Pediatric and Young Adult Exposure to Chemiluminescent Glow Sticks

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Background: Although chemiluminescent plastic rods, commonly called “glow sticks” or “light sticks,” are typically considered to be minimally toxic or nontoxic, published data about exposure to these products are scarce.

Objectives: To test our hypothesis that exposure to chemiluminescent products is unlikely to result in significant morbidity or mortality and to describe factors associated with exposure by reviewing reports to our urban poison control center of human exposure to chemiluminescent products.

Methods: Pediatric and young adult exposure to chemiluminescent products reported between January 1, 2000, and April 1, 2001, to our poison control center were evaluated with regard to demographic group, type of product involved, circumstances of exposure, symptoms, and management.

Results: Reported routes of exposure (n = 118) included ingestion (n = 108), ocular (n = 9), and dermal exposure (n = 1). Only patients exposed to chemiluminescent fluid from a leaking container reported symptoms (n = 27). Symptoms were limited to transient irritation of the exposure site, and no systemic toxicity occurred. All adults (n = 4) inadvertently ruptured or swallowed intact light sticks while at a dance club or dance party. Most exposure and all adult exposure occurred on holidays or weekends.

Conclusions: Most incidences of exposure to chemiluminescent products involve asymptomatic ingestion of fluid that leaks from glow sticks or ingestion of an intact glow stick. Symptoms occur after exposure to chemiluminescent fluid and consist of transient irritation at the site of exposure. The clustering of reported exposure on weekends and in dance clubs and parties coupled with a lack of occupational or workplace exposure suggest that recreational use is a major contributory factor. Exposure to chemiluminescent products infrequently resulted in symptoms and the symptoms reported were minor. Exposure to chemiluminescent products as described is unlikely to cause significant morbidity or mortality.

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Once a seldom-used specialty item of military personnel and outdoor enthusiasts, chemiluminescent products have become very popular and readily available consumer products. In particular, the use of glowing plastic rods, commonly referred to as “glow sticks,” at dance clubs and rave dance parties, and the use of glowing plastic jewelry at festivals, parades, sporting events, and other mass social gatherings is quite common. Typically, manufacturers describe these items as “nontoxic” and they are considered minimally toxic by many clinicians.

The active reagents in chemiluminescent products are anthracene and oxalates synthesized with dibutyl phthalate. Dibutyl phthalate has been reported to cause anaphylaxis and even death when ingested in large quantities. Reports of exposure to these chemiluminescent products are scarce and their toxicities and outcomes of exposure are essentially undescribed. In response to a dramatic increase in the number of incidences of exposure to chemiluminescent products reported to our poison control center, we sought to examine the characteristics and outcomes of such exposure.

We hypothesized that exposure to chemiluminescent products is unlikely to result in significant morbidity or mortality and that recreational use is a contributory factor. These hypotheses, coupled with a lack of published clinical data on exposure to chemiluminescent products warranted this examination of circumstances of exposure, toxicity, and management of patients exposed to these products. Since data about such exposure are

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lacking, current management of exposure to chemiluminescent products is based primarily on anecdotal experience. Further study of this issue is necessary for evidence-based management of these increasingly common types of exposure.

**DESIGN AND METHODS**

This study included predominantly retrospective review of human exposure to chemiluminescent products in patients younger than 25 years reported to our poison control center. This study did not require and did not undergo institutional review board approval. Computerized records (Toxicall, Aurora Springs, Colo) of all telephone reports made to our poison control center between January 1, 2000, and April 1, 2001, were reviewed, and exposure to chemiluminescent products were evaluated with regard to the demographic group exposed, the type of chemiluminescent product, the circumstances of exposure, the patient’s symptoms at the time of the initial report, and the symptoms at follow-up.

Exposure to such products was defined as for all other poisons reported to our center. These include known or suspected contact with the product by the following routes: ingestion, nasal inhalation, aspiration with ingestion, ocular, dermal, parenteral, rectal, otic, vaginal, other, and unknown. Significant morbidity was considered to be systemic toxicity, involvement of 2 or more organ systems, or symptoms requiring hospitalization. Mortality was defined as death attributed to exposure. Patient demographic and clinical data are reported as numbers and percentages.

**RESULTS**

In total, 118 incidences of exposure involving 72 males were reported (Table). These included 4 young adults (18-25 years old), 18 teenaged children (13-17 years old), and 96 younger children (0-12 years old). The preponderance of exposure cases involved light sticks (n = 106) but others involved glowing jewelry (n = 12). Ingestion (n = 108), ocular exposure (n = 9), and dermal exposure (n = 1) occurred.

Only patients exposed to an open container that leaked chemiluminescent fluid developed symptoms (n = 27). These symptomatic patients experienced irritation at the site of exposure, most commonly involving the mouth or throat (n = 13), eye (n = 9), and skin (n = 1). Four children exclusively experienced nausea (n = 1), emesis (n = 1), or dysgeusia (n = 2) after ingestion.

Twelve patients reportedly swallowed an intact glow stick and none had symptoms at the time of reporting or during follow-up. All adults had inadvertently rup-

| Age and Type of Exposure to Chemiluminescent Products* |
|----------------------------------|-----------------|-----------------|-----------------|-----------------|
|                                  | No. of Patients | Oral Asymptomatic | Oral Symptomatic | Ocular Dermal   |
| Children                        |                |                  |                  |                |
| ≤13 y                           | 96 (81.3)      | 79 (82.3)        | 11 (11.5)        | 5 (5.2)        |
| >13-18 y                        | 18 (15.3)      | 12 (66.7)        | 2 (11.1)         | 4 (22.2)       |
| Adults                          |                |                  |                  |                |
| >18-<25 y                       | 4 (3.4)        | 3 ...            | 4 (100)          | 9 (7.6)        |
| All Patients                    | 118 (100)      | 91 (77.1)        | 17 (14.4)        | 9 (7.6)        |

* N = 118. Data are given as number (percentage) of patients. Ellipses indicate not applicable.

Exposure to glow sticks and related chemiluminescent products is an increasingly common phenomenon. At the time this study was concluded in April 2001, the cases of chemiluminescent product exposure reported to our poison control center had increased 3-fold relative to January 2000, the earliest month included in the study. Prior to conducting this study, the nature of exposure at dance clubs and dance parties and the clustering of exposure on weekends led us to hypothesize that recreational use of these products was a major contributory factor to exposure. This is congruent with data from the most comprehensive publication on the subject: in the 6-month period from June 1993 to December 1993, 23% of all cases of exposure to chemiluminescent products reported to an urban poison control center occurred on the Fourth of July holiday weekend. In our study, the clustering of exposure incidences on holidays and weekends, the occurrence of all adult exposure at dance clubs and dance parties, and zero incidences of occupational or workplace exposure supported the notion that recreational use is a contributory factor. At this time, the only well-identified circumstances of exposure are children at home and adults at dance clubs or dance parties. All types of poisoning should be considered preventable, and this is particularly true for poisoning resulting from recreational activities.

The clinical effects of reported exposure cases were fortunately minor. Nearly all types of exposure were by ingestion (92%), although ocular and dermal exposure were also noted. Most exposure involved intact glow sticks and these types of exposure never resulted in symptoms. Only patients exposed to broken glow sticks or broken glowing jewelry developed

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symptoms. In total, only 23% of patients with exposure developed symptoms. Although the number of cases of ocular and dermal exposure was small, all resulted in symptoms.

Symptomatic patients experienced irritation at the site of exposure soon after it occurred. Irrigation of the exposure site or dilution by means of oral intake of fluids was the sole means of decontamination and treatment. A small subpopulation of children experienced minor nonspecific symptoms of nausea, dysgeusia, or emesis, which seemed to indicate local irritation of the gastrointestinal tract after ingestion.

Although many asymptomatic or minimally symptomatic patients did not have follow-up data collected after the initial contact with the poison control center, there were no cases of symptoms lasting longer than several hours or recurrence of symptoms after initial cessation. All patients in this study either remained at home or were evaluated in a health care setting and discharged after brief observation. No patient in this study required laboratory evaluation or hospital admission. No patient developed any systemic symptom.

By far, most patients with exposure were children, with adults comprising only 3% of exposure cases. This statistic identifies the pediatric population as being at the greatest risk of exposure, suggesting that pediatricians as well as emergency physicians should have an understanding of the toxicity of chemiluminescent products and the management of exposure to these products. Additionally, this suggests that education and prevention efforts be directed toward parents and children.

Nearly all chemiluminescent products involved were glow sticks and a small number were glowing jewelry. Of note, no patient exposed to an intact product, even if it was an ingested intact glow stick, developed symptoms. We believe that the number of swallowed intact glow sticks was higher than noted herein. The nature of our computerized patient records allows all types of exposure to easily be classified as “ingestion”; however, reporting a patient swallowing intact products requires additional data entry by manually typing a narrative of such, which may not occur in all cases.

Glow sticks are commonly available in several sizes, ranging from cylinders approximately 10 to 15 cm in length and 1 to 1.5 cm in diameter to smaller cylinders approximately 2 to 2.5 cm in length and 0.3 cm in diameter. No patient was known to have ingested a larger-sized glow stick. Although it is unlikely to occur based on the size of these objects, ingestion of a large glow stick may present a mechanical problem not noted in this study. Unfortunately, the smaller glow sticks are particularly marketed as an accessory to be held in the mouth, typically at dance clubs and dance parties. No patient in this study who ingested an intact glow stick experienced aspiration or airway obstruction, although the possibility of such an occurrence cannot be ignored.

Glow sticks are extremely common items used at dance clubs and dance parties. We surmise that use of glow sticks in such settings may involve particular risk factors, including holding glow sticks in mouth while dancing, concomitant use of drugs and alcohol that may impair cognition, and consumption of ecstasy (MDMA), a common adverse effect of which is bruxism, for which users may seek relief by chewing on glow sticks.

Industrial data report dibutyl phthalate as capable of causing severe morbidity and mortality. The quantities of this toxic reagent in glow sticks, glowing jewelry, and other chemiluminescent products is minimal and these products should not be presumed to have the same toxicity as industrially used dibutyl phthalate.

Based on the results of this study and our clinical experience, we consider unintentional exposure to chemiluminescent products, such as that discussed here, unlikely to result in symptoms in the absence of a broken or leaking container. In this study, ingestion of small, intact glow sticks never resulted in symptoms, although we acknowledge the potential for airway complications or complications that may result from ingestion of a larger glow stick.

Oral, ocular, or dermal exposure to liquid from chemiluminescent glow sticks and similar products may result in symptoms but the nature of these symptoms is transient irritation at the site of exposure. If necessary, treatment of topical exposure should consist of irrigation, and treatment of oral exposure and ingestion should consist of irrigation or dilution. In our study, these agents acted as a local irritant rather than as a systemic toxin. Since exposure to the small amounts of fluid that leak from these products does not seem to result in systemic toxic reaction, routine administration of activated charcoal after unintentional exposure is not necessary.

The limitations of this study include its retrospective nature, reliance on patients, caregivers, and clinicians to contact or consult our poison control center after exposure, and the inability to confirm that any reported exposure directly involved the chemiluminescent products of interest. Although we cannot declare that exposure to chemiluminescent products is free of potentially serious consequences, our data demonstrate that reported exposure to such products is unlikely to result in significant morbidity or mortality.
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fore fungal culture results are finalized, thus expediting the recovery process.

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REFERENCES


Correction

Error in Authorship. In the article titled “Pediatric and Young Adult Exposure to Chemiluminescent Glow Sticks” in the September issue of the Archives (2002; 156:901-904), the third author should have been Robert S. Hoffman, MD, New York City Poison Control Center, New York, NY. The Archives regrets the error.