pennsylvania
DEPARTMENT OF HEALTH
Bureau of Epidemiology

Pennsylvania Epi Notes

Fall 2013 Volume 3, Issue 4

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Ham-pocalypse: Two foodborne outbreaks associated with ham, Pennsylvania 2013

Outbreak #1: Foodborne Outbreak of Salmonellosis Associated with Ham Served at a Catered Event in County A

Introduction

In 2013, an astute emergency department nurse manager at a hospital in County B contacted the local state health center after identifying five patients with a diarrheal illness. All five reported attending the same catered event a few days earlier in County A. On that same day, a different hospital in County B reported a positive culture for *Salmonella* in a patient who had attended the same catered event in County A. This brief report describes the ensuing outbreak investigation.

Salmonellosis is a bacterial infection of the gastrointestinal tract. Common symptoms include diarrhea, fever and abdominal pain. Symptoms typically begin 12 to 72 hours after exposure and can last for several days.[1] Salmonellosis is a leading cause of foodborne illness and is responsible for an estimated 1.2 million infections each year, most of which are never reported.[2]

Methods

Approximately 150 to 200 persons attended the catered event. Difficulty in obtaining the event guest list resulted in a case-control study being conducted. Public health nurses were able to identify and interview some of the ill patients who attended the event. During those interviews, they obtained information on companions who attended the event but remained well. All identified attendees were interviewed with a systematic questionnaire to determine exposure to various foods and beverages available at the event. Epidemiology staff conducted bivariate and multivariate analyses to assess risk factors associated with illness.

Patient stool specimens and leftover food from the reception were secured and sent to the Bureau of Laboratories (BOL) to be tested for *Salmonella*. Positive cultures from specimens growing *Salmonella* were serotyped and molecularly characterized using pulsed-field gel electrophoresis (PFGE).

Results

A total of 35 cases and 17 controls were identified. Cases became ill between one and 14 days after the event (Figure 1). Diarrhea, abdominal cramps, headache, nausea, fever and weakness were the most frequently reported symptoms. Approximately two-thirds of the cases visited either a healthcare provider or an emergency department. Only one of the identified cases was hospitalized, and no deaths were reported. In statistical analyses of foods served at the reception, only baked ham was significantly associated with illness (Table 1, adjusted odds ratio = 5.5; 95% confidence interval: 1.3–23.3).

Seventeen of the 35 cases were confirmed by stool cultures positive for *S. enterica* serotype Enteritidis. PFGE analysis of all the patient isolates yielded an identical PFGE pattern. A sample of ham from the reception was also culture-positive for *S.* Enteritidis and had an identical PFGE pattern to patient samples (Figure 2).

(Ham-pocalypse continued)

Figure 1: Epidemic curve of illness onset dates

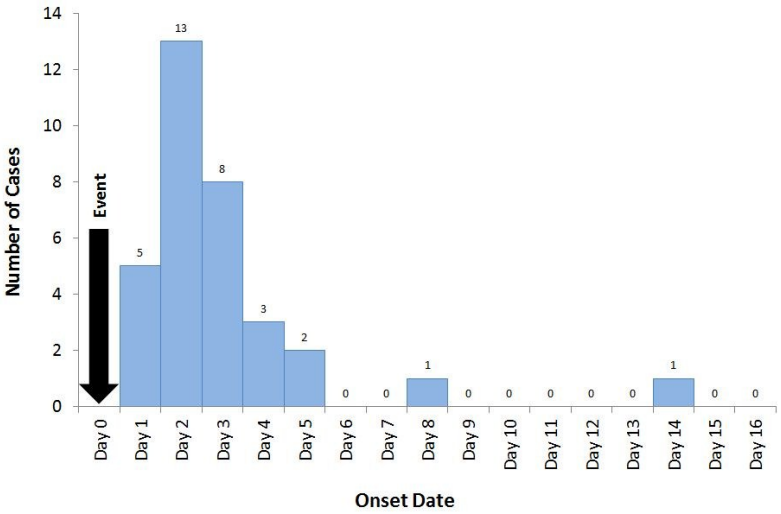
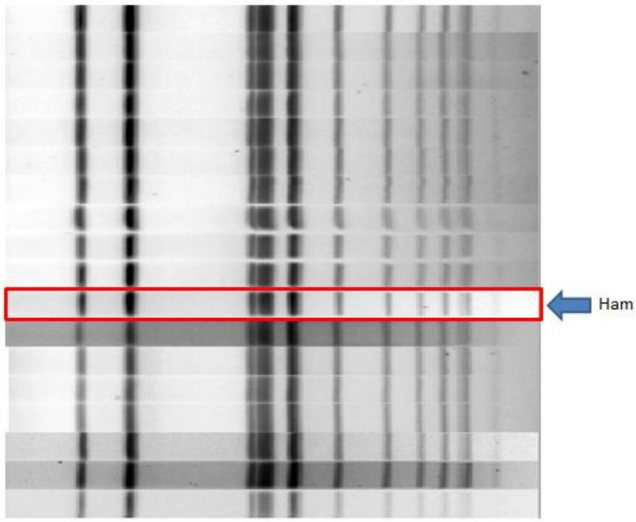


Figure 2: PFGE results for 17 cases and ham sample*



* All rows have matching PFGE patterns, indicating that the *Salmonella* bacteria from all 17 cases and the sample of ham are from the same source.

Table 1: Measures of association for selected exposures

Exposure	N Cases Exposed (%)	OR (95% CI)[a]	p-value[b]	Adjusted OR (95% CI)[d]	Adjusted p-value[e]
Baked chicken (any)	29 (94.0)	0.9 (0.1 – 10.8)	1.000[c]		
Baked chicken – white meat	19 (63.3)	0.7 (0.2 – 2.6)	0.614		
Baked chicken – dark meat	17 (56.7)	2.4 (0.7 – 8.2)	0.159		
Baked ham	23 (74.2)	4.3 (1.2 – 16.0)	0.024	5.5 (1.3 – 23.3)	0.021
Mashed potatoes	23 (74.2)	0.6 (0.1 – 2.7)	0.723[c]		
Haluski	22 (71.0)	2.2 (0.6 – 7.4)	0.212		
Pasta salad	21 (67.7)	3.5 (1.0 – 12.4)	0.047	4.1 (1.0 – 17.3)	0.057
Tossed salad	16 (55.2)	0.6 (0.2 – 2.0)	0.374		
Rolls	21 (72.4)	0.6 (0.1 – 2.5)	0.501[c]		
Butter	17 (60.7)	0.5 (0.1 – 2.0)	0.336		
Ice (in beverage)	17 (58.6)	0.1 (0.0 – 0.8)	0.016[c]		
Alcoholic beverage (any)	19 (63.3)	2.2 (0.6 – 7.6)	0.202		

[a]Odds ratio and 95% confidence intervals
[b]Chi square test unless otherwise noted
[c]Fisher exact test
[d]Adjusted odds ratio estimate based on logistic regression model including ham and pasta salad; Wald 95% confidence intervals.
[e]Wald chi-square test

Discussion

The ham product involved in this outbreak was obtained as a frozen, precooked, unsliced ham from a national food service distributor. The event caterer involved was licensed by a third-class municipality (not the Pennsylvania Department of Agriculture); the responsible local health official was notified of the outbreak and aided in the investigation. Interviews with catering staff failed to reveal food handling or preparation errors that would have contributed to bacterial contamination and growth. However, it is not suspected that the ham was contaminated at the time of purchase. Although market hogs can harbor *Salmonella*, *S.* Enteritidis is not typically detected in market hogs but is frequently associated with shell eggs and poultry.[3,4] Cross contamination cannot be ruled out, as other foods prepared for the event by the caterer contained raw poultry and eggs. Additionally, the kitchen facility that the caterer normally used was unavailable for the day and time needed for preparation. As a result, the caterer had to use a kitchen that was unfamiliar, which may have resulted in an altered workflow and increased risk of food preparation error.

(Ham-pocalypse continued)

In conclusion, this report describes a foodborne outbreak of salmonellosis which occurred in County A in 2013 among persons consuming baked ham served at a catered event. Recommendations for the prevention of future similar outbreaks include continuing education on food safety for persons in charge of licensed food operations and dedicated-use facilities for these operations whenever possible to minimize variables that may influence preparation errors and increase foodborne illness risk.

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Outbreak #2: Outbreak of Acute Gastroenteritis Associated with Ham Served at a Community Luncheon

Initial Notification

In 2013, the Pennsylvania Department of Health was notified by a hospital emergency department of a cluster of persons with acute gastroenteritis who had all attended a community luncheon. Initially, 14 ill persons were identified, six of whom had visited the emergency department.

All initially reported ill persons had attended the same annual community luncheon. The luncheon was held from 10 a.m. to 2 p.m., and take-out meals were available for purchase. The menu included sliced ham, beef barbeque (also known as sloppy joes), hotdogs, filling (also known as stuffing), mashed potatoes and gravy, green beans, ham and bean soup, and rolls with butter. For dessert, five flavors of pie and nine flavors of homemade ice cream were served.

Food Handling

Food preparation techniques were described by the luncheon staff. Seven pre-cooked hams were purchased and previously frozen for approximately one year prior to thawing at room temperature over-night, reheating, slicing, refrigerating, reheating and serving. The sliced ham was not used in the ham and bean soup. The nine flavors of homemade ice cream were made with fresh eggs that were cooked into custard prior to flavoring and freezing. Multiple leftover food items were collected for laboratory testing, including sliced ham, beef barbeque, filling and multiple ice creams.

Results

In total, 89 of the approximately 200 luncheon attendees were interviewed. Forty-five attendees (51 percent) were male, and the median age of attendees was 61 years (range 4-97 years). Seventy-seven persons (84 percent) actually attended the luncheon, with 14 (15 percent) consuming take-out meals afterwards.

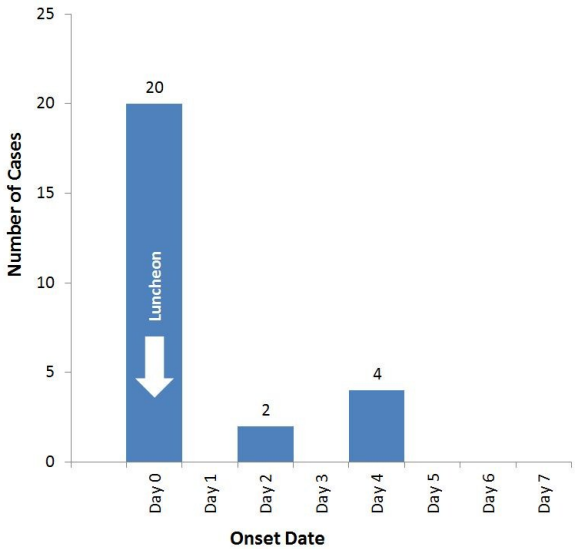
Outbreak-associated cases were defined as persons who consumed food served at the luncheon who later reported at least one symptom of: nausea, vomiting, diarrhea or abdominal cramps. In total, 27 outbreak-associated cases were identified. The most common symptoms reported by ill cases included nausea (85 percent), diarrhea (81 percent), vomiting (70 percent), fatigue (65 percent), abdominal cramps (63 percent) and chills (52 percent). Twenty cases (74 percent) reported illness onset on the day of the event (Figure 1). The short incubation period indicated a foodborne toxin, such as *Staphylococcus*

(Ham-pocalypse continued)

aureus or *Bacillus cereus,* could be the cause of illness. Seven remaining cases reported onset within four days of the event. Stool samples were collected and tested for four ill cases. However none were tested for either *S. aureus* or *B. cereus*, and all other routine tests (e.g., *Salmonella* spp., *Shigella* spp., *Campylobacter* spp., *Yersinia* spp. *E. coli* O157, *Vibrio* spp.) were negative.

Table 1 shows both epidemiologic and laboratory results by food item. Based on epidemiologic data, four food items were significantly associated with illness: sliced ham, coconut cream pie, peach pie and black walnut ice cream. Among tested food items, two bacterial pathogens and their associated toxins were identified. Sliced ham was positive for *Staphylococcus aureus* and *S. aureus* endotoxins A and B. Filling, raspberry, black walnut and peanut butter ice creams were all positive for *Bacillus cereus* and *B. cereus* endotoxin. No leftover pie of any flavor was available for testing. Though dinner rolls with butter seemed to be statistically significant, these were commercially produced, prepackaged products that were not believed to be associated with illness.

Figure 1: Epidemic curve of illness onset dates*



* Onset date was missing for one case.

Table 1: Epidemiologic and laboratory results, by food item

	Epidemiologic Results			Laboratory Results			
Food Item	**Ill/Ate Item (%)**	**Risk Ratio**	**95% CI**	***S. aureus***	***S. aureus* endotoxin A and B**	***B. cereus***	***B. cereus* endotoxin**
Entrées							
Sliced Ham	27/79 (34%)	∞	Undefined	+	+	–	–
Butter	19/45 (42%)	2.4	(1.2, 5.0)				
Dinner roll	20/51 (39%)	2.2	(1.1, 4.8)				
Green beans	21/58 (36%)	1.9	(0.9, 4.3)				
Gravy	22/64 (34%)	1.9	(0.8, 4.4)				
Mashed potatoes	22/65 (34%)	1.8	(0.7, 4.2)				
Filling/stuffing	22/65 (34%)	1.8	(0.7, 4.2)	–	–	+	+
Ham & bean soup	8/20 (29%)	1.0	(0.4, 2.0)				
Hot dog	0/8 (0%)	0.0	Undefined				
Beef barbeque	0/7 (0%)	0.0	Undefined	–	–	–	–
Homemade Ice Creams							
Black walnut	5/13 (38%)	2.0	(1.1, 4.0)	–	–	+	+
Vanilla	5/10 (50%)	1.9	(0.9, 3.9)	–	–	–	–
Raspberry	2/6 (33%)	1.4	(0.6, 3.0)	–	–	+	+
Peanut butter	0/8 (0%)	1.3	(0.6, 3.1)	–	–	+	+
PB/chocolate	4/11 (36%)	1.1	(0.4, 3.8)	–	–	–	–
Chocolate	6/11 (55%)	1.0	(0.4, 2.9)	–	–	–	–
Grapenut	3/10 (30%)	0.8	(0.3, 2.1)				
Lemon	4/16 (25%)	0.0	Undefined	–	–	–	–
Orange pineapple	0/2 (0%)	0.0	Undefined	–	–	–	–
Pies							
Peach	7/7 (100%)	4.3	(2.9, 6.5)				
Coconut cream	2/2 (100%)	3.7	(2.6, 5.2)				
Lemon meringue	2/6 (33%)	1.2	(0.4, 3.8)				
Cherry	1/5 (20%)	0.7	(0.1, 4.0)				
Chocolate meringue	1/6 (17%)	0.5	(0.1, 3.4)				

Laboratory Results

+ indicates positive test

- indicates negative test

empty cells indicate food items not tested

Discussion

Proper food handling is one of the most important steps in decreasing the risk of foodborne illness. The United States Department of Agriculture (USDA) Food Safety and Inspection Service recommends storing

(Ham-pocalypse continued)

frozen (0°F) cooked meats for only two to three months to maintain food quality. Frozen foods should not be thawed at room temperature. Safe ways to thaw frozen foods include: in the refrigerator, in cold water or in the microwave. Cold water or microwave thawed foods should be cooked and served immediately. If foods will not be served within two hours, hot foods should be kept at a minimum 104°F, and cold foods should be kept below 40°F. For more information on safe frozen food handling, please visit USDA's website on Freezing and Food Safety.

According to the Centers for Disease Control and Prevention (CDC), "*Staphylococcus aureus* is a common food bacterium" and is "important because it has ability to make seven different toxins that are frequently responsible for food poisoning." *S. aureus* bacteria can grow in salty environments like ham. While *S. aureus* bacteria are killed by proper cooking, the toxins produced by the bacteria are not heat sensitive and are not destroyed by cooking. These toxins are fast-acting, with most patients experiencing symptoms in one to six hours after eating a contaminated food. In general, the illness is mild, and symptoms include nausea, vomiting, stomach cramps and diarrhea. Most patients recover within one to three days. For more information on *Staphylococcus aureus*, please visit CDC's website on Staphylococcal Food Poisoning.

According to the United States Department of Health and Human Services (DHHS), "*Bacillus cereus* is a type of bacteria that produces toxins" and "are present in foods and can multiply quickly at room temperature." *B. cereus* can be found in multiple sources including rice, grains, leftovers and dairy. *B. cereus* toxins are also not destroyed by cooking, and symptoms can develop in 30 minutes to 15 hours after eating a contaminated food. Illness is generally mild, and symptoms include watery diarrhea, cramps, nausea and vomiting but typically last only about 24 hours. More information can be found on the DHHS website on *Bacillus cereus*.

Conclusions

This summary describes an outbreak of illness associated with a community luncheon after which approximately one-third of interviewed attendees were ill and multiple food safety issues were identified. In addition, leftover food samples tested positive for multiple bacterial pathogens and toxins. Based on food histories and laboratory results, illnesses were likely due to contamination with *S. aureus* and *B. cereus*. However, because patient stool specimens were not tested for these pathogens, we were not able to determine this definitively. Proper food handling can help to reduce the risk of foodborne illness.

Legionellosis

Legionellosis is the disease caused by *Legionella* bacteria. The disease was first described, and earned its name, following a 1976 outbreak at the American Legion convention in Philadelphia. Fifty-two species of *Legionella* and 70 serogroups have been identified, though only 22 species are associated with human disease. *L. pneumophila* is the species most commonly associated with disease and accounts for over 80 percent of legionellosis cases.

Symptoms

Legionellosis has two distinct clinical manifestations: Legionnaires' disease and Pontiac fever (Table 1). The incubation period for Legionnaires' disease is two to 10 days, most commonly five to six. For Pontiac fever the incubation period is five to 72 hours, usually 24 to 48. Patients with either manifestation commonly present with anorexia, malaise, myalgia, headache, fever, abdominal pain and diarrhea. Legionnaires' disease is the more severe form of the disease and is characterized by pneumonia and a nonproductive cough. Possible complications include lung failure and death; the case fatality rate is approximately 15 percent. Pontiac fever, on the other hand, is a self-limited illness that does not progress to pneumonia or death, and patients usually recover in two to five days without treatment.

(Legionellosis continued)

Diagnosis

There are a few different tests available for diagnosing patients with legionellosis (Table 2). The most common laboratory test used is the urine antigen test because it is rapid and will identify most legionellosis cases. However, it only detects *L. pneumophila* serogroup 1 (Lp1). Isolation of *Legionella* bacteria through culture identifies all species and serogroups but takes several days. An additional benefit of culture is that it allows comparison of clinical and environmental isolates when investigating the source of a patient's infection. Other possible diagnostic tests include paired serology, which requires three to six weeks for results, or direct fluorescent antibody staining (DFA). The Centers for Disease Control and Prevention (CDC) recommends using both urine antigen and culture in diagnosing Legionnaire's disease.[1] In addition to the laboratory tests described above, patients with Legionnaires' disease commonly have a chest x-ray to confirm pneumonia.

Treatment

The severity of Legionnaires' disease requires treatment with antibiotics and hospitalization for most cases. Pontiac fever typically resolves on its own and antibiotics are not beneficial.

Risk factors

Several risk factors increase a person's susceptibility to legionellosis. These include:

- Increasing age (Figure 1, most cases are over 50 years of age),
- Smoking,
- Diabetes,
- Chronic lung disease (such as COPD or emphysema),
- Renal disease,
- Malignancy,
- Compromised immunity (organ transplant recipients or patients on steroids), or
- Being male (Figure 2).

Table 1: Legionnaires' disease vs. Pontiac fever

	Legionnaires' disease	Pontiac fever
Clinical features	Pneumonia	Flu-like illness
Hospitalization	Common	Uncommon
Treatment	Antibiotics	None
Case fatality rate	5-40%	0%
Attack rate	<5%	>85%
High risk groups	Age 50+, smokers, immunosuppressed, diabetes, COPD	None
Incubation period	2-10 days	1-3 days
Isolation of organism	Possible	Virtually never
Pathogenesis	Replication of organism	Inflammatory response to endotoxin

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Table 2: Diagnostic tests for legionellosis

Test	Advantages	Disadvantages
Culture	• Clinical and environmental isolates can be compared • Detects all species and serogroups • 100% specific	• Technically difficult • Slow (>5 days to grow) • Sensitivity highly dependent on technical skill
Urine antigen	• 60-80% sensitive, >99% specific (for Lp1 only) • Rapid (same day)	• Can only detect *L. pneumophila* serogroup 1 (Lp1) antigen • Limited utility when compared to environmental isolates
Serology	• Unaffected by antibiotic treatment • 70-80% sensitive, >90% specific	• MUST have paired sera • 5-10% of population has titer ≥1:256
DFA	• Can be performed on pathologic specimens • 95% specific	• 25-75% sensitive

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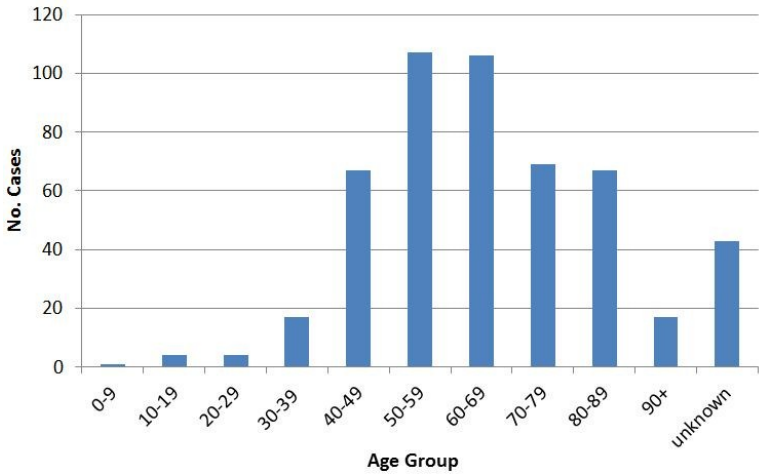
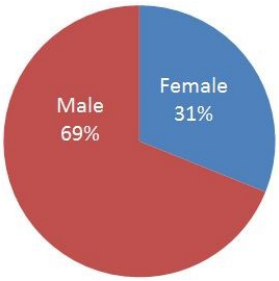
Figure 1: Legionellosis cases by age group, Pennsylvania 2011



Data from Pennsylvania National Electronic Disease Surveillance System (PA-NEDSS)

(Legionellosis continued)

Figure 2: Legionellosis cases by sex, Pennsylvania 2011



Data from Pennsylvania National Electronic Disease Surveillance System (PA-NEDSS)

Transmission

Legionellosis is not transmitted person-to-person. It is a waterborne disease with airborne transmission. It is acquired through inhalation of aerosolized water or aspiration of drinking water contaminated with *Legionella*. The bacteria grows well in warm water temperatures (25-42°C, 77-108°F), stagnation, scale and sediment, biofilms, in the presence of amoebae, and at low biocide levels. It has been documented in potable water systems (including showers, sinks, drinking fountains and ice machines), air conditioning cooling towers, evaporative condensers, humidifiers, whirlpool spas, respiratory therapy devices and decorative fountains. There is no evidence that *Legionella* grows in car or window air conditions. Natural rubbers, wood and some plastics support the growth of *Legionella,* while copper inhibits it. *Legionella* bacteria are found naturally in fresh water, but natural environments such as lakes and rivers do not have the bacteria in sufficient quantities to cause transmission.

Prevention

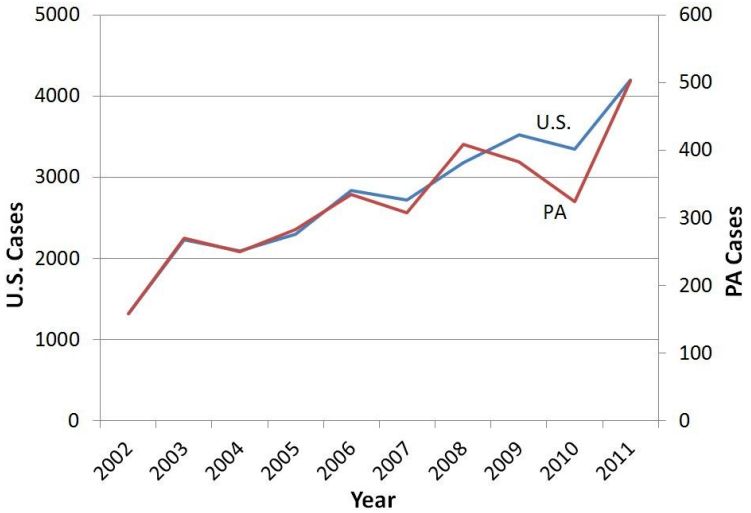
The best way to prevent legionellosis is to prevent the conditions needed for *Legionella* growth. Persons at high risk for infection may want to avoid activities that put them at risk, such as drinking tap water or using whirlpool spas.

Trends

In the United States, fewer than 4,500 cases of legionellosis are reported annually,[2] yet it is estimated that there are 8,000 to 18,000 hospitalizations due to the illness each year. The discrepancy has been attributed to underdiagnosis and underreporting.[3] In Pennsylvania, between 300 and 500 cases of legionellosis are reported annually. The number of reported cases per year has been increasing steadily in both Pennsylvania and the United States overall (Figure 3). One reason for the increase is that the population is aging. Other factors that may play a role are an increased population of persons at high risk for infection and improved diagnosis and reporting.[4,5]

Incidence rates of legionellosis are highest in the northeastern area of the United States, and Pennsylvania generally has one of the highest annual incidence rates by state (Table 3).

Figure 3: U.S. and Pennsylvania Legionellosis cases by year, 2002-2011



U.S. data from MMWR: Summary of Notifiable Diseases
Pennsylvania data from Pennsylvania National Electronic Disease Surveillance System (PA-NEDSS)

Table 3: Top ten states by legionellosis incidence rates, 2011

Rank	State	Rate per 100,000 persons
1	Pennsylvania	3.95
2	Massachusetts	3.67
3	Ohio	3.35
4	New York (State + City)	3.18
5	Rhode Island	2.76
6	New Jersey	2.67
7	Delaware	2.67
8	Maryland	2.48
9	Connecticut	2.27
10	New Hampshire	1.97

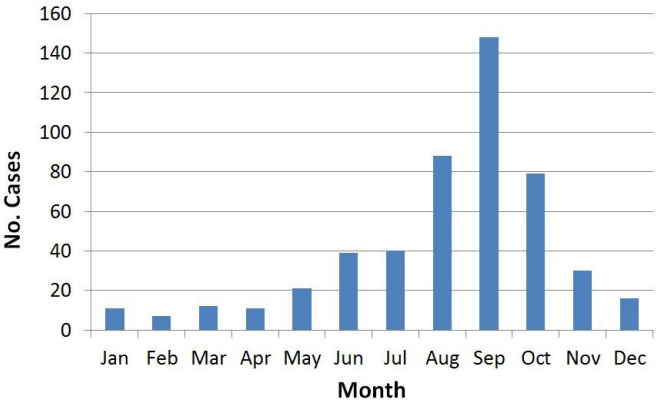
State case counts from MMWR Summary of Notifiable Diseases – United States, 2011
Rates calculated using 2010 U.S. Census data

(Legionellosis continued)

Cases can occur at any time of year, but most occur in summer and early fall (Figure 4). Several research studies have examined the impact of meteorological conditions on the risk of acquiring legionellosis. A common finding has been that warm, humid and wet weather increases the risk of illness,[6-11] which may explain the seasonal and geographic patterns of legionellosis in the United States.

In June 2013, many states in the Mid-Atlantic region and New England noted dramatic increases in the number of reported legionellosis cases. Although no formal analyses comparing weather and disease incidence have been completed to date, the National Oceanic and Atmospheric Administration (NOAA) determined that the summer months of 2013 were warmer and wetter than average in the Mid-Atlantic region and New England.[12] This weather pattern may have led to the increased number of cases.

Figure 4: Legionellosis cases by month, Pennsylvania 2011



Data from Pennsylvania National Electronic Disease Surveillance System (PA-NEDSS)

Outbreaks

In an effort to identify outbreaks, all reported cases of legionellosis are interviewed by public health nurses. Nurses use a structured questionnaire to ask cases about possible exposures they may have had in the 10 days prior to illness onset (see list at right), and the data is subsequently reviewed by an epidemiologist to identify risk factors mentioned by more than one case. If a common risk factor is identified, an outbreak investigation may begin. Efforts to identify outbreaks are hindered when cases are too ill to be interviewed, don't want to be interviewed or are unable to recall exposures.

Outbreaks of Legionnaires' disease can be difficult to detect due to low attack rates. The task is even more difficult in *Legionella* hot spots (such as some areas of Pennsylvania) and during the summer and early fall, when there is a seasonal increase in the number of cases. The easiest outbreaks to detect are those associated with cases' residences' or places they've stayed on a temporary basis. In recent years, Legionnaires' disease outbreaks in Pennsylvania have been linked to hotels, hospitals, outpatient healthcare facilities, correctional facilities, assisted living facilities, long-term care facilities and senior housing.

Possible exposures

- Overnight travel
- Excursions or day trips (e.g., casino, exhibit, fair)
- Use of nebulizer, CPAP, BiPAP, or any other respiratory therapy equipment for the treatment of sleep apnea, COPD, asthma or for any other reason
- Healthcare exposures (inpatient, out-patient, visitor, volunteer or employee at hospital, long-term care, rehab, skilled nursing facility or clinic)
- Assisted living or senior living (resident, visitor, volunteer or employee)
- Exposure to mists (e.g., decorative fountain, humidifier, steam room, water park, produce mister)
- Use of whirlpool spa
- Dental work

Resources

CDC *Legionella* website
Control of Communicable Diseases Manual
Red Book

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(Legionellosis continued)

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Public Health Planning for the Annual Little League Baseball® World Series

A mass gathering (MG) is typically defined by planners as a congregation of more than 1,000 persons in a specified location for a defined period of time and for a specific purpose; some literature describes the attendance as more than 25,000 persons. The World Health Organization (WHO) more broadly defines an event as an MG "if the number of people attending is sufficient to strain the planning and response resources of the community, state or nation hosting the event".[1] The length of time of a mass gathering may be from several hours to several days and the event might be planned or unplanned.[2,3] Although MG events have been taking place for centuries, attention to enhanced public health planning for these events has intensified since the 1980s, following the Institute of Medicine reports of 1988 and 2002. Public health planning is crucial for MGs in order to prevent or reduce the risk of ill health or injury and to enhance safety for participants, spectators, event staff and residents local to the event.[4] Potential public health threats at an MG may be influenced by the reason for the gathering. For instance, a summertime outdoor event may pose a risk of heat-related illness, or a highly-charged rock concert may pose risk of physical injury or alcohol-related incidences.[2,4,5] The most commonly reported health problems at MGs are injuries, respiratory or cardiac problems, heat-related illnesses, drug- or alcohol-related effects, and gastrointestinal illnesses.[5] In addition, the potential use of a weapon of mass destruction (chemical or biological agent, radionuclear device, or explosive device) exists at an MG, because of the large number of people that could be affected and the high-profile impact of an attack, especially at those with mass-media coverage.[2,4] However, the WHO advises that the risk of such an event at an MG ranks low compared to other health risks and should be considered when planning but not "allowed to dominate the process".[1]

Although infectious diseases have historically not been the cause of the majority of adverse health events at MGs, especially sporting MGs, the circumstances are ideal for the spread of communicable diseases.[1,5] Events that are attended by visitors from other nations may increase the risk for importation of infectious diseases not endemic to the host site; conversely, travelers to MGs may become infected with a disease

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not endemic in their home country while at the event and transport the disease back to their home environment, potentially starting new epidemics.[1,4,6] Recent examples of outbreaks that have occurred in association with MGs include: a measles outbreak at the 2010 Winter Olympics in Vancouver, Canada; a norovirus outbreak during the 2006 Football World Cup held in Germany; an influenza outbreak during World Youth Day 2008 in Australia; and recurrent meningococcal meningitis and other communicable disease outbreaks during the Hajj pilgrimage to Saudi Arabia.[1,3,7]

Because of the risk of infectious disease transmission, the WHO emphasizes the importance of planning before an MG takes place. To address topics related to communicable diseases at an MG, the agency has developed guidelines specifically related to management of communicable disease issues that affect health and safety:

- **Risk assessment** entails identification of infectious diseases that could pose a risk, assessment of likelihood of their occurrence, and assessment of their potential impact on the participants and host community.
- **Disease surveillance**, in the form of enhanced epidemiological surveillance and syndromic surveillance, is essential to improve disease detection.
- Finally, it is important to have an event management system in place in order to quickly **detect, verify, and respond** to an outbreak at an MG.[1]

The Little League Baseball® World Series (LLBWS) is a youth sports event held in South Williamsport, Pennsylvania each August. The tournament of 30 games, played over 11 days, brings together 16 international and U.S. Little League baseball teams, their supporters and baseball fans from all over the world. Although attendance varies each year, the event usually draws at least 300,000 persons. International teams represent all regions of the world: Mexico, Japan, Latin America, Europe and Africa, the Caribbean, Canada, Australia, and Asia-Pacific.[8] During the time teams are participating in the LLBWS, players, coaches and managers are housed in the Dr. Creighton J. Hale International Grove (The Grove), a limited-access complex in which housing, meals, recreation and medical care are provided.[9]

The Pennsylvania Department of Health (PADOH) has worked with staff at Little League International since 2004 to prepare for the annual event, with activities evolving from event-specific syndromic surveillance to broader public health risk assessment and response planning. In keeping with WHO guidelines, the risk assessment not only identifies hazards or diseases that may be present in the host community or that may be imported but also evaluates population vulnerability and potential public health impact.[1] The PADOH Bureau of Epidemiology conducts an extensive disease risk assessment to identify infectious diseases that pose a risk of occurrence at the LLBWS. In order to determine which infectious diseases might be a risk, a variety of global surveillance sources are utilized. Official surveillance data is accessed from the websites of several agencies, including Centers for Disease Control and Prevention (CDC), WHO and regional WHO (e.g., Pan American WHO), European Centre for Disease Prevention and Control, and national/state/provincial health departments. For example, a nationwide outbreak of rubella in Japan was well-publicized on several sites, including that of the CDC and the Japanese National Institute of Infectious Disease, two months before the LLBWS.[10] In addition to official health data, most of these sites also post health alerts and advisories, as well as press releases providing public health advice for people in their jurisdiction. Informal data sources, such as HealthMap Project, Global Public Health Intelligence Network, and the National Travel Health Network and Centre, are also reviewed to uncover potential threats. Although these latter sources are considered unofficial, they often publish official alerts and advisories from governmental sources when outbreaks are emerging.

Determination of vulnerability to disease can take several forms. Review of specific international immunization information may suggest which visitors may be under-immunized and at risk for infection. For instance, if a country only recommends one dose of measles virus-containing vaccine, individuals from those countries may be susceptible to measles, since up to 5 percent of single-dose recipients fail to develop antibodies to measles.[11] The WHO makes available select immunization coverage rates and current immunization schedules for 67 different vaccines for over 180 nations. Another vulnerability that may exist at MGs is that of foodborne and waterborne illness, especially at venues with compromised

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food or water hygiene.[12] At the LLBWS, the Pennsylvania Department of Agriculture performs food safety inspections for both The Grove and the concession venues for spectators to ensure conformance to food handling guidelines and regulations.[13] Since the LLBWS always takes place in the summer, there may be concern over West Nile virus or other vector-borne diseases. The Pennsylvania Department of Environmental Protection conducts surveillance for arboviral diseases through mosquito and avian testing. If a threat is identified, mosquito control measures are carried out. Some attendees at the LLBWS could arrive from tropical areas with vector-borne diseases such as dengue or malaria. This could be a risk to other attendees if the vector required for transmission is present in Pennsylvania. Finally, other vulnerabilities, such as safe crowd movement, heat-illness risks and individual injury are addressed by staff associated with the LLBWS.

WHO guidelines advise that public health officials plan for both disease detection and response preparedness. Communicable disease surveillance systems should be planned well in advance of the event taking place. If an outbreak occurs, surveillance systems may need to be enhanced as part of the public health response.[1] In order to monitor health events at the LLBWS, PADOH utilizes two existing systems. The Pennsylvania National Electronic Disease Surveillance System (PA-NEDSS) is used statewide for routine reports of certain communicable diseases. Another surveillance system, Health Monitoring System's EpiCenter, provides syndromic surveillance of emergency department registrations. In addition, event organizers and medical and first aid staff are encouraged to immediately contact PADOH to verbally report any disease or potential outbreak. Should an outbreak be identified, PADOH may set up an active surveillance system with event organizers and/or local emergency rooms to more quickly identify cases associated with the outbreak. The PADOH Bureau of Laboratories (BOL) is a crucial partner in outbreak identification and response. Testing offered by BOL not only aids in diagnosis of a suspected case of disease but may also help PADOH determine whether contacts of the case may be susceptible to illness. Finally, since many spectators travel great distances and lodge in the region, PADOH issues a Health Advisory through its Health Alert Network to make hospitals and emergency response staff aware of potential communicable disease threats, especially those that are not endemic in Pennsylvania.[14]

Finally, materials provided to the LLBWS staff contain information about some non-communicable infectious diseases, such as American trypanosomiasis (Chagas disease), dengue fever and leishmaniasis. Although conditions such as these have a low potential to cause an outbreak at the event, an attendee could seek treatment for an illness acquired elsewhere. Since these conditions are not commonly seen by providers in Pennsylvania, technical fact sheets for many infectious diseases are included with the materials to aid providers in consideration of differential diagnoses.

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Cases of select notifiable diseases in Pennsylvania *

(as of 11/25/2013)

	Total cases reported for previous 5 years				
	2013 †	**2012**	**2011**	**2010**	**2009**
Chlamydia	47,309	54,993	52,884	47,518	43,068
Gonorrhea	12,607	15,390	13,770	12,883	10,138
Salmonellosis	1,418	1,663	1,844	1,802	1,701
Campylobacteriosis	1,355	1,427	1,762	1,622	1,542
Giardiasis	642	651	792	783	837
Pertussis (whooping cough)	431	1,631	547	762	468
Legionellosis	396	300	502	324	383
Varicella (chicken pox)	226	294	337	403	461
Cryptosporidiosis	215	287	457	484	465
Shigellosis	121	126	121	634	1,201

* Confirmed cases only
† Case counts for 2013 are provisional and subject to change. Counts for earlier years are for complete years.

Disease Reporting

Healthcare practitioners, healthcare facilities and clinical laboratories are required to report certain diseases to the Pennsylvania Department of Health. In addition to the diseases on the list, all disease outbreaks and/or unusual occurrences of disease are reportable within the commonwealth. In most cases, reporting must be done electronically via Pennsylvania's version of the National Electronic Disease Surveillance System (PA-NEDSS). To request a PA-NEDSS account, healthcare providers may email PA-NEDSS@pa.gov; please include your contact information and the name and address of the facility for which you will be reporting.

For employment opportunities, visit the Pennsylvania State Civil Service Commission website.

Pennsylvania Epi Notes

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This newsletter is published quarterly at www.health.state.pa.us/epinotes.
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