disease prevention news

November 10, 1997

Vol. 57, No. 23

Cooperative Management of a Foodborne Disease Outbreak Involving *Bacillus cereus*

In midafternoon on January 14, 1997, citizens began to call the Lubbock City Health Department (LCHD) complaining that they had become ill after eating at a local restaurant. The following article describes the cooperative partnerships involved in resolving this outbreak and provides a timeline of events. The prompt containment of this outbreak illustrates the importance of having an effective public health surveillance system already in place. Surveillance activities and accompanying laboratory support were instrumental in determining the factors that contributed to the outbreak.

Twenty of the 28 customers (72%) who ate lunch at the restaurant were available for interview; the remainder could not be located. The 20 identified customers were asked to provide demographic information and information regarding symptoms, onset and duration of illness, and food history. A case-patient was defined as anyone who had experienced vomiting or diarrhea within 6 hours of dining at the restaurant. Nineteen (95%) of the 20 customers interviewed met the case definition, for a minimum attack rate of 68% (19/28).

The 19 case-patients consisted of 8 males, ranging in age from 25 to 76 years, and 11 females aged 4 to 74 years. A few of the patrons became ill while still at the restaurant. The incubation period ranged from under 30 minutes to 2.5 hours. Seven (37%) of the 19 case-patients sought medical treatment at local emergency rooms on January 14, the day of exposure; all 7 were given antiemetics and intravenous rehydration. None were hospitalized.

Analysis of the association of specific foods with illness demonstrated the following results. Of the 19 customers who became ill, all had eaten fried rice, mixed vegetables, and soup; 15 (79%), chicken; 9 (47%), brown mustard sauce; 5 (26%), fish; 5 (26%), steak; 4 (21%), shrimp; 3 (16%), egg rolls; and 3 (16%), salad (Figure 1). Of the 20 customers interviewed, the one who did not become ill had also eaten the fried rice, the mixed vegetables, the chicken and the salad. The lack of food histories for the well customers make it impossible to statistically associate any food item with illness. Since, however, only fried rice, mixed vegetables, and soup were eaten by all the ill persons, the epidemiological evidence suggests one of these items as the most likely vehicle of transmission.

Figure 1. Food Items Eaten by Ill and Not Ill Customers

Food Item	No (%) Ill Who Ate Food Item		Eaten by the One Well Customer?
Fried Rice	19	(100%)	Yes
Mixed Vegetables	19	(100%)	Yes
Soup	19	(100%)	No
Chicken	15	(79%)	Yes
Tea	13	(68%)	No
Mustard Sauce	9	(47%)	No
Steak	5	(26%)	No
Trout	5	(26%)	No
Alcoholic Beverage	4	(21%)	No
Shrimp	4	(21%)	No
Egg Roll	3	(16%)	No
Salad	3	(16%)	Yes
Water	3	(16%)	No
Soft Drink	2	(11%)	No

Continued ☞

Timeline of Events

Day 1. On January 14, 1997, calls to the health department began to come in at 3:40 PM from citizens who had become ill that day after eating lunch at the same local restaurant. The LCHD Surveillance Section notified sanitarians in the Environmental Inspection Services (EIS) Section. By 6:00 PM several ill people had reported to the emergency departments of two local hospitals. Infection control nurses from these emergency departments contacted the Surveillance Section around 6:20 PM. By 7:30 PM, EIS had responded and had begun a restaurant inspection. No obvious infractions, such as out-of-range temperatures, were noted during this initial visit.

Day 2. The Surveillance Section began contacting other clinics and emergency rooms for additional cases and also began contacting and interviewing patients (eg, home visits, case finding, stool collection). EIS collected food samples from the restaurant and began reviewing sales receipts to identify additional lunch customers. The laboratory began preparing specialized media.

Day 3. Because the incubation period appeared to be quite short, EIS collected nasal swabs from restaurant staff to look for a possible *S. aureus* carrier. Laboratory Services began plating food; gram stains showed gram positive rods, the first hard evidence of the causative agent.

Day 4. LCHD Laboratory Services began precursor examination of plated food samples, performed presumptive plate counts, and began preparing confirmatory test media. EIS met with the restaurant manager.

Days 5-8. The laboratory confirmation test procedures were conducted. *Bacillus cereus* was confirmed in both the food and stool samples.

Day 9. Isolates were sent to Silliker Laboratories in Chicago for diarrhea toxin study and to the Texas Department of Health in Austin for pulsed field gel electrophoresis (PFGE) tests.

Follow up. Samples were sent to the Federal Drug Administration laboratory in Denver for toxin study and were forwarded to the Centers for Disease Control and Prevention (CDC) for a polymerase chain reaction (PCR) study to detect genes responsible for toxin production.

Environmental Inspection Services

Two clinical syndromes are associated with *B. cereus* food poisoning. Both syndromes are caused by toxins released by the bacteria. A diarrheal syndrome with an incubation period of 10 to 12 hours is associated with a heat-labile toxin. An emetic syndrome with an incubation period of less than 6 hours is associated with a heat-stable toxin.

Of the 3 food items (fried rice, mixed vegetables, and soup) eaten by all the ill patrons, fried rice was targeted for initial investigation as the most likely vehicle of transmission because

- the short incubation periods suggested *B. cereus* as the etiological agent, and
- cooked rice is a frequent vehicle for *B. cereus* foodborne illness.

The LCHD Environmental Inspection Services (EIS) focused on rice preparation and storage in the restaurant as factors that may have contributed to this outbreak. At the time of the investigation, the establishment cooked large quantities of rice in a steamer where it was held at 170°F until served. The initial EIS inspection did not show any deviation from this critical control point (CCP). At the end of the day, any unused steamed

Continued ☞

rice was placed into a container, cooled, and stored in a walk-in refrigerator. The next day portions of this rice were reheated for individual orders of steamed rice or grilled for orders of fried rice.

Evaluation of the restaurant's food preparation practices indicated two critical control points at which the rice could have become contaminated. The unused steamed rice may accidentally have been left out at room temperature overnight and never refrigerated. Another possibility is that the large size of the pans used in this process may have prevented the warm rice from cooling properly even if it was refrigerated overnight. EIS recommended that shallower pans and/or ice baths be used to rapidly cool the rice.

Laboratory Results

To confirm involvement of a suspect food, the same organism or toxin must be found in epidemiologically implicated food as is found in specimens from patients. Laboratory samples should be taken from the implicated food, and the symptoms reported by the ill persons should be consistent with those produced by the agent that is being isolated from the implicated food. Incubation periods and symptoms dictate what tests are to be performed by the laboratory. Onset periods of 0.5 to 2.5 hours with symptoms of nausea, vomiting and diarrhea indicated an intoxication rather than infection. Because these symptoms were most consistent with either *Staphylococcus aureus* or *B. cereus* food poisoning, these two organisms were targeted for the investigation.

Ten food samples collected for analysis included a mixed meal, leftover rice, steamed rice, uncooked rice, soup, zucchini, salad dressing, chicken (raw), and butter. All samples except those from the raw chicken and the butter were initially cultured for *B. cereus* on Mannitol-Egg-Yolk-Polymyxin (MYP) agar and for *S. aureus* on Baird-Parker agar. Of the 10 food samples, 2 grew *B. cereus* in significant numbers: a leftover mixed meal sample grew 16,000,000 colony forming units per gram, and a leftover rice sample grew 18,000 CFU/G.

Of 4 stool samples set up on blood agar, all grew 4+ *Bacillus cereus*. In addition, nasal samples from employees of the restaurant were collected for *Staph aureus* screening; all 6 swabs tested negative. Although toxin can sometimes be demonstrated in vomitus samples, none were collected.

Isolated bacterial samples sent to Silliker Laboratory in Chicago for diarrheal toxin detection by enzyme immunoassay (EIA) came back as negative. This finding is not surprising since most outbreaks in which rice is implicated involve emetic toxin rather than diarrheal toxin. What was unusual about this outbreak, however, was that most of the case-patients exhibited both vomiting and diarrhea, even though it is uncommon for diarrhea to be associated with emetic toxin.

Ten food sample isolates and 4 stool sample isolates were sent to the TDH Bureau of Laboratories in Austin for PFGE; a method of analyzing bacterial chromosomal DNA patterns to determine "relatedness" of isolates. All isolates sent to TDH for genotyping exhibited indistinguishable DNA banding patterns.

In conclusion, laboratory results indicated that *B. cereus* was present in the fried rice sample at levels high enough to cause food poisoning. Levels of *B. cereus* in the leftover steamed rice strongly indicated the potential for food poisoning. The

Continued ☞

classic symptoms the patients experienced and the 4+ growth of *B. cereus* from their stool samples indicate that *B. cereus* toxins were responsible for the illness. The epidemiological data and the laboratory results, particularly the indistinguishable genotypes identified in the food isolates and stool isolated, indicate the rice was the most likely source of infection.

Economic Impact

...case-patients lost 73 hours of work to sick leave, which amounts to $970 in lost wages.

The following cost data are included to underscore the importance of maintaining, or even increasing, the food safety efforts of health agencies and the quality control efforts of the food industry. The costs below do not include any figures for the outbreak investigation itself (eg, laboratory staff salaries, laboratory media/ equipment, shipping, or epidemiology staff salaries). Other direct costs such as lost sales or legal liability suits for the restaurant are not available. Economic impact not accounted for in this total includes the indirect costs of such factors as lost leisure time for the patients as well as stress, travel, and disruption of normal routine for the patients' family members.

As a result of this outbreak, case-patients lost 73 hours of work to sick leave, which amounts to $970 in lost wages. Case-patients also missed 12 hours of school. Medical costs totaled $4,248.

Discussion

The Lubbock City Health Department (LCHD) was restructured in 1995 to include a Surveillance Section. To foster an appreciation and understanding of disease prevention in the community, the LCHD Surveillance Section established the Consortium for Health in the City, which is composed of infection control personnel from all major hospitals and clinics, sanitarians, laboratory personnel, and all other health personnel interested in disease prevention and surveillance. The Consortium meets quarterly and publishes a newsletter about the incidence of communicable diseases in Lubbock. To simplify the reporting process, all communicable disease that occur in the City are reported to one centralized number on a 24-hour basis.

Prompt handling and referral of food-related complaints and illnesses are foundations for a successful investigagation. It is a credit to the Lubbock City Health Department that the major elements were in place for a rapid response (eg, surveillance and communications networks, local sanitarians, and complete laboratory support for isolation and identification).

Prepared by Tommy Camden, Laboratory Services Manager, Lubbock City Health Department

Acknowledgements
Thanks are extended to Tigi Ward, LCHD Surveillance Manager; Kevin McClaran, LCHD Microbiologist II; Mark Keefer, LCHD Environmental Inspection Services Coordinator; Dr. Suzanne Barth, Director, Microbiological Services, TDH Bureau of Laboratories; local hospital infection control personnel; and numerous support personnel for their valuable assistance with this successful investigation.

EpiNotes

First Cholera Case Reported Since 1995

A 65-year-old Hispanic woman was admitted to Mercy Regional Hospital in Laredo, Texas, on October 13. *Vibrio cholerae* O1 was not initially suspected as a cause of her diarrhea. However, the hospital laboratory identified *V. cholerae* during a routine stool culture. The Laredo City Health Department Laboratory identified the *V. cholerae* as serotype O1, which was confirmed by the Texas Department of Health Bureau of Laboratories. The woman recovered from her illness and was discharged from the hospital on October 15. The source of her exposure is still under investigation at this time. She had traveled to Nuevo Laredo, but the dates are uncertain. She may have brought back shrimp and water from Mexico when she returned home. She lives alone, and no other cases have been identified.

This is the first case of cholera reported in Texas since April 1995. Good sewage and water systems will protect most United States residents. However, more than 200,000 persons are estimated to live in colonias along the South Texas-Mexico border, where a large proportion of the residents have inadequate drinking water and sewage systems. If cholera is introduced into the colonias, it could easily spread within entire families and their individual colonias. Boiling or home chlorination of water is recommended for persons whose drinking water comes from sources that are unprotected and not chlorinated.

Individuals who travel to Central or South America should use the usual precautions to avoid traveler's diarrhea. It is particularly important to avoid raw or undercooked seafood, including ceviche, food and beverages from street vendors, uncooked vegetables and fruits (unless peeled by the traveler), and ice in beverages. Travelers should use boiled/treated/bottled water to brush their teeth and drink only bottled water, hot tea, hot coffee, bottled carbonated beverages, or alcoholic beverages without ice. Food that is steaming hot in the center is invariably safe. Travelers should not bring seafood back home with them. Travelers developing severe watery diarrhea during or in the week following travel through epidemic areas should seek medical attention immediately and advise the physician of their recent travel.

The treatment for cholera is supportive and should precede identification of the organism. Severe cholera may cause fluid losses in excess of 10% of body weight. Cholera deaths can be prevented by the aggressive administration of IV and oral rehydration fluids, which will correct the dehydration, shock, and acidosis. Antibiotic treatment will lessen the duration of illness.

Only 1% to 2% of persons infected with *V. cholerae* O1, biotype El Tor have diarrhea severe enough to require IV therapy; 5% have milder dehydration that may be treated with oral rehydration solutions (ORS); and 18% have very mild symptoms. The remaining 75% of persons infected with this biotype are usually asymptomatic. In patients with diarrhea, a history of travel to Central or South America is additional reason to suspect cholera.

Health-care providers should report suspect or confirmed cases of cholera to their local health department immediately.

Individuals who travel to Central or South America should use the usual precautions to avoid traveler's diarrhea.

Epinotes Continued ☞

Infectious Diseases Case Reports Increase in Mexico This Year

According to the Secretary of Health of Mexico, as reported in *ProMED* (Internet Program for Monitoring Emerging Diseases), significant increases in the numbers of reported cases of many infectious diseases have been recorded in 1997, as compared with 1996. Some of this increase could reflect increased emphasis on disease reporting by public health officials in Mexico. The Ministry of Health is encouraging improved reporting of infectious disease in Mexico, and the Director General of Statistical Analysis and Information for the Secretary of Health has made changes recently in the criteria for publication of disease statistics.

A review of selected diseases reported in *Epidemiologia, Vol. 4, No. 21, May 18-24, 1997* through Week 19 (May 4-10, 1997), shows increases in reported cases of dengue fever (31%), typhoid fever (55%), and hepatitis A (266%) in Mexico in 1997, as compared with the number of cases reported in 1996 (Figure 1).

Figure 1. Increase in Selected Diseases Mexico: 1996 to 1997

Disease	No. 1996	No. 1997	% Increase
Amebiasis	187,933	344,039	83
Giardiasis	11,751	17,987	53
Hepatitis A	1,586	5,808	266
Shigellosis	6,002	8,450	41
Typhoid Fever	1,620	2,507	55
Rubeola	6,198	9,309	50
Varicella	30,616	75,162	145
Gonorrhea	3,444	4,588	33
Dengue Fever	983	1,290	31

Changes in reporting criteria make it difficult to obtain consistent, highly accurate data from which to compare reported disease statistics from one year to the next. In spite of these limitations, available data clearly indicate that many communicable diseases, especially enteric diseases, are highly prevalent in Mexico. Therefore, Texans traveling in Mexico (and other developing countries) **must** exercise caution when eating and drinking. In developing countries, public water supplies are **not** safe to drink; fresh fruits and vegetables, washed with local water and not subsequently cooked, are also potentially contaminated.

Cholera, introduced into the Western Hemisphere in Peru in 1991, has become endemic throughout Latin America. In Mexico cholera is associated with both contaminated drinking water and raw/undercooked seafood; the few Texans who have acquired cholera in Mexico have been exposed through consuming seafood.

Health-care providers are reminded to consider water- or foodborne illness in patients who plan to travel or have a recent history of travel to Mexico (or to other developing countries). Chemoprophylaxis to prevent diarrhea is not recommended for most travelers. However, all travelers to high-risk areas should have effective therapeutic agents available for diarrhea associated with abdominal pain or cramps or fever. A flouroquinolone antibiotic is the drug of choice for most adults traveling to developing countries.[1]

Malaria presents a limited threat for most travelers in Mexico: 10 Texans acquired malaria during the summer of 1985 while vacationing in resorts above and south of Acapulco Bay. (See *Texas Preventable Disease News, Vol. 45, No. 29, July 20, 1985* and *MMWR Vol. 34, No. 30, August 2, 1985.*) Chemoprophylaxis against malaria is recommended only for travelers to remote rural areas of selected Mexican states.[2]

Dengue fever, however, is widespread in Mexico. The primary prophylaxis CDC recommends for both these mosquito-borne diseases is to prevent insect bites. Travelers are encouraged to use an insect repellent containing 30% to 35% diethylmetatoluamide (DEET) whenever they are exposed to mosquitos.[2]

Continued ☞

The significant damage to Mexico's Pacific coast caused by Hurricane Pauline has created environmental conditions favorable for increased foodborne and insect-borne infections. These conditions are expected to continue and perhaps even worsen with the anticipated arrival of El Nino. Therefore, Texans traveling in affected areas should intensify their precautions to protect themselves from insect bites and from contaminated food and drink.

References

1. Dupont HL, Ericsson CD. Prevention and treatment of traveler's diarrhea. New Eng J Med 1993;328:1821-1827.

2. CDC. Health Information for International Travel 1996-97. Atlanta: US Public Health Service, December 1996.

Dengue Fever at the Border

Dengue has been confirmed in an 18-year-old El Salvadoran man who arrived in the United States on September 29, 1997, and experienced onset of illness on that date. He was hospitalized in Harlingen.

Dengue virus activity has been reported throughout Central America and Mexico. Sporadic cases have been reported from several Mexican cities on the Texas border (Matamoros, Reynosa, and Nuevo Laredo).

Increased Shigellosis Activity in Victoria County

Over 60 shigellosis cases have occurred in Victoria County since August 1, 1997. One patient had a *Shigella flexneri* infection; the remaining patients have had *Shigella sonnei* infections. Three separate outbreaks have been identified. Two outbreaks involved day-care center children and their parents. The third outbreak involved elementary school students. Shigella organisms have been resistant to amoxicillin/clavulanate, ampicillin, cefuroxime, trimethoprim/sulfamethoxazole, and tetracycline and sensitive to amikacin, ceftriaxone, ciprofloxacin, and gentamicin.

For medical advice on treatment of these diseases, contact Kate Hendricks, MD, at (512) 458-7676. For travel advisories or for further information regarding statewide activity of these diseases, call the Infectious Disease Epidemiology and Surveillance Division at (512) 458-7676.

TDH Audiovisual Library

The Texas Department of Health Audiovisual (AV) Library furnishes agencies, organizations, and individuals with a variety of media for health and safety education. Each year the AV Library fills approximately 13,000 media requests from throughout the state, charging only for return shipping and insurance.

Parenting, childbirth, safety, AIDS, diabetes, food hygiene, poisonous snakes, smoking, dental health, breast feeding, Africanized honey bees, and women's health are just a few of the topics covered. Library customers include public schools, businesses, nursing homes, hospitals, municipal governments, clinics, churches, and universities. Targeted audiences range from very young children to property managers to health professionals.

Begun in the 1940s with a few films, the AV Library now maintains more than 2,000 health and safety media available for short-term loan. Types of media include 16mm films, books,

Continued ☞

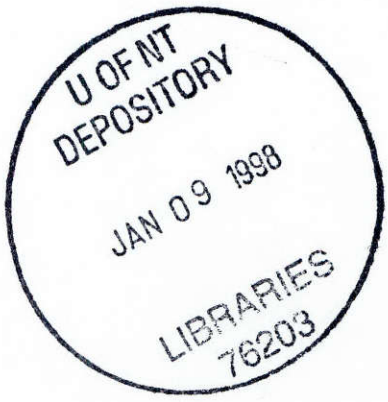
Disease Prevention News (ISSN 1068-7920) is a biweekly publication of the Texas Department of Health, Public Health Professional Education, 1100 West 49th Street, Austin, TX 78756-3199, (512) 458-7677. Periodical postage paid at Austin, TX.
http://www.tdh.state.tx.us/phpep/dpnhome.htm
TDH Healthy Texans BBS: (800) 858-5833

POSTMASTER: Send address changes to Disease Prevention News, 1100 West 49th Street, Austin, TX 78756-3199.

Disease Prevention News
Texas Department of Health
1100 West 49th Street
Austin, TX 78756-3199

Periodical Postage Paid at Austin, TX

Address Service Requested



TDH Audiovisuals, cont.

videocassettes, slide/tape programs, educational models, audiocassettes, and interactive diskettes. A limited number of materials can be used to earn continuing education credits. The programs are listed and described in the *1997 Health Media Catalog*.

Any responsible Texas resident may register to borrow media from the collection. Simply **mail or fax** a completed Statement of Responsibility Form to the following address.

Texas Department of Health
Audiovisual Library
1100 West 49th Street
Austin, TX 78756
Phone: (512) 458-7260
FAX: (512) 458-7474

The maximum loan period is 10 days from receipt of materials. Reservations can be made up to a year in advance. When possible, borrowers should submit a written request for media. Several services are also available at the AV Library's Internet homepage: **http://www.tdh.state.tx.us/avlib/avhomepg.htm**.

From this Website, you can learn more about the library and its offerings, order the catalog, and download the required registration form and the form for ordering materials. This site also provides access to email communication with the Library.

For more information, contact Jane Hazelton, of the Audiovisual Library, at 512-458-7260. Registered borrowers may contact Kelli Kennedy, also at 458-7260, for instructions on ordering media online.