

**NEWS**Frank Bryant, Jr. MD, FAAFP
Chairman
Texas Board of HealthRobert Bernstein, MD, FACP
Commissioner**contents:****NON-CIRCULATING**Gastrointestinal Illness in an
Intermediate School
Communicable Disease Reports Due**Bureau of Disease Control and Epidemiology,
1100 West 49th Street, Austin, Texas 78756 (512-458-7455)****GASTROINTESTINAL ILLNESS IN AN INTERMEDIATE SCHOOL****INTRODUCTION**

On November 12, 1987, the Infectious Diseases Program, Epidemiology Division, TDH, was contacted by the TDH Food and Drug Division regarding an apparent outbreak of gastrointestinal illness in a public school in Central Texas. Fourth and fifth graders attending an intermediate school were experiencing nausea, vomiting, and diarrhea. Some of the affected schoolchildren had become ill during the evening of November 11 and had remained home from school on November 12, whereas others had come to school on November 12 and become ill while there. Personnel at the Public Health Region (PHR) 1 office in Temple had been notified by the school and were waiting to coordinate their response with the Infectious Diseases Program.

BACKGROUND

This intermediate school, located in a town with an estimated population of 5,000, is one of five schools in the school district. The school has a total enrollment of 688 fourth and fifth graders. The primary school, located directly across the street from the intermediate school, has a total enrollment of over 800 kindergarten and first grade students.

The intermediate school is a new facility with its own cafeteria and kitchen. Approximately 350 breakfasts and 1,200 lunches are served each day, and all foods are prepared on site. Primary school students eat lunch at the intermediate school cafeteria from 10:30 AM to 11:40 AM; intermediate school students eat from 11:50 AM to 1:00 PM. Students either bring their lunches from home or eat from the serving line; intermediate students may also eat from a separate snack line.

The school nurses at both the primary and intermediate schools reported that, on an "average" day, 20 to 30 children were absent. On November 12, the nurse at the primary school indicated that an estimated 25 children were absent. However, 87 children at the intermediate school had been counted as absent by 10:30 AM when the official attendance was taken; still others had gone home ill after that time. The official absentee rate for November 12 was 12.6% (87/688) in the intermediate school, three to four times higher than expected.

METHODS

On November 13, a questionnaire was distributed to all students, faculty, and staff at the intermediate school. The questionnaire listed food items served at breakfast and lunch from November 9 to November 11 and asked about symptoms and time of onset of gastrointestinal illness. A sample cover letter was provided to school officials to accompany the questionnaire. Students in the primary school did not appear to be affected by this illness and were excluded from the survey. In addition, PHR 1 sanitarians conducted an inspection of the food preparation facilities at the intermediate school as well as a general inspection of other kitchens in the school district.

A case was defined as a student, teacher, or other staff member who experienced diarrhea for ≥ 24 hours OR diarrhea (of shorter duration) or vomiting and one additional gastrointestinal symptom after November 9, 1987.

RESULTS

Completed questionnaires were obtained from 427 students and four teachers, a total return rate of approximately 62%. Ninety individuals (87 students and 3 teachers) met the case definition. Symptoms experienced by the cases included: diarrhea (98%), abdominal cramping (81%), nausea (52%), tired or run down feeling (50%), headache (39%), loss of appetite (37%), vomiting (30%), and fever (22%). The reported duration of illness ranged from two hours to four days with a mean of 30.4 hours. The median duration of illness was 24 hours.

Although analysis of food-specific attack rates identified no association between illness and any one food item, eating from the serving line on November 11 was highly associated with illness ($p < 0.000001$, Table 1). [Although other meals were also significantly associated with illness ($p < 0.05$), the November 11 meal had the strongest association.] Food items available from the serving line on November 11 included frito pie with chili, pinto beans, tossed green salad, lime jello, bread, and milk. Conversely, students who brought their lunch from home on November 11 were least likely to have become ill ($p < 0.000001$). Only one of 42 individuals who brought their lunches from home on November 11 became ill, whereas 87 of 133 who ate foods from the serving line on November 11 developed a gastrointestinal illness.

Because eating from the serving line on November 11 was clearly associated with illness yet no specific food item was implicated, further analysis was required. Students and teachers (cases and controls) were grouped according to their most likely times of exposure (lunch periods). Time of exposure was significantly associated with illness as demonstrated by the chi-square test for trend ($p < 0.000001$, Table 2). That is, the later that lunch was eaten, the more likely one was to become ill.

Of the 90 cases, the earliest onset of symptoms occurred on the evening of November 10 (Figure 1). This case was excluded from further analysis since the apparent meal in question was served on November 11. The latest case experienced onset of symptoms November 16 and was most likely unrelated to the November 11 meal. The majority of cases became ill on November 12. If exposure did in fact occur on November 11, the median incubation period was 16 hours.

The food service inspection revealed that the warming trays in the school cafeteria were unable to maintain an appropriate temperature to prevent toxin production in the food. In addition, there were not enough heating units in the cafeteria to keep all hot foods hot after cooking. None of the cooked food items served on November 11 were available for laboratory testing.

DISCUSSION

The incubation time, symptoms, and clinical course of illness suggest gastroenteritis caused by a toxin, such as those elaborated by *Bacillus cereus* or *Clostridium perfringens*. Toxin-induced illness is manifested by a relatively short incubation period, gastrointestinal symptoms without fever, and a short duration of illness. In comparison, bacterial gastroenteritis is usually accompanied by fever and a longer duration of symptoms; viral illnesses generally have longer incubation periods.

Cl. perfringens gastroenteritis is characterized by sudden onset of abdominal pain followed by diarrhea; nausea is common, but vomiting and fever are usually absent. Generally, the duration of illness is short, one day or less. The incubation period ranges from six to 24 hours, usually 10 to 12 hours. Outbreaks often are associated with inadequately heated or reheated meats such as stews, meat pies, or gravies made of beef, turkey, or chicken. Spores survive normal cooking temperatures, germinate, and produce toxins during slow cooling, storage at ambient temperatures, and/or inadequate rewarming. Outbreaks have been traced to food catering firms, restaurants, cafeterias, and schools which have inadequate cooking and refrigeration facilities for large-scale service. Heavy bacterial contamination ($>10^5$ organisms/g of food) is usually required for clinical disease.

B. cereus gastroenteritis is characterized in some cases by sudden onset of nausea and vomiting and in others by abdominal cramping and diarrhea. Duration of illness is usually less than 24 hours. Two enterotoxins of *B. cereus* have been identified--one is heat-stable causing vomiting, and one is heat-labile causing diarrhea. Where vomiting is the predominant symptom, the incubation period ranges from one to six hours; however, where diarrhea is predominant (as in this outbreak), the incubation period is six to 16 hours. As for *Cl. perfringens*, foods which have been kept at ambient temperatures after cooking permit the multiplication of organisms, and meat dishes mishandled after cooking are often responsible for illness.

All foods were prepared in one kitchen, and the primary school students ate the same food items as the intermediate school students. However, additional chili reportedly had been added to the frito pie prior to its being served to the intermediate school students. If the frito pie were the responsible food item, this would help explain why the primary school students did not become ill. That is, the longer the chili/frito pie was held at inadequate temperatures, the more toxin was produced.

GENERAL RECOMMENDATIONS

1. Foods cooked in advance and kept "hot" must be held at a degree of heat which will provide a minimum temperature of 140°F throughout each particle of food.
2. Cooked foods should be reheated rapidly to $\geq 165^{\circ}\text{F}$ before placement on a steam table.
3. Prepared foods should be kept in shallow pans to assure adequate and thorough heating.
4. Foodhandlers should wash their hands before handling cooked food items, after handling raw foods, and after using the toilet.

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Table 1.
Attack rates for intermediate school students by source of lunch,
November 9-11, 1987

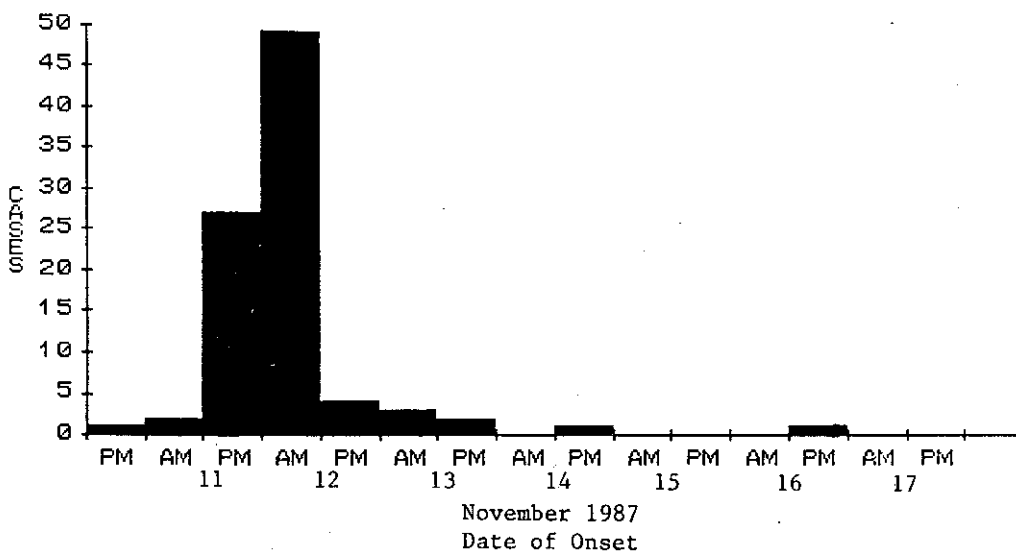
| SOURCE OF LUNCH | CASES | | | CONTROLS | | | p= |
|-----------------|-------|----|-------------|----------|----|-------------|----------|
| | Yes | No | Attack Rate | Yes | No | Attack Rate | |
| Home: | | | | | | | |
| November 9 | 16 | 74 | 18% | 38 | 65 | 37% | 0.0053 |
| November 10 | 14 | 76 | 16% | 38 | 65 | 37% | 0.0015 |
| November 11 | 1 | 89 | 1% | 41 | 62 | 40% | 0.000001 |
| Serving Line: | | | | | | | |
| November 9 | 64 | 26 | 71% | 50 | 53 | 49% | 0.0024 |
| November 10 | 67 | 23 | 74% | 50 | 53 | 49% | 0.0004 |
| November 11 | 87 | 3 | 97% | 46 | 57 | 4% | 0.000001 |

Table 2.
Reported illness by time of exposure,
Intermediate School, November 11, 1987

| Time of Exposure | # of Cases | # of Controls | % Ill |
|------------------|------------|---------------|-------|
| 11:55 AM | 1 | 8 | 11% |
| 12:00 NOON | 0 | 6 | 0 |
| 12:10 PM | 1 | 2 | 33 |
| 12:15 PM | 3 | 12 | 20 |
| 12:25 PM | 26 | 7 | 79 |
| 12:35 PM | 21 | 5 | 81 |
| 12:40 PM | 17 | 2 | 89 |
| 12:45 PM | 15 | 3 | 83 |

(Chi-square = 33.00073, p = 0.000001)

Figure 1. Outbreak of gastrointestinal illness by date of onset, Intermediate School, November 1987



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COMMUNICABLE DISEASE REPORTS DUE

The official statistical cut-off date for communicable disease reports from 1987 will be February 29, 1988. Please forward all reports of cases with dates of onset in 1987 to the Bureau of Disease Control and Epidemiology, 1100 W. 49th Street, Austin, Texas 78756-3180, before that date.

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