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Mass Psychogenic Illness Attributed to Toxic Exposure at a High School

To the Editor: Jones et al. (Jan. 13 issue)[1] describe a Tennessee high school whose students and teachers fell victim to a mass psychogenic illness. One should not assume that mass psychogenic illness was the cause, however, given the finding that "floor-drain traps in the index teacher's classroom (designed to keep gas out of the room) were noted to be dry and therefore not working."

Industrial hygienists are often summoned to investigate reports of odors in buildings. A common source is dry traps in floor drains. These U-shaped pipe bends, located beneath the floor, collect water and thus prevent sewer vapors from backing up into a room. In classrooms or other dry places, the water in these traps can evaporate over time, as occurred in this Tennessee high school. If volatile material (such as gasoline, laboratory solvents, or putrid material from "several grease and waste traps" in the school that were subsequently pumped out) enters the sewer, vapors can travel back up through the traps and into the building. Two thirds of those who became sick during the first episode reported an unusual odor; even persons who did not become ill reported an odor, and the odor was detected in more than 31 locations throughout the school.

Were there other dry traps in the school? If so, people who were closest to the drains and who were more susceptible[2,3] might have become sick first. Was the distribution of cases in the building similar for the two episodes? Were the same persons affected? Traps were refilled in the index classroom after the first outbreak, but what about drain traps in the rest of the school? Much of the salient environmental, blood, and urine testing appears to have been conducted one to several days after the outbreaks, long after volatile organic pollutants would have dissipated.

Claudia S. Miller, M.D.

University of Texas
Health Science Center
San Antonio, TX 78229-3900

Nicholas A. Ashford, Ph.D., J.D.
Massachusetts Institute of Technology
Cambridge, MA 02139

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To the Editor: Several sources of volatile toxins with neurologic effects were present at the outbreak of symptoms in the school, according to a report by the Environmental Protection Agency[1] and a report issued by the Nashville Public Schools and authored by Hatfield.[2] These investigations found a 1000-gal (3800-liter) grease trap that had been neglected since the school was built and that was "a tremendous source of odor/fumes." Gases from this trap and other sewer gases were exhausted from a 4-in. (10.2- cm) pipe on the roof a few feet away from the fresh-air intake of the air handler. Fumes from this trap would contain a mixture of gases, including hydrogen sulfide. The symptoms of exposure to hydrogen sulfide[3] are similar to the symptoms reported at the school. Brief exposure to hydrogen sulfide can be sufficient to induce injury. Hatfield concluded that the particular symptoms reported and the fact that most, but not all, persons' symptoms were alleviated once they were exposed to fresh air indicated that the symptoms were due to sewer gases. Also, an overflowing oil–water separator in the auto shop and a leak in the natural-gas supply were found.

I am concerned that no actual sampling data are presented. The fact that tests on later days showed low or undetectable levels of gases is not particularly meaningful, since entry of fumes from the exhaust pipe into the air handler would required a specific wind direction and velocity. Also, the fact that the traps were pumped out would make subsequent negative test results not meaningful. Jones et al. do not mention that ozone generators were used in an attempt to destroy the fumes in the school. Ozone at a concentration of 1 ppm causes lung injury and increases the permeability of the lung epithelium to other molecules,[4] thus perhaps contributing to the symptoms reported.

M. Dennis Goode, Ph.D.
University of Maryland
College Park, MD *20742*

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To the Editor: We cannot agree with Jones et al. that a physical trigger for the observed illness can be excluded. In spite of the extensive investigations, it remains possible that people in the school were exposed to potentially harmful substances, such as volatile organic compounds in the air.

Individual sensitivity to odor varies greatly, with girls and women often being more sensitive, and may be below the limit of laboratory detection.[1] A brief exposure from a passing plume might also elude detection. The timing and duration of environmental measurements are also crucial, since there may be large fluctuations in the concentration at different places in a dispersing plume of gas.[2]

The possibility of exposure to volatile organic compounds is consistent with both the reports of an odor and the reported symptoms. Swift recovery on removal from the source or treatment with oxygen, as described in the article, is also likely with exposure to volatile organic compounds. The reason for the lag between exposure and biologic sampling is not entirely clear, and this lag may be important, since some of these compounds have a half-life of only a few hours.[3]

Sources of pollutants may not be at all obvious. In 1997, a gasoline-like smell and upper respiratory tract symptoms were reported in Northern England and Wales.[4] Meteorologic modeling and results from the United Kingdom Hydrocarbon Monitoring Network indicated that the probable source, originally considered unlikely, was a spill of unleaded gasoline that had occurred several hundred miles away in the English Channel.

David Black, M.R.C.G.P., M.F.P.H.M.
Fiona Welch, B.Eng.
Virginia Murray, F.F.O.M., F.R.C.Path.
Guy's and St.
Thomas' Hospital *Trust*

London SE14 5ER,
United Kingdom

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To the Editor: Did Jones et al. carefully examine the patients who reported symptoms? Although routine laboratory tests were performed, as well as measurements of pseudocholinesterase and potential toxins, the patients themselves were apparently examined only by emergency room physicians. These tests would have been important because 91 persons reported having difficulty breathing, and 32 reported wheezing. Pulmonary-function and other tests were not performed. Tests that should have been repeated after several weeks (e.g., measurement of pseudocholinesterase) were not.

Jones et al. assume that negative results on environmental testing rule out the possibility of clinically significant symptoms and objective abnormalities in affected persons. This, in turn, is based on the assumption that environmental testing was thorough and that all samples were obtained at the right time and place. These assumptions may be unwarranted. Before concluding that mass psychogenic illness had occurred, the authors and appropriate specialists should have carefully examined the patients both at the time of the alleged exposure and several weeks afterward.

Gunnar Heuser, M.D.
NeuroMed and
NeuroTox Associates
Agoura Hills, *CA 91301*

To the Editor: In his editorial on the article by Jones et al., Wessely[1] reminds us that "psychogenic symptoms are physiologic experiences that are based on identifiable physiologic processes that cause pain and suffering" and are real even if anxiety causes them. I can understand the desire to reduce the stigma of having a psychogenic illness by pointing out that anxiety

can cause "real" symptoms. Yet I doubt that such an approach will reduce the embarrassment and defensiveness that most people feel when told that their physical symptoms were based on anxiety, especially when the source of the anxiety was a false belief. To become anxious during what is apparently a dangerous situation seems quite different from having anxiety in response to imagined danger. No sugarcoating hides the fact that, in the latter instance, the patient has been wrong and unrealistic.

Perhaps the best way to deal with individual persons and groups suffering from psychogenic illness is to confront this issue openly and to point out how easily we can be misled into having unrealistic anxiety, with its concomitant physical symptoms. Physicians fear doing that because of the embarrassment if they are proven wrong. We all hear stories of symptoms that were mistakenly attributed to anxiety, as if that incorrect diagnosis is worse than other mistaken diagnoses. Thus, some physicians avoid a straightforward diagnosis of anxiety-related illness through the use of euphemisms, such as "supratentorial," or negative diagnoses, such as "chest pain not due to heart disease." To help our patients overcome stigma, we should do so ourselves.

Arthur Rifkin, M.D.
Hillside Hospital
Glen Oaks, NY 11004

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The authors reply:

To the Editor: These letters raise important issues among the many considered during our investigation. We agree that the absence of proof of other causes is insufficient to confirm the diagnosis of mass psychogenic illness. Proposed explanations, however, should explain the overall epidemiologic characteristics of the outbreak.

Dry drains were identified in only two rooms, and they were filled after the first day. The oil–water separator was emptied after environmental testing, and no clear pathway of contaminants into the affected building was identified. Ozone air purifiers were reportedly used after the initial day of illness. Extensive efforts were made to identify potential sources of passing plumes of volatile organic compounds, under environmental conditions similar to those present during the outbreak. The practical constraints of conducting an epidemiologic investigation of an acute outbreak under uncontrolled circumstances precluded systematic long-term medical follow-up. Medical examinations were left to the discretion of patients and their physicians. The possible benefits of additional testing must be weighed against potential adverse effects[1] in the aftermath of an outbreak with an acute onset and rapid resolution.

It seems unlikely that the suggestions of the letter writers would explain the overall outbreak. People reported the onset of symptoms in rooms with independent air-handling systems, when they were away from the school, and on days when some proposed sources were not present.

Although no environmental cause for the inciting event in this outbreak was identified, the factors suggested by the letter writers could have contributed to some reports of odors or symptoms. No level of subsequent testing can disprove this possibility, and we would not argue to the contrary. The cause of odors or symptoms in an index patient or subgroup may differ from the cause of subsequent widespread illness. In our judgment, none of these proposed explanations adequately explain the epidemiologic characteristics of the overall outbreak. Regardless of the cause of the initial event, the epidemiologic characteristics of the subsequent illnesses remain most consistent with a diagnosis of mass psychogenic illness.

These comments highlight the complexities of episodes of possible mass psychogenic illness.[2] They invariably involve difficult decisions about how much investigation is enough. No extent of testing can eliminate the possibility that evidence of transient exposures may have been missed. Epidemiologic observations must be considered and balanced against the risks of overtesting and concern about the appropriate use of resources. It is our hope that as understanding of such outbreaks improves, responding to them may be easier in the future.

Timothy Jones, M.D.
Allen Craig, M.D.
Tennessee Department of *Health*
Nashville, TN 37247

William Schaffner, M.D.
Vanderbilt University
School of Medicine
Nashville, *TN 37235*

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