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

*Lavonas EJ, ‡Gerardo CJ, §O’Malley GO, ‡Arnold TC, **Bush SP, §‡Banner W, §‡Steffens M, *Kerns WP, *Carolina Med Ctr, Charlotte NC; ‡Duke Univ, Durham NC; §Virginia Poison Ctr, Richmond VA; §Louisiana State Univ, Shreveport LA; **Loma Linda Univ, Loma Linda CA; ‡Uni of Oklahoma, Tulsa OK; ‡Western Wake Med Ctr, Cary NC

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

Bryant SM, Cumpston K, Myczyk MB, Leikin JB, Rezak M, Pallasch E. Toxicology Consortium-Cook County Hospital, University of Illinois at Chicago, Omega ENH, Illinois Poison Center, Department of Neurology ENH, Chicago, Illinois

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 (H₂Se) GAS


Background: Hydrogen Selenide (H₂Se) 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% H₂Se. Case series: 13 workers were evaluated following inhalational exposure to H₂Se. 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 H₂Se 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

Ross IA, Sapienza PP, Hanes DE, Johnson W and Kim CS. Office of Applied Research and Safety Assessment, Center for Food Safety and Applied Nutrition, FDA, Laurel, MD, USA

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 $^{14}$H on the fatty acyl-chains of S. typhimurium grown in proteose peptone beef extract (PPBE) medium with 200 μCi/ml of [2-^3]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 μCi 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 × 1,000) obtained from incubation in SGF at 15 min were 181 ± 19; 30 min, 202 ± 23; 60 min, 232 ± 29 and 120 min, 253 ± 27. For SIF at 15 min were 30 ± 4; 30 min, 61 ± 20; 60 min, 93 ± 30 and 120 min, 104 ± 32. The values at plasma pH were 15 min 28 ± 7; 30 min, 37 ± 7; 60 min, 57 ± 12 and 120 min 72 ± 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 (H$_2$Se) GAS

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

Background: Hydrogen Selenide (H$_2$Se) is a water-soluble gas that can be extremely irritating to skin and mucous membranes. We report of a case of H$_2$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% H$_2$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 H$_2$Se gas. Once evacuated, the worker was decontaminated 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. Affecting areas were dressed with silver sulfadiazine and they improved over the course of 4–5 days. Conclusion: Exposure to concentrated H$_2$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 (H$_2$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: H$_2$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 H$_2$Se from patients who had inhaled this toxic gas. Case Series: Six patients from an accidental H$_2$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 H₂Se-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 H₂Se illness from H₂Se-exposed patients despite routine skin and clothing decontamination. The source of this H₂Se 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

DeBellonia R, Ruck B, Jennis T, Swenson R, Shih RD, Marcus S. New Jersey Poison Information and Education System, New Jersey Medical School, Newark, New Jersey

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.
<table>
<thead>
<tr>
<th>Fire</th>
<th>Wood (g)</th>
<th>Filter Weight (g)</th>
<th>Cartridge</th>
<th>Carbon Radicals (mm)</th>
<th>Oxygen Radicals (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>90.5</td>
<td>0.01</td>
<td>Yes</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>91.7</td>
<td>3.21</td>
<td>No</td>
<td>10</td>
<td>35</td>
</tr>
<tr>
<td>3</td>
<td>88.6</td>
<td>0.00</td>
<td>Yes</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>87.5</td>
<td>0.14</td>
<td>No</td>
<td>60</td>
<td>38</td>
</tr>
<tr>
<td>5</td>
<td>92.3</td>
<td>0.00</td>
<td>Yes</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>90.9</td>
<td>1.26</td>
<td>No</td>
<td>105</td>
<td>18</td>
</tr>
</tbody>
</table>

Abstract 194.

194 ADSORPTION OF FREE RADICALS BY RESPIRATOR CARTRIDGES


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 μm 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

Munday SW, Williams SR, Clark RF. Division of Medical Toxicology, University of California, San Diego (UCSD), San Diego CA

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 (NH₂NH₂) 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

Baylor M1, Holstege CP2, Baer AB2. 1Martha Jefferson Hospital, Charlottesville, VA; 2Blue Ridge Poison Center, University of Virginia, Charlottesville, VA

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 asymptomatic 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 asymptomatic 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 asymptomatic 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

Speranza V, Webb C, Gaar G, Normann S. Florida Poison Information Center-Tampa, Tampa. General Hospital Tampa, FL

Objective: To describe the presentation, management and outcome of a serious hydrofluoric acid dermal exposure in a child. Case Report: A healthy 7-year-old 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
aerilifted 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

Pace SA1, Pace A.2 1Tacoma Emergency Care Physicians, Madigan Army Medical Center, University of Washington, Tacoma, WA 2Occidental College, Los Angeles, CA

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 naïve 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 antimotic 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 (T1/2) 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 “Fosfur 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 rystagmus 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, pCO2 15, pO2 115, HCO3 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 PHYSTOGSTIGMINE USE FOR ANTICHOLINERGIC TOXICITY

O'Donnell SJ, Burkhart KK, Donovan JW, Holland MJ  Penn State Poison Center, Hershey PA

Background: Phystostigmine 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 phystostigmine administration at a regional poison information and treatment center for a 28 month period were retrospectively reviewed. A subset of cases where sign- symptoms of asystole, bradycardia, ventricular dysrhythmias or seizures were reported, underwent further review for relationship of sign/symptom to phystostigmine administration. Results: 255 cases of phystostigmine 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 phystostigmine 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 phystostigmine administration. In this case, sertraline and valproic acid were coningested. There were 16 additional cases of reported asystole, bradycardia or seizure but in all these cases, signs/symptoms preceded the administration of phystostigmine. Conclusion: In this case series, phystostigmine 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, 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

Barker K^1, Ford M^2, Wright K^3, Seger D^1. ^1Vanderbilt University Medical Center, Nashville TN, ^2Carolina Medical Center, Charlotte NC, ^3University of Tennessee Medical Center, Knoxville TN

Background: Supratherapeutic vancomycin infusions of 300–400 mg/kg were inadvertently administered to three premature neonates (AR, DH, SP). Reported beta-elimination half-life (T1/2) of normal dosing of vancomycin in neonates is 13.4–33.7 hours (hr). A T1/2 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—287.7 mcg/mL (wt 3120 g), DH—371.4 mcg/mL (wt 690 g), and SP—357.2 mcg/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. T1/2 for vancomycin pre- and post-MDAC (see Table). Conclusions: MDAC reduced the beta-T1/2 of vancomycin in 2 of 3 preterm neonates. T1/2 in the 3rd neonate during MDAC was less than previously reported in neonatal overdose. T1/2 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

Morrison LD, Velez L, Rivera W, Shepherd G. The University of Texas Southwestern Medical Center and The North Texas Poison Center, Dallas, TX, USA

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 arhythcmias 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.

<table>
<thead>
<tr>
<th>Patient</th>
<th>T 1/2 pre-MDAC</th>
<th>T 1/2 during MDAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR</td>
<td>5.3 hours (during therapeutic dosing)</td>
<td>1.9 hours</td>
</tr>
<tr>
<td>DH</td>
<td>14 hours (following overdose)</td>
<td>7.3 hours</td>
</tr>
<tr>
<td>SP</td>
<td>5.3 hours (during therapeutic dosing)</td>
<td>5.2 hours</td>
</tr>
</tbody>
</table>

Abstract 204.
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 ± 4.9% (2.5 g AC), 10.1 ± 2.1% (5 g AC), and 38.8 ± 8.5% (10 g AC) of GBL adsorbed and in simulated intestinal fluid, 5.1 ± 4.7% (2.5 g AC), 5.4 ± 4.7% (5.0 g AC) and 37.1 ± 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

Lackey G, Alsop J, Albertson T. California Poison Control System (CPCS)—Sacramento Division, University of California San Francisco, School of Pharmacy, Sacramento, CA

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 yrs). 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-AMINO-PYRIDINE

J Lowry, C Blume, J Sommerauer, G Wasserman. Division of Clinical Pharmacology and Medical Toxicology and Section of Critical Care Medicine, Children’s Mercy Hospital, Kansas City, MO and Missouri Poison Control Center, Cardinal Glennon Children’s Hospital, St. Louis, MO

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 20ml 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®, 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® 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® was ordered to aid in disimpacting the mass. The Golytely® 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® 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

Salhanick, S. Levy D. Burns M. Massachusetts/Rhode Island Regional Poison Control Center, Children’s Hospital, Harvard Medical School, Boston, MA. Holyoke Internal Medicine, Holyoke, MA

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.

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 gamma-butyrolactone (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 benztrapine (1 mg), diphenhydramine (25 mg), and dantrolene (2 mg/kg x 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 anisium 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

Kumar S, Barker K, Seger D. Vanderbilt University Medical Center

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 Ca²⁺ 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

Ragone, S. Bernstein, J. Lew, E Weisman, R. Florida Poison Information Center/Miami and Miami-Dade County Medical Examiner Department, Miami, Fl

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 invrto 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 phosphate 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/ pCO2 29.9/ HCO3 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 lead 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

Kemmerer D, Simone K, Tomassoni A. Northern New England Poison Center, Maine Medical Center, Portland, ME

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 29yo female presented to the ED following an acute overdose of sustained release bumetropin (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, PO2 97, PCO2 25, HCO3 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 acidoses not attributed to coinstant 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 coinstantes. 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

Robinson, R. Griffith, J. Nahata, M. Townsend, J. Mahan, J. Casavant, M.  Children’s Research Institute, Central Ohio Poison Control Center, Ohio State University College of Pharmacy, Columbus, OH, USA

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 ≤ 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.

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.

222 INADEQUATE PYRIDOXINE STOCK AND EFFECT ON PATIENT OUTCOME

Burda A1, Sigg T1, Haque D1, Hantsch C1,2. 1Illinois Poison Center, Chicago, ILL, 2Loyola University Medical Center, Maywood, IL

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

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

Ross MP, Rosenberg RB. Pediatric Critical Care of Arizona and St. Joseph’s Hospital, Phoenix, AZ

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
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 ingestants. 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.

Methods: 29 rats were randomized to receive pretreatment 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.

224 CYCLOPSORINE’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+, 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.

225 MITIGATION OF PENNYROYAL HEPATOTOXICITY IN THE MOUSE

Sztajnkyroer MD,1,2 Oten EJ,1,2 Bond GR,1,2 Lindsell CJ,1,2 Goetz RJ,1 1Cincinnati Drug and Poison Information Center, 2Department of Emergency Medicine, 3Institute for Health Policy and Health Service Research, University of Cincinnati, Cincinnati, OH

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
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 pentylenetetrazole 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 pentylenetetrazole.

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

Höjer J, Personne M, Hultén P, Ludwigs U*. Swedish Poisons Information Centre and *Department of Emergency Medicine, Karolinska Hospital, SE-171 76 Stockholm, Sweden

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 (4.5 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 (A, 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?

Guo C, McMartin K. Department of Pharmacology, Louisiana State University Health Science Center, Shreveport, LA.

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
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, 1, & 5 mM), sodium oxalate (NaOX at 0.1, 1, & 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 γ-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

Gunja N, Collins M, Graudins A. Department of Clinical Pharmacology and Toxicology, Westmead Hospital, Sydney, Australia

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 chromatography and mass spectroscopy (LCMS). Results: The pharmacokinetics of cyproheptadine (mean ± 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.

<table>
<thead>
<tr>
<th></th>
<th>Cmax (µg/L)</th>
<th>Tmax (hrs)</th>
<th>AUC (µg hr/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO arm</td>
<td>26.9 ± 3.8</td>
<td>4.0 ± 0</td>
<td>183.5 ± 23.2</td>
</tr>
<tr>
<td>SL arm</td>
<td>3.8 ± 1.5</td>
<td>9.5 ± 0.5</td>
<td>24.7 ± 8.2</td>
</tr>
<tr>
<td>P value</td>
<td>0.01</td>
<td>0.002</td>
<td>0.006</td>
</tr>
</tbody>
</table>

Abstract 228.

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

Bird SB, Gaspari RJ, Aaron CK, Boyer EW, Dickson EW. Dept. of Emergency Medicine, Univ. of Massachusetts Med. Center, Worcester, MA

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 × 25 × 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

Dix J, Freeman B, Hess M, Weber R, Frye R, Mrvos R, Krenzelok EP. Schools of Pharmacy and Medicine, University of Pittsburgh; Pittsburgh Poison Center, Pittsburgh, PA

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

Christophersen AB1, Hoegberg LCG1, Angelo HR2, Christensen HR1. 1Department of Clinical Pharmacology and 2Department of Clinical Biochemistry, H: S Bispebjerg Hospital, Copenhagen, Denmark

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

Quang L, Desai M, Maher T, Woolf A, Shannon M. Children’s Hospital Boston/Harvard Medical School, Massachusetts College of Pharmacy and Health Sciences, Boston, MA

Background: 1,4-BD and GBL produce toxicity through their common metabolite, GHB, which interacts with
GHB and GABAR receptors. Objective: We investigated if 1,4-BD and GBL neurotoxicity can be decreased with SCH-50911, a high affinity selective GABAR 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 GABAR receptor.

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

Quang L, Desai M, Maher T, Woolf A, Shannon M. Children's Hospital Boston/Harvard Medical School, Massachusetts College of Pharmacy and Health Sciences, Boston, MA

Background: 1,4-BD produces toxicity via GHB interaction at GABAR and GHB receptors. The effects of chronic 1,4-BD abuse are not known. However, chronic administration of GABARergic 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 (± SEM) daily intake of 1,4-BD in groups 2 and 3 was 1097 ± 23 mg/kg and 1384 ± 59 mg/kg, respectively. Latency (seconds) and distance traveled (cm) to reach the submerged platform were significantly

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

Delgado JH, Heard K. Rocky Mountain Poison & Drug Center—Denver Health; University of Colorado Health Sciences Center, Denver, CO

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 CaCl2 or MgSO4 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); CaCl2 40 (24–57); MgSO4 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.
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_B agonist, Baclofen, resulted in persistent rat spatial learning impairment. 1,4-BD doses up to 1.4 g/kg/d did not produce GABAergic-induced learning deficits.