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Suicide Fads: Frequency and Characteristics of Hydrogen Sulfide Suicides in the United States

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Objective: To assess the frequency of hydrogen sulfide (H₂S) suicides and describe the characteristics of victims in the United States (U.S.) since the technique became common in Japan in 2007.

Methods: To ascertain the frequency of intentional H₂S related deaths in the U.S. prior to the start of the Japanese trend in 2007, we searched the multiple-cause-of-death data from the National Vital Statistics System. To collect as much information about the victims as possible, we sent an email to the National Association of Medical Examiners (NAME) listserv asking for their cooperation in identifying cases of H₂S suicide. To identify cases that were not voluntarily reported by medical examiners but were reported by the media, we conducted Google searches using the search terms: “hydrogen sulfide suicide,” “H₂S suicide,” “detergent suicide,” “chemical suicide,” and “suicide fad.” We obtained all available autopsy reports and abstracted information, including the site of the incident, the presence of a note warning others about the toxic gas and the demographic characteristics of the victims. We contacted medical examiners who potentially had custody of the cases that were identified through media reports and requested autopsies of these victims. When unable to obtain the autopsies, we gathered information from the media reports.

Results: Forty-five deaths from H₂S exposure occurred in the U.S. from 1999 to 2007, all unintentional. Responses from the NAME listserv yielded autopsy reports for 11 victims, and Google searches revealed an additional 19 H₂S suicides in the U.S. since 2008. Overall (n=30), two cases were identified during 2008, 10 in 2009, and 18 in 2010. The majority of victims were white males, less than 30-years-old, left a warning note, and were found in cars. There were five reports of injuries to first responders, but no secondary fatalities.

Conclusion: H₂S suicides are increasing in the U.S., and their incidence is probably underestimated by public health officials and physicians. First responders are at risk when assessing these victims due to the severe toxicity of the gas. Emergency providers must be aware of H₂S suicides to educate others and care for the rare survivor. [West J Emerg Med. 2011;12(3):300-304.]

INTRODUCTION

Hydrogen sulfide (H₂S) is an infrequent but well recognized occupational and industrial hazard and is a cause of substantial morbidity and mortality. Typical occupational scenarios involve exposure to high concentrations of H₂S gas released from petrochemical plants, sewers, volcanoes, or manure pits. Fatalities of workers and rescuers involved in these incidents have been reported extensively.¹⁻⁶ The toxicodynamic

effect of H₂S is similar to cyanide in that it binds to cytochrome-*c* oxidase and is classified as a cellular asphyxiant. High concentrations of H₂S are associated with sudden loss of consciousness (the so-called “knockdown” effect), apnea and rapid death. Lower level exposures have resulted in pulmonary edema and keratoconjunctivitis among survivors.⁷

Fatal intentional exposures in the United States (U.S.) have not been described in the medical literature; however,

Table 1. Victim characteristics by case.

Year	Autopsy Available?	Age	Sex	Race	Warning note present?	Location of victim	Additional casualties?
2008	No	23	M		Yes	Car	No
2008	Yes	23	M	White	Yes	Car	No
2009	Yes	31	M	White	Yes	Car	No
2009	Yes	31	M	Black	No	Bathroom	No
2009	Yes	42	M	White	Yes	Car	No
2009	No	29	M	White	Yes	Car	No
2009	Yes	42	F	White	Yes	Car	No
2009	Yes	22	M	Black	Yes	Car	No
2009	No	21	M		Yes	Car	No
2009	Yes	22	M	White	Yes	Car	No
2009	No		M		Yes	Car	No
2009	No		M		No	Car	No
2010	Yes	22	M	White	Yes	Car	No
2010	No		F		Yes	Car	No
2010	Yes	21	M	Black	Yes	Closet	No
2010	Yes	20	M	White	Yes	Car	No
2010	Yes	44	F	White	Yes	Car	No
2010	No	20	F		Yes	Car	No
2010	No	33	M		No	Car in garage	Yes
2010	No	35	F		No	Car	Yes
2010	No	18	M		No	Bedroom	Yes
2010	No	31	M		Yes	Car	No
2010	No		M		Yes	House	No
2010	No	24	M	White	Yes		No
2010	No	23	M		No	Car	Yes
2010	No		M		Yes	Car	No
2010	No	24	M		Yes	Car	Yes
2010	No		M		Yes	Car	Yes
2010	No	40	M		Yes	Car	No
2010	No		M		Yes	Motel room	No

suicides using H₂S have been described in Japan since 2007.⁸ These suicides have been dubbed “detergent suicides” by the media because they are carried out by mixing household chemicals (often an acidic toilet bowl cleaner as a proton donor and insecticides or bath salts as a sulfur source) to produce toxic concentrations of H₂S gas.⁹ The specifics of this technique became available on Japanese websites in late 2007. It is thought that availability of this information contributed to a dramatic increase in the number of these cases reported.¹⁰ ¹¹ In 2007, there were only 27 cases of H₂S suicides in Japan; however, 517 cases were reported between January and July in 2008.⁷ To date, there has not been a comprehensive survey for fatalities from intentional inhalation of H₂S gas in the U.S. Furthermore, because there is no single database for reporting

causes of death or methods of suicide, it is likely that the prevalence of this “fad” may be underestimated by public health officials and emergency responders, the latter being at increased risk when attempting to extricate patients or victims from an environment of highly toxic H₂S. Through exploring the characteristics of these patients, we hope to educate emergency providers about the dangers posed by this novel suicide technique.

METHODS

To ascertain the frequency of intentional H₂S related deaths in the U.S. prior to the start of the Japanese trend in 2007, we searched the multiple-cause-of-death data from the National Vital Statistics System (NVSS) available via the

Table 2. Examples of household chemicals that can be mixed to produce H₂S gas in toxic concentrations.

Acid Sources	Sulfur Sources
Lysol® ready to use disinfectant (4-8% citric and hydroxyacetic acid)	Artist oil paints (0-15% zinc sulfide)
Lysol® toilet bowl cleaner (9.5% HCl)	Dandruff shampoos (1.0% selenium sulfide)
Sno Bol® toilet cleaner (15% HCl)	Pesticides (5-30% calcium polysulfides)
The Works® toilet bowl cleaner (15-25% HCl)	Spackling paste (1-2% zinc sulfide)
Blue-Lite® germicidal acid bowl cleaner (20.5% phosphoric acid)	Some latex paints (6.6% zinc sulfide)
Kaboom® shower, tub, and tile cleanser (5-7% urea-monohydrochloric acid)	Garden fungicides (5-90% sulfur)
Tile, stone cleaners (1-30% HCl)	Selected bath salts (25-35% sulfur)

HCl, hydrochloric acid

National Center for Health Statistics (NCHS) at the Centers for Disease Control (CDC). Mortality data from the NVSS are a fundamental source of demographic, geographic, and cause-of-death information. These data are provided through contracts between NCHS and vital registration systems operated in the various jurisdictions legally responsible for the registration of vital events and are considered the most comprehensive source of vital statistics in the U.S. These data are available to the public for query on the CDC website.

To collect as much information about the victims as possible, we sent an email to the National Association of Medical Examiners (NAME) listserv asking for their cooperation in identifying cases of self-inflicted H₂S poisoning. All information obtained was voluntarily contributed by medical examiners and was compliant with the Health Insurance Portability and Accountability Act regulations. All documents were transmitted by secure fax or by mail; all autopsies and patient identifiers were kept in a locked file cabinet. Medical examiners determined that the cause of death was H₂S in these cases based on the conditions of the event, such as presence of “rotten egg smell” in the environment and the presence of chemicals on scene that produce H₂S in sufficient concentrations as to cause death. To identify cases that were not voluntarily reported by medical examiners but were reported by the media, we also conducted multiple Google searches using the search terms: “hydrogen sulfide suicide,” “H₂S suicide,” “detergent suicide,” “chemical suicide,” and “suicide fad.”

Once cases were identified, we then obtained all available autopsy reports and abstracted information including the site of the incident, the chemicals used, the presence or absence of a note warning others about the toxic gas, and the demographic characteristics of the victims, mainly age, gender and race. We contacted medical examiners who potentially had custody of the cases that were identified through Google searches and media reports and requested autopsies of these victims. When unable to obtain the autopsy reports, we gathered as much information as possible from the media reports themselves.

RESULTS

According to the multiple-cause-of-death data from the NVSS, NCHS, there were 45 deaths from H₂S exposure in the U.S. from 1999 to 2007, but all were deemed unintentional. To date, the NVSS has only been compiled through 2007, thus it could not be queried for deaths occurring from 2008-2010. Responses from the NAME listserv inquiry yielded full autopsy reports for 11 victims from 2008 to 2010. Google searches revealed an additional 19 H₂S suicides in the U.S. since 2008. The sentinel case was identified by Google search and occurred August 26, 2008. The most recent case was also identified via Google search and occurred October 1, 2010. Overall (n=30), only two cases were identified during 2008, followed by 10 cases in 2009, and 18 in 2010. Victims were identified in 12 different states. The majority of victims were male (83%). Ten victims were identified as “white,” three were identified as “black,” and the remaining 17 had no racial identifiers. Age was available for 23 of the victims, who ranged from 20 to 44 years of age. Fourteen victims were less than 30 years of age. Twenty-four of the victims left notes warning neighbors and first responders of the potentially hazardous chemical suicide underway. Twenty-three (77%) victims were found in cars. There were five reports of injuries to first responders, but there were no secondary fatalities. The specifics of injuries to first responders were not available, however at least three required evaluation in the emergency department (ED).

DISCUSSION

“Detergent suicides” are becoming increasingly common in the U.S. Following the two sentinel cases in 2008, the number of victims increased five-fold in 2009, and nearly doubled again in 2010. The characteristics of this population are similar to other high fatality suicide modalities in that the majority of victims for whom demographic data is available are white males. As is referenced on the Japanese websites, it appears that the majority of victims believed that they were being considerate of first responders by selecting enclosed environments (such as cars and closets) and posting notes

warning them of the toxic gas within. In this survey, however, there were reports of injuries to five first responders. This clearly demonstrates that H₂S suicides constitute a threat to first responders, and that recognition of potential H₂S scenarios and appropriate personal protective equipment should be discussed to prevent further morbidity and mortality.

Overall, it seems likely that we can expect the frequency of H₂S suicides to increase as this method is popularized in media coverage of these deaths and more websites appear offering guidance on this issue. Additionally, the household chemicals needed to create toxic concentrations of H₂S gas are myriad and readily available in stores and on the internet. Given the facts that there were no H₂S suicides reported in the NVSS through 2007 and no media reports of H₂S suicides prior to 2008, it seems clear that this reporting represents an actual increase in cases and not simply an increase in media reporting of such events.

As emergency providers it is critical to be aware of this practice in order to adequately assess and educate bystanders and first responders after non-fatal exposures, as well as provide appropriate care to the rare victim that survives the initial attempt. To date, there have not been any fatalities among first responders involved in these incidents; however, two emergency medical technicians in North Carolina were sent to the ED for irritant respiratory symptoms after attempting to rescue a woman from her car when no warning sign was posted.¹² Furthermore, an incident in Japan in which a 14-year-old girl committed suicide with H₂S resulted in 90 ill neighbors after the gas seeped into adjacent apartments.¹³ These events illustrate the potential for inadvertent casualties associated with these suicides and highlight the need to educate ED providers regarding management of H₂S exposures.

Additionally, this study demonstrates a need for change in health policy to address the need for quicker dissemination of suicide statistics to prompt early implementation of prevention strategies. Furthermore, the fact that the majority of H₂S suicides were publicized on the internet or on television news highlights the responsibility of the media in disseminating perhaps more information than is prudent when discussing novel suicide techniques. There is a role for public health officials in addressing the manner and extent of such potentially destructive information when shared with the general public.

LIMITATIONS

This study is limited in that cases were referred by medical examiners on a voluntary basis only or when a publically available account (i.e. internet) could be attributed to the correct medical examiner. It is likely that there may be additional cases that were not captured in our query of medical examiners via listserv. Furthermore, it is also possible

that additional H₂S suicides occurred that were not reported in the media, and therefore not identified by Google searches. Analysis of the descriptive characteristics of these events was also limited by the lack of availability of full autopsy reports for 19 of the 30 victims.

CONCLUSION

To date, the incidence of suicide by intentional inhalation of homemade H₂S gas is probably underestimated by physicians and public health officials. It seems likely that we can expect these rates to increase as H₂S suicides are popularized in media coverage of these deaths and more websites appear offering guidance on this issue. Public health officials should be aware of this disturbing trend in order to implement plans for prevention of morbidity and mortality due to intentional H₂S exposure. Furthermore, first responders must be knowledgeable about these events to protect themselves when approaching a potential H₂S victim.

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