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## Epidemic of Acute Illness--West Bank

The Centers for Disease Control received a request through the U.S. Department of State to provide a team of physicians to investigate a health problem on the West Bank. The following is a report of the findings.

From March 21 to April 3, 1983, 943 cases of an acute, non-fatal illness characterized by headache, dizziness, photophobia, blurred vision, abdominal pain, myalgia, weakness, difficulty breathing, fainting, mydriasis, and peripheral cyanosis occurred in residents of communities throughout the West Bank. Six hundred sixty (70%) of patients were school girls between the ages of 12 and 17 years. Clinical, epidemiologic, and toxicologic analyses indicated the illness was of psychogenic origin and was induced by stress. The outbreak, which began at a girls' secondary school, may have been triggered by the odor of low concentrations of hydrogen sulfide (H<sub>2</sub>S) gas near the school.

To evaluate the clinical features of the illness and possible antecedent risk factors, a questionnaire interview of 124 patients and 57 age- and sex-matched controls from two affected villages was conducted. In the northern village of Arrabah, site of the initial outbreak, 58 (95%) of 61 affected school girls and four affected adults participated in the study; at Yattah, in the southern West Bank, 56 (64%) of 88 affected high school girls and six affected adults participated. The most frequently reported symptoms were headache (98%), dizziness (96%), and abdominal pain (76%)(Table 1). Patients reported no common exposures to food, drink, or agricultural chemicals. Eight (15%) of 54 patients at Arrabah and 50 (89%) of 56 at Yattah reported having noted an unusual odor before onset of illness; the odor was most frequently described as resembling rotten eggs. Eight of 25 controls reported an odor. No differences were found between cases and controls in perceived antecedent health status, school performance, or frequency of school absenteeism.

Sinus tachycardia, mild hypertension, hyperventilation, mydriasis, and peripheral cyanosis were commonly observed in early stages of illness. Detailed general physical and neurological examinations performed 2-12 days after onset of illness on 20 patients with persistent symptoms showed no demonstrable abnormalities. Although all these patients had difficulty walking, none had muscle weakness, sensory abnormalities, or cerebellar dysfunction. Clinical laboratory determinations, including hematologic indices, serum electrolyte concentrations, liver- and kidney-function tests, serum cholinesterase activity, and muscle enzyme levels

showed no consistent patterns of abnormal values. Electromyography was performed on four severely symptomatic patients and was within normal limits for all four.

Epidemiologic assessment indicated that cases had occurred in three waves (Figure 1). The first wave at Arrabah began at approximately 8:00 a.m. on March 21, when a 17-year-old student experienced a sensation of throat irritation and had difficulty breathing shortly after entering her classroom. Subsequently, she developed headache, dizziness, and abdominal pain and was sent home. Over the next 2 hours, an additional six students in the tenth and eleventh grades and an eleventh-grade teacher developed similar symptoms. Two of these students reported having noticed an odor resembling rotten eggs. At 10:00 a.m., local public health authorities arrived at the school in response to an emergency call. On the basis of the students' reports of odor, they suspected the presence of a toxic gas and immediately instituted a widespread but unsuccessful search for the source of gas. During the search, an additional 17 students developed symptoms. At 11:00 a.m., the school was closed. Additional cases occurred during the afternoon of March 21 and over the next 3 days. Examination of the case incidence pattern at the Arrabah school showed no clustering of cases in any area of the building.

The second wave of illness occurred March 26-28 in the city of Jenin, northern West Bank, and in surrounding villages. Although the majority of these cases (246/367, (67%)) again occurred among school girls, cases also developed in persons of all age groups and both sexes in an area of east Jenin after local residents observed a car moving through the streets emitting a thick cloud of smoke. Another four cases occurred in Jenin among Israeli Defense Force soldiers. The third wave of illness occurred April 3. Most of those cases occurred in the area of Hebron, southern West Bank, and included the cases at Yattah. Following the April 3 outbreaks, schools were closed throughout the West Bank, and no additional cases were reported.

Environmental studies were performed to evaluate possible toxic etiologies. Air samples, collected at the school in Arrabah and at other outbreak sites, were analyzed for carbon monoxide, total airborne hydrocarbons, oxides of nitrogen, H<sub>2</sub>S, sulfur dioxide, and methane. Low concentrations of H<sub>2</sub>S (16-50 parts per billion (ppb)) were found in an outdoor latrine adjacent to the girls' school in Arrabah; H<sub>2</sub>S concentrations in the subjacent percolating pit ranged from 200 to 350 ppb; methane and airborne hydrocarbons were also found there. No other airborne toxins were found. Soil and dust samples, screened at CDC by gas chromatography and bioassay, were analyzed chemically for the presence of organophosphates. No toxins were detected in any of these samples. Various objects, suspected by residents in affected villages as having possibly caused illness, were subjected to toxicologic study. A yellow powder from the schoolyard at Arrabah was identified microscopically as pollen. Powder from a tin at the Yattah schoolyard was found to be calcium carbonate. Residue in a cola can from the school at Yattah was identified as cola. No toxins were detected in those or in other fomite samples. In addition, gas chromatographic, mass spectroscopic, and emission spectrographic analyses were performed at CDC on 34 serum, 10 whole blood, and five urine samples collected from patients and on 21 serum samples from controls. Although low concentrations of chlorinated hydrocarbon pesticides have been tentatively identified in sera of several patients, no consistent patterns of any environmental toxins were evident, and no consistent differences were found between cases and controls. Reported by Div of Surveillance, Hazard Evaluations, and Field Studies, National Institute for Occupational Safety and Health, Div of Viral Diseases, Center for Infectious Diseases, Toxicology Br, Clinical Chemistry Div, Center for Environmental Health, CDC.

## Editorial Note

Editorial Note: Data collected in these investigations indicate that the West Bank epidemic was triggered either by psychological factors, or, more probably, by the odor of low, sub-toxic concentrations of H<sub>2</sub>S gas escaping from a latrine at the secondary school in Arrabah. Subsequent propagation of the outbreak was mediated by psychological factors, occurred against a background of anxiety and stress, and may have been facilitated by newspaper and radio reports that described the symptoms in detail and suggested strongly that a toxic gas was the cause. The epidemic was probably terminated by the closing of West Bank schools.

Negative evidence in support of the diagnosis of stress-induced illness was provided by normal physical examinations, including those of patients in considerable distress, by normal results of clinical laboratory studies, and by negative findings of toxicologic analyses. All objectively demonstrable findings on physical examination--mydriasis, peripheral cyanosis, mild hypertension, and sinus tachycardia--were compatible with a state of stress-induced anxiety.

Positive support for the diagnosis of stress-induced disease was provided by clustering of cases among adolescent women. Although the underlying psychodynamics have not been adequately explored, such a skewed age-, sex-distribution has frequently been observed in epidemics of stress-induced illness (1,2). Also, the evolution of the pattern of illness was consistent with a diagnosis of stress-induced disease. Although patients in the first outbreak appeared to have been the most severely ill, their illnesses were less constant in pattern than those of patients affected later. For example, 15% of patients at Arrabah noted an odor, contrasted with 89% at Yattah. Previous studies of psychogenic illness outbreaks have emphasized that perception of strange odors or gases by affected individuals has frequently preceded onset of illness (1). Also at Arrabah, the outbreak proceeded in a rather leisurely fashion with a slow beginning, a short peak perhaps occasioned by excitement of the search for gas, and a long continuation phase. By contrast, at Yattah, virtually all cases developed in the span of 2 hours. Such patterns suggest the existence of a subconsciously learned response (1).

No evidence was encountered to indicate that patients had deliberately or consciously fabricated their symptoms. Evidence against malingering was provided by normal findings on physical examination. Also, despite numerous press reports that affected students would be rendered sterile, no evidence suggested that reproductive impairment would result from this epidemic.

## References

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