Oral Herbicide (Diquat) Exposure

(1) Occupational Risk Factors

(3)
- Common Uses
- Mechanism of Toxicity
- Symptoms
- Treatment

(5)
- Material Safety Data Sheets
- Pesticide Labeling

(7) Signs and Symptoms
(9) Patient Follow-Up

A 49 year old (1) maintenance worker (2) accidentally spills an herbicide containing (3) diquat on his (4) face. The ER physician review the (5) MSDS and product label for the herbicide before discharging the patient. The (6) next day the patient develops severe upper airway (7) ulcerations and requires (8) intubation for three days, followed by a long (9) recovery requiring a PEG tube.

(2) Unintentional Exposure

(4)
- Dermal Absorption
- Ingestion
- Inhalation

(6) Delayed Onset of Symptoms
(8) Treatment

Problem-Based Learning Activity: Occupational Herbicide Poisoning Case Study

PART 1

A 49 year-old male ground maintenance worker presents to the ER with complaint of pesticide exposure. He had been cleaning a storage room and taking inventory of the chemicals at work. While reaching overhead to move a 2.5 gallon container on the top shelf, it fell over and splashed him in the face. The container had apparently been stored without the cap. The maintenance worker states that the liquid in the container was Reglone®, a concentrated pesticide that he uses to kill weeds. After immediate first aid, the employee was taken to the hospital. Immediately following the exposure, he had had an episode of nausea without emesis. He also states that he had gotten a little bit in his mouth--with subsequent coughing, wheezing and chest tightness. These symptoms resolved before arrival at the ER. Upon arrival, he complains of some mild eye irritation. The material safety data sheet (MSDS) for Reglone® "(also known as Diquat Dibromide)", is reviewed and the active ingredient is found to be a chemical called diquat dibromide. The patient is determined to have had minimal exposure--mostly dermal, with possible slight inhalation and no ingestion. Dermal toxicity is noted to be "practically nontoxic" and inhalation to be "moderately toxic." ROS & PMH are unremarkable. His smoking history is ½ ppd x 15 yrs. He is not taking any medications and has an allergy to PCN.

The physical exam is unremarkable. CXR is negative. His eyes are irrigated and the pH is measured as normal. O2 and IV NS are administered. He is discharged after several hours & told to follow up with an ophthalmologist.

A couple of hours later he returns to the ER complaining of epigastric pain, nausea, and vomiting. He has not been able to keep down any food or fluid since discharge. He now thinks he may have swallowed some of the diquat. The current ER physician notes that diquat causes GI toxicity with ulcerations of oropharyngeal mucosa and the rest of digestive track. The patient also complains of a mild headache. He denies mouth sores, vision changes, chest pain, SOB, palpitations, syncope, flank pain, or urinary symptoms and hematuria.

His vital signs are: BP 132/71, HR 92, Temp 99.7 F, RR 18, O2sat 97% RA. He appears uncomfortable but is breathing easily. The physical exam is unremarkable. Labs: Abd series shows no ileus or obstruction. CXR is clear, no pulmonary edema, urine and serum toxicity screens are negative, EKG shows normal sinus rhythm, Troponin negative, White count and differential are normal, Hgb 14, Hct 43, Chemistries normal, Lipase normal.

This is the end of Part I of this activity. Students should now take time to review the patient presentation and consider how they would proceed in treating the patient. Understand that this is real case and that the treatment provided may not have been the best option. This patient presents with a pesticide exposure that occurred in the work place. Specific objectives which should be considered include:

01 — Review the history for information about exposure.

02 — Discuss decontamination requirements and the potential to expose employees and other patients in the ER setting. Is there a potential for exposure to medical personnel?

03 — Obtain the MSDS for Reglone® and understand how to use an MSDS in the case of a chemical exposure.

04 — Pesticide labels must provide information about the chemical's toxicity. Consider consulting the pesticide label for additional information.

05 — Should poison control be contacted?

06 — Recognize if/how vital signs have changed following the exposure to diquat. Is there a potential dermal, GI, respiratory, neurological toxicity hazard?

07 — Discuss treatment options and labs to be ordered. Should patient be admitted or sent home?

PART 2

The patient is given IV Phenergan for nausea, 1L NS & some oral clear liquids. Dilaudid is ordered, but not given per patient refusal -- he states that he will be driving himself home. Since he does not appear to have renal, cardiac, neurological or pulmonary toxicity, it is felt that he did not have a significant exposure. Arrangements are made for him to have an endoscopy the following morning. He is discharged with Zantac150 mg bid, Phenergan 25 mg qid and should be NPO until post endoscopy. The following morning the GI laboratory sends him to the main hospital because he is "not looking very good". He undergoes esophagogastroduodenoscopy, which shows mild swelling of the vocal cords and hypopharyngeal region. After the procedure his temperature rises to 103° F and he is sent to the ER. He is been unable to swallow and has difficulty breathing. His lips feel swollen and his eyes are still irritated. The physical exam shows him to be in moderate to severe distress. He is sitting in tripod position, his lips are swollen & he is drooling. His conjuctivae are injected and oral mucosa are very dry.

Labs: CXR is clear. WBC 12.1, Hg, 14.2, Hct 41, platelets 169, segs 82, bands 10. Sodium 135, K 4.5, Cl 101, CO2 26, BUN 19, creatinine 1.5, glucose 159. Rest of CMP normal.

This is the end of Part II of this exercise. Students should take time to discuss the development of the case and consider how they would manage the case. Specific considerations should include:

01 — Evaluate the treatment decisions that were made. Given the developments in Part II, do students agree with the treatment? How would they have treated the patient differently? How would their treatment have changed the outcome of the patient?

02 — Why was the onset of serious symptoms delayed by almost 24 hours following the exposure? (Students may have to consult other case reports in the medical literature to answer this question)

03 — Did they look at long term management?

04 — Should they report the exposure and start a worker's compensation claim? Does OSHA need to be contacted?

Now review the outcome of the patient and discuss how a change in treatment could have decreased time of hospitalization:

The patient is treated with Solu-Medrol, humidified cool air, which does not help. His difficulty swallowing & breathing worsens and he consents to intubation. A bronchoscopy is performed to evaluate possible aspiration of the diquat. He is placed on steroids, Levaquin and a Propofol drip. He is extubated 3 days later, but complains of severe odynophagia. He has large mucosal ulcerations involving his oral mucosa and retro pharyngeal area. His lips bleed easily. He cannot eat well, only a soft, ice-cold diet. Clindamycin is added for anaerobic coverage and a PEG tube is placed for feeding. His hospital stay is 10 days and his PEG tube remains in place for 2 mos, despite the expectation that his mucositis should heal in 10-15 days.