanish-speaking community we believe similar-focused programs would benefit other immigrant populations.

147. Effectiveness of the “Be Poison Smart!TM” Poison Prevention Education Program’s Train-The-Trainer Approach

Malis (Roundtree) EM, Polivka BJ and Lang RT. *Central Ohio Poison Center, Children’s Hospital, Columbus, OH; The Ohio State University, College of Nursing, Columbus, OH.*

Background: Studies show that prevention information is best received when it is done one-on-one. Based on this information, the *Be Poison Smart!TM* (BPS) train-the-trainer program was designed to reach health care, education, and social service providers who then can share the BPS message with parents/caregivers of young children. *Methods:* Using the “Do You Know How to *Be Poison Smart!TM?*” Knowledge Survey, we assessed two groups of participants, professionals, and parents/caregivers. Surveys were administered to examine knowledge and behavior changes regarding poisoning and poison prevention practices pre- and 6 weeks post- BPS intervention. The number of correct knowledge questions was summed for a total knowledge score (total possible=13), and the number of positive poison prevention behaviors was summed for a total behavior score (total possible=11). Paired t-tests were used to determine if pre–post changes in mean scores were statistically significant. *Results:* The mean knowledge score for professionals trained in BPS (n=146) showed a statistically significant increase (p<0.01) from 9.4 [standard deviation (SD)=2.0] to 10.6 (SD=1.7). The mean knowledge score for parents/caregivers (n=69) also significantly increased (p<0.01) from 8.0 (SD=2.3) to 9.3 (SD=2.0). The number of correct behaviors reported by professionals significantly improved from 5.7 (SD=2.0) to 7.0 (SD=2.0), and the mean number of correct behaviors reported by parents/caregivers also significantly improved from 6.8 (SD=2.0) to 7.7 (SD=1.4). *Conclusion:* The BPS program positively impacted the self-report knowledge and behaviors of participating professionals and parents/caregivers.

148. Contents in Asian Medicated Topical Products—An Unconventional Source of Toxicity

Kang-Yum E, Chiang W, McGuigan M, Carracio T. *HerbWatch—Long Island Regional Poison and Drug Information Center, Winthrop University Hospital, NY.*

Background: Foreign to many western medicine users, the contents in some Asian over-the-counter medicated topical products are a potential source of acute and chronic toxicity. Toxic ingredients in significant amounts are commonly listed in these products. Excessive use or misuse are likely without proper directives and may pose a threat of severe toxicity even in small amounts. *Method:* A surveillance study was conducted at ethnic retail stores and online for over-the-counter Asian medicated topical preparations for aches and pain. A list consisting of their product name, contents, indications, direction for use and toxic effects is compiled. *Results:* Samples of Asian topical medicated oils, liniments and plasters were obtained with ease at ethnic stores and on the Internet. All products were sold in non-child-resistant packaging. Although some of the products included printed inserts, >50% of the information were written in Chinese. Among the more toxic ingredients listed in these products were the following: approximately 85% contained methyl salicylate (5%–67%), approximately 70% contained camphor (3%–16%), and approximately 30% contains turpentine oil (5%–18%). Diphenhydramine, menthol, eucalyptus oil, capsicum, lavender oil, and other volatile oils are also listed in several products. *Conclusion:* Asian herbal products are often touted as natural and effective remedies. However, the contents in some topical products can be hazardous with improper and discretionary use.

149. Using New Technologies for Medical Toxicology Education

Kirk MA, Kell S, Dobmeier S, Baer AB, Holstege CP, Huff JS, Jackson JM. *Blue Ridge Poison Center and Department of Emergency Medicine, University of Virginia, Charlottesville, VA.*

Background: Regional poison centers have an obligation to educate health care professionals within their service area. New technologies are available to provide professional education in the field of toxicology. *Methods:* Our regional poison center is using a variety of technologies for teaching. Our Webpage contains links to Web-enabled lectures (WEL). They are PowerPoint presentations with audio wav files converted to QuickTime movies that are small, scalable, and streamable. The Faculty Toy Box, a suite of online tools using Cold Fusion and SQL database, allowed us to create on-line examinations to assess knowledge gained from WEL. Telemedicine videoconferencing (TVC) using high-speed broadband communications allows our center to broadcast monthly lectures to multiple hospitals in remote, rural, medically underserved locations. We are using an intranet educator's archive to share presentations. We recently introduced Human Patient Simulation (HPS) into our toxicology rotation curriculum. *Results:* In the past 6 months, 222 people visited the on-line training site and, over the past year, 107 medical student and resident rotators viewed multiple WELs at this site. In the past year, monthly lectures were performed at 7 remote rural hospital sites through TVC, and we have the potential to expand to the other 50 active sites in our telemedicine network. Users considered these programs to have very good instructional content, to be convenient to use during "downtime," to improve scheduling logistics for staff, and to be more cost-effective for staff education. *Conclusions:* WEL, on-line examinations, TVC, shared intranet educators' archive, and HPS are available to expand poison center educational programming to health care professionals both on-site and in remote regions.

150. Availability of Syrup of Ipecac Following the Release of the American Academy of Pediatrics' Policy Statement

Chucovich V, Jaramillo JE, Shum S. *Texas Panhandle Poison Center, Texas Tech University Health Sciences Center, Amarillo, Texas, USA.*

Background: Recently the American Academy of Pediatrics (AAP) published an updated statement that "ipecac should no longer be used as a home treatment strategy and that existing ipecac in the home should be disposed of safely..." Our poison center has recognized that there are rare instances in which the use of syrup of ipecac has utility and has continued to encourage callers in rural areas to keep ipecac on hand. Unfortunately, some callers reported having difficulty locating ipecac in local pharmacies. *Objective:* The objective of our survey was to determine if ipecac remains available in local pharmacies, if it is stored on the shelf or behind the counter, and to

prepare a list of local pharmacies that stock ipecac. *Methods:* A list of local independent and community pharmacies was compiled by accessing a database maintained by our State Board of Pharmacy. A pharmacist or technician was contacted at each pharmacy and surveys were completed. *Results:* Fifty-five local pharmacies were contacted. A majority (84%) still stock syrup of ipecac. Of those that continue to stock ipecac, 70% keep it on the shelves and 30% stock it behind the counter. Of the 9 that do not stock ipecac, 4 of them have never stocked it, 2 discontinued stocking because it expired, and 3 discontinued stocking after the AAP published its statement. *Conclusion:* Ipecac remains readily available at most of our local pharmacies. If consumers are unable to locate ipecac, they should consult with their pharmacist, who may be able to provide ipecac from storage behind the counter.

151. Outsourcing Health Education to Community-Based Organizations: A Unique Model for the Delivery of Poison Prevention Education

Simeonov IM, Giraldo G, Heard SE. *California Poison Control System, University of California San Francisco.*

Objective: Increase community-based, one-on-one consumer education and decrease costs associated with public health promotion. Contract annually with community-based organizations (CBOs) statewide for the services of indigenous community health workers (CHWs). Utilize CHWs already employed by CBOs to disseminate information about PCC services to consumers. *Methods:* Target audiences demonstrating consistently low utilization rates of PCCs and partner with CBOs recognized for successful outreach to those communities. Identify and contract with CBOs, train CHWs, supply educational tools and language-appropriate materials. Provide continuous guidance, support, and training. Assess the program through process and outcome-based evaluations, including organizations/individuals reached, new CBO affiliations, CHWs trained, pre/post-knowledge testing of CHWs, events classified by modality, geographic areas covered, materials requested and distributed, and later, call volume. *Results:* A statewide network of 8 CBOs with 50 CHWs trained in poison prevention and capable of clearly articulating PCC message to consumers that are difficult to reach through traditional channels. Twenty poison prevention and PCC awareness talks are presented per month. Ten thousand nonduplicated households were reached. *Conclusion:* Outsourcing education to CBOs was found to be an effective, lower-cost strategy to increase access to health information, improve health status, change negative health-related behavior, and increase PCC awareness.

152. Comparing 1994, 1999, and 2004 Drug Interaction and Cytochrome P450 Information in Pharmaceutical Advertisements: Are Current Ads More Informative?

McFee RB, Caraccio TR, McGuigan MA. *Long Island Regional Poison and Information Center, Winthrop University Hospital, Mineola, NY.*

Background: The population of the United States is aging. It is well known that a significant proportion of patients over age 50 are taking multiple medications that include over-the-counter, herbal, and prescription preparations. This polypharmacy presents an increased risk for drug interactions in an already vulnerable population. According to toxic exposure surveillance system (TESS) data from the American Association of Poison Control Centers, the number of exposures in patients >50 have steadily increased from 158,097 in 1999 to 192,227 in 2002. How can we prevent drug interactions? Studies suggest clinicians learn a lot about the medications they prescribe from the pharmaceutical companies. *Objective:* To determine if medication advertisements have improved in terms of depth of information concerning the potential for drug interactions over the last 10 years, perhaps as a result of high-profile interactions involving SeldaneTM. *Methods:* Examine advertisements in the first issue of *New England Journal of Medicine* (NEJM) and *Journal of the American Medical Association* (JAMA) from 1994, 1999, and 2004. *Results:* In JAMA/NEJM 1994, less than 40% of advertisements mentioned CYP, increasing to just over 50% in 1999 and almost 90% in 2004. Virtually all ads discussed drug interactions, albeit variable and limited in 1994 and 1999. *Discussion:* A dramatic increase in pharmacokinetics information has been included in drug ads in the last few years. The impact of and ultimately the knowledge of how to use this information remain to be studied.

153. Financial Savings Associated with Videoconference Technology

Simone KE, Clement C, Tomassoni AT. *Northern New England Poison Center, Maine Medical Center, Portland, ME.*

Background: Many poison centers have difficulty providing adequate outreach to distant areas in a cost-effective manner. The Northern New England Poison Center (NNEPC) serving Maine and Vermont covers a population of 1.9 million dispersed over a land area of 40,000 square miles. Some areas are located more than 300 miles, 7 h driving distance, from the Outreach Educators and other professional staff. The NNEPC collaborated with the University of Vermont to provide videoconferencing services to distantly located health care professionals at large cost savings. *Method:* The NNEPC surveyed the target audiences, public health nurses, and hospitals, to determine toxicology educational needs. Based on results, the center made repeated contacts until sessions were scheduled. Recipients were asked to evaluate the sessions. Cost-savings are estimated using the mileage, work hours, food, and hotel charges associated with each presentation if an on-site lecture had been made to each participant site. *Results:* Seventeen presentations were made. One to five sites were involved in each conference. A total of 9,621 travel miles and 197 personnel hours were saved. A total of \$24,323 was saved over a 17-month period. Saved were \$3,875 in mileage, \$1,680 in hotel, \$1,305 in food, and \$17,463 in personnel-associated charges. The cost of providing this service varies depending on the geographic area and technological capabilities of the host institution. Equipment required a one-time expenditure of \$5,000. Phone and bridging charges cost \$3,500. Of those who returned evaluations, 95.2% indicated interested in future presentations. The most sparsely populated and distant sites showed the greatest interest. The NNEPC currently uses videoconferencing at least two to three times monthly. *Conclusion:* Videoconferencing allows delivery to rural areas at a reduced cost.

154. Developing an Innovative Poison Control Information Video to Target Low-Income Spanish-Speaking Parents

Giraldo G, Simeonov IM. *California Poison Control System, University of California San Francisco, Love, G. California State University, Fullerton.*

Objective: To develop an innovative poison control center information video to target low-income, low-literacy Spanish-speaking parents who have never used the poison center hotline utilizing an education–entertainment framework. *Methods:* A partnership was created between the poison center and a state university department of communications to develop an educational video. Primary and secondary research of the target audience guided the development of the core messages. The video utilized a popular *telenovela* format where a family gathering (a baby shower) is the vehicle to teach about the poison center and its services, utilizing different family members to describe the service, the rationale for utilizing the service, and clarifying the fears and misconceptions about using a medical advice line. The education–entertainment strategy is the process of purposely designing a media message to both entertain and educate in order to increase the target audience knowledge about a health issue, shift social norms, and change behavior (Singhal & Rogers, 2002). *Results:* A 10-minute video was produced titled “The Baby Shower.” The production team was composed of communications department students and faculty, the poison center educator, actors from the target community, and a county hospital pediatrician. *Conclusion:* A high-quality educational video was produced with a low-budget by strategically partnering with a diverse production team and by guiding the development by primary research and by a synergetic model based on consumer-based health communication theory and the education–entertainment strategy.

155. Differences in Poisoning Admissions Between Urban and Rural Health Centers in Zimbabwe

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Background: Toxicoepidemiological data from rural areas of developing countries is scarce. Most studies examine admissions to urban referral hospitals and extrapolate to lower-level health facilities. The validity of this approach was examined in this work. *Methods:* A retrospective review of all poisoning admissions was conducted at the provincial hospital (PH) and six district hospitals (DHs) in Mashonaland Central province, Zimbabwe, for the period January 1998 to December 1999 (inclusive). Patient records were traced by hand from medical ward registers. Relevant information was collected using a standard data collection tool. *Results:* There were 711 poisoning admissions to the DHs and 341 to the PH. Case demographic details were similar at both the PH and DHs with a male to female ratio of 1:1 and most cases in the 0–5, 16–20, and 21–25 yr age groups. Most admissions resulted from accidental poisoning (>60%) at both levels of care. However the important causes of admission differed with animal envenomation (especially snakebite) predominating at DHs (43.6% of admissions), whereas pesticide poisoning (26.1%) predominated at the PH. Pharmaceutical exposures were common at the PH (15%) but not at the DHs (5%). Despite this, patient demographics and reasons leading to poisoning were similar for animal, pesticide, and pharmaceutical exposures. *Conclusion:* Important differences existed between provincial and district poisoning data in Zimbabwe. Caution must be used when using urban referral hospital data to describe prevalence of poisoning in rural areas.

156. Toxicoepidemiology in Zimbabwe: Pesticide Poisoning

Tagwireyi D,¹ Ball D,² Nhachi C.³ ¹*Drug & Toxicology Information Service and* ³*Department of Clinical Pharmacology, University of Zimbabwe, Harare, Zimbabwe;* ²*Department of Pharmacy Practice, Kuwait University, Kuwait City, Kuwait.*

Background: Acute pesticide poisoning (APP) is a well-recognized cause of morbidity and mortality but is not well described in developing countries. We describe the toxicoepidemiology of APP in Zimbabwe. *Methods:* All cases of APP admitted to eight major referral hospitals in Zimbabwe from January 1998 to December 1999 (inclusive) were identified using ICD-9 codes and ward registers and relevant information recorded on a standard data collection sheet. *Results:* There were a total of 914 single pesticide exposures. Almost half (49.1%) resulted from oral exposure to rat poisons (RP), 42.2% from anticholinesterase-type pesticides (AChTP), mostly organophosphates (OP), which were responsible for over 90% of admissions from AChTP. Accidental and deliberate self-poisoning (27.1% and 58.6% respectively) accounted for most cases with only eight homicides. The case fatality rate (CFR) in deaths per 100 admissions was 6.8 (62 deaths; 95% Confidence Interval {CI} 5.2–8.6) and was significantly higher in males (9.4) than females (4.1) [CI for difference in proportions; 2.0–8.5]. In addition the CFR for deliberate self-poisoning (DSP), 6.5 deaths/100 admissions, was also significantly higher than that for accidental poisoning (0.8 deaths/100 admissions) [CI for difference in proportions 3.2–7.9]. OPs were implicated in 70.9% of all mortalities, with over 20% resulting from oral exposure to RP. *Conclusion:* OP and RP are the leading causes of APP admissions to major referral hospitals in Zimbabwe with most of the admissions being the result of deliberate self-poisoning. Greater control in the sale and use of these products could help prevent significant morbidity and mortality.

157. Lead Problems in Washington State?

Robertson W. *Washington Poison Center, Seattle, WA, USA.*

Background: Nationally, lead is still regarded as an enormous public health menace. While clearly valid half a century ago, is it still so today? Our federal government obviously thinks so since it mandates “universal blood-lead testing” of all toddlers—with the loss of federal-matching Medicaid funds for failure to comply. Our Pacific Northwest states have repeatedly contested the need of such action—with one labeling it “indisputable child abuse!” We review our rationale. *Method:* Our data stem from 1) Washington’s Lead Surveillance Program’s outcome data from all blood-lead determinations done on any citizen since 1993 and analyzes all results from children; 2) our Department of Labor and Industries, which analyzes all adult lead levels; 3) all “CHARS” hospital discharge data of lead poisoning over the past decade; and 4) lead data from our Poison Center. *Results:* From 1993 through 1995, only 3.5% of 7,942 high-risk kids’

levels exceeded 10 micrograms/dL; for 1996–1998's 12,715 toddlers, it was 2.1%; for 1999–2001's 11,749 toddlers, it was 1.4%; and for 2002's 7,336 toddlers, 1.2%. For adults, 1993 through 2001 saw 94% of 43,432 reports <25 µg/dL; 2002 saw >98% <25. Hospital discharge data for the decade of the 1990s confirmed not a single pediatric lead case. And, the Poison Center only hears from the “worried well,” and then only after media scare tactics. *Discussion:* Assuming total screening costs at \$70 for each child tested, some \$2.7 million was actually spent over 10 yrs to pinpoint the 130 children with levels >20—only one of whom was ever chelated. The identification cost was \$21,400 per case—which we feel could have been better spent elsewhere. *Conclusion:* Testing all Washington kids would cost \$28 million annually—and *any benefits remain* in doubt. Moreover, some 400,000 kids would be subjected *annually!* Would the cost be worth the benefit?

158. The Epidemiology of Poisoning Injuries in the Northeast

Sheppard MA, Boyce LM, Snowden CB. *Pacific Institute for Research and Evaluation, Calverton, MD.*

Objective: To describe poison-related deaths, hospital discharges, and calls for toxic exposures in selected northeastern states. *Methods:* Descriptive analyses involving National Center for Health Statistics mortality, state hospital discharge, and Toxic Exposure Surveillance System (TESS) databases for selected northeastern states were conducted. Case selection processes used for deaths and hospitalizations were similar to those used for TESS. *Results:* Annually there were an average of 3,426 deaths, 34,276 hospitalizations, and 279,448 calls for toxic exposures in the region. The majority of poison-related deaths and poison exposures were unintentional, whereas the majority of poison-related hospitalizations were self-inflicted. The leading substance categories for deaths, hospitalizations, and exposures, respectively, were Other Drugs, Tranquilizers/Other Psychotropic Agents, and Cosmetics/Personal Care Products. Adults ages 25–64 yrs, males, and non-Hispanic Blacks had the highest poison-related fatality rates. Adolescents ages 15–19 years, females, and non-Hispanic Blacks had the highest nonfatal poison-related hospitalization rates. Children younger than 6 yrs comprised 49% of toxic exposure cases. Twenty-three percent and 12% more poison-related deaths and hospitalizations, respectively, were identified with the expanded case definition than with the current definition. *Conclusion:* Current methods used to ascertain poisoning deaths and hospitalizations may result in a gross undercount of the actual problem. The additional poison-related cases identified had another injury/condition as their primary ailment but were related to poisoning. The expanded case definition is more reflective of TESS, and its use in poisoning surveillance is warranted.

159. The Effect of Military Deployment Upon Psychiatric-Related Admissions and Drug Overdoses at a Military Community Hospital

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Introduction: Military combat activities have been associated with mental illness such as post-traumatic stress disorder (PTSD). Less is known about the effect of pending and recent deployments upon military members and dependents. The goal of this study was to examine the effects of pending and recent deployments in a large military population. The frequency of psychiatric-related complaints (drug overdose, depression, anxiety) presenting to the emergency department (ED) and subsequent admissions to the hospital were our primary measured outcomes. *Methods:* The study took place in a high-volume, low-acuity military hospital. The periods covered included the first 4 months of 2001, a period of low deployment, and the first 4 months of 2003, a period of high deployment, approximately 20,000 troops. Admission diagnoses were reviewed and compared for all admissions and transfers from our emergency department within the study periods. *Results:* In the first 4 months of 2001 our ED experienced 21,870 visits with a total of 1,114 admissions, 61 admitted for drug overdose and 97 admitted for other psychiatric complaints. Fifteen drug

overdoses were admitted to the intensive care unit and 12 were sent to 24 h watch with a military guard. For the same period of 2003 (deployment phase), 20,118 ED visits occurred with 1,124 admissions, 71 admitted due to drug overdose and 122 admitted for psychiatric-related complaints. Twenty-five patients were admitted to the ICU for drug overdose and 20 were sent to military watch. While there was a trend toward increased numbers of patients admitted for overdose and psychiatric complaints during 2003 compared with 2001, there was no statistical significance. A total of 19.4% of all admissions in the first 4 months of 2003 were psychiatric-related, as opposed to 16.6% during the 2001 study period (95% CI = -0.32% - 4.62%). There were an additional 51 psychiatric-related admissions during the 2003 period (a 27% increase). *Conclusion:* There appears to be a correlation between increased deployment tempo and psychiatric-related admissions for military members and dependents at this military hospital. Data throughout the final 8 months of the year may elucidate the significance (or lack thereof) of this correlation.

2001/2003	Admits	ICU	Overdose admissions	Psychiatry admissions	OD-ICU admits	Total ED patients seen	Military watch	Total OD+ psych
January	326(304)	82(81)	20(21)	27(44)	2(5)	5873(5278)	2(6)	51(76)
February	260(254)	85(80)	13(16)	24(21)	5(5)	5493(4983)	4(6)	46(48)
March	267(275)	86(100)	19(20)	21(24)	5(9)	5257(5206)	4(6)	49(59)
April	261(291)	85(105)	9(14)	25(33)	3(6)	5247(4651)	2(2)	41(55)
Total	1114(1124)	338(366)	61(71)	97(122)	15(25)	21870(20118)	12(20)	187(238)

160. Ipecac: Population Density, Frontier Designation, and Poison Center Recommendations

Horowitz BZ, Watson WA, Reid NE, Litovitz T. *Oregon-Alaska Poison Center, Portland, OR, and the American Association of Poison Control Centers, Washington, DC.*

Background: In November 2003 the American Academy of Pediatrics recommended that ipecac no longer be considered for routine home management of pediatric poisoning. Some toxicologists believe ipecac may continue to play a role in remote regions of the country with limited access to health care facilities. *Methods:* A review of the AAPCC TESS database for 2000 through 2003 was done. All ingestions by children <6 yrs of age were included. The ipecac recommendation ratio (IRR) was calculated as the number of recommendations per 1000 ingestions where the poison center recommended ipecac use. Actual administration of ipecac was not a study criterion. The IRR by county population density was compared among population density quartiles and by frontier vs. nonfrontier county categories [Frontier Education Center (FEC) definition (www.frontierus.org)]. *Results:* The mean county IRR was 7.91 ± 11.18 (SD). The mean IRR by county for the four interquartile population density ranges, ranked from lowest- to highest-population density ranges, were similar (6.49 ± 13.54 ; 9.00 ± 11.65 ; 8.12 ± 9.87 ; 8.04 ± 8.98). In 492 (61%) of frontier counties, ipecac was not recommended; in 315 counties ipecac was recommended at least once; 3 frontier counties had no pediatric ingestions. Frontier counties had an IRR of 6.18 ± 13.38 and nonfrontier counties had an IRR of 8.51 ± 10.24 . *Conclusions:* Population density and designation as a frontier county did not appear to impact the frequency of poison center recommendation of ipecac between 2000 and 2003. The substance ingested and interpoison center variations in use of ipecac syrup may be more significant factors than access to health care services.

161. Multicenter Case Series of Corrosives Poisonings: Hospitalization and Lethality

Sarmanaev S,¹ Sentzov V,^{2,6} Akhmetov I,¹ Zobnin Yu,³ Mouzofarov I,¹ Freidin A,⁴ Vishnevetsky M,⁵ Tuktarova R,¹ Berdin I.¹ *Toxicological Center, ¹Ufa, ²Ekaterinburg, ³Irkutsk, ⁵Perm, ⁴Kurgan, Tagil⁶; Russia.*

Background: Acute corrosive poisonings are widely spread in the United States, Europe, as well as in Russia (Christesen 1994; Cox & Brooks 2000; Kardon 2000; Issley 2000; Luzhnikov 2000; Khalfin & Sentzov 1999; Sarmanaev 2000; Sarmanaev, Sentzov, Zobnin et al., 2002). There are no large case series published on corrosive poisonings. *Aim:* A study of distribution and outcomes of peroral corrosive poisonings. *Data and Methods:* We retrospectively studied data from nine toxicological centers (total of inhabitants under inspection: 6 mln) for 3 yrs, which included 29,601 medical reports of patients with acute poisonings. *Results:* Out of these, 2,133 patients were poisoned by corrosives. The general lethality being 832 patients, acute corrosive poisonings accounted for 230 victims. *Conclusions:* 1) Hospitalization at the toxicological centers in connection with acute poisonings was 164 persons per 100,000 inhabitants a year. The average proportion of patients with corrosive poisonings made up 7.23%; 2) The total lethality being 2.8%; out of this total, the lethality in cases of acute corrosive poisonings makes up 27.6%; 3) A further prospective in-depth multicenter study is necessary in order to clarify factors underlying the present picture of acute corrosive poisonings.

162. Toxic Exposure Surveillance System (TESS) Poison Exposure Reports: Did the Exposure Actually Occur?

Litovitz TL, May ME, Watson WA. *National Capital Poison Center and American Association of Poison Control Centers, Washington, DC.*

Objective: To assess the likelihood that an exposure reported to a poison center actually occurred. *Methods:* All exposure cases reported to one poison center over 3 yrs were included. During case management, the CSPI used standard definitions to assess whether the exposure was unlikely, suspected, likely (but not confirmed), confirmed by history (including witnessed exposures or histories provided by reliable patients), confirmed by clinical effects, confirmed by lab, or confirmed by multiple parameters (history, clinical effects, lab). *Results:* Of 103,144 human exposures assessed during the study period, 84% were confirmed. Two percent of human exposures were coded as unlikely to have occurred. The 23.8% of patients managed in a health care facility had confirmed exposures more often than those managed outside a health care facility (87.7% vs 82.8%; $P < 0.001$). Cases with less severe outcomes were more often unconfirmed (23.0% of cases with no effect vs. 6.7% of minor, moderate, major effect or fatal cases; $P < 0.001$). Exposures in children under 6 yrs old were unconfirmed in 21.7% of cases compared to 10.5% of adult exposures ($P < 0.001$). Of the more serious pediatric exposures—those with moderate, major, or fatal outcomes—only 9.3% were unconfirmed. *Conclusion:* There is a high likelihood that exposures reported to TESS actually occurred. While 12% of cases were unconfirmed, only 2% were deemed unlikely to have occurred. By relying on more severe cases reported to TESS for regulatory or policy decisions, confidence in the data increases. Cases managed at home are confirmed nearly as often as cases managed in health care facilities, thus this outpatient population adds a valuable dimension for hazard and terrorism surveillance.

163. The Hispanic Health Council's "Participatory Community Response Team Drug Monitoring Study"—What is in Dust?

Perez A, Wu AH, Smith A, Shaw S, Rodrigues I, Singer M. *Hartford Hospital/UConn School of Medicine, Hispanic Health Council of Hartford.*

Background: Drug Abuse Warning Network (DAWN) data indicate that emergency department (ED) visits involving phencyclidine (PCP) have doubled in the past 4 yrs. An important limitation of DAWN is the fact that it reports hospital chart "mentions" of drug abuse with or without testing. This study's objective was to determine how many individuals who reported smoking a product containing PCP (dust, Illy, wet) in the last 48 h have PCP in their urine. *Methods:* A cross-sectional study of drug-using community members who reported smoking PCP in the past 48 h was implemented. A standardized interview covering medical history, medication use, and drug use was supplemented by a urine sample tested for drugs of abuse with the Triage TOX Drug Screen (Biosite

Diagnostics). Positive PCP screens were confirmed with GC/MS. *Results:* Thirty-five subjects participated. Only 34% of these had detectable PCP in their urine. All positive PCP screens were confirmed. Ninety percent (9/10) of participants who additionally stated they used cocaine had cocaine metabolites in their urine. Almost 50% (10/19) who were positive for cocaine denied cocaine use. *Conclusions:* Only one-third of individuals who claimed to have smoked PCP-containing products had PCP detectable in their urine. The detection of cocaine in 50% of admitted drug-experienced individuals who denied its use suggests that the product they smoked was laced with cocaine and not PCP. The lack of correlation with reported use and actual drug-testing results casts further doubt on the validity of DAWN data.

164. Primary Overdose Treatment by Community Health Aides in Alaska

Horowitz BZ, Giffin S. *Alaska Poison Center, Oregon Health & Sciences University, Portland, OR.*

Background: The pre-hospital system in most parts of the United States involves sending EMTs or paramedics to the callers' home for primary treatment and usually results in immediate transport to a health care facility (HCF). In Alaska, a system is in place such that in remote villages a community health aide (CHA) will primarily evaluate the patient, sometimes in their own home, and begin treatment in conjunction with a "radio MD" or the Regional Poison Center. CHA's can continue treatment in a small village clinic and must stabilize the patient and then await the next available transport, which can take up to 24 h, depending on the weather and resources. *Methods:* A 1-yr review of CHA calls to the regional poison center was done. *Results:* There were 97 patients treated by CHAs in 2003. The most common substances ingested include ethanol, acetaminophen, NSAIDs, aspirin, diphenhydramine, antibiotics, SSRIs, and nontoxic household products. Four were work-related chemicals. Thirty-seven (38%) of these cases were children less than 6 yrs old. Thirty-nine (40%) of the patients were transported by plane to a HCF. Seventeen patients had a delayed transport due to bad weather and were stabilized by the health care worker in the clinic until transport to a hospital could be accomplished. Initial treatments involved oral N-Acetylcysteine, oral ethanol, and IV bicarbonate in cases with potentially significant toxicity. Of the transported cases, 7 out of 17 delayed-transport cases had resolved their toxicity and were placed on the next available commercial air flight to the destination location for psychiatric evaluation. All patients were managed appropriately and had a good outcome. *Conclusion:* An alternate pre-hospital care system utilizing CHAs is reviewed, and it may be an appropriate model for other rural or frontier areas that have remote access instead of ambulance-based personnel.

165. Application of Poison Center TESS Data for Toxicosurveillance: The Concept of the Surveillance Technician—10% Automation and 90% Perspiration

Bronstein AC,¹ Seroka AM,¹ Wruk KM,¹ Peterson J,¹ Watson WA,² Bogdan GM,¹ Schaetzle L,¹ Dart RC.¹ ¹*Rocky Mountain Poison Center, Denver, CO;* ²*American Association of Poison Centers, Washington, DC.*

Background: Near real-time, automated analysis of TESS center data signals has been initiated as a poison event early-warning detection system. We studied the infrastructure necessary to achieve this goal. *Methods:* Each 24 h period, our poison center's previous-day TESS clinical effects (CE) data is analyzed for volume "outliers" using a 3-yr (14 days/yr) historical mean+ 3 SD. Automated email notice of outlier signals (observed number) is reported. Specific case identification and details are not included. A manual case search and human analysis is necessary to determine significance. To accomplish these tasks, poison specialists from our CQI department serve as surveillance technicians (ST). When the automated outlier email is received, the ST manually retrieves the corresponding case records. The ST and medical director review the data to determine outlier significance. *Results:* After 43 days of reporting, we have had 10 CE outlier days for a total of 18 CE from nine groups. Search, review, and interpretation time per outlier record is 15.3 min. No significant poison events were detected. All outliers had valid explanations.

Conclusion: Automated TESS signal analysis is a valuable tool, but it is only one aspect of near real-time surveillance. Case identification, review, and interpretation require significant human resources in our center. Our experience indicates that regional poison centers may require dedicated personnel, such as ST's, to meet real-time toxicosurveillance requirements.

166. Review of Pediatric Mortality Reported by TESS From 1997–2001

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Background. In 1992, a review of 5 yrs (1985–1989) of Toxic Exposure Surveillance System (TESS) data on pediatric exposures compared pediatric poisoning hazards. Additionally, TESS data on pediatric fatalities from unintentional exposures were summarized for 1983–1990. There has been no subsequent analysis of the TESS data to identify changes in pediatric poisoning deaths. *Methods:* TESS reports for 1997–2001 were reviewed manually and all pediatric (age ≤ 19 yrs) deaths were compiled and analyzed using Excel™. *Results:* Over the 5 yrs, there were 11,070,553 calls reported with 7,376,168 (~60%) concerning patients ≤ 19 yrs. A total of 4,428 deaths were reported with 436 (9.8%) occurring in pediatric patients. Prescription and OTC medications were responsible for 52%, street drugs for 13%, and volatile hydrocarbons (from the nonpharmaceutical category) for 11% of all pediatric deaths. Analgesics, cardiovasculars, antidepressants, sedative/hypnotics/antipsychotics, and street drugs specifically accounted for 75% of reported deaths, however, this drops to 40% for pediatric patients, reflecting volatile substance abuse. Unintentional death from iron, previously the most common cause of unintentional deaths (11 from 1985–1989), occurred only twice. Unintentional deaths dropped from 97 (1983–1990) to 54 from 1997–2001. In decreasing order, opiates (6 deaths, 3 from methadone), salicylates (3), antidepressant (2), iron (2) and cardiovasculars (2) were the most common causes. Acetaminophen was the most common cause for all pediatric deaths (33 deaths), followed by opiates (31, 11 from methadone), cyclic antidepressants (28), and SSRIs (13). No other agent or class had more than 10 deaths. Twelve of the 20 deaths due to therapeutic error were pediatric, acetaminophen (4 deaths), digoxin (2), and fosphenytoin (2) were the three most common. *Conclusion:* Significant changes in TESS pediatric poisoning fatalities have occurred; should education, training, and research change also?

167. Pyrethroid Insecticides: Advances, Limitations in Biomonitoring

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Introduction: There have been significant advances in analytical methods for the assessment of human exposure to pyrethroid insecticides. The purpose of this review is to identify pyrethroid metabolites that are the subject of biomonitoring studies and investigate the extent to which there may be opportunities for human exposure to these metabolites in the environment. *Methods:* A systematic review of the scientific literature on the metabolism and environmental fate of pyrethroids was conducted utilizing SciFinder Scholar (2004 edition). An initial search strategy using the keywords “pyrethroid” and “urine” was conducted, followed by a more specific search strategy using CAS numbers for pyrethroid insecticides (*cis*- and *trans*-permethrin, deltamethrin, cyfluthrin) and metabolites [3-phenoxybenzoic acid, *cis*-DCCA, *trans*-DCCA, 4-fluoro-3-phenoxybenzoic acid, and *cis*-3-(2,2-dibromovinyl)-2,2-dimethylcyclopropane carboxylic acid (Br₂CA)] used in biomonitoring studies. *Results:* A total of 50 studies were identified demonstrating the occurrence of pyrethroid metabolites in the environment, including 3-phenoxybenzoic (nonspecific metabolite of multiple pyrethroids), *cis*-DCCA (metabolite of *cis*-permethrin, cypermethrin, cyfluthrin), *trans*-DCCA (metabolite of *trans*-permethrin, cypermethrin, cyfluthrin), and Br₂CA (metabolite of deltamethrin). *Conclusions:* Several of the pyrethroid biomarkers used in biomonitoring studies are chemicals that may also be generated as a result of the environmental transformation and degradation of these pesticides. Further evaluation is warranted to clarify the extent to which such measurements quantify exposure to the parent compound vs. their metabolites in the environment. Investigation of the environmental occurrence of these metabolites and their bioavailability in humans is needed.

168. Pediatric Poisoning with Antipsychotics; A Systematic Review

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Objective: To determine spectrum and severity of effects of unintentional antipsychotic poisoning in children. *Methods:* A computerized literature search of MEDLINE (1966–November 2003) and EMBASE (1980–November 2003) was undertaken. The internet was searched using www.google.com. Proceedings of NACCT and EAPCCT were hand-searched. All cases of unintentional antipsychotic (all classes) poisoning in children aged 0 to 6 yrs were included. Data extracted were age, weight, antipsychotic, dose, clinical effects, outcomes, and treatment. Toxic dose was estimated as the lowest dose causing objective adverse effects. *Results:* Fifty-nine reports were identified, but no controlled trials. Few reports contained all required information. Most case series included multiple antipsychotics with limited information on individual drugs or included all ages with limited pediatric information. Ingestion of one tablet for most antipsychotics caused symptoms, sometimes severe and usually lasting 1 to 3 days. Extrapyramidal side-effects (EPS) were often delayed, up to 12–24 h. Chlorpromazine caused CNS depression, hypotension, and miosis; EPS and cardiac effects were rare; toxic dose 15 mg/kg. Haloperidol caused drowsiness (rarely coma) and over half had neuromuscular effects (mainly EPS); toxic dose 0.15 mg/kg. Thioridazine causes CNS depression and potentially cardiac effects; toxic dose 1.4 mg/kg. Atypical antipsychotics caused significant CNS depression (except risperidone), less commonly EPS (toxic doses: clozapine 5 mg/kg, olanzapine 0.5 mg/kg). EPS responded to anticholinergic drug treatment. *Conclusions:* Unintentional antipsychotic ingestion in children can cause severe effects lasting 1 to 3 days, often with one tablet. Children potentially ingesting a toxic dose or who are symptomatic should be assessed in a hospital. Most cases resolve with good supportive care.

169. Patterns of Reporting to TESS of a New Drug: Strattera™

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Objective: On November 26, 2002 the FDA approved a new drug for the treatment of attention deficit/hyperactive disorder, Strattera™ (atomoxetine). The purpose of this study is to examine the patterns of Strattera calls to the AAPCC TESS database during the first 14 months after approval. *Methods:* The TESS database was searched for all cases with the substance codes for atomoxetine or Strattera. Data reviewed was from November 1, 2002 through December 31, 2003. All records were included in the analysis. *Results:* There were 2,552 records in the Toxic Exposure Surveillance System (TESS) database for the study period: 1,694 human exposures, 108 animal exposures, 17 confirmed non-exposures, and 733 information calls. In November and December 2002, the first 2 months following approval, and prior to marketing, there were three information calls reported to TESS. The first human exposure was in January 2003. The total number of calls/month increased from 29 in January to 351 in December 2003. In the first quarter of 2003, human exposures accounted for 77.1% of all reported calls and 19.8% were information calls. By the fourth quarter of 2003 those percentages changed to 62.6% and 32.1%, respectively. From the first to fourth quarters, human exposures in children <6 yrs old increased from 13.5% to 20% of all calls. Therapeutic errors in 6–19-yr-olds accounted for 32.8% of all calls in the first quarter, decreasing to 21.15% in the fourth quarter. The reported reason for exposures was most commonly unintentional general in children <6, therapeutic error for both 6–12 and 13–19-yr-olds. *Conclusion:* The number and type of Strattera calls to poison centers changed over the first 14 months of its use, dramatically increasing after marketing began. TESS can be used to detect the rapidly changing reporting patterns of new drugs.

170. Disease Surveillance and Nonprescription Medication Sales Can Predict Increases in Poison Exposure Calls

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Background: Realtime Outbreak and Disease Surveillance (RODS) is a national real-time syndromic surveillance system that classifies hospital registration chief complaints into one of 7 syndromic categories. The National Retail Data Monitor (NRDM) is a public health surveillance tool that is designed to collect and analyze the daily sales of 18 categories of nonprescription medications. The goal of RODS and NRDM is to provide early warning of disease outbreaks, such as biological terrorism. The purpose of this study was to determine whether peak syndromic activity and the consequential purchase of nonprescription medications could predict an increase in poisoning exposures involving NRDM-monitored medications. *Methods:* Data from the RODS and NRDM databases were plotted graphically to portray activity that occurred during the entire year of 2003. Data from a RPIC electronic medical record system that involved all human exposure calls related to NRDM-monitored medications in 2003 were extracted and graphed. Analysis included comparisons between the data sets. *Results:* Poison center exposure volume correlated predictably and simultaneously with peak activity in both the RODS and NRDM databases. *Discussion:* There was no delay between the onset of a disease outbreak, such as influenza in December 2003, the sale of palliative medications, and the increase in poison center exposure call volume. Increased availability of and access to nonprescription medications resulted in more poison exposure calls. *Conclusions:* Real-time surveillance using other databases can help to forecast poison center activity. This knowledge allows the poison center to provide anticipatory guidance to the residents of its service region.

171. Therapeutic Misadventures in Infants Less Than Six Months of Age

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Background: Ingestions are a prevalent event in the pediatric population. Therapeutic misadventures are defined as prescribing errors, incorrect delivery of product, and adverse reactions. Other characterizations of ingestions are malicious intent, accidental, and toxic exposure. Due to the paucity of data for infant exposures, this study was designed to elucidate the descriptive epidemiology of ingestions in infants age 0 to 6 months. The study hypothesis was that dosing errors would account for at least 25% of these cases. *Methods:* A retrospective chart review provided a convenience sample of calls from birth to the age of 6 months to the Regional Poison Control Center from December 28, 2002 to December 28, 2003. Information obtained from each case included the route, amount, and name of ingestant, toxicity, symptoms, and disposition. An agreement rate statistic and 95% CI was determined for the observed vs. hypothesized (25%) dosing error rate. *Results:* A total of 358 cases were reviewed (59% med, 41% nonmed). The most frequent medications implicated were ranitidine (7%) and metoclopramide (6%). Incorrect dosing, repeated dosing, incorrect interval, and incorrect route accounted for 42% of caregiver dosing errors. Ten cases (3%) were due to pharmacy error, and the wrong medication was given in 32 (9%) of cases. Twelve percent of medications given were over the range of toxicity. Nine infants were admitted, and 39 (11%) were evaluated in an ED. *Conclusion:* Dosing errors accounted for 42% [95% CI (37%, 47%)] of poison center cases in infants less than 6 months. The observed proportion was significantly greater than 25% ($z=4.74$, $p<0.001$). Health care providers can increase prevention of dosing errors by educating caregivers upon dispensing medication and demonstrating use of appropriate measuring devices.

172. Case of Elevated Blood Lead in a South Asian Family that Has Used Sindoor as a Food Coloring

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Background: In March 2004, the Poison Control Center was contacted regarding a case of elevated blood lead levels (BLLs) in a South Asian family of three with unknown source of lead exposure. *Case Report:* After a routine blood testing, the pediatrician of the family discovered that their 13-month-old boy had a BLL of 57 $\mu\text{g}/\text{dL}$. The initial home inspection and interview with the family carried out by the local health department did not reveal a specific source of lead exposure. Since the baby was mostly breast-fed, the pediatrician did a blood test on the mother and the result

showed a BLL of 85 µg/dL. As the mother denied any history of pica behavior, the pediatrician suspected a source of lead to which the entire family might have been exposed, and did a blood test on the father. The results showed a BLL of 95 µg/dL. A second visit to the family's home was conducted by specialists from the health department accompanied by the poison center's epidemiologist. Samples were collected from a number of ethnic remedies, food spices, and cooking products used by the family. The subsequent laboratory analyses identified one of these samples, a product called Sindoer, as containing more than 57% of acid-extractable lead by weight. The parents reported that they had used Sindoer on several occasions to give their food a deep orange-red color. Sindoer is widely available and it is primarily used by Hindu women for cosmetic and religious purposes. *Conclusion:* Given the extremely high content of Pb in this product, Sindoer poses a serious risk of lead poisoning if used for food coloring.

173. Syndromic Surveillance: A Novel Active Approach to Detecting Mass Poisoning

Greller HA, Rodriguez C, Hoffman RS. *NYC DOHMH, NYC PCC, New York, NY, USA.*

Background: Despite advances in warning devices, carbon monoxide (CO) remains the most common cause of environmental toxin-related fatalities. Poison control center (PCC) reporting is passive, often incomplete, and requires clinical recognition. Syndromic surveillance (SS) is health department-based near real-time analysis of emergency department (ED) chief complaints (CCs) designed to identify infectious disease outbreaks. SS analyzes daily logs of ED CCs from 48 area hospitals. We present the first application of this system for CO poisoning. *Methods:* Three years of PCC data were pooled, and clinical indicators of confirmed CO poisoning recorded. Chi-square analysis identified significant symptoms, and logistic regression determined the covariates predictive of CO exposure. This syndromic model of CO poisoning was then prospectively added SS. Positive SS signals were then matched with the PCC database and confirmed by direct hospital contact. *Results:* A garment factory was evacuated because of mass illness. A defective space heater caused ambient CO levels as high as 200 ppm. Eighteen people were hospitalized with COHb levels ranging from 4–19%. Eight patients were reported to the PCC from one ED. SS identified 14 patients in two EDs, only 4 of which matched PCC cases. All 18 were confirmed by direct ED contact. Thus SS identified 10 more patients than the PCC. *Conclusion:* This novel approach demonstrates that SS can detect environmental poisonings in near real-time. Active surveillance identifies cases missed by passive PCC data collection. Identifying clusters by symptoms might allow for early diagnosis such that first responders can investigate and mitigate serious health consequences. This new method of syndromic definition may apply to a wide range of poisonings including chemical terrorism.

174. Poison Centers and the Hospitals They Serve: What is the True Incidence of Poisoning?

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Background: Historically, because of passive voluntary reporting, poison centers have failed to capture the majority of consequential exposures. Unlike most regions, however, local health law mandates that all poisoning cases must be reported to our poison control center (PCC). We undertook this preliminary study designed to compare hospital cases of confirmed poisoning with those reported to the PCC. *Methods:* A 1-yr sample of all discharge diagnoses from a large urban public hospital remote from the PCC was searched electronically for ICD-10 codes defining acute or chronic poisoning. This database included all patients regardless of whether they were admitted or treated and released from the ED. Cases of withdrawal were excluded. Because of confidentiality issues, hospital cases were stripped of unique identifiers prior to release to the PCC. Hospital cases were then matched with PCC cases of confirmed poisoning based on diagnosis, date of admission, and length of stay. *Results:* For the study period, 136 patients had at least one hospital discharge diagnosis classified as a poisoning. These were matched against 139 poisonings reported to the PCC from the same hospital. Although 51 cases matched, 62.5% (85/136) of hospital cases were never called to the PCC and 63.3% (88/139) of PCC cases were not found among the hospital discharges.

Thus the entire sample included 224 unique cases of poisoning. *Conclusions:* Clear deficits exist in both hospital coding of known cases of poisoning, and reporting of poison cases to the PCC. Thus utilization of either database alone to appreciate the true incidence of poisoning is flawed. Sharing of data may increase capture and help the properly define the epidemiology of poisoning.

175. A Comparison of Foodborne Illness Cases Reported to a Poison Center and Public Health Department

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Background: Poison Centers provide real-time data that could enhance public health surveillance systems for foodborne disease outbreaks including those produced by deliberate contamination. *Methods:* We analyzed all human exposure calls to the Arizona Poison and Drug Information Center (APDIC) from January 1 through March 31, 2000, coded as food product or food poisoning. Poison Center call data were reviewed by a public health nurse using a case definition of patient-reported suspected contaminated food and any one of the following symptoms; abdominal pain, nausea, vomiting, and diarrhea. To determine if APDIC cases overlapped with other data sources, we compared these calls to Pima County Health Department (PCHD) cases using zip code, age, gender, and date of onset of symptoms. *Results:* There were 88 human exposure calls. Of the 57 symptomatic human exposure calls, 55 (96%) met the case definition for foodborne illness. Over half of the callers (56%) that met the case definition, contacted this center within 24 h of suspected exposure. Approximately one-third (36%) of these callers reported an exposure outside of the home. During this same time period, there were 71 laboratory-confirmed foodborne illnesses reported by the PCHD. None of the calls were an exact match to a confirmed illness case. However, there were no significant differences between the gender and age groups of callers and cases in the APDIC and PCHD databases. *Conclusion:* APDIC calls and PCHD cases appear to be two independent data sets. Poison Center foodborne illness calls can provide a useful addition to surveillance data reported to public health agencies.

176. Lessons Learned from Response to a Covert Chemical Threat

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Background: Mass poisoning presenting as a foodborne outbreak triggered epidemiologic investigation and poison center (PC) response. While PC care was in progress, active surveillance by Toxic Exposure Surveillance System (TESS) rapidly and correctly identified the cluster. CDC was notified; similar clusters were excluded nationwide. *Methods:* Following a church social several individuals presented to a rural ED. Complaints were typical of gastroenteritis; onset was rapid in some cases. Hypotension refractory to fluids and pressors followed in a few. PC was consulted; differential diagnosis was expanded to nonbacteriologic causes. The toxidrome focused care, lab, and forensic investigations on arsenic; data were uploaded to TESS. *Results:* Preliminary lab results yielded positive As. A PC antidote registry and a state antidote stockpile were essential to timely response. Active surveillance by TESS correctly identified the case cluster above background. Forensic concerns inadvertently prolonged time to lab confirmation. *Conclusions:* Presentation at a point source of care facilitated local recognition of the outbreak; consultation by the PC yielded correct diagnosis in real time; active surveillance by TESS flagged the cluster and excluded similar outbreaks nationwide; forensic and clinical specimen streams should be separated to avoid delays in diagnosis; antidote supplies maintained in this large rural state proved essential to management.

177. School Nurse Utilization of the Poison Center: Five Year Review

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Background: What is the incidence of school nurse consults with the poison center? A 5-yr profile of school nurse calls may define trends or problems. *Methods:* This study reviewed data of the Toxic Exposure Surveillance System (TESS), 1999–2003, selecting “site of caller” as school nurse, to a regional poison center. *Results:* Exposures are 71% of the consults, and 87% of these were managed by the school nurse or in a non-health care facility. Males are 58% percent of patients. The reasons for exposure are 79% unintentional, 17% intentional, 2% adverse drug reaction, and 2% malicious intent. Ingestion is the largest route of exposure followed by ocular, dermal, and inhalation. In the school-age bracket of 6 to 19 yrs, non-drug substances outnumber drugs 3.5:1. The largest non-drug category is arts/crafts/office supplies, and 60% of those substances are pens and pencils. Chemicals, plants, and cosmetics follow. Analgesics, stimulants, and street drugs are the top pharmaceutical categories. Known medical outcomes are primarily no effect or minor effects with no major outcomes documented. Fifty percent of cases were not followed to known medical outcome, although only 2.4% were coded as “not followed, potentially toxic” exposure. Calls from school nurses are <1% of the annual call volume. *Conclusions:* School nurses do not call the Poison Center as frequently as perceived by Poison Information Specialist staff. Education regarding the safety of gel pens and other ink pens may help school nurses manage this common exposure.

178. A False Elevation of Bilirubin in the Blood and Urine of a Naproxen Overdose Patient

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Objective: Naproxen is a commonly used nonsteroidal anti-inflammatory (NSAID) in the 2-arylpropionic acid class. Overdoses of this drug are not uncommon and are generally benign. Naproxen is biotransformed to glucuronoconjugates and sulfated metabolites, which are excreted in the urine. Etodolac, a carboxylic acid NSAID, is metabolized to 6 and 7 hydroxylated compounds that have been demonstrated to give false positive (+) reactions for bilirubin on the urine dipstick using the diazo method. We report a case of significant elevation of serum and urine bilirubin in a non-icteric patient using the diazo method. *Case Report:* A 16-year-old healthy male presented to the emergency department (ED) 12 h after taking a “handful” of 250 mg naproxen tablets. He endorsed no physical complaints and noted depressive symptoms. His vital signs and physical exam were unremarkable and within normal limits. Acetaminophen and salicylate levels and a urine drug screen were negative. Liver function tests were within normal limits except for total serum bilirubin of 9.4 mg/dl (diazo method) with a direct bilirubin of 0.2 mg/dl. Urinalysis demonstrated 1 mg/dl of bilirubin and 4 mg/dl of urobilinogen (diazo method). The serum bilirubin was repeated and verified. Right upper-quadrant ultrasonography was within normal limits. The patient was non-icteric and without complaints. He was discharged to psychiatry for further evaluation. Two weeks later, a repeat total bilirubin was 0.8 mg/dl (normal). *Conclusion:* As with etodolac, we suspect that the diazo method used for measuring bilirubin cross-reacted with naproxen metabolites or the parent compound to result in a false elevation of bilirubin in the serum and urine. In the case of etodolac, the oxidized method did not give false positive results, but this methodology is not available at our institution. To our knowledge this is the first case report of a falsely elevated bilirubin level in a patient with a known, isolated naproxen overdose.

179. Coca Tea Consumption Causes Positive Urine Cocaine Assay

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Background: Coca tea, or mate de coca, is commonly consumed in South America and is thought to contain cocaine plant material. *Methods:* Institutional IRB approval was obtained. Coca tea was prepared using commercial mate de coca tea bags from Peru. One gallon of water was boiled and 12 tea bags steeped in the water for 20 min. Five healthy volunteers ingested between one and five 8-ounce cups of coca tea over 15 min. None of the volunteers

reported sympathomimetic symptoms after consuming the tea. Urine samples were collected from each of the subjects preingestion (control) and 2, 12, 24, and 36 h postingestion. Urine toxicology assays for benzoylecgonine were performed by fluorescence polarization immunoassay using Abbott AxSym™ system. *Results:* The NIDA-recommended cutoff for urine benzoylecgonine level is 300 ng/mL. Most reference laboratories use this cutoff when reporting positive urine cocaine screening. Each subject's urine cocaine assay was positive (level exceeding 300 ng/mL) by 2 h postingestion, and three out of five remained positive at 36 h. Mean benzoylecgonine urine concentrations in all postconsumption samples were 1,777 ng/mL (95% CI:1,060–2,495). In two subjects, 12 h levels exceeded 5,000 ng/mL. *Conclusion:* Coca tea ingestion causes a positive urine assay for cocaine. Health care professionals should consider a history of coca tea ingestion when interpreting urine toxicology results.

180. An Evaluation of Bedside Ultrasound Detect Pills in the Stomach

Lee DC, Theodoro D, Chiricolo GC, Nelson MJ. *North Shore University Hospital, Manhasset, NY.*

Background: The best method of gastric decontamination of potential toxins after a recent ingestion remains controversial. Patients who present with significant amounts of toxins in the stomach on presentation to the hospital may benefit from gastric lavage. Unfortunately, the clinician seldom knows if there are toxins in the stomach. Our hypothesis is that a bedside ultrasound can detect recently ingested pills. *Methods:* We performed a randomized, single-blinded, controlled pilot study evaluating the sensitivity and specificity of bedside ultrasound. Study volunteers agreed to fast for 4 h, then randomized to ingest 10 tablets of a nontoxic compound (GNC Triple Garlic Herbal Supplement, General Nutrition Corporation) with 100 cc of water or just water. A bedside ultrasound was performed by an experienced ultrasonographer (RDMS-certified Emergency Medicine attending) and also by an Emergency Medicine senior resident. Positive and negative predictive values were calculated. This protocol was approved by our IRB. *Results:* Eight study subjects were enrolled. The experienced ultrasonographer had PPV of 1.0 and an NPV of 0.80. The resident ultrasonographer had a PPV of 0.60 and a NPV of 0.66. *Conclusions:* The preliminary results in this pilot study showed that an experienced ultrasonographer can detect gastric pills, but an inexperienced ultrasonographer could not. Further enrollment is presently ongoing.

181. It's Ricin and VX and Anthrax. Oops, Our Bad—It's Baking Powder

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Background: Since the anthrax incidents that occurred in the fall of 2001, many fire departments and hazardous materials (HazMat) units have acquired various technologies so they can perform field testing on suspicious substances. Treatment recommendations are frequently made based on these field tests while waiting for formal lab test results. *Case Report:* The poison center's medical toxicologist was contacted by state officials requesting decontamination and treatment recommendations for persons potentially exposed to ricin. A threatening letter was delivered by the U. S. Postal Service to a large mail-order-processing company. The envelope contained a white noncrystal powder along with a letter that made specific threats against the company. The building was evacuated and a hazardous materials team went in to assess the scene and recover the letter. While in the building, a hand-held chemical agent monitor registered low-level positives for VX. Field testing performed by the HazMat team on the powder revealed multiple positive and negative results for both ricin and anthrax. State and poison center officials were told that ricin, VX, and anthrax were present. Later that evening, analysis of the powder by Fourier Transform InfraRed (FTIR) spectroscopy revealed that the substance was a commercially available baking soda. Microbiological cultures and PCR of the powder were negative. *Conclusion:* Results of field testing for hazardous materials and biological agents must be interpreted in context of the event, the competence of the people performing the test, and people's symptoms. Undue reliance on field-testing results may generate recommendations that are inappropriate or potentially harmful to those exposed.

182. Ephedrine Alkaloid Urine Concentrations and Cross Reactivities with Amphetamine/Methamphetamine Immunoassays

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Background: False positive urine toxicology results for amphetamine (AMP) and methamphetamine (METH) may occur in individuals taking pharmaceutical phenethylamines because of nonspecificity of some immunoassays. We sought to determine if ephedra herbal products or synthetic ephedrine taken in usual doses could produce such false positives. *Methods:* Urine samples collected from 39 healthy research subjects participating in pharmacology studies on ephedra were analyzed for quantitative ephedrine alkaloid concentrations by LC-MS/MS. Urine samples were also tested for AMP/METH by Roche ON-LINE™ (in-house cutoff 900 ng/mL) and Microgenics CEDIA™ (cutoff 1000 ng/mL) assays on automated chemistry analyzers in our clinical laboratory. Prior to study initiation, subject urines were tested for drugs-of-abuse using the ON-LINE assay. *Results:* Concentrations of total ephedrine alkaloids averaged 6.1 ± 2.9 mcg/mL in 24 h urine samples collected after a 25 mg dose of ephedrine sulfate; 7.3 ± 3.4 mcg/mL in 14 h urine collections after a single dose of an ephedra dietary supplement (23 mg ephedra alkaloids); and 8.5 ± 4.6 mcg/mL in 24 h urine collections after two doses of an ephedra dietary supplement were taken 6 h apart. Single doses of ephedra or ephedrine produced no false (+) urine AMP/METH results. One of 16 subjects in the two-dose ephedra study had a urine sample that tested (+) by ON-LINE but (–) by CEDIA for AMP/METH. All pre-dose urines were (–) for drugs-of-abuse. *Conclusions:* False (+) AMP/METH tests are not likely to result after single doses of ephedra or ephedrine but may occur with repeat dosing. Increased urine ephedra/ephedrine concentrations due to dehydration or overdose could potentially increase the rate of false-positives.

183. New Etiology of Cocaine True Positive Drug Screen: Does South American Coca Tea Really Contain Cocaine?

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Background: Mate de coca tea is a popular South American drink brewed from leaves of the coca (*Erythroxolon coca*) plant. Andean natives recommend the tea to visitors for decreasing symptoms of altitude illness, especially in Peru and Bolivia. It is also now available in the United States via the Internet as an anorexiant. Although alleged to contain cocaine, the medical literature does not describe this phenomenon well. *Case Report:* A 30-yr-old woman contacted our hospital toxicology laboratory requesting analysis of a “Bolivian weight-loss tea” that she has been drinking. She recently had a urine drug test by her employer that revealed a+benzoylecgonine implying recent cocaine use. The patient adamantly denied cocaine use, but suggested that her Windsor Mate Coca Tea purchased over the Internet might be the cause of her urine drug screen testing positive for cocaine metabolites. Intact samples of Windsor Mate Coca Tea were obtained. A tea was prepared and then analyzed by gas chromatography-mass spectroscopy for cocaine and metabolites. A significant peak for cocaine was seen. Further quantification revealed 6.4 mgs cocaine/gram of tea, 0.02 mgs benzoylecgonine/gram of tea and traces of ecgonine methyl ester. *Conclusion:* South American coca tea may contain measurable quantities of cocaine and may be sufficient in vivo to cause a positive urine drug screen. Given the perceived sensitivity and specificity of forensic cocaine testing, this new finding may complicate interpretation of positive cocaine tests in the future.

184. Analysis of Modern Absinthe Formulations for Thujone Content and Coloring Metals

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Background: Absinthe is an alcoholic beverage extracted from *Artemesia absinthium*. It enjoyed a popularity in nineteenth century Europe, and a resurgent interest is seen in the modern media, including the internet. Our goal was

to determine the thujone content of these beverages and the presence of metal contaminants historically used for coloring. *Methods:* Five samples of products labeled to contain absinthe, all made in France, were procured in Germany and Canada in 2003–2004. Thujone was extracted in chloroform from an ethanol/water mixture. The chloroform layer was removed and evaporated to dryness. The residue was re-dissolved in 100 μL ethyl acetate and analyzed via GC/MS. Using the total ion chromatogram and a 10 $\mu\text{g}/\text{mL}$ thujone standard, concentrations of the thujone isomers were determined via ratios of areas under the curve (AUC). Fresh samples were then digested in 5% nitric acid for metals analysis via ICP/MS. *Results:* Thujone is characterized by m/z fragments of 81, 95, 110, and 152, with differing ratios for the α and β isomers. Total thujone content ranged from nondetectable to 6.1 $\mu\text{g}/\text{mL}$ via this method. Trace amounts of antimony and copper, historically used as colorants, were detected. *Conclusion:* Thujone content is quite variable among the compared samples. Other terpenoids, including camphor, are detected. Historical colorant metals are present in only trace amounts. Further studies will need to determine how these concentrations relate to the clinical toxicity of absinthe formulations, in excess of the effects of their primary intoxicant, ethanol.

185. Insulin and C-Peptide in Sulfonylurea-Induced Hypoglycemia

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Overview: Insulin (I) and c-peptide (CP) levels are used to differentiate causes of unexplained hypoglycemia. However, no systematic literature review describing I and CP levels in sulfonylurea-induced hypoglycemia (SIH) are available. We report I and CP levels associated with SIH found in a systematic literature review. *Methods:* We performed a systematic review of the English literature using MEDLINE and references of pertinent articles. I and CP values were included if drawn when blood glucose was <60 mg/dl in cases of SU exposure (confirmed by history or lab tests). Patients taking other glucose-lowering agents or those with renal or hepatic failure were excluded. Statistical analysis, other than ranges, was performed on sets (set=I, CP, and BG) with exact levels only (i.e., values not reported as $<$ or $>$). Levels obtained before therapies (BT) such as glucose or octreotide were compared to those obtained after therapy (AT). If it was unknown when levels were obtained, they were included in the AT group. *Results:* There were 79 patients and 93 sets of levels obtained from 23 articles. Eighty-six sets (10 BT) of levels were used for statistical analysis. Means for age ($p=0.3$), BG ($p=0.57$), I ($p=0.34$), or CP ($p=0.75$) were not different for BT and AT groups, so both were pooled for analysis. Patient age ranged from 3 h to >91 yrs (median 65.5 yrs). Range, median, and mean (SEM) for BG (mg/dl), I ($\mu\text{U}/\text{ml}$), and CP (ng/ml) were 2–59, 28, 28.7 (1.4); <3.5 –114, 29.5, 35.5 (2.4); and <0.3 –44.1, 5.7, 6.7 (0.6) respectively. CP was 12,100 ng/mL in one case, but is most likely erroneous as the next highest level is 44.1 ng/mL. Normal fasting I and CP are approximately 5–27 $\mu\text{U}/\text{mL}$ and 1.1–4.5 ng/mL. *Conclusion:* Reported I and CP levels in SIH vary widely and may be within normal ranges. Hypoglycemic therapy does not affect I and CP levels obtained during hypoglycemia.

186. Variability in Methanol Content Among Solid Fuel Products

Wiener SW, Ravikumar PR, Cotter B, Nelson LS. NYC Poison Control Center, New York, NY.

Background: Solid fuel products are commonly used for fondue sets, chafing dishes, and camping stoves. Management of exposed patients is problematic because the methanol (MeOH) content of these products is often unclear. Most containers do not list MeOH%. Additionally, PoisindexTM (PD) lists multiple formulations of identically labeled products with widely divergent MeOH content. We analyzed the MeOH content of solid fuel and compared it with that reported on the label and in PD. *Methods:* A convenience sample of six solid fuel products was obtained. Physical attributes of each can (including label, volume, fuel color, and printed information on the can) were used to identify the product and determine its contents using PD. Aliquots of each sample were placed in vials and weighed. An amount of 10 mL of water was added to each vial and vortexed. Samples were diluted 10:1 in water and injected into a Perkin-Elmer

Sigma 3B gas chromatograph with a Supelco 0.2% CW-1500/support 60/80 carbopack C, 4 ft x 4 mm glass column at 95°C, injection temperature 200°C and an FID detector at 250°C. Results were compared to the content listed in PD. *Results:* Only one product (Sterno Canned Heat Cooking Fuel™) listed the MeOH content on the can (3.3%); the measured concentration was 4.8%. Another (Fancy Heat™), not listed in PD, was 59.8%. Handy Fuel Canned Heat™ was listed in PD with several formulations, containing either 71% or 3–4% MeOH; we were unable to identify which formulation we purchased, but it had 58.4% MeOH. The remaining three products had 3.1%, 3.9%, and 68.0% MeOH, and correlated well with PD values. *Conclusion:* For some products MeOH% correlated well with PD. However, some products with widely divergent MeOH levels cannot be definitively identified even when the can is available. In cases where the product is not definitively identified, patients should be presumed to have a consequential MeOH ingestion.

187. Cinnamoylcegonine in the Urine of Cocaine Users

Wiener SW, Ravikumar PR, Hoffman RS, Nelson LS. *NYC Poison Control Center, NY, NY.*

Background: Ingestion of *Mate de coca* (coca leaf tea) as a source of clinical false-positive urine cocaine screening has recently been raised as a concern. Analysis of alkaloids present in coca tea revealed cinnamoylmethylecgonine (CME) (also known as cinnamoylcocaine) as a significant component; a CME derivative is also detectable in the urine of coca tea drinkers. Although small amounts of CME were found when samples of cocaine seizures were analyzed, it is unclear whether there would be sufficient quantities to enable detection in the urine of cocaine users. It has been suggested that the presence of this alkaloid might help distinguish between true cocaine users and drinkers of coca tea because the preparation of cocaine for illicit commercial sale may preferentially decrease the amount of contaminants such as CME. We demonstrate the presence of cinnamoylcegonine (CE), a hydrolysis product of CME, in the urine of cocaine users. *Methods:* Ten waste urine samples that had tested positive for benzoylecgonine on EMIT screening were obtained. A total of 2 mL aliquots were mixed with an ammoniacal buffer at pH 9.5, and alkaloids were extracted with methylene chloride and isopropanol (9:1). CE and BE were derivatized with pentafluoropropanol and pentafluoropropionic anhydride (1:2), heated to 90°C for 30 min, cooled and evaporated off at 45°C. Samples were dissolved in 40 µL ethyl acetate, and 2 µL of each were injected into the GC/MS. Spectra were analyzed for the BE and CE derivatives, pentafluoropropylbenzoylecgonine and pentafluoropropylcinnamoylcegonine. *Results:* Eight of 10 samples tested positive by GC/MS for the presence of CE. The presence of BE was also confirmed by GC/MS in all samples. Quantitative analysis of CE was not possible because a standard was not available. *Conclusion:* CE is detectable in the urine of cocaine users. It would not be useful in distinguishing cocaine users from drinkers of *Mate de coca*.

188. Comparison of Diphenhydramine, Glycopyrrolate, and Atropine in the Treatment of Organophosphate Poisoned-Mice

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Objective: Treatment of acute organophosphate poisoning includes the use of the antidote atropine. However, mass casualties from organophosphate poisoning may quickly outstrip the supply of available atropine. Few studies have evaluated other anticholinergic agents as potential antidotes. We attempted to compare the effectiveness of the anticholinergics: diphenhydramine, glycopyrrolate, and atropine in treating organophosphate poisoned mice. *Methods:* A dose-lethality curve was calculated for the organophosphate dichlorvos. Maximal safe doses of all antidotes were determined. All mice received IP pretreatment with the antidote (glycopyrrolate, diphenhydramine, or atropine) or an equivalent volume NS control followed in 5 min by IP injection of dichlorvos. Mice were observed for the onset of seizure activity and time to death up to 24 h. *Results:* The maximal safe dose of IP diphenhydramine, glycopyrrolate, and atropine was 50 mg/kg, 120 mg/kg, and 180 mg/kg, respectively. Diphenhydramine, glycopyrrolate, and atropine did not affect the onset of seizure activity or time to death in comparison to controls. In dichlorvos poisoned mice (35 mg/kg), the mortality rate for the pretreatment antidotes were diphenhydramine (50 mg/kg), 100% (p=NS); glycopyrrolate (90 mg/kg), 40% (p=0.02); and atropine (50 mg/kg), 0% (p=0.01). The mortality rate for the control group at this

dose was 100%. At a lower dose of dichlorvos (30 mg/kg), the mortality rate of diphenhydramine pretreated mice (50 mg/kg) was 40% vs. 100% for controls, ($p=0.04$). *Conclusion:* Both diphenhydramine and glycopyrrolate pretreatment decreased mortality in dichlorvos-poisoned mice. However, neither drug was as effective as atropine.

189. Amelioration of Lead Toxicity with Vitamin C and Silymarin Supplementation

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Key Words: Lead; Vitamin C; Silymarin; Liver; Serum.

Background or Objective: The aim of the present study was to investigate the impact of the combined supplementation of vitamin C and silymarin on lead toxicity. *Methods:* Male albino rats were subdivided into three groups; the first was considered as normal controls, the second received lead acetate in diet as 500 mg/Kg diet, the third received the same lead acetate dose and supplemented with vitamin C (1 mg/100 g body weight) and silymarin (1 mg/100 g body weight) by gastric tube three times per week. Samples were taken after 2, 4, and 6 weeks of treatment. *Results:* Lead induced significant elevations in serum ALT, AST, GGT, and ALP activities after different periods of treatment. However serum LDLc was decreased. The intensities of RNA and apoptotic fragments of DNA were measured as optical density by Gel-pro program. Lead acetate decreased the intensity of DNA at 6 weeks and induced apoptotic DNA fragments reversibly with time. After two weeks of lead administration dilation and congestion of terminal hepatic veins and portal vein branches were observed. Lead also induced hepatocyte proliferation without any localized distribution among zones 1,2,3. Portal inflammatory infiltrate with disruption of the limiting plates (interface hepatitis), steatosis, apoptosis, and mild fibrosis were detected especially by 6 weeks of lead administration. *Conclusion:* Combined treatment of lead with vitamin C and silymarin showed marked improvement of the biochemical, molecular, and histopathological findings. These experimental results strongly indicate the protective effect of vitamin C and silymarin against toxic effects of lead on liver tissue.

190. Evaluation of Hepatotoxicity in Alcoholic Patients from 3-Day Maximal Therapeutic Dosing of Acetaminophen (APAP)

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Background: Two previous trials involving 260 alcoholic patients showed no difference in serum transaminase activity (AST or ALT) between patients treated with 2-day dosing of APAP (4 g/day) and those treated with placebo. *Objective:* To evaluate effect on liver enzymes and INR from 3-day dosing of APAP (4 g/day) in alcoholic patients. *Methods:* A prospective, double-blinded, randomized, placebo-controlled trial of confirmed alcoholics with recent drinking activity was conducted at a detoxification center. Baseline serum APAP, AST, ALT, INR, and glutathione (GSH) were determined. Exclusion criteria included recent ingestion of >4 g of APAP, serum APAP >20 mcg/mL, AST or ALT >200 IU/L, or INR >1.5. Patients were randomized 2:1 to receive APAP (1 g every 4 h for four doses on days 1, 2, and 3) or placebo (same schedule). AST and ALT were measured on days 3 and 5; GSH on day 3. *Results:* A total of 210 patients completed the trial: 145 received APAP and 65 received placebo. Treatment groups were not different in demographics, severity of alcoholism, nutritional status, or baseline AST, ALT, INR, or GSH. Six patients (three APAP, three placebo) developed an AST ranging from 215 to 448 IU/L; three of these patients (two APAP, one placebo) tested positive for influenza or infectious hepatitis. There was no difference between groups on any day with respect to mean AST, ALT, or INR: the study had 80% probability of detecting a 15 IU/L mean difference in AST. There was no change in mean serum GSH in either group. *Conclusion:* Alcoholic patients treated

with the maximal therapeutic dosage of APAP for 3 days did not develop hepatotoxicity. Our study does not support the concept of reducing the maximal therapeutic dose of APAP in the alcoholic patient.

191. Glibenclamide (GLB) Does Not Produce a Dose-Dependent Improvement of Hemodynamics in Verapamil (VER) Toxicity

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Background: Intravenous sulfonyleureas increase blood pressure in vasodilatory shock from hypoxia, endotoxemia, and hemorrhage in animal studies. Prior work on VER toxicity showed a small increase in systolic blood pressure (SBP) 5 min after a low dose of GLB. It is unknown if higher doses of GLB would be more effective. We hypothesize that increasing doses of GLB will result in a dose-dependent increase in SBP. *Methods:* Nine anesthetized dogs were instrumented to measure arterial blood pressures (DBP, SBP, MAP), left ventricular pressures (LV max pressure), cardiac output, pH, insulin, and glucose. VER toxicity (50% decrease in MAP) was induced with VER at 6 mg/kg/hr and maintained for 30 min by titrating the VER rate. After titration, the VER rate was changed to 1 mg/kg/hr for the duration of the study. After 1 h of VER at 1 mg/kg/hr, the dogs received the following GLB infusions for 60 min: 0, 30, 60, 120, 240 (mcg/kg/min). Hemodynamic measurements were compared to the mcg/kg/min dose of GLB using linear regression at 5, 15, 30, and 60 min after the start of the GLB infusion and at 30 and 60 min after the completion of the GLB infusion. *Results:* During the GLB infusion, GLB resulted in the following dose-dependent increases: SBP at 30 min (0.21 mmHg/mcg GLB, 95% CI 0.05,0.36); DBP at 15 min (0.02 mmHg/mcg GLB, 95% CI 0.01,0.04) and 30 min (0.004 mmHg/mcg GLB, 95% CI 0.001,0.07); LV max at 30 min (0.011 mmHg/mcg GLB, 95% CI 0.01,0.2) and 60 min (0.09 mmHg/mcg GLB, 95% CI 0.006,0.17). We were unable to detect a dose-dependent change in these and other parameters at other times. *Conclusion:* We were unable to detect a consistent and clinically significant dose-dependent effect of glibenclamide on hemodynamic parameters in the setting of verapamil toxicity in this animal model.

192. Vitamin K1 for Them All? A Multicenter Review of Treatment of Brodifacoum Ingestion in Animals

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Background: Multiple factors encountered with ingestion of brodifacoum-containing rodenticides in animals often lead to empiric treatment with phytonadione (Vitamin K1). Confirmation of exposure to brodifacoum is often lacking but may be obtained through laboratory analysis. The purpose of this study was to evaluate assessment and determination of treatment of brodifacoum ingestion in animals. *Methods:* Retrospective analysis of data reported to three human poison control centers (PCCs), an animal PCC, and a state veterinary diagnostic laboratory (VDL) during the year 2002. All cases of brodifacoum ingestion in animals reported to the participating PCCs were evaluated for treatment recommendations and compared to diagnostic data from submitted biological samples tested for long-acting anticoagulant rodenticides (LAAR). *Results:* Of the 557 brodifacoum-related animal calls reported to the three human PCCs, empiric Vitamin K1 therapy was suggested in 0–17%, and laboratory testing in 0–2% of the cases. In contrast, of the 771 brodifacoum-related cases reported to the animal PCC, Vitamin K1 therapy was suggested in 68%, with concurrent recommendation for laboratory testing in 61% of the cases. A total of 40% of the 220 samples submitted to the VDL were confirmed positive for LAAR exposure, with 53% of that testing positive for brodifacoum exposure. *Conclusion:* Confirmation through diagnostic or laboratory testing may lead to more accurate diagnosis and directed treatment plan in animals exposed to LAAR products.

193. Severe Oral and Esophageal Irritation Following Ingestion of Presumed Taro Root

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Background: *Alocasia esculenta* contains calcium oxalate crystals that may cause oral irritation when ingested. We report a case of a brief oral exposure, without chewing, that resulted in prolonged and severe oral and throat irritation. *Case Report:* A 27-yr-old male cut, peeled, and put a quarter-of-an-inch square sliver of an *A. esculenta* root into his mouth thinking it was taro (*Colocasia*). Within seconds he felt a severe burning sensation, spit it out, rinsed his mouth, and drank a sip of milk. An hour later he presented to a clinic with lip and tongue swelling, drooling, chest pain, and difficulty breathing. Diffuse swelling of the posterior pharynx, tongue, and lips were noted. He received epinephrine SQ and diphenhydramine IM. After 30 min the swelling stabilized but did not resolve. He was unable to swallow and began to vomit. He received normal saline, prochlorperazine, morphine, and methylprednisolone IV. Tongue and throat pain persisted, resulting in difficulty sleeping and eating. Two days later, physical exam revealed raised white lesions on the left lateral border of the tongue. He received prednisone, pantoprazole, and an antacid/lidocaine mixture for home use. Eleven days postexposure flexible laryngoscopy showed diffuse irritation of the mucosa from the tongue down into the esophagus. *Discussion:* *Alocasia* and taro are members of the Araceae family, of which all genres are regarded as toxic. Oral irritation from oxalates is usually minor and requires chewing of the plant to release the crystals. This patient had immediate effects without any chewing. *Conclusion:* Effects from a brief oral exposure to *A. Esculenta* root were more severe and prolonged than expected from this plant family.

194. Pediatric Anabasine Toxicity from a Topical Folk Remedy

Murphy NG,¹ Albin C,² Tai W,¹ Benowitz NL.¹ ¹*California Poison Control System—San Francisco Division, University of California, Department of Clinical Pharmacy, San Francisco, CA;* ²*Santa Clara Valley Medical Center, CA.*

Background: Toxicity from anabasine, a nicotine-like alkaloid, is rare and has been described mainly after accidental ingestion of leaves from the tree tobacco plant, *Nicotiana glauca*. Clinical manifestations are predominantly neuromuscular blockade and respiratory paralysis. Toxicity from dermal absorption of anabasine has not been described. *Case Report:* A 3-month-old female presented to the ED with a 3 h history of progressive respiratory failure, diaphoresis, and fixed and dilated pupils. Intubation was performed on arrival; the initial heart rate was 55 beats per minute with a blood pressure of 140/90 mmHg. No excess gastrointestinal or pulmonary secretions were noted. The neurological exam revealed apnea, an absent gag reflex, negative cold caloric test, and flaccid paralysis that remained unchanged at 12 h. Medical workup was negative. The urine toxicology screen was initially reported as (+) for amphetamine and subsequently as an unidentified substance resembling nicotine. Further questioning revealed that the parents had applied tree tobacco leaves to the patient's abdomen as a folk remedy for constipation. The patient was extubated 48 h later and recovered full neurologic function. Anabasine was later identified by gas chromatography/mass spectrometry in both the patient's urine specimen and a sample of the leaves. *Conclusion:* We report the first known case of dermal anabasine toxicity from a folk remedy in an infant. Increased awareness of the nature and use of folk remedies is essential for identification of toxins and patient education.

195. A Poison Center's Management of Mushroom Exposures: An 8-Year Retrospective Study

Roche K, Webster C, Sangalli B, McKay CA, Bayer MJ. *Connecticut Poison Control Center, University of Connecticut Health Center, Farmington, CT.*

Background: Since 1996, we have referred all unintentional mushroom (MR) ingestions to a health care facility (HCF), unless documented as one bite or less of a "little brown mushroom" (LBM) from a manicured lawn. We

reviewed our center's experience with this clinical management guideline from 1996–2003 to evaluate its safety and efficacy for our management of unintentional MR exposures. *Method:* A retrospective review and analysis of MR exposures were reported to the CPCC between 1966 and 2003. Inclusion criteria were all unintentional MR ingestions. Data collected included age and underlying health, amount ingested, witnessed vs. suspected ingestion, description and site of MR, management site, treatment, symptoms and onset, outcome, and attempts by individuals (health care or others) to identify the MR. *Results:* A total of 726 of 921 total MR cases met the criteria; 66.2% (481/726) were witnessed, 36.3% (264/726) were managed on site with fluids, and 61.4% (446/726) were managed in a HCF. Of those in a HCF, 86.5% (386/446) received syrup of ipecac, activated charcoal, or lavage, alone or in combination. A total of 7.5% (55/726) reported symptoms but only 29% of these (16/55 or 2.2% of the total cases) had symptoms deemed related to the exposure. All related symptoms were minor and gastrointestinal in nature. A total of 81% (13/16) reported that the symptoms had resolved at 24 h follow-up (3 lost to follow-up); 79.1% (574/726) of all cases were followed for ≥ 24 h. *Conclusion:* The guideline provided a safe method of managing MR ingestions. However, 61.4% were managed in a HCF. A revision is under way to reduce the number of HCF referrals and increase the number of unintentional MR ingestions safely managed at home.

196. Aggressive Potassium Correction May Halt Death in *Cleistanthus Collinus* Poisoning

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Background: Death due to ingestion of poisonous plants is widely prevalent in India. One common poisonous plant is *Cleistanthus collinus*, belonging to family Euphorbiaceae. Poisoning due to consumption of the plant's leaves is most common with suicidal intention and all four cases admitted last year in our IMCU had marked hypokalemia, and responded to IV potassium supplementation. *Methods:* Poisoning by leaves of *Cleistanthus* were observed on a 2 h basis, for the first 3 days, and recording of Na and K were done and potassium correction resorted to (rate of 20 mEq/h) until K⁺ values were 4.5–5.0. Potassium was administered in 100 mL of Mannitol. We had to exceed the 80 Meq/day limit of potassium prescribed in hypokalemic periodic paralysis and had exceeded more than 120 mEq in one case. ECG evidence of Hypokalemia was also documented. Since patients were conscious, oral administration of potassium chloride syrup and fruit juices were also given. *Results:* Of the four cases, one case died due to inadequate potassium supplementation, one recovered from a hypokalemic episode and after a stay of 8 days at ICU was transferred to a general ward but represented with acute pneumonia and respiratory failure and died later despite ventilation. The two cases that survived received potassium supplementation IV and were discharged from the hospital alive and healthy. *Conclusions:* A 2 h monitoring of Serum K⁺ and intravenous supplementation, keeping K⁺ values above 4.5 in the first 3 days of admission probably helps in reducing mortality in *Cleistanthus collinus* poisoning.

197. Backyard Mushroom Ingestions: No Gastrointestinal Decontamination—No Effect

Mrvos R, Swanson-Biearman B, Krenzelok EP. *Pittsburgh Poison Center, Children's Hospital of Pittsburgh, Chatham College, School of Pharmacy, University of Pittsburgh, Pittsburgh, PA.*

Background: Whether or not to treat the unintentional "backyard" mushroom ingestion continues to be a controversial issue among some poison centers. Some centers advocate emesis and/or charcoal while others do nothing. To determine the outcome of patients who were not GI-decontaminated, a review of ingestions that involved yard mushrooms was conducted. *Methods:* A RPIC conducted a retrospective review of all mushroom ingestions involving children less than 6 yrs of age. Data were extracted from the RPIC electronic medical record system for the years 2000–2003, sanitized of patient identifiers, and converted to a relational database for analysis. All exposures that involved the ingestion of mushrooms, with no GI decontamination and that were found growing in a cultivated yard, were included in the analysis. None of the mushrooms were identified. *Results:* There were 322 mushroom exposures in children less than 6 yrs of age with no gastrointestinal decontamination that were reviewed. The mean age reported was 2.1 yrs (SD \pm 1.18). All exposures with a definitive outcome had a 24 hr

follow-up post-exposure to make this determination. No effect was reported in 256 cases (79.5%), minor effect in 6 (1.9%), judged as nontoxic, expect no effect in 20 (6.2%), minimal clinical effects possible in 31 (9.6%), and unrelated effect in 9 (2.8%). Minor effects included three patients who vomited once, two patients with one episode of diarrhea, and one patient who vomited three times. In exposures where the RPIC staff recalled the home without success, a minimal clinical-effects possible outcome was used. *Conclusion:* “Backyard” or “lawn” mushrooms do not present a toxicity hazard in unintentional pediatric exposures and do not require gastrointestinal decontamination.

198. Pesticide Exposure in Spouses from the Farm Family Exposure Study

Baker BA, Alexander BH, Mandel JS, Acquavella JF, Chapman P. *Regions Hospital, St. Paul, MN, School of Public Health, University of Minnesota, Minneapolis, MN; Rollins School of Public Health, Emory University, Atlanta, GA; Monsanto Company, St. Louis, MO, Exponent Inc, Menlo Park, CA.*

Background: The Farm Family Exposure Study was designed to characterize pesticide exposure to farm family members around the time of pesticide application. *Methods:* Farm families were recruited from lists of licensed pesticide applicators in Minnesota and South Carolina. Twenty-four-hour urine samples were collected 1 day before, the day of, and 3 days after application of glyphosate, 2,4-D or chlorpyrifos. A field researcher observed potential exposure opportunities during 106 pesticide applications (10 involving more than 1 pesticide). Spouses completed questionnaires that recorded farm-related activities and other potential routes of pesticide exposures. *Results:* The spouses had significantly less pesticide exposure than the farmer or children. Only 8% of spouses had detectable urine glyphosate after application. Sixty-eight percent of spouses had quantifiable 2,4-D concentrations postapplication (mean 1.4 ppb) compared with 41% preapplication (mean 1.0 ppb). One spouse had a significant increase in TCP (a chlorpyrifos metabolite) concentrations postapplication although all had detectable levels of TCP (geometric mean 4.5–4.9 ppb). Dose estimates derived from the urine levels will be presented. *Conclusion:* Spouses had lower urine pesticide levels than applicators or children. Spouses may be exposed during mixing or loading of pesticides but were less likely than children to be involved in mixing or applying pesticides. Pesticide levels varied according to which chemical was applied, and chemical-specific properties are probably important when evaluating exposure. *Conflict of Interest:* John Acquavella works for Monsanto, which manufactures glyphosate.

199. Intrauterine Lead Exposure in Pre-Eclamptic Pregnancies

Kaul PP,¹ Sing U,² Singh N,² Mathur N.¹ ¹*Industrial Toxicology Research Centre Lucknow (India);* ²*King George Medical University Lucknow India.*

Background: The placenta does not serve as a barrier in transplacental transfer of lead (Pb), and thus presents potential for exposing the embryo/fetus to the accumulated exposure of the mother. This general population study was undertaken to determine the effect of Pb levels in placenta and maternal blood in preeclampsia. *Methods:* Patients who had no accidental or occupational exposure to lead were screened for pregnancy complications. The average age of our patient was 25±5 yrs. All our patients were Rh+. Lead levels in placenta and maternal blood were measured by flameless atomic absorption spectrophotometry. Umbilical blood flow (UBF) was measured by using a combination of real-time ultrasonography and pulsed Doppler ultrasound before vaginal or abdominal delivery. *Results:* The maternal blood lead (MPbB) level in preeclamptic patients was 324, 46±84.01 ppb, while in normal cases the MPbB was 66.13±28.84 ppb. The lead level in preeclamptic placenta was 105.02±70.02, as against normal placenta Pb level 42.50±28.01 ppb. The preeclamptic placenta weighed 30 gm less than the placenta of normal cases. The blood pressure in preeclamptic patients ranged from 140/90–160/110 mm Hg, and proteinuria in these cases was >1.0 g/day. Umbilical blood flow of normal cases ranged from 92–120 ml min⁻¹ kg⁻¹, and in preeclamptic cases the UBF ranged from 50–81 mL min⁻¹ kg⁻¹. The birth weight of neonates born to preeclamptic mothers was 972.50 gm < than the neonates born to normal mothers. *Conclusion:* Pb levels in maternal blood and placenta may aggravate hypoxic state in preeclampsia and interfere in supply of micronutrients and oxygen to the growing fetus, which in turn may be responsible for reduced umbilical blood flow and neonate birth weight.

200. ECG Findings in Patients with Vaccinia-Related Myopericarditis

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Objective: To describe a series of cases of probable smallpox-vaccination-associated myopericarditis. *Background:* During the first eight months of 2003, the military community at Fort Hood vaccinated 20,000 active duty service members. We describe the findings of six cases of probable myopericarditis associated temporally with smallpox vaccination.

Case Series:

Patient number one was a 23-yr-old male who presented with left arm tenderness, chest pain, and stiff neck 7 days after smallpox vaccination. After a normal ECG and negative lumbar puncture the patient was sent home. He returned 2 days later with chest pain and difficulty breathing and was found to have a troponin of 0.78. ECG showed sinus tachycardia. He was discharged home.

Patient number two was a 21-yr-old male who presented with chest pain 11 days after smallpox vaccination. The patient had a troponin of 0.49, and sinus bradycardia on ECG. The patient was admitted with an uneventful hospital course.

Patient number three was a 21-yr-old male who presented with chest pain 12 days after smallpox vaccination. ECG showed ST elevation of 5 mm in leads II, III, aVf, and V3–V6 with ST depression in V1 and V2. Troponin was 8.12. He was admitted to cardiology.

Patient number four was a 42-yr-old male who presented with chest pain 20 days after smallpox vaccination. ECG revealed Q waves in leads I and aVI, otherwise normal. Troponin was 0.11. The patient was admitted and had an uneventful hospital course.

Patient number five was a 21-yr-old male who presented with chest pain 7 days after smallpox vaccination. Initial visit ECG was normal and patient was discharged home. Patient returned to the ED with worsening chest pain. Repeat visit ECG revealed ST elevation in leads II, III, and aVf. Troponin was 6.22. Patient was admitted to cardiology.

Patient number six was an 18-yr-old male who presented with shortness of breath 14 days after smallpox vaccination. ECG showed a junctional rhythm. Troponin was 0.01. Patient was admitted to cardiology.

Discussion: The findings of six cases of myopericarditis in approximately 20,000 vaccines between January and August 2003 represent an increased relative risk over the expected incidence of 2.16/100,000. The six cases represent an unadjusted estimate of relative risk of 10. These patients were all males ranging from ages 18–42. The clinical presentations were fairly similar with all presenting within 3 weeks following smallpox vaccination. The ECGs varied (normal, ST elevations, junctional rhythm). Troponin levels ranged from normal to 8.12. All did well without sequelae at this time. *Conclusion:* We summarize clinical presentations, ECG findings, and troponins in six cases of myopericarditis related to smallpox vaccination. *Troponin ng/mL.

201. Toxic Chemical Release: A Fatal H₂S Exposure with Multiple Secondary Casualties

Schwartz M, Geller R. *Georgia Poison Center and Department of Pediatrics, Emory School of Medicine, Atlanta, GA.*

Background: Hydrogen sulfide poisoning is infrequently reported. We describe a case of fatal H₂S poisoning in a railroad worker, the exposure of 11 coworkers and rescue personnel, and the clinical laboratory assessment and management of the cases. *Case Report:* A fatal exposure to H₂S occurred at a railcar cleaning facility. Coworkers

attempting to rescue the index case were also exposed. Rescuers who responded to the scene were similarly exposed to H₂S. Evaluation of all cases in the ER included thiosulfate levels, paired arterial and venous blood gases, and chest x-ray. Medical interventions included oxygen and respiratory therapy. The index patient was the only fatality. Three of 11 secondary exposures resulted in syncope. Ten of 11 secondary exposures resulted in respiratory symptoms. Venous pO₂ measurements were elevated in 6 of 11 secondary cases, however, no detectable thiosulfate was found in these 11 patients. Higher venous pO₂ measurements were seen in those with more severe symptoms. Lack of proper PPE was felt to contribute to the number of secondarily exposed persons in this release. *Conclusion:* Toxic industrial releases pose threats to rescuers as well as those exposed. Medical management of mass casualty chemical events is based largely on our understanding of the toxicology of the agents and is limited by our lack of experience and the absence of routine human exposure data. Incidents such as this one will form the basis of our response if and when a large-scale event ever occurs.

202. Reimbursement Profile of a Private Toxicology Service

Leikin, J, Stevens, P, Vogel, S, Samo, D. *ENH OMEGA, Glenview, IL.*

Objective: Private practice clinical toxicology services are in an embryonic form in the United States. As such, characteristics of these services are still evolving. We describe the first 2 yrs of such a practice in a suburban Chicago setting encompassing five hospitals and one clinic. *Methods:* Financial and electronic record data for all patient visits from October 1, 2001 through September 30, 2003 were analyzed. Workman's compensation patients were excluded. Only diagnosis codes representing >30 visits were studied and correlated with reimbursement data. *Results:* A total of 2651 patient charges were studied. A total of 228 (9%) patients were public aid—the remaining were commercial and Medicare. The top five inpatient diagnoses were toxicity associated with acetaminophen (n=417); antidepressant (323); drug/narcotic withdrawal (267); benzodiazepines (160); and opiates (159). The top outpatient (clinic) diagnoses included toxic inhalation (229); mercury (82) or arsenic exposure (63); rash (56); and petroleum product toxicity (40). Baseline collection rate of all charges was 34% (range 19–55%). Diagnosis codes with greater than 50% reimbursement rate included visits involving mercury, arsenic, petroleum products, seizures, and rhabdomyolysis. Diagnosis codes with reimbursement rates under 25% included coma, salicylates, and acute delirium. Critical care code (99291) was reimbursed at 27% and disallowed at 34% rate. Problems with the highest rate of insurance disallowance (baseline rate is 23%; range 17–36%) were opiate toxicity (36%) and psychotropic toxicity (34%). It should be noted that only one patient with heavy metal evaluation required chelation therapy. *Conclusion:* With regards to nonoccupational toxic events, third-party payers are more likely to reimburse at a higher rate for outpatient environmental exposures as opposed to symptomatic or critical care inpatient drug overdoses.

203. Detection of Toxaphene Congeners in Native Alaskan Women

Patel M,¹ Berner J,² Sjodin A,¹ Patterson DG Jr,¹ Needham L,¹ Holmes A,¹ Rubin C.¹ *CDC, ¹Atlanta, GA; ²Alaska Native Tribal Health Board, Anchorage, AK.*

Background: The insecticide Toxaphene has been banned in many countries during the last two decades because of its carcinogenicity in experimental animals, environmental persistence, bioaccumulation, and potential for global dispersion. However, recent detection of Toxaphene in freshwater fish from the Arctic, an area where Toxaphene was never used, prompts concern about potential on-going human exposure. Using a newly developed laboratory method, we determine whether Toxaphene is present in Alaska Native women and, if so, whether levels correlate with age and proximity to freshwater. *Methods:* Thirty-six serum pools were formed from 108 individual samples of a prospective cohort of pregnant women in Barrow and Bethel, Alaska. Samples were stratified by subject's age, location, and proximity to fresh vs. saltwater. Three Toxaphene congeners [Parlar (P)

26, P50, P62] were measured using gas chromatography/high-resolution mass spectroscopy. *Results:* Two toxaphene congeners were detected in more than 50% of the samples [Geometric mean (GM) of p26=1.10 ng/g lipid-weight (LW) (95% CI=0.66–1.84) and GM of p50=1.61 ng/g LW (0.96–2.72)]. There was a significant correlation between congener levels and age [$r=0.60$, $p<0.0001$ (P26) and $r=0.59$, $p<0.0001$ (P50)] but no correlation with proximity to freshwater. *Conclusion:* Detection of Toxaphene congeners in people temporally and geographically remote from any exposure source reaffirms the biological persistence and global distribution of this chemical. Future studies should investigate whether there is a correlation between exposure to low levels of Toxaphene and adverse health effects.

204. Dimethylamine Borane Intoxication-Induce Cerebellar Dysfunction

Hung D. *Department of Occupational Safety & Health, Taichung Veterans General Hospital, Taichung, Taiwan.*

Background: Dimethylamine borane (DMBA) is a reducing agent and used in the semiconductor manufacturing process. It is identified to be toxic and dangerous for the environment in a material safety data sheet. In the literature, there were no case reports of DMBA intoxication. Here, we report a case of DMBA contamination presented with cerebellar dysfunction. *Case Report:* A 37-yr-old male was sprayed over his head and left shoulder by a DMBA product while working in a chemical factory. He swept out the chemical by his hands and continued to work. Dizziness, nausea, and sore throat developed several hours later. Progressive limb numbness, slurred speech, and unstable gait were noted the second day. Physical examination revealed a reflexia and positive cerebellar signs bilaterally. Magnetic resonance imaging of the brain revealed of symmetric demyelination over bilateral cerebellar peduncles and putamen and was compatible with the clinical findings. *Conclusion:* From this case, we find that DMBA can be absorbed from the skin and can induce symmetric neurological injuries. Active decontamination with profuse water as soon as possible might be the decisive factor in preventing DMBA intoxication from occupational environments. Otherwise, the toxic mechanism of DMBA in brain tissues needs more investigation.

205. Blood and Urinary Metal Levels in Pregnant Women from the United States

Wang RY, Jain R, Jones R, Caldwell K, Needham LL, Sampson E. *Division of Laboratory Sciences, NCEH/ATSDR, CDC, Atlanta, GA, US 30341.*

Objective: To characterize blood and urinary metal levels in a pregnant population. *Method:* This cross-sectional study consisted of a subset of women from the National Health and Nutrition Survey (1999 to 2000), who ranged in age from 20 to 39 yrs and had a pregnancy test. Hg (total and inorganic), Pb, and Cd were measured in whole blood. Sb, Ba, Cd, Ce, Co, Pb, Mo, Pt, Tl, and W were measured in urine. Statistical analyses included ANCOVA and linear regression. Covariates included age, urine and serum creatinines, smoking status, BMI, and urine albumin. Alpha was set at 0.05. The human subjects review committee approved this study. *Results:* Blood and urinary metal levels were measured in 248 and 72 pregnant women, and in 631 and 197 nonpregnant women, respectively. Pregnant women distributed by trimester included 43% in the second and 40% in the third. The mean ages (yrs) of the pregnant and nonpregnant women were 27 and 30, respectively. Blood metal levels (geo. mean) in pregnant women were Pb (0.80 ug/dL), Cd (0.36 ug/L), total Hg (0.89 ug/L), and inorganic Hg (0.31 ug/L). Although these levels were about 15% lower in pregnant vs nonpregnant women, the difference was not significant. The urinary metal levels (geo. mean, ug/L) in pregnant women were Ba (3.10), Cd (0.33), Co (0.72), Mo (68.95), Ce (4.85), Pb (0.88), Pt (0.03), Sb (0.16), Tl (0.18), and W (0.10). For Ba, Co, Ce, Mo, and Sb, the levels were about 1.2 to 2.7-fold higher in pregnant vs nonpregnant women. Smoking, increased age, and urinary creatinine were associated with higher urinary levels for several metals. *Conclusion:* The levels for several metals are reported in the blood and urine of pregnant women from the U.S. general population. Certain urinary metal levels are noted to be higher during pregnancy and require further investigations to explain.

206. Levels of Persistent Organic Chemicals in Human Milk at Two U.S. Locations

Wang RY, Needham LL. *Division of Laboratory Sciences, NCEH, CDC, Atlanta, GA.*

Objective: To estimate the exposure of a local population to globally distributed persistent organic chemicals by using human milk. *Method:* Ten primipara women from each lactation center (California and North Carolina) were conveniently recruited from December 2002 to January 2003, according to the third WHO—coordinated exposure protocol. The milk at each location was pooled and HRGC/HRMS was used to measure polybrominated diphenylethers (PBDEs), organochlorine pesticides, and nitro-musk oils. All levels were expressed as ng/g fat. The project was exempt from human subjects review because the milk specimens were pooled and no personal identifying information was collected. *Results:* (1) The ages of the participants ranged from 23 to 41 yrs. (2) The patterns of the measured organochlorine pesticides and nitro-musks were similar between the two locations. The organochlorine pesticide levels for CA and NC were HCB (7.8, 5.5), pp'DDT (10.5, 10.3), dieldrin (4.3, 6.3), heptachlor-epoxide (2.5, 6.8), oxychlorodane (9.0, 18.1), trans-nonachlor (10.7, 26.3), beta-HCH (22.8, 7.0), and gamma-HCH (1.3, 1.3). The levels for musk-ketone were (CA 2.25, NC 1.25) and musk-xylene (CA 11.5, NC 8.0). (3) The PBDE levels were consistently higher (by 2- to 4-fold) in the CA group compared to the NC group. The levels for PBDEs 28, 47, 99, 100, 153, and 154 were CA (17.9, 210.0, 65.8, 41.6, 27.5, 3.9) and NC (5.4, 55.1, 19.8, 12.2, 13.1, 1.4). *Conclusion:* The levels of these chemicals in human milk suggest that the local population's exposure to organochlorine pesticides is decreasing over time, and that PBDEs are higher than other countries. The levels of the nitro-musk oils are initial evidence that they are present in human milk from the United States. The health significance of these chemicals in human milk remains to be determined.

207. Alprazolam Toxicity After Accidental Inhalation Exposure at a Pharmaceutical Plant

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Background: Alprazolam toxicity has not been reported from inhalational exposure. We report a patient with toxicity after occupational exposure to alprazolam dust. *Case Report:* A 51-yr-old healthy female on no medications inadvertently entered a room containing an open 50-kg drum of pharmaceutical-grade alprazolam powder. Not wearing any personal protective equipment, she was exposed to the aerosolized alprazolam for 4 to 5 min. She became unresponsive to physical and verbal stimuli minutes after leaving the room. History was negative for other chemicals or drugs. On emergency department arrival she was obtunded. Vital signs were normal except for BP 150/90. Pulmonary exam was unremarkable and pulse oximetry was 99% on 2L of O₂. For diagnostic purposes, she received four sequential 0.05 mg doses of flumazenil resulting in brief LOC improvement, but somnolence recurred within minutes. Intubation or additional flumazenil was not required. Blood ethanol was undetectable. Comprehensive metabolic panel was normal. Head CT scan was negative. Urine drug screen showed benzodiazepines, and confirmatory testing revealed only alprazolam metabolite. Serum HPLC analysis revealed an alprazolam concentration of 710 ng/mL (therapeutic: 10–50 ng/mL). Mental status changed from somnolence to agitation requiring restraints on hospital day 2. By day 3 she was asymptomatic and discharged home. *Conclusion:* This is the first reported case of occupational alprazolam inhalation. Flumazenil appeared to have limited diagnostic benefit in this case of benzodiazepine toxicity.

208. Residential Phaseout of Chlorpyrifos and Diazinon: Reductions in Reported Human Exposure Cases in Washington State

Morrissey BF, Harter LC, Cropley JM, Burgess JL. *Washington State Department of Health, Olympia, WA; Washington Poison Center, Seattle, WA; and University of Arizona, Tucson, AZ.*

Background: A phase-out of most residential uses of two organophosphate (OP) insecticides, chlorpyrifos and diazinon, was initiated in June and December 2000. Retail sale to consumers was permitted until December 2001

for chlorpyrifos and December 2004 for diazinon. *Methods:* We evaluated data from the Washington Poison Center (WPC) for cases of human exposure and the Washington State Dept. of Health (WDOH) for cases of human illness related to chlorpyrifos, diazinon, and all organophosphate pesticides from 1997 through 2003. WDOH reports of illnesses, collected from multiple sources in the state, were restricted to nonagricultural cases coded as definitely, probably, or possibly related to pesticides. *Results:* Initiation of the phase-out was associated with rapid reduction in human exposures reported to our sources. A downward trend in all OP cases was noted as well.

Conclusion: Although the phase-out did not require immediate withdrawal from retail shelves, it was associated with a rapid reduction in reported human exposure and illness cases.

		1997	1998	1999	2000	2001	2002	2003
WPC	All OP	372	395	267	301	209	198	124
	Chlorpyrifos	–	–	49	64	37	23	8
	diazinon	–	–	81	112	69	51	27
WDOH	All OP	31	35	15	24	16	6	–
	Chlorpyrifos	12	13	8	4	2	0	–
	Diazinon	9	4	3	9	5	1	–

209. Reduction in Total Inorganic Urinary Arsenic and Toenail Arsenic with Provision of Bottled Water

Burgess JL, Rowland H, Josyula A, Hysong TA, Sturup S. *Environmental and Occupational Health, University of Arizona, Tucson, AZ, Dartmouth College, Hanover, NH.*

Background: Arsenic exposure is associated with increased cancer incidence. The purpose of this study was to measure the effectiveness of provision of bottled water in reducing inorganic urine and toenail arsenic concentrations in a population with elevated arsenic tap water levels. *Methods:* Urine, tap water, and toenail samples were collected from a random sample of nonsmoking adults (≥ 18) residing in Ajo and Tucson, Arizona. After the baseline sample, Ajo subjects were provided with bottled water and were asked to use it for cooking, drinking, and food preparation. *Results:* At baseline, 40 subjects in Ajo and 32 subjects in Tucson provided urine and toenails. Total inorganic urinary arsenic (ppb) was higher in Ajo (29.1 ± 20.4) than Tucson (11.0 ± 12.0) ($p < 0.001$). Creatinine-adjusted urinary total inorganic arsenic ($\mu\text{g/g}$) was also higher in Ajo (35.5 ± 25.2) than Tucson (13.2 ± 9.3) ($p < 0.001$). Toenail arsenic concentrations ($\mu\text{g/g}$) were 0.51 ± 0.72 in Ajo and 0.17 ± 0.21 in Tucson ($p < 0.001$). At follow up, 36 of the original 40 participants in Ajo again provided urine, water, and toenails. Mean urinary total inorganic arsenic dropped from 29.4 ± 21.1 to 23.2 ± 23.2 ($p = 0.026$). Creatinine-adjusted urinary total inorganic arsenic was lower at follow-up (29.6 ± 20.8) than baseline (34.8 ± 27.4), although this change was not statistically significant ($p = 0.776$). Toenail arsenic concentrations also decreased (0.49 ± 0.68 vs. 0.26 ± 0.19 , $p = 0.061$). *Conclusion:* Urinary and toenail arsenic were higher in Ajo, the town with higher tap water arsenic levels, than in Tucson. Provision of arsenic-free drinking water in Ajo reduced urinary total inorganic arsenic concentrations.

210. Chronic Consumption of Fish Associated with Mercury Toxicity

Gray T, Baker B, Lintner C, Wells S, Gray K. *Hennepin Regional Poison Center, Minneapolis, MN.*

Background: The Department of Health (DH) releases an annual fish consumption advisory. It outlines how many fish meals can safely be consumed each week to minimize the risk of toxicity due to mercury and other contaminants. Information gathered from the DH, Department of Natural Resources (DNR), and the Pollution Control Agency's Fish Contaminants Monitoring Program is used to develop the annual fish consumption advisory for specific lakes. Two cases with frequent consumption of large amounts of fish resulting in elevated blood mercury

levels are presented. *Case Report:* Two women reported eating approximately two meals per day for years of large predatory fish from lakes. DH fish advisories recommended that consumption of large fish from these lakes be limited to one to two meals per week. The subjects reported fatigue and lethargy, and one complained of memory loss. Both women became concerned after a family member informed them of the fish advisories. Their initial blood mercury levels were 20 µg/L and 25 µg/L, while whole blood mercury levels rarely exceed 10 µg/dL in unexposed individuals. One woman was treated with dimercaptosuccinic acid (DMSA) by her private physician, and one woman did not receive any chelation treatment. Both women were advised to limit their fish consumption. Mercury levels normalized and symptoms resolved within several months. *Conclusion:* Elevated mercury levels can be seen with frequent consumption of larger fish. Mercury toxicity can be avoided by following the DH's annual fish consumption advisories.

211. Delayed Cardiac Death from Hydrogen Sulfide Exposure

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Background: Hydrogen sulfide (H₂S), like cyanide, is a potent inhibitor of cellular respiration. Patients exposed to H₂S suffer from loss of consciousness within seconds and death within minutes. Most victims of acute H₂S poisoning who recover do so promptly and completely. We present a case of an H₂S victim, hemodynamically stable for >24 h who then precipitously developed EKG ST elevations and suffered fatal cardiac arrest despite having normal coronary arteries. *Case Report:* A 37-yr-old male, working in a manhole, lost consciousness and fell 18–20 ft. EMS detected H₂S levels >230 p.p.m at the scene. The patient arrived in the emergency department awake but combative. He was sedated, intubated, and mechanically ventilated with 100% O₂; P.E. V.S. HR 107, RR 32, B/P149/97, pulse Ox 98%. Lungs were clear. EKG showed no ischemia. CXR showed a LUL infiltrate. Initial Labs: WBC 17.4, Bicarb 19, anion gap 12. CPK 442, MB 7.2, Index 1.6, troponin 0.4. The patient was treated with 10 cc 3% sodium nitrate, IV fluids, and antibiotics. Lactate levels dropped from 5.8 to 2.8. Clinically, the patient continued to improve. He was awake and following commands. Around 30 h postexposure, his ECG showed diffuse ST elevation, CPK 1983, MB 15.1, troponin 6.5. He was transferred, and emergent cardiac catheterization revealed “widely patent coronary arteries.” Echo demonstrated biventricular systolic dysfunction with LVEF 25%. Approximately 50 h postexposure, the patient suffered a fatal cardiopulmonary arrest. The autopsy noted “Subepicardial and subendocardial interstitial edema.” *Discussion:* The patient's delayed but fulminant global cardiac ischemia, despite normal coronaries, may be the result of mitochondria's role in cell signaling and apoptotic modes of cell death. *Conclusion:* We report a case of delayed but fatal cardiac collapse after exposure to hydrogen sulfide.

212. Mercury Exposure Assessment in a Nevada Middle School—2004

Azizz-Baumgartner E, Lubert G, Jones R, Schurz-Rogers H, Backer L, Rubin C, Belson M. *Centers for Disease Control and Prevention, Atlanta GA.*

Background: Few studies have quantified biological exposure of children who have briefly handled elemental mercury. On January 6, 2004 a 60 mL spill of elemental mercury occurred at a Nevada school after it was carried from one of the student's home. Air samples exceeded the upper limit-of-detection of the instrument used to measure school contamination (50 µg/m³). The Environmental Protection Agency minimal risk level for mercury is <0.3 µg/m³. The objective of our investigation was to determine mercury exposure in the school children after the spill. *Methods:* From January 9–11, we administered questionnaires and obtained urine samples from 280 persons: 200 students, 55 of whom were considered exposed and received decontamination, 63 teachers, and 17 first-responders. A two-sample t-test was used to compare urine mercury levels in students with varying exposure based on questionnaire data. *Results:* The urine mercury geometric mean (GM) for the 200 students was 0.36 µg/L (normal <10 µg/L) (95% CI 0.32 µg/L – 0.40 µg/L). Although overall mean mercury levels were low, students who touched the mercury (n=39) had a higher GM than

students who did not touch the mercury (n=161) (GM 0.50 µg/L vs. 0.33 µg/L, p=0.003). The student who handled the mercury in the week before the spill had a mercury level of 11.35 µg/L. *Conclusion:* Despite excessive environmental contamination, rapid identification of the elemental mercury spill, separation of the students from the source, and removal of potentially contaminated personal belongings prevented prolonged exposure to mercury.

213. Environmental Sampling and Laboratory Analysis for Ricin

Kiefer M, Schier J, Patel M, Belson M, Schwartz M, Osterloh J, Meyer R, Deitchman S, Rubin C. *Centers for Disease Control and Prevention, Atlanta, GA.*

Background: A ricin-containing package with a threatening note was discovered in a U.S. Postal Facility (PF) in South Carolina in October 2003. This discovery prompted local officials to request that the Centers for Disease Control and Prevention (CDC) assist with environmental sampling and analysis to assess potential health risks. We discuss strategies for determining sampling locations and techniques and lab test results. This discussion will help public health agencies respond to future chemical terrorism events. *Methods:* There is currently no validated environmental sampling technique for ricin. We began formulating targeted sampling strategies by interviewing personnel on site regarding the package's route through the PF. A detailed work area assessment revealed specific contact points: bins, conveyors, loaders, material handlers, sorters, human contact points (levers, controls), and storage rooms. Seventy surface samples were collected with premoistened individually packaged Dacron[®] swabs. Five vacuum surface dust samples were collected from porous (e.g., carpet) and other material in the PF. Microcassettes containing 37-mm mixed-cellulose-ester filters with a pore size of 0.8 microns, and portable sampling pumps with a flow rate of 2.5 L/min were used to collect the vacuum surface samples. Collection techniques followed guidelines for collecting *Bacillus anthracis* environmental samples. Samples were shipped directly to the CDC's Rapid Response and Advanced Technology Laboratory for ricin testing by time-resolved fluorescence (TRF) immunoassay. *Results:* Sample analysis was completed within 8 h, and all specimens tested negative for ricin. *Conclusion:* A logical and targeted environmental sampling mission for ricin, coupled with negative test results, significantly contributed to the decision to reopen the facility.

214. Jewelry Confusion: The Importance of a Site Visit Following Toxin-Induced Injury in the Workplace

Bouchard NC, Schmidt J, Goldfrank LS, Nelson LS. *Bellevue Hospital Center, New York City Poison Control Center, USA.*

Background: Hydrofluoric acid (HF), ammonium bifluoride, and hydrochloric acid (HCl) are often used in the process of removing plaster and imparting a colored hue to freshly cast gold jewelry. In small establishments safety standards are often suboptimal and poorly supervised, and worker knowledge of toxic risks is limited. *Case Report:* A 30-yr-old man was working with "strong acid" to clean gold jewelry for about 1 hr when he noted severe "crawling-like pain" in his right arm. His pain caused two near syncopal events en route to the hospital. In the emergency department, his vital signs, oxygen saturation, and ECG were unremarkable. Physical exam revealed that his pain localized to a very small, slightly blanched area on the dorsum of his right thumb. The patient reported wearing new, intact latex gloves while working. The factory supervisor stated that the acid was a "diluted" mixture of ammonium bifluoride and HCl. On further questioning, both thought that no HF was used. The patient was admitted for pain control and local calcium therapy for the presumed diagnosis of dermal ammonium bifluoride toxicity. Despite aggressive therapy, he developed a significant injury to his right thumb. A site visit by the medical toxicology staff found that in addition to the aforementioned acids, 70% HF was used in large open containers in a poorly ventilated area with limited other safety equipment. On-site education was done, and on follow-up the factory installed a new ventilation system and had modified the acid workstation. *Discussion:* This

case illustrates that workers and supervisors are poorly informed about the chemicals they use, and that identification of a sentinel event can allow toxicologists to intervene to improve industrial safety.

215. Profound Thrombocytopenia Induced by *Crotalus Horridus* Envenomation Unresponsive to Crofab

Baer AB, Kirk MA, Eldridge DL, Holstege CP. *Blue Ridge Poison Center, Department of Emergency Medicine, University of Virginia, Charlottesville, VA.*

Background: The efficacy of Crofab[®] in treating venom-induced thrombocytopenia (VIT) in *Crotalus horridus* envenomation is unknown. We report a case series of *Crotalus horridus* envenomations causing prolonged and profound VIT despite Crofab administration and platelet transfusions. **Case 1:** A 39-yr-old male was bitten twice on his upper extremity and once on his chest. His course was complicated by recurrent thrombocytopenia, hematuria, and diffuse petechiae. **Case 2:** A 21-yr-old male was bitten on his hand. His course was complicated by prolonged thrombocytopenia with diffuse ecchymosis of the involved extremity and distant body sites. **Case 3:** A 24-yr-old male was bitten on his hand. His course was complicated by diffuse petechiae, hematemesis, and a large hematoma under his tongue. **Conclusion:** This case series suggests that persistent thrombocytopenia induced by *Crotalus horridus* envenomation is refractory to CroFab and platelet transfusions. Also, each case in this series manifested active bleeding, which has rarely been reported following *Crotalus horridus* envenomation.

	Case 1	Case 2	Case 3
Initial/total vials of CroFab	15/21	6/10	6/6
Doses of PLT (5 units)	5	19	2
Lowest/Mean PLT ($\times 1000$)	<10/61	<10/39	3/12
Days that PLT <30	4	7	>2 (left AMA)
Active bleeding	+	+	+

216. Scleroderma in Long-Term Employees at a Semiconductor Plant

Kurt TL. *University of Texas Southwestern Medical Center, Dallas, TX.*

Background: Scleroderma has been reported associated with silicosis in South African gold miners as well as with long-term chlorinated solvent exposures in the United States. Both silica exposure from slicing computer chip wafers and chlorinated solvent exposure in fab operations occur in semiconductor plants before manufacturing processes enclosed wafer slicing and curtailed chlorinated solvent exposure. **Methods:** Epidemiologic risk was determined for a cluster of cases of scleroderma/CREST identified by an internist and referred for review. Diagnosed by esophageal motility and other appropriate procedures, cases were identified from a computer-based practice of 4,400 active patients, each being employed at a single semiconductor plant where exposure to silica dust and chlorinated solvent vapor occurred. **Results:** An epidemiologic evaluation of the 7 identified cases of scleroderma/CREST was performed based upon a workplace population averaging 2,000, and the prevalence of scleroderma averaging 260 per million in the general U.S. population. The relative risk (RR) was 13.5; and all were employed 11 yrs or more. As controls, no cases were found among the balance of the internist's patients not employed at the semiconductor plant. With only a quarter of the plant's population being employed 11 yrs or more, the actual RR was four times higher among the long-term employees implying a long latency or incubation period. **Conclusion:** This epidemiologic study finds a high scleroderma risk (RR 13.5) among the long-term employees of a semiconductor plant where silica and

chlorinated solvent exposure occurred. Those in health care of patients in such occupational environmental exposures should be alert for increased scleroderma risk.

217. Dermatitis in Mine Personnel: Evaluation of Days Lost by Job Titles Associated with Chemical Exposure

Hysong TA, Miller HD, Burgess JL. *University of Arizona, Tucson, AZ.*

Background: Occupational skin diseases and disorders are the most commonly reported non-trauma-related category of occupational illnesses in the United States. Chemical exposure is a major cause of dermatitis, which has not been systemically studied in mining. *Methods:* A database maintained by the Mining Safety and Health Administration, which records all cases of occupational dermatitis in mine personnel, was analyzed to evaluate the importance of job description on days lost from work. *Results:* Nine hundred and seventy-five cases of dermatitis were recorded from 1983–2002 in mines across the United States and Puerto Rico. Fifty mine personnel (5%) lost 1 day, 74 (8%) lost 2–5 days, 48 (5%) lost 6–10 days, and 71 (7%) lost 11 or more days. Review of the job titles indicated that 351 (36%) of the cases performed tasks with potential chemical exposure. Of these, 173 (49%) were mechanics/repairmen, 150 (43%) were involved in washing and cleaning plant operations, 13 (4%) were oilers and/or greasers, and the remaining 15 (4%) performed various tasks. Fifty-one (30%) mechanics/repairmen lost one or more day of work due to their dermatitis. In the washing and cleaning plant operators, 40 (27%) lost one or more day of work due to dermatitis, and in oilers and/or greasers, 4 (31%) lost one or more days of work due to dermatitis. This is compared with 86 (21%) of 408 mine personnel in support roles and 40 (30%) of 135 production miners that missed one or more days of work due to their dermatitis. *Conclusion:* Dermatitis in mine personnel with job titles associated with chemical exposure did not have a marked increase in time loss as compared with other mine personnel with dermatitis. Better understanding the distribution of this condition in miners including the effect of chemical exposure could lead to intervention strategies to reduce disease.

218. Measurement of Sputum 8-OHdG as a Biomarker of DNA Damage in the Lung Associated with Exposure to Inhaled Toxicants

Josyula A, Hysong TA, Burgess JL. *University of Arizona, Tucson, AZ.*

Introduction: Few biomarkers of carcinogenic effect have been evaluated in induced sputum. The 8-hydroxy-2'-deoxyguanosine (8-OHdG) is released during repair of DNA oxidative damage, and its measurement in urine is well accepted as a measure of DNA damage and repair. *Methods:* Participants were recruited based on smoking status (nonsmokers, light smokers <10 cigarettes per day, and heavy smokers \geq 10 cigarettes per day) from university staff and students. Thirty subjects in total participated, with 10 in each of the smoking groups. Smoking subjects provided induced sputum prior to their first cigarette of the day. The 8-OHdG was measured using commercial ELISA assays. Statistical comparisons used the Wilcoxon signed-ranks test. *Results:* The three groups were similar in terms of age, gender, and race. At initial sputum induction, the concentration of 8-OHdG (ng/mL) in the three groups, 67.4 ± 54.6 in nonsmokers, 75.7 ± 63.2 in light smokers, and 225.7 ± 258.8 in heavy smokers, was not statistically significant ($p=0.440$), although our power to detect a significant difference of the measurement magnitude between non- and heavy smokers was only 37%. The percentage of neutrophils was significantly higher in heavy smokers (28%) than in nonsmokers (7%) ($p=0.015$) although the percentage of neutrophils was not statistically correlated with 8-OHdG concentrations. *Conclusion:* Sputum 8-OHdG may be eventually found useful in measuring DNA damage and repair following exposure to respiratory toxicants. However, the large variation seen in this study will need to be reduced through additional steps, including possible expression of 8-OHdG as a ratio with total DNA.

219. Aspiration Pneumonia Rarely Occurs with Single-Dose Activated Charcoal

LoVecchio F, Bermudez J, Shriki J, Innes K. *Banner Good Samaritan Regional Poison Control Center, Maricopa and Banner Good Samaritan Medical Center, Arizona College of Osteopathic Medicine, Phoenix, Arizona.*

Background: A potential adverse effect of activated charcoal administration (AC) is the possibility of resultant aspiration pneumonia. We conducted a study to describe the frequency at which this may occur. *Methods:* Following a brief training, reviewers blinded to the purpose of the study completed a standardized data collection sheet. Four consecutive years of poison center patient encounters were reviewed. Age, outcomes, and time-to-administration of charcoal were recorded. Aspiration of charcoal was described as charcoal in the endotracheal tube (ETT) or new infiltrate on chest x-ray following the administration of charcoal. *Results:* Approximately 150,000 human exposures were reviewed. Of these, 16,914 were acute ingestions that presented to a health care facility and received charcoal. The mean age was 25 yrs old (range 1 month–87 yrs old). Of these 16,914, charcoal was noted in the ETT of 10, and a new infiltrate in 18 patients. All patients who aspirated were comatose or had a seizure. *Conclusions:* Aspiration pneumonia occurs infrequently following AC administration. It was not reported in patients who did not have a seizure or coma. However, limitations are numerous, including lack of a gold standard for aspiration and no universal diagnostic testing in these patients.

220. It Is Rarely Feasible to Administer Charcoal Within One Hour of Acute Overdose

LoVecchio F, Shriki J, Innes K, Bermudez J. *Banner Good Samaritan Regional Poison Control Center, Maricopa and Banner Good Samaritan Medical Center, Arizona College of Osteopathic Medicine, Phoenix, Arizona.*

Background: The American Academy of Clinical Toxicology; European Association of Poisons Centres and Clinical Toxicologists recommend activated charcoal (AC) within 1 h of an acute toxic ingestion. We conducted a study to describe how often patients present during this time frame. *Methods:* Following a brief training, reviewers blinded to the purpose of the study completed a standardized data collection sheet. Three years after publication of these consensus statements, 4 consecutive years of poison center patient encounters were reviewed. Age, outcomes, and time-to-administration of charcoal were recorded. *Results:* Approximately 150,000 human exposures were reviewed. Of these, 16,914 were acute ingestions that presented to a health care facility and received charcoal. The mean age was 25 yrs old [range 1 month–87 yrs old]. Of these, 16,914 patients, 2,700 (16%) received charcoal within 60 min of acute overdose. Of these 2,700 that received charcoal within 60 min, prehospital personal-administered AC in 762 of these cases. *Conclusions:* Only 16% of acute overdose patients are seen by a health care provider and given charcoal within the recommended 60 min time frame. Twenty-eight percent of patients, whom received charcoal in a timely fashion, underwent prehospital administration.

221. Statewide Pharmacy Response During TOPOFF 2 Disaster Drill

Burda A, Meyers S, Wahl M, Uthavongsakdi KT. *Illinois Poison Center, Chicago, Illinois, USA; Illinois Council of Health-System Pharmacist, Rockford, Illinois, USA.*

Objectives: In 2002, a state health-system pharmacy network (SHSPN), a network of 180 hospitals, was created to respond to major emergencies or disasters anywhere in the state. The SHSPN was activated during the May 2003 TOPOFF 2 disaster drill involving an outbreak of pneumonic plague in a metropolitan area. Hospital antibiotic inventories and response rates over a 48 h period were calculated and reported to the state health department through the regional poison center. *Methods:* All hospital pharmacies of the SHSPN were notified via e-mail or fax during TOPOFF 2. Response time and drug stock were recorded. *Results:* Forty-four percent of SHSPN volunteers

responded within 3 h, 72% within 7 h, 93% within 23 h, and 98% within 48 h. A total of 214 pharmacist and 117 technicians volunteered to go to other sites to assist in patient care. Statewide medication inventory is tabulated as follows:

Medication doses available in hospitals statewide.

Streptomycin 1 gm: 1102	Chloramphenicol Inj: 1280	Ciprofloxacin Inj: 17,000
Gentamicin Ped Inj: 5836	Doxycycline 100 mg Inj: 7481	Premixed gentamicin: 2032
Gentamicin 80 mg: 12,702	Doxycycline 100 mg: >159,000	Cipro 500 mg oral: 111,807

Conclusion: During the TOPOFF 2 state-wide disaster drill, the SHSPN provided timely and valuable resource information to state public health authorities with an emergent infrastructure needs assessment of hospital antibiotic stocking. Pharmacy associations and poison centers are encouraged to establish SHSPNs and participate in large-scale disaster drills to identify problems and maximize effectiveness of these networks.

222. Three-Year Experience with Ziprasidone Exposures

Watts D, Lovecchio F. *Good Samaritan Regional Medical and Poison Center/Maricopa Medical Center, Phoenix AZ.*

Background: Ziprasidone (ZIP) is a new antipsychotic and sedative-hypnotic used in the treatment of chronic psychiatric disorders and acute sedative management. The toxicities of ZIP during standard clinical use are described; there is a dearth of information regarding either accidental oral ingestion or intentional overdose. *Methods:* We conducted a retrospective chart review of isolated ZIP ingestions reported to our poison center during 2001–2003. *Results:* Thirty-two patients met the criteria. The average amount of ZIP ingested was 205.62 mg (data from 32 cases), and the average patient age was 22.7 yrs (ranging from 1–41 yrs). The most common formulation ingested was the 20 mg tablet. Eight patients accidentally ingested ZIP, and 23 admitted intentional ZIP ingestion and 1 patient contacted the poison center for “withdrawal symptoms.” Seven of the 8 accidental ZIP ingestions were observed at home with PCC follow-up for 24 h, all with good outcomes. The other patient was observed in the emergency department (ED) and discharged home. Nineteen of the intentional ingestions were observed at the ED with good outcomes, 1 was lost to follow-up, 1 patient was evaluated by paramedics and watched at home. One patient ingested an unknown quantity of ZIP, presenting to the ED comatose, requiring endotracheal intubation and recovered after 8 h. *Discussion:* Although ZIP toxicity can be severe and, perhaps, life-threatening, this does not appear to be a phenomenon associated with either accidental or suicidal oral ingestion.

223. U.S. Poison Control Center Management of Pediatric Long-Acting Warfarin Rodenticide (LAWR) Ingestions

Qureshi ST, Smolinske S, White SR. *Children’s Hospital of Michigan PCC, Detroit, Michigan.*

Background/Objective: Up to 16,000 LAWR exposures in children less than 6-yr-old are reported yearly to U.S. Poison Control Centers (PCCs), and their management is not standardized. *Methods:* We conducted a questionnaire-survey of managing directors of the 65 U.S. PCCs. *Results:* Responses from 49 (75.4%) of PCCs were received. Of these, 38 (77.6%) had a written protocol for LAWR ingestions. Criteria for GI decontamination varied widely: 10 (20.5%) did not recommend decontamination at all; 5 (10.2%) recommended ipecac alone; 2 (4.1%) recommended ipecac and/or charcoal, and 32 (65%) used charcoal only. Forty-eight based management on amount ingested, and 1 (2%) recommended ED evaluation and decontamination on all ingestions; 1 (2%) on less than a mouthful; 10 (20.5%) on less than half-a-box; 10 (20.5%) on greater than a mouthful, and 5 (10.2%) on greater than half-a-box. Twenty (40.8%) had

other widely variable criteria for decontamination (e.g., 5 pellets, 1 tsp, 6 tsp, 10 g of a 0.005% bait, 30 g, etc.). Lab workup was recommended for all ingestions by 1 (2%); less than a mouthful by 2 (4.1%); less than half-a-box by 9 (18.4%); greater than a mouthful by 11 (22.4%); greater than half-a-box by 13 (26.6%), and on patients with abnormal neurological/psychological development by 25 (51%). All 49 PCCs recommended lab workup on chronic ingestions. Workup was recommended at baseline by 16 (32.7%), at 24 h by 13 (26.5%), at 48 h by 40 (81.6%), and at greater than 48 h by 7 (14.3%). The most frequently recommended lab test was PT with INR (n=16, 32.6%). *Conclusion:* U.S. PCCs vary widely in their management of LAWR ingestions in children less than 6 yrs of age. There appears to be a need for standardization of recommendations.

224. Lead Poisoning Misdiagnosed as Acute Intermittent Porphyrin

Sawyer TS, Oller LK, Lowry JA. *Mid-America Poison Control Center, Department of Pharmacy, University of Kansas Hospital and Medical Center, Kansas City, Kansas.*

Background: An adult mistakenly treated for acute intermittent porphyria was found to have an undiagnosed case of lead poisoning from a 20-yr-old gunshot wound. *Case Report:* A 47-yr-old female with an original diagnosis of porphyria was hospitalized for CNS changes, cerebral edema, and seizures. She had been receiving treatment for 2 months for porphyria without improvement of symptoms. She had two prior admissions to other hospitals for nausea, vomiting, abdominal pain, anorexia, and progressive confusion with agitation. Past medical history was significant for hepatitis C, hospital-acquired pneumonia, and anemia. An x-ray indicated bullet fragments near C1 vertebrae and in the right chest wall. An initial lead blood level was drawn, and the resulting level was 111 mcg/dL. Patient was treated with IM BAL in oil and EDTA. BAL was not tolerated and treatment was changed to succimer. A lead level at 5 days of treatment was 39 mcg/dL. Hypertension and seizures complicated the chelation course for this patient. The patient underwent surgery to remove the bullet fragments in the pleura. On dismissal to rehab, the patient had a lead level of 31.8 mcg/dL. The patient's mental status and other symptoms improved steadily as the lead levels decreased. *Conclusion:* Long-term toxic lead levels can cause symptoms similar to acute intermittent porphyria. We report the successful treatment of lead toxicity with IV BAL, EDTA, succimer, and surgery in a misdiagnosed porphyria patient.

225. Demand for PCC Services "Surged" During the 2003 Blackout

Klein KR, White SR, Herzog P, Smolinske SC. *Children's Hospital of Michigan Regional Poison Control Center, Detroit, MI.*

Background: The largest geographic power failure in the history of the United States impacted eight states for up to a 24 h period beginning August 14, 2003. Our PCC catchment area was one of the most severely affected, with most of the population left without electrical or fuel supplies. Even after power restoration, the disaster was compounded by a 72 h ban on the use of potable municipal water. The paucity of reports on the impact of disasters on PCC operations led us to summarize our experience. *Methods:* Data sources included 1) Toxicall human exposures during August 2003 (with comparison to 2002 and to national trends) and 2) an afteraction report completed by SPIs on duty. *Results:* Average PCC call volume for August 2003 increased by 7.8%. Significant increases in human exposures occurred in four categories: gasoline exposure, carbon monoxide exposure, food poisoning, and water contamination. A 208% monthly increase in gasoline exposures (related to siphoning) peaked at 24 h. There was a 47% increase in CO exposures related to generator use. Food spoilage and water contamination queries rose by 54% and 183%, respectively, and peaked late during weeks 2 and 3 postdisaster. After-action report findings included interrupted power supply to the center; lack of redundant communication methods; short-staffing; and exclusion of PCC staff from hospital disaster plans. *Conclusion:* During the blackout of 2003, there was a measurably increased demand for poison center services, particularly notable in four human-exposure categories. PCC disaster plans should address increased staffing needs during the time of disaster, possibly extending for weeks, depending on the

scenario. Communication system redundancy, back-up power supply, and SPI needs (food, water, transportation, environmental safety, and rest/rotation) must be taken into account.

226. Isolated Atomoxetine (Strattera™) Ingestions Commonly Result in Toxicity

LoVecchio F, Kashani J. *Banner Good Samaritan Regional Poison Control Center, Maricopa and Banner Good Samaritan Medical Center, Arizona College of Osteopathic Medicine, Phoenix, Arizona.*

Background: Atomoxetine is a recently approved medication for attention deficient disorder. It is a selective norepinephrine reuptake inhibitor with an onset of action within 2 h and duration of effect up to 40 h in therapeutic doses. Experience in the overdose setting is limited. *Methods:* Following a brief training of systematic chart review, reviewers blinded to the purpose of the study completed a standardized data collection sheet. Two years after atomoxetine was released, poison center patient encounters were reviewed. Age, outcomes, and signs and symptoms were recorded. All patients were followed until the cessation of symptoms or 24 h. *Results:* Approximately 100,000 human exposures were reviewed. Of these, 17 were isolated ingestions. The age range of these 6 patients was 9 months–28 yrs old with a mean of 15.6 yrs. The range of amount ingested was 10–1200 mg. Symptoms were delayed as long as 3 h in 3 patients. All neurological symptoms were preceded by tachycardia. Ten of 17 patients had tachycardia, 6/17 had emesis, and 3/17 had agitation that required benzodiazepines to control. All symptoms resolved within 30 h. *Conclusions:* Supratherapeutic ingestions of atomoxetine can result in transient tachycardia, vomiting, and cognitive disturbances.

227. Validating Send-In Guidelines: Factors Influencing Triage Decisions for Pediatric Ibuprofen Ingestions

Kearney TE, Van Bebber SL, Olson KR, Hiatt PH. *California Poison Control System (CPCS), SF Division, Department of Clinical Pharmacy, University of California San Francisco, SF, CA.*

Background: We established a clinical guideline for pediatric ibuprofen ingestion with a threshold for referral to a health care facility (HCF) of >250 mg/kg. *Objective:* To identify factors influencing specialists' decisions to refer patients to a HCF with ibuprofen-only ingestions. *Methods:* Retrospective case-control using statewide data from 2001 and 2002. Inclusion criteria: unintentional, ibuprofen-only, ingestion, <6 yrs old, call from home, management site "referred to HCF." Controls had the identical criteria, except management site was "managed on-site (non-HCF)." Cases and controls were reviewed to determine amount ingested, symptoms, caller characteristics (e.g., overly anxious), and product characteristics. *Results:* Of 6,497 pediatric ibuprofen ingestions, only 91 (1.4%) were referred to a HCF; 49 that met our criteria and 118 controls were reviewed. Using the amount ingested as the sole basis for referral accounted for only 11 (22.4%) of the 49 cases referred to a HCF. Other variables associated with HCF referral were uncertain amount ingested (73.5% cases vs. 1.7% controls), symptoms present (14.3% vs. 5.1%), solid tablet form (98% vs. 46.6%), packaging of >100 tablets (49% vs. 1.7%), and high strength >200 mg/tablet (14.3% vs. 2.5%). Only 11 cases (22.4%) had ingested a known amount >250 mg/kg and none of the controls had ingested >250 mg/kg. *Conclusion:* A send-in threshold of 250 mg/kg for pediatric ibuprofen ingestions resulted in rare PCC referrals and no unanticipated significant outcomes. The highest risk factor for HCF referral was uncertainty of the amount ingestion and suggests that product packaging and strength of ibuprofen products influenced HCF referral rates.

228. Validating Send-In Guidelines: Factors Influencing Triage Decisions for Pediatric Diphenhydramine Ingestions

Kearney TE,¹ Hiatt PH,¹ Machado L,² Romeiro R,² Olson KR.¹ ¹*California Poison Control System (CPCS), SF Division, Department of Clinical Pharmacy, University of California San Francisco, SF, CA* and ²*Faculdade de Farmacia Universidade de Lisboa, Lisbon, Portugal.*

Background: We established a clinical guideline for pediatric diphenhydramine ingestion with a threshold for referral to a health care facility (HCF) of >10 mg/kg. *Objective:* To identify factors influencing decisions to refer patients to a HCF with diphenhydramine-only ingestions. *Methods:* Retrospective case-control using data from 2001 and 2002. *Inclusion criteria:* unintentional, diphenhydramine-only, ingestion, <6 yrs, call from home, management site ‘‘referred to HCF.’’ Identical controls, except managed at home. Cases and controls were reviewed to determine amount ingested, symptoms, caller characteristics (e.g., overly anxious), and product characteristics. *Results:* Of 1728 pediatric diphenhydramine ingestions, only 186 (10.8%) were referred to a HCF; 133 that met our criteria and 280 controls were reviewed. Only 81 (61% of cases) had ingested amounts >10 mg/kg. Variables most commonly associated with referral were uncertain amount ingested (33.3% cases vs. 2.5% controls), symptoms present (18.8% vs. 10.7%), and high-strength ≥ 50 mg/tablet (18.2% vs. 11.8%). Twice as many calls received >30 min after exposure involved symptoms [23 (56.1%) compared to no symptoms 11 (26.8%)], but these delayed calls were more likely to be managed at home [31 (75.6%) vs. 10 (24.4%) referred to a HCF]. *Conclusion:* Pediatric diphenhydramine ingestions <10 mg/kg were commonly referred to a HCF if there was uncertainty in the amount ingested or symptoms were present. This suggests that delaying the decision to refer a mildly symptomatic ingestion of an uncertain amount until after a 30–60 min follow-up may reduce unnecessary HCF referrals.

229. State-Based Poison Control Center Cost-Effectiveness Study

Bottei EM, Kalin LB. *Iowa Statewide Poison Control Center, Sioux City, IA.*

Background: Poison control centers (PCC) continue to need to justify their existence in these difficult financial times. At the request of our state health department, our PCC performed a cost-effectiveness study within our state. *Methods:* A total of 215 callers to our PCC, who were appropriately managed at home, were asked what alternative action they would have taken had the PCC not been available. Emergency departments, private physician’s offices, and nurse telephone advice lines were surveyed to determine how they would respond to poisoning-related telephone calls. Those who would provide poisoning advice over the telephone were asked to complete a five-poisoning-case questionnaire. These responses were used to create a matrix through which we could assign a final disposition to the 215 callers to our PCC. The average cost of an ED visit, a doctor’s office visit, and an ambulance run were determined. *Results:* Overall, 63% of the callers would have gone to an emergency department, 7% would have gone to their doctor’s office, 5% would have called 911, and 25% would have been managed at home. A conservative estimate of the total charges for these medical services would be \$44,070, or \$204.98 per call. Comparatively, the actual costs incurred by our PCC in managing these cases were \$6,272, or \$29.17 per call. This is a ratio of 7 to 1. Of note, several management recommendations made by health care professionals in the five-poisoning-case questionnaire would have been unnecessary, contraindicated, or dangerous in the cases described. *Conclusion:* Direct access to PCC’s lowers health care costs by reducing the unnecessary use of emergency health care resources and also provides timely and appropriate treatment recommendations in poisoning episodes.

230. Corporate Use of the 800 Number, An Unintended Consequence of National Access

Doyle CR, Mrvos, R, Krenzlok EP. *Pittsburgh Poison Center, Children’s Hospital of Pittsburgh, Schools of Pharmacy and Medicine, University of Pittsburgh, Pittsburgh, PA.*

Background: A national 800 number was implemented in 2002 by the AAPCC with the intended purpose of routing calls to the nearest participating poison information center (PIC). When calls are placed to a corporate entity such as an insurance company advice nurse, then transferred to the PIC via the 800 number, the call may arrive at a destination in a different state from where it originated. For example, the medical advice department may route poison calls that they receive from the entire country to the local PIC in their area via the 800 number. The PIC has experienced a dramatic increase in transfer calls received from insurance companies. *Methods:* Data from 2001–2004 involving all out-of-state calls to the PIC were analyzed to identify calls that were transferred from an insurance company intermediary.

Results: The number of calls that were transferred to the PIC by insurance companies increased from 1 call in each of the years 2001 and 2002 to 12 calls in the latter part of 2003, and 45 calls in the first 3 months of 2004. One call involved a symptomatic pediatric clonidine exposure. The child was referred immediately to the emergency department but the PIC experienced significant difficulty in locating the referral hospital. This resulted in a substantial delay of appropriate therapy. Other cases involved regionally specific substances that were not common to the PIC. *Conclusion:* Calls to a PIC from another region of the country can create confusion and delays in providing information to treating facilities. Communication with insurance companies with regard to appropriate 800 number use or by setting up a relationship with the cooperating PIC may facilitate more effective management of poisonings. The same problem has the potential to occur when manufacturers utilize the 800 number in a similar fashion.

231. Providing Health Information During Disease Outbreaks

Bogdan GM, Seroka AM, Swanson D, Peterson J, Wruk KM, Dart RC. *Rocky Mountain Poison and Drug Center—Denver Health, Denver, Colorado USA.*

Background: Chemical or biological terrorism presents extraordinary challenges for poison centers, with the need for rapid deployment of services to accommodate thousands of calls that may overwhelm current facilities. The Health Emergency Line for the Public (HELP) was created to provide information during bioterrorism and public health emergencies. We describe an option for poison centers to perform a larger role in health emergencies. *Objective:* Develop a service that can be rapidly implemented to provide information and referrals for major health events within our state. *Methods:* The toll-free HELP phone lines were activated for smallpox vaccinations—1/28/03 to 3/26/03; West Nile Virus (WNV) outbreak—7/22/03 to 10/10/03; and influenza outbreak—11/17/03 to 1/31/04. A system was created to provide multiple options for callers: up-to-date recorded information 24 h daily in English and Spanish; referral to a Web page; and specially trained information providers from 07:00 to 23:00 daily to answer questions, collect surveillance data, and provide referrals. Providers used Frequently Asked Question (FAQ) scripts prepared by state health epidemiologists covering symptoms, treatments, and prevention measures. *Results:* HELP received 36,679 calls related to three events: influenza—23,949; WNV—12,537; and smallpox—193. Most callers (63%) only listened to recorded information; the remainder waited to speak with information providers. Highest call volumes all pertained to the influenza outbreak: 345 hourly; 2,565 daily; and 7,145 weekly. The most requested FAQs: dead bird reporting for WNV, symptom information for influenza, and referrals for military smallpox vaccinations. *Conclusion:* Poison centers can partner with local, state, and federal public health agencies to effectively manage a large volume of contacts expected from a terrorist event.

232. Use of the On-Line Poisons Database TOXBASE® in the Event of Terrorist Alerts—Usage and Media Coverage

Bateman DN, McGrory CE, Good AM, Laing WJ, Kelly CA. *NPIS Edinburgh, Scottish Poisons Information Bureau, Royal Infirmary of Edinburgh, Edinburgh, UK.*

Background: TOXBASE®, the primary clinical toxicology database of the UK National Poisons Information Service, is available free on-line for registered NHS health professionals. We have analyzed the usage of the database in relation to terrorist incidents as reported in the UK press, using ricin, anthrax, and “terror” chemicals as examples. *Methods:* A retrospective analysis of TOXBASE® statistics was carried out on the number of ‘hits’ to relevant TOXBASE® entries and relevant time periods. LexisNexis, an on-line news resource tool, was interrogated to give an indication of media coverage in the UK in the same period. *Results:* Between January 2002 and February 2004 the ricin entry received 1318 ‘hits,’ 390 (30%) of which occurred on January 7–8, 2003 (ricin detected in London January 7, 2003). There was correlation with the number of UK newspaper reports containing the word ricin ($R^2=0.99$). For anthrax the correlation

was weaker for our poisons (i.e., not primarily bacteriological) database ($R^2=0.96$). At the same times as peaks in access to these agents there were upsurges in general accesses to chemicals potentially used by terrorists (presented as a group on TOXBASE[®]). *Conclusions:* On-line databases offer health care providers up-to-date information on terrorist chemicals. Significant numbers in the UK used our facility, thus avoiding unnecessary telephone enquiries to poisons centers and obtaining information useful for planning response measures locally.

233. A Poison Center's Role in Adverse Drug Reaction Monitoring, Analysis, and Reporting

Wedin GP, Strozyk NJ, Anderson DL. *Hennepin County Medical Center and Hennepin Regional Poison Center, Minneapolis, MN.*

Background: The Joint Commission on Accreditation of Healthcare Organizations requires institutions to have a process to respond to actual or potential adverse drug events. A large public teaching hospital utilizes the poison center (PC) as the primary point of contact for clinicians to report adverse drug reactions (ADRs). TOXICALL[®], software commonly used by poison centers nationwide for case documentation, was recently introduced to replace existing paper reports and limited data collection using Microsoft[®] Access. *Methods:* ADRs are identified by direct reports to the PC through an ADR hotline, written reports submitted by clinicians, and a retrospective analysis of E-Codes. Each ADR is documented in TOXICALL applying AAPCC Toxic Exposure Surveillance System (TESS) standards for data collection. Each reported ADR is reviewed to determine whether it was preventable, the probability of association between the medication and ADR, and the outcome. A User Configurable Field is used to document this unique information. *Results:* Direct entry of ADR incidents into TOXICALL has eliminated a labor-intensive process of data extraction from medical records and redundant data management. More complete data, including clinical effects and treatments, are now tracked for each event. Advanced data analysis, tracking, and reporting is now easy and integral to the monitoring process. *Conclusion:* TOXICALL provides for an efficient and organized process of data entry, secondary review, and data management. Utilizing the poison center as a central point of contact integrates the PC in a key hospital monitoring effort and capitalizes on the expertise of PC personnel.

234. Fomepizole Administration is Often Delayed in Toxic Alcohol Poisoning

Mycyk M, Wills B, Mazor S, DesLauriers C, Metz J. *Toxikon Consortium, Illinois Poison Center, Chicago, IL, USA.*

Background: Like most antidotes, fomepizole is most useful if immediately available when needed for ethylene glycol (EG) and methanol (ME) poisoning. *Methods:* To assess fomepizole utilization, a 2-yr retrospective analysis was conducted of all potential EG and ME ingestions reported to a regional poison center. Cases without EG or ME serum assays were excluded from analysis. *Results:* A total of 133 cases were identified; 102/133 (77%) had complete data for analysis. Immediate ADH inhibition was recommended in 79/102 (77%) cases. Fomepizole was recommended in 61/79 (77%); ethanol was recommended as an alternative in 32/61 (52%) of these cases if fomepizole were not immediately available. Ethanol alone was recommended in 18/79 (23%) because fomepizole was not on hospital formulary. Fomepizole was eventually administered in 39/61 (64%) cases where recommended, but delays (range: 2–24 h) to administration occurred in 19/39 (49%) because of unfamiliarity with it, inability to locate it, and cost. Six of 19 (32%) patients were transferred to another hospital for fomepizole. There was no association between delay to therapy and age, gender, intention, anion gap, or osmol gap of patient. Delays were more likely in cases where ethanol and fomepizole were both recommended (odds ratio 7.3, 95% CI 2.4–21.9; $p<0.001$). Toxic EG or ME levels were confirmed in 59 cases, including 13/19 (68%) cases where fomepizole was delayed. *Conclusion:* Despite its ease of administration, fomepizole is used less frequently than recommended by poison center staff and is often delayed in cases with confirmed toxicity. It is unclear why delays were more likely when a choice in ADH inhibition was given.

235. The Drug and Poison Information Service at Govt Head Quarters Hospital (GHQH) in India: Poison Management Service to Rural Indian Population—An Initiative Study

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Poisoning by chemicals is a significant risk in all countries where substantial quantities and increasing numbers of chemicals are being used in various purposes such as dye, agriculture, etc. Ooty, India, being an agricultural land, many chemicals were used as agrochemicals like pesticides, insecticides, rodenticides, herbicides, fungicides, and fumigants. In GHQH, a majority of cases reported were due to usage of agrochemicals as suicidal-attempt poisoning cases. In order to address this issue and optimize the treatment of poisoning cases in GHQH by clinical pharmacist, work was carried out to improve the outcome of poisoning cases. Poison protocol was developed to identify the agrochemicals used in this part of the region. During the study period (1 yr) 135 patients were admitted as poisoning patients. Twenty-five cases of organophosphates, 28 cases of glyphosate, 10 cases of paraquat, and other poisoning like rodenticide, carbamate, pyrethroid were admitted. Unknown poisoning cases were reported, more due to poor literacy, or patient had difficulty in giving details. Such patients were generally treated symptomatically. The development of methodology for identification greatly influences the documentation, and a drastic reduction in the number of unknown poisons was observed during the intervention and postintervention periods. Irrespective of the different periods of study all the patients who were admitted early survived, and the patients who expired were found to have presented late. The interventions also reduced the average length of stay at the hospital.

236. An Automated Poison Control Center Schedule Management Tool

Hart K, Sangalli BC, Bayer MJ, Barko I. *Connecticut Poison Control Center, University of Connecticut School of Medicine, Farmington, CT, USA.*

Background: Managing Poison Control Center (PCC) staff scheduling is a time-consuming task, made complex by efforts to meet both the needs of the center and those of individual staff members (SPIs). In our center, its complexity was recently increased when all mandatory overtime was replaced by procedures for voluntary staffing to cover planned and unplanned absences. We developed a system to automate many functions of PCC schedule preparation and maintenance. *Methods:* An initial schedule of SPIs' usual schedules for a 4-week block is defined in a Microsoft[®] Excel 2000 spreadsheet. Updates are automatically reflected in displays of each SPI's scheduled shifts and other paid time (e.g., vacations), PCC staffing for each hour, and total hours scheduled for each SPI. Potential problems are highlighted (e.g., too few SPIs scheduled to meet minimum staffing requirements, or too few hours scheduled for a SPI), as are special scheduling situations (e.g., holidays). Both standard shifts (e.g., days) and nonstandard shifts (e.g., 13:00–19:00) are supported. The schedule is created in draft form and adjusted to complete a final ('posted') version; further updates may result from unforeseen events (e.g., illness). *Results:* After a brief hands-on session, our PCC manager was quickly able to prepare schedules using a two-page written procedure for reference. The benefits of this system became even more apparent when the unexpected resignation of an SPI required several schedule changes. *Conclusions:* An automated system can enhance a Poison Control Center manager's effectiveness by reducing time spent preparing and maintaining staff schedules.

237. Implementation and Real-Time Web-Access to an Integrated Statewide Database Built with Disaster Redundancy

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Background: The three poison centers (PCCs) within the Florida Poison Information Center Network operated on independent center-specific data servers utilizing a quarterly manual data merge model to provide statewide data. This

model prevented any electronic case sharing and provided statewide data that could be as much as 3 months old. *Methods:* The network considered multiple replication models and central server-based models being used currently in U.S. poison centers but found that they lacked the priority specifications we felt were important. Among these: 1) allowing the center-specific data server model to persist so the PCCs were not dependant on WAN communication to a central database server; 2) allowing the PCCs to view, modify, or take over cases entered by any of the other two PCCs; 3) allow for efficient case search algorithms and efficient use of WAN bandwidth and server resources; 4) allow a PCC to access another PCC's cases even if the originating center servers are down; 5) allow for a real-time centralized database; 6) allow for easy recovery after a disaster. To accommodate these specifications the network created and implemented a new data infrastructure using a unique two-way replication venue to provide instantaneous statewide case access for all three PCCs, a real-time centralized statewide database, an infrastructure which would (with no detrimental effects on the PCCs) allow for WAN failure or individual/multiple PCC closures while maintaining continued access to the closed PCC's cases, and real-time web-based access to data by user-configurable queries and reports.

238. First Two-Year Experience with Escitalopram Exposures

Watts D, LoVecchio F, McDowell T. *Banner Good Samaritan Regional Medical and Poison Center, Maricopa Medical Center, Phoenix AZ.*

Background: Escitalopram (ESC) is a new selective serotonin reuptake inhibitor (SSRI) used in the treatment of major depressive disorder. ESC is the S-enantiomer of citalopram, has little to no effect on norepinephrine or dopamine reuptake. The toxicities of ESC during standard clinical use are described; however, there is a dearth of information regarding either accidental oral ingestion or intentional overdose. *Methods:* We conducted a retrospective chart review of isolated ESC ingestions reported to our Poison Center during 2003–2004. *Results:* Thirty-seven patients met the criteria. The average amount of ESC ingested was 85.5 mg (range 5–450 mg) (data from 32 cases) and the average patient age was 17.2 yrs (ranging from 2–75 yrs). The most common formulation ingested was the 20 mg tablet. Twenty-one patients accidentally ingested ESC, and 16 admitted intentional ESC ingestion. Eighteen of the 21 accidental ESC ingestions were observed at home with PCC follow-up for 24 h; all remained asymptomatic. The other 3 patients were observed in the emergency department (ED) and discharged home. Sixteen of the intentional ingestions were observed at the ED with good outcomes. One of the ED observations was admitted for lethargy. Three of the 16 had diaphoresis and tachycardia. *Discussion:* Although ESC toxicity can be severe and, perhaps, life-threatening, this does not appear to be a phenomenon associated with either accidental or suicidal oral ingestion. An important limitation of our series is the small sample size and lack of blood confirmation in some cases.

239. Obtaining Medical Information During a Nuclear, Biological, or Chemical (NBC) Incident: A Survey Study

Baer AB, Kirk MA, Holstege CP. *Department of Emergency Medicine, University of Virginia, Charlottesville, VA.*

Background: “Basing disaster plans on what people are likely to do rather than what they should do” is an important principle of disaster medicine. If a terrorist event occurred today, where would clinicians most likely seek information? *Methods:* A questionnaire was mailed to a random sample of 600 emergency physicians drawn from our state chapter of the American College of Emergency Physicians. Using scenarios, questions were asked about information resources they would likely access during a NBC event. Specifically, what information resources would they use for obtaining recommendations about diagnostics, expected symptoms, treatment, antidotes, and

decontamination. *Results:* 134 questionnaires (22%) were returned with a $\pm 7.8\%$ margin of error. The Table shows the top three information resources chosen for each item.

	Diagnostics and symptoms	Treatment	Antidote	Decontamination
Chemical	PC, MJ, NET	PC, MJ, NET	PC, MJ, NET	HMT, PC, MJ
Biological	PC, CDC, LHD	PC, CDC, MJ	PC, CDC, LHD	SHD, PC, CDC
Nuclear	HMT, MJ, PC	MJ, PC, TC	PC, LHD, SHD	HMT, EPA, PC

Key: CDC—Center of Disease Control; EPA—Environmental Protection Agency; (L)SHD—Local and State Health Department; MJ—Medical Journals; NET—Internet; PC—Poison Center.

The Poison Center was always picked in the top three selections for each scenario of the 15 possible choices. Reasons cited for choosing the Poison Center include ease of contact, availability, rapid response time, and clinical knowledge. *Conclusion:* This study suggests that Poison Centers are likely to be used by EM physicians for information during NBC events.

240. Acute Iron Toxicity from Accidental Intravenous Administration of an Oral Iron Preparation

Hayashi SA,¹ Thundiyil J,¹ Flori H,² Kearney TK.¹ ¹California Poison Control System, SF Division, Department of Clinical Pharmacy, University of California San Francisco, San Francisco; ²Children's Hospital, Oakland CA.

Background: We report an unusual case where a therapeutic oral dose of iron was given intravenously to an infant. *Case Report:* A 5.5 (5 kg)-month-old boy with a malabsorption syndrome of unknown etiology on chronic TPN was admitted for a clogged broviac catheter. On hospital day 2, 32 mg of elemental iron in the form of an oral solution of ferrous sulfate was accidentally rapidly infused into his broviac. He quickly developed difficulty breathing and hypotension (BP 55/24 mmHg, HR 194/min), requiring brief bag and mask ventilation and fluid resuscitation. Two hours later, his iron level was 4637 mcg/dL, glucose was 369 mg/dL, and transaminases were normal. Over the following day he had bloody stools, coagulopathy (PT 35.6, INR 2.4, PTT >120) and metabolic acidosis (venous blood gas: pH 6.19, pCO₂ 83, pO₂ 64, HCO₃ 13). Deferoxamine infusion was begun at 75 mg/h and continued for 12 h. At 3.5 and 9 h postinfusion, his iron level was 212 and 119 mcg/dL, respectively. His iron levels continued to drop (100 and 56 mcg/dL at 14.5 and 22.5 h postinfusion, respectively) during his ICU stay. Coagulation abnormalities resolved with FFP, platelets, and packed red blood cells and the acidosis was corrected with sodium bicarbonate. *Conclusion:* We present a case of inadvertent IV administration of an oral iron supplement to an infant who developed shock, apnea, and a coagulopathy, and recovered without sequelae. The acute pulmonary and hemodynamic effects may have been caused by an anaphylactoid reaction.

241. What Would You Have Done if You Were Not Able to Contact a Poison Center?

Wahl M, Ness S, Des Lauriers C, Metz J. *Illinois Poison Center, Chicago, IL, USA.*

Background: Poison control centers (PCC) are constantly asked for proof that the services they provide reduce unnecessary health care costs. To help provide this proof, the question, "What would you have done if you were not able to contact a poison center?" was added to an ongoing PCC customer satisfaction survey. *Methods:* A convenience sample of general public callers was chosen on a monthly basis; suicidal callers, calls from workplaces,

and health care providers were excluded. Callers were asked 14 questions, including the one above. Possible responses for the question above included call 911, call doctor, visit doctor, call emergency department (ED), visit ED, call urgent care, visit urgent care, call nurse advice line, wait and see, nothing, and other. *Results:* Out of 210 respondents, the following answers were obtained: call 911—19 (9%); call doctor—64 (30%); visit doctor—10 (5%); call ED—46 (22%); visit ED—43 (20%); call urgent care—0; go to urgent care—0; call nurse help line—3 (1%); wait and see—12 (6%); nothing—6 (2%); and other—7 (3%). *Conclusion:* Of the respondents, 25% of callers stated they would go directly to a health care provider; 64% stated they would call a health care provider or 911. EMS and 911 will generally transport the patient if the guidance of a poison center to determine if transport is necessary is unavailable. Physicians and ED staff often will ask for the patient to be seen, as triage criteria and recommendations in a poisoning case are out of the usual scope of practice for primary care physicians and ED staff. It is possible that the majority of those callers who would have been observed at home by a PCC would instead end up receiving unnecessary medical care. This ongoing survey provides further evidence that PCC services provide the general public with an alternative to unnecessary medical care for toxic exposures that can be safely managed at home.

242. Geographical Information System for Poison Center Planning

Benitez JG, Warburton NE. *Finger Lakes Regional Poison and Drug Information Center, University of Rochester, Rochester, NY.*

Background: Poison Centers (PC) frequently use graphs and charts to develop a “picture” of their operations or their exposures. Statistics and charts of these types may be difficult to interpret. A Geographical Information System (GIS) approach to PC statistics or call statistics offers valuable “pictorial” evidence that is clear and easily understood. In more complex PC regions, where large numbers of counties or even states are covered, GIS offers several unique ways to analyze data. GIS was utilized to look at the data in our 12-county region. *Methods:* A free GIS system was obtained and installed at the PC. Data analyzed included poison prevention education data and select TESS data. Data were reviewed by county and by zip code, to locate differences in measures in these geographic variables. *Results:* Poison prevention education data showed that 146 educational events had occurred in our region. Poison education committee review of this data was positive in that “sufficient” outreach had occurred. However, subsequent GIS plotting of this data demonstrated lack of educational outreach to one county. Plotting of Toxic Exposure Surveillance System (TESS) data demonstrated specific geographic patterns when caller location was plotted (by county and by zip code) vs. exposure substances. When plotted as exposure rates, however, these patterns were minimized. *Conclusion:* No high-exposure prevalence rates were identified in the region. Poison prevention educational outreach missed one county in the region. GIS is a valuable tool for planning and evaluating multiple aspects of PC operations. Data generated in this fashion is potentially useful not only for the poison center itself, but to other health care providers, county and state health departments, and to host institutions.

243. Can a Remote Agent Match the Performance of an In-House Poison Center Specialist?

Farnsworth VL, Scherger DL, Peterson JE, Bogdan GM, Wruk KM, Dart RC. *Rocky Mountain Poison Center—Denver Health; University of Colorado Health Sciences Center, Denver, CO.*

Background: Poison centers are challenged by recruitment and retention issues. Strategies are needed to attract and retain staff, maximize telephone coverage during peak call volume times, and to maintain staffing during catastrophic, high call volume events. Remote telephone agents who take live incoming calls from their homes can increase poison center flexibility to maintain adequate staffing coverage. *Objective:* To evaluate whether a remote certified specialist in poison information (CSPI) can manage calls as effectively, both qualitatively and quantitatively, as an on-site agent.

Methods: One remote poison center CSPI then worked 50% of shifts from home and 50% at centralized call center, using equivalent technology with the same methods of documentation and call distribution in both locations. Call volume was measured by chart note entries so that both new incoming calls and ongoing case management could be compared. Quality of call management in both settings was measured using standard continuous quality improvement (CQI) tools already in place for centralized call center. *Results:* The CSPI managed an equal number of calls from both locations (remote= 7.3 ± 2.5 SD, on site= 7.8 ± 1.4 SD). CQI review showed no difference in quality of call management (accuracy scoring: on-site $88.3\% \pm 11.2\%$ SD, remote $88.4\% \pm 8.4\%$ SD). In addition, there were two occurrences in which the remote agent filled 2 h overtime intervals with short notice. *Conclusion:* Provided with equivalent technology tools, the CSPI in this study was able to work remotely as efficiently and accurately as on-site. Remote agents may therefore be a viable option to consider for optimizing poison center staffing.

244. Caller Access and Satisfaction with Poison Center Advice

Hudmon KS, Hiatt PH, Nguyen NN, Kearney TK, Heard SE. *California Poison Control System, Department of Clinical Pharmacy, University of California San Francisco, San Francisco, CA and Yale University School of Medicine, New Haven, CT.*

Background: Little information is available characterizing consumer's 1) route of access to the poison control center (PCC), 2) tendency to seek additional advice prior to or after calling the PCC, 3) perceived consistency of advice received from non-PCC sources, vs. PCC advice, and 4) satisfaction with PCC services. *Methods:* In two data collection periods over 24 days, PCC callers (>18 years, unintentional human exposure, non-emergency, English speaking) consented to participate in a follow-up telephone interview that occurred within 10 days of their initial call to the PCC. *Results:* Of 1,049 callers surveyed, the most common source for obtaining the PCC telephone number was the telephone book (35.0%). Eleven percent obtained advice prior to calling the PCC; the most common resource was family members (37.3%). In 67.3% of these cases, consumers were advised to call the PCC; however, 79 (7.5%) consumers received actual treatment recommendations from other sources, and 19.7% perceived these recommendations to be not at all consistent with the recommendations that they later received from the PCC. After speaking with the PCC, 7.6% received additional advice from other sources. Participants expressed high satisfaction with the PCC; 47.7% were repeat callers, and all but one respondent would use the service again and would recommend it to friends/family. Eight percent would not have called the PCC if it had been a toll call, and 27.1% would have gone to an emergency room if the PCC did not exist. *Conclusion:* Callers are highly satisfied with the PCC, and few receive additional advice either prior to or after contacting the PCC. Existence of the PCC likely reduces medical costs by eliminating unnecessary emergency room visits.

245. The Effect of Recording Notification on Pill Identification Calls

Beuhler MC, Rouse AM. *Carolinas Poison Center, Carolinas Medical Center, Charlotte, NC.*

Background: Pill identification (ID) calls are responsible for substantial poison center call volume. A large number of these calls feature agents with significant abuse potential. It was hypothesized that caller awareness that conversations are being recorded would reduce the number of nefarious pill ID calls. *Methods:* An announcement stating that "this call is being recorded for quality assurance purposes" was added to the poison center line on January 2, 2003. The number of total calls, pill ID and pill ID, calls in the "drug-sometimes-involved-in-abuse" TESS subset were determined for December 2002 and 2003; January 2002 and 2004; and February 2002, 2003, and 2004. Analysis was performed comparing January 2002 to 2004, February 2002 to 2003, February 2003 to 2004, and December 2002 to February 2003. Chi-squared analysis was utilized to determine statistical significance (smallest $n=498$). *Results:* There was no difference in the percentage of pill ID calls between December 2002 (17.6%) and

February 2003 (18.28%). There was a statistically significant ($p < 0.001$) increase in the percentage of pill ID calls between January 2002 (17.51%) and January 2004 (20.18%). There was no significant difference in the percentage of pill ID calls in the “drug-sometimes-involved-in-abuse” category from February 2002 (6.43%) to February 2003 (6.32%). There was a statistically significant ($p < 0.0001$) increase in the percentage of pill ID calls in the “drug-sometimes-involved-in-abuse” category from February 2003 (6.32%) to February 2004 (8.18%). *Conclusion:* There was no noticeable effect on pill identification call volume following the adoption of a verbal warning of the recorded nature of the phone conversation.

246. PDR Overdose Advice Revisited: A Ten-Year Update

Mullen WH, Hayashi SA, Tsutaoka BT, Blanc PD. *California Poison Control System, San Francisco Division, Department of Clinical Pharmacy, University of California, San Francisco.*

Background: We previously studied overdose (OD) management advice in the 1994 *Physicians' Desk Reference* (PDR) and found serious discrepancies in OD treatment advice compared to a consensus of five toxicology references. In that study, 80% of PDR entries were deficient and almost half advised ineffective or contraindicated therapies. We chose to revisit the PDR overdose entries to identify any changes in PDR overdose management advice. *Methods:* Monographs for the 20 drugs identified in the previous 1994 PDR study were re-reviewed in the 2004 PDR for the same deficiencies identified by a consensus of four of five toxicology references in the previous study. For brand name drugs that no longer had monographs, alternative brands for the same generic drug were selected either from the same manufacturer if available (three drugs) or an alternate manufacturer that had the only PDR monograph available for that drug (one drug). One drug (phenylpropanolamine) had been removed from the market in the interim period. *Results:* We found some improvements in the 2004 PDR compared to our previous study, however, a majority of drugs had at least one deficiency present. Of the 19 PDR entries, 12 (63%) had at least one deficiency, two (11%) advised ineffective treatments with potential for harm. Seven entries (37%) had no deficiencies. *Conclusion:* Despite substantive improvements, management of overdose based on PDR monographs would reflect information deficiencies in the majority of cases and, in certain instances, ineffective or inappropriate therapy.

247. Development and Use of a Decentralized Antidote Stockpile in a Rural State

Tomassoni AJ, Simone KE. *Northern New England Poison Center, Portland ME.*

Background: Poison center (PC) survey of this rural state reported in 1997 confirmed inadequate regional antidote supplies for poisoning emergencies. Understocked medications included atropine, pralidoxime, BAL, and other agents potentially useful in HAZMAT/chemoterrorism incidents. Funding available in the wake of terrorist attacks of 2001 made possible an antidote stocking program to partially fill the gap. *Methods:* The PC approached the State Bureau of Health to seek funds for improving statewide supplies of antidotes. Under contract, the PC has ordered, inventoried, and delivered selected antidotes known to be in short supply to hospitals statewide that agreed to accept the new Hospital Pharmaceutical Stockpile. Instructions for compounding, dosing for adult and pediatric patients, and aftercare were provided as appropriate. *Results:* During assembly of the antidote packages by the PC, mass poisoning with arsenic in a remote part of the state triggered need for substantial amounts of chelating agents. Existing supplies were moved from the nearest facilities to the sites of care, followed by agents from the stockpile, then supplies ordered from vendors. Air ambulance, police, and couriers were utilized to transport the agents. Future program refinements will include expanded provider education, development of protocols for distribution of antidotes to local EMS, and use of agents by EMS providers. *Conclusion:* Locations of incidents cannot always be

predicted. Advance deployment of antidotes is essential for timely response in rural regions. Reliance upon vendor-managed inventory alone may be inadequate.

248. Mercury Excretion in Sweat

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Background: Excretion of mercury (Hg) in urine, feces, and expired air is well known, whereas excretion of Hg in sweat is poorly documented. Advanced equipment allows detection of Hg vapor at low levels. *Case Report:* A 60-yr-old female presented with paresthesias, subjective memory deficits, and episodes of profuse sweating after consuming a suspicious "cup of coffee." Urinary Hg excretion was 151.6 mcg/24 h (normal <20 mcg/L) and blood Hg was 25.8 mcg/L (normal <10 mcg/L). The patient's home was extensively tested for Hg using an Ohio Lumex Mercury Vapor Analyzer (MVA) with a 2 ng/m³ threshold for detection. Home air sampling results were less than the minimum risk level of 1 mcg/m³. Abnormal Hg vapor readings were obtained from the patient's personal belongings: underwear: 4 mcg/m³; clothes: 1.7–2.4 mcg/m³; personal care items: 0.6–.8 mcg/m³; towel: 1.2–2 mcg/m³. After showering, donning newly purchased clothes, and no cosmetics, body MVA testing showed zero Hg when passed over the patient's hair, face, neck, axillae, clothes, shoes, or breath. Repeat testing after exercise until perceptible sweating appeared showed neck: 0.2 mcg/m³; axillae: 0.2 mcg/m³; head/hair: 0.6 mcg/m³; and bagged clothes moist with perspiration: 0.6 mcg/m³. The source of Hg exposure was not confirmed but was suspected to be a Mexican skin cream, "Crèma de Belleza-Manning." The patient completed 19 days of chelation with DMSA with subsequent urinary Hg of 12 mcg/24 h. *Conclusion:* Detection of Hg vapor in sweat may support the diagnosis of Hg exposure. Further study is needed to determine if sweat Hg vapor levels can differentiate exposed from unexposed individuals, whether they are affected by environmental contamination, and whether this may pose a secondary Hg exposure threat, especially to young children.

249. Air Sampling and Urine Analysis Following Decontamination of an Elemental Mercury (Hg) Spill in a High School Chemistry Lab

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Background: Elemental Hg may volatilize at room temperature, leading to inhalation exposure if air levels are elevated. ATSDR guidance recommends that air Hg samples be less than 1 ug/m³ prior to re-occupancy of a contaminated area. Air Hg levels >10 ug/m³ require isolation from the area. We review an elemental Hg spill in a school lab, having an exposure risk to 70 students. *Case Series:* Two ounces of elemental Hg were sprayed through a glass manometer spilling throughout a science lab. Once found, the area was isolated and three classes of exposed students were isolated, showered onsite, and changed into Tyvek suits prior to dismissal. Clothing was sealed in plastic bags for each exposed student, and the air space of the bags tested for Hg vapor. The shoes of all individuals not exposed in the lab were analyzed for Hg prior to their dismissal to rule out tracking of Hg off the premises. Hg air samples were taken pre- and post-cleanup, amalgamation, and ventilation. Forty-two exposed students submitted urine samples for Hg analysis. *Results:* No Hg levels were detected on the shoes of individuals not in the lab. Air Hg levels exceeding 1 ug/m³ were found in the clothing bags of 8 of the 70 exposed students (all > 0 ug/m³). Air samples in the lab were 14–22 ug/m³ and in the lab's exterior hall 2–3 ug/m³. Following school decontamination, Hg vapor samples were 0.3–0.39 ug/m³, and Hg particulate was less than 0.0022 ug/m³. Forty-one of 42 urine samples had nondetected Hg at <5 ug/L, 1 sample at 6 ug/L. *Conclusion:* Hg spill in a classroom resulted in air samples exceeding safe limits. Post-decontamination confirmed Hg removal as all air sampling was below guidance levels of 1 ug/m³. Nontoxic urine Hg levels were found in exposed students who submitted samples following decontamination.

250. Using Cell Culture to Assess Thallium Neurotoxicity: A Preliminary Study

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Background: Although applications for thallium (Tl) are essentially limited to industrial use in the United States, malicious exposure and international availability still produce numerous cases of severe neurotoxicity. Because the mechanism for Tl neurotoxicity is largely unknown, animal studies are both expensive and difficult to perform and too few cases exist to perform controlled human trials, we sought to develop and a cell culture model to investigate toxicity and therapy. *Methods:* An immortal line of rat hippocampal astrocytes cells was selected for investigation. To ascertain an initial toxic effect, a growth study was performed. Sixty flasks were seeded with 15,000 cells each in media enriched with 10% FBS and grown until subconfluency. The media was removed and replaced with fresh media containing 10% FBS and various concentrations of thallium acetate constituting five study groups; 0.0 as a control group, 0.5 mM Tl, 1.0 mM Tl, 1.5 mM Tl, and 2.0 mM Tl. The cells were collected by trypsinization and counted on treatment days 2, 4, 6, and 8. The entire study was repeated three times. Scanning electron microscopy (SEM) was used to examine cells for morphologic defects. *Results:* Control cells grew normally achieving 140×10^3 by day 8. On day 2, all Tl groups had counts $< 1 \times 10^4$; the control group had 5×10^4 . Between days 2 and 8 a dose-response curve showed that higher Tl doses produced less cell growth. SEM done on day 2 demonstrated cell surface abnormalities and a reduction in retraction fibers in Tl-treated cells. *Conclusions:* Thallium administration inhibits growth rate and produces structural changes of rat hippocampal astrocytes. This model will be used to compare currently accepted antidotes with potential therapies for thallium neurotoxicity.

251. Cocaine-Associated Chest Pain and the Incidence of a Positive Troponin I Assay: A Two-Year Retrospective Review

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Background: In a previous retrospective review of 101 patients presenting with cocaine-associated chest pain at our institution none of the patients had evidence of myocardial infarction (MI) using the CK-MB laboratory assay. We questioned if utilizing the cardiac Troponin I assay would change the incidence of MI. Therefore, we reviewed the presenting symptoms, risk factors, EKG findings, and the incidence of the elevated Troponin I enzyme in a similar cohort of patients. *Methods:* A retrospective chart review of all patients admitted between 3 March 2001 and 3 March 2003 to a cardiac observation unit in a 485-bed public teaching hospital with a chief complaint of chest pain and having toxicologic evidence and/or history supporting antecedent cocaine use. A total of 106 patients' medical records were reviewed. In all patients EKG findings, risk factors for coronary artery disease, serial Troponin I assays, and outcomes are documented. *Results:* Of 106 patients 9 (8.5%) met the criteria for acute MI (serum Troponin I greater than 0.3 ng/mL). EKG was diagnostic for acute MI in only 2 of 9 patients with positive troponin assays. There were no in-hospital deaths. Five patients underwent coronary angiography and three of these received interventions. *Conclusion:* Patients presenting with cocaine-associated chest pain have a low probability of having enzymatic evidence of MI, even using the very-sensitive Troponin I assay. However, the ECG in troponin-positive patients is often nondiagnostic suggesting that this assay is the gold standard for diagnosing an acute MI in this patient population.