

## Abstracts

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### 1 ELEVATION OF CYTOKINES IN ACETAMINOPHEN OVERDOSE

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**Background:** A previous study found that serum IL8 levels correlate with indices of acetaminophen (APAP) toxicity. **Methods:** To further study the relationship between cytokines and APAP toxicity, serum levels of IL6, IL8, MCP1, GRO alpha and ENA 78 were measured by ELISA in blood samples of patients with acute APAP overdose. **Results:** 38 patients were enrolled and stratified by AST/ALT elevation. (See Table.) Peak IL6 levels were higher in patients with severe toxicity than those with moderate toxicity ( $p = 0.005$ ) and no/mild toxicity ( $p = 0.02$ ). Peak IL8 ( $p = 0.048$ ) and MCP1

levels ( $p = 0.002$ ) were higher in patients with severe toxicity than those with no/mild toxicity. Significant differences between subgroups were not apparent for GRO alpha or ENA 78. **Conclusions:** Elevations of serum IL6, IL8 and MCP1 in patients with APAP toxicity support the involvement of the inflammatory cascade in the mediation and/or repair of cellular injury.

### 2 CARDIAC TOXICITY OF THIORIDAZINE IN A PORCINE MODEL

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**Objective:** Thioridazine is said to have similar cardiac toxicity to the tricyclic antidepressants but no data exists to support these claims. A preliminary investigation of the cardiac toxicity of thioridazine and treatment with sodium bicarbonate was conducted

Toxicity	Serum Concentration (Median & Range, pg/mL)		
	IL6	IL8	MCP1
No/Mild (24) (AST/ALT < 100 IU/L)	0 (0-91)	0.6 (0-177)	738.5 (296-1502)
Moderate (6) (AST/ALT ≥ 100 & ≤ 1000 IU/L)	0 (0-0)	4.7 (0-183)	1205.3 (533-1808)
Severe (8) (AST/ALT > 1000 IU/L)	5.7 (0-58)	17.9 (0-331)	3783.6 (473-6291)

Abstract 1.

in a porcine model. **Methods:** Anesthetized adolescent pigs (approximately 30 kg in weight) underwent femoral artery cannulization for blood pressure monitoring. Cardiac rhythm was recorded continuously. Thioridazine dissolved in ethanol was administered at a rate of 12.5 mg per minute until the onset of QRS interval > 100 milliseconds or heart block. At that point, thioridazine infusion was terminated and sodium bicarbonate, 3 mEq/kg was administered. A control animal received ethanol infusion without thioridazine. Serum thioridazine levels were measured at the onset of toxicity. **Results:** Ethanol infusion without thioridazine had no cardiovascular toxicity. Thioridazine was infused into four pigs. Hypotension and tachycardia developed before QRS widening or 3rd degree heart block in all pigs. 3rd degree block without QRS widening developed in 2 of the 4 pigs. In these two pigs, third degree block with hypotension was the terminal event and did not respond to bicarbonate. There was no response to sodium bicarbonate infusion in the two cases with QRS widening. **Conclusion:** In a porcine model of thioridazine toxicity, toxicity was significantly different from toxicity described for tricyclic antidepressants. This preliminary result suggests that thioridazine toxicity is different from tricyclic antidepressant toxicity, and further study is needed to definitively define thioridazine toxicity and possible treatments.

### **3 EKG CHANGES RELATED TO COCAINE USE IN AN INNER CITY EMERGENCY DEPARTMENT**

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**Objective:** Chest pain related to cocaine use presenting to acute care is a common occurrence. Cocaine has the propensity to produce ischemic cardiomyopathy and myocardial infarction. However, we have found that most patients abusing cocaine do not have evidence of acute ischemic cardiomyopathy regardless of chest pain or abnormal EKG's. **Methods:** Over 3 years we have followed the epidemiology of cocaine users presenting to our emergency department. From our data we selected 200 patients presenting to acute care with chest pain and 200 patients presenting to acute care without chest pain. All patients either had a positive history of recent cocaine use or a positive drug screen for cocaine metabolites. We had the EKG's from both groups read by qualified

physicians. We did not disclose which patients had chest pain. We also captured cardiac isoenzyme results from the patients presenting with chest pain. **Results:** The majority of EKG's were abnormal including findings of left ventricular hypertrophy, atrial enlargement and ventricular conduction delay. The EKG changes did not correlate with whether the patient had chest pain or not. Over one hundred measures of isoenzymes (Troponin I and CK MB fractions) were negative for evidence of cardiac ischemia from patients with chest pain in the acute care setting. Over a dozen patients had multiple EKG's across multiple visits to the emergency room showing progression of the EKG abnormalities. More than half of the patients in both groups had signs and symptoms documented that were consistent with congestive heart failure. **Conclusion:** Cocaine use is associated with an indolent cardiomyopathy that is not from acute myocardial ischemic but is associated with progression of EKG's abnormalities.

### **4 UNEXPECTED CARDIOVASCULAR DEATHS WITH DROPERIDOL: A SMOKING GUN OR JUST SMOKE AND MIRRORS?**

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**Background:** Droperidol is a butyrophenone antiemetic and antipsychotic drug commonly used for perioperative nausea, acute psychosis, and migraine headaches. In December 2001, the manufacturer added a "black box warning" based upon reports to the US FDA MedWatch which appeared to suggest that unexpected cardiovascular deaths commonly occur at or below normal therapeutic doses. **Methods:** We reviewed data from all 270 MedWatch reports (including 99 reports of death) submitted between 1 Nov 1997 and 10 Jan 2002. Data extracted included outcome, dose of droperidol (if known), other symptoms reported (cardiovascular vs. non-cardiovascular), age, gender, source (US or foreign), and concomitant medications. **Results:** There were 99 death reports representing 90 patients. 68 of 90 case reports specified a dose. 75 fatality reports (83%) were foreign, including 59 with a known dose. Out of these 59 cases, the dose was  $\geq 50$  mg in 29 cases (49%) and  $\leq 2.5$  mg in only 3 cases (5%). Only 15 of 90 reports (17%) were from the US, including 9 with a specified

dose. Out of these 9 cases, the dose was  $\leq 2.5$  mg in 5 cases (56%) and 5–10 mg in 4 cases (44%). Non-fatal cardiovascular adverse events uniformly occurred at  $\leq 5$  mg in 12 US reports but  $\geq 5$  mg in 9 foreign reports. Conclusion: Acute cardiovascular deaths after therapeutic doses ( $\leq 2.5$  mg) of droperidol appear rare. Foreign cases involving very large doses ( $\geq 10$  times dosages used in the US) account for most reported fatalities and cardiovascular adverse events. Mandatory EKG screening appears unnecessary.

## 5 MULTI-CENTER ELECTRONIC DATA SHARING: A 5-STATE PILOT STUDY

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Background: Past attempts at retrospective analysis of poisoning reports across multiple states often involved slow and cumbersome methods to assemble and merge data. Often, the coordinating Poison Control Center had to manually re-enter data from paper records to create a unified electronic database for analyses. Methods: We designed a method to electronically capture and merge human agricultural chemical exposures reported in 2001 from 174 counties of the lower Mississippi River Delta in 5 states; (1) Electronic instructions for 5 TOXICALL<sup>®</sup>-based PCCs were created containing inclusion criteria for 55 AAPCC generic codes, primarily pesticides; (2) Each PCC implemented the instructions by pasting the electronic commands into a search engine and then selecting the counties; (3) Matching records were downloaded to a CD in Microsoft<sup>®</sup> Access; (4) At the coordinating PCC, data from the 5 PCCs were merged into a single Access database, including the narrative; (5) Analysis of data was conducted using SAS<sup>®</sup> software. Results: A single, searchable database containing 1,996 human exposure reports was created. Analysis can be conducted using multiple types of software in addition to routine TOXICALL<sup>®</sup> reports. No manual re-entry of cases was necessary, thus minimizing cost and eliminating a potential source of data entry error. Conclusions: Our experience suggests that a fast, simplified and centrally-coordinated electronic retrospective data collection approach is feasible and efficient for multi-state studies. Our approach increases the utility of PCCs' medical records and permits construction of multi-state

data sets based on geographic area, toxic agent, patient age or other epidemiologic factors. Converting the database into a statistical software data file permits a more sophisticated analyses.

## 6 ADVERSE EVENTS FOLLOWING DRUG INTERACTIONS IN THE ELDERLY

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Background: Drug–drug interactions are a preventable cause of iatrogenic harm, yet their consequences in large populations are unknown. We explored adverse outcomes associated with three drug–drug interactions in the elderly. Methods: We conducted a population-based nested case-control study linking multiple healthcare databases and identified all patients  $\geq 66$  years of age treated with glyburide, digoxin, or an angiotensin-converting enzyme (ACE) inhibitor in Ontario, Canada. Case patients were those admitted to hospital because of drug toxicity (hypoglycemia, digoxin toxicity or hyperkalemia, respectively). We compared the prescription records of case patients to those of matched control patients for receipt of specific interacting medications (co-trimoxazole with glyburide, clarithromycin with digoxin, and potassium-sparing diuretics with ACE inhibitors). Results: During the 7-year study period, 909 elderly patients were admitted with a most responsible diagnosis of hypoglycemia. Of these, 35 had received co-trimoxazole in the preceding week. Multivariate adjustment for other interacting medications and renal insufficiency indicated that patients on glyburide given co-trimoxazole faced a tenfold increased risk of admission for hypoglycemia (O.R. 10.0; 95% C.I. 6.3 to 21.7). Similarly, patients admitted with digoxin toxicity ( $n = 1051$ ) were about ten times more likely to have recently received clarithromycin (O.R. 10.9; 95% CI 6.1 to 26.3), and patients receiving ACE inhibitors admitted for hyperkalemia ( $n = 523$ ) were about twenty times more likely to have recently received a potassium-sparing diuretic (O.R. 22.9; 95% C.I. 9.1 to 89.0). Conclusions: Predictable and potentially avoidable drug–drug interactions involving these commonly used medications cause considerable morbidity in the elderly.

## 7 ICELAND POISONING STUDY— PRELIMINARY RESULTS

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**Background:** A study was undertaken to assess the occurrence and nature of toxic exposures as well as the manner of response of the health care system to these events for an entire nation for one year. The nation in question is a small, physically isolated European country. Towards this end, a study was designed to obtain information about all exposure advice calls handled by health care facilities, and all patient visits to hospitals and health care facilities due to exposure to toxic substances. In this manner, the poison center could also gain a measure of its penetrance as an information source for such exposures in the country. **Methods:** The study was performed prospectively with a designated coordinator for each hospital and health care facility. Information was collected on a data sheet designed for ease of use and to allow comparison of the study data to data collected during the same period by the country's only poison information center. Inservice teaching was carried out to aid in correct collection of the data. Copies of the data sheet were sent along with written material describing the study and proper completion of the forms to the coordinators at all hospitals and health care centers in the country. The data sheet was to be filled out each time a phone call was received or a visit to a health care facility or hospital was made regarding exposure to a toxic substance. The study was carried out from April 1st, 2001, until March 31st, 2002. The completed data sheets were mailed to the study nurse at the largest hospital in the country to be collected and entered into a computer database. **Results:** Results are available at this time for the first 6 months of the study. 531 exposures to toxic substances were recorded of which 234 (44%) were exposures to pharmaceuticals, 208 (39%) non-pharmaceutical substances and 89 (17%) involved multiple agents. Exposures in children 6 years and younger represented 26% of the study sheets. Comparison to poison center data for the same period indicates that a majority of phone inquiries in this age group were made there. Among the most common causes of toxic substance exposure were suicide

attempt—36%, accidental—25%, misuse of a substance for a purpose other than that intended—21%, occupational exposure—10% and other causes—8%. Again, this was in contrast to the poison center data for the same period for which the majority of exposures were accidental. **Conclusions:** Our preliminary data indicates that for the country as a whole, poisoning exposure has nearly the same incidence as motor vehicle accidents on a per capita basis, that poison exposures with symptoms occur as frequently as motor vehicle accidents with trauma, and that toxic exposures are much more common than previously believed. This data demonstrates poisoning exposure to be a grossly underestimated cause of illness and utilization of health care resources in this small, European country.

## 8 SYRUP OF IPECAC UTILIZATION: DEMOGRAPHICS, APPROPRIATENESS, AND MEDICAL OUTCOMES

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**Objective:** To describe demographic characteristics and assess appropriate utilization of Syrup of Ipecac (SOI) within a regional poison center setting. **Methods:** A retrospective review of all single substance exposures over a 21-month period with SOI as documented therapy was conducted. Data analysis included patient age, gender, therapeutic class, and medical outcome. Appropriateness of utilization was analyzed by subsequent random sampling using existing triage recommendations and protocols as assessment criteria. **Results:** SOI was administered in 0.9% of human exposures, a figure comparable with national data (0.8%). 1099 exposures met inclusion criteria; 52% were male and 80% involved children  $\leq 3$  years of age. Five therapeutic classes accounted for nearly two-thirds of exposures involving SOI therapy: mushrooms (21%), analgesics (17%), multiple vitamins with iron (9%), long-acting anticoagulants (8%), and cough and cold preparations (7%). Only 8% of exposures resulted in documented clinical effects: minor (7%), moderate (1%), with no major effects or deaths. One-third of 356 cases randomly selected to assess appropriateness of utilization involved SOI use prior to poison center consultation. Inappropriate utilization rates by the public and poison center were 97% and 9%, respectively, with the public most often



administering SOI for nontoxic ingestion's and the poison center recommending SOI > 1 hour post-ingestion. Conclusion: This regional poison center data indicate a minimal number of substances accounted for the majority of SOI recommendations. As poison centers move toward phasing out or abandoning SOI for gastrointestinal decontamination, a demographic analysis can help impose restrictive use criteria.

### **9 IRON POISONING IN YOUNG CHILDREN: ASSOCIATION WITH THE BIRTH OF A SIBLING**

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Background: Iron is a leading cause of poisoning deaths in young children, and it is routinely prescribed to women in the perinatal period. We designed a case-control study to explore the association between hospital admission for iron poisoning in young children and the birth of a sibling. Methods: We used population-based healthcare data to identify children less than 3 years of age hospitalized for iron poisoning between April 1991 and March 2000 in Ontario, Canada. Matched controls were randomly selected from the general population. The healthcare records of each child's mother were analyzed to identify deliveries in temporal proximity to the poisoning event. We used conditional logistic regression to estimate the relative risk of iron poisoning at various intervals from delivery, adjusting for maternal age and socioeconomic status. A similar analysis was performed for acetaminophen poisoning. Results: We identified 40 children hospitalized with iron poisoning. Children of women who gave birth had a twofold risk of admission for iron poisoning within 6 months (RR 2.0; 95% CI 1.0 to 4.2) and the risk increased nearer delivery. The postpartum period was particularly hazardous (RR at one month 4.1; 95% CI 0.9 to 18.1). A slight but inconsistent increase in the risk of acetaminophen poisoning was also noted. Conclusions: Maternal pregnancy is a distinct risk factor for iron poisoning in young children. The risk is greatest in the immediate postpartum period, and the resemblance of some iron tablets to candy may underlie this finding. Almost half of all hospitalizations for iron poisoning in young children could be prevented if iron products were stored securely in the year surrounding the birth of a sibling.

### **10 AN INCREASE IN POISON CENTER PENETRANCE IS ASSOCIATED WITH THE USE OF A SPANISH-SPEAKING OUTREACH PROGRAM**

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Background or Objective: Penetrance, the number of calls to a poison control center (PCC) divided by the population, is commonly low among Hispanic (HIS) groups. A proactive program using an outreach Hispanic educator was instituted in these areas to increase awareness about poisoning and poison center functions. We conducted a study to determine if any difference in penetrance occurred following this intervention in comparison to controls during the same time frame. Methods: We identified 9 zip code zones in which the US Census Bureau 2000 Report identified as predominately (>20%) Hispanic population. Mean population for the study years was also obtained from this and a similar updated report. A comparison group, of two neighboring zip codes with the greatest geographical contact and <20% HIS, were used as controls. Mean penetrance was calculated 6 months before (7/-12/00) and 6 months (7/-12/01) after a HIS outreach program was initiated in the HIS group only. Penetrance difference % was calculated and compared for both groups using a two-tailed t-test. Results: Mean penetrance for the HIS zip code zones increased 200 calls per 100,000 population compared to a decrease of 160 calls per 100,000 population in the control group (p > .002). Conclusions: An outreach Hispanic program was associated with increased penetrance in zip codes with >20% Hispanic versus controls.

### **11 POISON CENTRE (PC) VS HOSPITAL REPORTED ED VISITS FOR POISONING AS A MEASURE OF PC FUNCTION**

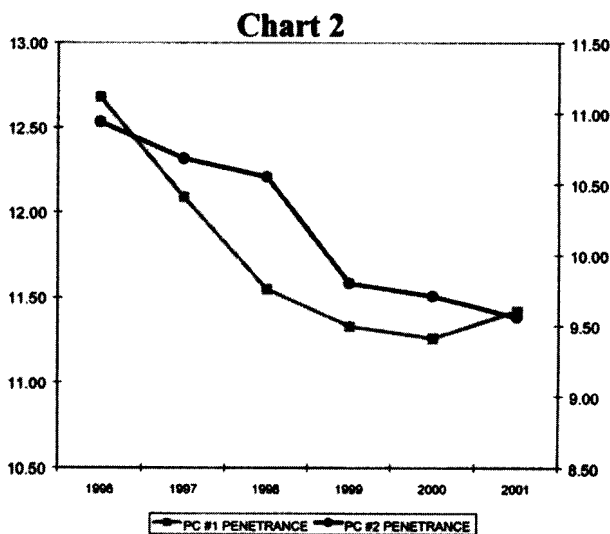
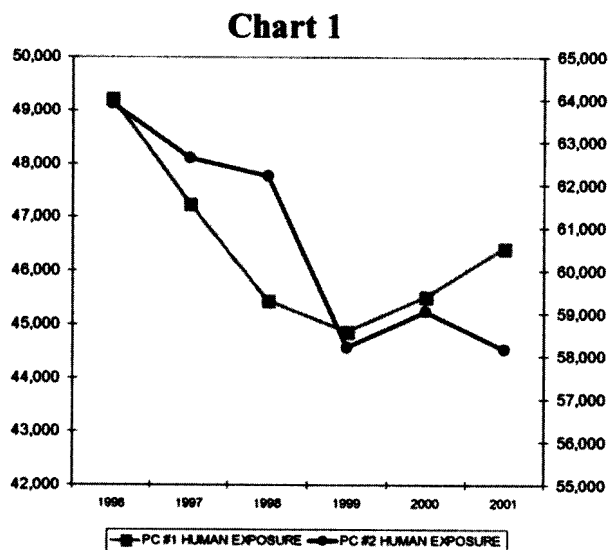
Vicas I, McGrath-Hill C. *Alberta Poison Centre, Calgary, Alberta*

Background: Recent PC data indicate a trend in decreasing call volumes in all age groups, particularly in children <5, despite a 12% overall population increase. Our PC sought to identify causal factors in order to develop short and medium term strategies. Methods: PC data was integrated and compared with regional utilization data obtained from health authority health records and population data from the vital statistics department. Emergency visits (which

include hospital admissions) were extracted for poisoning ICD-9 codes. Data was available for some regions since 1995. 6 year trends in ED visits as reported by hospitals were compared to ED visits for several regions for all age groups, children <5, ages 5–14, 15–29, 30–59 & >60. Results: The population of children <5 has declined overall in the past 4 years partially accounting for the decreasing trend in poison calls in that age group. In one region, for children <5, the curve of ED visits reported by hospitals was virtually superimposable on that of ED visits reported by the PC. This was identified as being partially due to parent awareness together with ED staff willingness to contact the PC about preschool poisonings. In other regions and for all other age groups, there was a significant disparity between hospital and PC reported ED visits, with the adult age groups & particularly the senior age group showing a marked increase in hospital reported ED visits over the past 2 years. Conclusion: Comparing hospital & PC reported ED visits may be a valuable metric to measure PC effectiveness. Awareness programs to promote contacting the PC first before going to the ED should target seniors & adults.

**12 EVALUATION EFFECT OF A PUBLIC EDUCATOR OF PENETRANCE AND HUMAN EXPOSURES REPORTED TO A POISON CENTER**

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Background: There are few studies that use measurable outcomes to gauge the effect of a public educator on the mission of the poison center. Method: Evaluated call volume, penetrance, and human exposures from two regional poison centers for six years (1996–2001). In Poison Center #1 a dedicated educator was employed for the final three years of data (1999–2001). Poison Center #2 data acted as a control with no dedicated educator for the six year period. The two centers were comparable in a number of ways, 1; similar demographic rural and urban populations, 2; similar geographic and economic region, and 3; served one entire state. Results: Human exposures in Poison Center #1 increased 10.8% in the two years after employment of a dedicated educator. (Chart #1) A steep decline in penetrance in Poison Center #1 was reversed after employment of a dedicated (Chart #2) educator. Human exposures and penetrance for Poison Center #2 continued to decline during the study years. Conclusion: The addition of a Public Educator was associated with a positive impact on human exposures and penetrance reported to a regional poison center.

**13 INFANT ALUMINUM RELATED BONE DISEASE (ARBD) AFTER CHRONIC ANTACID ADMINISTRATION**

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**Background:** High concentrations of serum aluminum can inhibit bone remodeling producing osteomalacia and adynamic bone disease. **Objective:** To describe a case of ARBD due to OTC antacid used to treat GERD. **Case Report:** An 8 month-old male presents to ER due to irritability and pain with movement. A skeletal survey revealed multiple rib fractures, evidence of osteoporosis and rickets. PMH was positive for GERD and he was prescribed ranitidine and aluminum hydroxide antacid (1/2 tsp per 6 oz bottle of formula  $\times$  1 month). Clinical and laboratory evaluation suggested hypophosphatemia due to aluminum toxicity. Lab values: Serum PO<sub>4</sub> 2.3 mg/dL (3.2–6.3 mg/dL), Serum Al 14 mcg/L (0–9 mcg/L), Urine Ca 26.7 mg/dL (80–160 mg/dL), Urine PO<sub>4</sub> 2.8 mg/dL (0.3–1.31 mg/dL). The formula was found to contain elevated aluminum, 1/2 tablespoonful instead of 1/2 teaspoonful antacid had been added to each 6-oz bottle for the prior 6 months. **Conclusions:** We report this case to increase awareness of ARBD with use of OTC aluminum containing antacids in children and infants. Query carefully for details such as dose, rate, results and side effects when taking a medication history.

#### 14 LEVETIRACETAM POISONING INDUCES COMA: CONFIRMED BY LABORATORY ANALYSIS

Barrueto F Jr., Williams K, Howland MA, Hoffman RS, Nelson LS. *New York City Poison Control Center, New York, NY*

**Background:** Levetiracetam (Keppra<sup>®</sup>), a new anticonvulsant used to treat partial complex seizures, is also being investigated for its mood-stabilizing properties. Although its precise mechanism of action is unknown, levetiracetam does not appear to directly interact with the GABA system. We report the first intentional overdose with levetiracetam including clinical effects and serial serum concentrations. **Case report:** A 38-year-old woman ingested 60 (500 mg) tablets of levetiracetam that she used as a mood-stabilizing medication for bipolar disorder. She had no other prescription medications available and no other medical history. She vomited four hours after ingestion and presented to the ED two hours later. In the ED, she was obtunded and had diminished deep tendon reflexes. Her presenting vital signs were: BP 105/66 mmHg; P 66/min; R 10/min; T 97.8°F; O<sub>2</sub> sat of 70% on 100% O<sub>2</sub>. She was intubated both for ventilatory

assistance and protection of her airway. Orogastric lavage was performed and activated charcoal (50 grams) was administered. A comprehensive urine drug screen was negative as were serum ethanol, lithium, carbamazepine, phenytoin and valproic acid levels. Her levetiracetam serum concentration was 400  $\mu$ g/mL at 6 hrs, 72  $\mu$ g/mL at 18 hrs and 60  $\mu$ g/mL at 20.5 hrs. The steady state therapeutic serum concentration after daily ingestion of 3000 mg is 10–37  $\mu$ g/mL. Peak levels 1.5 hours after a therapeutic dose are 10–60  $\mu$ g/mL. She was extubated the next hospital day and recovered without sequelae. **Conclusion:** In overdose, levetiracetam is sedating and causes respiratory depression. This patient recovered rapidly with supportive care.

#### 15 DIGITOXIN POISONING FROM AN HERBAL CLEANSING PREPARATION

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**Background:** Cardioactive steroid poisoning is rarely associated with the use of herbal preparations. Identification of the specific compound is difficult due to the large number of potential agents and limitations of the analytic technique. We describe such a case and the subsequent analytic investigation. **Case Report:** A 36-year-old woman with no medical history and taking no conventional medication ingested an herbal preparation marketed for “internal cleansing.” Its ingredients were neither known to the patient nor listed on the accompanying literature. The next morning she developed nausea, vomiting and weakness. In the ED, her pulse was 30/min and BP 110/60 mmHg. Her ECG revealed a junctional rhythm at a rate of 30/min with “digitalis effect.” After empiric therapy with 10 vials of digoxin-specific Fab, her symptoms resolved and she reverted to a sinus rhythm at a rate of 68/min. Her serum digoxin concentration measured by fluorescence polarization immunoassay (FPIA; Abbott TDx<sup>®</sup>) was 1.7 ng/mL. Further serum analysis by the Tina Quant (Roche<sup>®</sup>) digoxin assay, a more digoxin-specific turbidimetric immunoassay, found a concentration of 0.34 ng/mL and an enzyme immunoassay for digitoxin revealed a concentration of 20 ng/mL (therapeutic 10–30 ng/mL). Serum HPLC analysis revealed the presence of active digitoxin metabolites; the parent compound was not present. **Conclusion:** An empiric dose of 10 vials of

digoxin-specific Fab should be given initially in patients poisoned by an unknown cardioactive steroid and then re-evaluate to determine if further administration is needed. Though the diagnosis should be suspected clinically, laboratory analysis involving immunoassays of varying specificity can confirm the presence of cardioactive steroids and perhaps assist with identification.

### 16 SEVERE LACTIC ACIDOSIS IN A METFORMIN OVERDOSE IN THE ABSENCE OF RENAL OR HEPATIC IMPAIRMENT

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**Background:** A case of severe lactic acidosis with an overdose of metformin, in the absence of pre-existing renal or hepatic insufficiency is presented. **Case report:** A 64 year-old female overdosed on metformin and alcohol. Intravenous fluids were begun and the patient was given 2 mg of naloxone with no response. Initial finger stick blood glucose was measured at 240 mg/dl. Initial laboratory values revealed the following: ABG pH of 7.20, pCO<sub>2</sub> of 30 mmHg, pO<sub>2</sub> of 601 mmHg, HCO<sub>3</sub> 11 mmol/L, sodium 125 mmol/L, potassium 4.4 mmol/L, chloride 93 mmol/L, HCO<sub>3</sub> 11 mmol/L, anion gap of 21, BUN 5 mg/dl, creatinine 0.8 mg/dl, and normal liver functions. Acidosis progressively worsened despite 178 meq of intravenous sodium bicarbonate and a constant infusion of bicarbonate. Serum pH fell to 6.98 and hemodialysis against a bicarbonate bath restored pH to 7.23. An arterial blood gas drawn at the completion of hemodialysis showed a pH of 7.23, PCO<sub>2</sub> of 21 mmHg, PO<sub>2</sub> of 151 mmHg, HCO<sub>3</sub> of 9 mmol/L. Despite continued bicarbonate infusions after hemodialysis, the pH fell to 7.16, lactate rose to 18.5 mmol/L, and a second hemodialysis was instituted. By the end of the second hemodialysis run, the patient was alert and oriented and following commands. The patient's pH returned to 7.53, lactate was 6.4 mmol/L and remained stable without recurrent acidosis. **Conclusion:** This case illustrates the occurrence of severe lactic acidosis with a metformin overdose, in the absence of renal failure, liver failure, or hypoxia, the three most common risk factors for metformin associated lactic acidosis. Acidosis was refractory to aggressive bicarbonate therapy and required prolonged hemodialysis against a bicarbonate bath to correct the lactic acidosis.

### 17 MISLEADING LIVER NEEDLE BIOPSY IN TRANSPLANT EVALUATION FOR ACETAMINOPHEN-INDUCED FULMINANT LIVER FAILURE

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**Background:** While the King College Criteria utilizing pH, PT, creatinine and degree of encephalopathy has been advocated for determining patient selection for orthotopic liver transplantation (OLT) in the setting of acetaminophen (APAP) induced fulminant hepatic failure (FHF), some transplant centers may include liver biopsy as a key determinant. Reports suggest that  $\geq 70\%$  hepatic necrosis is predictive of poor outcome without OLT. We report a case of chronic APAP-induced FHF who recovered completely without OLT despite an initial percutaneous liver biopsy (PLB) showing  $> 80\%$  necrosis. **Case Report:** A 32 yo woman presented after long-term hydrocodone/APAP use for chronic pain with AST 2398 IU/L, PT 35.8 sec, APAP 67.2 ug/mL and negative viral serologies. By hospital day (HD) 2 she progressed to grade IV encephalopathy and worsening coagulopathy. Treatment included IV NAC, factor VII and DDAVP. Serum pH and creatinine remained normal. Given her clinical deterioration OLT was considered and a PLB was performed on HD 3 demonstrating  $\geq 80\%$  centrilobular necrosis. Transplant arrangements were made. By the time the donor liver arrived (HD 5) the patient's clinical and laboratory status had somewhat improved. A second PLB showed 40–50% necrosis. OLT was not performed and the patient swiftly recovered and was discharged on HD 7. **Conclusion:** The use of PLB for OLT patient selection in patients with APAP induced FHF may be misleading. PLB results should be interpreted with caution, as the procedure samples a very small, potentially misrepresentative fraction of the entire organ. Until the use of PLB in this setting is validated, the Kings College criteria should be relied upon for patient selection.

### 18 DELAYED DYSTONIA FOLLOWING PIMOZIDE OVERDOSE IN A CHILD

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**Background:** Pimozide overdose has not previously been reported in children. In adults, pimozide intoxication may cause seizures, extrapyramidal and anticholinergic effects, hypotension, QT prolongation and torsades de pointes. We report dystonia, hypotension and drowsiness following pimozide ingestion in a child. **Case report:** An alert 18-month-old presented to hospital 40 minutes after ingesting up to 6 mg (0.5 mg/kg) of pimozide. Vital signs: BP 91/62, HR 130, RR 26. She received gastric lavage and activated charcoal. One hour later, her QTc was 420 msec, HR 150. She remained asymptomatic until 12 hours post-ingestion, when she developed drooling, tongue thrusting and drowsiness. BP was 75/40, HR 150, QTc 440 msec. BP increased to 95/50 after a bolus of normal saline. Her dystonia subsided over the next 12 hours without treatment. Drowsiness and tachycardia persisted until 40 hours post-ingestion. QTc at this time was 370 msec. Patient recovered without sequelae. **Conclusion:** Pimozide overdose in children may be associated with delayed onset of symptoms, including dystonia.

## 19 LATE SEIZURE FOLLOWING INGESTION OF VICKS VAPORUB

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**Background:** Nearly all seizures from camphor occur following ingestion of liquid preps containing 10–20% camphor. Toxicity following ingestion of Vicks VapoRub (VVR), an ointment containing 4.8% camphor, is extremely rare and late seizures have not been reported. We report a case of camphor toxicity with seizure 9 hr following ingestion of VVR. **Case report:** Parents of a 4 yo girl found her lying in bed in her emesis with altered mental status. 6 hr earlier they had applied a small amount of VVR from a new container to her chest for minor cold symptoms. The 3-oz container was found with 2 oz missing and small finger marks in the remaining product. Parents reported that the pt commonly ingested non-food products and estimated this ingestion to be 5 hours earlier, after application of the VVR and prior to going to sleep. In the ED, the pt vomited repeatedly with the emesis smelling of VVR. She was alert, oriented and afebrile, with clear lungs and a normal neuro exam. During 4 hr of observation there was no seizure activity. Just prior

to discharge home, 9 hr following the ingestion, she had a sudden tonic-clonic seizure lasting 3 min. Although this was the first witnessed seizure, it is possible that she had an unwitnessed seizure at home. She received IV lorazepam and phenobarbital, and awoke without further toxicity as sedation wore off. Amount of camphor ingested was 175 mg/kg and serum level 12 hr following the ingestion was 4.1 µ/ml, both consistent with toxicity. **Conclusion:** Products containing low percentages of camphor, widely perceived as harmless, may be dangerous when ingested. Ointment formulations may delay absorption of camphor and its toxic effects.

## 20 THERAPEUTIC ERRORS IN CHILDREN

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**Objective:** To characterize the most common pharmaceutical agents implicated in therapeutic errors in young children and to describe the clinical manifestations and medical outcomes of these errors. **Methods:** A retrospective review of all therapeutic errors in children <6 years of age reported to the American Association of Poison Control Centers Toxic Exposure Surveillance System from 1999–2000. Data analyzed included demographics, medications involved, route of exposure, clinical effects, therapy provided, and medical outcome. **Results:** Therapeutic errors were reported in 95,827 children <6 years of age; 54% males and 27% <1 year of age. Eighty-three percent of these errors were acute, 96% involved ingestions, and 98% occurred at a residence. The most common therapeutic classes involved were cough/cold preparations (36%), analgesics (22%), antimicrobials (11%), antihistamines (10%), and asthma medications (4%). Clinical effects were documented in 12% of cases: minor (67%), moderate (8%), major (0.7%), no follow-up (24%), and 4 deaths. Neurological and GI effects were noted in 76% and 18% of symptomatic cases, respectively. Therapeutic errors were associated with moderate or major clinical effects in a number of drug categories, including antineoplastics (26%), muscle relaxants (8.5%), sedative/hypnotics (8%), anticonvulsants (7%), and cardiovascular drugs (6%) as well as a number of individual drugs, including ketamine (50%), insulin (26%), chloral hydrate (26%), and phenytoin (22%). Eight percent of all cases were managed in a health care facility. Only 3% of all

children required therapy other than decontamination, most commonly IV fluids. Conclusion: Therapeutic errors are common in young children. Overall, clinical significance is uncommon; however, a select number of medications are more likely to result in adverse effects when given to a young child in error.

## 21 METHANOL TOXICITY IN A NEWBORN INFANT

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Background: Methanol toxicity has not been previously described in a human during the neonatal period. Early recognition of methanol poisoning is vital to prevent the toxic effects of its metabolites. Case Report: A 28 year-old female G<sub>3</sub>P<sub>2002</sub>, who was 28 weeks pregnant, presented to the emergency department in respiratory distress. She had a history of asthma, cocaine abuse, and a hospitalization 2 months earlier for unexplained metabolic acidosis. On this presentation, she was acidotic (ABG pH 7.17, PCO<sub>2</sub> 10, BD 22) with an anion gap (AG) of 26 and fetal bradycardia was noted. Her son was delivered by emergent C-section: 950 gram birth weight with Apgars of 1 and 3. He required 2 doses of epinephrine and airway intubation for resuscitation. His ABG at 1 hour: pH 6.9, PCO<sub>2</sub> 36, BD 26. During his first 2 days of life, his perfusion was poor and his acidosis persisted (AG > 27) despite fluid, blood, and bicarbonate administration. The mother also had persistent metabolic acidosis (pH < 7.1) despite fluids, bicarbonate, and dopamine. Other initial maternal labs included: lactic acid 2.9 mmol/L (1.4–4.1), undetectable ethanol and salicylates, and an osmolar gap of 41. An ethanol drip was initiated 36 hours after admission when a methanol level of 54 mg/dL was reported. Our regional poison center was consulted on hospital day 3. Recommendations included adjusting the ethanol drip, starting dialysis, and a repeat methanol level for the mother (0 mg/dL). Antizol and a methanol level were recommended for the newborn (62 mg/dL). Because the infant developed a grade 4 intraventricular bleed, no further therapy was offered and he expired on day 4. The mother developed renal failure and expired on hospital day 10. Conclusion: This is the first reported case of methanol toxicity from transplacental exposure. Persistent acidosis in a newborn may be suggestive of maternal drug

toxicity. Early recognition of toxicity may improve outcome.

## 22 SEVERE PERMETHRIN TOXICITY IN A 19-MONTH CHILD DUE TO INAPPROPRIATE HOME TREATMENT FOR HEAD LICE CONTROL

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Background: The US Environmental Protection Agency considers permethrin to be a pesticide with low potential for human toxicity. Intentional permethrin ingestion has been reported to cause vomiting, diarrhea, headache, paresthesias, muscle fasciculation, and coma. We present a case of severe permethrin toxicity due to 4-day exposure in a contaminated home. Case Report: Three siblings (9 Y, 7 Y, 19 mo) received one application of 1.0% permethrin cream rinse for head lice. The children's bedding was then saturated with 3 canisters of 0.5% permethrin spray. Additionally, 2 pounds of 0.25% permethrin powder was sprinkled throughout the home. Over the next 3 days all 5 family members developed mild diarrhea and emesis. The 19-month female developed progressive GI symptoms and cough attributed to an infection. On day 4 she presented with agitation, ataxia, seizures, fasciculations, cardiac conduction blockade, and respiratory failure due to severe pulmonary edema. Broad infectious disease workup was negative. Permethrin exposure was elucidated the day of ICU admission. Surface swab testing of the family's home for permethrin revealed (ppm):

- Parent's bedroom (2.4)
- Child's upholstered chair (227)
- Family room carpet (15.3)
- Child's bedroom carpet (70.9)
- Kitchen surface (2)
- Child's toys (9.7)

Conclusion: Over zealous home application of permethrin resulted in widespread insecticide contamination. Mild effects were noted in 2 adults and 2 older siblings. We postulate that continuous exposure to higher parts per million contamination produced effects consistent with severe permethrin poisoning in the most at-risk member of this family.

### 23 SKIN BREAKDOWN AND BLISTERS FROM SENNA CONTAINING LAXATIVE INGESTION IN YOUNG CHILDREN

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**Background:** At the direction of the FDA, phenolphthalein was removed from all OTC laxatives in 1999. Phenolphthalein was replaced in most laxative products with the natural product senna from *Cassia avatifolia* Delile which contains various anthraquinones. No safety studies of senna use in children under 6 years of age have been performed. **Method:** Evaluation of all ingestion exposures of senna-containing laxatives in children less than 5 years of age from six poison centers over a nine-month period. Inclusion criteria required 24-hour follow-up and the presence of diarrhea to confirm ingestion. Parents were told routinely that severe diaper rash was possible and to protect the perianal area with frequent cleaning and a barrier ointment if the child was wearing diapers. **Results:** 110 cases were reported. 19 children experienced no diarrhea and four were lost to follow-up. 87 exposures were evaluated. 50 Children (57%) were  $\leq 2$  years old. 47 children remained in diapers, 31 children were fully toilet trained and 9 wore diapers (pull-up pants) overnight. Twenty-six children (30%) experienced a severe diaper rash. The mean time to recognition of the diaper rash was 16.0 hours (SD  $\pm$  8.5). Eight children (9%) had blisters and skin sloughing. In three cases suggestion of child abuse via hot water immersion burn was initially investigated because the skin breakdown was so severe. Skin burns and loss were seen primarily on the buttocks and perineum loosely following the diaper area. The mean time to onset of blisters was reported as 15.7 hours (SD  $\pm$  6.4). These data have been reported to the FDA via the MedWatch program. **Conclusion:** Exposure to senna-containing laxatives in young children may potentially cause severe diaper rash, blisters and skin sloughing.

### 24 RETROSPECTIVE REVIEW OF TRAMADOL CASES REPORTED OVER 2.5 YEARS

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**Objective:** Previous literature suggests that tramadol overdoses (T-OD) cause only 1–2 seizures (szs) within 4 hrs. A case with multiple szs occurring up to 10 hrs later prompted a review of all T-OD reported to the CPCS. **Method:** All T-OD from Jan 1, 1999 to July 19, 2001 were analyzed. **Results:** 602 cases of T-OD; 366 had known outcome; 191 T-OD-only. Demographics: M 45%, F 55%, acute 89.5%, chronic 8.4%, acute on chronic 2.1%, age 9 mo to 80 yr (avg. 26.2 yr), suicide 37%, unintentional gen. 28%, intentional misuse 13%, abuse 8%, ADR 8%, therapeutic error 6%. **Main Findings:** CNS depression 26.2%, N/V 20.9%, tachycardia 17.3%, szs 13.6%, HTN 5.8%, dizziness 5.8%, agitation 5.2%, movement disorder 4.7%. Dose: taste—5000 mg, (avg. 751 mg). Tx: obs. only 42.4%, AC 47.1%, naloxone (Nx) 5.8%, lavage 3.1%, antiemetic 2.6%, sedative 1.6%, anticonvulsant 1% (used without effect). Nx used in 11 patients (7 responded, 1 no response, 3 unknown results). The smallest amount of T-OD causing szs was 200 mg. 84.6% of szs occurred within 6 hrs. # szs: one (80.8%); two (3.8%); multiple (11.5%); and unknown (3.8%). Outcome: no effect 36.3%, minor 43.7%, moderate 19.5%, major 0.5%. Duration of effect:  $< 2$  hr 7.4%,  $< 8$  hr 37.4%,  $< 24$  hr 16.8%,  $< 3$  days 2.1%. **Conclusion:** CNS depression, N/V, tachycardia and szs were commonly reported. Szs occurred in 13.6% of T-OD after as little as 200 mg. 80% of szs were single events. Szs occurred within 6 hrs post ingestion in 84.6% but delayed szs  $> 10$  hr post ingestion did occur. Nx improved mental status without unmasking szs. T-OD rarely caused major effects. 81.1% of patients had effects lasting less than 8 hrs.

### 25 RAPID METHANOL CLEARANCE WITH HIGH-FLUX HEMODIALYSIS

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**Background:** Characterization of methanol clearance in overdose by the new high-flux hemodialyzers has not previously been reported in the literature. **Case Report:** A 17 year-old male presented to the ED 30 hours after drinking a half cup of methanol-containing windshield wiper fluid in a suicide attempt. He denied any co-ingestants or symptoms including visual disturbances. Initial vital signs were within normal limits. His physical and funduscopic examination were unremarkable. His

initial laboratories included CO<sub>2</sub> 28 mmol/L, anion gap 13, osmol gap 50 and methanol level 129 mg/dl. Acetaminophen and salicylate levels were negative as were ethanol, ethylene glycol, acetone, isopropanol and a urine drug screen. Fomepizole was administered and he was placed on emergent hemodialysis for 6 hours using a Fresenius F80 dialyzer cartridge with a blood flow of 400 ml/min. Serum methanol concentrations were collected hourly during dialysis. In the middle of the dialysis run, a matched pre- and post-dialyzer set of methanol levels were obtained for calculation of the extraction ratio and dialyzer clearance. Methanol blood concentrations showed good fit to a first-order elimination process before and during dialysis with half-lives of 19.5 hours ( $r^2 = 0.89$ ) and 1.74 hours ( $r^2 = 1.0$ ) respectively. The extraction ratio of methanol at mid-run was 1.0 (pre-dialyzer 46 mg/dl, post-dialyzer 0 mg/dl) with clearance being limited only by blood flow. Methanol concentration 1.25 hours after dialysis was <10 mg/dl. The patient never developed signs or symptoms of methanol poisoning. Conclusion: The half-life of methanol on normal hemodialysis has been reported to be in the range of 3.4 hours. High-flux hemodialysis may decrease this by one-half potentially limiting the number of hours dialysis needs to be performed for methanol intoxication.

## 26 AN OUTBREAK OF CIGUATOXIN POISONING FOLLOWING BARRACUDA FISH INGESTION IN SOUTHERN TAIWAN

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Background: Barracuda fish ingestion is not common in southern Taiwan. Therefore, outbreak of ciguatoxin poisoning following barracuda fish ingestion had rarely been described before. We report an outbreak of ciguatoxin poisoning following barracuda fish ingestion in southern Taiwan. Case series: Three patients of a family developed nausea, vomiting, watery diarrhea and myalgias about one hour after taking three to ten pieces of eggs of barracuda fish. Numbness and tingling of the lip and four limbs followed the GI symptoms about 2 hours after ingestion. Severe headache and dizziness were noted. The more severe two patients were sent to our hospital right away. Physical examination revealed hyperthermia, hypotension, bradycardia and hyperre-

flexia. Initial laboratory studies included normal renal and liver function. ECG showed sinus bradycardia. After receiving volume resuscitation with normal saline, and dopamine infusion at 10 µg/kg/min, her blood pressure raised to 110/70 mmHg. Subsequent treatment included repeated doses of intravenous atropine 1 milligram each. Vomiting and diarrhea got recovered one day later; however, bradycardia persisted for several days, and one patient required intravenous atropine continuous infusion 40 mg totally within 2 days. EMG and nerve conduction study revealed negative finding. Further follow up of the patients disclosed improvement of neurological sequelae and bradycardia, but still with sensory impairment. Conclusion: This is an outbreak of ciguatoxin poisoning following barracuda fish ingestion in Taiwan. Ciguatoxin poisoning can cause severe bradycardia requiring careful ECG monitoring. Adequate hydration and atropine use is mandatory in the management of ciguatoxin poisoning.

## 27 DERMAL ABSORPTION OF A LIQUID DIPHACINONE RODENTICIDE CAUSING COAGULOPATHY

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Background: Rare cases of coagulaopathies from dermal absorption of hydroxycoumarin derivatives have been reported. We report the first case of dermal absorption of an indandione derivative rodenticide causing severe coagulopathy. Case report: An 18 year-old male worker at a pest exterminating company spilled a concentrated liquid preparation of 0.106% diphacinone in his boot. He did not remove the boot or wash the area for 6 to 8 hours. Seven days later he presented to the emergency department with flank pain, hematuria and epistaxis. Laboratory values were PT > 40 sec, PTT > 90, Hgb 16.2, Platelets 273. Urinalysis reported gross hematuria with RBCs too numerous to count. Prolonged bleeding was noted at IV puncture sites. Initial therapy included IM injection of vitamin K and nasal packing. The patient's religious beliefs precluded the use of blood products. The patient was admitted for observation until PT was controlled. He was discharged on high dose oral vitamin K dose titrated to the INR measured Q 48 hrs. After two weeks, a dose of 100 mg/day was set and the patient followed as an outpatient for three months. Vitamin K therapy was tapered and discontinued at 60 days post



exposure with no further elevation in PT. Diphacinone was detected in a serum sample drawn 60 days post exposure using gradient and isocratic HPLC methods with fluorescence and UV detection. **Conclusion:** We report the first case of dermal absorption of diphacinone causing severe coagulopathy. Potential factors increasing the dermal absorption of the diphacinone were: prolonged skin contact in a confined area and exposure to a concentrated solution.

## 28 OUTCOMES OF CHLORINE EXPOSURE: A FIVE-YEAR POISON CENTER EXPERIENCE

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**Introduction:** The outcome following chlorine exposures is poorly described. **Methods:** We conducted a five-year retrospective poison control center (PCC) review of chlorine exposure cases. Inclusion criteria was self (or surrogate) reported concentrated "chlorine" liquid ( $\geq 10\%$  concentration of sodium hypochlorite) or tablet ( $\geq 90\%$  concentration) exposure. Two reviewers blinded to the main purpose of the study reviewed charts and a third reviewed 10% of the charts and a kappa score was calculated. Parameters reviewed included type of exposure (tablets, liquid or both), symptoms (cough, chest pain, etc), time to symptom onset, treatment received, hospital referral rate and outcomes. **Results:** 598 patient records were reviewed with a mean age of 29.63 [range: 11–82] yrs. 41.5% (248) were exposures to tablets and 53.5 (320) were exposed to liquid chlorine with the remainder exposed to both. Complaints included 38.1%: shortness of breath, 8.5%: eye irritation, 9.7%: nasal complaints, 70.1%: cough, 2.5%: skin complaints, 11.5% (69 patients) were evaluated at a HCF (11 referred by PCC and 58 were self-referrals). 5 (.8%) total patients were admitted and 4/5 had a history of reactive airway disease. Mean time till peak symptoms was 94.4 minutes (min.), 63.2% had the peak of their symptoms within 30 min. and 82% within 120 min. with 74% of all patients asymptomatic within 150 min. All 5 admitted patients were discharged within 48 hours and all others remained clinically well at 24 hr telephone follow-up. The P-value for kappa and 95% confidence interval (CI's) for interobserver reliability was  $p = .0005$ , kappa of .73 with CI's (.41–.96). **Conclusions:** Exposure to chlorine tablets and liquid rarely requires hospital referral with almost all symptoms resolving with 24 hours.

## 29 SEIZURES, DYSRHYTHMIA AND DEATH AFTER ZONISAMIDE OVERDOSE

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**Background:** Overdose experience with the anti-epileptic agent Zonisamide (Zonegran<sup>®</sup>, ZNS) is limited. **Case Report:** Paramedics were called to the scene of an unresponsive 18-y.o. woman after single drug ingestion of ZNS 4.8 gm in a suicide attempt. The patient experienced multiple generalized T-C seizures, and manifested copious airway secretions. En route to the ED, she sustained a cardiopulmonary arrest. Upon arrival, she had an asystolic rhythm, which converted to a perfusing wide complex tachycardia after 17 minutes with 5 mg epinephrine, 3 mg atropine and 3 ampules of sodium bicarbonate. In addition to dopamine, over the next hour she received 4 more ampules of sodium bicarbonate and a sodium bicarbonate drip, with generation of a narrow complex perfusing rhythm. Urine comprehensive drug screen was negative. Serum ZNS levels are pending. CT scan of the head approximately 24 hours after presentation revealed massive cerebral edema with tonsillar herniation. Brain death was confirmed. No other organ system (renal, hepatic, pulmonary, cardiac) showed signs of hypoxic/ischemic injury. She was a multi-organ transplant donor. **Conclusion:** The mechanism of action of ZNS includes inhibition of voltage sensitive Na<sup>+</sup> channels, T-type Ca<sup>2+</sup> channels, and the enzyme carbonic anhydrase. The isolated cerebral injury suggests there may be a ZNS-related injury mechanism beyond ischemia. ZNS may cause seizures, cardiac arrest, and isolated massive cerebral edema in the setting of acute overdose.

## 30 BAKING SODA POISONING FOLLOWING PROPHYLACTIC "NIPPLE DIPPING" TO PREVENT COLIC

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**Background:** Baking soda is a commonly used home remedy to alleviate gastric upset. We report severe

complications from baking soda given to an 11-day-old infant to prevent colic. **Case Report:** An 11-day-old healthy female, who had been staying with her maternal grandmother, was admitted to the hospital with a one day history of fever and fussiness. Empiric antibiotics were given for a white blood cell count of 23,300/mm<sup>3</sup>. Other significant laboratory results included sodium 187 mmol/L, bicarbonate 44 mmol/L, and pH 7.95. Further history revealed that the patient's grandmother mixed "2 scoops" of Arm and Hammer baking soda with 2 ounces of water in the child's formula and also dipped the milk-bottle's nipples in baking soda to prevent colic. A CT scan of the head revealed cerebral edema. The patient's course was complicated by apnea, intubation, mechanical ventilation, and multiple episodes of generalized tonic-clonic seizures. Isotonic fluids, phenobarbital, and acetazolamide were used to treat the patient. She was discharged in good health 6 days after admission. **Conclusion:** Significant morbidity can follow inappropriate ingestion of baking soda. This case illustrates the youngest patient poisoned by a prophylactic administration of baking soda and represents the highest pH reported after baking soda toxicity.

### 31 ACCUPRESSURE TO PREVENT EMESIS DUE TO ACTIVATED CHARCOAL

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**Background:** Emesis after activated charcoal (AC) is problematic. Acupressure (traditional Chinese medicine) has been used to treat emesis, but has not been tested in overdose patients. **Objective:** To determine (1) the incidence of emesis after AC and (2) the ability of acupressure to prevent AC-induced emesis. **Methods:** Part one was a prospective study of consecutive overdose patients to determine the incidence of emesis after AC. Awake patients > 17 yr received 1 gm/kg AC orally or via nasogastric tube, and were then observed for 1 hr. These patients served as controls for part two of the study, where acupressure bands were placed on patients at the Nei-Guan P6 point of both wrists prior to AC, followed by 1 hr observation. Exclusion criteria included: antiemetic drug ingestion, antiemetic drug therapy within 1 hour of AC, or intubation. **Results:** 81 patients served as controls and 106 patients received acupressure. Demographics and ingested substances were similar in both groups. 21/81 (26%) in the control group and 15/106 (14%) in the acupressure group vomited. Emesis was 46% lower in the acupressure group

( $p = 0.043$ ;  $\chi^2$ ). The 95% CI for the difference in proportions was 23–0.6%. Within the acupressure group, the mean duration of prophylactic acupressure was  $10 \pm 18$  min for patients without vomiting, compared to  $5 \pm 6$  min in those with vomiting ( $p = 0.049$ ; students t test). **Conclusion:** The incidence of emesis after AC at our institution was 26%. Prophylactic acupressure reduced AC-induced emesis by 46%. Investigators suggest at least five minutes of acupressure prior to AC decontamination.

### 32 PERCHLOROETHYLENE MULTIPLE-CASUALTY INCIDENT

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**Background:** Perchloroethylene (PCE) is a halogenated hydrocarbon solvent widely used in dry cleaning and as a metal degreaser. Most human PCE studies relate chronic low-level occupational or environmental exposures to renal and hepatic effects and potential carcinogenicity. Reports of acute PCE exposures are uncommon, and usually involve single, isolated victims. We report a multiple-casualty acute PCE exposure incident involving a primary victim and 5 rescue workers presenting for medical care. **Case Series:** The primary victim was a 36-year-old male who lost consciousness while cleaning a 6 inch deep vat of PCE in an enclosed space. He was removed, decontaminated, and presented for medical attention with diffuse 1st degree chemical burns, amnesia to the event, and slow speech. Fiberoptic endoscopy revealed erythema of the arytenoids, and the patient had elevated liver function tests (peak ALT 75, peak AST 57). The first rescuer used protective gear, including SCBA, and developed heat exhaustion. Two firefighters without respiratory protection who lowered the first rescuer into the vat developed dizziness, throat irritation, and shortness of breath, and were admitted for overnight observation. Two other rescue workers developed similar, but milder symptoms and were discharged home after medical evaluation. **Conclusion:** This multiple-victim case series demonstrates the range of effects that may occur with acute PCE exposure, including mucous membrane and dermal irritation, central nervous system depression, and toxic hepatitis, and that exertional heat illness may complicate rescue efforts when personal protective gear is employed.

### 33 PREHOSPITAL ACTIVATED CHARCOAL: WHO SHOULD BE TREATED?

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**Background:** Pre-hospital administration of activated charcoal (AC) has been suggested as a potentially effective intervention for overdose patients. This study investigates the feasibility and potential risk benefit of AC in different patient groups. **Methods:** Prospective 6 year cohort study of presentations to a toxicology unit. Outcomes included time since ingestion for ambulance attendance and subsequent emergency department triage. Cases were stratified by ingestion type, based on toxicity and the potential for sedative effect. **Results:** Of 2041 cases included, 774 cases (38%) were attended by ambulance within 1 hour, 161 (8%) were triaged within 1 hour. 1247 cases (61%) were attended by ambulance within 2 hours, 862 cases (42%) were triaged within 2 hours. Non-sedating highly toxic substances were ingested in 55 cases, of these only 24 were attended by ambulance, and 5 triaged, within 1 hour. Conversely of 439 patients ingested less toxic sedative agents (e.g. benzodiazepine), 160 were attended by ambulance, and 32 triaged, within 1 hour. Compared with protocols that suggest ambulance initiated AC to all patients who ingest any medication absorbed by charcoal, limitation to patients who ingest highly toxic compounds reduces the need to treat to 3.1% at 1 hour and 2.9% at 2 hours. **Conclusion:** Ambulance administration of AC increases the number of patients who could potentially be decontaminated by exposing 21% of patients with low risk sedative poisonings to an increased risk of aspiration. The risk benefit of AC is enhanced by targeting only life-threatening high risk poisonings.

### 34 EVALUATION OF THE ACCURACY OF ECG AND TCA LEVELS IN THE PREDICTION OF COMPLICATIONS RESULTING FROM TCA OVERDOSE

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**Objectives:** To summarize and compare different prognostic criteria used to predict occurrence of seizures, ventricular arrhythmia (VA) and death in patients with

TCA overdose. **Methods:** A MedLine search (1966–2001) identified 32 articles. Studies were excluded if 2 × 2 tables could not be reconstructed (n = 11); only discriminated between TCA positive and TCA negative patients (n = 2); and abstract or duplicate articles (n = 4). Accuracy measures were summarized across studies. In addition, data were analyzed using linear regression methods after accounting for possible threshold differences between studies. SROC curves were then generated. **Results:** The sensitivity (Se) and specificity (Sp) of the QRS  $\geq 100$  ms to predict seizures were 0.71 [95% CI 0.56–0.82] and 0.66 [95% CI 0.52–0.78] compared to 0.71 [95% CI 0.57–0.82] and 0.72 [95% CI 0.61–0.72] for the TCA level ( $\geq 500$  or 1000 ng/mL). The Se and Sp of the QRS to predict VA were 0.70 [95% CI 0.42–0.99] and 0.52 [95% CI 0.37–0.66] compared to 0.79 [95% CI 0.49–0.95] and 0.43 [95% CI 0.37–0.49] for the TCA level. The Se and Sp of the QRS to predict death were 0.79 [95% CI 0.48–0.94] and 0.65 [95% CI 0.60–0.69] compared to 0.76 [95% CI 0.49–0.91] and 0.60 [95% CI 0.47–0.72] for the TCA level. Very few studies evaluated the accuracy of QTc and T 40 ms axis. Positive likelihood ratios (LR) of the criteria evaluated were between 1.14 and 2.92 and negative LR between 0.32 and 0.94. **Conclusions:** Overall, the ECG and the TCA level had poor positive and negative predictive value for complications, such as seizures, VA or death, associated with TCA overdose. Improved recording of the timing, measurements and outcomes leave room for substantial improvement in the performance of these tests.

### 35 TWO CASES OF SUSPECTED SAXITOXIN POISONING FROM PUFFER FISH INGESTION

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**Background:** In 2000, approximately 41 tons of blowfish (puffer fish) were sold in the US with no reported cases of toxicity. We present the 1st 2 cases of blowfish-associated poisoning in the US, in which saxitoxin was detected in the non-consumed portions of the fish. **Case 1:** A 65 yo female ate 6 pieces of blowfish (caught by a recreational fisherman in Florida) and within minutes developed tingling of her lips and tongue. Over the next 2 hours her symptoms intensified and she had 1 episode of vomiting. Her vital signs were: BP, 160/76 mmHg; pulse, 109/min; temperature 99.5F. She developed chest pain and was treated with topical nitroglycerine. Over the next 4–6 hours, she

developed ascending paralysis and declining pulmonary function, and was intubated. Over the next day she regained reflexes and voluntary movement and, was extubated 72 hours later. Case 2: A 69 yo male (husband of Case 1) ate 6 pieces of blowfish and within minutes developed tingling of the lips and fingertips. On presentation his vital signs, mental status, respiratory status, and neuromuscular examination were all within normal limits. He was treated with mannitol and activated charcoal. On day #2 he was asymptomatic. Toxin analysis: Liquid chromatography-tandem mass spectrometry identified saxitoxin and 2 analogs in uneaten samples of the puffer fish, concentrations ranged from 9,000 to 20,000 mcg saxitoxin/kg of tissue. No tetrodotoxin was detected. Additional cases: Subsequent to our original case report, 10 additional suspected cases were uncovered in 2 other states. Conclusion: Blowfish caught off the Florida coast appear to be vectors for saxitoxin poisoning.

### 36 PEDIATRIC BODY-PACKING: A 12-YEAR-OLD “MULE”

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Background: After the events of September 11, increased border security in the United States has had many effects, one of which is to increase the amount of drugs confiscated at US border crossings. As a result, drug traffickers may be under pressure to use any means possible to deliver their product to the US, including the utilization of children. In conjunction with this hypothesis, we report a 12-year-old body-packer, the youngest such patient ever described. Case Report: A 12-year-old presented to the Emergency Department complaining of rectal bleeding. He had recently arrived in the US from Europe, and had passed through airport security without incident. In the ED he admitted to body-packing 87 packets of heroin, and stated that he had passed several packets before presentation. He had no other somatic complaints. His vital signs were normal. His mental status was normal, and pupils were midrange and reactive. Abdominal examination revealed normal bowel sounds. Abdominal radiography demonstrated multiple foreign bodies, consistent with drug packets. He was treated with whole bowel irrigation and activated charcoal, and ultimately passed the remaining 84 bags of heroin. Barium-enhanced radiography and colonoscopy after the passage of these packets confirmed an empty gastrointestinal tract. The patient was discharged to the custody of law enforcement officials. Conclusion: An

increase in airport security after the events of September 11 in the US has led to greater confiscation of smuggled drugs, and smugglers may try previously unutilized and underutilized means to deliver their product to the United States. We report a 12-year-old body-packer, the youngest such patient ever reported, and urge physicians to be aware that body-packing is not confined to the adult population.

### 37 KETAMINE MEDICATION ERROR RESULTING IN DEATH

Long H, Nelson LS, Hoffman RS. *New York City Poison Control Center, NY, NY*

Background: Ketamine causes relaxation of bronchial smooth muscles and is used to treat bronchospasm in asthmatic patients who require mechanical ventilation. It increases heart rate, blood pressure, and cardiac output with a resultant increase in myocardial oxygen consumption. Ketamine is considered to have a wide margin of safety, with no adverse outcomes reported even in the setting of profound overdose. We report a death directly attributed to iatrogenic ketamine overdose. Case Report: A 69 year old woman with a history of hypertension and asthma presented with shortness of breath. She was treated for asthma exacerbation with standard therapy, including albuterol and methylprednisolone, with little improvement. Prior to intubation the patient was administered midazolam and ketamine. Within minutes, the patient developed cardiopulmonary arrest and died. It was subsequently discovered that the patient was given 500 mg of ketamine IV instead of the intended dose of 50 mg IV (recommended dose is 1–2 mg/kg). Post-mortem examination revealed 75% stenosis of the left anterior descending coronary artery and hypertensive heart disease. Cause of death was attributed to coronary artery disease exacerbated by ketamine overdose. Conclusion: Although ketamine overdose is not generally life-threatening, serious outcomes may occur, particularly in patients with underlying heart disease. This case also highlights the need for continuing efforts to prevent medication dosing errors.

### 38 SUPPORTIVE TREATMENT FOR INTRA-DIGITAL EPINEPHRINE INJECTIONS

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**Background:** Aggressive treatments of intra digital injections of epinephrine may include phentolamine, digital blocks, or vasodilators. This study examined outcomes in cases treated with aggressive or supportive therapy (warmth and range of motion). **Method:** All cases of unintentional intra digital injections of epinephrine managed by one poison center (PC) over 40 months were retrospectively reviewed. **Results:** In 44 cases meeting the entry criteria, the mean age was 25.5 yrs (5–82 yrs). Mean time from exposure to initial PC contact was 12.5 min (1–503 min). Finger injections (25/44) were more common than thumb. 20/44 (45%) were treated at home with only supportive therapy. 6 (14%) were referred to a Health Care Facility (HCF) primarily for patient complaints of pain and pallor; 5 received supportive therapy and 1 received topical nitropaste. 18 (41%) were self referred to the HCF; 12 received supportive therapy, 3 received topical nitropaste, and 3 received phentolamine infiltration. 37/44 (84%) received supportive care only, regardless of management site. Symptom frequency in those treated supportively (n = 37) vs aggressively (n = 7): edema (13 vs 0), decreased perfusion (28 vs 7), numbness/tingling (11 vs 2), pain/trauma (23 vs 4), and non-digit symptoms (7 vs 0). Accurate length of symptoms could not be determined due to inadequate follow up. Only, one patient (treated with phentolamine) had a prolonged morbidity (pain) for 7 days. Regardless of treatment method, tissue necrosis or loss of digit didn't occur. **Conclusion:** Most patients receiving unintentional intra digital injections of epinephrine are treated with supportive care with good outcomes. A larger and prospective study is required to determine indications for aggressive treatment.

### 39 UNUSUAL PRESENTATION OF HEMOLYTIC ANEMIA IN PARAQUAT INTOXICATION? A CASE REPORT

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**Objectives:** Paraquat is the most toxic dipyrilidium herbicide and has caused numerous human fatality. Poisoning with paraquat can induce serious damage to many organs, especially the lungs, the kidneys or the liver, and is associated with a high mortality rate. We present a case with severe paraquat intoxication and observe the uncommon hemolytic anemia after gastrointestinal

symptoms, respiratory distress and oliguria renal failure. **Case report:** A 27-year-old male who intentionally drank about 50 ml 24% paraquat mixed with the same amount of wine was transferred to our ER for management several hours after ingestion. Severe vomiting and diarrhea, and rapid renal function deterioration were present. Uncommonly, jaundice and pallor face were observed on Admission Day 4. Hemolytic anemia was found. Glucose-6-phosphate dehydrogenase (G6PD) deficiency was identified unexpectedly. **Conclusion:** It is well known that paraquat produces circulatory failure, with multi-system organ failure and respiratory failure. The mechanism of paraquat toxicity has been attributed to the production of superoxide, resulting from redox cycling of paraquat in microsomes. In addition, paraquat could cause hemolysis in individuals deficient in G6PD because it poses an oxidant threat to the RBC.

### 40 HAS FLUMAZENIL AN ANTAGONISTIC EFFECT IN GHB-INDUCED CNS DEPRESSION?

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**Background:** The benzodiazepine antagonist flumazenil is not regarded as efficacious to reverse gammahydroxybutyrate (GHB)-induced CNS depression, although it interacts with the GABA receptor complex. **Case Report:** A 36 year-old white caucasian male presented to our Emergency Department in frank coma (Glasgow Coma Scale 3) at time = 0. We only later learned that he had ingested GHB and some alcohol approximately one hour previously. His pupils were pinpoint, the physical examination was otherwise unremarkable, with no meningeal signs. At t = +5 min. blood was drawn for chemistry and an intravenous line was inserted. Because drug-induced coma was suspected, naloxone 0.4 mg was administered intravenously at t = +30 min. without effect. At t = +105 min. flumazenil 0.2 mg was given via the intravenous line, with a rapid and complete reversal of the coma (GCS rose from 3 to 14 within 5 minutes), with no relapse. Plasma GHB concentration was 137 mg/L; ethanol, benzodiazepines, zolpidem and zopiclone were non-detectable. **Conclusion:** This well-documented report shows a striking effect of flumazenil on GHB-induced coma. The only alternative explanation

is that arousal and flumazenil administration were coincidental. Against this view stands the close temporal relationship between the two events, the fact that plasma GHB concentration was very high 100 minutes earlier, and that the presence of flumazenil-sensitive drugs was excluded. The effect of flumazenil in this setting should be studied prospectively.

#### 41 CHARACTERIZING PEDIATRIC EXPOSURES TO DIPHENHYDRAMINE

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**Background:** Diphenhydramine is a frequently used antihistamine. Although there are case reports of severe toxicity following diphenhydramine overdose, there is no literature summarizing the effects of diphenhydramine overdose in children. **Methods:** A retrospective review of 1998 AAPCC TESS data was completed. All pediatric (age < 6 years) exposures to diphenhydramine were examined. **Results:** There were a total of 11,663 pediatric diphenhydramine exposures reported. For those cases with a known outcome, 92% were minor. The following are characteristics of the 152 cases (8%) which resulted in a severe outcome (defined as moderate, major, or death). 85% of exposures were unintentional with the majority occurring at home. 83% involved one substance. Frequency of the reported clinical effects included agitation (53), drowsiness (52), hallucinations (47), tachycardia (39), mydriasis (18), and seizures (4). 75% of children exposed were seen in a health care facility, with the majority being treated and released after receiving decontamination only. Anticonvulsants were used in 5 cases and physostigmine in 2. Within 8 hours, 63% of the symptoms had resolved. The majority of the remaining symptoms resolved within 24 hours. **Conclusions:** Review of 1998 TESS data indicates that pediatric ingestion of diphenhydramine rarely results in serious toxicity.

#### 42 THE MOST UNKINDEST CUT OF ALL:\* PONTINE HEMORRHAGE ASSOCIATED WITH EPHEDRINE

Roberts D, Setzer S, Bangh S, Conterato M, Horowitz C, Bauer N.

**Background:** Use and abuse of ephedrine has been associated with intracerebral and subarachnoid hemor-

rhages, as well as cerebral vasculitis. Pontine hemorrhage following chronic use of recommended doses has not been reported. **Case Report:** A 41 year-old hockey coach presented to the emergency department with lightheadedness, double vision, and numbness and tingling of the left hand and foot. His pulse was 72 and blood pressure 134/75. For the last 18 months he had been taking 4 capsules tid (maximum recommended dose) of Hydroxycut<sup>®</sup> (hydroxycitric acid, ephedrine, caffeine, willow root, L-carnitine, chromium picolinate), a "thermogenic" sports nutrition supplement. He took no other prescribed or OTC medications, and he had no risk factors for cerebrovascular disease. His physical and neurologic examination was normal except for disconjugate gaze when he looked to the right. A CT examination of his head showed a small, high density lesion in the mid-pons. An MRI exam confirmed a 7 mm hemorrhage in the inferior aspect of the central pons. An MRI angiogram showed no cerebral aneurysm or vascular malformation. An echocardiogram demonstrated no cardiac abnormality. Follow-up neurologic examination several weeks later was normal except for disconjugate gaze and diplopia, and he was able to return to work. **Conclusions:** A small pontine hemorrhage occurred in an otherwise healthy patient who took the maximum recommended dose of an ephedrine-containing diet supplement.

\**Julius Caesar*, III, ii, 183

#### 43 HYPOTENSION COMPLICATING WHOLE BOWEL IRRIGATION IN DILTIAZEM OVERDOSE

Cumpston K, Manzanares M, Pallasch E, Sigg T, Aks S. *Toxikon Consortium, Cook County Hospital, University of Illinois at Chicago, Illinois Poison Center, Chicago, IL*

**Background:** Whole bowel irrigation (WBI) has been shown to be effective in volunteer studies in decreasing the absorption of some extended release products. The exact indication and clinical setting for use remains theoretical. We present a case of an ileus and distension in a hypotensive patient receiving WBI after diltiazem XR ingestion. **Case Report:** A 58-year-old male ingested 7.2 grams of diltiazem XR. He was asymptomatic and hemodynamically stable 3 hours after ingestion and WBI was started at 2L/hr. In one hour, his systolic blood pressure dropped to 70 mm Hg, and WBI was continued. Four hours after he became hypotensive, his systolic

blood pressure had not increased greater than 90 mm Hg, after multiple calcium and glucagon boluses. At this time, only 2L of WBI had been given when he began to vomit; there still was no rectal effluent. The WBI was decreased to 500 cc/hr. After another 1.5 hours, the patient had a brief period of asystole, which responded to external pacing, calcium, glucagon, and maximum doses of dopamine and norepinephrine. The WBI was discontinued when his abdomen became distended. The patient's clinical course never did completely improve and the patient expired 6 hours later, despite aggressive medical therapy. Conclusion: While there is some evidence that WBI may potentially decrease toxicity, this case illustrates that it should not be attempted in the hemodynamically unstable overdose patient. We postulate that WBI can be ineffective and harmful in situations when there is hypoperfusion to the gastrointestinal system.

#### 44 SEVERE FERRIC CHLORIDE POISONING: TREATMENT OF ACUTE AND DELAYED EFFECTS

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Introduction: Ferric chloride (iron trichloride) is used as an etching agent for printed circuitry and it has also been rarely used as astringent in the treatment of human skin disorders. Very few case-reports of ferric chloride poisoning have been reported in literature. Case report: A 65-kg 33-year-old man with psychiatric disorder, in treatment with risperidone, promethazine, biperidene and delorazepam, arrived in the evening at the ED, 3 hours after the ingestion of approximately 30 ml of an unknown brownish acid (pH = 1) liquid used as an etching agent for printed circuitry. The patient had retrosternal and epigastric pain, vomiting without hematemesis and yellow-brown discoloration of oral and faringeal mucosa. Initial metabolic acidosis (arterial pH 7.24) was present. After pulmonar and abdominal radiographic evaluation, an immediately performed esofagogastroduodenoscopy showed hyperhemic esophagitis, gastritis with diffuse ulcerations, mucosal edema, absence of peristalsis and duodenal superficial erosions. In suspicion of ferric chloride, deferoxamine (90 mg/kg in 8 hours infusion) chelation therapy was instituted before iron determination. Chemical analysis

of the liquid confirmed the presence of FeCl<sub>3</sub> 28%. Iron determination in the following day showed an initial concentration of 257.5 mcg/ml reduced to 10 mcg/ml 12 hours later. No effect of iron intoxication was observed. Three weeks later gastric and piloric stenosis developed and gastrectomy with esophago-jejunostomy was necessary after 3 attempts of endoscopic dilatation. Conclusion: For the best outcome, ferric chloride poisoning should be rapidly diagnosed and aggressively treated with the participation of toxicologists, endoscopists and surgeons.

#### 45 MASSIVE OXYCONTIN® INGESTION REFRACTORY TO NALOXONE

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Background: OxyContin® (oxycodone controlled release) has received widespread media attention as a drug of abuse despite little medical literature describing poisoning. Case Report: A 45-year-old female suffered an opioid toxidrome and generalized convulsion following the ingestion of a handful of OxyContin®. Two mgs of IV naloxone fully reversed the toxidrome and ED exam revealed crackles at both lung bases and a normal neurological exam. The OxyContin® bottle (noted to be almost full) was inadvertently left near her bedside, and 20 minutes after arrival she ingested the entire contents. The full bottle originally contained 4000 mg. Charcoal was administered but attempts at WBI were unsuccessful. Over 14 hours the patient received 188 mg of naloxone in both drip and bolus form. After realization that 24 mg of naloxone/hr was inadequate to maintain adequate ventilation, the patient's trachea was intubated, and no further naloxone was administered. She required mechanical ventilation for approximately 72 hours before being discharged. Comprehensive urine drug screen by TLC revealed only oxycodone and 10 hours after ED presentation the serum level was 2400 ng/mL (therapeutic 10–100). ECG, brain CT, and lumbar puncture were normal. Conclusion: We report a patient who ingested a massive quantity of OxyContin®. She suffered a convulsion, noncardiogenic pulmonary edema, and CNS and respiratory depression refractory to naloxone. The severity and length of poisoning was likely related both to the quantity and formulation of oxycodone.

#### 46 EFFECTIVENESS OF HOME IPECAC SYRUP ADMINISTRATION WHEN IT IS NOT INITIALLY AVAILABLE

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**Background:** The home administration of ipecac syrup is still recommended in many guidelines for the management of specific pediatric poisonings. A common challenge poison specialists have is what to do when ipecac syrup is indicated but not immediately available in the home. This study examines whether or not ipecac syrup can be administered and produce timely emesis in this circumstance. **Methods:** Over a 6-month period, a prospective observational study was undertaken to determine if ipecac syrup can be effectively administered to children when it is indicated but not available in the home. Cases where ipecac syrup was indicated but not readily available were included if parents stated that they could obtain ipecac within fifteen minutes. Timely administration and emesis were defined as < 30 min and < 60 min, respectively. **Results:** Twenty-five cases met inclusion criteria. Ages ranged from 1 to 6 years old. The mean time to administration of ipecac from exposure time was 40.1 minutes (SD = 13.7). Administration of ipecac syrup occurred at  $\geq 30$  minutes in 80% of the cases. The mean time to first emesis from exposure was 59.8 minutes (SD = 16.1). Initial emesis occurred at  $\geq 60$  minutes in 64% of the cases. **Conclusion:** Ipecac syrup often cannot be administered at home in a timely manner when it is not initially available. Parents of pediatric patients who have a significant ingestion should not be referred to purchase ipecac.

#### 47 FAILURE OF HYPERINSULINEMIA/EUGLYCEMIA THERAPY IN SEVERE DILTIAZEM OVERDOSE

Cumpston K, Mycyk M, Pallasch E, Manzanares M, Knight J, Aks S, Hryhorczuk D. *Toxikon Consortium, Cook County Hospital, University of Illinois at Chicago, Illinois Poison Center, Chicago, IL*

**Background:** We report failure of Hyperinsulinemia/Euglycemia (HIE) therapy in 3 cases of diltiazem overdose, initiated after standard antidotal therapy (SAT) with intravenous fluids, glucagon, calcium and

vasopressors. **Case Reports:** (1) A 55-year-old male developed hypotension and bradycardia after ingesting 32 g of Diltiazem SR, 4 hours prior to arrival (PTA). After 30 minutes of aggressive SAT without improvement, a bolus of 90 u regular(R) insulin and an infusion of 90 u R insulin/hr were started, but the patient expired 45 minutes later. (2) A 58-year-old male ingested 7.2 g of Diltiazem XR, 3 hours PTA. Because aggressive SAT and transcutaneous pacing failed, HIE therapy with a 10 u bolus and 0.5 units/kg/hr of R insulin was started 10 hours after arrival, but the patient expired 3 hours later. (3) A 36-year-old female ingested 3.4 g of Diltiazem CD, 2.5 hours PTA. The patient had an acetyldiltiazem level of 5,700 ng/dl. After 7 hours of aggressive SAT and transvenous pacing, HIE was started with 0.2 units/kg/hr R insulin; this patient survived, but remains in a permanent vegetative state. **Conclusion:** A number of successes with HIE therapy, at our own institution and in the published literature, used insulin doses of 0.1–1.0 units/kg. Since early experimental canine studies used insulin doses of up to 16 units/kg, failures in these cases suggest the optimal dose of insulin in HIE therapy for severe diltiazem overdose is yet to be determined.

#### 48 A RARE INTOXICATION OF BLACK LOCUST TREE BARK

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**Background:** The Black Locust (*Robinia Pseudoacacia*) tree contains the toxalbumins, robin and phasin. Toxalbumins exert their toxic effects through inhibition of protein synthesis. Clinical presentation of patients exposed to toxalbumins includes gastrointestinal symptoms and can progress to generalized multi-system organ dysfunction after adequate exposure. We report the first intoxication due to Black Locust bark in North America in over one hundred years. **Case Report:** An eight-year-old male was brought to the emergency department with complaints of lethargy and emesis 6 hours after chewing and expelling 3 to 4 mouthfuls of Black Locust bark. Symptoms began approximately 2.5 hours after exposure. Vital signs included: oral temperature, 97.5°F; blood pressure, 128/75 mm Hg; heart rate, 114 beats per minute; respiratory rate, 15 breaths per minute. Management included supportive care, 4 mg ondansetron intravenously, 1 g/kg of oral activated charcoal, and intravenous fluids. He was admitted to the intensive care unit for observation.



Laboratory findings were unremarkable with the exception of an elevated white blood cell count of 18.4 K/uL and an elevated alkaline phosphatase of 183 U/L. The patient remained asymptomatic throughout his stay and was discharged on the fifth day of admission with a normal white blood cell count of 4.1 K/uL and an alkaline phosphatase of 251 U/L. Conclusion: Despite the favorable outcome of our patient, toxalbumin toxicity should be managed aggressively and with extreme caution.

#### 49 SAFETY OF MONTELUKAST IN ACCIDENTAL INGESTIONS BY CHILDREN

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Background: The use of montelukast sodium (Singulair<sup>®</sup>), a leukotriene antagonist, in children for treatment of asthma continues to increase. The recommended daily dose in children ages 2–5 years is a single oral dose of 4 mg. Adverse effects appear to be uncommon, and there is limited published experience with overdoses. We conducted a retrospective review of pediatric montelukast ingestions reported to a regional poison center. Case Series: A total of 217 cases of montelukast ingestion were identified over a 40-month period (1/1/99 to 4/20/02). The number of cases doubled from 1999 to 2000, and again in 2001. Of these 217 cases, 165 (76%) occurred in children ≤5 years old (range from 10 months). Only 3 of 165 cases involved co-ingestants. Ingested doses and patient weight were identified for 149, and 103 patients, respectively. Dosing analysis was performed only on these cases. The mean dose was 20.4 mg (1.3 mg/kg). 144 children (87%) were managed at home, 2 of whom received ipecac. The remaining 21 (13%) were treated in hospital; 10 received activated charcoal and 11 were only observed. In 153 patients observed without treatment the average known dose was 16.7 mg (1.1 mg/kg), with a range of 4–96 mg. The highest dose was 330 mg (15 mg/kg) in a 5-year-old who received ipecac at home. No clinical effects were observed in any of the 165 patients. Conclusion: Reports of accidental montelukast ingestions in young children are increasing; this case series represents the largest experience to date. These exposures appear to be non-toxic. Toxicity following pediatric overdose has not been identified, and it is unknown if a minimal toxic dose exists. Children who ingest up to 96 mg (24 times the daily dose) can be safely observed at home.

#### 50 AGITATION AS A COMMON MANIFESTATION OF GHB INTOXICATION

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Objective: Gamma hydroxybutyrate (GHB) and its analogs are most commonly described as central nervous system depressants. Past reports of GHB toxicity have therefore focused on somnolence, obtundation, stupor, and coma (SOSC). Methods: From August 2000 to April 2002, we conducted a prospective observational study at our Level I Trauma Center. Clinicians were trained to recognize agitation, combativeness, and bizarre or self-injurious behavior, in addition to SOSC, as suspicious clinical signs of GHB toxicity. Final diagnosis of GHB toxicity was by unambiguous history of GHB ingestion and/or gas chromatography/mass spectrometry (GC/MS) measurement of GHB levels. Results: Of 45 cases of acute GHB toxicity identified, 25 (56%) manifested >/= 1 episode of agitation +/- combativeness (15 with agitation before or after SOSC, 4 with agitation alternating with SOSC, 6 with agitation only), 2 of whom had unusual features (head punching, facial tics). Twenty (44%) manifested SOSC only, 2 of whom had unusual features (odd vocalizations, catatonic state). Of the 25 cases with agitation, 10 had co-intoxication with stimulants (amphetamine, methamphetamine, cocaine, and/or MDMA) confirmed by toxicologic screen or supported by history, and 7 were confirmed negative for these stimulants and for ethanol. GC/MS detected GHB in 13 cases (serum range 266–391 mg/L, urine range 644–6380 mg/L). Of these 13, 5 manifested agitation. Toxicologic screens confirmed the absence of stimulants and ethanol in 3 of these 5 cases. Conclusions: Clinicians should broaden their definitions of GHB toxicity to include stimulant effects including agitation, combativeness, and bizarre or self-injurious behavior. Future studies, with universal toxicologic and GC/MS screens, are necessary to fully characterize the clinical presentation of GHB toxicity.

#### 51 USE OF PROMOTILITY AGENTS IN THE TREATMENT OF BODY-PACKERS

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Background: Body-packers, patients who smuggle contraband in their gastrointestinal tract, are usually treated with

whole bowel irrigation (WBI) to promote the passage of packets. We report the safe addition of the promotility agents erythromycin and metoclopramide to WBI in the treatment of two body-packers. **Case Series:** Patient 1-A 36 year-old female who confessed to body-packing heroin presented for medical clearance. She had no somatic complaints, and her physical examination was unremarkable. An upper GI series (UGIS) revealed one remaining packet in the stomach. She was treated with WBI for 18 hours, and a repeat UGIS indicated that the packet remained in the stomach. She was treated with metoclopramide 10 mg IV, and 8 hours later with a second dose of metoclopramide 10 mg IV and one dose of erythromycin 250 mg IV. 8 hours after the second dose of medication she passed the packet per rectum, just prior to a planned endoscopic removal. Patient 2-A 41 year-old male in custody for suspicion of body-packing heroin presented for medical clearance. He denied body-packing or any somatic complaints. His physical examination was unremarkable. Plain abdominal radiography confirmed the presence of multiple packets. He was treated with WBI, erythromycin, and metoclopramide, and passed a total of 85 packets per rectum over the next 36 hours. **Conclusion:** In two body-packers, the promotility agents erythromycin and metoclopramide were used safely. In one case, the use of these agents appeared to result in the passage of a single packet that had not progressed after 18 hours and extensive WBI. We believe that the use of promotility agents in the treatment of body-packers deserves further consideration.

## 52 NEUROLOGICAL CHANGES AFTER INGESTION OF TOPIRAMATE

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**Background:** Topiramate is a relatively new anti-convulsant. Although metabolic and ocular toxicity are reported with chronic use, there are little data regarding acute toxicity. We report a case of neurological changes in a young girl after isolated topiramate ingestion. **Case report:** Shortly after returning home from school, a previously healthy 5-year-old girl began acting strangely. She took a nap, and awoke 3 hours later screaming that she "couldn't feel anything". Her mother noted "arching movements" of the child's back. The mother took topiramate for seizures, and the daughter admitted to ingesting some of this medication. On arrival to the

hospital, vital signs were: pulse, 96/minute; blood pressure, 116/73 mm Hg; respiratory rate, 20/minute; temperature, 99.0°F. The patient was alert and oriented. Mild lateral nystagmus was noted. She perseverated in response to simple questioning, giving correct answers but repeating these answers five or ten times in quick succession. She also demonstrated repetitive mouthing movements. The remainder of the physical examination was normal. Routine blood testing, urine toxicology testing for drugs of abuse, and non-contrast computerized tomography of the head were all unremarkable. Electroencephalographic studies were also within normal limits. A serum topiramate level was 10.5 mcg/ml, confirming ingestion. The patient was admitted for observation, and recovered uneventfully. **Conclusion:** Topiramate ingestion appears to have produced neurological changes in a 5-year-old girl. Physicians should be aware that neurological changes may be part of the toxicity associated with acute topiramate ingestion.

## 53 CARDIAC AND NEUROLOGIC TOXICITY FROM LAMOTRIGINE INGESTION

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**Background:** Lamotrigine is an anticonvulsant that inhibits voltage-dependent sodium channels resulting in neuronal membrane stabilization and prevention of excitatory neurotransmitter release. Clinical experience surrounding lamotrigine overdose is limited, with only one previous case of cardiotoxicity reported in the literature. **Case report:** We report a 19-year-old male with a history of seizure disorder who ingested 250 tablets of lamotrigine (100 mg) and approximately 100 tablets of gabapentin (300 mg) in a suicide attempt. He was combative, tachycardic (heart rate 110 to 130 bpm) and mildly hypertensive (blood pressure of 155/90 mmHg). Electrocardiography revealed PR and QRS intervals of 213 and 104 msec, respectively, with rightward axis shift of the terminal portion of the QRS. QRS interval increased to approximately 120 msec at 2 hours post-ingestion. He was treated with gastric lavage, activated charcoal, and serum alkalization. His course was complicated by multiple episodes of brief generalized seizures, controlled with benzodiazepines. QRS and PR prolongation responded to serum alkalization and resolved within 24 hours. At discharge,

the PR and QRS intervals were 158 and 88 msec, but the axis changes persisted. Metabolic profiles were normal. The serum and urine drug screens were negative, including TCA levels, which were non-detectable. Conclusion: We report the second case of cardiac conduction disturbances related to lamotrigine ingestion, this case additionally complicated by seizures. The proposed mechanism for lamotrigine cardiotoxicity is sodium channel blockade. Gabapentin is not known to impact sodium channel function and was an unlikely contributor to the conduction abnormalities noted in this case.

#### 54 METHYLERGONOVINE MIX-UP IN THE DELIVERY ROOM

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Background: Ergot toxicity in the newborn usually manifests itself as respiratory depression, oliguria, and seizures. Death is usually caused by respiratory failure. Very few neonatal cases have been reported, and almost all previous cases involved confusion of maternal methylergonovine with neonatal vitamin K. Little is known about the effectiveness and dosing of sodium nitroprusside. Case Report: A full-term male infant was inadvertently given 0.18 mg of methylergonovine IM at birth. The intended drug was naloxone, to treat respiratory depression (Apgar score 3 at 1 minute). The substitution was recognized in the delivery room, and he was transferred to the NICU. At first, only slightly decreased oxygen saturation and mildly delayed capillary refill (3 sec) was observed, though hands and feet were warm and pink. Several hours later, he developed hypercarbia (pCO<sub>2</sub> 94) and required intubation and mechanical ventilation. A nitroprusside infusion was begun at a rate of 0.3 mcg/kg/min (peak rate 1.2 mcg/kg/min). Peripheral perfusion (capillary refill) and respiratory status improved rapidly, and he was extubated on the third hospital day. He was transiently and mildly oliguric, but urine output improved with nitroprusside as well. Conclusions: Even asymptomatic newborns should be transferred to NICU for close observation after methylergonovine administration, because toxicity can be delayed. Rapid recognition of the therapeutic error, ventilatory support, and prompt administration of sodium nitroprusside resulted in a good outcome. Relatively low doses of nitroprusside improved ventilation and perfusion.

#### 55 PEDIATRIC FATALITY FOLLOWING PROPYLENE GLYCOL INGESTION

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Background: Propylene glycol (PG) is a widely used excipient. Although generally considered safe, rare cases of CNS depression and metabolic acidosis are described with overdose. Case report: A 5-year-old female with Angelman Syndrome (Chromosome 15-related developmental disorder without metabolic defects), rumination, and seizure disorder, controlled via ketogenic diet, ingested a large amount of gel air freshener (propylene glycol 6%, perfume 5%, ethoxylate 13%, water 77%) 8.5 hours prior to presentation. Inspection of the patient's emesis showed it to be the same consistency and fragrance as the product in question. In the ED, she was unresponsive, hyperpneic and required intubation. Initial arterial pH was 7.0, osmolality was 364, lactate was 29.9 mmol/L, and ammonia was 302 micromol/L. Treatment included intravenous ethanol, fomepizole, thiamine, pyridoxine, leucovorin, and multiple episodes of hemodialysis. Acetone, isopropanol, methanol, and ethylene glycol were not detected. PG level was 66 mg/dL (pre-dialysis). Initial and repeat valproic acid levels were < 1 mcg/mL. HPLC revealed only hydroxyzine metabolites. Despite hemodialysis, hyperammonemia and acidosis worsened, as did the patient's hemodynamic status. The autopsy, including histology of the liver, was negative, as were organic acid and amino acid tests for inborn errors of metabolism. Conclusion: We report the first case of severe hyperammonemia and lactic acidosis following PG ingestion, possibly related to the PG metabolite, propionic acid. Similar toxic metabolic effects are caused by other aryl-propionic acids through inhibition of beta-oxidation of free fatty acids, which competitively inhibit pyruvate carboxylase, ureagenesis and the TCA cycle.

#### 56 PROSPECTIVE STUDY EVALUATING THE EFFECTIVENESS OF TOPICAL ANTACIDS FOR TREATING CAPSAICIN-INDUCED DERMATITIS

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**Background:** Dermal exposure to capsaicin may result in severe pain that may last for hours to days. Home-based topical treatments that have been advocated include: milk, ice water, vinegar, and vegetable oil. However, none of these treatments has effectively resulted in prompt, sustained pain relief. Effectiveness of poison center-guided topical antacid application for capsaicin-induced dermatitis was assessed with a prospective study. **Methods:** All patients  $\geq 12$  years old with dermal discomfort from capsaicin-containing products or plants reported to a regional poison control center (PCC) over a 17 month period were included. At the initial PCC contact, patients were assessed by a standardized survey and asked: (1) what treatments have you already tried, and (2) how would you rank your pain currently on a scale of 0 to 10? Patients then proceeded to use either topical antacids or other non-antacid therapy based on accessibility. On follow-up patients were asked: (1) what treatments did you use after calling the PCC, (2) how would you rank your pain after therapy on a scale of 0 to 10, and (3) how long did the therapy take to work? Positive response to treatment was determined as a decline in the pain scale ranking of  $\geq 33\%$  within 30 minutes. **Results:** A total of 100 patients met the inclusion criteria, but 13 were lost to follow-up. The remaining 87 patients received a total of 101 treatments (note: some used multiple treatments). A significantly higher positive response was reported in 72% (53 of 73) of the antacid treatment group compared to only 14% (4 of 28) of the non-antacid treatment group ( $p < 0.001$ ). **Conclusion:** PCC-guided topical application of antacids was an effective home-based treatment for capsaicin-induced dermatitis.

### **57 DYING TO BE THIN—HYPERPYREXIA AND WEIGHT LOSS: A CASE REPORT OF A DINITROPHENOL (DNP) RELATED FATALITY**

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**Background:** 2,4 dinitrophenol (DNP) originally was used as an explosive and later introduced in the 1930's to stimulate metabolism and promote weight loss. Concerns about hyperpyrexia lead to DNP being banned as a dietary aid in 1938. **Case** A 22 year old male presented to the ED with change in mental status 16 hours prior to his last does

of DNP. He ingested 600 mg of DNP for 4 days prior to admission. On admission he was sweating profusely, and had a fever of 102°F PO. Admission labs were within normal limits except creatinine 2.3 mg/dL, chloride 99 mEq/L, glucose 179 mg/dL, magnesium 2.4 mg/dL. Shortly afterwards he became agitated and subsequently delirious. Intravenous midazolam, and mechanical cooling had no effect. Pancuronium was administered and the patient was intubated. Over the next hour the patient became bradycardic, then asystolic. In spite of resuscitative efforts, the patient expired. **Discussion:** Advertisements claim DNP is safe, especially at the dose our patient ingested. DNP uncouples oxidative phosphorylation, can cause profound hyperthermia, and lowers ATP synthesis, which can result in death. The hypermetabolic state resulting from DNP resemble heat stroke. Elevated ambient temperatures, as well as decreased fluid intake, and exertion can exacerbate the deleterious effects. Internet sites state DNP will not increase body temperature, in spite of thermogenic properties. America is an obese nation, and weight loss is a national obsession. Billions are spend on diet products, including chemicals designed to alter metabolism. Though the epidemiology of use is unknown, DNP remains available on the Internet, and is a public health concern.

### **58 VASOPRESSIN FOR HYPOTENSION IN SEVERE AMITRIPTYLINE POISONING**

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**Background:** Due to neurotransmitter reuptake inhibition, peripheral alpha receptor blocking effects, and sodium channel blockade, severe tricyclic antidepressant (TCA) poisoning may lead to intractable hypotension. We report a case of severe amitriptyline toxicity, with hypotension unresponsive to direct alpha receptor agonists after pH manipulation, but improved with intravenous (IV) vasopressin. Vasopressin use in the setting of TCA toxicity has not been previously reported. **Case Report:** A 56 year-old man was found unresponsive with convulsive activity near an empty bottle of amitriptyline. He was intubated and treated with sodium bicarbonate and midazolam in the field. He was resuscitated with IV fluid, additional sodium bicarbonate and a dopamine infusion but remained persistently hypotensive with a wide complex tachycardia.

The vasopressor agent was changed to norepinephrine (NE) and bicarbonate therapy was continued, but limited by a serum pH of 7.64. Hypertonic saline was not used since his serum sodium remained above 145 mEq/L. A lidocaine infusion was initiated without improvement. Convulsions continued despite 46 mg of lorazepam. Phenobarbital loading was limited by continued hypotension. At that time, a vasopressin infusion was initiated at 0.04 U/min. His blood pressure stabilized over the following hour and by 3 hours the NE infusion was decreased. A toxicology screen confirmed the presence of tricyclic antidepressant. After a complicated hospital course, the patient recovered with no neurologic sequelae. Conclusion: Vasopressin may be a beneficial agent in the treatment of recalcitrant hypotension associated with tricyclic antidepressant toxicity.

### 59 USE OF THE OSMOLAR GAP AND SERUM LACTATE TO PREDICT IATROGENIC PROPYLENE GLYCOL TOXICITY IN CRITICALLY ILL PATIENTS

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Background: Propylene glycol (PG) is a solvent used in many drug preparations, including intravenous lorazepam (40% PG). Case reports describe toxic effects (hyperosmolality, lactic acidosis, renal insufficiency) in patients receiving large doses of medications containing PG. This study explored the correlation of osmolar gap and lactic acid concentrations as potential indicators of serum PG concentration.

Methods: A series of 62 surgical ICU patients included 38 patients receiving  $\geq 2$  mg/hour of IV lorazepam for  $\geq 36$  hours and 24 control patients with no lorazepam or other PG-containing drugs for the preceding 36 hours. We defined *a priori* "low dose" and "high dose" subgroups as receiving lorazepam at  $\geq 2$  but  $< 6$  mg/hr and  $\geq 6$  mg/hr, respectively. Laboratory studies included electrolytes, BUN, creatinine, glucose, serum lactate, measured osmolality, and serum PG (by HPLC) in a single blood draw. Results: Mean PG concentrations (mg/dL) in the control, low dose, and high dose groups were 0.4, 21.3 and 37.1, respectively. Mean osmolar gaps (mOsm/kg of water) were 3.7, 4.2 and 8.5. Mean lactate concentrations (mmol/L) were 1.5, 1.8, and 1.9, respectively. Correlation ( $r^2$ ) between osmolar gap and PG concentration in the

control, low dose and high dose groups were 0.02, 0.38, 0.90, respectively. Correlation ( $r^2$ ) between lactate and PG concentrations was low in all groups (range = 0.15 to 0.25). Conclusions: Osmolar gap is more useful than serum lactate concentration as an indicator of potentially toxic concentrations of propylene glycol.

### 60 PREDICTING ANTIMUSCARINIC AGENT POISONING BASED ON CLINICAL SIGNS AND SYMPTOMS

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Objective: To analyze the frequency of clinical signs in patients presenting with acute poisonings of antimuscarinic agents. Methods: Retrospective medical record review of all patients presenting to two tertiary care medical facilities during a six-year period. Inclusion criteria were a definite history of acute poisoning with an agent known to possess antimuscarinic activity, confirmation of drug presence with qualitative urine toxicology screening, and complete medical records. Patients were excluded for incomplete medical records, if the primary poisoning consisted of any other type of ingestion based on history or laboratory data, or if blood or breath ethanol concentrations were greater than 100 mg/dL. Clinical information obtained included vital signs, pupil size, ECG characteristics, the presence or absence of oral secretions, urine output on bladder catheterization, quality of bowel sounds, mental status (including GCS and presence of convulsions or coma), need for intubation, and time required for resolution of toxicity. Results: 345 patients were identified, with inclusion and exclusion criteria met in 213. The most common substances involved were tricyclic antidepressants (34%), antihistamines (30%), antipsychotics (12%) and antiparkinson agents (9%). The most common signs of antimuscarinic toxicity included decreased oral secretions (74.4%), tachycardia (68%), hypoactive or absent bowel sounds (50%), drowsiness (47%), confusion (44%), and urinary retention (30%, average 700 mL). Convulsions were noted in 7% while coma was reported in 18%. When three of the most commonly encountered features of toxicity (tachycardia, decreased oral secretions, and confusion) were evaluated together, 95% of cases displayed at least one of these findings. However, only 27% of all cases exhibited all three of

these signs. Tachycardia, confusion and mydriasis together were reported in 18% of cases, while at least one of these signs was present in 93%. The combination of tachycardia and mydriasis was noted in 36%, while tachycardia and decreased secretions were found in 55%. Combining confusion with tachycardia identified 33% of cases, while decreased secretions and confusion were found in 41%. Conclusions: Classically described signs of toxicity are common in patients poisoned with antimuscarinic agents. Analyzing combinations of signs lacked sensitivity in predicting toxicity.

### 61 LOPERAMIDE TOXICITY IN A PEDIATRIC PATIENT

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Background: Loperamide is often used to minimize fluid loss in children. Though generally not recommended for children <2 yrs old with mild to moderate infectious diarrhea, few cases of toxicity have been reported. We report a case of loperamide toxicity in a neonate. Case Report: A 14-day-old male with 3 days of mild diarrhea was given one-half of an “herbal Thai pill” to stop the diarrhea. The medicine was bought from a door-to-door salesman. The baby awoke to feed but refused the bottle and appeared to have difficulty swallowing. An hour later the baby was found apneic. The patient was intubated in the field and brought to the ED. Initial vitals were: temperature 36.1°C, blood pressure 68/49 mmHg, heart rate 152 min<sup>-1</sup>, and there were no spontaneous respirations on a mechanical ventilation rate of 30 min<sup>-1</sup>. The child was unresponsive and the pupils were pinpoint. Initial ABG was pH 7.09, pCO<sub>2</sub> 55 mmHg, pO<sub>2</sub> 448 mmHg and HCO<sub>3</sub> 17 meq/L. Though unable to identify the medicine, an opiate was suspected based on the clinical presentation. Urine drug screen, acetaminophen and aspirin levels were all negative. A comprehensive drug screen by GC/MS revealed one large unidentified peak. With supportive care, the baby’s mental and respiratory status slowly improved by the third day allowing extubation. The family eventually brought in the “herb” pill package, which identified it as a Loperamide 2 mg tablet. The unknown GC/MS peak was confirmed as Loperamide.

Conclusion: Loperamide is a structural derivative of diphenoxylate that produces opioid effects. One tablet or less can cause serious toxicity in a neonate. This case demonstrates the dangers that occur when medications are inappropriately dispensed and used.

### 62 A ONE-YEAR REVIEW OF PEDIATRIC ZIPRASIDONE INGESTIONS

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Background: Ziprasidone is a newer benzisothiazolyl piperazine atypical antipsychotic. Little is known about the clinical effects of ziprasidone ingestion in children. Methods: This limited information prompted a retrospective evaluation of pediatric ziprasidone ingestions. All pediatric ziprasidone exposures reported to CPCS for a 12 month period during April 2001 until April 2002 were analyzed. Age, amount ingested, clinical symptoms, treatment, and outcome were evaluated. Results: Seven pediatric exposures were documented with ziprasidone as the only substance ingested. Of the 7 exposures, 3 (43%) were males, and 4 (57%) were females. Their ages ranged from 22 months to 16 years old (mean age 8.6 years). All exposures were treated in an ED. Two children aged 22 mo and 2 years old who ingested 40 mg and 80 mg respectively, received decontamination with activated charcoal. One child remained asymptomatic (40 mg) and the other became somnolent (80 mg). The remainder of the cases included 5 children greater than 9 years of age (mean 12.8 years) who ingested 60 mg to 360 mg (mean 156 mg). 2 were asymptomatic and 3 developed somnolence. One child, a 14 year old, who ingested 360 mg, developed tachycardia (120 bpm) that did not require treatment. Orthostatic hypotension, EKG changes, or extrapyramidal symptoms were not reported in any of these pediatric ingestions. Patient outcomes in cases followed to a known outcome were: no effects in 3 cases (43%), minor effects in 3 cases (43%), and moderate effect of tachycardia (120 bpm) in 1 case (14%). Conclusion: In contrast to typical antipsychotics, this small study of pediatric ziprasidone ingestions showed favorable outcomes with GI decontamination and minimal supportive care. Continued evaluation of pediatric ingestions of ziprasidone is essential to determine more specific thresholds for toxicity.

### 63 CGP-35348 IS A REVERSAL AGENT FOR 1,4-BD AND GBL TOXICITY

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**Background:** 1,4-BD and GBL produce toxicity through their common metabolite, GHB, which interacts with GHB and GABA<sub>B</sub> receptors. **Objective:** We investigated if 1,4-BD and GBL neurotoxicity can be decreased with CGP-35348, a selective high affinity post-synaptic GABA<sub>B</sub> receptor antagonist. **Methods:** For 1,4-BD, 16 male CD-1 mice received 1,4-BD 600 mg/kg i.p. followed 15 minutes later by CGP-35348 500 mg/kg i.p. (N = 8) or control injection (N = 8). For GBL, 16 mice received GBL 750 mg/kg i.p. followed 15 minutes later by CGP-35348 500 mg/kg i.p. (N = 8) or control injection (N = 8). All mice were then evaluated for neurotoxicity every 15 minutes by the righting reflex (RR), rotarod test (RT), grip strength (GS, peak pull force in lbs.), and open field locomotion (OFL, distance traveled in cm.). **Results:** 1,4-BD and GBL produced initial deficits for all outcome measures in all mice. CGP-35348 decreased the duration of RR failure for 1,4-BD and GBL from 60 and 180 min. in controls to 45 and 60 min. in treated mice, respectively. CGP-35348 decreased the duration of RT failure for both 1,4-BD and GBL from 180 min. in controls to 60 min. in treated mice. CGP-35348 promoted more rapid recovery of GS to baseline values versus controls for both 1,4-BD and GBL ( $P < 0.05$  by area-under-the-curve, AUC, analysis). For OFL, CGP-35348 significantly improved the distance traveled by treated mice versus controls ( $P < 0.05$  by AUC analysis) for both 1,4-BD and GBL. **Conclusion:** CGP-35348 significantly reverses neurotoxicity related to 1,4-BD and GBL, presumably by antagonizing GHB effects at the GABA<sub>B</sub> receptor.

### 64 DECREASE IN CYTOSOLIC CALCIUM CONCENTRATION IN TCA-INDUCED CARDIOTOXICITY IN PERFUSED RAT HEART

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**Background:** TCA-induced cardiotoxicity is associated with decreased contractile function. **Objective:** To

evaluate the change in cytosolic free calcium concentration in the perfused rat heart during TCA-induced cardiotoxicity. **Methods:** (1) Isolated rat hearts were equilibrated by perfusing with physiologic buffer (KHB) at a coronary flow of 10 mL/min for ~30 mins and pacing at 300 bpm. Temperature was maintained at 30C. The protocol included basal, treatment, and recovery. Left ventricular (LV) pressures were measured with a balloon-tipped catheter placed in the LV via the mitral valve. LV generated pressure (LVGP) was used as an index of cardiac function and was calculated by subtracting LV end diastolic pressure (LVEDP) from LV peak systolic pressure. (2) Changes in cytosolic free calcium concentrations ( $[Ca^{2+}]_i$ ) during treatment were measured by fluorine 19 nuclear magnetic resonance (NMR) spectroscopy in 5FBAPTA-loaded perfused rat hearts.  $[Ca^{2+}]_i$  was calculated as the product of the ratio of peak areas for bound and free 5FBAPTA in the NMR spectra and the dissociation constant (300 nM). (3) Treatments were for 30 mins and included imipramine (IMIP, at 600 ng/mL, n = 3) or KHB (Control, n = 3). Values represent means. Data were analyzed by ANOVA and  $p < 0.05$  determined significance. **Results:** (1) At KHB basal,  $[Ca^{2+}]_i$  was ~280 nM. (2) IMIP treatment decreased  $[Ca^{2+}]_i$  to ~18% of basal (vs. ~86% for Control), which later increased to ~77% of basal (vs. ~77% for Control) during recovery. **Conclusion:** TCA-induced cardiotoxicity is associated with decreased cytosolic ionized calcium concentration in the isolated perfused rat heart. This finding can cause the diminished contractile function that is observed with TCA toxicity.

### 65 PREPARING FOR CHEMICAL TERRORISM: STABILITY OF EXPIRED ATROPINE

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**Background:** Since a massive nerve agent attack may rapidly deplete in-date supplies of atropine, we considered using atropine beyond its labeled shelf life. The following study was designed to assess atropine stability after labeled expiration. **Methods:** Four atropine solutions (400 µg/mL) (Elkins-Sinn, Inc [n = 3] and American Pharmaceutical Partners, Inc [n = 1]) were stored in a dark, temperature controlled setting according to manufacturers' recommendations. At the time of

sampling, these solutions ranged from in-date to 12 years beyond expiration (exp). Standards of atropine sulfate and tropine were prepared and quantified by GC/MS. Study samples were prepared by adding an ammonia buffer to 250  $\mu$ L of each sample to obtain a pH of 9.5, extracting with a methylene chloride and isopropanol mixture (9:1 ratio), followed by evaporating the organic layer to dryness. Pentafluoropropionic anhydride and pentafluoropropanol were then added as derivatization reagents and the mixture was heated for 20 minutes at 92° centigrade. The samples were again evaporated and then reconstituted in 100  $\mu$ L of ethyl acetate for injection into the GC-MS. An additional LC-MS was performed on the oldest sample. **Results:** All solutions were clear and colorless. Atropine sulfate breakdown products include tropine and tropic acid. Insignificant amounts of these compounds were present in all samples. Atropine concentrations (in  $\mu$ g/mL) were as follows: in-date, 295; 2001 exp, 324; 1999 exp, 342; 1990 exp, 404. **Conclusion:** The presence of high concentrations of atropine in clear and colorless expired solutions, coupled with the absence of breakdown products suggests their potential utility in times of emergency since dosing is determined by clinical response. Variability in samples may relate to variability in the manufacturing process.

#### **66 CHRONIC BUT NOT ACUTE ESTRADIOL TREATMENT PROTECTS AGAINST THE NEUROTOXIC EFFECTS OF NMDA RECEPTOR ANTAGONISTS IN ADULT RATS**

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**Background:** Drugs that block NMDA glutamate receptors, thereby inducing an NMDA receptor hypofunctional (NRHypo) state, include drugs of abuse, anesthetics, and investigational neuroprotective agents. However, neurotoxic and psychotic side effects that these agents can cause in adult rats and humans respectively, compromise their clinical usefulness. In addition, an NRHypo mechanism has been postulated to play a role in neurodegenerative and psychotic disorders. Thus, developing methods for preventing adverse NRHypo-related effects could have clinically relevant benefits. Based on preliminary evidence that female rats in late pregnancy may be resistant to the neurotoxic effects of NMDA antagonist drugs, we hypothesized that estrogen may exert a protective action against NRHypo-induced neurotoxicity. **Methods:** Three

study groups of adult female rats (n = 8 per group) received estradiol benzoate, as follows: Group 1 (100  $\mu$ g sc as a one time dose), Group 2 (100  $\mu$ g bid  $\times$  4.5 days), and Group 3 (300  $\mu$ g bid  $\times$  4.5 days). Two hours after the last estradiol dose, the selective NMDA antagonist, MK-801, was administered in a dose (0.5 mg/kg sc) known to produce a robust neurotoxic injury. Controls received MK-801, but no estradiol benzoate. Animals were sacrificed 4 hours after MK-801 and the brains processed for quantitative histological evaluation by methods previously described. **Results:** Compared to controls, a single dose of estradiol produced no change in the severity of injury (p = 0.24). Chronic treatment with either low or high doses of estradiol was associated with an approximate 25% reduction in the number of injured neurons (p = 0.034 and p = 0.048 respectively). **Conclusions:** Chronic but not acute estradiol treatment can confer neuroprotection against NRHypo-induced neurotoxicity. Supported by AG11355 and DA07261.

#### **67 A COMPARATIVE DOSE-RESPONSE STUDY BETWEEN GBL AND GVL**

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**Background:** Gamma-valerolactone (GVL) is the methylated congener of the GHB precursor, gamma-butyrolactone (GBL). Like GBL, which is a key ingredient in the illicit manufacture of GHB, GVL appears on internet websites as a key ingredient in the synthesis of methyl-GHB. There are no studies directly comparing toxicity between GBL and GVL. **Objective:** This study evaluated GBL and GVL dose-response curves for neurotoxicity. **Methods:** Male CD-1 mice received either GBL or GVL i.p. at graduated doses (25–4800 mg/kg) until all animals were toxic (n = 10 for each group at each dose). For each dose of GBL and GVL, mice were evaluated for neurotoxicity 30 and 60 minutes after injection, respectively, by the righting reflex (RR) and rotarod test (RT). The percent of animals failing the RR and RT were recorded, and full dose-response curves were generated. The TD<sub>50</sub> of GBL and GVL for the RR and RT were calculated by the Litchfield-Wilcoxon Test and compared by the Z-statistic. Mortality for each group was also recorded for each dose at 24, 48, and 72 hours after administration.



**Results:** The  $TD_{50}$  of GBL and GVL for the RR were 366.2 mg/kg (95% CI, 273.6–490.2 mg/kg) and 2799.0 mg/kg (95% CI, 2591.3–3023.3 mg/kg), respectively ( $P < 0.05$ ). The  $TD_{50}$  of GBL and GVL for the RT were 99.0 mg/kg (95% CI, 60.1–163.2 mg/kg) and 2084.8 mg/kg (95% CI, 1948.8–2230.2 mg/kg), respectively ( $P < 0.05$ ). Only one mouse died from GBL at the dose of 1 g/kg. Conversely, 80–100% of mice died when GVL was administered at doses greater than 2400 mg/kg. **Conclusion:** GBL has a lower  $TD_{50}$  than GVL for the RR and RT, but GVL has a higher mortality rate than GBL.

### 68 CHILDHOOD PESTICIDE EXPOSURES ON THE TEXAS–MEXICO BORDER: POISON CENTER UTILIZATION AND OUTCOME

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**Objective:** To describe and evaluate differences between Texas–Mexico border and non-border county childhood pesticide exposures. **Methods:** A retrospective review of all pesticide exposures in children  $\leq 6$  years of age reported to the South Texas Poison Center during 1997–2000. Data analysis included demographics, exposure site, route of exposure, the pesticide involved, clinical effect, management site, and medical outcome. **Results:** Reports of 2,520 pesticide exposures were analyzed; 55% involved males, 86% involved ingestions, and 98% occurred at a residence. Insecticides were implicated in 52% of all exposures; pyrethrins and organochlorines were more commonly implicated in border county exposures. Rodenticides accounted for 48% of the border exposures compared to 34% of the non-border exposures. Seventy-seven (3%) children developed clinical effects; 61 (79%) were minor, 13 (17%) were moderate, and 3 (4%) were major. No deaths were reported. Vomiting and ocular irritation were the most commonly reported symptoms. Non-border counties had twice the reported exposure rate versus border counties. Despite a similar clinical picture, parents of border children were significantly less likely to contact the poison center following an exposure compared to non-border children (60% vs. 82%) and more likely to have their child evaluated in a healthcare facility (40% vs. 19%). **Conclusions:** Increasing awareness of the poison center and identifying potential barriers for utilization of the center for residents of the Texas–Mexico border communities may prevent unnecessary healthcare facility visits.

### 69 COMPLEMENTARY AND ALTERNATIVE MEDICINES: PRACTICES OF TENNESSEE PHARMACISTS AND IMPLICATIONS FOR EDUCATION

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**Objective:** To determine the practices and educational needs of Tennessee pharmacists related to complementary and alternative medicines (CAMeds). **Methods:** A structured, 60-item survey instrument was administered to pharmacists who participated in one of five continuing education programs held throughout the state during Autumn 2001. Inclusion criteria included a completing all responses to the survey and practicing Pharmacy in Tennessee. Data were entered in a computerized database and the Chi-square test with Yates correction was used for comparisons where appropriate. **Results:** A total of 650 surveys were submitted and 349 met the inclusion criteria. Of these, 265 pharmacists (76%) indicated they personally used dietary supplements, homeopathic medicines or megavitamin therapy or advised patients on their use. Compared to pharmacists who employed other complementary and alternative therapies or none of these approaches, the majority of CAMeds pharmacists practiced in community pharmacies (77%,  $p < 0.001$ ), and desired further education on the topic (83%,  $p < 0.001$ ). The number of years in practice was not an influence. Ninety-one pharmacists (34%) stated that they suspected an adverse reaction from a dietary supplement in a patient during the past year, and 4 (4%) reported the incident to the FDA. **Conclusion:** Many Tennessee pharmacists use CAMeds and provide advice thereon; they observe suspected adverse events from dietary supplements, and desire additional education on complementary and alternative therapy. Educational efforts should include the benefits of reporting adverse reactions to the FDA directly or through poison control centers.

### 70 DESICCANT INDUCED GASTROINTESTINAL BURNS

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**Background:** Desiccant packets are widely used within consumer products' packaging to maintain a suitable

humidity during storage. Desiccant packets in the United States typically contain non-toxic products such as silica gel. Approximately 1.8% of calls to our poison control center in 2001 were in regard to human desiccant exposures of which only minor outcomes occurred. These included the following: vomiting (1), cough/choke (2), abdominal pain (1), oral irritation (1) and mechanical throat irritation (1). We present a case of a toddler who ingested the contents of a desiccant packet and suffered a caustic injury. Case Report: A 2-year-old male presented to the ED after ingesting the contents of a desiccant packet found in a box of imported Chinese cookies. The child was initially given water by his parents, which he swallowed but then vomited. He presented to the ED with a history of vomiting, drooling and foaming at the mouth. Physical exam in the ED revealed an erythematous tongue and posterior oropharynx. The child's vocal cords and proximal trachea were examined by nasopharyngoscopy and found to be atraumatic. The child was admitted to the hospital with the intention of having upper gastrointestinal endoscopy performed the following day. Over the next 12 hours, the patient began tolerating oral intake. For this reason, endoscopy was not performed and the patient was discharged home following an additional day of observation. The packet itself had both English and Chinese words on it and stated "DO NOT EAT" and that its main ingredient was "CAUSTIC LIME." The pH of the packet's content was 11. Conclusion: Desiccant packets from other countries may contain toxic ingredients such as strong alkali. A thorough inquiry into the nature of the product and the history of the exposure should always be obtained.

## 71 UTILIZATION OF A POISON CENTER (PC) IN EVENTS REPORTED TO THE MINNESOTA DEPARTMENT OF HEALTH USING HSEES

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Background: 16 States contribute to the Hazardous Substance Emergency Events Surveillance (HSEES) program of ATSDR. HSEES collects geographical, scenario, injury, and evacuation data regarding events that involve a release of hazardous substances. Events may involve victims; defined as individuals who were symptomatic from direct exposure to the substance's release. A study was done to determine the number of HSEES incidents that involved victims where the PC was

contacted, and determine reasons why the PC was not involved in others. Methods: The following data was reviewed: (1) MN 2000 & 2001 HSEES report to identify events with victims. Date, County, and Substance were recorded for these events. (2) PC's Toxicall database searched for 2000 & 2001 human exposure cases that fit the identified HSEES events. Results: 49 (5.6 %) of 872 HSEES events involved victims; 34 were facility release and 15 transportation releases. PC had involvement in 11 of 49 cases. The PC advised receiving hospitals in 8 of 11 events. The PC was contacted by the public or EMS in 3 cases. Identified reasons for lack of PC notification included: (1) mildly symptomatic, single victim incidents treated at the scene and not transported to hospitals in 9 cases. (2) Assistance was provided by State or Local Health Department. (3) Lack of awareness of the PC's services. Conclusions: Poison Center utilization may be limited if EMS providers are not aware of the PC services, feel assistance is not required, or another agency is used for assistance. A program between MN HSEES and the PC is now initiated in order to improve poison center consultation and reporting for events that involve hazardous substance release.

## 72 EFFICIENT POISON-PREVENTION LITERATURE DISTRIBUTION

Wolowich WR, Fuller-Pyle J, Casavant MJ. *Central Ohio Poison Center, Columbus, Ohio*

Objective: Distribution of poison prevention literature increases utilization of a poison center. Until 2000 our SPIs offered to mail poison prevention literature to callers, but only when the SPI remembered to ask, and was not too busy. Sending a packet meant writing the address on the envelope, and dropping the packet in the mailbox. We devised an improved method. Methods: One of the free areas in the Toxicall charting program was used as a "send poison prevention literature" check-box. When the specialist felt the caller would benefit from prevention information, they selected the check box, and typed the caller's address in Toxicall. The address was retrieved automatically from Toxicall using Microsoft Access, and sent into a mail merge to generate mailing labels that were then affixed to the packets by support staff. After 1 year of optional use, the literature check-box was made a mandatory field; the SPI could elect to send literature, or choose several options to explain why this caller does not get literature. SPI time per packet sent was reduced from

Year	2000				2001				2002	
	Quarter	1	2	3	4	1	2	3	4	1
Packets sent	235	938	770	875	907	1023	841	967	2427	
Literature check box added		↑				check box made	mandatory field			↑

Abstract 72.

120 sec to 30 seconds. Equally important, volume of literature mailed from the center increased (see Table). Conclusions: Lack of time is a frequently cited barrier that prevents SPIs from engaging in prevention activities. We were able to leverage existing database technology to make the prevention literature offer an integral part of a call to the poison center.

### 73 THE USE OF AN ON-LINE SURVEY TO ASSESS VISITOR SATISFACTION WITH A POISON CENTER WEBSITE

Dodge S, Cucchi P. *Georgia Poison Center, Atlanta, Georgia.*

Background: The Internet has become an increasingly popular source for health-related information. Websites have gained popularity with poison centers seeking low cost, effective methods to disseminate information. Like other health education tools, websites should be evaluated to assess their effectiveness at delivering appropriate information and their ability to attract repeat visitors. A Regional Poison Center (RPC) implemented an on-line survey to assess visitor satisfaction. Methods: A RPC conducted an on-line survey between 1/1/01 and 9/30/01. The 22-item survey was designed to assess demographics, satisfaction with content, organization, graphics, and ease of navigation. Results: A total of 39,479 visitors viewed the RPC's website. 104 (0.26%) visitors took the on-line survey accessible from the site's home page. Respondents indicated they visited the site to find general poisoning information (55%); first-aid information (12%); and to order materials (9%). 39% of the respondents indicated they did not find what they were looking for. The majority of those surveyed said the site was informative (69%) and the information was easy to read and understand (76%). More than half found the information to be credible (69%), well organized (68%) and easy to find (60%). Overall, 59% of the respondents were satisfied with the site, but only 35% stated they would return or recommend the site to others.

Conclusions: Websites should be evaluated to assure that they attract visitors and the information they provide is appropriate. The information gathered in this survey will be used to improve and maintain the quality of the RPC's website.

### 74 NEWSPAPER COVERAGE OF CLINICAL TOXICOLOGY

Suchard J. *Division of Emergency Medicine, UC Irvine Medical Center, Orange CA.*

Objective: The non-medical community receives much of its knowledge regarding toxicology from the lay press. This study enumerates and categorizes articles relevant to clinical toxicology found in 2 newspapers over a 1-year period. Methods: Articles from 2 large regional newspapers that associated adverse human health effects with drugs, toxins, or other poisonous chemical substances were collected from 4/01 through 3/02. By pre-determined inclusion criteria, any articles related to venomous animals, or chemical or biological warfare (CBW) were also collected; articles about radiation injury, or about drug use without describing adverse effects or pharmacologic mechanisms, were excluded. Results: 1374 articles met inclusion criteria, for an average of 1.85 articles/day per newspaper. CBW articles comprised 46.7% of all items collected, and a dramatic increase in such items occurred following September 11<sup>th</sup>, 2001. The next most common categories were: therapeutic drugs (225 articles), inhaled toxins [air pollution, smog, smoke, gases] (81), natural toxins (72), illicit drugs (71), metals (63), industrial chemicals (54), herbs / dietary supplements (51), and carcinogens [not included above] (41). The great majority of articles about metals, carcinogens, and/or environmental pollutants described potential risks in the absence of any demonstrable adverse health effects. The individual, non-CBW topics with greatest coverage were: medical use of marijuana (29) and Oxycontin<sup>®</sup> abuse (20). Two stories about toxicologic homicide had 7 articles each.

116 articles were featured on the front page. 45 articles involved acute toxic multiple-casualty events. Conclusion: Newspapers frequently report items relevant to clinical toxicology. The public's ability to interpret actual toxic risks may be affected by journalistic practices that report potential adverse effects without quantifying their likelihood of occurrence.

### **75 INITIAL IMPACT OF TOLL-FREE ACCESS ON POISON CENTER CALL VOLUME**

Krenzelok EP, Mrvos R. *Pittsburgh Poison Center, Children's Hospital of Pittsburgh; Schools of Pharmacy and Medicine, University of Pittsburgh; Pittsburgh, PA.*

Background: Prior to the implementation of the nationwide toll-free telephone number, most poison centers already provided toll-free service. Therefore, the impact of toll-free access to a poison center on call volume is difficult to assess in the majority of poison centers. The objective of this analysis was to examine the effect that the new nationwide toll-free telephone number had on total call volume (exposures and information calls) in a poison center without previous toll-free access and serving a large urban and rural population. Methods: All calls received by a RPIC over a consecutive 27 month period (2000, 2001, Jan–Mar 2002) were analyzed using a relational database. April 2001 was the first full month of toll-free service. Jan 2000–Mar 2001 served as the benchmark period and April 2001–Mar 2002 constituted the study period. Jan–Mar 2000, 2001 and 2002 were used for trend analysis. Awareness of the telephone number was via massive distribution of stickers that listed the toll-free number. Results: 3,150,000 stickers with the toll-free number were distributed throughout the region over the study period. Use of the toll-free number increased from 63 calls in April 2001 to 2,056 in March 2002. Total call volume increased by 1.5%, overall exposure volume decreased by 8.8% and information calls increased by 20.9%. Trend analysis revealed exposure erosion when comparing 2000 data with 2001 and 2002 data. However, exposure volume increased by 8.6% (2001 vs. 2002). There was a significant increase in utilization of the toll-free number for information purposes from people residing in rural counties. Conclusions: Toll-free access to the RPIC has increased the volume of information calls dramatically. Initial trend analysis indicates that the availability of toll-free access has reversed the erosion of exposure-related calls.

### **76 WAS THERE AN INCREASE IN ANTIFREEZE/ETHYLENE GLYCOL CALLS DURING A HIGHLY PUBLICIZED MURDER TRIAL INVOLVING THE USE OF ANTIFREEZE AS THE CAUSE OF DEATH?**

Anguish D, Caliva M, Stork CM, Cantor R. *Central New York Poison Center, Upstate Medical University, Department of Emergency Medicine, Syracuse, NY*

Background: The Specialists in Poison information at our Center noted that there appeared to be an increase in ethylene glycol/antifreeze calls in 2000 versus 2001. The only apparent difference between 2000 and 2001 was intensive multiple media coverage (newspaper, radio and TV) of a local murder trial involving a poisoning using antifreeze. The coverage frequently mentioned antifreeze as the poison and how this poison can cause death. The coverage of the trial occurred during the last six months of 2001. Methods: A retrospective review of all antifreeze/ethylene glycol calls to our center in 2000 and 2001 was conducted. The data was sorted by month and year. We compared calls during 2000 versus 2001. The first six months of 2000 was compared to the first six months of 2001, the last six months of 2000 was compared to the last six months of 2001 and the first six months of 2001 was compared to the last six months of 2001. Excluded from review were all calls not originating from the area code where the trial was being conducted and where there was media coverage of the trial. Results: There were 11 calls in 2000 versus 48 calls in 2001. During the first six months of 2000 there were 5 calls versus 12 calls in 2001. During the last six months of 2000 there were 6 calls versus the 36 calls in 2001. Comparison of 2001 data showed 12 calls during the first six months versus 36 calls during the last six months. Conclusion: Our Center did receive more antifreeze/ethylene glycol calls in 2001 versus 2000. Our greatest increase was during the last 6 months of 2001. This timeframe corresponds to when there was intensive media coverage of the trial.

### **77 A PRELIMINARY PROCESS EVALUATION OF A REGIONAL POISON CENTER'S NATIONAL 800 NUMBER CAMPAIGN**

Collins A, Cucchi P. *Georgia Poison Center, Atlanta, Georgia*

Background: A Regional Poison Center (RPC) implemented a statewide campaign to promote the

national 800 number. The RPC conducted a preliminary process evaluation to determine the extent to which the campaign was successfully implemented and to document calls to the 800 number. Methods: Prior to the launch of the campaign in January 2002, the RPC identified target audiences and developed six primary campaign strategies. These included a press conference in which the state health director announced the new number; dissemination of mass media messages via newspaper, radio and television; publication of articles in professional association and organization newsletters; incorporation of information into the RPC's poison prevention materials; placement of information on the RPC's website; and publication of an article in the RPC's newsletter. Process evaluation measures included documentation of campaign media coverage, website visits, and an analysis of call volume to the new 800 number. Results: Data were collected for the time period 10/01–03/02. The campaign generated 7 newsletter and 3 newspaper articles reaching an estimated 9,000 people. Three television and 3 radio broadcasts were confirmed reaching nearly 250,000 people. The website generated 24,494 visitor sessions. The average monthly call volume to the 800 number pre-launch (Oct–Jan) was 247 calls versus an average of 1,154 calls post-launch (Feb–Mar). Conclusion: The preliminary results of the campaign indicate the six campaign strategies were successfully implemented as planned. In addition, there was a noted increase in the calls to the 800 number after the launch of the campaign. Further evaluation is necessary to determine the impact of marketing activities on the new 800 number.

#### 78 ABBREVIATION ABUSE—STILL MORE

“B.S.” (B--- S---!)

Henry P, Robertson WO. *Washington Poison Center, Seattle, WA, USA*

Background: Back in the 1960's, “medication mix ups” or “drug errors” first surfaced as risks to our patients' well being. Far too frequent use of abbreviations were crucial contributors to erroneous interpretations of both written and as well as verbal orders. Does “DPT” mean “Demerol, Phenergan and Thorazine” or “Diphtheria, Pertussis and Tetanus”? By the 1970's, the Joint Commission of Accreditation of Hospitals moved to require each hospital to develop its own unique list of approved abbreviations for exclusive use on their

premises. Misinterpretations of their meaning continued to run amuck. Between 1972 and 1997, we surveyed our medical staff on the written records of their practices 8 different times. Repeatedly, barely 50% of the “used and approved” abbreviations were correctly interpreted and usually staff was no better than 50:50 in identifying which had been approved. Not unexpectedly, no corrective action whatsoever was undertaken. Spurred on by the Institute of Medicine's “To Err is Human,” we decided to re-survey our target audiences again this year. Method: A 15 item form listing only approved abbreviations was widely distributed among our staffs, along with pleas for completion. Results: Among the sample of 1500 interpretations we selected for analysis, this time just short of 55% of the respondents were correct in their interpretations of the “approved abbreviations”. Poison Center staff were not significantly better- or worse. D/W (Distilled/Water) was “misinterpreted” as Dextrose/Water by 95%–95%! of the respondents. And, WA (Wide Awake/With Assistance) was also erroneously interpreted as Washington by 99%. In contrast, B.S. (Bowel Sounds/Breath Sounds) was correctly interpreted by 81% of respondents although “Logan's Medical Abbreviations” lists 30 other approved meanings—admittedly failing to include the most common usage b--- s---!. Conclusion: Abbreviations are alive, well and thriving—and still producing errors!

#### 79 REPOSITIONING THE POISON CONTROL CENTER IN THE HEALTH CARE CONTEXT

Simeonov IM, Heard SE. *California Poison Control System, University of California, CA*

Objective: Determine how to effectively shift poison exposures with no adverse outcome in low socio-economic groups from the ED to the PCC for management. Define market position and core message for educational materials and forge new communications strategies to reach consumers. Methods: A series of eight, 2 hour, focus groups combining ethnographic and cognitive mapping techniques were assembled in 4 cities to investigate the terms poisoning and poison emergency. Sixty-four participants were selected by income level, insurance status, frequency of ED visits, and presence of children <5 at home. Two groups consisted of low-income African-Americans, 4 of low-income Latinos, with 2 low-English proficiency Latino groups. Two middle-income, suburban mother groups were also held.

Heavy ED users ( $\geq 4$  annual visits) were present in each group, as were a minority who had called a PCC. Results: Trouble in distinguishing a “poison emergency” surfaced in all groups, regardless of socio-economic status, as did an inability to place the PCC as a health care resource. Responses to poison exposure scenarios were polarized. Participants projected that they would respond by taking urgent action (ED/911), administering a home remedy, or doing nothing, regardless of the actual severity of exposures. In most cases of mild to moderate exposure participants, although indicating a strong desire to alleviate their anxiety, participants said they would take only low-level action, such as calling a friend or relative, or no action. Conclusion: After being presented with PCC capabilities, participants described the PCC as a superior alternative to unverified or unproven self-care, or no care, and as a preliminary step to seeking medical attention in the ED or calling 911. This information is critical in formulating an effective market position and core message, and in developing all aspects of a PCC public outreach program.

## 80 REGIONAL POISON CENTER AS A SOURCE FOR REPORTING MEDICATION ERRORS

Zell-Kanter M, Burda A, Krantz AJ. *TOXIKON Consortium, Cook County Hospital, Illinois Poison Center, Chicago, IL*

Background: Recently there has been a trend to systematically study medical errors including medication errors. Poison centers (PC) do not consistently report adverse drug reactions/medication errors to the FDA’s MedWatch. PC data has not been thoroughly explored as a resource for documenting medication errors. Methods: We performed a retrospective review of all medication errors reported to our regional PC from January 1–12, 2000, and collected patient demographics, type of medication, type of medication error, and patient outcome. Results: 136 cases of medication errors were reported. One call came from an ED, 1 from a PICU, and the remaining were from home. 56 occurred in adults  $> 18$  years. Of the pediatric cases, 40 occurred in infants  $\leq 2$  years, 14 occurred in  $> 2$ –5 year olds, 15 occurred in 6–12 year olds, and 11 occurred in 12–18 year olds. One pediatric and 4 adult cases were referred to an ED. 3 cases of medication error resulted from incorrect dosing route. Of these, 1 adult ingested calamine lotion without sequelae, a 2-year-old received sulfacetamide 10% otic

solution to the eye without sequelae, and a 1-month-old, 28 week gestation infant with a complicated course received breast milk with fortifier IV. This patient was followed for 36 hours, and continued to have a complicated course. Conclusion: Only a small percentage of medication errors reported to PCs occur in the hospital. Errors that are unique and potentially serious may not be reported to other agencies. They may represent an underutilized source of information that, if studied systematically, may contribute to our understanding of error prevention.

## 81 A COLLABORATIVE MODEL WITH A “SAFE COMMUNITY” ASSOCIATION (SCA) TO INCREASE RURAL CAPACITY TO IDENTIFY & PREVENT POISONINGS

Kaczowka R, Palin T, Button G, Vicas I. *Alberta Poison Centre (PC), Calgary, AB; High River & District Safe Community Association (SCA), High River, AB, Canada.*

Background: A SCA serving a primarily farming & ranching population identified poisonings as a target for injury prevention due to perceived high number of ED visits for poisonings. A distance collaborative model was piloted, linking regional PC expertise & experience with local SCA commitment & access to the target population. Methods: The PC provided content expertise (problem overview, causes, educational material development) & prevention expertise (strategies, tools). The SCA provided knowledge of the community (audience, needs, motivators), ability to mobilize local resources (financing, organizations, people), & access to the community (schools, events). Work was conducted primarily via telephone & e-mail, after initial on-site orientation visits. Results: A variety of social marketing processes were planned & implemented to promote jointly determined goals: increase awareness of poisoning as a health concern, promote general & farm-specific practices that reduce the poisoning risk, & increase PC awareness in all age groups. A school-based age-appropriate prevention program was taught to 1400 children (kindergarten to grade 5). Existing PC prevention material was featured at 5 local fairs/exhibits (health, farm safety, rural women). Newsletters (content written by PC staff), a teacher information package, local newspaper ads, a “Spray it Safe” theme & web pages were developed along with local media coverage,

contests, promotional incentives (neoprene gloves). Conclusion: The PC & SCA prevention goals were achieved collaboratively & at a distance in a rural community, at relatively low cost to the PC. Newsletter article content is now the base for PC production of region-wide educational materials focused on agricultural poisons.

## 82 RETROSPECTIVE ANALYSIS OF PEDIATRIC RISPERIDONE EXPOSURES

Bauer G, Lopez G, Belson M. *Georgia Poison Center, Emory University, Atlanta, GA*

Background: Risperidone is used for the treatment of disorders including schizophrenia, Tourette's syndrome, autism, bipolar mania, and anorexia nervosa. With the exception of case reports, limited data describe risperidone's pediatric toxicity profile. Methods: A retrospective review of the American Association of Poison Control Centers Toxic Exposure Surveillance System data of risperidone exposures without co-ingestants in children <12 years of age from 1999–2000. Variables analyzed included demographics, incidence and severity of clinical effects, management site, therapy provided and medical outcome. Results: 1099 exposures were reported; 64% males, 40% <3 years of age, and 82% acute. Unintentional exposures (n = 979) resulted in no symptoms or minor effects (54%), no follow-up (39%), moderate effects (7%), major effects (coma) (0.3%), and no deaths. Drowsiness (24%) and dystonias or tachycardia (3% each) were the most frequent clinical effects. Intentional exposures (n = 57) resulted in no symptoms or minor effects (60%), no follow-up (28%), moderate effects (12%), and no major effects or deaths. Drowsiness (49%) and dystonias or tachycardia (5% each) were the most frequent clinical effects. Of the 60 adverse drug reactions, 30% were dystonias and 12% were muscular rigidity. Of all exposures, 52% were managed on site, 28% treated/evaluated and released, and 5% admitted to ICU. No therapy or observation only was received in 48% of total exposures, 30% received decontamination only, and clinical effects lasted <24 hours in 89% of exposures. Conclusion: While the majority of pediatric risperidone exposures result in minimal toxicity, clinically significant symptoms requiring health care facility evaluation, including adverse dystonic reactions, are not uncommon.

## 83 TOBACCO INGESTION AND FAMILY'S SMOKING LIFESTYLE

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Introduction: Tobacco is always top of the list for substances most frequently involved in pediatric exposures in Japan. We conducted a case-control study to investigate the relationship between smoking lifestyle and risk of tobacco ingestion. Methods: Cases are nineteen patients diagnosed with tobacco ingestion in Fujimoto Children's Hospital between February 1, 2001 and January 31, 2002. Age- and gender-matched controls (1:3) were randomly selected from children who visited the hospital during this study period. Informed consent was obtained from all parents of the cases and those of controls before interview. Questions covered detailed of family history, smoking habits of family, lifestyle and knowledge of poisoning prevention. For case group, present history of ingestion and blood samples were obtained. Results: The average age of 19 cases was 12.7 months. Symptoms of accidental tobacco ingestion in children were seen in 6 of 19 (31.6 %) children, with an onset of 50 min to 3 h and included nausea, vomiting, weakness, pallor and cough. Accidental ingestion frequently occurred in nursing area such as living room, dining room and kitchen. To leave cigarettes within reach of children and to share smoking and nursing in the same room were predominant risk factors. Conclusion: The results suggest that the frequency of tobacco ingestion by children is mainly attributed to the lifestyle of Japanese, which involves leaving cigarettes in low tables and smoking in nursing area.

## 84 MEDICATION EXPOSURE CALLS TO POISON CONTROL: A MARKER FOR PRESCRIBING PATTERNS?

McFee RB, Caraccio TR, McGuigan MA. *LI Regional Poison Control Center*

Background: National data indicate an increase in prescribing of psychotropic medications to adolescents and children. It is estimated many of these are

inadequately studied for safety or effectiveness. Non-psychiatric drugs such as guanfacine increasingly are being prescribed off-label to children for psychiatric indications, including ADHD. Are exposures called into PCC reflective of these prescribing (Rx) patterns? Can such information be used as an early warning system to identify emerging and potentially worrisome trends in medication use? **Objective:** To our knowledge this pilot study is the first attempt to correlate PCC data with national Rx practices. **Method:** Retrospective review of exposures of selective serotonin reuptake inhibitors (SSRI), tricyclic antidepressants (TCA) and central nervous system stimulants (CNSS) involving children 0–20 years called to PCC from 1999 to 2001, compared to national prescribing patterns and Medicaid studies. **Results:** Medicaid data showed significant increases in CNSS use, and national data demonstrate >20% annual increases in CNSS and >30% SSRI, with the greatest increases from 1997 to 1999. TCA Rx declined 20%. PCC data show SSRI increased >20%, the most dramatic increase (30%) from 1999–2000, while CNSS and TCA had declines of 20% and 6%. **Discussion:** Although this was a pilot study, the data suggest PCC calls reflect trends in Rx patterns of SSRI and TCA. CNSS may reflect geographic RX differences. Further study is needed to evaluate the predictive value of PCC data, and develop models able to estimate Rx prevalence, and risky emerging trends. **Conclusion:** PCC pediatric calls involving SSRI and TCA parallel national Rx trends

## 85 CHARACTERISTICS OF PATENTS WITH NO UNDERLYING TOXICOLOGIC SYNDROME EVALUATED IN A TOXICOLOGY CLINIC

Leikin JB, Mycyk MB, Bryant SB, Cumpston KL. *ENH-Omega, Toxikon Consortium, Chicago, Illinois*

**Background:** An increasing number of patients suffer from chronic subjective symptoms associated with a single toxic trigger without any confirming diagnostic or laboratory evidence. Despite removal of the source, biologic implausibility relating the trigger of the symptoms, and inconclusive workups, afflicted patients are convinced of ongoing poisoning and undergo frequent re-evaluation. This report describes our clinic experience with these patients. **Case Series:** 20 patients with a mean age of 41 years (median age 42 years; range: 4 to 65 years) were evaluated. None of these individuals had a pre-existing

psychiatric history or were on psychotropic medications. 50% were male; 20/20 (100%) describe a single toxic exposure triggering their symptoms; 0/20 (0%) describe other chemical sensitivities; 2/20 (5%) report on-going exposure, 18/20 (95%) had a limited exposure dating 1 month to 5 years prior to toxicology clinic evaluation; 9/20 (45%) are currently employed; 6/20 (30%) sought alternative medical therapy prior to toxicologist evaluation; 6/20 (30%) have attempted litigation. **Conclusion:** The clinical pattern exhibited by these patients is consistent with a post-traumatic stress disorder combined with a panic disorder. This clinical pattern is distinct from Multiple Chemical Sensitivity Syndrome, because our patients are not intolerant to other chemical triggers and are not debilitated by their symptoms. Despite repeatedly normal toxicologic and medical evaluations, all data refuting an underlying toxic cause is not accepted by this series of patients and their search for a diagnostic linkage persists.

## 86 FLUOXETINE EXPOSURES—ARE THEY SAFE FOR CHILDREN, AS BELIEVED?

Baker SD, Morgan DL. *Central Texas Poison Center, Scott & White Memorial Hospital, Temple, Texas*

**Objectives:** Although it is believed that unintentional ingestions of fluoxetine by children is relatively safe, a MEDLINE search revealed no such information is currently available. Our goal is to ascertain if fluoxetine is safe for children under 6 years old and what dose is tolerable. This information will be of considerable use when triaging pediatric patients exposed to fluoxetine. **Methods:** Data was retrieved from the (STATE) Poison Central Toxic Exposure Surveillance System database. Inclusion criteria included fluoxetine exposures: between 1998–2001, pediatric patients <6 years old, known amount ingested, single substance ingestions, and follow up done within 6 hours. **Results:** One hundred seventy nine cases met all criteria out of the total four hundred thirty pediatric fluoxetine exposures between 1998–2001. The age distribution was 14% between 3 months to 12 months, (34%) 12 months to 23 months, (33.5%) 2 year olds, (10%) 3 year olds, (6%) 4 year olds, and 1% each for 5 and 6 year olds. The range of fluoxetine ingested was 5 mg to 140 mg. Distribution of the doses ingested were 5 mg (7%), 10 mg (22%), 20 mg (40%), 40 mg (13%), 60 mg (7%), others (13%). Follow up results showed that only minor effects were noted in 4 cases (2.23%), all others 175 cases were asymptomatic.



Effects reported were vomiting in 3 cases (1.68%) and sedation in one case (0.55%). Conclusion: Since these are pediatric exposures, each patient took only a few capsules. In 87% of the cases the amount ingested was 60 mg or below. Most patients (91.5%) were 3 years old or younger. This chart review provides some evidence that up to 60 mg of fluoxetine is safe in children 3 years old or younger. These children can be left at home with only minimal effects if any. Information of this nature is valuable to the poison specialist when triaging patients.

### 87 TRAMADOL: A RETROSPECTIVE REVIEW OF REGIONAL POISON CENTER CASES

Willis B, Nester ML, Shum S. *Texas Panhandle Poison Center, Amarillo, TX*

Background: We conducted a review of 405 cases of Tramadol exposure and compared it with previously published data related to Tramadol's similarity to opioid intoxication and also the increased risk of seizures associated with Tramadol exposure. Methods: We performed a retrospective review of the Toxicall charts from six regional poison control centers for the years 2000 and 2001. Results: Ages: Of 405 cases, 45 (11%) patients were below the age of six, 64 (16%) were between the ages of six and nineteen, and 296 (73%) were greater than nineteen years of age. Reasons: 120 (30%) exposures were unintentional, 245 (60%) were intentional, 31 (8%) were adverse reactions, and 9 (2%) were other. Outcomes: 126 (31%) patients experienced no effect, 193 (48%) had a minor effect, 63 (15%) had a moderate effect, and 23 (6%) had a major effect. There were no reported deaths in the cases reviewed. 21 (5%) patients experienced seizures after Tramadol exposure. Conclusion: Our data correlates well with previously published data relating to the propensity of Tramadol to cause effects similar to opioid intoxication. We also confirm that there is a significant risk of seizures associated with Tramadol exposure.

### 88 DELIBERATE SELF-POISONING: THE POISON CENTER PERSPECTIVE

Bentur Y, Lavie M. *Israel Poison Information Center, Rambam Medical Center, Faculty of Medicine, Technion, Haifa, Israel*

Background: Deliberate self-poisoning (DSP) is a major health problem with increasing incidence mainly among youth. Objective: To examine the clinical and toxicological characteristics of DSP and compare it to unintentional exposures. Methods: 2-year retrospective poison center chart review. Statistics:  $\chi^2$  analysis. Results: 3,802 DSP cases were reported. Most calls (95%) were made by physicians (51% in unintentional exposures,  $p < 0.0001$ ). There were almost twice as many females as males, unlike unintentional exposures ( $p < 0.001$ ). Peak frequency involvement for females was at the age of 15–20 years and older for males. Only 19.8% of DSP calls were made within the first hour of exposure compared to 46% of the unintentional calls ( $p < 0.001$ ). Younger patients tended to present earlier. The vast majority of exposures occurred at home and by ingestion. Drugs and chemicals were involved in 86% and 12% of DSP cases, respectively (29% and 44% in unintentional exposures, respectively,  $p < 0.001$ ). Sedatives were more commonly used in older age groups and analgesics among the younger. Insecticides and cleaning products were the frequently used chemicals. 48.2% had neurological involvement (16.9% in unintentional exposures). DSP was associated with worse severity than unintentional exposures (21% and 10% had moderate-severe toxicity, respectively,  $p < 0.001$ ). Severity was greater among males at age older than 45 years, time elapsed 24 hours or longer and with chemicals. Conclusions: Most DSP patients were females, aged 15–20 years, used drugs and had neurological involvement. Male gender, age over 45 years, longer time to toxicology consult and the use of chemicals were associated with increased severity. These parameters should increase the treating physician's awareness to a possible worse outcome, hence to a more aggressive approach.

### 89 PHARMACY COMPOUNDING AND ORDER-OF-MAGNITUDE ERRORS

Seifert SA, Jacobitz K, Scheer A. *The Poison Center at Children's Hospital, Omaha, NE. St. Elizabeth Regional Medical Center, Lincoln, NE*

Background: Medications are compounded by pharmacies due to a lack of suitable prepackaged formulations. This creates the potential for prescription filling errors of dose by orders-of-magnitude. Case Reports: Case 1. An 11-year-old male was administered an oral liquid dose of

atropine preoperatively for a urologic procedure. The pharmacy substituted grams for milligrams in preparing a portion of the solution, resulting in 734 times the ordered dose. After the procedure, he was agitated, disoriented and had hallucinations. Pupils were dilated, he was afebrile, and had a pulse of 170 bpm (sinus). Agitation was controlled with midazolam and most symptoms resolved within 24 hours. Case 2. A 2-year-old male was given his first dose of oral liquid clonidine for ADHD. The pharmacy substituted grams for milligrams and the patient received 510 times the ordered dose. Shortly after administration, he experienced CNS depression and a respiratory arrest. He was resuscitated and recovered over two weeks with some ongoing sequelae. **Discussion:** Compounding increases the risk of medication errors, notably order-of-magnitude dose errors. The substitution of grams for milligrams or milligrams for micrograms results in a three-order-of-magnitude dose error. Children are particularly at risk because of the lack of unit dosing of many preparations. Error reduction strategies should be improved. There should also be reduced use of agents that must be compounded that are potentially fatal in overdose, have low therapeutic indices, and for which safer alternatives are available.

#### 90 IRB SUBMISSION PRACTICES WHEN UTILIZING POISON CENTER DATA

Bryant SM, Paloucek F, Aks S. *Toxikon Consortium-Cook County Hospital, University of Illinois at Chicago, Chicago, Illinois*

**Background:** Our regional poison center is located at a site separate from the hospital sponsoring our medical toxicology fellowship. The purpose of this study is to evaluate current practices for obtaining IRB approval for studies involving poison center data. **Methods:** A 7-question survey was emailed to directors of accredited medical toxicology fellowship programs and medical directors of United States poison centers. **Results:** A total

of 52 surveys were distributed and 40 responses (77%) were obtained. The answers received were varied. Most centers do clinical research through their poison centers and most poison centers are located at a hospital. 53% state that their IRB will approve studies involving remote sites (sites contacted by telephone) while 25% were either unsure or haven't tried. 15% do not get approval when remote sites are involved and 7.5% specifically addressed obtaining IRB approval from remote sites in addition to IRB approval from their home institution. 25% do not obtain IRB waiver for studies because they involve only collection of data but not intervention from a standard toxicology management. **Conclusion:** Current practice for obtaining IRB approval for studies involving poison center data is varied among United States poison centers and accredited medical fellowship programs.

#### 91 SERIOUS POISONING EFFECTS IN THE 6 TO 12 YEAR AGE GROUP

Stremski E, Crouch R, Lintner C, Anderson D. *Children's Hospital Poison Center, Milwaukee, Iowa Statewide Poison Center, Sioux City, Hennepin Regional Poison Center, Minneapolis*

**Background:** Children age 6–12 years accounted for 7% of all human poison exposure cases reported by the AAPCC in Year 2000. **Objective:** Analyze 2001 human exposure cases in children 6–12 years to determine the differences in factors found in seriously injured patients compared to those with minor or no effects. **Methods:** Review of AAPCC Reports from 3 US Poison Centers. Children grouped by AAPCC defined Medical Outcome: **I.** Serious Effects recorded (Medical Outcome = Death, Major, Moderate). **II.** No Serious Effects (Medical Outcome = None, Minor, Not followed / judged non-toxic). **Results:** Of 4,137 total cases 131 (3.2 %) were Group I, this did not differ between the 3 states. Some significant differences noted between the two groups are shown in the table. No significant differences were seen

	Group I	Group II	p-value
Intentional	23/131 17.5%	236/4,006 5.9%	0
Acute on Chronic	19/131 14.5%	228/4,006 5.7%	0
2 or more substances	17/131 12.9%	185/4,006 4.6%	0

between the groups with respect to Gender, Site, or Route of Exposure. The 5 most frequently involved substances differed significantly in the two groups: **I.** Analgesics (21), Stimulants (16), Antidepressants (14), Antihypertensives (13), Sedatives (13). **II.** Foreign bodies (639), Analgesics (586), Personal Care (538), Crafts (504), Cough-cold (441). Conclusion: Few differences existed with respect to those who did and did not develop serious effects due to the poison exposure. Intentional ingestion of prescription and illicit medications appears to be a reasonable focus for reducing serious poison injury in the 6–12 year age group.

## 92 TRENDS IN FATAL DRUG OVERDOSES: UNITED STATES, 1983–2000

Meggs WJ, Bloch RM. *Brody School of Medicine at East Carolina University, Greenville, NC 27858*

Background: Factors affecting deaths from drug overdoses include the availability of drugs with low therapeutic indices. Changing prescribing practices and the introduction of new drugs with greater or lesser lethality may influence overdose deaths from different drugs. Methodology: The American Association of Poison Control Centers (AAPCC) Toxic Exposure Surveillance System (TESS) was used to assess changing trends in drugs used in fatal overdoses in the United States, 1983 to 2000. Deaths reported to Poison Control Centers (PCCs) participating in TESS were analyzed over the study period. Total reported deaths for each drug each year were normalized to total population served by participating PCCs for that year. Data is reported as the number of deaths reported to participating PCCs per hundred million population served (RPHMP). Results: Over the study period, several drugs demonstrated marked changes in deaths reported to participating PCCs per hundred million population served. Deaths reported from digoxin ranged from a high of 38 RPHMP in 1992 to 8 RPHMP in 2000. Theophylline deaths ranged from a high of 18.93 RPHMP in 1991 and fell monotonically to 3.69 RPHMP in 2000. Deaths from tricyclic antidepressants (TCAs) peaked at 78.91 RPHMP in 1991, then leveled from 1996 to 2000 at approximately 40 RPHMP. Total anti-depressant deaths peaked at 98.62 RPHMP in 1992 and fell to 47.67 RPHMP in 2000. Deaths from verapamil and diltiazem were 0 RPHMP in 1982. During the 1990's, deaths ranged from 13.79 to 18.52 RPHMP. Conclusion: Remarkable changes occurred during the study period in deaths from several drugs.

## 93 INJECTION OF PYRETHRINS WITHOUT SIGNIFICANT SEQUELAE

LoVecchio F, Penix J, Thole D. *Good Samaritan Regional Poison Center, Phoenix, Az*

Introduction: Intravenous injection with pyrethrins is rarely described. We describe minimal toxicity following intravenous injection. Case Report: A 36-year-old man injected 6 ml of Real Kill Ant and Roach Killer 2™ into his antecubital fossa and 2 ml subcutaneously into his abdomen in a suicide attempt. Upon evaluation in the emergency department one hour later he had pain at the injection site and no other symptoms. He denied any co-ingestion, medications or medical problems. His heart rate was 80 beats per minute; BP 120/76; Respirations 15 per minute and Temperature 97.6°F. His physical examination was normal except for a dime-sized area of erythema at the antecubital injection site and a small needle mark at the abdominal site. An EMIT drug assay, electrolytes, glucose, CK and CBC were within normal limits. He was observed for 4 hours and had resolution of his antecubital pain and erythema. He was admitted to inpatient psychiatry and remained clinically well throughout his 3-day course. The ingredients of the product included: mineral spirits (4%), propylene glycol monobutyl ether (6%), tralomethrin (.01%), isobutane (3%), propane (2%), N-octyl bicycloheptene dicarboximide (1%) and D-trans allethrin (.05%). Conclusions: Intravenous and subcutaneous injection of a pyrethrin resulted in only local toxicity in our patient.

## 94 POISON CENTER CASES INVOLVING CHILDREN LESS THAN 60 DAYS OF AGE

Powers, M, Stremski, E, Anderson D. *Children's Hospital of Wisconsin Poison Center, Milwaukee, WI, and Hennepin Regional Poison Center, Minneapolis, MN*

Background: Annual Toxic Exposure Surveillance System reports do not specifically describe the circumstances and outcomes of poison exposure cases involving newborns. Objective: Describe the demographics, reasons, outcomes, and products in poison exposure cases involving children less than 60 days of age. Methods: A two-year Retrospective Case Review of 2 poison center's cases searched by age < 30 days or = 1 month, done in tabular and descriptive analysis. Results:

217 cases accounted for <0.15 % of all human exposures recorded, 49 % were Male. Four cases were found to be Intentional (neonatal drug withdrawal from maternal poly-drug abuse). The reasons for 213 Unintentional exposures included: 85 General, 77 Therapeutic Error, 31 Environmental, and 20 directly related to Infant Formula mixing errors. Professional labeling errors were found in 7 cases. Of the 205 exposures that occurred in the Residence, 186 were onsite managed without symptoms. 8 exposures occurred within a Health Care Facility. The 5 most frequently involved products involved accounted for 35 % of all cases: 22 Isopropanol, 20 Infant Formula, 15 Ranitidine, 11 Natural gas leak, 10 Simethicone. In 11 cases significant adverse effects developed. In 6 of these 11 cases a drug error was made by a health care professional, 3/11 were related to neonatal drug withdrawal, while 2 were due to an excessive dose given by a parent. Three of 4 cases that required critical interventions occurred due to a medication error made in a health care facility. There were no fatalities. Conclusion: Unintentional poison exposure of an infant at home rarely resulted in adverse outcome. Serious effects manifested in infants from an unintentional poisoning were often due to errors made by health care professionals.

## 95 HIGH DOSE ACYCLOVIR GIVEN TO AN ELEVEN DAY OLD CHILD

Baker KL, Baker SD, Morgan DL. *Central Texas Poison Center, Scott & White Memorial Hospital, Temple, Texas*

Background: Acyclovir is an antiviral agent indicated for the treatment of herpes simplex-1 and -2, herpes simplex encephalitis, herpes zoster, and varicella zoster. It has also been used for prophylactic treatment of cytomegalovirus. Doses normally range from 10 mg/kg/day to 60 mg/kg/day in the neonate population, but pediatric and adult patients use as high as 80 mg/kg/day. A MEDLINE search revealed the largest reported intravenous dose inadvertently administered to a neonate was 100 mg/kg/dose. This patient was treated with exchange transfusion and hydration with no consequences. Case Report: An eleven day old male (3.4 kg) being treated for suspected HSV inadvertently received a dose of intravenous acyclovir 750 mg (220 mg/kg/dose) as the result of a medication error. The acyclovir was given over 60 minutes at a concentration of 5 mg/ml after a fluid bolus of 30 ml of normal saline. Prior to the exposure, the infant

had received 5 doses of acyclovir at 10 mg/kg/dose every eight hours, then the 220 mg/kg/dose, and an additional 2 doses at 19 mg/kg/dose every eight hours prior to discovering the error. The error was discovered 24 hours post exposure. The only treatment the patient received was normal saline hydration. No tremor, myoclonus, or seizures were noted. At the time of discovery, the serum creatinine transiently increased from a baseline of 0.5 to 0.7 mg/dl before returning to the baseline level within 66 hours. Conclusion: To our knowledge, this is over twice the largest reported dose (220 mg/kg) of intravenous acyclovir inadvertently given to a neonate. The patient was treated with hydration and only had a minor transient increase in creatinine and no other symptoms.

## 96 POISON CENTER SURVEILLANCE FOR BIO-CHEM TERRORISM

Mrvos R, Krenzelok EP. *Pittsburgh Poison Center, Children's Hospital of Pittsburgh; Schools of Pharmacy and Medicine, University of Pittsburgh, Pittsburgh, PA*

Background: The events of September 11, 2001 created an immediate need for continuous monitoring of symptoms to identify sentinel events that may signal acts of biological or chemical terrorism. By virtue of their 24/7 operation and utilization by both the public and medical professionals, poison centers have the capability to fulfill this monitoring need through surveillance of their online medical record database. A RPIC, in conjunction with its local MMRS, FBI and health department developed a monitoring method and implemented it immediately on September 11, 2001. Methods: A literature review of anticipated biological and chemical terrorist agents was conducted to identify commonly associated symptoms. Seagate Analysis was used to construct a query that analyzed for the specified symptoms, patient history and demographics. To identify trends the query was run on the current online database that included both human and animal exposures and against the previous year's symptom data as a benchmark. If an increase in any symptom was noted in comparison with the benchmark data, the individual case was reviewed. If the symptoms were inconsistent with the contaminant, the patient was contacted and a further medical history was obtained. Results: From 9-11-01 to 4-10-02, 47,330 cases were reviewed and 3,483 exhibited symptoms that had the potential to be associated with a biological or chemical terrorism agent. However, no incidents attributable to

terrorism have been identified. The data are monitored continuously in the poison center and forwarded to the appropriate authorities. Conclusion: The AAPCC defines a poison center as an organization that “provides hazard surveillance to achieve hazard elimination” as one of its purposes. Daily monitoring for biological or chemical contamination helps to achieve this goal.

### 97 MASS SOCIOGENIC ILLNESS... REAL AND IMAGINARY!

Doyle CR, Akhtar J, Mrvos R, Krenzelok EP.  
*Pittsburgh Poison Center, Children's Hospital of Pittsburgh, University of Pittsburgh Schools of Pharmacy and Medicine, Pittsburgh, PA*

Background: Mass sociogenic illness is the occurrence of a group of nonspecific physical symptoms for which no organic cause can be determined and is often transmitted by ‘line of sight’. The fears of bioterrorism can also lead to panic and produce cases of “mass sociogenic illness,” in which people develop symptoms in response to an imaginary threat. Poison centers are faced with resolving the dilemma of sociogenic vs. poison-related symptoms. We report two situations of mass sociogenic illness involving school age children where multiple victims exhibited similar symptoms prompted by the presence or suggestion of fumes. Case series: (1) Twenty children were observing a demonstration in school where the teacher was creating theatrical smoke using dry ice. The children started to complain of dizziness, shortness of breath being light-headed. Some of the children were hyperventilating. Seventeen of the victims were transported to emergency departments for evaluation. No pathology was identified and all children improved spontaneously. On-site air monitoring revealed no irregularities. (2) Children were attending mass in a church at the same time that a natural gas leak was detected in the vicinity. Church officials were notified and symptoms of headache and dizziness developed in 14 children after they were informed about the incident. They were transported to two different emergency departments where every examination and test performed, including carboxyhemoglobin, were normal. The symptoms resolved spontaneously. Conclusion: When clusters of unexplained illness occur, a sociogenic etiology should be considered in the differential diagnosis. Also, as fears about bioterrorism increase, the frequency of such incidents and the anxiety generated may increase.

### 98 CERTIFIED SPECIALISTS IN POISON INFORMATION AS INVESTIGATORS OF EPIDEMICS

Zeng X, Wagner MM, Mrvos R, Krenzelok EP. *Center for Biomedical Informatics, Pittsburgh Poison Center, University of Pittsburgh School of Pharmacy, Pittsburgh, PA*

Background: We are interested in how Certified Poison Information Specialist (CPIS) nurses work as on-call investigators for suspected disease outbreaks or bioterrorism attacks. Objectives: (a) To determine the potential epidemiological data that can be retrieved manually in the emergency department (ED) admission notes. (b) To evaluate the accuracy and speed of retrieval of these data by CSPI nurses. Methods: 22 data elements were selected from a form for the investigation of acute gastroenteritis epidemics. 50 ED admission notes with a free text chief complaint of acute diarrhea were selected. We asked 3 physicians to determine whether the data were available in the notes for each data element. The data elements that have data available in at least one note were retained as the candidate elements for acute diarrhea epidemic investigation based on ED notes. Then we selected 100 ED notes with ICD-9 coded chief complaints indicating that the patient may have prodromal GI disorder and we asked the CPIS's to retrieve data from them. The accuracy and speed that the CSPI's extracted data from these ED notes were analyzed against the expert epidemiologist's case classification. Results: We found that the data were available in at least one ED note for 17 of 22 data elements included in the standard form. The sensitivity and specificity of CSPI's to classify acute diarrhea cases were 0.92 and 0.97, respectively. The average time that each nurse spent to collect needed data on each case was 48.3 seconds. Conclusions: Most of the data needed for the investigation of acute diarrhea epidemics were presented in the ED admission notes and the CSPIs achieved a significantly high level of accuracy and speed when they retrieved the data from the ED admission note.

### 99 EMERGENCY DEPARTMENT TRIAGING OF SELF POISONING

Dowsett R, Graudins A. *Department of Clinical Toxicology and Pharmacology, Westmead Hospital Sydney, Australia*

Background: Guidelines for the triage of patients with self-poisoning (SP) are not well defined. Variation in

	Total Presentations		Self Poisoning Triage		Waiting Time (minutes)		Left Without Being Seen	
	All	SP	High Urgency	Lower Urgency	All	SP	All	SP
TTU	75700	838	39%	61%	82	48	8%	3%
District	105003	891	22%	78%	59	32	15%	7%

Abstract 99.

practice between hospital and the impact on outcomes has not been described. Methods: Triage data obtain from 3 Emergency Departments (ED) utilizing a common patient database were analysed to determine how many patients were triaged with SP, what the assessed urgency was, how long patients waited to be seen by a Doctor and how many left the ED without a medical assessment. Data was obtained from 1 teaching hospital with a Toxicology Treatment Unit (TTU) and 2 EDs of district hospitals on 2 campus. Result: There were 1729 patients with SP over a 2 year period. Results are summarised in the table. A significantly higher proportion of SP patients presented to the TTU ( $p < 0.0001$ ) which triaged them as more urgent ( $p < 0.0001$ ). Waiting times were not significantly different between EDs. 4.9% of patients with SP ho left without being seen with no difference between EDs. Conclusion: Teaching hospitals with TTU triage more patients with SP and rate them with a higher urgency but waiting times are not shorter. 1 in 20 patients leave without medical review.

### 100 ENVIRONMENTAL EXPOSURE SURVEILLANCE: 21<sup>ST</sup> CENTURY CANARY SYSTEM

Bogdan GM, Dart RC. *Rocky Mountain Poison & Drug Center—Denver Health; University of Colorado Health Sciences Center, Denver, CO*

Background: A hotline was established to address public health concerns related to the 17-year remediation of a major chemical weapons site. Despite on-site and perimeter air monitoring, surrounding communities had great anxiety and demanded a system for sentinel event detection and a means to report health concerns. Methods: A 24-hr toll-free hotline was established in 1998 and publicized in these communities. Recorded messages in English and Spanish provide information for odor concerns and clean up activities. Callers with health concerns speak

with poison center staff who complete a standardized panel of questions to assess the potential agent, route and duration of exposure, health concerns (signs, symptoms) and other factors (occupation, lifestyle). Callers are urged to seek medical evaluation from their primary care provider (PCP) and evaluation by a medical toxicologist is available. Toxicologists review each case and assess likelihood of relationships to known site chemicals and air monitoring data for these agents. Assessments are part of the state health department's overall monitoring system. Results: In 40 months we received 676 calls; 41 (6%) spoke to staff with only 27 related to site remediation concerns. Of the 27 callers, 11 reported specific medical concerns they attributed to the site and 16 wanted general information on environmental exposures. Case assessments indicated that reported medical concerns were likely due to smoking or normal aging processes. No PCP contacted us concerning a patient. During this period, no chemical releases across perimeter were indicated from air monitoring data. Conclusions: Passive surveillance mechanisms for reporting of environmental health concerns can alleviate public apprehension of community hazards and can potentially detect sentinel events if environmental releases were to occur.

### 101 SUPRATHERAPEUTIC USE OF OVER-THE-COUNTER (OTC) ANALGESICS BY PATIENTS REPORTING TO AN URBAN MEDICAL CENTER

Havey JM, Phelan S, Bogdan GM, Pons P, Dart RC. *Rocky Mountain Poison & Drug Center and Denver Health Medical Center—Denver Health; Univ. CO Health Sciences Center, Denver, CO*

Background: In a previous study of urban dental clinic (DC) patients, OTC analgesic use was common (82/127), as was supratherapeutic misuse (17/82). Analgesics requiring fewer total tablets per day for therapeutic dosing were more likely to be misused. We surveyed emergency

# Patients:	Approached	Surveyed	Mean Age	% Males	Using OTC	Misusing OTC
ED	225	194	40	57	60	3
DC	194	127	28	52	82	17

Abstract 101.

department (ED) patients to characterize their OTC analgesic use and to compare the two patient populations. **Methods:** Patients reporting to an urban ED were interviewed by trained research assistants using a standardized questionnaire. We recorded patient demographics, the types and amounts of OTC analgesics taken over the past 3 days, and safety perceptions. The study was completed over 8 consecutive days. We defined supratherapeutic as a daily cumulative dose greater than the recommended daily dosage on the package. We defined primary OTC analgesic as the medication taken in the greatest amount if a combination of analgesics was used. **Results:** Only 5% of ED patients misused OTC analgesics compared to 21% of DC patients in the same hospital ( $p < 0.05$ ). Primary OTC analgesic in ED patients was acetaminophen (29/60) with 3% reporting misuse and in DC patients was ibuprofen (39/82) with 31% reporting misuse (see table). **Conclusion:** OTC analgesic use differed significantly among ED and DC patient populations of an urban medical center. Efforts to educate specific patient populations about the potential dangers of supratherapeutic OTC analgesic use should reflect these differences.

## 102 NATIONAL DATA SOURCES FOR THE SURVEILLANCE OF POISONINGS

Gotsch KE, Thomas JD. *Rollins School of Public Health, Emory University School of Medicine, Atlanta, GA*

**Background:** National data on poisonings is important to determine the magnitude of the problem, track trends, and guide prevention efforts. With the explosion of electronic resources, there are many national datasets available relevant to poisoning surveillance. **Methods:** Eight national data sources were considered—DAWN, HCUP/NIS, NCHS mortality data, NEISS, NHAMCS/ NAMCS, NHDS, NHIS, and TESS. A Medline search was performed from 1966 through the April 2002 to determine the number of poisoning-related articles that used each data source. In addition, the data sources were compared based on type of cases captured, method of case identification, data years

available, number of poisoning-related cases present, and method of accessing the data. **Results:** Very few poisoning articles in the medical literature use any of these national data sources. The most commonly used data source was TESS for which 21 articles were found. National mortality data was the second most common source with 8 articles. All six other data sources had less than 5 articles a piece, with no articles found for HCUP/NIS. The types of cases captured varied greatly and included deaths, hospitalizations, emergency department visits, and poison center calls. **Conclusion:** There are a number of easily available national data sources with information relevant to poisoning surveillance, many of which can be downloaded free or queried online. Currently these resources are underutilized. Greater awareness of these data sets, each with its own strengths and weaknesses, is needed to reveal a more complete picture of poisoning epidemiology.

## 103 SCREENS FOR ILLICIT DRUGS FROM DRIVERS IN THE IL TRAUMA REGISTRY

Martens K, Hantsch C, Durazo-Arvizu R. *Loyola University Medical Center, Maywood, IL*

**Objective:** The purpose was to report trends in use of illicit drugs by drivers in the IL Trauma Registry (ITR). **Methods:** The study was a descriptive analysis of toxicology (tox) screens from drivers in the 1995–1998 ITR. A tox screen was considered positive (+) if cocaine, phencyclidine (PCP), amphetamine or marijuana (THC) was detected. Injury severity, reflected by death rate, length of stay (LOS) and charges, was assessed relative to tox screen results. (Injury Severity Scores were not available.) **Results:** The total number of drivers was 27,313 (see table). A tox screen + for illicit drugs was associated with a serum [EtOH] > legal limit in 45% of drivers. Males comprised 78% of drivers with + tox screens. The percentage of females increased from 20 to 26 during the study period. Frequencies of drugs were: 3% cocaine; 43% PCP; 22% amphetamine; 20% THC; 12% mixed. A + tox screen was associated with an

	1995	1996	1997	1998	Total
Toxicology screen results known (% total drivers)	2430 (31%)	2057 (31%)	2211 (36%)	2691 (40%)	9389 (34%)
Drivers with positive toxicology screen (% drivers with tox screen results known)	507 (21%)	452 (22%)	616 (28%)	808 (30%)	2383 (25%)

Abstract 103.

increase in median charges; there was no correlation with death or LOS. Conclusion: Illicit drug use by drivers in the ITR appeared to increase during the study period despite inability of tox screens to detect newer agents (e.g. GHB). Limitations of screens also include variance due to analytical method, inability to distinguish prescribed from illicit drugs, and cross-reaction of substances (e.g. PCP with diphenhydramine or dextromethorphan). Epidemiological data may support development and monitoring of injury prevention initiatives. (Conclusions are not necessarily those of IDPH.)

#### 104 ALCOHOL & DRUG USE BY DRIVERS <21 YEARS IN THE IL TRAUMA REGISTRY

Martens K, Hantsch C, Durazo-Arvizu R. *Loyola University Medical Center, Maywood, IL*

Objective: The purpose was to describe trends in use of illicit substances by drivers <21 years old in the IL Trauma Registry (ITR). Methods: The study was a descriptive analysis of the 1995 to 1998 ITR. Any detectable serum (>0.005 g/dL) and toxicology (tox) screens detecting cocaine, marijuana (THC), phencyclidine (PCP), and/or amphetamine were considered positive (+). Results: Of all 27,313 drivers, [EtOH] was measured in 13,642 (50%); 6,079 (45%) were > legal limit. Tox screens were obtained in 9,389 (34%); 2,383 (25%) were positive (see table).

Of drivers <21 years old with +serum [EtOH], 74% were >0.08 g/dL and 81% were males. For those with a +tox screen, frequencies of drugs identified were: 1% cocaine; 17% THC; 65% PCP; 7% amphetamine; 9% mixed. Conclusion: In contrast to drivers of all ages, there appears to be a recent decrease in use of illicit substances documented in the ITR. Limitations of screening includes failure to detect new agents (e.g. GHB), variance due to analytical method, cross-reactions (e.g. PCP with diphenhydramine or dextromethorphan) and inability to distinguish prescribed from illicit drugs. Epidemiological data may support development and monitoring of injury prevention initiatives. (Conclusions are not necessarily those of IDPH.)

#### 105 THE USE OF POISON CENTERS FOR SURVEILLANCE AND RESPONSE TO BIOTERRORISM EVENTS

Allen, S., Bernstein, J., Weisman, R., Ragone, S. *Florida Poison Center/Miami*

Background: Poison Centers play a vital role in the community response system, acting as early warning surveillance for suspicious events. Poison Centers offer real-time and continuous data vital for preparation and response during such events. Methods: This is a retrospective study of case volume received in response

	1995	1996	1997	1998	Total
Detectable [EtOH] in drivers <21 years (% of all drivers with [EtOH] > legal limit)	196 (11%)	178 (12%)	189 (14%)	158 (11%)	721 (12%)
Positive tox screen in drivers <21 years (% of all drivers with positive tox screen)	86 (17%)	87 (19%)	120 (20%)	104 (13%)	397 (17%)
Positive [EtOH] and tox in drivers <21 (% of drivers <21 years with positive tox)	41 (48%)	23 (26%)	55 (46%)	44 (42%)	163 (41%)

Abstract 104.



Year	Yearly Total	Monthly Average	Daily Average	October Totals
1999	51,143	4,262	140	4,139
2000	52,198	4,262	143	3,054
2001	51,400	4,283	141	4,887

Abstract 105.

to the discovery of anthrax contamination in a West Palm Beach office building. Data was extracted from the local poison center information database. Results: Case totals are shown in the table. The data indicates a significant increase of case reported for October 2001. The largest case total reported for single day during October 2001 was 267. Due to the inability of the data system to log and record the nature of these initial cases, this data cannot be evaluated further, changes to the TESS system occurred in mid-October. In addition, the case numbers for October 2001 may not accurately reflect the true number of incoming calls, as many were not logged due to increase demands on staff members. The case totals may be considered even more significant as the yearly totals for 2001 were slightly lower than for 2000. Conclusions: Poison Centers should be considered a vital part of the community response, as a resource for health information and as an early warning surveillance system.

#### 106 MULTICENTER CASE SERIES OF ACETIC ACID POISONINGS: HOSPITALIZATION AND LETHALITY

Sarmanaev S, Sentzov V, Zobnin Yu, Provado I, Vishnevetsky M, Achmetov I. *Toxicological Center, Ufa, Ekaterinburg, Irkutsk, Perm, Russia*

Background: Acute corrosive poisonings are widely spread in USA (Christesen 1994; Cox&Brooks 2000; Kardon 2000; Issley 2000) as well as in Russia (Luzhnikov 2000; Khalfin&Sentzov 1999; Sarmanaev 2000). There are no large case series published on acetic acid. Aim: A study of distribution and outcomes of peroral corrosive poisonings, and, particularly, poisonings by acetic acids. Data and Methods: We retrospectively studied data from 9 toxicological centers (total of inhabitants under inspection: 6 mln) for 3 years, which included 29601 medical reports of patients with acute poisonings. Results: Out of these, 2133 patients were poisoned by corrosives. The total of patients with acute peroral acetic acid poisonings amounted to

1084. The general lethality being 832 patients, acute corrosive poisonings accounted for 230 victims. Out of these, 157 victims died after being poisoned by acetic acid. Conclusions: 1) Hospitalization at the toxicological centers in connection with acute poisonings was 164 person per 100000 inhabitants a year. The average proportion of patients with corrosive poisonings made up 7.23%; out of these, 50.82% were acute acetic acid poisonings. 2) The total lethality being 2.8%; out of this total, the lethality in cases of acute corrosive poisonings makes up 27.6%; 3) The proportion of the patients who died of acetic acid poisonings is equal 18.9%; 4) A further prospective in-depth multicenter study is necessary in order to clarify factors underlying the present picture of acute corrosive poisonings.

#### 107 COMBINED EXCHANGE TRANSFUSION AND CHELATION THERAPY FOR NEONATAL LEAD POISONING

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Background: Long-term neurologic disability from in-utero lead exposure is well described, but the optimal treatment of neonatal lead poisoning is still unknown. We combined exchange transfusion and chelation therapy in a neonate with an elevated blood lead level (BLL). Case: A 34-year-old Hispanic woman with a long history of eating glazed pottery gave birth to a healthy appearing girl at 40 weeks of gestation. The mother's pre-conception BLL was 117 mcg/dL and third trimester BLL was 72 mcg/dL. The infant weighed 3.7 kgs, Apgar scores were 8 and 9, and physical exam was normal. The infant's hemoglobin was 16 g/dL and the cord BLL was 100 mcg/dL. The mother's BLL at delivery was 87 mcg/dL, ZPP was 711 (0-60). The infant underwent single volume exchange transfusion within 12 hours of birth. BLL was 28 mcg/dL following the exchange, and a 5-day course of chelation with BAL and CaNa<sub>2</sub>EDTA was initiated on day 2 of life. Infant BLL was

37 mcg/dL at the end of inpatient chelation. The infant is undergoing further outpatient chelation and evaluation. Discussion: In utero lead exposure may result in long-term neurologic disability despite a healthy appearing infant at the time of birth. Exchange transfusion has been successfully used for other neonatal poisonings, and in this case successfully reduced the central compartment lead burden. Parenteral chelation therapy was added to reduce the soft tissue burden of lead, but the long-term neurologic efficacy of our combination strategy remains to be seen.

### 108 FATAL MERCURY TOXICITY FROM HEATING DENTAL ALMALGAM

Brubacher, JR. *Vancouver General Hospital, Vancouver, British Columbia*

Background: Mercury vapor is toxic to the lungs. We report on a dentist who died following exposure to fumes from heated dental amalgam that contained mercury. Case Report: A 41-year-old dentist presented with severe dyspnea. The previous evening he had been in his kitchen when some dental amalgam "accidentally" fell on a hot burner and released thick white fumes. After 15 min he opened a window and turned on a fan but remained in the room all night. The following morning he was unable to speak in full sentences. His vital signs were: BP 110/75 mmHg, pulse 115/min, respirations 32/min. His arterial blood gases on 80% oxygen by mask were pH = 7.44, PCO<sub>2</sub> = 36 mmHg, PO<sub>2</sub> = 72 mmHg, bicarbonate = 24 mEq/L. His CXR showed patchy consolidation in both lower lobes. A chest CT scan showed diffuse ground glass opacification with consolidation at the lung bases consistent with severe inhalational exposure. Electrolytes were normal except bicarbonate = 22 mMol/L and anion gap = 15 (explained by his lactate of 3.08 mMol/L). There was no elevated osmole gap. Acetaminophen and salicylates were not detected. Urine tox screen (including opioids) was negative. A spot urine mercury level was reported as 9689 µg/L. DMSA was started in the emergency department and continued for the duration of his admission. Urinary mercury excretion was 14,549 µg on Day 1 (normal <30 µg per day) and decreased to 1659 µg on day 7. Despite supportive care in the ICU, he suffered progressive respiratory failure requiring intubation on day 8. On the 9<sup>th</sup> hospital day he became hyperthermic and impossible to ventilate and died of cardiac arrest. Conclusion: We report a case of fatal pulmonary toxicity from mercury inhalation from dental amalgam.

### 109 CHRONIC ARSENIC (As) TOXICITY FROM CHITOSAN<sup>®</sup> SUPPLEMENT

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Background: Chitosan<sup>®</sup> is a natural product derived from chitin. Chitin, a polysaccharide found in shellfish, can prevent absorption and storage of fat. We are reporting a case of possible chronic As toxicity in a woman who was taking the recommended dose of this "fat trapper" for a year. Case report: A 39-yr-old woman presented to an ED with a history of fatigue, headache and weakness for 6 months. PMH were negative and she was taking Chitosan<sup>®</sup> 6 capsules/day for a year. When her neurologist reported she had a sensory peripheral neuropathy, a toxicologist advised getting a 24-hr urine collection for heavy metals. Results (on fish free diet) revealed elevation of urine As (UAs):186ug/L (nl: 0-50 ug/L)(organic <25ug/L). A repeat 24 hr UAs drawn 19 d later (off drug) was 100ug/L. FDA analysis of the pills confirmed 135.5 ng/gm/capsule of As (0.015ug/kg/day-1 yr). No other sources of As were identified in her water/diet/environment. Her neurological manifestations subsided over 4 mths when the 24 hr UAs was <10 ug/L. Shellfish is a known source of As. Although sensorimotor peripheral neuropathy has been associated with higher As doses (30 ug/kg/d), As may accumulate over time because of longer elimination times (weeks) in chronic dosages. Although a 24 hr UAs >100 ug/L is considered the WHO action level for intervention, no chelation was provided. Conclusion: Patients who develop a sensory peripheral neuropathy while on long term "fat trapper" dietary supplements should be evaluated for possible arsenic toxicity.

### 110 TRANSIENT ISCHEMIC ATTACK ASSOCIATED WITH METABOLIFE<sup>™</sup> USE

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Background: Metabolife<sup>™</sup> contains chromium picolinate, Ma Huang (typically 12 mg Ephedrine), Guarana concentrate (typically 40 mg Caffeine) and various herbal and vitamin supplements per tablet. Symptomatics have been associated with vasoconstriction. In theory ephedrine could result in symptomatic vasoconstriction. Case Report: A

20-year-old woman presented to the emergency department complaining numbness to her left face, arm and leg that began one hour prior to arrival. She had a mild headache and nausea. She denied any other similar episodes or prior medical problems. She admitted to 4 tablets of Metabolife™ less than 30 minutes prior to the episode. She also stated that she ingested 6–15 tablets daily for the 3 days prior in an attempt to lose weight. Her family history, social history and review of symptoms were negative. Her physical examinations revealed a well-developed woman in no distress. Her heart rate was 89 beats per minute, Blood pressure 134/84 mm/Hg, respiratory rate of 16 per minute and oral temperature of 99.1°F. Her pupils were 4 millimeters, equal and reactive. Her neck, pulmonary, cardiovascular, abdominal examination were normal. Her cranial nerves (II–XII) were intact. Motor was 5/5 in all extremities. Two point discriminations was decreased throughout her left side. Reflexes were equal and normal bilaterally. Romberg sign and cerebellar signs were normal. Cranial computerized tomography was normal. The patient was admitted and a neurological consult was obtained. A electrocardiogram, complete blood count, coagulation studies (PT/PTT, Fibrinogen), Cardiolipin IGA, IGG, IGM, Lupus anticoagulant, anti-nuclear antibodies, homocysteine levels were normal. A urine EMIT™ drug screen for amphetamine, barbiturates, cocaine, ethanol, opiate, propoxyphene, tricyclic and cannabinoids was negative. A lumbar puncture revealed normal cell counts and culture. A brain magnetic resonance imaging was normal. The patient symptoms resolved within 4 hours and she was discharged the following day. No rechallenge was done. **Conclusions:** The use of Metabolife™ was temporally related to the development of a transient ischemic attack in our otherwise healthy 20-year-old patient.

**111 HOT RELIEF FOR “HUNAN HAND”**

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**Background:** Thanks to the liberal use of “chili pepper”, pepper spray and other capsaicin containing products, contact dermatitis or “Hunan hand” has become a hot topic in many poison centers. Unfortunately, based on a medline and general reference search there is no definitive treatment. Herman et al sited Maalox® as a potential treatment in a letter to the American Journal of Emergency Medicine (1998). Our effort was to determine the effectiveness of antacids on Hunan hand. **Methods:** Participants exposed to capsaicin were asked to wash area with soap and water then soak for 20 minutes in Maalox® or Mylanta®. **Results** are given in the table.

**Conclusion:** The persistent pain of Hunan hand is a challenge. Previous treatments have been varied with unpredictable results. There remains no definitive treatment. But, with 80% of participants obtaining some form of relief, antacid soaks should be considered a viable option.

**112 ACUTE AIRWAY COMPROMISE REQUIRING EMERGENT TRACHEOSTOMY FOLLOWING ONE BITE OF A DIEFFENBACHIA STEM**

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**Background:** Oral contact with *Dieffenbachia* is usually associated with minimal side effects limited to oral mucosal irritation. We report a case of an adult *Dieffenbachia* ingestion, which resulted in acute airway compromise requiring and emergent tracheostomy. **Case Report:** A 69 year-old male bit into the stem of a *Dieffenbachia* which he mistook for sugar cane. He spit out the plant fragments and presented to the emergency department 30 minutes post ingestion. He was drooling, had muffled speech, and edematous lips, soft palate, uvula,

Length of time exposed to capsaicin	< 15 min 35%	15–30 min 25%	1 hr 30%	3 hr 5%	4 hr 5%	Mean < 1 hr
Duration of pain prior to call	< 15 min 25%	1–2 hr 40%	3–4 hr 20%	8 hr 10%	> 24 hr 5%	Mean 2.17 hr
Other treatments prior to calls	Cold water 20%	Vegetable oil 25%	Milk 15%	Vinegar 5%	Soap & water only 35%	
Relief obtained from antacid soak	No relief 20%	Partial relief 15%	Fast relief (< 1 hr) 40%	Slow relief (> 1 hr) 25%	Any relief 80%	

and tongue on initial examination. Treatment with: diphenhydramine 25 mg bolus IV, methylprednisolone 125 mg IV, 2 albuterol nebulized treatments, and 3 racemic epinephrine nebulized treatments, were ineffective in preventing the progression to stridor. Because of impending upper airway collapse, an otolaryngologist placed a tracheostomy tube within 2 hours of presentation. The tracheostomy site was capped after 3 days, and the patient recovered without sequelae. Conclusion: Most *Dieffenbachia* ingestions involve the leaf and the majority of these result in mild oral swelling. The exact mechanism of edema is in question and medical treatment can have unpredictable efficacy. Preparation for a possible surgical airway should be considered in severely symptomatic *Dieffenbachia* ingestions, even from a brief exposure involving the stem.

### 113 MONKSHOOD-INDUCED DYSRHYTHMIA TREATED WITH MAGNESIUM

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Background: Monkshood (*Aconitum napellus*) ingestion is uncommon in North America. All parts of the plant, particularly the leaves and roots, contain potentially cardiotoxic diterpene and norditerpene alkaloids. We report a case of ventricular dysrhythmia that responded to intravenous magnesium therapy after monkshood ingestion. Case report: A 36-year-old male presented to the emergency department five hours after ingesting a portion of a monkshood root in an attempt to control chronic neuropathic pain. The ingested dose was estimated as thirty grams of the root, pulverized into an aqueous slurry. He presented with paresthesias, palpitations, and chest discomfort, but no visual symptoms and no vomiting or gastrointestinal symptoms. Cardiac monitoring revealed frequent multiform premature ventricular contractions and runs of non-sustained ventricular tachycardia. Ventricular tachycardia was controlled with intravenous magnesium sulfate. Ectopy resolved without sequelae over the next twenty-four hours on a continuous magnesium sulfate infusion. Conclusion: *Aconitum* ingestion may result in significant, life-threatening dysrhythmias. Rhythm disturbances may be refractory to usual anti-arrhythmics. Magnesium infusion appears to be of benefit and warrants further investigation in monkshood toxicity.

### 114 HUMAN FATALITY FROM POISON HEMLOCK INGESTION

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Background: *Conium maculatum* is a ubiquitous alien species in the US containing nicotine-like alkaloids. Early clinical effects after ingestion of poison hemlock include both nicotinic and indirect muscarinic effects. Late desensitization of acetylcholine receptors causes an ascending neuromuscular paralysis and coma. Death may ensue due to airway obstruction, cardiovascular effects or ventilatory failure secondary to neuromuscular paralysis. Case Report: Two 13-year-old girls ingested *C. maculatum* after mistaking it for parsley. They developed giddiness, thirst, agitation, flushing, diaphoresis, nausea and vomiting and sought relief by bathing. One girl with a history of atopy, developed dystaxia, dyspnea, marked tongue edema and ascending paralysis. She became cyanotic and seized. Paramedics found her hypothermic and in cardiorespiratory arrest with blood tinged sputum and fixed pupils at 8 mm diameter. She was orotracheally intubated and resuscitated with intravenous fluids, epinephrine and dopamine. Gastric lavage yielded plant fragments. Activated charcoal was given. Brain tomography showed hypoxic ischemia. Lab values were significant for a severe metabolic acidosis and coagulopathy. She was declared brain dead about 36 hours from the time of ingestion. A plant sample was positively identified as *C. maculatum*. Conclusion: Fatalities due to plant exposures in the US are rare. The American Association of Poison Control Centers database from 1983–2000 reveals one fatality due to poison hemlock out of 63 total plant-related deaths and 1,709,807 total plant exposures. The cause of death may have been due to upper airway obstruction from angioedema, direct tissue irritation, seizure or due to respiratory paralysis leading to tissue hypoxia.

### 115 THE STRUCTURE OF POISONINGS BY BLEACHES (PB)

Sarmanaev SKh\*, Aidarova LF, Yamanaeva IE, Vafina GM. *Toxicological Center, Ufa, Russia*

Background: Bleaches are a widely spread etiological factor of peroral poisonings not only in USA (Babl, 1997),

Agent	Cases		Suicides %		Fatality		Duration of Hospitalization (Days)	Severity According to Persson et al. (1998), %					
	Abs.	%	M	F	Abs	%		0	I	II	III	IV	
	M	F											
Chlorine-containing	58	170	72.1	16.2	68.8	1	0.4**	4.64 ± 1.2*	12.3	70.1	14.9	2.3	0.4
Oxygen-containing	30	17	14.9	4.2	17.0	0	0	5.9 ± 0.7*	4.2	51.1	40.3	4.2	0
KMnO <sub>4</sub>	12	9	6.6	33.3	33.3	1	4.8	7.63 ± 3.0	28.6	47.6	9.5	9.5	4.8
Summary (bleaches)	100	196	66.2	15.5	87.7	2	0.7**	6.05 ± 1.25*	12.1	65.5	34.1	3.0	0.7
All corrosives	417	284		13.5	32.0	35	8.13	7.70 ± 0.53	7.8	42.9	26.9	14.3	8.1

\*-p < 0.05 (t-test); \*\*-p < 0. (Fisher's angular transformation); in both cases as compared with all corrosives.

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but also in Russia. **Aim.** A study of the structure and the medical outcomes of PB. **Data and methods:** The study analyzed 296 medical cards of patients with PB. The study singled out the groups of chlorine-containing (hypochlorous acid, potassium hypochlorite, chloramin, chloride lime) and oxygen-containing (hydrogen peroxid, perhydrol, KMnO<sub>4</sub>) bleaches. **Results:** The table summarizes the values for PB that were investigated. **Conclusions:** 1. According to the frequency of admission, acute poisonings by chlorine-containing bleaches prevail (72.1%), women (66.2%). 2. Acute PB (except KMnO<sub>4</sub>) are characterized by more favorable than other types of corrosives. 3. In majority of cases (87.7%), women take the agent intentionally, men do it without intent (84.5%).

#### 116 HEMOLYSIS OF ERYTHROCYTES AND THE MISBALANCE OF HEMOSTASIS IN CASES OF ACUTE CORROSIVE POISONINGS (ACP)

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*Toxicological Center, RCH, Ufa, Russia*

**Background:** A strong resorbative influence is a characteristic of organic acids, but there are indications of development of hemolysis in cases of poisonings by inorganic acids as well. **Aim:** To study the frequency of the development of hemolysis of erythrocytes and the pathology of the hemostasis in cases of corrosive poisonings. **Materials and methods:** We retrospectively studied 609 medical cards of patients with ACP. The analyzed parameters were: activated recalcification time, protrombin index, fibrinogen, ethanol test immediately prior to the admission of the patients to the hospital.

Statistical processing of the data was carried out by means of Fisher's angular transformation. **Results:** Hemolysis of erythrocytes with different degree is registered with all types of ACP, which may act as a cause for the development. Misbalance of hemostasis was most frequently found in cases of poisonings by acetic acid (39.9% of cases). Disseminated intravascular coagulation (DIC) was most frequently found in this group of patients (p < 0.05). In cases of poisonings by table acetic acid and inorganic substances misbalance of hemostasis is registered mainly in the form of hypercoagulational syndrome. In cases of poisonings by alkali and bleaches changes in the system of hemostasis are found to be much rarer as compared with the former two groups (p < 0.001). **Conclusions:** 1. Hemolysis of erythrocytes is registered for all types ACP but with different frequencies and degrees of markedness. 2. Mostly marked misbalance of hemostasis, brought even to the development of DIC, is registered in cases of poisonings by acetic acid. 3. In cases of bleach and alkali poisonings misbalance of coagulation system is registered significantly rarer as compared with poisonings by acids (p < 0.001).

#### 117 HEMOSTASIOLOGICAL ASPECTS OF ACETIC ACID POISONINGS (AAP)

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*Toxicological Center, (Ufa), RCH, (Ufa) Russia*

**Background:** AAP are a widely spread type of poisoning in Russia (Sentzov 2000). AAP causes hemolysis of erythrocytes as well as a release of free hemoglobin and tromboplastin-like substances, which activate coagulation of blood. **Aim:** To study the frequency of

	Minor, % (n = 53)	Moderate, % (n = 65)	Severe, % (n = 44)	Fatal, % (n = 34)
Hemolysis	7,5*	36,9*	59,1*	96,9
Normcoagulation	63,8*	59,6*	64,6*	11,5
Hypercoagulation	36,9***	40,4**	17,9	13,6
Hypocoagulation	2,1**	0*	17,5	18,2
DIC	0*	0*	4,5*	53,8

\*-p < 0,001; \*\*-p < 0,01; \*\*\*-p < 0,05 as compared with the group "Fatal" (Fisher's angular transformation).  
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misbalance of hemostasis in cases of acute AAP. **Materials and methods:** The study analyzed 196 medical cards of patients with AAP. The degree of severity of AAP was estimated according to the scale by Persson et al (1998). We determined the level of free Hb, activated period of recalcification, prothrombin index, fibrinogen and ethanol test at the moment of hospitalization. **Results:** The table summarizes the values for selected parameters that were investigated. AAP of the minor and moderate degree of severity as a rule led to development of hypercoagulational shift. AAP of the severe degree significantly more often resulted in hemolysis, disseminated intravascular coagulation (DIC), and hypocoagulational shifts. The largest misbalance of hemostasis in the form of development of DIC was registered with deceased patients. **Conclusions:** 1) AAP are characterized by development of hypercoagulation, which with a part of patients with severe AAP turns into DIC and hypocoagulation. 2) Development of DIC is a prognostically unfavorable feature.

### 118 CONCENTRATIONS OF EPHEDRA ALKALOIDS AND CAFFEINE IN DIETARY SUPPLEMENTS AND HUMAN RESEARCH SUBJECTS

Haller C, Jacob III P, Benowitz, NL. *Div Clinical Pharmacology, U.C.S.F., San Francisco, CA*

**Background:** Despite numerous reports of serious adverse effects associated with use of dietary supplements (DS) that contain ma huang (ephedra alkaloids) and guarana (caffeine), these products continue to be widely marketed and used in the U.S. for weight loss and athletic enhancement. Adequate research on the pharmacology of multicomponent DS is lacking. **Methods:** We developed and validated a new LC/MS-MS method for quantitating the individual ephedrine-group alkaloids

contained in ma huang, and used this method to analyze 35 commercial DS. We then applied this method to measure plasma and urine levels in 8 human subjects given a single oral dose of Metabolift™. **Results:** All 35 DS contained measurable quantities of ephedrine (E), pseudoephedrine (PE), norephedrine (NE), norpseudoephedrine (NPE), methylephedrine (ME), and caffeine. Plasma concentration-vs-time profiles and urine recoveries of alkaloids were determined in healthy human subjects. Two of the DS did not list the quantity of ephedra alkaloids, and 7 did not list the caffeine content on the label. The range of total ephedra alkaloid content ranged from 5.97 mg to 29.3 mg per serving. 31% of the products contained > 110% of the total ephedra alkaloids listed on the label, and 6% of the DS contained < 90% of the listed amount. Significant variation in total alkaloid content was found in 2 of 4 products investigated for lot-to-lot consistency. Three brands contained proportions of alkaloids that were inconsistent with *E. sinica*, including one that was 98% E, one with 10% NPE, and one that was 13% ME. **Conclusion:** Product inconsistency and misbranding of DS that contain ephedra alkaloids and caffeine is common. A single dose of such a supplement results in measurable quantities of 5 ephedrine-group alkaloids and caffeine in human plasma and urine.

### 119 A SINGLE EPISODE OF ALCOHOL CONSUMPTION CAN INCREASE PARAQUAT ABSORPTION THROUGH SKIN

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**Background:** Topical ethanol is used as a dermal penetration enhancer in some commercial transdermal patches. This led to the hypothesis that ethanol,

consumed orally, would behave similarly. Previous studies in our laboratory demonstrated that chronic ethanol consumption can disrupt skin barrier function, leading to increased penetration of topically applied herbicides. The purpose of this project was to determine if a single drinking episode could also cause changes in transdermal absorption of herbicides. **Methods:** Male Wistar rats were gavaged with 4.3 g/kg ethanol or saline and were allowed to recover for either 2 hours (high circulating blood ethanol) or 16 hours (low circulating blood ethanol). Animals were then sacrificed, skin shaved, removed and placed in an *in vitro* Bronaugh flow through diffusion chamber. 100  $\mu$ L of paraquat spiked with  $^{14}$ C labeled herbicide was placed on the epidermis for 24 hours. Buffer flowing past the dermal side of the skin was collected in 90-minute fractions and counted via liquid scintillation. The percent of herbicide absorbing completely through the skin in 24 hours was determined. **Results:** Paraquat penetration increased across skin removed 2 hours after ethanol gavaging, when blood ethanol levels were still high, as compared to controls  $4.95 \pm 1.13\%$  vs  $0.63 \pm 0.57\%$  ( $p < 0.05$ ). The enhancement remained 16 after ethanol treatment, when blood ethanol levels were low  $5.39 \pm 1.69\%$  vs  $1.65 \pm 0.94\%$  ( $p < 0.05$ ). **Conclusions:** Both acute and chronic ethanol consumption compromise dermal barriers. These studies imply that increased absorption of topical chemical can occur after alcohol consumption.

## 120 POTENTIAL UTILITY OF A RAPID ETHYLENE GLYCOL (EG) BEDSIDE TEST

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**Objective:** Since many hospitals must send samples for EG out to a reference laboratory, delays in diagnosis and treatment may occur. A qualitative colorimetric test [Ethylene Glycol Test Kit (EGT)], already in use by veterinarians, gives results in 30 minutes with little expertise or cost. We sought to determine if the test detects EG, its metabolite glycolic acid (GA), or other alcohols in human plasma. **Methods:** EG was added to human fresh frozen plasma to yield EG concentrations of 1, 10, and 100 mg/dL. GA was added to separate vials at concentrations of 1, 10, 50, 100 and 500 mg/dL. A control vial with no EG was included. To other vials the

following compounds were added to yield a concentration of 100 mg/dL: propylene glycol (PG), ethylene glycol butyl ether (EGBE), ethanol, methanol, and isopropanol (ISOH). The EGT kit was used according to the manufacturer's instructions and includes an internal control. Two blinded study groups, medical toxicologists ( $n = 3$ ) and EM residents ( $n = 11$ ) - assessed vials for color change. Inter-rater reliability was assessed with a kappa statistic with a  $p < 0.05$  considered significant. **Results:** Complete agreement among all observers was obtained on the following: EG at all concentrations: positive; all controls: negative; PG: positive; methanol and ethanol: negative; GA: positive except at a concentration of 1 mg/dL which was negative. Discordant results were obtained for EGBE and ISOH. Overall inter-observer agreement was high, with kappa = 0.87 for the toxicologists and 0.708 for the EM physicians ( $P < 0.001$  for both). **Conclusions:** The EGT reliably detected the presence of EG at all tested concentrations in human plasma. False positive findings will occur with PG and possibly ISOH and EGBE. The additional ability to detect glycolic acid at clinically relevant concentrations offers a unique advantage over standard testing. Prospective study in patients with suspected EG poisoning is warranted.

## 121 ALCOHOL-ACETAMINOPHEN SYNDROME: MAXIM OR MYTH?

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**Background:** Numerous case reports have associated acute liver failure in alcoholics with therapeutic doses of acetaminophen (APAP) in a condition termed 'alcohol-acetaminophen syndrome' (AAS). However, AAS does not appear to be a prominent malady in studies involving alcoholics taking APAP. **Methods:** A systematic review of the worldwide literature (all languages) in which alcoholics received  $\geq 1$  therapeutic doses ( $\leq 4$  g/d) of APAP was undertaken. MEDLINE and EMBASE were searched using the broad search criteria of the CAS registry number for APAP, "human" and "alcohol". Trained abstractors performed standardized data abstraction of patient demographics, dose, liver function, pathology and outcome. **Results:** The initial search yielded 910 papers. Of these, 45 papers in 10 languages reported a total of 669 alcoholic patients that received at

least one therapeutic dose of APAP. Class I and Class II (prospective) studies yielded 620 alcoholic patients that received APAP with no evidence of subsequent liver injury, including 172 patients that received multiple maximal therapeutic doses. Class III (retrospective) studies provided 49 alcoholic patients with evidence of liver injury attributed to AAS. All Class III cases were compromised by at least one serious deficiency: 1) conflicting data, 2) incomplete evaluation of other diagnoses or 3) a major plausible alternative diagnosis. Conclusions: AAS is a diagnosis of exclusion. Prospective data provide no indication for increased susceptibility to therapeutic doses. Retrospective data associate liver injury in selected cases, but include conflicting data or inappropriate assessment of causation. A comprehensive systematic review of the medical literature located no case of hepatic injury that could be reasonable attributed to the therapeutic use of APAP in an alcoholic patient.

## 122 SERUM LEVELS AND URINE DETECTION OF *CENTRUROIDES SCULPTURATUS* VENOM IN SIGNIFICANTLY ENVENOMATED PATIENTS

Chase PB, Vazquez HL, Boyer L, Theodorou A, Walter FG, Alagon AC. *University of Arizona Health Sciences Center, Tucson AZ and Instituto de Biotecnologia, Universidad Nacional Autonoma de Mexico, Cuernavaca, Mexico*

Background: Alacramyn (equine Fab<sub>2</sub> developed against *Centruroides limpidus* venom) is being investigated for use in the US for treatment of envenomation by *C. sculpturatus* (aka *C. exilicauda*). Toxicokinetics of envenomation by *Centruroides* species are unknown. Methods: Western blot analysis indicated hybridization of Alacramyn to *C. sculpturatus* venom but not venoms of *Hadrurus arizona* or *Vejoavis arizona*. Serum and urine were collected from 3 patients envenomated by *C. sculpturatus*. Venom levels were determined using sandwich ELISA in which the sample was added to wells containing scorpion venom Fab<sub>2</sub> conjugated to sephurose. After incubation and rinsing, rabbit IgG against *C. limpidus* venom was added, followed by incubation with non-specific human IgG and goat anti-rabbit antibodies conjugated with HRP. Standardized curves were generated using known amounts of venom, and human serum with previously-determined *C.*

*limpidus* venom levels served as additional controls. Results: Serum levels (post envenomation time in min) for an 85-year-old female were 8.2 ng/ml (~150), 2.8 ng/ml (515) and 1.6 ng/ml (1200) with a T<sub>1/2</sub> of 416 min. Levels for a 14-month-old female were 29.7 ng/ml (~50) and 5.0 ng/ml (729) with a T<sub>1/2</sub> of 235 min. A 3-year-old female had a serum venom level of 11.1 ng/ml (~313) and a urine venom level of 9.0 ng/ml (~490). Conclusions: The time course of *C. sculpturatus* venom concentration decay in humans is consistent with a two-compartment model. Further research is needed to determine whether serum venom levels correlate with clinical symptoms and what effect immunotherapy has on the toxicokinetics.

## 123 EFFICACY OF 2 ANTIVENOMS VS. VENOM OF NORTH AMERICAN PIT VIPERS

Sánchez EE, Galán J, Ramírez MS, Chase P, McNally J, Boyer L, and Pérez JC. *Natural Toxins Research Center, Texas A&M University, Kingsville, TX, and University of Arizona Health Sciences Center, Tucson, AZ*

Background: The standard of care of pit viper bite treatment in the United States involves the use of antivenom, administered as soon as possible after a bite has taken place. Antivenom in the US has for many years been in short supply. Other antivenoms against pit viper venom have been in use outside the US for many years, but comparative studies are lacking. In this study we have tested the efficacy of 2 antivenoms (CroFab, developed against US venoms, and Antivipmyn, a Mexican antivenom) against 11 North American pit viper venoms. Methods: Three different assays were used to study the efficacy of the antivenoms: a serum protection test (ED<sub>50</sub>), an antihemorrhagic assay, and an anticoagulation assay using a Sonoclot Analyzer. Results: ED<sub>50</sub>: In comparing ED<sub>50</sub> of the two antivenoms using 11 venoms, CroFab was more effective in neutralizing 6 out of 11 of the venoms while Antivipmyn was more effective with 4 out of the 11 venoms. Neutralization was comparable against *C. v. helleri*. Antivipmyn effectively neutralized all venoms except *A. c. laticinctus*. CroFab effectively neutralized all venoms except *A. c. laticinctus* and *C. m. molossus*. Antihemorrhagic assay: Antivipmyn was more effective than CroFab in neutralizing the hemorrhagic activity of the majority of the hemorrhagic



venoms with the exception of *C. atrox* and *C. s. scutulatus* Type B venom. Sonoclot: Antivipmyn was more effective than CroFab in neutralizing the procoagulant activity in all 11 venoms. Conclusions: Fab antivenom developed against U.S. species and Fab<sub>2</sub> antivenom developed against Mexican species have comparable activity against venoms of North American pit vipers.

#### 124 EFFECTS OF SMOKE EXPOSURE ON SPUTUM INFLAMMATORY CYTOKINES

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**Background:** Elevated sputum interleukin-8 and -18 (IL-8 and IL-18) concentrations are present in inflammatory lung conditions, but little is known about acute changes in these markers following exposure to inhaled toxicants. **Methods:** Thirty volunteers were recruited for the study, including 10 nonsmokers, 10 light smokers and 10 moderate-heavy smokers. After a period of at least 8 hours following any smoke exposure, sputum was induced through inhalation of hypertonic (3%) saline. Smokers then smoked 1-4 1R4 research cigarettes. A second sputum induction was collected one hour following cessation of smoking, or for non-smokers, after a similar period of time. Sputum was centrifuged and the supernatant separated for analysis of IL-8 and IL-18. Sputum cell count and differential were determined. **Results:** Sputum IL-8 ( $r^2 = 0.13$ ,  $p = 0.03$ ) but not IL-18 correlated with the percent of total cells that were neutrophils. There were no changes in IL-8 and IL-18 concentration one hour after smoke exposure. **Conclusion:** Sputum IL-8 and IL-18 do not acutely change with smoke exposure. While additional time points should be evaluated, these cytokines may reflect more chronic exposure.

#### 125 ACUTE LEAD EXPOSURE TRIGGERS NEURONAL APOPTOSIS IN THE DEVELOPING MOUSE BRAIN

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**Background:** Environmental exposure to lead has long been considered detrimental to the developing brain, but the mechanisms involved have remained elusive. It has recently been shown that blockade of the N-methyl-D-aspartate (NMDA) subtype of glutamate receptor for only a few hours during synaptogenesis (first 3 weeks of life in rodents), can cause widespread apoptotic neurodegeneration in the developing brain. Lead reportedly blocks NMDA receptors. Therefore, we hypothesized that acute exposure to lead may produce apoptotic neurodegeneration in the developing mouse brain. **Methods:** Seven-day-old C57BL/6 mice were given a single IP injection of lead acetate at a dose calculated to deliver an amount of lead equivalent to that which would be ingested during a 1 week period if the diet contained 1000 ppm lead acetate. To assess neurodegenerative changes in the brain, immunohistochemistry for activated (cleaved) caspase-3, a sensitive marker for apoptosis, was performed at 8 hours, electron microscopy at 10 hours and DeOlmos cupric silver and Nissl staining at 24 hours post-treatment. **Results:** In specific layers of the frontal, parietal and temporal neocortex, the number of neurons displaying caspase-3 activation was significantly increased, compared to saline controls, and a significant increase in the number of degenerating neurons and neuronal fragments (apoptotic bodies) was detected in these same neocortical locations by silver and Nissl staining. Electron microscopy confirmed that the degenerative process meets classical ultrastructural criteria for apoptosis. Additional brain regions are currently being evaluated. **Conclusions:** Apoptosis, triggered by NMDA receptor

Cig/week	n	Baseline			Post-exposure	
		IL-8 (pg/ml)	IL-18 (pg/ml)	% neutrophils	IL-8 (pg/ml)	IL-18 (pg/ml)
0	10	0.075 ± 0.074	4.57 ± 7.67	11.8 ± 7.3	0.108 ± 0.104	12.0 ± 26.7
1-12	10	0.107 ± 0.046	5.51 ± 5.60	23.9 ± 19.7	0.109 ± 0.091	6.29 ± 4.88
≥12	10	0.121 ± 0.107	3.53 ± 6.81	38.6 ± 27.6	0.102 ± 0.076	2.53 ± 3.87

interference, is a candidate mechanism to explain the deleterious effects of lead on the developing brain. Supported by HD37100/DA07261.

### 126 INTERLEUKIN-10 SINGLE NUCLEOTIDE POLYMORPHISMS AND LONGITUDINAL DECLINE IN LUNG FUNCTION

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**Objective:** Lung inflammation may lead to accelerated rate of decline in lung function. Interleukin-10 (IL-10) suppresses inflammation through modulation of inflammatory mediators. The IL-10 single nucleotide polymorphism (SNP) at -1082 is associated with differential expression of IL-10, and the effects of other IL-10 SNPs have not been as well characterized. To purpose of the study was to evaluate the role of IL-10 SNPs in susceptibility to accelerated loss of lung function. **Methods:** Blood or mouthwash samples were collected from City of Phoenix Fire Department firefighters after obtaining informed consent. Information on age, present smoking, and annual forced expiratory volume in one second (FEV<sub>1</sub>) were collected from medical surveillance records. DNA was extracted from blood using alcohol precipitation and from buccal cells using Qiagen QiaAmp DNA mini Kit. IL-10 SNPs at -1082 and -819 were screened using the TaqMan<sup>®</sup> assay. **Results:** 314 subjects with at least three annual FEV<sub>1</sub> tests were included in the study. Average age was 41.6 ± 7 years, 18% were ever smokers, and annual mean decline in FEV<sub>1</sub> was -40 ± 40 ml. Genotype frequencies at -1082 were AA 31%, AG 50% and GG 17%, and at -819 were CC 55%, CT 37% and TT 8%. After adjusting for baseline FEV<sub>1</sub>, age, and smoking using linear regression analysis, there were no significant differences in annual decline for SNPs at -1082 (p = 0.974) and -819 (p = 0.126). **Conclusion:** There were no associations between IL-10 SNPs at -1082 and -819 and longitudinal decline in lung function in our study population. Inclusion of environmental and occupational exposure data and analysis of additional cytokine polymorphisms may help to better define the genetic basis of variation in decline in lung function.

### 127 THE PREVALENCE OF ALCOHOL EXPOSURE IN NEONATES

Moore C, Jones J, Lewis D. *U.S. Drug Testing Laboratories, Des Plaines, IL; Buchi K. Department of Pediatrics, University of Utah, Salt Lake City, UT*

**Background:** Fetal exposure to alcohol can cause CNS dysfunction, mental retardation, pre and post-natal growth problems, cardiac defects and attention deficit disorders in the neonate. To date, diagnosis of fetal alcohol effect depends largely on maternal interview, although clinical tests are becoming more widely used. This paper estimates the prevalence of fetal alcohol exposure in two populations by detecting fatty acid ethyl esters in meconium. **Methods:** Fatty acid ethyl esters (FAEE) are formed in the body, by esterification of ethanol with free fatty acids and trans-esterification of glycerides; and have been detected in the meconium of newborns. The prevalence of FAEE's in the meconium from two separate groups of neonates using solid-phase extraction and analysis by gas chromatography-mass spectrometry in chemical ionization mode. **Results:** In the first study, seventy-three (16.7%) of the meconium specimens tested (n = 436) were considered to be positive for FAEE's. When broken down into quartiles, the mean values of total FAEE's measured were 1059 ng/g; 3133 ng/g; 6628 ng/g and 62115 ng/g. In the second study, thirty-five (11.9%) of the specimens (n = 292) were considered positive. When broken into quartiles, the mean values were 1139 ng/g; 3067 ng/g; 7674 ng/g and 50,143 ng/g. The overall FAEE profiles of the two study sets were remarkably similar. **Conclusion:** When the total FAEE concentration is greater than 10,000 ng/g, in an adequate meconium specimen, it is likely that the newborn has been exposed to significant amounts of alcohol during pregnancy.

### 128 TESS AND TEEN DRUG ABUSE: USING PRESCRIPTION ADHD DRUGS TO EXAMINE THE UTILITY OF TOXIC EXPOSURE SURVEILLANCE SYSTEM

Bond GR. *Cincinnati Children's Hospital, Cincinnati, OH*

**Objective:** Using stimulant ADHD drugs as a model, this study sought to assess the ability of the AAPCC TESS

data alone to track prescription drug diversion and abuse by teens over time. **Methods:** Query of TESS human exposure numbers for Adderall<sup>®</sup>, Ritalin<sup>®</sup> and generic methylphenidate, 1997 to 2001 (by month, with site of call) meeting criteria: Teen or age 13y to 19y; misuse or abuse; and numbers for Adderall<sup>®</sup>, all human exposures. **Results:** Over the period, total reports of teen abuse/misuse of these ADHD drugs were essentially unchanged. Calls related to Ritalin<sup>®</sup> or generic methylphenidate fell 57%, replaced by Adderall<sup>®</sup>. Between Jan–Jun 1997 and Jul–Dec 2001 Adderall<sup>®</sup> human exposures reported to TESS steadily rose 8 fold. Reports of teen misuse or abuse of Adderall<sup>®</sup> rose 13 fold (from 4% of all Adderall<sup>®</sup> human exposure calls to 7%). Reports from health care facilities and from homes rose in parallel. **Conclusion:** TESS data alone reveal that reports of teen abuse of ADHD agents are stable, but that there is growing teen diversion and abuse of Adderall<sup>®</sup>. However, it is not clear if or how TESS data lead, lag or parallel actual teen abuse/misuse of these products. To understand this and the relative influence of other factors on TESS reporting (change in market share, ADHD stimulant therapy market growth, increased availability of prescription amphetamines to teens, teen abuse preference shifts toward amphetamine, shifts to abuse of diverted prescription amphetamine from illicit amphetamine or physician familiarity managing teen ADHD abuse complications), non-TESS data are required. However, TESS outcome data can help assess the impact of this changing pattern of ADHD drug abuse and suggest the influence of outcome severity on reporting frequency (reporting bias).

### 129 TEEN SUBSTANCE ABUSE IN TESS DATA: WHAT IS REVEALED?

Bond GR, Hariharan SL. *Cincinnati Children's Hospital, Cincinnati OH*

**Objective:** To better understand how the TESS database can be used to identify and track substances and patterns of teen substance abuse. **Methods:** Query of 2001 TESS data; Human; teen or 13 to 19 years; reason-abuse; displayed by substance and outcome categories. Like substances were grouped by category. Relative frequencies were compared internally and with data from Monitoring The Future<sup>®</sup> (MTF) **Results:** TESS received 19,473 teen abuse exposure calls (14,246 pharmaceuticals, 5,227 non-pharm.). Percentage of all calls by

category follows with data from 2001 MTF 12<sup>th</sup> grade, ever used, in brackets: Alcohol 14% [80%], MJ 4% [49%], hallucinogens (including cough and cold preparations, anticholinergics, MDMA) 28% [13%], inhalants 4% [13%], amphetamines 5% [16%], non-heroin narcotics 5% [10%], sedatives (including muscle relaxants, anticonvulsants, antidepressants, GHB) 16% [9%] Cocaine 2% [8%], heroin <1% [2%], PCP <1% [4%]. Classification may not exactly parallel MTF. In MTF, teens are guided by example, but self-classify. There is no stimulant category in MTF, some may appear in hallucinogens or amphetamines above. Caffeine 4% and Herbals (ma huang, ephedra, etc.) 2% are not included above. Of interest, SSRI abuse calls alone were 2% of total. The most deaths were reported with hallucinogenic amphetamine (5), followed by amphetamine (3) and benzodiazepines (3). Poor outcome (major severity or death) exceeded 20% only with GHB (26%—no deaths), heroin (25%—one death) and nortriptyline (22%—no deaths). **Conclusions:** TESS may not reflect actual teen abuse frequency. It may be biased towards drugs that cause significant symptoms or that are unfamiliar to parents/physicians when abused. TESS may complement other teen abuse tracking systems by revealing abuse of specific classes or brands of OTC or prescription pharmaceuticals. Such data can guide intervention and education.

### 130 DEXTROMETHORPHAN: A SUCCESSFUL EXAMPLE OF MONITORING FOR EMERGING ABUSE USING THE TOXIC EXPOSURE SURVEILLANCE SYSTEM

Simone KL, Bond GR. *Northern New England P C & Cincinnati Children's Hospital*

**Objective:** It has been suggested that TESS could serve as a surveillance monitor for emerging trends in drug abuse. Dextromethorphan (DXM) has been shown to be a preferred drug for teen abuse in Cincinnati. We sought to determine if the nationwide TESS database observed a month to month change in teen DXM product abuse that might provide a model of surveillance effectiveness. **Methods:** Query of TESS human exposures, 1997–2001, by month, intentional abuse or misuse, teen or ages 13y to 19y, for DXM containing products and Coricidin<sup>®</sup> branded products with DXM. **Result:** There was also a non-sustained blip in Coricidin<sup>®</sup> and Coricidin<sup>®</sup> as percent of all DXM in October/November of 1998.

Coricidin<sup>®</sup> as percentage of all DXM began a sustained rise in April/May of 1999, not leveling off until February of 2001. Over a 6 month period starting in August 1999 DXM calls almost tripled and Coricidin<sup>®</sup> calls, after doubling each of two months in a row, increased to 10 times baseline. Over the next two years DXM calls doubled again and Coricidin<sup>®</sup> calls tripled. Conclusion: It is clear that a dramatic and sustained rise in reports was observed over a short period. That the reports were specific for teens and abuse/misuse suggests a real emerging pattern and the value of TESS subset analysis in detecting it. A TESS monitoring strategy looking for accelerated total reporting of specific substances or branded products, including subset trends (eg., abuse, teen) would have detected this. Early detection of OTC product abuse could lead to changes such as restricted “in-store” availability. The data supplied to us do not allow us to understand whether the trend started in one or a few locations and increased dramatically in only those areas or if it started in one or a few areas and reports increased as it spread nationwide.

### 131 HEROIN-INDUCED LEUKO-ENCEPHALOPATHY DUE TO CHASING THE DRAGON

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Background: “Chasing the dragon” involves heating heroin on aluminum foil and inhaling the pyrolysate. It is increasingly popular among heroin users as a means to avoid the risks associated with drug injection. Unique to chasing the dragon is the development of a rare neurologic disorder due to a progressive spongiform leukoencephalopathy. Case Report: A 43 year old woman with a history of polysubstance abuse presented with two weeks of bizarre behavior. Her initial evaluation was significant only for a urine toxicology positive for heroin. During her first three days of hospitalization she developed choreoathetoid movements of her upper extremities and restlessness of her legs, her speech deteriorated to a soft mumble (pseudobulbar speech) and she exhibited apathy, memory loss and a paucity of movement. A noncontrast head CT and cerebrospinal fluid (CSF) analysis were normal. On day 5 the patient exhibited spontaneous decerebrate-like posturing and a decreased level of consciousness. A repeat noncontrast head CT revealed

diffuse and extensive white matter hypoattenuation. She developed persistent fever of 104–106°F; multiple blood and urine cultures were negative. The diagnosis of heroin pyrolysate-induced leukoencephalopathy (HIL) was considered and she was empirically treated with coenzyme Q. The family confirmed that “she did inhale heroin after heating it over aluminum foil with a flame.” The patient expired on day 10. Post mortem findings included a slight softening of the white matter, spongiform degeneration of the white matter, and vacuolation of myelin sheaths and scattered axonal bodies. These findings are considered diagnostic of HIL. Conclusion: The diagnosis of HIL should be considered in a patient with a history of “chasing the dragon”, neurobehavioral changes including confusion, apathy, cerebellar signs, and motor restlessness, and characteristic radiographic findings.

### 132 ADULTERANTS AND CONTAMINANTS IN COCAINE AND HEROIN SAMPLES

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Background: Illicit cocaine and heroin may be intentionally adulterated with pharmacologically active agents or bulking agents during manufacturing or distribution. Accidental contamination of cocaine and heroin may also occur. Because some adulterants and/or contaminants (A/C) may pose clinically important hazards, we sought to determine the current pattern of adulteration/contamination of cocaine and heroin in the Philadelphia area. Methods: Consecutive samples of cocaine and heroin that were submitted from law enforcement to a medical laboratory were tested using gas chromatography mass spectroscopy during a 4-month period in 2001. Bulking agents (e.g. talc) were not identified. Results: Of 449 cocaine samples tested, 47% contained A/C. 35% (n = 156) of the samples contained 1 A/C, 10% (n = 45) contained 2 A/C, and <1% contained 3 or 4 A/C. The following A/C were identified: caffeine (135), procaine (47), benzocaine (22), nicotinamide (19), lidocaine (17), aminopyridine (16), phenacetin (4), nicotine (4), heroin (2), noscapine (2), papaverine (2). Of the 49 heroin samples tested, 57% contained A/C. 12% (n = 6) contained 1 A/C, 2% (n = 1) contained 2 A/C,

31% (n = 15) contained 3 A/C, and 12% (n = 6) contained 4 A/C. The following A/C were identified: papaverine (22), noscapine (14), procaine (8), benzocaine (5), lidocaine (4), caffeine (4), hyoscyamine (3), atropine (3), quinidine (1), xylazine (1), cocaine (1), meperidine (1), morphine (1). Conclusions: Approximately half of the cocaine and heroin samples analyzed contained either adulterants or contaminants. Several pharmacologically active substances were identified in the samples tested.

### 133 TRENDS IN POISONING WITH DRUGS OF ABUSE

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Background: Drugs of abuse are an important cause of mortality in the young. There is little research in the UK literature relating to trends in enquiries concerning poisoning with drugs of abuse. The National Poisons Information Service (NPIS) accepts telephone enquiries from medical and paramedical staff about cases of suspected or actual poisoning. Methods: A retrospective audit of the enquiries to one of the NPIS Centres in the UK between 1990 to 2001. Details of cases involving drugs of abuse (amphetamine, butane, cannabis, cocaine, ecstasy, gamma hydroxybutyric acid (GHB), glue, heroin, khat, liquid lighter fuel, lysergic acid diethylamide (LSD) and *Psilocybe semilanceolata*) were collated. Results: Total enquiries to the NPIS centre concerning actual or assumed self-poisonings has increased markedly from 5,602 in 1990 to 34,804 in 2001. Enquiries involving drugs of abuse increased from 97 (1.73%) in 1990 to 1,577 in 2001 (4.53%). Drugs used on the 'club scene' have seen the biggest rise, with ecstasy increasing from 0.12% of enquiries in 1990 to 1.43% in 2001. The proportion of males was greater than females for each agent. The peak age of onset was 1–4 years for glue, 20–24 years for amphetamine and cocaine, but 15–19 years for the other agents. Conclusions: The total number of enquiries to one National Poisons Information Service Centre during this period has risen more than six-fold, with enquiries relating to drugs of abuse more than doubling during the same period.

### 134 "AGENT LEMON": A NEW TWIST ON DEXTROMETHORPHAN TOXICITY

Roll D, Tsipis G. *Cincinnati Drug and Poison Information Center, Cincinnati Children's Hospital Medical Center, Cincinnati, OH*

Background: Dextromethorphan abuse is well documented. Many abusers dislike taking available liquid preparations due to their relatively low concentrations, unpleasant taste and propensity to cause vomiting. In response to this aversion, underground chemists have developed an extraction technique called Agent Lemon. We report a case in which a patient inappropriately applied this method. Case Report: A 17-year-old male presented to the emergency department approximately 18 hours after ingesting an estimated "2 cups" of a combination of dextromethorphan-containing cough syrup, lighter fluid and ammonia. Symptoms included hallucinations, ataxia and numbness. He denied vomiting. His urine toxicology screen was negative, Chem-7 was within normal limits, ammonia = 38 mcg/dl and chest x-ray negative. His mental status and gait returned to normal within 8 hours and he was discharged following a psychiatric consultation. Discussion: Detailed instructions for the Agent Lemon extraction method can be found at [http://www.erowid.org/chemicals/dxm/faq/dxm\\_chemistry.shtml](http://www.erowid.org/chemicals/dxm/faq/dxm_chemistry.shtml). The process is described as a dual-phase acid-base extraction in which the dextromethorphan hydrobromide salt is converted to freebase (with the addition of ammonia), extracted into a non-polar solvent (with the addition of lighter fluid) and converted back to the acid salt, dextromethorphan hydrochloride (with the addition of a citric acid). Conclusion: Poison control centers and emergency room physicians should be aware that such information exists on the Internet. The additional toxicity concerns of ammonia and lighter fluid make these dextromethorphan ingestions unique.

### 135 THE ECSTASY AND MISERY OF A TEENAGE MYOCARDIAL INFARCTION

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Background: 3, 4-methylenedioxymethamphetamine (MDMA) or ecstasy, is reaching epidemic abuse. It is a

potent sympathomimetic with well-described adverse effects, including hyperthermia, mental status changes, hypertension and tachycardia. Case report: A 19-year-old male took 4 ecstasy tablets at a rave party and presented lethargic, diaphoretic, heart rate 196 bpm, respiratory rate 40 per minute, temperature 104.6 F, blood pressure 91/37 mm Hg, pupils 4 mm, and rigid extremities. The ECG showed a PSVT with anterior ST elevations, QRS 188 ms, and QTc 426 ms. Initial labs revealed troponin 1.02 ng/ml, CKMB 1.4 ng/ml, myoglobin 773 ng/ml and a urine drug screen negative for cocaine and PCP. The patient was chemically cardioverted with diltiazem to sinus tachycardia, given benzodiazepines for signs of serotonin syndrome and aggressively cooled. The second set of cardiac enzymes 2 hours later showed a troponin 3.87 ng/ml, myoglobin 3,769 ng/ml, and CKMB 8.4 ng/ml. The third set was troponin 4.84 ng/ml and CKMB 20.5 ng/ml. The fourth set had a troponin of 5.95 ng/ml, CPK 7632 U/L, myoglobin 1351 ng/ml, and CKMB 42.2 ng/ml. Repeat cardiac enzymes trended downward for the next 2 days. The patient's ECG and cardiac enzymes fulfilled World Health Organization criteria for myocardial infarction (MI), and was treated appropriately. A cardiac echocardiogram on day 4 had an ejection fraction of 67% and no wall or valve abnormalities. The patient recovered full mental status and admitted to his ingestion and his past use of ecstasy, but no other drugs. Conclusion: There is one reported case of MI associated with ecstasy use, but this is the first case reported in a teenager. Ecstasy toxicity appears to be a noteworthy risk factor for MI, regardless of age or other cardiac risk factors.

### 136 PREVALENCE OF OXYCONTIN ABUSE IN HIGH SCHOOL STUDENTS

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Background: There has been growing concern regarding the use of OxyContin as an opioid of abuse. Few studies have been published addressing the prevalence of OxyContin abuse in the general population and no studies have been published pertaining to the pediatric population. Our hypothesis is that there is significant OxyContin abuse in high school students. Methods: A 22-item survey adapted from the University of Michigan Monitoring the Future Project was administered at a

single rural high school. Items surveyed included age of first use of OxyContin, number of times used, whether use had occurred in the past 30 days, and time of use. The targeted population of this study included all high school students. A research assistant administered surveys on a single day. This study received IRB approval. Only students with parental consent were allowed to partake in the study. Results: Of 780 students, 84 students received parental consent and completed the survey. Ninety-eight percent of these students had heard of OxyContin and 9.5% had tried OxyContin without parental knowledge. Of those that had used it, 50% had tried it more than 20 times and over half had used it within 30 days. Of the students that participated in the survey, 72% marked that it was "not hard at all to get OxyContin." Of those that responded that they used OxyContin, the majority marked that they had used it in the evenings and on the weekends. Conclusions: Though the capture rate was low in this pilot study due to lack of parental consent for student participation, the majority of students surveyed had heard of OxyContin and felt that it was not hard to obtain for use. In this sample, 9.5% of students claimed to have used OxyContin at least once in their lifetime. Physicians need to be aware of the risk of OxyContin abuse in this population.

### 137 INCREASE IN OXYCONTIN ABUSE OR MEDIA HYPE?

Hughes AA, Bogdan GM, Bond R, Dart RC. *Rocky Mountain Poison Center, Denver Health, Denver, CO. Cincinnati Drug & Poison Information Center, Cincinnati, OH*

Background: There is concern across the United States about opioid abuse. The media have focused on OxyContin, a continuous-release oxycodone formulation. However, there is a need to define and understand the extent of opioid abuse, specifically OxyContin. We hypothesized that calls to poison centers (PCs) represent one indicator of misuse and abuse. Methods: We searched for all exposure and information calls related to four opioids (oxycodone—excluding OxyContin, hydrocodone, morphine, and fentanyl) and compared them to OxyContin calls at two PCs (A and B), one urban and one combined rural and urban, for 2001. Results: Call rates for these opioids per 100,000 population are given in the table. There are differences in call type rates between the geographic areas. Furthermore, the information and

<i>Information Call Rates</i>	OxyContin	Oxycodone	Hydrocodone	Morphine	Fentanyl
Center A	2.23	15.30	2.69	1.99	0.08
Center B	3.30	29.09	5.28	8.26	0.37
<i>Exposure Call Rates</i>	OxyContin	Oxycodone	Hydrocodone	Morphine	Fentanyl
Center A	1.67	4.70	1.23	0.76	0.20
Center B	0.40	0.63	0.29	0.18	0.11

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exposure calls for Center A have increased for all of the opioids over the past two years. **Conclusions:** The rates of oxycodone calls are 3- to 5-fold greater than the other opioids. Calls about OxyContin constitute 7 to 10% of all opioid information calls and 20 to 25% of all opioid exposure calls.

### 138 OUTCOMES FOLLOWING ABUSE OF METHANOL-CONTAINING CARBURETER CLEANERS

Sawyers B, Thole D, LoVecchio F, Beuhler MC. *Good Samaritan Regional Poison Center, Phoenix, AZ*

**Introduction:** Carbureter cleaners may contain methanol and are occasionally recreationally abused. Significant toxicity resulting from the methanol component of these products is unknown. **Methods:** We conducted a retrospective poison center chart review over a four-year period (3/98–3/02) of outcomes following methanol containing carbureter cleaners (MCC). Inclusion criteria were: (1) use of MCC, (2) evaluation in health care facility (HCF), (3) no known co-ingestions and (4) at least 12 hour follow-up. **Results:** 33 cases were reviewed with 12 cases eliminated because of significant co-ingestions. Of the remaining 22 cases the mean age was 17 [range: 14–41] yrs old with >90% of cases between ages 14–17 yrs old. Six of 22 cases had acidosis (serum bicarbonate < 22 mmol/L or pH < 7.35), 100% of patients had neurological symptoms (ataxia, etc.), and 14/22 had vomiting on presentation. Three patients received treatment with ethanol (1) and fomepizole (2); all others received intravenous fluids (15) or no treatment (4). Mean methanol level was 28 mg/dl [range 0–34] with 17/22 developing acidosis. In the patients whom developed acidosis the mean minimum pH was 7.15 and mean minimum bicarbonate was 16 mmol/l. All meta-

bolic disturbances resolved within 24 hrs except in one patient (41 yr old) in which her disturbances resolved with 72 hrs. No patient developed visual disturbances or known neurological sequelae. **Conclusions:** Significant toxicity following MCC was rare with symptoms improving without aggressive care (dialysis, alcohol dehydrogenase blockade).

### 139 DETECTION OF UNUSUAL ABUSE PATTERNS USING BROAD SEARCHING OF THE TOXIC EXPOSURE SURVEILLANCE SYSTEM

Simone K, Bond GR. *Cincinnati Drug & Poison Information Center, Cincinnati Children's Hospital, Cincinnati, OH and Northern New England Poison Center, Maine Medical Center, Portland, ME*

**Background:** The AAPCC is moving towards real-time monitoring of poisoning trends, including new and unusual types of substance abuse. Such patterns may be difficult to detect before the practice is known. The recent Coricidin HBP Cough and Cold (CCCHBP) abuse trend noted in Cincinnati, OH in the year 2000 was used as a model to determine whether TESS is able to detect trends before the abuse practice is widely recognized. As no code for CCHBP was available until 1999, and many of the initial calls were assumed to be suicides due to the large number of tablets ingested at one time and lack of familiarity with the abuse practice, a broad search of Coricidin products and reasons for exposure was necessary. The national TESS database was queried to determine whether the CCCHBP trend could have been found prior to the reporting of exposures in Cincinnati. **Method:** The national TESS database was queried for exposures in humans 6 y.o. to 29 y.o. to all non-pediatric Coricidin brand substances, for all reason categories, from 1993 to 2000. Coding pattern changes suggesting

unexplained increases in exposures to CCHB were assessed. **Results:** Coricidin exposures increased dramatically starting in 09/98. A shift from Canadian and non-CCCHBP Coricidin products to CCCHBP occurred from 1999 to 2000, suggesting that prior non-CCCHBP coded products may actually have been CCCHBP products. The “abuse” reason code increased substantially in 1997. The “suicide,” “intentional unknown” and “general” reason categories increased initially, and then began to decrease proportionally as “abuse” coding increased. Both the specific product and reason codes shifted towards CCCHBP abuse in conjunction with anecdotally observed understanding of the new abuse trend. **Conclusions:** Trends CCCHBP were detectable 2–3 years prior to the report of exposures in Cincinnati, OH using the TESS database. It was necessary to search broadly to detect this trend. TESS is a useful database for monitoring unusual drug abuse trends. Searching strategies must consider early lack of recognition of the trend.

#### 140 FATAL CYCLOBENZAPRINE OVERDOSE WITH POST MORTEM VALUES

Spiller, HA, Cutino, L. *Kentucky Regional Poison Center, Louisville, KY*

**Background:** While reports of cyclobenzaprine overdose are not uncommon, fatal cyclobenzaprine overdose reports are rare. In the last 5 years TESS reported 22,090 exposures, with 15,180 treated in a HCF and only 36 fatalities. There are only two published cases of overdose with post-mortem blood cyclobenzaprine concentrations. Cyclobenzaprine is a skeletal muscle relaxant with a cyclic structure similar to amitriptylene. **Case one:** A 56-year-old female was found in full arrest after a verbal suicide threat to a friend. Resuscitation attempts by EMS and ED staff were unsuccessful. Autopsy revealed no anatomical cause for death. Post mortem blood concentrations, drawn from a femoral site, were cyclobenzaprine 0.96 mg/L and diazepam 0.3 mg/L. No other drugs or volatiles were found. **Case two:** A 37-year-old male was found in full arrest by a family member after an intentional ingestion of cyclobenzaprine. Resuscitation attempts by EMS and ED staff were unsuccessful. Autopsy revealed no anatomical cause for death. Post mortem blood concentrations, drawn from a femoral site, were cyclobenzaprine 0.8 mg/L and ethanol 0.174 gm/dl. No

other drugs or volatiles were found. **Discussion:** The concentrations of diazepam and ethanol reported in these two patients were not found in quantities usually associated with a fatal outcome, suggesting that the cyclobenzaprine was the primary cause of the fatality. Additionally the blood was drawn from a femoral site, so that post mortem redistribution is not a likely factor. Blood concentrations of non-fatal cyclobenzaprine overdose patients in the ED have been reported as 0.03 to 0.35 mg/L. **Conclusions:** Blood concentration of  $\geq 0.8$  mg/L cyclobenzaprine may be associated with a fatal outcome. This report increases the number of post mortem values available for evaluation of cyclobenzaprine overdose cases.

#### 141 POST MORTEM OXYCODONE AND HYDROCODONE CONCENTRATIONS

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**Background:** There is limited data on post mortem oxycodone concentrations, consisting of 3 published reports with a total of 11 cases, many of which were polypharmacy cases. **Methods:** Review of autopsy and coroner's reports from 10 counties for the years 2000 and 2001 to locate cases with oxycodone or hydrocodone exposure as a leading cause of death. **Results:** Eighty-eight cases were located. Twenty-four deaths were attributed to oxycodone alone. Mean and median post-mortem oxycodone concentrations were 1.23 mg/L (SD  $\pm$  2.2) and 0.43 mg/L, respectively. The range was 0.12 to 8.0 mg/L, with 13 cases (54%)  $\leq 0.5$  mg/L. Seventeen deaths were attributed to hydrocodone alone. Mean and median post mortem hydrocodone concentrations were 0.53 mg/L (SD  $\pm$  0.39) and 0.40 mg/L, respectively. The range was 0.12 to 1.6 mg/L, with 11 cases (65%)  $\leq 0.5$  mg/L. There were 7 cases where the cause of death was attributed to the effects of a combination of hydrocodone and oxycodone. Mean oxycodone and hydrocodone concentrations were 0.34 mg/L (SD  $\pm$  0.29) and 0.14 mg/L (SD  $\pm$  0.9), respectively. Forty cases involved polysubstance overdoses with significant involvement of other drugs and ethanol. Mean oxycodone and hydrocodone concentrations were 0.18 mg/L (SD  $\pm$  0.2) and 0.29 mg/L (SD  $\pm$  0.35), respectively. The reason for exposure was drug abuse (n = 38), suicide (n = 22), therapeutic misadventure (n = 15), reason unclear (n = 11) and



other (n = 2). The list of other substances involved was extensive but included ethanol, amitriptyline, methadone, codeine, propoxyphene, and acetaminophen. All 88 cases were discovered in full arrest. Conclusions: this study reports oxycodone values associated with a fatality at blood concentrations lower than previously reported. This may represent enhanced information because of the larger sample group. Hydrocodone values associated with a fatality were similar to published values.

#### 142 FALSE-POSITIVE ACETAMINOPHEN LEVELS WITH HYPERBILIRUBINEMIA

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Background: Serum acetaminophen (APAP) levels are often obtained in cases of unexplained liver failure. However, serum APAP levels in jaundiced patients may be potentially misleading. The GDS Diagnostic<sup>®</sup> enzymatic assay package insert cautions bilirubin levels > 25 mg/dL may result in falsely elevated APAP levels in the presence of APAP. We present 2 jaundiced patients in whom serially elevated APAP levels were detected using GDS Diagnostic assay when APAP wasn't present by GC/MS. Case Reports: A 36 year-old man with alcoholism/Hepatitis C presented with jaundice without history of APAP ingestion. Initial bilirubin level was 19.5 mg/L, and serial serum APAP/bilirubin levels were drawn (see table). A 31-year-old woman with alcoholism presented after an acute APAP overdose (unknown time) with an initial APAP level of 178 mg/L and bilirubin of 9.9 mg/dL. Serial APAP/bilirubin levels were drawn (Table). Conclusions: Despite complete absence of APAP, hyperbilirubinemia was associated with measurable APAP concentrations using the GDS Diagnostics assay, even with bilirubin concentrations

below 25 mg/dL. The mechanism and threshold of this interference are unknown. Clinicians must realize elevated APAP levels in jaundiced patients using the GDS assay may not reflect APAP use.

#### 143 CARBON MONOXIDE, ETHANOL AND CYANIDE POISONING IN SMOKE INHALATION FATALITIES

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Objective: This study examined the association between blood hydrogen cyanide (HCN), ethanol (ETOH) and carboxyhaemoglobin (COHB) levels in victims of fatal smoke inhalation in Victoria. Methods: Autopsy reports from the Victorian Institute of Forensic Medicine were electronically searched for "burns," "smoke" or "fire" as a cause of death between 1992 to 1998. Data on the circumstances of the fire and results of toxicological screening were obtained on 178 persons. HCN, ETOH and COHB levels were determined. Results: Most victims died at the scene, while 32 died after a period of hospitalisation. Most of the fires were in houses (114) and cars (29). The ETOH level was zero in 112 cases while 53 cases had a mean level of 0.17%. The COHB level was zero in 43 cases while 111 had a mean level of 40%, of which 44 cases had a level greater than 50%. HCN levels were zero in 52 cases but in 86 victims a mean HCN level of 1.65 mg/L was detected, with 11 having a level greater than 3.0 mg/L. Those persons with a blood ethanol level of 0.10% or higher had significantly higher blood levels of both COHB and HCN. Conclusions: This study showed correlation between elevated blood ETOH, HCN and COHB levels. Mean CN level was 1.3 mg/L in those cases with a carboxyhae-

Laboratory Values	Pt 1 (hrs after admit)				Pt 2 (hrs after admit)	
	16	41	210	282	306	346
Bilirubin, mg/dL	17.7	23.3	21.0	26.5	32.7	40.1
APAP, mg/L (GDS)	22	16	22	26	28	26
APAP (GC/MS)	None	None	None	None	None	None

moglobin level of greater than 10%. ETOH levels significantly correlated with both COHB and HCN. A significant correlation between COHB and HCN levels was noted. Further studies are needed to address the issue of empirical treatment of cyanide poisoning in patients with a significantly raised COHB.

#### 144 MALICIOUS FONOFOS POISONINGS, ANIMALS AS SENTINEL FOR HUMANS?

Hansen SR, Khan SA, Murphy LA, Allen C. *ASPCA Animal Poison Control Center, Urbana, IL*

**Background:** Intentional animal poisonings represent 0.2% of cases managed at this center. Of these suspected intentional poisoning cases, 37% involve pesticides. Unexplained animal deaths often go uninvestigated because of insufficient resources, including funding and manpower, or a reluctance of law enforcement officials to devote time to enforcement of animal cruelty laws. **Case report:** A five-year-old 5.4 kg spayed female Boston Terrier, that was reportedly normal 30 minutes earlier, was found in the owner's front yard exhibiting hypersalivation, vomiting, diarrhea, tremors, and seizures culminating in death within 60 minutes. The same day, a four-year-old 18 kg male Chow Chow mix, that had been allowed to roam during the previous eight hours, was found dead in a shed on the owner's property with visible evidence of vomiting, diarrhea and hypersalivation. One house separated the pet owner's residences. Reportedly, 13-17 dogs from the neighborhood had been found dead, or had died during prolonged seizure activity, within the past five years. A forensic investigation was initiated. The Boston Terrier was exhumed and the Chow mix was obtained from a veterinary hospital storage freezer. Liver and stomach contents were harvested for analysis. Fonofos was detected and confirmed by GC/MS. **Conclusion:** Fonofos, whose EPA registrations were cancelled in 1997, is a highly toxic organophosphate insecticide with a rat acute oral LD<sub>50</sub> of 5.5-11.5 mg/kg. Fonofos is on a

poison center FBI alert list as a possible terrorist weapon. Unexplained animal deaths warrant investigation to reduce possible subsequent intentional or accidental human injury or death.

#### 145 POSITIVE CANNABINOID URINE DRUG SCREEN AFTER WEIGHT LOSS

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**Background:** The high fat:plasma partition coefficient and resultant long excretion half-life of cannabinoids/metabolites ( $\Delta$ -9-tetrahydrocannabinol (THC) and the 11-hydroxy and 11-nor-carboxy metabolites) commonly results in a positive urine drug screen in chronic users for up to a month after cessation of drug use. **Case Report:** Subject is a 5'9" tall adult male, weighing 285 pounds (130 Kg) with an estimated body fat composition of about 50%. He used marijuana heavily (5-8 times/day with an estimated THC concentration of 2%) for 15 months prior to stopping use in March 2001. He began a physician controlled exercise/weight loss program and lost approximately 35 pounds between February and May 2001. He tested positive on urine drug screens for cannabinoids 3 times between March and June 2001 despite no reported marijuana use. Using established literature pharmacokinetic values ( $V_d \approx 10 \text{ L/Kg}$ ) for cannabinoids/metabolites, we established a three-compartment (blood, fat, and urine) model with loss from the central compartment via urine and bile. Cannabinoid enterohepatic recirculation was simplified to a net loss with a single net rate constant. **Conclusions:** With an average weight loss of 0.14 Kg/day, we estimated that it was possible to have a positive urine drug screen result with a cutoff concentration of 100 ng/ml cannabinoids and that urinary concentrations of cannabinoids could reach as high as 1000 ng/ml of urine.

Dog	Liver Fonofos (GC/MS)	Stomach Fonofos (GC/MS)
Boston Terrier	1.53 ppm	80.0 ppm
Chow Chow mix	1.56 ppm	120.0 ppm

#### **146 TRICYCLIC ANTIDEPRESSANT (TCA) URINE IMMUNOASSAYS: MAKING BETTER USE OF A TEST**

Gee A, McKay CA, Wu, AHB. *Hartford Hospital/UCONN School of Medicine, Hartford, CT*

**Background:** Interpretation of TCA urine immunoassays is confounded by frequent false positive results, often leading to problematic interpretation. Although clinical evaluation of TCA toxicity is most important, increased specificity of these frequently ordered tests would be helpful. We compare two TCA immunoassays with cutoffs of 1000 ng/mL (SureStep by Applied Biotech, Inc., and Triage Drugs of Abuse Panel by Biosite Diagnostics) with our existing immunoassay (EMIT by Syva, cutoff 300 ng/mL nortriptyline) to determine if the increased threshold is sufficient to decrease false positive results. We also investigate the ability of these assays to identify patients with clinical TCA toxicity. **Methods:** Adult patients with positive TCA urine assays by EMIT who had stored urine were included in the study. A retrospective chart review was performed, abstracting data for toxicants and clinical evidence of TCA toxicity (hypotension, tachycardia, altered mental status, anticholinergic toxidrome). Available EKGs were reviewed for evidence of abnormal terminal R wave in lead aVR and QRS duration. **Results:** 66 patients met inclusion criteria. 3 patients demonstrated clinical evidence of TCA toxicity. Both higher cutoff assays detected these 3. Positive predictive values were 4.5%, 12% and 13% for the EMIT, Biosite and Applied Biotech assays respectively. Specificity (95% confidence intervals) was 65% (52–78%) and 68% (56–80%) for the SureStep and Triage assays, respectively. **Conclusions:** Utilizing a TCA immunoassay with a cutoff of 1000 ng/mL maintains sensitivity for TCA overdose, while eliminating more than 1/2 of the false positive results in this patient population. Further study may support the use of low and high threshold testing combined with clinical presentation to suggest the presence of TCA immunoassay cross-reactants.

#### **147 QUETIAPINE (SEROQUEL™ BY ASTRAZENECA) INTERFERENCE WITH TRICYCLIC ANTIDEPRESSANT IMMUNOASSAYS**

McKay CA, Wu, AHB. *Hartford Hospital/UCONN School of Medicine, Hartford, CT*

**Background:** Urine immunoassays for tricyclic antidepressants (TCAs) suffer from many cross-reactivities which vary by concentration of the interfering substance and manufacturer. A recent report (Sloan et al., *Am J Psych* 2000) indicated that the new atypical antipsychotic, quetiapine fumarate, gave a positive TCA result in an immunoassay marketed by Diagnosic Reagents, Inc. This assay uses a calibrator cutoff of 300 ng/ml for nortriptyline. TCA immunoassays rely on polyclonal sheep antibodies. We have seen two patients with quetiapine overdoses who had positive EMIT TCA assays; the presence of quetiapine and absence of typical TCAs was confirmed by high performance liquid chromatography (Remedi, BioRad Labs, Hercules, CA). An in vitro study of quetiapine cross-reactivity with three TCA immunoassays was conducted. **Methods:** A 25 mg tablet of quetiapine was dissolved in 250 ml of water and serial dilutions tested by the EMIT system (Syva Co.; cutoff of 300 ng/ml), and two point-of-care (POC) devices, Triage Drugs of Abuse Panel (Biosite Diagnostics; cutoff 1000 ng/ml), and SureStep (Applied Biotech; cutoff 1000 ng/ml). **Results:** The EMIT assay was positive at 4.5 µg/ml (cross reactivity 6.6%), comparable to the previous report of 4.3% using the Diagnosic Reagents, Inc. assay. There was no cross-reactivity with either of the two POC assays when tested up to 100 µg/ml (cross reactivity <0.3%). Both urine samples from the quetiapine patients were negative for TCA using the POC assays. **Conclusions:** There is interference by quetiapine with antibodies used in some TCA immunoassays. The use of more specific antibodies and higher cutoffs may decrease the detection of cross-reacting substances, while still detecting TCAs in overdose.

#### **148 USE OF CARBON MONOXIDE (CO) BREATH MONITOR TO DETECT OCCULT CO POISONING**

Belman A, McKay CA. *Hartford Hospital/UCONN School of Medicine, Hartford, CT*

**Background:** Occult CO poisoning has been reported in 2–23% of emergency department (ED) patients, with higher prevalence associated with wintertime “flu-like illness.” A non-invasive screening tool would be useful to evaluate CO body burden. We evaluated breath CO using a Bedfont Instruments EC50 TOXCO breath monitor to identify occult CO poisoning in an ED

population presenting with “flu-like” symptoms. **Methods:** This prospective case-control observational study evaluated patients with “flu-like illness” presenting to an urban university-affiliated ED during 5 one-week periods over two years. Controls were age-matched (within 5 years). Patients completed a questionnaire regarding their symptoms, smoking status and time since last smoke, heating sources, and availability of CO detector. CO breath determinations were recorded as COHgb equivalents. **Results:** 196 patients (91 cases, 105 controls) were entered in the study. This sample size would allow detection of a 2% difference in COHgb ( $p < 0.05$ ) with a power over 80%. There was no significant difference between CO measurements (1.5%) for these groups. Although there was a trend for smokers to have higher CO measurements (3.1 vs. 0.9%), there was significant overlap, related to time elapsed since last smoke while waiting for care. Three non-smokers had unexpected elevated breath CO (5.4, 7.2, and 8.8%). The latter likely had chronic CO exposure at home, while the other two suggest problems with the device at the low end of its spectrum. **Conclusions:** We found a low prevalence (1%) of unrecognized CO exposure in an ED population with “flu-like symptoms.” Although the breath monitor generally is a reliable (accurate and precise), easy-to-use instrument for assessing breath CO, potential sources of interference require that all unexplained elevations be confirmed.

#### 149 IS THE MEIXNER TEST CLINICALLY USEFUL FOR THE IDENTIFICATION OF AMANITIN CONTAINING MUSHROOMS?

McKay CA, Tyler C, Hill D. *Hartford Hospital/University of Connecticut, Hartford/Storrs, CT*

**Background:** Clinical identification of hepatotoxic mushrooms is difficult. Nonspecific early symptoms, difficulty identifying mushroom fragments, and the desire to provide early treatment result in the referral of many patients to emergency departments. A simple screening test for  $\alpha$ -amanitin would be of great utility. The Meixner test is an acid-catalyzed reaction between a chromophore and high lignin-content paper (newsprint) yielding a blue-green color. It has been reported to have excellent sensitivity for  $\alpha$ -amanitin at concentrations above 200 mg/mL. We investigated its potential application to clinical practice in a laboratory setting. **Methods:** Observers blinded to mushroom characteristics

graded Meixner tests of dried native mushrooms collected and identified by mycologists, and  $\alpha$ -amanitin standards (Sigma, diluted in methanol). Mushrooms were then analyzed for  $\alpha$ -amanitin content by high performance liquid chromatography (HP1090, with diode array detection). **Results:** Meixner tests were performed on 58 mushroom specimens and 5  $\alpha$ -amanitin standard dilutions (12.5–1000 mg/mL). The  $\alpha$ -amanitin standards were readily identified at concentrations at or above 125 mg/mL. An *Amanita phalloides* specimen (containing 602  $\mu$ g  $\alpha$ -amanitin/g dried mushroom) yielded a positive Meixner test, while specimens of *A. virosa* containing smaller quantities of  $\alpha$ -amanitin were not always detected (test sensitivity 67%). Some non-amanitin containing mushrooms yielded positive Meixner tests (test specificity 80%). **Conclusions:** A positive Meixner test is not specific for  $\alpha$ -amanitin containing mushrooms. Although a negative test supports the absence of large amounts of  $\alpha$ -amanitin, the Meixner test is not reliable to exclude  $\alpha$ -amanitin containing mushrooms when infrequently performed by personnel without prior training.

#### 150 A QUALITATIVE ANALYSIS OF DIAZINON AND ITS METABOLITES G-27550 AND GS 31144 IN HUMAN URINE, SWEAT, TEARS, SALIVA, AND BRONCHIAL SECRETIONS BY GAS CHROMATOGRAPHY MASS SELECTIVE DETECTION

Chase PB, Buckhold FR, Hopson MJ, Boyer L, Schram K, Jimenez E. *University of Arizona Health Sciences Center, Tucson AZ*

**Background:** Little information is available as to the likelihood of secondary contamination from bodily fluids of the pesticide poisoned patient. **Methods:** The following samples (post ingestion time) were taken from a critically ill 38 yo male who had ingested approximately 8 ounces of 25% diazinon: urine (7.5 hr, 12.75 hr, 25.5 hr), pooled sweat from forehead, axillae and thighs (cotton 2 × 2 s placed from 24 hr to 32 hr); tears (32 hr); saliva (32 hr); and bronchial secretions (32 hr). Samples were purified using solid-phase extraction (SPE) columns. The SPE-purified extracts were dissolved in acetone and analyzed using a Hewlett-Packard Gas Chromatograph/Mass spectrometer (GC/MS) to identify diazinon and its two major metabolites (GS 31144 and G-27550). Both full scan

and selective ion monitoring (SIM) spectra were obtained. **Results:** Diazinon was detected in the earliest urine sample and in saliva, whereas its metabolite GS 31144 was found in all three urine samples and in tears. Neither diazinon nor metabolite was detected in sweat or bronchial secretions. **Conclusions:** Diazinon metabolite GS 31144 is excreted in both urine and tears up to 32 hours post ingestion. Further research is needed to document the activity of these metabolites and whether diazinon is present earlier in other bodily fluids. Caution is advised when caring for patients poisoned with diazinon.

### 151 THE OSMOLAL GAP AS A SCREENING TEST FOR TOXIC ALCOHOL POISONING

Pursell RA, Lynd LD, Brubacher J, Sivilotti MLA, Pudek M, Lepik KJ, Abu-Laban RB, Perkins S. *Universities of BC, Queen's and Ottawa, and the BC Drug & Poison Info Centre, Canada*

**Objective:** To evaluate the diagnostic performance of the osmolal gap (OG) in toxic alcohol poisoning. **Methods:** Laboratory records from 3 referral hospitals were retrospectively reviewed. All patients with simultaneous determination of  $\text{Na}^+$ , urea, glucose, ethanol (EtOH), osmolality, methanol (ME) and ethylene glycol (EG) were included. Two clinically relevant screening thresholds were defined a priori: RT (requires treatment):  $\text{ME} \geq 6 \text{ mM}$  or  $\text{EG} \geq 3 \text{ mM}$  (20 mg/dL) and RD (requires hemodialysis):  $\text{ME} \geq 15 \text{ mM}$  or  $\text{EG} \geq 8 \text{ mM}$  (50 mg/dL). OG was calculated using Formula A:  $2\text{Na}^+ + \text{Urea} + \text{Glucose} + \text{EtOH}$  (all in mM) and Formula B: as above but using  $1.25 \times \text{EtOH}$ . Sensitivity (Sens) and specificity (Spec) were calculated at various OG cutoffs, and ROC curves were constructed (SAS v. 8.02). **Results:** Of 173 cases identified, 17 had levels  $\geq$  RD threshold, 8 had levels between RT and RD, and 148

had levels  $<$  RT threshold. **Conclusions:** The OG alone has imperfect sensitivity and poor specificity for detecting high or intermediate concentrations of ME or EG. Using a coefficient of 1.25 for EtOH did improve the specificity appreciably. A clinical decision rule incorporating the OG along with clinical and other lab parameters would be of value when ME and EG levels are not readily available.

### 152 A FLUOROMETRIC ASSAY FOR DETECTION OF FLUORESCEIN IN PLASMA

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**Background:** Ingestion of ethylene glycol (EG) from antifreeze can lead to metabolic acidosis, renal injury and death. The yellow-green dye, fluorescein, is added to antifreeze to facilitate detection of cooling system leaks and help deter ingestion. Gas chromatography is the best method for quantitating serum EG concentrations but the method is difficult and few hospital laboratories perform this assay. A rapid and reliable diagnostic test to evaluate potential antifreeze poisoning victims is needed. **Methods:** A fluorometric assay for the detection of fluorescein in plasma was developed using a Hitachi F-2000 fluorescence spectrophotometer. Blank human plasma from a date-expired banked single donor unit was spiked with fluorescein concentrations from 2.0–200 ng/mL. The low concentration is over an order of magnitude less than calculated peak fluorescein concentration in a 70 kg adult with a 30 mL antifreeze ingestion. **Results:** A seven point calibration curve including a blank for these data was linear with  $r^2 = 0.999$  using the average of triplicate determinations of each point. The limit of detection was determined to be 0.5 ng/mL with a

Formula	OG	Requires Treatment Threshold		Requires Hemodialysis Threshold	
		Sens (95% CI)	Spec (95% CI)	Sens (95% CI)	Spec (95% CI)
A	0	1.0 (0.83, 1.0)	0.05 (0.02, 0.10)	1.0 (0.77, 1.0)	0.04 (0.02, 0.09)
	10	0.80 (0.58, 0.92)	0.34 (0.26, 0.42)	0.94 (0.69, 1.0)	0.35 (0.27, 0.43)
B	0	0.92 (0.72, 0.98)	0.18 (0.12, 0.25)	1.0 (0.77, 1.0)	0.18 (0.12, 0.25)
	10	0.68 (0.46, 0.84)	0.57 (0.49, 0.65)	0.94 (0.69, 0.99)	0.48 (0.40, 0.56)

limit of quantitation of 2.0 ng/mL. Previous reports examining fluorescence using a Wood's lamp suffered from light contamination as a result of the broad wavelength range of the light. We solved this problem by use of specific excitation (494 nm) and emission (516 nm) wavelengths. Analysis of blank samples demonstrated that typical plasma components did not interfere with the assay. Conclusions: A fluorometric assay can detect fluorescein in plasma as a surrogate marker for EG ingestion. The preliminary results obtained with this assay are promising and support further investigation of the use of this assay in actual antifreeze exposures.

### 153 A POISON CENTER'S ONE-YEAR EXPERIENCE WITH RABIES INFORMATION SUPPORT

LoVecchio F, Orletsky P. *Good Samaritan Regional Poison Center, Phoenix, AZ*

Introduction: Rabies information calls are typically handled by local or state departments of health (DOH). This constant coverage can be expensive. To increase revenue, local poison centers may handle off-hour calls to assist the departments of health. Reluctance by poison centers has often been secondary to potential volume and complexity of these calls. We addressed these concerns over a prospective 12-month period. Methods: Data was collected from diverted (5 pm–9 am on weekdays and all weekend) calls to a "Rabies Hotline." A one-page flow chart was established in conjunction with the local DOH and Center for Disease Control recommendations. All charts were reviewed by a medical toxicologist and health department physician for quality assurance. Results: A total of 154 calls were received with 119 from the public and 35 from healthcare personnel. Three calls were informational (location, etc.) only. Of the 35 calls from healthcare providers, 33 questioned the need for rabies vaccine (9 asked the dose) and 2 questioned the dates of follow-up dosing. There were no questions regarding vaccine toxicity or management of rabies. Of the 154 cases, a physician was contacted in 8 cases (5%) for clarification in atypical cases. Rabies immunization was not recommended in 123 of 151 cases (82%). Chart review by a medical toxicologist revealed 100% compliance with the previously delineated management guidelines. No adverse outcomes occurred following DOH follow-up and no additional costs were incurred for

the poison center. Conclusions: A poison center can provide after-hours rabies information with minimal burden on staff. This service can increase funding to the poison centers, while decreasing costs to the DOH.

### 154 UTILIZATION OF A POISON CENTER (PC) IN EVENTS REPORTED BY THE HAZARDOUS SUBSTANCES EMERGENCY EVENTS SURVEILLANCE (HSEES)

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Background: 16 States contribute to the HSEES program of ATSDR. HSEES collects geographical, scenario, injury, and evacuation data regarding events that involve hazardous substances release. Events may involve victims: defined as individuals who were symptomatic from direct exposure to the substance's release. Objective: Determine the number of HSEES incidents that involved victims where the PC provided real-time assistance, and discover reasons as to why the PC was not involved in the other incidents. Methods: Review by State HSEES Coordinator and PC Med Director of: (1) WI 2001 HSEES report to identify events with victims. Date, County, and Substance were recorded for these events. (2) PC's Toxicall database searched for 2001 human exposure cases that fit the identified HSEES events. Results: 27 (5.2%) of 517 HSEES events involved victims: 19 were facility release and 9 transportation releases. PC had real-time involvement in 8/27 (all 8 involved multiple victim scenarios). In these 8 events the PC provided medical advice to receiving hospitals prior to the victim's arrival. Identified reasons for lack of PC notification included: (1) Mildly symptomatic, single victim incidents treated at the scene by EMS providers and not transported to hospitals (11) or (2) Assistance provided by State or Local Public Health Department. Conclusions: Poison Center utilization may be limited if EMS providers feel assistance is not required in minimally symptomatic victims, or another agency is used for medical for assistance. Single victim events did not generate PC consultation. Poison Center and state HSEES interactions are now initiated in WI as a means to strengthen victim assistance and enhance TESS reporting of events that involve hazardous substances.

### 155 TO CHART OR NOT TO CHART: WHAT IS THE ANSWER?

McVoy J, Fladby C, Jacobitz K, Seifert SA. *The Poison Center at Children's Hospital, Omaha, NE*

**Background:** Factors affecting charting quality in poison centers are unknown. Structured charting has been shown to improve charting quality in other settings. **Objective:** We studied charting quality measures among poison centers using Toxicall<sup>®</sup>. **Methods:** A center questionnaire and blinded, retrospective analysis of charts in three exposure categories from poison centers using Toxicall<sup>®</sup> were performed. Chart quality was scored on measures of completeness, clarity, and utility. **Results:** Twenty-seven centers responded (60% of the 45 centers using Toxicall<sup>®</sup>). Four were excluded because of incomplete data. Of the 23 centers meeting inclusion criteria 18 (78%) were AAPCC-certified and 5 (22%) were not. Nine (39%) were staffed with RN's, one (4%) with RPh's, and 13 (57%) with both. Sixteen (70%) had formal charting guidelines (CG) and 12 (52%) had formatted documentation systems (FDS). Seven (30%) centers had the highest quality scores in all three exposure categories. Nine (39%) centers had no charts with the highest quality scores in any category. Centers that used FDS scored significantly better on quality measures than centers that did not ( $P = 0.0152$ ). There was also a trend to higher quality scores in centers using CG ( $P = 0.0574$ ). There were no significant differences in quality of charting based on certification status, educational background of SPI, percentage of calls audited, whether calls were taped, center call volume or calls per shift taken by SPI. **Conclusions:** Centers that have formatted documentation systems produce higher quality charts. Documentation guidelines may also contribute to quality of charting.

### 156 DO POISON CENTERS DIAGNOSE ORGANIC DUST TOXIC SYNDROME?

Seifert SA, Von Essen S, Jacobitz K, Crouch R, Lintner CP. *The Poison Center at Children's Hospital, Omaha, NE; University of Nebraska Medical Center, NE; Iowa Statewide Poison Control Center, IA, Hennepin Regional Poison Center, MN*

**Background:** In 1994, NIOSH issued an alert to increase awareness of organic dust toxic syndrome (ODTS). This

study attempted to determine how well poison centers (PC) diagnose ODTS. **Methods:** The databases of 4 regional PC's in midwestern states were searched for cases coded as ODTS and synonyms, NOx and synonyms, and dust and mold exposures. A consensus panel of 3 expert reviewers assigned a diagnosis of ODTS, exposure to oxides of nitrogen (NOx), or unknown/other (UNK) based on chart review and case definitions. **Results:** Of 425,520 human exposures between 6/1/97 and 10/1/01, 65 cases (0.02%) meeting inclusion criteria were identified. PC's did not code any cases as ODTS. Twenty-six cases (40%) met study criteria for ODTS, 10 for NOx and 29 for UNK. Of the 29 UNK, 5 were likely either ODTS or NOx, 3 were likely other diagnoses and 21 had insufficient data to determine a diagnosis (NSF). Diagnoses of ODTS or NOx were significantly more likely to be associated with exposures to grains, to be males and to be referred to a health care facility than NSF. ODTS cases were significantly more likely to have fever than NOx. NOx cases were significantly more likely to be hospitalized, be in the ICU, have an abnormal CXR, and to have worse outcome scores than ODTS. PC documentation of key data elements was grossly incomplete. **Conclusions:** Poison centers are not making the diagnosis of ODTS. Differences in the presentation, course, treatment, prognosis, and prevention strategies of various pulmonary exposures mandate the need for PC education, more complete data collection and improved diagnostic accuracy.

### 157 TRIPTANS IN PEDIATRIC OVERDOSE. IS MEDICAL TREATMENT NECESSARY?

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**Objectives:** The oral triptans are a relatively new class of migraine medications that exert their therapeutic effect by stimulation of 5HT<sub>1B/1D</sub> receptors. The treatment and outcome of children unintentionally exposed to these medications have not been studied. The goal of this retrospective chart review was to determine if these children require immediate referral to an emergency department (ED) and medical treatment. **Methods:** Data was collected from human exposures reported to the Texas Poison Center Network from January 1999 through December 2001. Inclusion criteria were patient

age six and under, ingestion of an oral triptan product, acute ingestion, single product only and follow-up was completed. **Results:** Of the 464,283 human exposures during the study period, 32 patients met the inclusion criteria. They were exposed to only four triptans: Amerge<sup>®</sup>, Imitrex<sup>®</sup>, Maxalt<sup>®</sup>, and Zomig<sup>®</sup>. Twenty-six patients ingested two or less adult doses, three patients ingested three or more doses and three ingested an unknown amount. Five patients reported a least one effect. Vomiting, nausea, abdominal pain and drowsiness were all reported. None of the patients required admission or other treatment. Of those five symptomatic patients one ingested a single tablet, one ingested two tablets and the other three ingested three or four tablets. Four of those five patients were treated in the ED and three of the five received activated charcoal. All of those patients were asymptomatic at the time of the follow-up phone call. **Conclusions:** This limited retrospective review indicates that children who unintentionally ingest one or two adult dosage units of an oral triptan medication may be safely observed at home. Further studies are needed before guidelines are established.

#### **158 CONTINUATION OF POISON CENTER SERVICE DURING A WORK STOPPAGE**

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*California Poison System, San Francisco, CA*  
*Washington Poison Center, Seattle, WA*

**Background:** Poison Centers (PCs) throughout the country have developed plans for continuation of service to their region in the event of a disaster by sharing and/or consolidating resources with other PCs. We present implementation of a disaster plan which allowed a population of 4.5 million within 3 states to be served by 5 alternative PCs for 2 months during a labor dispute. **Methods:** The requirements of a disaster plan for a potential work stoppage included: ability to implement the plan within 1 hour of final notification, call routing to maintain consistency of caller access to the same PC, and the ability to distribute calls among 5 centers according to ability of each to handle additional call volume. Regional resources, health care facility/agency contacts and open case data were distributed to facilitate consistent, comprehensive case management by the alternative centers. **Results:** Incoming calls to the PC originate from 7 different phone numbers managed by 3

separate telecommunications services. A telephone routing plan was developed based on availability of routing mechanisms for each phone number and the additional call volume capacity of each alternative PC. The institutional phone switch of the PC allowed internal call routing of any additional calls terminating on a local line within the center. The alternative PCs provided ongoing evaluation of call activity to facilitate early identification and resolution of concerns. Medical and administrative staff of the PC maintained continuous contact with the alternative PCs to assist with case management and regional resource utilization. **Conclusions:** Detailed analysis of call volume from all sources, advanced call routing strategies and the ability to mobilize necessary resources can facilitate alternative call handling in the event of a disaster.

#### **159 INITIATION OF POISON CENTER SERVICE IN AN UNSERVED REGION**

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*Oregon Poison Center, Oregon Health & Science University, Portland, OR, Alaska Section of Community Health and EMS, Juneau, AK*

**Background:** Alaska is the last remaining region of the country where poison center (PC) service has not been accessible to all residents. The diverse and vast geography of the region and the remoteness of villages present unique challenges to provision of health care services. The Poison Control Enhancement and Stabilization Act provided support for implementation of PC service to this region. **Methods:** The Alaska Poison Control System (APCS) was established to provide on site coordination of efforts within the state. A committee representing the Alaska Section of Community Health and EMS, regional health care providers (HCPs) and agency representatives developed a plan for service provision. A certified regional PC was contracted to provide emergency toxicology treatment recommendations to callers. Education programs have been developed through a collaboration of the PC and the APCS. Promotion of the new service was facilitated through print, radio and television media and mailings to each health care facility and clinic. PC staff were oriented to the unique care delivery system within remote areas of this region. A survey and needs assessment tool was sent to HCPs and community health care workers (CHWs) to evaluate skill, interest and resources. **Results:** Call volume



has exceeded expectations since the first day of service with a call penetrance of 11. The established EMS system and CHWs in rural villages have readily embraced this service, incorporating treatment recommendations within their existing resource network. Conclusions: The expertise and resources of a certified regional PC in collaboration with the extensive resources of the existing care delivery system can provide a model for successful implementation of PC service to an underserved region.

### 160 WHERE CALLERS OBTAIN THE POISON CENTER TELEPHONE NUMBER

Lopez, CM, Watson WA. *Texas Poison Center Network, University of Texas Health Science Center at San Antonio, TX*

Background: Planning poison center marketing campaigns requires an understanding of where the public expects to find information. The objectives of this survey were to determine where callers locate the telephone number and to identify any differences between first-time and repeat callers. Methods: As part of a larger survey, consecutive callers to one of 5 poison centers were asked (1) if they had called a poison center before and (2) where they located the telephone number. Callers were caregivers of children who inquired about a minimally toxic exposure. Surveys were completed during a follow-up call. All calls were received prior to the National Number Campaign. Results were tabulated and comparisons made using two-tailed chi-square test with Bonferroni correction. The project was approved by the IRB at each center's institution. Results: Of the 457 surveys collected, 203 were included. First-time callers accounted for 113 (56%) of those surveyed. The sources reported for obtaining the telephone number were telephone information (39%), health care professionals (23%), poison center materials (22%), health care facilities (10%), and other sources (7%). Repeat callers were more likely to utilize poison center materials to locate the telephone number compared to first-time callers (22% vs. 12%,  $p \leq 0.01$ ); there were no significant differences among the use of other sources. Conclusions: Prior to the National Number Campaign, callers most often used non-poison center sources to obtain the telephone number. In addition, poison center educational materials may not be the most effective method for targeting first-time callers. Therefore, poison center awareness campaigns should consider focusing on non-poison center sources as well as determine whether their marketing approach influences the source used to locate the telephone number.

### 161 BURNOUT AMONGST POISON SPECIALISTS

Herrington LH, Geller RJ, Patel MM. *Georgia Poison Center, Emory University School of Medicine, Atlanta GA*

Background: One factor influencing employee turnover is burnout. Burnout is described as a syndrome of increased emotional exhaustion (EE), increased depersonalization (DP), and reduced personal accomplishment (PA). The Maslach Burnout Inventory-Human Services Survey (MBI-HSS) is a tool designed to assess the degree of burnout. The purpose of this study is to determine the degree of burnout amongst poison specialists. Methods: The MBI-HSS and a demographic questionnaire were mailed to 1,114 poison specialists in the US and Canada. Analyses included two-sample t-tests and multi-variate linear regression. Results: 336 completed surveys were returned (30%). Respondents were 59% RNs, 29% RPh, 2% MD, and 10% non-RN/non-RPh. Average age was 41 years; 76% were female. Poison specialists had lower EE scores ( $p < 0.0001$ ) and higher PA scores ( $p < 0.0001$ ) than the "medical" normative score, indicating lower levels of burnout. Perceived fair & manageable workload and positive managerial/administrative support were negatively associated with EE ( $p < .0001$  each). Individuals who perceived their jobs as stressful were likely to have greater DP ( $p < .0019$ ). Poison specialists reporting more emotional satisfaction had lower EE and DP, and higher PA ( $p < .0003, .0001, .0001$ , respectively). Conclusions: The cost of training new poison specialists is high. The non-monetary cost of losing experienced staff is even higher. Managerial and administrative support, an equitable distribution of workload, and assistance in achieving professional satisfaction may impact the incidence and degree of burnout among poison specialists.

### 162 FLUORIDE-CONTAINING DENTAL PRODUCT LABELING AND CALL VOLUME TO POISON CENTERS

Watson WA, Brown JP. *The University of Texas Health Science Center Schools of Medicine and Dentistry, San Antonio, TX*

Background and Objective: Product label wording would be expected to impact the number of public calls to poison centers. The objective of this study was to determine the impact of an FDA-mandated, specific warning statement

on nonprescription FI-containing toothpaste on the poison center call volume about these products. **Methods:** TESS data was tabulated for FI-containing toothpaste to FI-containing mouthwashes and supplements (tablets and liquids). The percentage of TESS cases (mean  $\pm$  SD) for 1992 and 1995 were compared to 1998 through 2000. The new labeling on FI-containing toothpaste "...If more than used for brushing is accidentally swallowed, get medical help or contact a Poison Control Center right away," had an initial effective date of 10/96 which was then delayed until 4/97. Other product labels did not define the extent of ingestion that should result in calling a poison control center. **Results:** The proportion of all TESS cases that were FI-containing toothpaste was initially  $0.166 \pm 0.04\%$  and increased 5.8 fold to  $0.971 \pm 0.05\%$  after the labeling change. The other FI-containing products were initially  $0.248 \pm 0.04\%$  (1.5 fold greater than toothpaste), and remained unchanged at  $0.265 \pm 0.001\%$  after the labeling change. **Conclusions:** The labeling change for FI-containing nonprescription toothpaste appears to have significantly increased calls concerning these exposures. Labeling changes should be evaluated in light of the significance of the exposure and impact on public health resources.

### 163 A POISON CENTER EXPERIENCE WITH WHOLE BOWEL IRRIGATION

Metz J, Wahl M, Burda A, Sigg T. *Illinois Poison Center, Advocate Illinois Masonic Medical Center, Chicago, IL, USA*

**Background:** Whole bowel irrigation (WBI) is a modality of GI decontamination for sustained released medications, drug packets and agents not adsorbed by charcoal. Our recommendation for adults is to administer 1.5–2 L/hr PO or by NG tube. This is an unfamiliar modality for some hospitals and difficulty with hospital compliance has been noted by PCC staff. **Methods:** 211 cases (from 1/2000 to 3/2001) were retrospectively reviewed for (1) reason for recommendation; (2) Procedural compliance i.e. WBI done—not recommended; WBI recommended—not done; WBI done—done per recommendations; WBI done—not per recommendations; (3) How many cases were completed to an endpoint of clear rectal effluent. **Results:** Of the 211 cases, 100 were sustained release products, 83 were illicit drug packets and 28 were drugs/poisons not absorbed by charcoal. In evaluating compliance with recommendations, 56 cases were

excluded because of insufficient documentation. Of the remaining 155 patients, 6 patients (4%) had WBI done without recommendation; 32 patients (21%) had WBI recommended but not done; 89 (57%) had WBI done but not per recommendations and 28 (18%) had WBI done per recommendations. Of the 179 cases that had WBI performed, 73 charts did not have an endpoint of clear rectal effluent adequately documented and were not considered in this review. Of the remaining 106 cases, 47 (44%) did not have clear effluent and 59 (56%) attained clear rectal effluent. **Conclusions:** WBI is frequently recommended but infrequently performed per recommendations with only 18% done per PCC recommendations. Slightly over half (56%) of our patients were decontaminated to clear rectal effluent. For WBI to be an effective method of GI decontamination, increased hospital education may be warranted, as a large percentage of patients did not receive adequate decontamination in this study.

### 164 REDEFINING THE SEROTONIN SYNDROME

Whyte IM, Dawson AH. *Department of Clinical Toxicology and Pharmacology, Newcastle Mater Hospital, Newcastle, New South Wales, Australia*

**Background:** The diagnosis of serotonin syndrome (SS) is commonly based on Sternbach's criteria that were derived from 38 cases reported in the literature. There are a number of important sources of bias in such criteria and the applicability and predictive value of signs in overdose is not established. **Methods:** Prospectively collected data from consecutive patients with serotonergic reuptake inhibitor (SSRI) drug overdose was extracted. A subset of patients who satisfied Sternbach's criteria for SS was identified. The odds of the patient having a sign or symptom were calculated for SSRI versus non-SSRI drugs and for SSRI poisonings with or without SS. **Results:** In a 12 year period there were 5,521 admissions with deliberate self-poisoning. Of these, 504 (9.1%) were admissions where an SSRI was taken in overdose. Of the 504, 82 (16.3%) had SS (3 or more Sternbach criteria present). Signs or symptoms with a high association (OR, 95% CI) not noted by Sternbach; Clonus (ocular 13.3 (5.6–33.1), inducible 12.2 (6.3–24.0), spontaneous 8.6 (4.5–16.0)), Rhabdomyolysis 11.3 (2.9–52.2), Hypertonia or rigidity 7.8 (3.8–16.0), Tachycardia 4.2 (2.5–7.2), Coma 3.9 (1.8–8.2), and Mydriasis 2.4 (1.4–4.0). A number of signs reported in the Sternbach criteria did not discriminate between a SSRI and non-SSRI

poisoning. Conclusions: The design of our study has a strong bias towards detecting a high odds ratio for signs described by Sternbach's criteria as this was used for case definition. Despite this we have identified a number of clinical findings that have a stronger association with SS than those used in Sternbach's criteria.

### 165 EXTENDED HOME FOLLOW-UP WITH SYMPTOMATIC PEDIATRIC HYDROCARBON INGESTIONS

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Background: Aspiration and the resulting pulmonary symptoms are the most serious results of hydrocarbon ingestions. The usual protocol in patients presenting with initial pulmonary symptoms is to obtain a chest x-ray to assess for infiltrates at 6 hours post-ingestion and appropriate symptomatic treatment. After experiencing a pediatric patient who developed delayed x-ray findings 48 hours post-ingestion, a RPIC instituted a 72-hour follow-up policy in all pediatric hydrocarbon ingestion patients who were symptomatic on the initial call. Method: A retrospective review of all hydrocarbon ingestions with 72-hour follow-up was conducted. Data reviewed were patient demographics, type of hydrocarbon, clinical effects, x-ray findings, patient outcome and the need for referral to a hospital. Results: The RPIC records of 57 symptomatic hydrocarbon-exposed children, from an 24 month period, were identified and reviewed. The mean age was 18.8 months. Males accounted for 42 (74%) exposures and females 15 (26%). Forty-five (78.9%) of the symptomatic children had an x-ray performed and 17 (37.8%) showed the presence of infiltrates. Those children were admitted for subsequent care. During the 72 hours of home follow-up, 2 children were referred back to the hospital because of recurrent symptoms. They were found to have positive x-ray findings at 10 and 18 hours post-ingestion. Conclusions: Extended follow-up on symptomatic pediatric hydrocarbon ingestions was shown to identify children with delayed positive x-ray findings after the usual 6 hour post-ingestion x-ray. However, no delayed emergence of aspiration was identified beyond 18 hours post-ingestion. Children initially symptomatic should be followed for 24 hours post-ingestion.

### 166 ARE SOLID CANNED HEATING FUEL PRODUCTS (SCHF) TOXIC?

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Background: SCHF such as Sterno<sup>®</sup> contain methanol in concentrations from 4–100% and ethanol >60%. A potentially fatal amount of 100% methanol in a 2 yr is 2.5–5 ml and may cause blindness. Many PCC consider SCHF dangerous and refer *all* unintentional pediatric acute oral ingestions <6 yrs (PAOI) into an ED for evaluation. Methods: During the first 2 years (1993/94), all PAOI of SCHF were referred into an ED for evaluation and assessment of methanol/ethanol levels. Over the last 8 years, our PCC has prospectively monitored all PAOI of SCHF at home with telephone monitoring at 2, 4, and 24 hr PI. Parameters evaluated: patient demographics, dose, clinical effects, disposition and outcomes. Results: 50 PAOI of SCHF containing methanol during the last 10 yrs were studied. All involved small amounts (licks or tastes). During the first 2 yr of the study, 12 were evaluated in ED's. 10/12 were released within 6 hours, 1 was admitted for 24 hr and 1 left AMA. 11 had blood methanol/ethanol levels that measured "0." All remained asymptomatic. During the last 8 yrs, 38 PAOI remained asymptomatic at home by telephone FU. Discussion: Based on our 10 yr experience and a review of the medical literature for 40 yrs, we did not identify any toxicity associated with an PAOI of non ignited SCHF. In many products, ethanol is in greater concentration than methanol and signs of inebriation may serve as an early predictor of toxicity. Unknown ingestions of these products may require ED evaluation. Conclusions: PAOI of non-ignited SCHF in small amounts can be safely managed by a PCC at home with reliable caretakers in a more cost effective manner.

### 167 DROPERIDOL AND THE BLACK BOX

Mieckowski A, Burns M. *Massachusetts and Rhode Island Regional Poison Control Center, Children's Hospital, Harvard Medical School, Boston, MA*

Background: Droperidol is a butyrophenone used as an antipsychotic, sedative, neuroleptic and antiemetic. On 12/4/01 the Food and Drug Administration (FDA) issued a "Black Box" warning for droperidol, citing cases of

Outcome	Total (%) (n = 273)	QT &/or <i>torsades</i> (%) (n = 19)
Death	100 (37%)	5 (26%)
Hospitalization	43 (16%)	2 (11%)
Life-threatening reaction	35 (13%)	8 (42%)
Disability	4 (1%)	0 (0%)
Required intervention	9 (3%)	0 (0%)
Other	59 (22%)	1 (5%)
None	23 (8%)	3 (16%)

Abstract 167.

QT prolongation and *torsades de pointes* following administration at or below recommended doses. We describe the frequency of QT prolongation and *torsades* among cases recorded by the FDA. **Methods:** We reviewed 273 case summaries provided by the FDA which led to the implementation of the “Black Box” warning to determine the frequency of increased QT interval and *torsades* associated with the FDA-defined outcomes listed below. The mean droperidol dose, mean QT interval, specific arrhythmia descriptions, prior cardiac disease and potential coingestants were not provided. **Results:** See table. **Conclusions:** While QT prolongation and *torsades* are important factors, other adverse effects are also potential contributors leading to the “Black Box” labeling of droperidol.

#### 168 A POISON CENTRE (PC) ELECTRONIC DATABASE OF HOSPITAL-BASED RESOURCES: AN ADJUNCT TO TRANSFER DECISIONS

Walny N, Vicas I. *Saskatchewan Poison Centre, Calgary, Alberta*

**Background:** PC frequently recommend transfer of poisoned patients if local facilities do not have the resources to adequately assess/manage the patient. The opportunity for our PC to provide service to a geographic area of 1M population, challenged us to develop a facility information database to support timely IS transfer recommendations. Our aim was to deliver service as if PC staff worked or lived in the area. **Method:** A questionnaire was distributed to every health care facility (hospital, care centers, nursing stations) in the service region to describe baseline services & referral practices in 3 areas: (1) description of the facility including bed capacity, distribution of beds, specialty beds/services, ED staffing/ hours, (2) antidote availability options, (3)

laboratory investigation capability. Data was collated into a system written in FoxPro Relational database & functioning in a LAN environment. **Result:** Questionnaires were sent to & received from 146 facilities, 118 laboratories & 106 pharmacies. Flexible database search options allow IS to search by a variety of search parameters & keywords, alone or in combination. IS can retrieve (1) descriptive facility information (contact numbers, ED /ICU capabilities, staffing), (2) laboratory capabilities (hours of operation, phone contacts, tests performed on site or referred out, turn-around time), (3) pharmacy & antidote availability. A sectoral map provides visualization of distances to the closest medical center. The system is readily updatable on an ongoing basis as changes in service capabilities are identified. **Conclusions:** A database specific to the PC provides rapid accurate access to resource information impacting timely patient care & transfer decisions.

#### 169 THE IMPACT OF A PUBLIC ACCESS TELEPHONE HEALTH INFORMATION SERVICE UPON THE NATIONAL POISONS INFORMATION SERVICE IN THE UNITED KINGDOM

Russell EM, Hutchings AD, Routledge PA, Thompson JP. *National Poisons Information Service (Cardiff Centre), Llandough Hospital, Penarth, UK*

**Background:** The National Poisons Information Service (NPIS) provides advice to health care professionals concerning cases of poisoning and suspected poisoning. There is no specialised public access telephone poisons information service within the UK. However, as part of the National Health Service (NHS) in England and Wales a telephone health information service NHS Direct has been established recently. This study identifies the

impact introduction of this service has had upon the NPIS. Method: NPIS centers provided data on telephone enquiry numbers and use of Toxbase, the first-tier, internet based database for answering poisons enquiries in the UK. NHS Direct centers provided data on their use of NPIS services. Results: Calls to NPIS from NHS direct are increasing, both in absolute numbers and as a proportion of total enquiries. In 2001 more than 30% of enquiries to one NPIS Center came from NHS Direct. Other centers in England and Wales reported 13%, 14% and 22% of enquiries originating from NHS Direct. Use of Toxbase by NHS Direct has increased from six per cent of all user sessions in 2000 to 22% of user sessions in 2001. Conclusions: Introduction of NHS Direct has resulted in increased telephone enquiries to the NPIS. This increase has occurred despite increased use of the Toxbase database by NHS Direct. Reasons for contacting NPIS are discussed.

#### **170 POISON INFORMATION CENTER: THE COMMAND CENTER FOR THE DECONTAMINATION FACILITY OF MASS URBAN CASUALTY EVENTS**

Allen, S., Bernstein, J., Weisman, R., Ragone, S. *Florida Poison Center/Miami*

Background: The management of mass casualties is more of an organizational problem than a medical problem. The coordination of such events is vital to its success. To better assist our community, a decontamination facility has been instituted into the existing health care system. The Poison Center has been appointed the position as the Command Center for regional mass casualty events. Methods: Collection of data was obtained from books, journals, newspaper reports as well as summaries of minutes from meetings held within the hospital and countywide drills. This data was collected over the previous months to chronicle the development of the decontamination facility. Results: In preparation for mass casualty events the Poison Center has assumed the position as the Command Center for the purpose of coordinating and integrating facility response. Roles assumed by the center include; training and education of staff and decontamination teams, as well as the coordination and advisory of countywide drills. The infrastructure of the Poison Center makes it ideal for the identification and activation of emergency response to a crisis situation within the community. This is accom-

plished by acting as liaison with law enforcement, Emergency Operations Center, Federal Bureau of Investigation, and Health Department. The Poison Center will assist with the coordination of decontamination teams and provide the necessary medical advise for the treatment of victims in the event of mass urban casualty.

#### **171 TELETOXICOLOGY: A FEASIBILITY STUDY**

Vicas I. *Alberta Poison Centre, Calgary, Alberta*

Background: Many rural & remote hospitals use video-telehealth equipment (VTE) to link with specialty consultants or continuing education programs in tertiary care centers. Our PC sought to explore the feasibility of enhancing standard PC service delivery to health care professionals(HCP) with a visual solution. Methods: A list of all rural/remote centers with VTE was cross-referenced to PC data identifying rural centers whose HCP contacted the PC frequently. The local telehealth coordinator & key community nursing or medical leaders were surveyed by telephone to determine current telehealth utilization profiles, & identify physical, procedural or attitudinal obstacles to 24/7 clinical telehealth consultation for poisonings. Results: 25 communities met the VTE criterion. While 28 rural/remote communities met the high use criterion, only 13 centers also had VTE on site. Of these, 5 communities were interested in 24/7 toxicology consultations. All centers currently used VTE for education or pre-booked specialty consultations during regular work hours only. None had been offered 24/7 consultation access by other specialty practices. No VTE was located in a clinical area, although it could be relocated with varying degrees of difficulty. 2 centers committed to participating including one who would permanently locate their new equipment in the ED resuscitation room. All centers identified the need for the PC, the local telehealth coordinator & the clinical leadership to work closely with the bedside HCP to address the perceptions this technology would complicate & not enhance care. Conclusions: While all centers were intrigued by the potential for 24/7 teletoxicology consultation, significant logistical & attitudinal issues need to be addressed before this modality becomes a regular part of PC practice.

### **172 INCIDENT MANAGEMENT: THE USE OF THE HOSPITAL EMERGENCY INCIDENT COMMAND SYSTEM (HEICS) IN POISON CENTERS**

Scherger D, Hintzen-Schmidt YP, Bogdan GM, Dart RC. *Rocky Mountain Poison & Drug Center—Denver Health; University of Colorado Health Sciences Center, Denver, CO*

Background: The September 11, 2001 terrorist attacks and the intentional distribution of anthrax spores through the United States Postal Service stunned the Nation. Our poison center and nurse advice line (Center) collectively managed over 40 cases per day related to anthrax concerns. This represented a 10% increase in daily call volume although no incidents occurred in our service region. Had an event actually occurred in our region, demand for our services would have surged, thus overwhelming existing Center and other public health emergency systems. To optimize limited resources, we implemented a role-based incident management process to provide a coordinated response to an emergency. Method: Center management was trained to utilize the role-based management process, Hospital Emergency Incident Command System (HEICS), and participated in a tabletop exercise. The management strategies were then tested in conjunction with an unannounced citywide exercise involving a chemical agent release. Results: February 22, 2002, “injured” patients began contacting the Center. Available management personnel assembled within minutes of notification via text paging. Using the HEICS model, the team organized, assigned roles and implemented an action plan to prepare us for a surge in call volume. Within 60 minutes, additional phone lines were operational with specific information for those calling about the chemical agent release. Staff evaluations indicated that our Incident Command was established quickly and efficiently with the use of HEICS. Conclusions: Using HEICS enabled us to maintain normal operations while rapidly and effectively addressing the increased demand for services due to a simulated emergency despite the absence of key management personnel.

### **173 DISASTER PLANNING: HOW POISON CENTERS CAN PREPARE**

Scherger DL, Wruk KM, Hotton KJ, Dart RC. *Rocky Mountain Poison & Drug Center, Denver Health Medical Center, Denver Health, Denver, CO*

Background: In June 1999, a utility company severed our poison center’s telephone lines. Service was restored to the building nearly seven hours later. Alternate telephone routing allowed calls to be re-directed which prevented loss of access to critical poison emergency services. However, our disaster plan was revised to address the need to maintain telecommunications systems and ensure rapid business recovery. Method: To minimize the impact of an outage, our telephone switch contains redundant processors, critical operations are balanced between the processors, and emergency power is available. In addition, three local and three long distance T1 circuits connect via a Sonet ring with primary and secondary paths entering the building from different locations to provide redundancy. Our disaster recovery plan has three levels of escalation. Level One involves the loss of long distance T1 circuits, whereby toll-free numbers on that circuit are re-routed to a local T1 circuit to restore service. Level Two involves loss of the telephone switch and T1 circuits, whereby all numbers are re-routed to an off-site switch but can still be answered at an on-site location. Level Three involves evacuation of the building, whereby all calls are re-routed to an off-site switch and answered at an off-site location. In addition, our poison information lines can be routed to other centers through pre-arranged agreements. Results: In January 2002, we performed a Level Two test which involved re-routing a test toll-free number to an off-site switch yet managing calls at an on-site location. Emergency telephones were deployed, the toll-free number was re-routed, and calls were received on-site within 30 minutes. Conclusions: All poison centers need to prepare and plan for multiple levels of telecommunications disasters in order to ensure that patients have uninterrupted access to life-saving poison emergency services.

### **174 TELETOXICOLOGY: WHEN IS VIDEOLINK OF VALUE?**

Vicas I, Kaczowka R, Cull M, Ma P, Harris J. *Alberta Poison Centre, Calgary, Alberta*

Background: Our PC committed to incorporating videototelehealth capabilities into interactions/consults with health care professionals(HCP) in order to enhance delivery of our toxicology consultation service & to position the PC as a virtual bedside partner within an integrated clinical care team. In the pre-clinical delivery

phase, PC carried out a needs assessment to characterize clinical scenarios that would be enhanced by a videotelehealth link. Method: A PC videoteletoxicology Steering Committee subgroup of IS, coordinators & medical toxicologist (MT) retrospectively reviewed MT charts to answer the question: in what situations would video link enhance IS or MT assessment or care of the patient? The cases were reviewed independently, before group discussion. Results: Video link capacity was considered to be of potential value when (1) symptoms/toxidromes are atypical, complex, subtle, questionable, best described visually (e.g. dermal effects, agitation, movement abnormalities) or unfamiliar to the bedside care team; (2) the clinical diagnosis is unknown; (3) the descriptors provided by the bedside HCP are vague, have a spectrum of severity, are subjective or judgemental in nature; (4) clinical evolution of signs/symptoms by serial reassessments enhances accuracy of diagnosis and/or treatment; (5) visual identification of plant, mushroom, toxin samples is required. Conclusions: Characterizing cases potentially enhanced by a video tele link forms a key initial step in the IS & MT training process leading to operationalizing this technology into everyday PC care.

#### **175 TECHNICAL DESCRIPTION OF TELEMEDICINE/TELEHEALTH SOLUTION TO ENHANCE POISON CENTRE (PC) CONSULTATION SERVICE**

Johnston RV, Vicas I. *CHR Telehealth unit, Alberta  
Poison Centre, Calgary, Alberta*

Background: Telemedicine solutions are used in many areas of medicine. We sought to enhance current audio consultations with a visual solution by building on an existing advanced telehealth/telemedicine (TH/TM) system. Methods: A system meeting the special needs of a telecare service was established in the PC. The referring center would be assessed in the usual manner. If a videolink was felt to be an enhancement of service the TM/TH system would be deployed. The TM/TH equipment included a conference style unit in the educational area capable of either dial up (H320) or IP (H.323) connectivity as well as bridging (multiple calls) and gateway functionality (H.320 to H.323 translation). The PC clinical area was equipped with a similar codec with functionality to allow the IS to interact with the referring site without disturbing other team members. The medical toxicologist's (MT) home office was

equipped with an entry level desktop unit via ADSL through a secure IP tunnel into the corporate wide area network thus allowing connection to the units in the PC. Significant enhancements were made to the corporate firewall to allow video traffic to traverse. Results: On test calls, the system between the referring center & PC functions well at 384 kps over a dial up network. The bridging/gateway function, connecting the PC to the MT functions at a bandwidth of 192 /256 kps. The asynchronous nature of the DSL connection from the MT office allows an improved image quality from the referring center but less clarity to the referring center. Conclusions: While a functional system has been established, ongoing evaluation will identify the utility of this modality in PC operations.

#### **176 APPLICATION OF ELISA IN TAIWAN COBRA SNAKEBITE**

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Emergency Department, Taichung Veterans General  
Hospital, Taichung, Taiwan*

Background: Cobra snakebites have been shown to induce significant local tissue necrosis in addition to systemic neurotoxic paralysis. Owing to the notable tissue swelling, cobra snakebite is frequently misdiagnosed as habu (*Trimeresurus mucrosquamatus*) snakebite initially. The administration of correct and specific antivenin was typically delayed. Here, we developed an enzyme-linked immunosorbent assay (ELISA) to detect Taiwan cobra venom existed in the serum of the cobra snakebite victims. Methods: Sandwich-ELISA with horseradish-peroxidase conjugated method for detecting cobra venoms in biological samples were used and applied in a case of snakebite to confirm our clinical diagnosis. Serum samples of clinical cobra snakebite patients were collected when patients were admitted to the emergency room. Result: This established technique allowed us to detect as less as 1 ng/ml. The linear regression of standard cobra venom in the serum in concentration ranging from 1 ng/ml to 100 ng/ml was well with R-value to be 0.9779. Totally, 31 serum samples of 27 recognized and suspected cobra snakebite patients were analyzed by the developed ELISA technique. The highest venom level detected was 1270 ng/ml in a case 2 hours after being envenomed. The serum concentrations of the venom in the bitten patients were well correlated with the severity of local

tissue destruction. Conclusions: these results indicate that ELISA method that we have developed is valuable in early diagnosis and severity assessment of Taiwan cobra snakebite.

### **177 PROSPECTIVE STUDY OF MORBIDITY ASSOCIATED WITH SNAKEBITE ENVENOMATION**

Spiller HA, Bosse GM. *Kentucky Regional Poison Center, Louisville, KY 40232-5070*

Background: the morbidity associated with snakebite envenomation has not been well documented. Method: Using a standard questionnaire all patients with snakebite reported to a regional poison center during the year 2001 were followed after hospital discharge by telephone until resolution of symptoms. Results: 128 snakebite cases were reported, of which 16 (12.5%) were lost to follow-up and 31 (24.2%) reported no progression of symptoms beyond puncture and were deemed “dry bites.” Eighty-one (63.3%) patients were followed for the duration of symptoms. The snakes were identified as Copperhead (n = 57), unidentified venomous (n = 17), Timber rattlesnake (n = 6) and Cottonmouth (n = 1). All patients were evaluated in a HCF of which 51 were admitted. Nine patients received antivenin. Age ranged from 1 to 86 years with a mean of 32 years. There were 64 males (79%). Of the 37 patients who had a job, 33 lost a mean of 14 days of work (range 1–105 days, SD ± 18.1). Duration of edema was reported as 1 to 55 days, with a mean of 11.4 (SD ± 12). Persistent intermittent edema frequently occurred with limb activity. Pain was scored on a scale of 1 to 10, with a mean score of 4.8 (SD ± 2.7). Duration of pain was reported as 1 to 24 days with a mean of 7.8 days (SD ± 6.4). 30 patients required accommodation for ambulation including crutches (n = 11), limp (n = 11) and no shoes or loose shoes (n = 14). Of the 26 patients bitten on the hand or finger, duration of reduced function persisted from 2 to 38 days with a mean of 14.3 days (SD ± 10.4) and reduction of hand strength persisted for 4 to 105 days with a mean of 22 days (SD ± 25.5). Five patients had poorly healing ulcers at the bite site which persisted from 14 to 77 days with a mean of 45 days (SD ± 22.8) Conclusions: In this study snakebite resulted in significant duration and extent of morbidity.

### **178 SCORPION ENVENOMATIONS IN CHILDREN LESS THAN TWO YEARS OLD: A THREE-YEAR REVIEW**

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Background or Objective: *Centruroides* envenomations in children may be life-threatening, and result in respiratory compromise. The epidemiology in children is rarely described. Our objective was to describe the distribution of the clinical grading system, onset of clinical signs and symptoms, rate of deterioration, and admission and intubation rates following pediatric scorpion envenomation. Methods: A retrospective poison center chart review of 391 scorpion envenomations in children ≤ 2 years old calls from 1/1999–12/2001 was conducted. One reviewer reviewed all charts and assigned grades based on previously published *Centruroides sculpturatus* grading scales. The grades were correlated with admission rates and clinical deterioration. Outcomes of patient observed at home were recorded. A second reviewer examined 10% of the charts, and a kappa was calculated. Results: Of the 391 charts, 387 had adequate information available. Of these 387 cases, 343 (71%) were Grade 1, 8 (1.7%) were Grade 2, 49 (10.1%) were Grade 3 and 83 (17.2%) were Grade 4. Mean age 20.8 [Range: 2–24] months, mean time to advancement of grade was 31.9 [Range: 0–120] minutes. 133 (27.5%) presented to an ED, 86 received antivenin and 25 total patients were admitted. Three patients were intubated (.6%). No long-term adverse events were recorded. The P-value for kappa and 95% confidence interval (CI's) for interobserver reliability was p = .0005, kappa of .69 with CI's (.44–.95). Conclusions: The majority of children less than two years were managed at home. Clinical deterioration typically occurs within 30 minutes.

### **179 OCULAR EXPOSURE TO TOXINS FROM A EUROPEAN FIRE-BELLIED TOAD WITH NO SYSTEMIC CONSEQUENCE**

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Background: Many reptiles and amphibians have chemical defense toxins that protect the species from being



consumed by predators. The European fire-bellied toad, *Bombina bombina*, secretes two toxins, bombesin, a tetradecapeptide with cardiovascular activity, and bombinine, a low molecular weight tetracosane peptide with hemolytic activity. *Bombina bombina* secretes these toxins onto its surface from hundreds of tiny pores located throughout its body in response to provocation. Reports of toxicity are limited, and human ocular exposures have not previously been reported. We present a patient with an ocular exposure of toxins of *Bombina bombina* resulting in localized, but no systemic toxicity. Case Report: A 6-year old male was handling the family pet, a European fire-bellied toad, when it exuded a liquid substance onto his hands. He inadvertently transferred the liquid to his right eye. Reddening of the conjunctiva and intense pain ensued, and home irrigation of the eye was unsuccessful at relieving the symptoms. Further irrigation was initiated upon arrival to the ED, and fluorescein stain revealed corneal abrasion to the eye. Due to the highly vascular nature of the eye, the patient was observed for 6 hours, with periodic evaluation of vital signs to monitor for systemic toxicity. The patient remained stable with no systemic changes and was discharged with ophthalmic antibiotics to treat the eye. Conclusions: We report an ocular exposure to the toxins secreted from the toad, *Bombina bombina*, resulting in redness, intense pain, and corneal abrasion, but no systemic toxicity.

### 180 USE OF CROFAB® IN AN EIGHT MONTH PREGNANT WOMAN

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Background: Crotalinae envenomations are an infrequent occurrence in pregnant women but have been associated with a high incidence of maternal death (10%) and fetal demise (43%). CroFab® [Crotalidae Polyvalent Immune Fab (Ovine)] was recently approved for use in the US. We present the first known use of CroFab® in a pregnant patient. Case Report: A 29 y.o. eight month pregnant woman presented to a central California hospital ED 30 minutes after a rattlesnake bite to her right thumb. There were two puncture marks on the digit. Initially she had only local swelling and hemorrhage. The snake was described as a baby rattler that had to be physically removed from the digit. Within one hour, her swelling had progressed to involve the entire hand and she

complained of pain and perioral numbness. At this point antivenom use was considered. The treating hospital had a few vials of Wyeth Antivenin (Crotalidae) Polyvalent® (Equine) in stock, but the treating physician wanted to transfer the patient to a larger health care facility. Because of this, the higher risk of anaphylaxis and other potential consequences to the mother and fetus from the use of horse serum antivenom, she was transferred to a nearby hospital with CroFab® in stock. The first four vials of CroFab® were given within the first four hours. She received a total of 22 vials of CroFab® over the next two days. Swelling and ecchymosis involved the entire extremity to the shoulder. The prothrombin time, platelet count and fibrinogen level remained normal. She was discharged after 3 days. No complications with the pregnancy have occurred to date. Conclusions: To our knowledge this is the first reported use of CroFab® during pregnancy in a rattlesnake victim.

### 181 BIPHASIC RATTLESNAKE VENOM-INDUCED THROMBOCYTOPENIA

Steven R. Offerman MD, J. David Barry MD, Aaron B. Schneir MD, Richard F. Clark MD. Department of Emergency Medicine University of California San Diego, San Diego, CA

Background: Rattlesnake venom-induced thrombocytopenia (VIT) is frequently reported although the mechanism is not clearly understood. In most instances, VIT improves with antivenom therapy. Case Report: A 42 year-old male presented 30 minutes after a rattlesnake strike to the left index finger. Upon presentation he had swelling, bruising, and pain of the hand and arm consistent with envenomation. There were no systemic signs. Initial lab values were remarkable for a platelet count of 2,000/hpf. Four hours later, the patient arrived at our facility and was treated immediately with 6 vials of crotaline Fab (croFab). Lab values after the initial dose of croFab were: platelets of 215,000/hpf, fibrinogen of 161 mg/dL, PT of 13.5s, and INR of 1.3. Due to progression of local symptoms an additional 8 vials of croFab was administered. At 12-hours, the patient had swelling and bruising of the entire left upper extremity that appeared to be stable, platelets of 190,000/hpf, and normal coagulation panel. Coincident with the plateau of local symptoms, thrombocytopenia recurred. Platelet count steadily fell to a low of 7,000/hpf despite aggressive croFab administration. He was given 32

additional vials of croFab and 10 vials of Antivenin Crotalidae Polyvalent over the ensuing five days without any effect on platelet counts. During this period of thrombocytopenia, bleeding times were found to be highly abnormal. Other coagulation abnormalities never recurred. Conclusions: We report a case of biphasic VIT. The early phase being immediately responsive to croFab administration and therefore possibly due to platelet binding proteins within the snake venom. The late phase was refractory to all forms of antivenom therapy and may be explained by platelet sequestration at the wound site.

### 182 SEVERE SYSTEMIC TOXICITY WITH MINIMAL LOCAL EFFECTS AFTER CONTACT WITH AN UNPRESERVED RATTLESNAKE CARCASS

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Background: Crotalid envenomations can present with a spectrum of local and systemic toxicities. We report an unusual case of systemic toxicity with minimal local effects following envenomation by a 7-day-old unpreserved rattlesnake carcass. Case Report: A 29 year old male presented to a local hospital within an hour of sustaining a superficial scratch on his finger from the fang of a *Crotalus tigris* (tiger rattlesnake) that was killed 7 days prior by an automobile. Initially asymptomatic, the patient developed dyspnea, paresthesias, generalized weakness, and diffuse myalgias with minimal local effects at the site of inoculation. At initial evaluation, his PT and PTT were beyond detectable limits and his fibrinogen level was below the threshold of detection. Shortly after treatment with Wyeth® Polyvalent Crotaline Antivenin at an outside hospital, he developed urticaria, hypotension, and shortness of breath. He was started on an epinephrine drip and transferred to our facility. Further evaluation revealed continued elevation of coagulation studies (PTT > 150, PT > 106, fibrinogen < 20, fibrin degradation products 2048) and elevated CPK (peak 16,510). He received serial dosing of CroFab® as recommended by the manufacturer with resolution of symptoms and normalization of coagulopathy over the next 48 hours. Conclusions: Although cases of local toxicity have been reported with preserved crotalids, no case of severe systemic toxicity from superficial contact with an unpreserved snake 7 days after death has been reported. Our case clearly demonstrates the danger of handling even long-dead rattlesnakes.

### 183 DETECTION OF SERUM IGE ANTIBODIES TO *CENTRUROIDES SCULPTURATUS* VENOM IN A PATIENT WITH CLINICAL HISTORY OF ANAPHYLAXIS

Chase PB, Vazquez HL, Boyer L, Schumacher M, Alagon A. *University of Arizona Health Sciences Center, Tucson AZ and Instituto de Biotecnologia, Universidad Nacional Autonoma De Mexico, Cuernavaca, Mexico*

Background: Death by anaphylaxis secondary to scorpion envenomation has been reported previously, but detection of serum IgE to *Centruroides sculpturatus* venom has not been described. Case Report: A 65-year-old woman with a history of multiple scorpion envenomations was stung at home by a scorpion. She took antihistamine, and self-injected 2 ampoules of epinephrine, but was found by the medics to be unconscious, hypotensive (57/35), tachycardic (138), and incontinent of bowel and bladder, with “hives”. Emergency treatment included fluid resuscitation, intravenous cimetidine and methyl prednisolone, albuterol nebulizations, and subQ epinephrine. Approximately 7 months after her hospitalization, serum was obtained and incubated, at room temperature, in microtiter plate wells that had previously been incubated overnight with *C. sculpturatus* venom. After numerous washes (0.05 M Tris-HCL, tween) and the addition of blocking human IgG antibodies, mouse antihuman IgE antibodies conjugated with HRP were added. Controls consisting of serum from human volunteers with no history of prior scorpion envenomations were also used. Results: IgE antibodies to *C. sculpturatus* were detected in the patient’s serum only. Conclusion: Venom-specific IgE is detectable after apparent anaphylactic reaction to envenomation by *C. sculpturatus*.

### 184 RATTLESNAKE ANTIVENOM STOCKING: A PROBLEM WAITING TO STRIKE?

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Background: In 1998 & 1999, only 30% of hospitals had sufficient amounts of antivenom on-hand to treat one envenomation patient. In 2002, the supply of new antivenom may be lower than expected. Methods: In

	Wyeth-1998	Wyeth-1999	Wyeth-2002	CroFab-2002
Hospitals (n)	160	161	205	205
NV	143	144	80	48
ID	212	188	47	91
MT	312	291	186	40
CO	614	585	289	164
Totals	1281	1208	602	193

Abstract 184.

1998, 1999, and 2002, we surveyed acute care hospital pharmacies in Colorado, Montana, Idaho and Clark County, Nevada for in-stock amounts of antivenom: Antivenin (Crotalidae) Polyvalent [Wyeth] and CroFab [Protherics]. Results: Survey response rates/year averaged 72%. The amount of antivenom vials on-hand are summarized in the table. In 2002, there was a 38% decrease in rattlesnake antivenom in our service area compared to 1998. It takes approximately 18 vials of either antivenom to treat one patient. Therefore, our treatment capacity has decreased from 71 to 44 patients during this period. Conclusions: Existing and new production of antivenom have decreased. Furthermore, 32% of current antivenom stock is located at larger hospitals in and around major urban areas. In the face of continued rattlesnake antivenom shortages, this affords poison centers the opportunity to take proactive measures to identify the location and amounts of antivenom in their service areas.

### 185 INITIAL EXPERIENCE WITH CROTALINE FAB ANTIVENOM IN THE TREATMENT OF COPPERHEAD (*AGKISTRODON CONTORTRIX*) SNAKEBITE

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Background: Although approved for this indication by the FDA, crotaline Fab antivenom has not been tested in humans envenomated by copperhead snakes. Case Series:

An observational case series. Patients were enrolled if they were envenomated by copperhead snakes, received crotaline Fab antivenom, and had ongoing progression of swelling at the time antivenom was initiated. Results: 23 patients were identified. Most had moderately severe envenomation. The median time to antivenom administration was 4.0 hours. In 19 of these cases (82%; 95% CI, 79–85%), progression of swelling was completely halted within one hour of the antivenom infusion and did not recur. The mean antivenom dose used to achieve initial control of envenomation was 4.4 vials (range: 2–8 vials). In 2 cases, antivenom administration appears to have prevented the need for a digital dermatomy. One patient developed delayed coagulopathy that appeared to respond to repeat administration of Fab antivenom. One patient had a mild adverse reaction to antivenom, consisting of mild rash and wheezing in one patient that resolved without treatment. Conclusion: It appears reasonable for physicians to treat victims with progressive swelling due to copperhead snakebite with crotaline Fab antivenom. Recurrent swelling and delayed coagulopathy may occur in treated patients.

### 186 FACIAL NERVE NEURITIS SECONDARY TO ULTRAVIOLET RADIATION

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Background: Dermatitis has frequently been described as a consequence to ultraviolet (UV) exposure. We describe a patient who developed facial nerve injury following significant exposure to UV radiation. Case Report: A 49-

year-old construction worker developed erythema and edema on the left side of his face (exposed side) 12 hours after working within 18 inches of a metal halide incandescent light bulb for a total of 2 hours. The outer envelope of this 400 watt bulb had been broken and the filaments were reattached by an electrician. A mid-left facial burn resolved over the next 2 days. One month later, the patient noted a painful burning sensation over the left side of his face associated with marked left facial weakness and inability to close his eye (peripheral VIIth nerve palsy). A CT scan of the brain and a comprehensive urinalysis for heavy metals were normal. Pain was controlled with gabapentin. 2 months later, synkinetic left facial movements were noted (suggesting aberrant regeneration). Over the next several months, forceful episodic spasmodic activity developed in the muscles of facial expression on the left, identical to that seen in hemifacial spasm. Conclusion: Rarely has UV radiation been implicated in damage to subcutaneous nerves. This case demonstrates that significant neurologic morbidity may follow high exposure to UV radiation.

### 187 OCCUPATIONAL EXPOSURE TO 100% HYDROGEN SELENIDE (H<sub>2</sub>Se) GAS

Shrestha M, Friedman A, Snyder W, Emmerich H, Peltz H, Kelly S, Blum L, Henretig F, Greenberg M. *MCP/Hahnemann University, National Medical Services, Inc., and The Philadelphia Poison Control Center, Philadelphia, PA*

Background: Hydrogen Selenide (H<sub>2</sub>Se) gas is an irritant gas that can be fatal when inhaled even at low concentrations (IDLH: 1 ppm). We report a series of patients with severe pulmonary symptoms from an accidental industrial release of 100% H<sub>2</sub>Se. Case series: 13 workers were evaluated following inhalational exposure to H<sub>2</sub>Se. All reported “garlic” or “metal” odor at the scene. Those patients closest to the point of release were the most severely affected manifesting severe chest pain, cough, dyspnea, wheezing, and hypoxia. Severe workers were initially afebrile and developed high fever, leukocytosis, and pulmonary infiltrate with patchy atelectasis within hours. These workers were admitted for parenteral antibiotics, corticosteroids, and nebulized bronchodilator therapy. Workers who were further from the point of release demonstrated moderate or no shortness of breath initially only to become hypoxic within hours. The remaining workers had mild (or no) shortness of breath,

were observed in the emergency department and discharged. There were no cases of acute liver or renal toxicity. Serum selenium levels obtained from several affected workers were normal or slightly elevated. Conclusion: Acute inhalational exposure to concentrated H<sub>2</sub>Se can cause severe pulmonary symptoms. The development of symptoms is related to the degree of exposure and may be delayed. Treatment continues to be supportive care with oxygen, and individualized treatment with parenteral pain medications, nebulized bronchodilators, corticosteroids and antibiotics.

### 188 LEAD POISONING DERIVED FROM AYURVEDIC MEDICATION

Shrestha M, Greenberg MI. *MCP Hahnemann University School of Medicine, Division of Toxicology, Philadelphia, PA*

Background: Occupational lead poisoning continues to be a common cause for adult lead poisoning. We report herein, an Indian male patient, referred for presumed occupational lead exposure, who was found instead to have been lead poisoned by Ayurvedic medication. Case report: A 41 year-old-worker at an automobile parts facility was reported to have a blood lead level of 78 mcg/dL associated with malaise, weakness, abdominal pain, and weight loss, requiring admission to a hospital. He was noted to be anemic (hemoglobin = 7.9 g/dL). A careful history revealed that the patient recently traveled to India where an Ayurvedic practitioner gave him medication known as “EX” and “ADISSA”, purportedly to treat oligospermia. The patient was advised to stop taking the Ayurvedic medications. Plain radiographs of the Ayurvedic medications themselves revealed them to be markedly radio-dense. Laboratory analysis of the pills revealed high concentrations of lead: 13,084 mcg/g in one pill and 1,917 mcg/g in the other. Based on the patient’s dosing schedule, we estimate that he had ingested a total of 1.26 grams of lead during the course of his Ayurvedic therapy. The patient’s BLL responded well to oral chelation using Succimer and he was able to return to work without restriction. Conclusion: When searching for a source of lead exposure in the lead poisoned individual the possibility of the use of traditional medicines, obtained overseas and contaminated with or containing lead, must be considered.

### 189 THE MEASUREMENT OF ENDOTOXIN RELEASE FROM *SALMONELLA TYPHIMURIUM* AT STOMACH, INTESTINAL, AND PLASMA PH IN VITRO FOR BIOLOGICAL MODELING

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**Objective:** To determine the release of endotoxin, lipopolysaccharide (LPS), from *Salmonella enterica* serotype Typhimurium in gastrointestinal and plasma conditions. **Methods:** LPS was biosynthetically labeled with  $^3\text{H}$  on the fatty acyl-chains of *S. typhimurium* grown in proteose peptone beef extract (PPBE) medium with 200 uCi/ml of [ $2\text{-}^3\text{H}$ ] acetate sodium salt (sp. act. 20 Ci/mmol). A volume of 0.1 ml of bacterial cell culture (34.24 mg protein, 6.23  $\mu\text{Ci } ^3\text{H}$ ) was incubated in 0.9 ml of simulated gastric fluid (SGF) (pH 1.2), simulated intestinal fluid (SIF) (pH 7.5), and PPBE medium (pH 7.4), representative of plasma, at 37°C for 15, 30, 60 and 120 minutes. At the end of the incubation period the samples were centrifuged and the supernatant measured for radioactivity. **Results:** The time course for the incorporation of the radiolabel into the cells indicated the uptake increased linearly for the first 60 min and reached steady-state level by 120 min. The results (dpm  $\times$  1,000) obtained from incubation in SGF at 15 min were  $181 \pm 19$ ; 30 min,  $202 \pm 23$ ; 60 min,  $232 \pm 29$  and 120 min,  $253 \pm 27$ . For SIF at 15 min were  $30 \pm 4$ ; 30 min,  $61 \pm 20$ ; 60 min,  $93 \pm 30$  and 120 min,  $104 \pm 32$ . The values at plasma pH were at 15 min  $28 \pm 7$ ; 30 min,  $37 \pm 7$ ; 60 min,  $57 \pm 12$  and 120 min  $72 \pm 19$ . The LPS released at 120 min were 0.5, 0.8 and 1.9% for plasma, SIF, and SGF, respectively. The results were significant at  $p < 0.5$  level for SIF ( $n = 6$ ) and  $p < 0.001$  for SGF ( $n = 6$ ), as compared with the plasma pH values ( $n = 6$ ). This information is needed to construct a physiologically-based pharmacokinetic (PBPK) model of endotoxins for quantitative risk assessment.

### 190 SKIN AND SCROTAL LESIONS FROM PROLONGED EXPOSURE TO HYDROGEN SELENIDE ( $\text{H}_2\text{Se}$ ) GAS

Shrestha M, Baniukewitz A, Vail S, Shusterman W, Greenberg M. *MCP/Hahnemann University, St. Mary's and Mercy Hospitals, Philadelphia, PA*

**Background:** Hydrogen Selenide ( $\text{H}_2\text{Se}$ ) is a water-soluble gas that can be extremely irritating to skin and mucous membranes. We report of a case of  $\text{H}_2\text{Se}$  skin exposure that resulted in the development of painful bright orange skin discoloration and injury. **Case Report:** A 40 year-old-man was at work when 100%  $\text{H}_2\text{Se}$  was accidentally released in an adjacent room. He donned a self-contained breathing mask and continued to perform tasks he deemed important for 20 minutes in a room filled with  $\text{H}_2\text{Se}$  gas. Once evacuated, the worker was decontamination and taken to the hospital, where he was noted to have painful orange palms, feet, and scrotum, that were tender with occasional blisters. The patient's skin was cleansed using moist gauze and water irrigation. The effluent from skin cleansing was tested and demonstrated high concentrations of selenium (Se). Systemic narcotic analgesia was required for pain control. The patient also had mild coughing and shortness of breath that worsened over the course of several hours. Affected areas were dressed with silver sulfadiazine and they improved over the course of 4–5 days. **Conclusion:** Exposure to concentrated  $\text{H}_2\text{Se}$  gas can cause painful chemical injury to moist skin areas such as hands, feet, and scrotum. The deposited material contains Se and can be difficult to remove. Treatment remains prompt removal from exposure, decontamination, skin cleansing, and local chemical injury care.

### 191 EMERGENCY DEPARTMENT (ED) WORKER MORBIDITY FROM HYDROGEN SELENIDE ( $\text{H}_2\text{Se}$ ) EXPOSED PATIENTS

Shrestha M, Emmerich H, Friedman A, Kelly S, Henretig F, Greenberg M, Roberts JR. *MCP/Hahnemann University; Frankford Bucks, St. Mary's and Mercy Hospitals; and the Philadelphia Poison Control Center, Philadelphia, PA*

**Background:**  $\text{H}_2\text{Se}$  gas is very irritating to mucous membranes even at low concentration (IDLH: 1 ppm). This report documents clinical illness in ED workers who were secondarily exposed to  $\text{H}_2\text{Se}$  from patients who had inhaled this toxic gas. **Case Series:** Six patients from an accidental  $\text{H}_2\text{Se}$  gas release were taken to a local hospital. For decontamination, all their clothing was removed and they showered at least once. The two sickest patients, who had severe dyspnea and hypoxia, were placed in a large treatment room with closed doors. One physician spent a total of 1 hour in this room and developed burning eyes,

nose, throat, dry cough, and laryngitis. Another physician developed mucous membrane irritation and headache. A third developed eye irritation requiring irrigation. A nurse who had a history of asthma, and who had decontaminated the sickest patient, was unable to return to work for 2 weeks due to asthma exacerbation. The affected physicians became asymptomatic over 12 hours. No H<sub>2</sub>Se-related symptoms developed in the ambulance crew, or ED staff of another hospital where patients with less severe pulmonary toxicity were taken. Conclusion: Health care workers can develop clinical H<sub>2</sub>Se illness from H<sub>2</sub>Se-exposed patients despite routine skin and clothing decontamination. The source of this H<sub>2</sub>Se is most likely the exhaled patient air. To prevent second hand exposure, precautions such as adequate ventilation are required in addition to skin/clothing decontamination.

### 192 SENSITIZATION TO UV-CURABLE ACRYLATES: A CASE REPORT AND REVIEW OF THE LITERATURE

Pearson, KC. *Massachusetts Department of Public Health, Boston, MA*

Background: Acrylic acid esters are used extensively in the production of paints, adhesives, printing inks and various coating formulations. Manufacturers have been able to reduce the need for volatile organic compounds through the use of ultraviolet radiation curable (UV-curable) coatings containing chemically and biologically reactive acrylates. Dental medicine has made extensive use of such compounds, as has the artificial fingernail industry. Acrylic monomers are well-known sensitizers. Because the finished products generally contain < 1% acrylic esters as a result of the polymerization process, consumers are not generally exposed to these compounds. Only a few cases of clinically relevant contact sensitization to acrylic resins have been reported. Case report: A printing company employee developed severe allergic contact dermatitis requiring prolonged treatment with systemic steroids when a UV-curable acrylate-containing chemical with which he was working was spilled on his face, abdomen, and arms. Upon reentering the workplace, he experienced recurrent dermal lesions despite avoidance of any direct contact with the chemical. Patch testing was positive for allergy to acrylate containing products. He has continued to experience episodic flares of his dermatitis, in one case associated with exposure to recently-applied artificial nails. Conclusion: Individuals who become highly sensitized to

UV-curable acrylates may develop contact reactions to even low concentrations of acrylic esters in consumer products.

### 193 FAULTY BACKFLOW VALVES LEADING TO CONTAMINATED POTABLE WATER AND TOXICITY

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Introduction: Potable water lines enter building boilers, refrigerators, and other devices. Back flow prevention valves are often utilized to prevent back contamination of these potable lines. These valves can malfunction and lead to toxic contamination of the potable water system. We report 3 separate incidents that demonstrate this toxic mechanism. Incident #1: Several restaurant patrons reported nausea, vomiting and metallic taste after consuming soda from the restaurant's soda fountain. A faulty back flow prevention valve on a copper potable water line was found entering the carbonator of the soda fountain. Carbonated water entered the potable water system through this faulty valve and was found in all the water lines including, the coffee machine, toilets, and ice machine. Carbonic acid, formed by the carbonation process, dissolved copper from the water pipes, contaminating the water that ran through the soda fountain system and into the beverages. Incident #2: 29 school children, aged 6–9 were diagnosed with methemoglobinemia (MetHb), MetHb levels were between 3 and 47%. The school children had ingested canned soup that had been diluted with a hot tap water source in the building. Analysis of the leftover soup revealed high levels of nitrite and the presence of sodium metaborate (both utilized as preservatives in the boiler system). Investigation of the boiler system revealed a faulty back flow prevention valve in the potable hot water line. Incident #3: 4 office workers were diagnosed with methemoglobinemia (MetHb), MetHb levels were between 6–16%. All of these individuals drank coffee from the same pot. The coffee had been prepared from a hot tap water source in the building. Analysis of the leftover coffee revealed elevated nitrite levels. Investigation of the boiler system revealed a faulty back flow prevention valve in the potable hot water line. Conclusions: Faulty back flow prevention valves can lead to contaminated potable water. Ingestion of water from these sources can lead to significant toxicity.

Fire	Wood (g)	Filter Weight (g)	Cartridge	Carbon Radicals (mm)	Oxygen Radicals (mm)
1	90.5	0.01	Yes	5	0
2	91.7	3.21	No	10	35
3	88.6	0.00	Yes	0	10
4	87.5	0.14	No	60	38
5	92.3	0.00	Yes	0	0
6	90.9	1.26	No	105	18

Abstract 194.

### 194 ADSORPTION OF FREE RADICALS BY RESPIRATOR CARTRIDGES

Wagner P, Burgess JL, Castranova V, Leonard S, Fleming JE, Crutchfield CD. *Univ. of Arizona, Tucson, AZ and National Institute for Occupational Safety and Health, Morgantown, WV*

**Objective:** Free radicals produced during combustion contribute to pulmonary toxicity following smoke exposure. The purpose of the study was to measure the reduction in free radical exposure associated with the use of air purifying respirators. **Methods:** Smoke was generated through the combustion of pine wood in a chamber. Fires were allowed to burn for 10 minutes prior to sampling. Smoke from each fire was sampled on a 37 mm 0.45  $\mu\text{m}$  Teflon SKC TF 450 filter using a high volume pump. Three of the six samples were collected following the introduction of a cartridge filter (Scott Aviation Model 642-MPC-P100) into the sampling train. Filters were analyzed for radicals using an EPR Spectrometer. **Results:** Cartridge respirators reduced mean oxygen and carbon based radicals measurements by 97% and 89% respectively (see table). **Conclusion:** This initial study suggests that respirator multipurpose cartridges are effective at reducing exposure to free radicals.

### 195 SWEAT GLAND DYSFUNCTION DUE TO DERMAL IODINE EXPOSURE

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**Background:** US Customs agents are exposed to a wide variety of potentially toxic materials used to manufacture

illicit drugs as they are confiscated at the U.S. border. We report a case of axillary sweat gland dysfunction in a customs agent who had dermal exposure to crystalline iodine that had been smuggled unsuccessfully across the U.S./Mexico border. **Case Report:** A 22 year-old female presented to our clinic complaining of purple discoloration of the underarms of her clothing. She denied any noticeable discoloration of any other body fluids including her sweat but did note some darkening of her axillary skin bilaterally. By the end of each day for the past week, the underarms of her clothing would turn purple. One week prior to onset of her complaints, she had been asked to photograph a large container of approximately 100 pounds of crystalline iodine due to her employment as a US Customs photographer. She was wearing a cartridge respirator, latex gloves and jeans, and a short-sleeve shirt. The gloves became stained as she handled the iodine; however, she developed no symptoms prior to the onset of axillary discoloration. Her past medical history was completely unremarkable. Physical examination, thyroid scan and thyroid stimulating hormone concentration were all normal. The discoloration of her axilla and clothing resolved over several weeks. **Conclusion:** Dermal exposure to and absorption of iodine can lead to persistent sweat gland abnormality.

### 196 ACUTE INHALATION EXPOSURE TO COMBUSTION PRODUCTS OF HYDRAZINE

Erdman AE, Dart RC, Cetaruk EW. *Rocky Mountain Poison & Drug Center-Denver Health; University of Colorado Health Sciences Center, Denver, CO*

**Objective:** Hydrazine ( $\text{NH}_2\text{NH}_2$ ) is a liquid propellant used in emergency power units (EPU) of jet fighters. It undergoes catalytic decomposition to produce hot gas,

which provides emergency thrust and power. No human exposure to combusted hydrazine has been reported in the literature. We describe several patients who were exposed to the combustion products of aqueous hydrazine. Case Series: Eleven members of the Colorado Air National Guard ground crew were working 100 yards downwind of an F-16 aircraft taxiing down the runway, when they all noticed an irritating ammonia-like smell. After leaving the area, respiratory symptoms (cough, dyspnea, chest discomfort) and mucous membrane irritation developed. Five patients were brought to a university hospital where they were evaluated. All but one was asymptomatic on arrival. This patient continued to experience throat irritation and chest discomfort. An investigation revealed that the pilot had accidentally activated the EPU containing a mixture of 70% hydrazine and 30% water. The patients were exposed to the exhaust plume generated by catalytic decomposition of this mixture. Exhaust products include ammonia, hydrogen, and nitrogen gases, and small amounts of unburned hydrazine, water, aniline, and carbon dioxide. The patient's chest radiograph was normal, his oxygen saturation was 94% and his peak flow exceeded 800 L/min. He was admitted for observation and discharged the following day without further symptoms. The other four patients had normal oxygen saturation and peak flow measurements. They were discharged after 6 hours of observation. One week later, all patients were asymptomatic. Conclusion: While hydrazine itself is toxic after inhalation, its catalytic decomposition products appear to cause only respiratory and mucous membrane irritation.

### 197 CASE SERIES OF PROLONGED CHOREOATHETOSIS, FEVER, AND HALLUCINATIONS FOLLOWING PEMOLINE INGESTION

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Background: Prolonged choreoathetosis, fever, and hallucinations induced by pemoline have rarely been reported. We report 4 cases of prolonged choreoathetosis, fever, and hallucinations following cases of pediatric overdose, intentional abuse, and therapeutic error associated with pemoline. Case Series: Case 1: A 5-year-old ingested an unknown amount of pemoline. She

presented with HR 190, RR 36, T 38.7, choreoathetosis, and hallucinations. She remained symptomatic for 3 days. CPK peaked at 1592 U/L. Case 2: A 3-year-old ingested an unknown amount of pemoline. She presented with HR 200, RR 36, T 38.0, choreoathetosis, and hallucinations. She remained symptomatic for 2 days. CPK peaked at 561 U/L. Case 3: A 41-year-old drug abuser ingested an unknown amount of pemoline. She presented with HR 160, RR 30, T 38.5, choreoathetosis, and hallucinations. She was intubated and remained symptomatic for 3 days. Case 4: A 37-year-old increased his pemoline dose to 150 mg/day. He presented with HR 110, RR 26, T 38.6, choreoathetosis, and hallucinations. His pemoline was discontinued and over 2 days he had gradual resolution of his symptoms. CPK peaked at 1622 U/L. Conclusion: Pemoline induced choreoathetosis, fever and hallucinations may persist for days. High doses of benzodiazepines may be necessary to diminish agitation and surveillance for rhabdomyolysis should be performed.

### 198 HYDROFLUORIC ACID DERMAL EXPOSURE RESULTING IN FATALITY

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Objective: To describe the presentation, management and outcome of a serious hydrofluoric acid dermal exposure in a child. Case Report: A healthy 7 y female was playing in her backyard when she jumped into a 5-gallon bucket that contained approximately one gallon of 70% hydrofluoric acid. This chemical was used in a family pressure washing business as an aluminum brightener. The child immediately suffered chemical burns to 10% of her BSA affecting both lower extremities. The child was rinsed off at the scene but developed labored breathing and was transported by the father to an area hospital. At the hospital the child was further decontaminated and a calcium paste was applied to the affected areas. The child developed respiratory distress requiring intubation then minutes later developed cardiopulmonary arrest. Resuscitative efforts included epinephrine and cardioversion. Intravenous calcium chloride and dopamine were given for hypotension. The child suffered two additional cardiac arrests both of which required extensive resuscitation. The child was then



airlifted to our institution for further stabilization and treatment of her chemical burns. During transport the child suffered a fourth cardiac arrest and arrived at our institution in asystole. The child was given additional doses of calcium chloride and again was resuscitated. The child was noted to have agonal respirations and evidence of pulmonary edema. The child's pupils were fixed and dilated. Aggressive alkalinization and calcium replacement were undertaken. The serum calcium level was 5.5 mg/dL. Despite aggressive resuscitative measures the child was pronounced dead approximately six hours after the exposure. **Conclusion:** This case represents the serious and fatal result following the dermal exposure (10% BSA involvement) from concentrated hydrofluoric acid.

### 199 DINITROPHENOL ORAL INGESTION RESULTING IN DEATH

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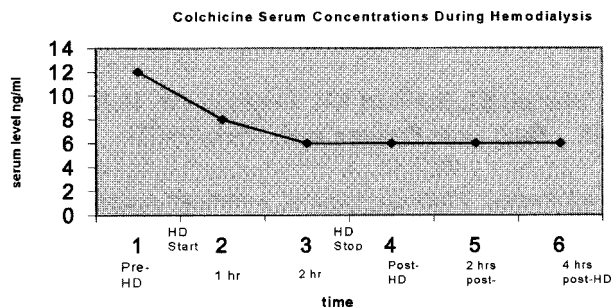
**Background:** Dinitrophenol, an agricultural insecticide, is a metabolic poison which uncouples oxidative phosphorylation. Energy produced by oxidation is released as heat rather than being stored as high energy phosphates. Hyperpyrexia, acidosis, and cardiovascular collapse characterize acute poisoning. **Case Report:** A 17 year old female presents after 24 hours of vomiting. There was no history of medication or illicit drug use. On examination she appeared lethargic and ill with HR = 120, BP = 120/36, RR = 36, 101.1°F. She does not communicate coherently. Physical examination was remarkable only for the presence of a tampon in the vagina which was removed. Other than an acidosis (bicarbonate = 16 meq/lit) her laboratory evaluation was non-diagnostic. Her condition deteriorated rapidly. She developed severe hypotension, seizures, respiratory failure, and despite intensive care she expired four hours after arrival to the emergency department. All cultures (blood, urine, and the tampon) were negative for pathogens. The day after her death the patient's father brought an unmarked gelatin capsule containing a yellowish powder to the pulmonologist involved with her care. She had been using these capsules to lose weight. The capsule was passed on to the county medical

examiner who identified the contents as dinitrophenol and subsequently confirmed the presence of dinitrophenol in the patient's serum. The case is currently being investigated as a potential child homicide. **Conclusion:** Dinitrophenol has been used as a dietary aid to promote weight loss and represents a risk to naive individuals who may, unknowingly, expose themselves. Accidental, intentional ingestion causing death is a rare occurrence.

### 200 COLCHICINE OVERDOSE TREATED WITH HEMODIALYSIS

O'Malley G, Ashe A, Rose R. *Virginia Poison Center, Richmond, VA*

**Background:** Colchicine is a potent antimetabolic agent with a high mortality rate following overdose. Reference materials report that hemodialysis to enhance excretion would be unsuccessful due to colchicine's large distribution volume. **Case Report:** A 20-year-old female presented to hospital 90 minutes after ingestion of 20–30 tablets of 0.6 mg colchicine in a suicide attempt. Vital signs were stable and co-ingestants were ruled out in the ED. Contrary to the instructions of the consulting poison center, the patient underwent hemodialysis (HD). **Methods:** HD was initiated at 7.5 hrs after ingestion for 3.5 hrs. **Result:** The serum colchicine determinations are illustrated in the figure. The patient developed granulocytopenia on hospital day 2, was not treated with GCSF and began recovering bone marrow function by hospital day 7 and was discharged to home. **Conclusions:** The mean half-life of colchicine is 4.4 hrs in patients with normal renal function. Calculated half-life (T<sub>1/2</sub>) during HD = 3.5 hrs, suggesting HD did



not appreciably enhance excretion of colchicine in this patient. We were unable to find any other reports in which HD was used to treat a colchicine poisoned patient in the medical literature.

## 201 FATAL INGESTION OF ZINC PHOSPHIDE RODENTICIDE

Broderick, M, Birnbaum, K. *San Diego, California*

**Background:** Lethal exposures to zinc phosphide in the United States are uncommon. We report a fatality due to ingestion of a zinc phosphide rodenticide. **Case Report:** A 52 year old male presented to an ER one hour post ingestion of a diluted Mexican rodenticide labeled "Fosfuro de Zinc". Prior to arrival he vomited several times but was without gastrointestinal complaints in the ER. Initial vitals were HR 85, BP 120/79, RR 20 and oxygen saturation of 97%. Slight nystagmus and basilar crackles were noted on exam. Activated charcoal was given and an IV of normal saline was started. Laboratories included ethanol 0.14%, digoxin 0.4 ng/ml, serum bicarbonate 16, ph 7.44, pCO<sub>2</sub> 15, pO<sub>2</sub> 115, HCO<sub>3</sub> 9.6. The patient became increasingly agitated despite chlordiazepoxide, haloperidol and lorazepam but improved after diazepam was given. Within a few hours the blood pressure dropped to 78/58 and respirations decreased. Shortly after intubation the patient developed ventricular fibrillation and asystole. Resuscitation was unsuccessful and the patient expired 8 hours after presentation to the ER. The coroner reported pulmonary edema and an elevated urine zinc level of 1160 mcg/L. **Conclusion:** Although patients may present with minimal initial symptomology, patients with intentional zinc phosphide ingestions are at risk for increasing or delayed toxicity and should be monitored in an intensive care setting.

## 202 SAFETY OF PHYSOSTIGMINE USE FOR ANTICHOLINERGIC TOXICITY

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**Background:** Physostigmine is a tertiary amine, carbamate acetylcholinesterase inhibitor that competitively antagonizes central and peripheral effects of toxins with anticholinergic properties. It effectively reverses anticholinergic toxicity but safety concerns have limited its use. **Methods:** All reported cases of physostigmine administration at a regional poison information and treatment center for a 28 month period were retrospectively reviewed. A subset of cases where sign-

s/symptoms of asystole, bradycardia, ventricular dysrhythmias or seizures were reported, underwent further review for relationship of sign/symptom to physostigmine administration. **Results:** 255 cases of physostigmine administration to reverse delirium or to diagnose anticholinergic toxicity were identified. Ages of patients ranged from 2–86 years. Of these, 168 (66%) were single-substance ingestions while 86 (34%) involved multiple (2 to 10) substances. 154 (60%) of the cases of physostigmine use involved exposure to antihistamines (n = 100), atypical neuroleptics (n = 35), and prescription anticholinergic drugs (n = 19). There was 1 case (0.5%) of single-episode 1 minute seizure, 5 minutes after physostigmine administration. In this case, sertraline and valproic acid were coingested. There were 16 additional cases of reported asystole, bradycardia or seizure but in all these cases, signs/symptoms preceded the administration of physostigmine. **Conclusion:** In this case series, physostigmine was safe and rarely associated with adverse effects.

## 203 DELAYED SALICYLATE TOXICITY AFTER A SINGLE OVERDOSE

Rivera W, Kleinschmidt K, Velez LI, Shepherd JG. *The University of Texas Southwestern Medical Center and The North Texas Poison Center, Dallas, TX, USA*

**Background:** Aspirin is a widely used over the counter drug. Peak levels are reported to occur 1–6 hours after an oral therapeutic dose. We describe a case of delayed toxicity following a single ingestion of aspirin, where the initial levels were nearly undetectable and the patient was completely asymptomatic for the first 35 hours. **Case Report:** A 14 years old female was evaluated after a single ingestion of 120 tablets of 81 mg aspirin and 6 tablets of ciprofloxacin two hours before arrival to the emergency department. She denied nausea, abdominal pain, tinnitus, or shortness of breath. Vital signs were RR 18/min., HR 100/min., and BP 134/74. She received one dose of activated charcoal. The first salicylate level (four hours after ingestion) was reported at 1 mg/dl. Follow up salicylate levels were 13 mg/dl at 8 hrs, 14 mg/dl at 17 hrs, and 18 mg/dl at 27 hrs. The patient was still asymptomatic. At 35 hrs, the patient became symptomatic (dizziness, tinnitus and epigastric discomfort). Her level was now 46 mg/dl. A second dose of activated charcoal was administered and IV bicarbonate was started as a continuous infusion for 30 hours. This

resulted in a steady decrease of the salicylate level to normal. **Conclusions:** The standard practice in the treatment of salicylate overdoses relies on levels and symptoms. We present the importance of following salicylate levels until a decreasing level is present. While delayed salicylate toxicity is well reported in the literature, but no report was found with levels increasing to toxicity 30 hours post ingestion. The delayed aspirin absorption may be due to salicylate-induced pylorospasm or the formation of pharmacobezoars.

#### 204 MULTIPLE DOSE ACTIVATED CHARCOAL AS TREATMENT OF VANCOMYCIN TOXICITY IN PREMATURE NEONATES

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**Background:** Supratherapeutic vancomycin infusions of 300–400 mg/kg were inadvertently administered to three premature neonates (AR, DH, SP). Reported beta-elimination half-life (T<sub>1/2</sub>) of normal dosing of vancomycin in neonates is 13.4–33.7 hours (hr). A T<sub>1/2</sub> of 35 hr was reported in an iatrogenically-overdosed premature neonate. Multiple dose activated charcoal (MDAC) was given to enhance elimination in our 3 patients. **Case Series:** Following vancomycin infusion, three neonates developed apnea, hypotension, flushed skin, and inflamed infusion sites. Initial vancomycin levels were: AR—287.7mcg/mL (wt 3120 g), DH—371.4mcg/mL (wt 690 g), and SP—357.2mcg/mL (wt 1275 g). MDAC (1 g/kg every 4 hours) was given for 24 hours to patient AR and 48 hours to patients DH and SP. T<sub>1/2</sub> for vancomycin pre- and post-MDAC (see Table). **Conclusions:** MDAC reduced the beta-T<sub>1/2</sub> of vancomycin in 2 of 3 preterm neonates. T<sub>1/2</sub> in the 3<sup>rd</sup> neonate during MDAC was less than previously reported in neonatal overdose. T<sub>1/2</sub> reduction was greatest in AR

who received the highest mg/kg dose of AC. MDAC should be considered for treatment of vancomycin toxicity.

#### 205 OCULAR EXPOSURE TO XYLAZINE HYDROCHLORIDE RESULTING IN HYPOTENSION AND BRADYCARDIA

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**Background:** Limited reports of human overdose with the animal tranquilizer, xylazine hydrochloride, are present in the literature. The reported routes of exposure have been oral, intravenous, intramuscular, and inhalation. Reported effects include hypotension, bradycardia and respiratory depression. Human ocular exposure to xylazine has not been reported in the literature. **Case Report:** A 38 years old male arrived to the Emergency Department, reporting the accidental irrigation of both eyes with approximately 8 ml of xylazine (100 mg/ml) 30 minutes prior to arrival. The patient was asymptomatic on arrival, with heart rate 78 beats per minute and blood pressure 132/72 mmHg. Copious irrigation of both eyes with normal saline was performed. The patient developed sinus bradycardia at 40–50 beats per minute and hypotension to 90/60 mmHg approximately 2 hours after the exposure. A decreased level of consciousness coincided with the cardiovascular effects. The patient was admitted to a telemetry unit for observation, where the sinus bradycardia and hypotension were noted to persist for 24 hours. No other arrhythmias were noted during this time. The patient remained otherwise asymptomatic. The bradycardia and hypotension resolved without intervention (other than IV fluids) approximately 30 hours after the exposure and the patient was discharged home. **Conclusion:** Our case demonstrates that ocular exposure to xylazine can cause systemic central nervous system and cardiovascular effects.

Patient	T <sub>1/2</sub> pre-MDAC	T <sub>1/2</sub> during MDAC
AR	5.3 hours (during therapeutic dosing)	1.9 hours
DH	14 hours (following overdose)	7.3 hours
SP	5.3 hours (during therapeutic dosing)	5.2 hours

## 206 THE EFFECTIVENESS OF ACTIVATED CHARCOAL IN ADSORBING GBL

McGrath JC, Klein-Schwartz W, Coop A. *Maryland Poison Center. University of Maryland School of Pharmacy, Baltimore, MD*

**Background:** Gamma-butyrolactone (GBL), a precursor of gamma-hydroxybutyrate (GHB) has gained popularity since GHB became a Schedule I substance in March 2000. Given the low molecular weights of GHB and GBL it is questionable whether activated charcoal (AC) will effectively adsorb these chemicals to any extent. The purpose of this in-vitro study was to determine the effectiveness of activated charcoal in adsorbing GBL at doses that would be useful in a clinical setting. **Methods:** GBL (5 grams) was combined with simulated gastric fluid (pH 1.2) and simulated intestinal fluid (pH 6.8). Activated charcoal (2.5 g, 5 g or 10 g) was added to these solutions. The solutions were then filtered and analyzed using gas chromatography and mass spectrometry (GCMS). Initial analysis of samples derivatized with 1% BSTFA was inaccurate due to conversion of part of the sample to GHB. Subsequent direct analysis of an aliquot of the filtrate yielded results. **Results:** Triplicate sample analysis in simulated gastric fluid resulted in  $14.1 \pm 4.9\%$  (2.5 g AC),  $10.1 \pm 2.1\%$  (5 g AC), and  $38.8 \pm 8.5\%$  (10 g AC) of GBL adsorbed and in simulated intestinal fluid,  $5.1 \pm 4.7\%$  (2.5 g AC),  $5.4 \pm 4.7\%$  (5.0 g AC) and  $37.1 \pm 21.7\%$  (10 g AC) of GBL adsorbed. **Conclusions:** Findings suggest that large doses of activated charcoal adsorb GBL to a limited extent. The clinical significance is unclear given rapid absorption of GBL from the gastrointestinal tract.

## 207 ZIPRASIDONE: A 12-MONTH REVIEW OF ACUTE OVERDOSES

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**Background:** Ziprasidone is a newer benzisothiazolyl piperazine atypical antipsychotic. Published reports of clinical experience with acute overdose of ziprasidone are minimal. **Method:** A 12-month retrospective study was completed on all cases of adult ingestion of

ziprasidone reported to CPCS. The parameters used in the case analysis were ziprasidone as the single substance, age 18 years or older, sex, amount ingested, clinical symptoms, and patient outcome. **Results:** A total of 26 cases of ziprasidone ingestion without coingestants were identified. Of the 26 exposures, 23% were male, and 77% were female with a mean age of 30 years old (range 18–54 yo). The mean amount ingested was 720 mg (range 180 mg to 4020 mg). Of the 26 patients, 19 (73%) developed somnolence, 8 (31%) patients had tachycardia (range 100–120 bpm), and one patient (4%) had hypotension with a blood pressure of 90/60 mmHg, which required only IV fluid therapy. EKG changes and extrapyramidal symptoms were not seen in any of the 26 cases. All patients had decontamination in the ED with activated charcoal and were discharged without sequelae. **Outcome:** no effect in 7 patients (27%), minor effects in 17 patients (65%), and two patients (8%) had moderate effects: one patient had tachycardia of 120 bpm and one patient had hypotension of 90/60 mmHg. **Conclusion:** Ziprasidone toxicity manifested primarily as CNS depression and cardiovascular symptoms of tachycardia and hypotension. Supportive care and gastric decontamination with activated charcoal appear to be the mainstays of therapy for acute ingestions of ziprasidone.

## 208 SEVERE TOXICITY IN AN INFANT FOLLOWING INGESTION OF 4-AMINOPYRIDINE

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**Background:** 4-Aminopyridine (4-AP) is an orphan drug used for the treatment of neurologic disorders such as multiple sclerosis. It has potassium blocking activity that increases intracellular calcium and acetylcholine release. Toxicity has been seen in doses as low as 0.6 mg/kg. **Case Report:** A 1 year old was found to be drooling and lethargic 30 minutes after being found with an open bottle of 4-AP 10 mg capsules. In route to the ED, he developed tonic-clonic seizure activity. He was given lorazepam and a loading dose of fosphenytoin which terminated the seizure activity. Upon transfer to a

Pediatric ICU, he was noted to be awake but not alert. Vital signs: HR 134; BP 124/56 mm Hg; RR, 34, and T 37 C. Lateral nystagmus was noted. He was noted to have intermittent fasciculations and myoclonic movements of all extremities. Exam was otherwise unremarkable. The electrocardiogram showed sinus tachycardia with no QRS or QTc abnormalities. The patient was intubated due to CNS depression and received activated charcoal. Twelve hours after the ingestion, the child was extubated without sequelae. Analysis of 4-AP concentration from admission revealed a serum concentration of 266 ng/ml (therapeutic: 30–59 ng/ml). Pharmacokinetic analysis revealed as little as 1 capsule could have been ingested. Conclusion: We present an ingestion of 4-AP in an infant that resulted in severe toxicity with the highest serum concentration reported. There is a low margin of safety with 4-AP in as little as 10 mg (0.85 mg/kg) could have been ingested.

### 209 INTENTIONAL INTRAVENOUS INJECTION OF SODIUM HYPOCHLORITE

Tuckler V, Martinez J, Smith G, Arnold T, Halton E, Ryan M. *Medical Center of Louisiana at New Orleans and the Louisiana Poison Control Center, Monroe, Louisiana*

Background: Liquid bleach products for household use typically contain between 3% and 10% sodium hypochlorite. Bleaches are commonly used as a laundry additive, cleaning agent, and as a disinfectant. Household liquid bleach is commonly used by intravenous drug abusers to disinfect dirty needles. Small doses, less than one milliliter, of liquid bleach administered intravenously have been described in the literature. We report a case of a large intentional intravenous injection of liquid household bleach. Case Report: The patient was a 42 year-old male who was a paraplegic secondary to multiple gunshot wounds in the lumbar spine area. His past medical history also documented osteomyelitis. The patient had intravenous access via a port-a-cath. In a suicide attempt, 20 ml of liquid household bleach (5.25% sodium hypochlorite) was self administered into the port-a-cath. After admission to the hospital, the patient complained of transient muscle pain. He also experienced vomiting. His urine was noted to have a "tea-like" appearance. The following lab values were noted to be exceptional; creatinine kinase 6,000 IU/L and urine myoglobin

120 mg/dl. Serum electrolytes, CBC, BUN, creatinine, ABG's and chest radiograph revealed no abnormalities. During his stay, the patients condition was managed with IV fluids and pain medications as needed. The patient recovered fully with no permanent sequelae. Conclusion: We report an intravenous injection of 20 ml sodium hypochlorite. The patient in this case experienced pain and transient rhabdomyolysis that resolved completely with supportive care.

### 210 ACCIDENTAL LARGE INTRAVENOUS INFUSION OF GOLYTELY

Tuckler V, Cramm K, Martinez J, Arnold T, Ryan M, Williams D, Zhang Z, Udall J,S. Sommerfeld E. *Medical Center of Louisiana at New Orleans, Louisiana Poison Control Center*

Background: Golytely<sup>®</sup>, a polyethylene glycol (PEG) solution, is a common agent used for pre-procedure bowel cleansing and to aid in disimpacting fecal masses. It is routinely administered orally or by nasogastric tube in the hospital setting. It has also been utilized as a GI decontamination tool for certain types of ingestions. We report a case of accidental intravenous infusion of Golytely<sup>®</sup> PEG solution. Case report: The patient, a 12 year old, 27.3 kilogram male with a history of cerebral palsy was hospitalized with severe fecal impaction. Golytely<sup>®</sup> was ordered to aid in disimpacting the mass. The Golytely<sup>®</sup> was to be administered via nasogastric tube but was inadvertently administered intravenously instead. The patient quickly experienced abdominal discomfort and distention. The treating physician then ordered two adult Fleet enemas to be given three hours apart and intravenous fluid hydration. The patient was noted shortly after this time to have a temperature of 101.8 F. It was only then discovered that the patient had received approximately 470 ml of Golytely<sup>®</sup> intravenously over the previous six hours. Electrolyte analysis performed immediately revealed a serum potassium of 2.1 mmol/L. Other electrolytes, CBC, EKG, and CXR were all within normal limits. The patient was treated with supportive care and recovered fully with no further sequelae reported or observed. Conclusion: We present a case of an unintentional intravenous administration of a large amount of polyethylene glycol solution resulting in abdominal discomfort and distention, fever and hypokalemia that were tolerated well and resolved completely with supportive care.

## 211 ASPIRIN BEZOAR PROVEN BY UPPER ENDOSCOPY

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**Background:** Bezoar formation is frequently cited as a cause for delayed absorption of aspirin following ingestion. Attention has been drawn to the fact that there is no clearly documented case of aspirin bezoar formation. A literature search using standard search engines and reference checks of published literature confirms this. We report a case of bezoar formation following aspirin overdose documented by upper endoscopy. **Case Report:** An 83-year-old man presented after ingesting an unknown quantity of aspirin. Initial salicylate level was 27.6 mg/dL. Urine alkalization was initiated and multiple dose activated charcoal administration was attempted, but the patient could not tolerate charcoal due to acute dysphagia. Attempts to pass a nasogastric tube were unsuccessful due to apparent obstruction. Salicylate levels rose over the ensuing 20 hours to 59 mg/dL prompting evaluation of the obstruction. Barium swallow indicated a mass at the distal esophagus. Upper endoscopy revealed a large, solid mass of aspirin pill fragments, which was removed after being broken into pieces by the endoscopist. Photographs obtained during the procedure document the existence of the obstructing foreign body. No other cause of esophageal obstruction was revealed and the dysphagia resolved following removal of the aspirin. Charcoal was given and salicylate levels rapidly fell to the therapeutic range. **Conclusions:** Aspirin can form bezoars after ingestion, potentially causing delayed absorption.

## 212 THE CASE OF INKJET CLEANER "HURRICANE"—ANOTHER GHB RECIPE

Yambo CM, McFee RB, Caraccio TR, McGuigan MA. *LI Regional Poison Control Center, Winthrop University Hospital, Mineola, NY*

**Background:** Gamma hydroxybutyrate (GHB) is widely used as a sexual enhancement drug, a euphoriant, muscle building agent, for sleep disorders, weight loss, and as a

date rape agent. GHB has resulted in several thousand toxic exposures, untold date rapes and 65 deaths. This lead to GHB being listed as a schedule 1 drug. In spite of this, precursor ingredients such as gammabutyrolactone (GBL) and GHB recipes remain available, especially via the Internet. We believe this is the first report of a case of an organic inkjet cleaner containing a GHB precursor 1,4 butanediol and butylene glycol. **Case:** A 26-year-old male suddenly fell unconscious during work. EMS found him unresponsive, with constricted pupils, convulsing, shallow respirations at 30 breaths per minute, bradycardic at 48 BPM, with a blood pressure of 150/80-mm HG. The patient was intubated and transported. A bottle labeled "Hurricane" was found in his pocket. Blood and urine toxicology screens were negative for cocaine, ethanol, barbiturates, opioids, tricyclic antidepressants and amphetamines. Urinalysis was negative. CBC, electrolytes were all within normal limits. The patient did not respond to naloxone. Approximately 5 hours post ingestion the patient awoke. Soon thereafter he was extubated. The patient left against medical advice was clinically stable, alert and oriented at the time. **Discussion:** The patient recently purchased "Hurricane" an organic ink jet cleaner-sleep aid, and calming agent with active ingredients similar GHB to treat his panic attacks. In spite of legislative changes restricting GHB, the precursors remain available, and thus continue to be a public health threat. Will office product suppliers be the next source?

## 213 HALOPERIDOL CONCENTRATIONS AFTER ACUTE INTRAVENOUS OVERDOSE

Kostic MA, Palmer RB, Dart RC. *Rocky Mountain Poison & Drug Center-Denver Health; University of Colorado Health Sciences Center, Denver, CO*

**Background:** Neuroleptic malignant syndrome (NMS) entails a spectrum of disease, and is an idiosyncratic reaction to neuroleptic medication. We report a case of acute IV overdose of haloperidol. **Case Report:** An 84 y.o. man was hospitalized for a heparin window. His pertinent medical history included coronary disease and chronic AFib. He had never before received a neuroleptic or lithium. On day 3 post-op, he was noted to be confused and slightly agitated. Haloperidol 0.5 mg IV was ordered, but 25 mg IV was administered. Within 1-2 hrs, he became increasingly agitated and confused. 4 hrs after the dose, he also

displayed rigid extremities and cogwheeling, with a fever to 39.4 C. He was administered benzotropine (1 mg), diphenhydramine (25 mg), and dantrolene (2 mg/kg  $\times$  1). His rigidity resolved over several hrs. Low-grade fever persisted another day. He had intermittent tachycardia with normal blood pressures. Serum chemistries, LFTs, ECG, CT head, LP, cultures, and CBC were all normal. His peak CK was only 179 U/L. He remained delirious, had pronounced dyskinesia, and spoke only in garbled, incomprehensible speech for approximately 72 hrs. He then returned to his baseline. Haloperidol serum concentrations were 5.9 ng/ml at 6 hrs and 1.2 ng/ml at 41 hrs (serum half-life = 15 hrs). A CSF haloperidol level at 43 hrs was 0.8 ng/ml (therapeutic range for serum and CSF is 0.8–33 ng/ml). **Conclusion:** This case provides the first reported example of a severe reaction to haloperidol after intravenous overdose with serum and CSF concentrations of the drug. His reaction appears to be a variant of NMS, with minimally elevated CK values. The rapidity of onset and persistence of symptoms may have been more related to the abrupt manner in which these drug concentrations were reached, rather than the levels themselves.

#### 214 SEIZURE IN AN INFANT FROM ANISEED OIL TOXICITY

Tuckler V, Peck C, Nesbitt C, Coleman M, Weimer S, Martinez J, Ryan M, and Arnold T. *Medical Center of Louisiana at New Orleans—University Hospital and the Louisiana Poison Control Center, Monroe, Louisiana*

**Background:** Aniseed oil has been used historically as a homeopathic remedy for cough, bronchitis, colic and other dyspeptic conditions. It has been referenced in literary works from Virgil to St. Matthew and is commonly used in folk medicine. Aniseed oil is extracted from the fruit of the *Pimpinella anisum* plant. The active component, trans-anethol constitutes approximately 90% of the volatile oil. The tea is traditionally made by diluting 2 teaspoons of oil in 1 pint of boiling water. The usual dose in infants for colic is one teaspoon of the tea. **Case Report:** A 12-day-old infant presented to the Pediatric Emergency Department with generalized tonic-clonic seizures. The infant had an unremarkable history except that he had unintentionally received multiple doses of undiluted aniseed oil by the parents as a treatment for colic. A complete blood count, electrolytes,

spinal fluid analysis with culture, blood cultures, CT scan of the brain, and EEG were all normal. No further seizure activity was noted after admission to the hospital. The infant subsequently recovered with no further sequelae reported. **Conclusion:** We report a case of seizures in an infant temporally related to the ingestion of aniseed oil and no other explanation for the seizure activity. A literature search did not reveal other documented cases of aniseed toxicity in infants. Physicians should be aware of possible toxic syndromes resulting from ingestion of aniseed oil and other herbal supplements.

#### 215 DINITROPHENOL-INDUCED HYPERTHERMIA RESOLVING WITH DANTROLENE ADMINISTRATION

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**Background:** The efficacy of Dantrolene in the treatment of drug-induced hyperthermia is controversial. Dantrolene acts directly on skeletal muscle where it inhibits release of calcium from the sarcoplasmic reticulum and reduces intracellular calcium, which leads to muscle relaxation. Dinitrophenol (DNP) causes hyperthermia by uncoupling oxidative phosphorylation in the mitochondria. This decreases available ATP and increases the free  $Ca^{++}$  within the cell, leading to muscle contraction. Because of the hypermetabolic state it can induce, DNP is marketed on the internet for body building and weight loss. **Case:** A thirty-year old male presented to an emergency department following ingestion of DNP. He was diaphoretic, flushed, and tachycardic. Serum creatine phosphokinase concentration was 62,000 IU/L. His body temperature reached 108°F and was decreased to 104°F with cooling blankets. Twenty minutes following Dantrolene administration his body temperature decreased to 100.8°F. Repeated doses of dantrolene were needed to maintain a stable body temperature. Two other DNP cases resulting in death from hyperthermia have been reported to our center in the past three years. Both of these patients remained hyperthermic despite cooling blankets. **Conclusion:** Mortality in DNP toxicity is caused by life-threatening hyperthermia. Uncoupling of oxidative phosphorylation causes DNP-induced hyperthermia which may be ameliorated by Dantrolene. Further investigation is needed.

## 216 FATAL ALUMINUM PHOSPHIDE INGESTION

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**Introduction:** Aluminum Phosphide, in tablet or pellet form, is used as a fumigant, insecticide, and rodenticide. We report a case of fatal Aluminum Phosphide toxicity following ingestion. Anatomic findings and laboratory values are discussed. **Case Report:** A 16-year-old female intentionally ingested a single tablet of an unknown South American insecticide. The patient experienced nausea, vomiting, and diarrhea and collapsed at a neighbor's house. At a local children's hospital she presented with severe hypotension, bradycardia, shallow respirations, severe cyanosis, and trismus. Gastric lavage was performed and despite administration of high doses of epinephrine, atropine, and dopamine the patient remained hypotensive. The patient was admitted to the pediatric intensive care unit, where she expired approximately one hour later. **Conclusion:** When Aluminum Phosphide in tablet form combines with water, humidity, or gastric juices converts from its solid state to a gas state, Hydrogen Phosphine. Hydrogen phosphine becomes a very potent invitro inhibitor of cytochrome-c oxidase. Complex-III of the mitochondrial electron transport chain is inhibited, resulting in the inability to produce ATP or any of its equivalents. The unknown tablet was identified by the Toxicology Department of the County Medical Examiner as Aluminum Phosphide. This reaction liberates large amounts of hydrogen phosphine gas. The final autopsy report revealed the diagnosis of Acute Aluminum Phosphide Toxicity.

## 217 MILRINONE OVERDOSE INDUCED HYPOTENSION REVERSED BY VASOPRESSIN AND NOREPINEPHRINE INFUSIONS

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

**Background:** No milrinone overdoses have been previously published in the literature. We report a case of sustained hypotension induced by an inadvertent

overdose of milrinone that was responsive to vasopressin and norepinephrine infusions. **Case Report:** A 78-year-old male was inadvertently administered 18 mg of milrinone by rapid intravenous push during a coronary artery bypass graft surgery. The initial blood pressure was 110/58, but precipitously dropped to 80/40 after the 18 mg of milrinone was infused. His pulse did not change at all. Milrinone, trade name Primacor, was mistaken for protamine because of the similarity in names. The dose infused was approximately 270 fold the recommended infusion dose for milrinone. Vasopressin and norepinephrine infusions were started within 30 minutes and titrated to sustain a systolic blood pressure of 100, with maximum doses used of 0.08 units/minute and 25 micrograms/minute respectively. No seizure activity or dysrhythmias occurred following the dose of milrinone. The vasopressin and norepinephrine drips were titrated off over the ensuing 12hrs and he was discharged from the hospital 5 days later without sequelae. **Conclusions:** This is the first reported case of massive milrinone overdose with resulting hypotension. This case suggests that hypotension induced by milrinone overdose may not respond solely to norepinephrine and may require the addition of vasopressin.

## 218 THE ETHICAL IMPLICATIONS OF DELAYED TREATMENT FOR INTENTIONAL ASPIRIN OVERDOSE—A CASE REPORT

Yambo CM, McFee RB, Caraccio TR, McGuigan MA. *LI Regional Poison Control*

**Background:** Aspirin overdose is a common poisoning; often a result of suicide attempts. Death occurs when patients are inadequately treated or misdiagnosed. **Case:** A high speed car chase ended after a 16 year old male collided the car he stole into a pickup truck. On site he vomited once. Although he told paramedics he ingested 500 tablets of aspirin at 11 am the emergency department (ED) only obtained a drug screen, then transferred him to police. At 5 PM he complained of abdominal pain, difficulty breathing, and reiterated he ingested 500 aspirin. Police brought him to the same ED. The initial salicylate levels were 49 mg/dL, ABG-pH 7.44/ pCO<sub>2</sub> 29.9/ HCO<sub>3</sub> 20.8; he was tachypneic. PCC was contacted and immediate transfer to a facility with nephrologist and dialysis capabilities were recommended. These weren't done and his condition



continued to deteriorate. Subsequent salicylate levels were 105 and 133.8 mg/dL. At 20 hours post ingestion he coded, and died. Antemortem salicylate level—503 mg/dL. Discussion: Aspirin bezoars may form after large ingestions, leading to prolonged absorption. Although the serum salicylate levels (toxic) were steadily rising, and PCC recommended early dialysis, medical care was delayed, dialysis withheld. The unnecessary delay in treatment may have led to this young man's death. It is worrisome to postulate that this patient, with a known mental health history and suicide risk was denied basic care, concern over his wellbeing, or timely treatment at an ED based upon his recent criminal actions. One can hope this is an isolated occurrence. Unfortunately studies suggest provider attitudes towards patients perceived as "difficult" can impact the treatment such persons receive.

### 219 NON-ANION GAP METABOLIC ACIDOSIS ASSOCIATED WITH ACUTE ON CHRONIC TOPIRAMATE OVERDOSE

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Background: Topiramate has been implicated as the causative agent of metabolic acidosis when used therapeutically. We report a case of non-anion gap metabolic acidosis associated with acute on chronic topiramate overdose. Case Report: A 29 yo female presented to the ED following an acute overdose of sustained release bupropion (4500 mg), enalapril (200 mg), fluoxetine (600 mg), glimepiride (20 mg), and topiramate (3000 mg). In the ED she received charcoal with sorbitol and labs were drawn. The patient was initially hypertensive and tachycardic, but quickly resolved. She was admitted to ICU for observation. Normal saline infusion with 10 mEq of KCl was administered at the rate of 125 cc/h. Over the next 12 hours a non-anion gap metabolic acidosis developed and was associated with a decrease in level of consciousness. Room air ABG yielded pH 7.26, PO<sub>2</sub> 97, PCO<sub>2</sub> 25, HCO<sub>3</sub> 12. Electrolytes were Na 136, K 3.9, Cl 114, CO 14, Glu 294, BUN 8, Creat 0.5. Anion gap was 11. No obvious gastrointestinal losses of bicarbonate were noted. A urinary anion gap was not run. The patient gradually improved over the next three days with

supportive care. Mental status improvement and resolution of acidosis occurred without bicarbonate therapy. Conclusion: Topiramate has been implicated as the causative agent in therapeutic dosing through inhibition of carbonic anhydrase producing a proximal renal tubular acidosis. In this case of acute overdose the patient developed a moderately non-compensated non-anion gap acidosis not attributed to coingested agents. When non-anion gap metabolic acidosis is encountered in the setting of normal renal function after topiramate overdose, consider that topiramate may be the responsible agent in the differential diagnosis.

### 220 IBUPROFEN-INDUCED ACIDOSIS AND COMA

K Wiger, DD Gummin. *Departments of Pediatrics and Emergency Medicine, Medical College of Wisconsin, and the Children's Hospital of Wisconsin Poison Center, Milwaukee, Wisconsin*

Background: Ibuprofen ingestion is rarely linked to deterioration in mental status. We report an adolescent who demonstrated progressive metabolic acidosis and deterioration of mental status after an isolated ibuprofen ingestion. Case report: A 17-year-old healthy female ingested approximately 14 grams of ibuprofen in a suicide attempt. She presented to the emergency department, unarousable, six hours post-ingestion. Her gag reflex was present, but her Glasgow coma scale (GCS) was consistently six (6). She was endotracheally intubated and placed on a ventilator for airway protection in the Pediatric Intensive Care Unit (PICU). Initial laboratory studies were significant for an anion gap-positive metabolic acidosis (venous pH: 7.19, anion gap: 31). Serum ibuprofen level on admission was 962.6 mg/L (therapeutic: 5–49 mg/L). A subsequent serum lactate level was elevated (33 mg/dL). Her acidosis worsened, requiring sodium bicarbonate administration. She was extubated on hospital day two, but her clinical course was complicated by high output renal failure (peak serum creatinine: 2.3 mg/dL on hospital day two). She recovered fully by three days post-ingestion. Workup and history were negative for coingestants. Conclusion: Massive ibuprofen ingestion may cause acute deterioration of mental status, and should be included in the differential diagnosis of altered consciousness after an unknown ingestion.

## 221 A CASE SERIES OF HERBAL DIETARY SUPPLEMENT INGESTIONS

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**Background:** Many herbal dietary supplements used for weight loss contain stimulants such as ephedra and/or caffeine. We have seen an increase in caller reports of adverse events with both intentional and unintentional ingestion of herbal dietary supplements. **Methods:** Demographic information such as patient weight, age, gender, and medical history were recorded from all ingestions reported to the Central Ohio Poison Control Center in 2000. Preparation ingredients, concurrent medications, type of ingestion, site of ingestion, clinical presentation, treatment site and treatment were documented. **Results:** Eighty calls were recorded in 2000 (49 females, 31 males). The underlying reason for ingestion differed between males and females ( $p = 0.025$ ). Seventy-five percent of intentional ingestions occurred in females and 51% of the unintentional ingestions occurred in males. As expected, clinical effects differed with the underlying reason for ingestion ( $p \leq 0.001$ ). Eighty percent of intentional ingestions became symptomatic. Not surprisingly, adverse effects were reported more often with unknown or higher than recommended doses (78%) ( $p = 0.15$ ). We also found that 70% of patients who took the recommended dose ( $n = 10$ ) reported at least one clinical effect. **Conclusions:** Patients who intentionally misuse, abuse or attempt suicide with herbal dietary supplements are generally females who experience adverse effects and seek medical attention. The significant presence of symptoms in non-abusers requires more study as to the overall safety of herbal dietary supplements.

## 222 INADEQUATE PYRIDOXINE STOCK AND EFFECT ON PATIENT OUTCOME

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**Background:** Antidote survey studies have shown that hospital stocks of the antidote intravenous pyridoxine

HCl (vitamin B6, B6) are often inadequate. The objective of this study was to determine if inadequate stocking of B6 resulted in adverse outcomes in patients with isoniazid (INH) poisoning. **Methods:** The study was retrospective. Poison center cases of INH poisoning between 1/98 and 12/01 for which B6 was recommended/given were included. **Results:** Twenty cases were identified. Seventeen (85%) patients had seizures, acidosis, and/or CNS depression. The median amount of INH ingested was 6 g (range 1.8–13 g). The median recommended B6 dose was 5 g (range 3–13 g). The median initial B6 dose administered was 4.2 g (range 1–12.1 g). Six (30%) patients received the initial recommended dose and had a favorable outcome as defined by avoidance or resolution of toxicity. Fourteen (70%) did not receive the initial recommended dose; the median shortage of B6 was 2.5 g (range 0.9–5.9 g). Two asymptomatic patients with an inadequate initial B6 dose (2.5 g and uncertain shortage) remained asymptomatic. Eleven of the 12 symptomatic patients improved despite an inadequate dose. One (4 g shortage) had refractory seizures despite additional treatment with large doses of benzodiazepines. Emergent hemodialysis was performed and additional B6 (5 g pNG) was administered later. The patient's mental status normalized. **Conclusions:** In this study, approximately 2/3 of patients did not receive an appropriate initial B6 dose because of inadequate hospital stock. One patient had prolonged, severe toxicity until an invasive treatment was performed and additional antidote was available. This patient is an example of the possible complications of inadequate B6 stocking. Hospitals should review stocking policy in view of the potential for morbidity and mortality.

## 223 EXTRACORPOREAL MEMBRANE OXYGENATION (ECMO) TREATMENT OF CARDIORESPIRATORY FAILURE FOLLOWING POISONING

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**Background:** Extracorporeal membrane oxygenation (ECMO) is a supportive modality for patients with potentially reversible cardiac or respiratory failure. Limited anecdotal data regarding ECMO use for poisoned patients has been reported. The Extracorporeal Life Support Organization (ELSO) maintains a database

	All pts. (n = 61)	Survival (n = 34)	Non-survival (n = 27)
Age (months)	54 ± 87 (18)	46 ± 82 (17)	64 ± 93 (24)
Sex (male/total, %)	28/58 (48%)	16/32 (50%)	12/26 (46%)
Weight (kg)	21.7 ± 25.9 (11)	19.4 ± 10.6 (10.6)	24.3 ± 29.0 (11)
Ventilation pre-ECMO (days)	5.1 ± 7.2 (2)	3.6 ± 4.4 (2)	6.4 ± 9.4 (3)
Duration of ECMO (hours)	257 ± 166 (233)	236 ± 141 (218)	281 ± 196 (283)

Abstract 223.

regarding use and outcome of patients treated with ECMO. **Methods:** The patient data base of ELSO was queried using ICD9 codes related to poisoning and drug abuse. Demographic information, ventilator and ECMO support, complications, and survival were analyzed. Survivors and non-survivors were compared using non parametric statistics. **Results:** Sixty-one patients were identified, with 34 survivors (56%). Hydrocarbons (34/61; 56%), noxious gases (21/61; 34%), and pharmaceuticals (4/61; 7%) were the most common intoxicants. Demographic data (mean ± s.d., (median)) (see Table). **Conclusions:** The majority of poisonings requiring ECMO support involved hydrocarbon ingestion. The patients treated with ECMO are predominantly children, and mortality is significant. No data exists to compare outcome of ECMO and conventionally treated patients. Further investigation is needed to identify patients likely to benefit from this invasive treatment modality.

#### 224 CYCLOSPORINE'S EFFECT ON SURVIVAL TIME IN A RAT MODEL OF ACUTE SALICYLATE TOXICITY

Katz K, Curry S, Brooks D, Gerkin R, Ruha AM, Beuhler M, Watts D. *Good Samaritan Regional Medical Center, Phoenix, Arizona, USA*

**Background:** Salicylate (SAL) toxicity, in vitro, produces mitochondrial membrane permeability transition (MPT), an inner membrane pore formed, at least in part, from the adenine nucleotide transporter (ANT) and cyclophilin-D (CyP-D). MPT increases permeability of the inner membrane to molecules < 1500 Da, including H<sup>+</sup>, thereby uncoupling oxidative phosphorylation. Cyclosporine A (CSA) inhibits SAL-induced MPT formation in vitro by binding to CyP-D. This study's purpose was to determine if pretreatment with CSA prolongs survival time in rats poisoned with SAL.

**Methods:** 29 rats were randomized to receive pre-treatment with either 30 mg/kg CSA or an equal volume of control diluent IP. 4 h later, when circulating [CSA] exceeded concentrations that had been shown to prevent MPT in vitro, all rats received 1700 mg/kg sodium SAL IP. Time until death was recorded. Heart blood for measurement of serum [CSA] and [SAL] were obtained immediately after death. With 11 animals in each group, we calculated a power of >0.95 to detect a doubling of survival time. **Results:** Median survival time in controls was 18 minutes (95% C. I. of 14–22 minutes) and for CSA animals was 14 minutes (95% C.I. of 13–15 minutes). The log rank test for the survival distributions between the 2 groups was significant, indicating shortened survival time for the CSA group (p < 0.001). Using Cox proportional hazards, salicylate level did not significantly influence survival time (p = 0.60). **Conclusion:** Pre-treatment with CSA shortened survival time in rats with SAL toxicity.

#### 225 MITIGATION OF PENNYROYAL HEPATOTOXICITY IN THE MOUSE

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**Background:** Pennyroyal oil ingestion has been associated with severe hepatotoxicity and death. The primary constituent, pulegone, is metabolized via hepatic cytochrome P450 to toxic intermediates. The purpose of this preliminary study was to assess the ability of the specific CYP450 inhibitors disulfiram and cimetidine to mitigate hepatotoxicity in mice exposed to toxic levels of pulegone. **Methods:** 20 gm female BALB/c mice were pretreated either with cimetidine 150 mg/kg *ip*, disulfiram 100 mg/kg *ip*, or both. After one hour, mice were

Experimental Group	Mean SGPT (IU/L)	Std Error	95% CI
No treatment	27.0	2.3	
Pulegone	182.0	50.7	
Disulfiram + Pulegone	93.3	18.9	–12.8–190.3
Cimetidine + Pulegone	71.2	5.6	6.9–214.7*
Disulfiram + Cimetidine + Pulegone	64.0	7.3	14.1–221.9*

Abstract 225.

administered pulegone 300 mg/kg *ip*, and sacrificed 24 hours later. Data were analyzed using one-way ANOVA. Post-hoc t-tests used Bonferroni correction. 95% CI refers to the 95% confidence intervals of the difference of the mean from pulegone (\* =  $p < 0.05$ ) (see table). Conclusions: At present, no specific therapy for pennyroyal toxicity exists. The current data suggest that within the limitations of a pretreatment animal model, the combination of cimetidine and disulfiram significantly mitigate the effects of pennyroyal toxicity.

## 226 TOPICAL TREATMENTS FOR HYDROFLUORIC ACID BURNS—A BLIND CONTROLLED EXPERIMENTAL STUDY

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Objective: Calcium gluconate gel 2.5% has proven effect as treatment for hydrofluoric acid (HF) burns. Hexafluorine (Prevor, France) is developed for acute decontamination of HF exposures. However, scientific documentation is insufficient why this study was undertaken. Methods: S–D rats (300–325 g,  $n = 35$ ) were anaesthetized. Four filter papers ( $\phi$  10 mm), soaked into 50% HF, were applied on a shaved area of each rat for 3 minutes. Exactly 30 s after HF exposure, animals

were treated with either 500 ml Hexafluorine for 3 minutes (H), 500 ml water for 3 minutes (W), 500 ml water for 3 minutes and a single application of calcium gel (Ca) or received no treatment (0, controls). The burns were separately and blindly rated on a six-point scale, yielding a single mean value for each rat. Scoring scale: 0 = no mark, 1 = diffuse erythema, 2 = distinct erythema, 3 = score 2 plus wounds or discoloured spots, 4 = score 2 plus wounds or discoloured areas > 50%, 5 = necrotic wound covering burn surface. Results: Mean score values in the four groups are shown in the table. Conclusion: Based on these observations, there is no support for replacing water rinsing plus calcium gel with Hexafluorine after skin exposure to HF.

## 227 RENAL TOXICITY OF ETHYLENE GLYCOL—IS IT OXALATE OR CALCIUM OXALATE?

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Background: Ethylene glycol (EG) poisoning results in an acute renal failure that is linked with proximal tubular cell necrosis and metabolism of EG to oxalate (OX). One mechanism for the renal failure is that OX crystallizes within the tubular lumen as calcium oxalate (COM), leading to luminal blockage and compression-induced

Group	Day 1	Day 2	Day 3	Day 4	Day 5
H ( $n = 10$ )	2.90	3.45 <sup>a</sup>	3.20 <sup>b</sup>	3.05	3.00
W ( $n = 10$ )	2.80	2.90	2.60	2.50	2.40
Ca ( $n = 10$ )	2.40	2.55	2.20	2.25	2.20
0 ( $n = 5$ )	5.00	5.00	5.00 ( $n = 3$ )	5.00 ( $n = 1$ )	5.00 ( $n = 1$ )

<sup>(a)</sup> $p < 0.05$  compared to group Ca on day 2 and <sup>(b)</sup> $p < 0.05$  compared to group Ca on day 3, using Kruskal–Wallis statistical analysis. Abstract 226.

loss of glomerular filtration. However, others have suggested that COM or OX induces cytotoxic damage, leading to tubular necrosis and renal failure. Our initial studies using normal human proximal tubule (HPT) cells in culture showed that OX, but not glycolate nor glyoxylate, produced toxicity. In the present studies, we compared the toxicity of COM with that of NaOX on HPT cells in order to assess which may produce greater cytotoxic damage. Methods: Confluent cultures of HPT cells were exposed to buffers containing pre-formed COM crystals (0,1,3 & 5 mM), sodium oxalate (NaOX at 0,1,3 & 5 mM), or NaOX (0–5 mM) plus EDTA (4 mM) for 6 hours at 37°C. Cytotoxicity was assessed by measuring the release of lactate dehydrogenase (LDH) into the external buffer and the activity of  $\gamma$ -glutamyl transpeptidase (GGT) in solubilized cells. Results: NaOX and COM produced similar dose-dependent increases in LDH release and decreases of GGT activity. The effects of NaOX on LDH were partially reduced by EDTA, while those on GGT were not reduced by EDTA. Conclusion: The results indicate that COM and OX, on an equimolar basis, induce toxicity in HPT cells in roughly the same proportion, although part of the effects of OX may be due to formation of COM in solution (since the effects of OX are partially reduced by EDTA).

## 228 A COMPARISON OF THE PHARMACOKINETICS OF ORAL AND SUBLINGUAL CYPROHEPTADINE

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Background: Cyproheptadine (CYPRO) is reported to be effective in treating serotonin syndrome (SS). It is only available as an oral (PO) preparation and administration after SSRI overdose treated with activated charcoal is problematic. Sublingual (SL) administration may circumvent this problem. However, the pharmacokinetics of SL-CYPRO are unknown. This study compares the pharmacokinetics of CYPRO following PO and SL administration. Methods: Cross-over, non-blinded, volunteer study using 4 healthy males. 8 mg of PO- or SL-CYPRO were administered on separate occasions with a one-week washout period. SL arm subjects were pre-treated with 50 g of PO activated charcoal 30 minutes prior to CYPRO, to prevent any gut absorption. Serum CYPRO concentration was measured at baseline, 30 minutes, and 1, 2, 3, 4, 6, 8, and 10 hours by liquid

	Cmax ( $\mu\text{g/L}$ )	Tmax (hrs)	AUC ( $\mu\text{g hr/L}$ )
PO arm	26.9 $\pm$ 3.8	4.0 $\pm$ 0	183.5 $\pm$ 23.2
SL arm	3.8 $\pm$ 1.5	9.5 $\pm$ 0.5	24.7 $\pm$ 8.2
P value	0.01	0.002	0.006

Abstract 228.

chromatography and mass spectroscopy (LCMS). Results: The pharmacokinetics of cyproheptadine (mean  $\pm$  SEM) are summarized in the table. Conclusion: Serum concentrations after SL-CYPRO are significantly less than after PO-CYPRO. These concentrations may not be effective in treating SS. A comparison of both routes of administration, in patients with SS, may be indicated.

## 229 NEBULIZED IPRATROPIUM BROMIDE OFFERS NO PROTECTION AGAINST SEVERE, ACUTE ORGANOPHOSPHATE POISONING IN THE RAT

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Background: Organophosphates (OP) represent a common poisoning exposure throughout the world. Additionally, recent events have given rise to the possibility that individuals could use OP as weapons of terror or mass destruction. Due to the profound pulmonary effects of OP and the potentially large number of victims in a mass poisoning, an alternative anti-cholinergic agent with primarily pulmonary effects is desirable. The objective of this study is to determine the protective effect, if any, of nebulized ipratropium bromide in a rat model of acute, severe OP poisoning. Methods: 24 male Wistar rats were randomized to receive pretreatment with intramuscular normal saline (placebo) or 5 mg/kg atropine (positive control), or 75 mg/kg of nebulized ipratropium bromide, prior to poisoning with 25 mg/kg of subcutaneous dichlorvos. Placebo and atropine were given 5 minutes before poisoning and the experimental group received 1 hour pretreatment with continuous nebulized ipratropium bromide in an airtight 25  $\times$  25  $\times$  40 cm chamber. The primary outcome measure was survival to 10 minutes. Twenty-four hour survival was the secondary endpoint. The groups were compared via Chi-square analysis. Results: All 16 rats in the saline and

experimental groups succumbed by the first endpoint (survival 0%). All 8 rats in the atropine treatment group survived to the second endpoint (survival 100%,  $p = 0.001$ ). Signs of cholinergic excess were not evident in any group. Conclusion: Pretreatment with nebulized ipratropium bromide offered no mortality protection to rats in a model of severe organophosphate poisoning.

### 230 ATROPINE STABILITY FOR USE IN MASS CHEMICAL TERRORISM EVENTS

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Objective: Preparedness for chemical terrorism includes the procurement of the appropriate pharmacological antagonists. A large emphasis has been placed on having a sufficient quantity of atropine available to treat patients exposed to acetylcholinesterase inhibitors such as sarin. Severe exposures may necessitate the administration of large amounts of atropine and dictate the need to prepare significant quantities of extemporaneously compounded atropine solution to respond to mass numbers of casualties over the first 24–48 hours post-exposure. The objective of this project was to determine the stability of atropine solution prepared in multi-use bags over a 72 hour period. Methods: Atropine sulfate solution 1 mg/ml in normal saline was prepared from sterile pharmaceutical grade atropine sulfate powder. 100 ml multi-dose bags of atropine sulfate were stored at controlled temperatures of 72°F and 100°F for periods of 6, 12, 24, 48 and 72 hours. All bags were protected from light and three samples from each bag at each time interval were assayed using USP/NF HPLC methods for atropine sulfate injection and compared to a standard control. Results: Atropine sulfate solutions from all time intervals and at each temperature maintained stability of at least 97.1% compared to control. The USP standard for atropine sulfate stability dictates that the drug concentration must be maintained at 95%. Conclusions: The amount of atropine necessary to treat hundreds to thousands of nerve agent poisoned patients is immense. The extemporaneous preparation of atropine solution from pharmaceutical grade powder eliminates concerns about storage of huge quantities of atropine. The compounded atropine sulfate solution should remain stable for a sufficient period of time to treat patients during the most critical period of time.

### 231 ACTIVATED CHARCOAL IN A SIMULATED PARACETAMOL OVERDOSE: DOWNSCALING OF DOSE TO 10 GRAMS—PRELIMINARY RESULTS

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Background: The dose of activated charcoal for gastric decontamination purposes has not been well defined. One recommendation is a charcoal: drug ratio of 10:1. In large overdoses a standard dose of charcoal (50 grams) might be inadequate. We wanted to investigate if there is a reserve capacity in vivo, as seen in in vitro studies. Methods: A randomised crossover study on 16 volunteers, using paracetamol 50 mg/kg bodyweight in 125 mg tablets as a simulated overdose. The mean dose of paracetamol was 3875 grams. Each study day volunteers were given a standard meal 1 hour before paracetamol intake, then charcoal 1 hour later in 3 doses: Day A 50 grams, day B 25 grams and day C 10 grams. Paracetamol concentrations were determined by high pressure liquid chromatography. Reductions in the area under the time-concentration curve (AUC) were used to estimate the efficacy of each charcoal dose. Results: Preliminary results show no difference in AUC for the 3 charcoal doses, mean values and 95% Confidence Intervals were (in mg/l × minutes): Day A 9910 (6114–13706), day B 7940 (6095–9785) and day C 10039 (7184–12895). A 10 gram dose had the same efficacy as 50 grams on the approximate 2 grams of paracetamol remaining in the stomach at 1 hour. Conclusion: The reserve adsorptive capacity of charcoal found in vitro seems to exist also in vivo, where even a charcoal: drug ratio of approx 5:1 seems as effective as the standard dose.

### 232 SCH-50911 IS A REVERSAL AGENT FOR 1,4-BD AND GBL TOXICITY

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Background: 1,4-BD and GBL produce toxicity through their common metabolite, GHB, which interacts with

GHB and GABA<sub>B</sub> receptors. **Objective:** We investigated if 1,4-BD and GBL neurotoxicity can be decreased with SCH-50911, a high affinity selective GABA<sub>B</sub> receptor antagonist. **Methods:** For 1,4-BD, 16 male CD-1 mice received 1,4-BD 600 mg/kg i.p. followed 15 minutes later by SCH-50911 30 mg/kg i.p. (N = 8) or control injection (N = 8). For GBL, 16 mice received GBL 750 mg/kg i.p. followed 15 minutes later by SCH-50911 30 mg/kg i.p. (N = 8) or control injection (N = 8). Mice from all groups were then evaluated for neurotoxicity every 15 minutes by the righting reflex (RR), rotarod test (RT), grip strength (GS, peak pull force in lbs.), and open field locomotion (OFL, distance traveled in cm.). **Results:** 1,4-BD and GBL produced initial deficits for all outcome measures in all mice. SCH-50911 decreased the duration of RR failure for 1,4-BD and GBL from 135 and 180 min., respectively, in controls to 45 min. in treated mice. SCH-50911 decreased the duration of RT failure for 1,4-BD and GBL from 210 and 420 min. in controls to 105 and 90 min. in treated mice, respectively. SCH-50911 promoted more rapid recovery of GS to baseline values versus controls for both 1,4-BD and GBL ( $P < 0.05$  by area-under-the-curve, AUC, analysis). For OFL, SCH-50911 significantly improved the distance traveled by treated mice versus controls ( $P < 0.05$  by AUC analysis) for GBL only. **Conclusion:** SCH-50911 significantly reverses neurotoxicity related to 1,4-BD and GBL, presumably by antagonizing GHB effects at the GABA<sub>B</sub> receptor.

### 233 ORAL DECONTAMINATION WITH CALCIUM OR MAGNESIUM SALTS DOES NOT IMPROVE SURVIVAL FOLLOWING HYDROFLUORIC ACID INGESTION

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**Background:** Hydrofluoric acid (HF) ingestion can be rapidly fatal. Toxicity results when absorbed fluoride ions bind with divalent cations resulting in systemic hypocalcemia and hypomagnesemia. Administration of calcium or magnesium salts has been recommended because they combine with fluoride to form insoluble salts. This approach has never been studied in a whole animal model. We hypothesized that co-administration of calcium or magnesium salts would prolong survival in fluoride poisoned mice. **Methods:** We conducted a

randomized, placebo-controlled trial using two oral decontamination methods in a mouse model of HF toxicity. Preliminary studies showed that mice given 3 mmol/kg of aqueous HF orally died within 60 minutes. Using this model, 1.5 mmol/kg of either CaCl<sub>2</sub> or MgSO<sub>4</sub> was pre-mixed with the HF solution and given by gavage. Control animals received 3 mmol/kg of HF and saline by gavage. Animals were assigned to treatment groups by forced randomization and time to death was recorded in minutes by unblinded observers. **Results:** Mean survival in minutes (95% CI) for the groups: Control 34 (15–54); CaCl<sub>2</sub> 40 (24–57); MgSO<sub>4</sub> 36 (24–48). P-value was 0.8149 by one-way ANOVA, (not statistically significant). **Conclusion:** Co-administration of calcium chloride or magnesium sulfate in HF-poisoned mice did not prolong survival. These data do not support administration of these agents following ingestion of HF.

### 234 EFFECT OF ORAL 1,4-BD SELF-ADMINISTRATION ON SPATIAL LEARNING AND MEMORY IN THE RAT

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**Background:** 1,4-BD produces toxicity via GHB interaction at GABA<sub>B</sub> and GHB receptors. The effects of chronic 1,4-BD abuse are not known. However, chronic administration of GABA<sub>B</sub>ergic agents have produced learning and memory deficits in rats. **Objective:** We examined the effect of oral 1,4-BD self-administration by rats on the Morris water maze task. **Methods:** 24 male SD rats were divided into 4 groups (N = 6 each group). Group 1 (controls) received only tap water in their drinking bottle. Group 2 received 1,4-BD (0.75% w/v) in their drinking bottle. Group 3 was treated with 4-methylpyrazole (4-MP) 25 mg/kg i.p. daily and received 1,4-BD (0.75% w/v) in their drinking bottle. Group 4 was treated with Baclofen 6 mg/kg i.p. daily and received tap water in their drinking bottle. Rats were tested daily for spatial learning and memory by the Morris water maze test for 7 consecutive days. **Results:** The mean ( $\pm$  SEM) daily intake of 1,4-BD in groups 2 and 3 was  $1097 \pm 23$  mg/kg and  $1384 \pm 59$  mg/kg, respectively. Latency (seconds) and distance traveled (cm) to reach the submerged platform were significantly

increased for groups 2–4 versus controls on day 2. Thereafter, only group 4 continued to exhibit significant deficits. Memory was not impaired in any rat. Conclusion: Oral self-administration of 1,4-BD in drinking water by rats produced an early but transient

deficit in spatial learning; 4-MP did not prevent this deficit. Only the pure GABA<sub>B</sub> agonist, Baclofen, resulted in persistent rat spatial learning impairment. 1,4-BD doses up to 1.4 g/kg/d did not produce GABA<sub>B</sub>ergic-induced learning deficits.